Port of Gisborne

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

Biosecurity New Zealand Technical Paper No: 2005/11

Prepared for BNZ Post-clearance Directorate
by Graeme Inglis, Nick Gust, Isla Fitridge, Oliver Floerl, Chris Woods, Barbara Hayden, Graham Fenwick

NIWA
Taihoro Nukurangi

ISBN No: 0-487-07917-6
ISSN No: 1176-838X

March 2006

Disclaimer

While every effort has been made to ensure the information in this publication is accurate, the Ministry of Agriculture and Forestry does not accept any responsibility or liability for error or fact omission, interpretation or opinion which may be present, nor for the consequences of any decisions based on this information.

Any view or opinions expressed do not necessarily represent the official view of the Ministry of Agriculture and Forestry.

The information in this report and any accompanying documentation is accurate to the best of the knowledge and belief of the National Institute of Water & Atmospheric Research Ltd (NIWA) acting on behalf of the Ministry of Agriculture and Forestry. While NIWA has exercised all reasonable skill and care in preparation of information in this report, neither NIWA nor the Ministry of Agriculture and Forestry accept any liability in contract, tort or otherwise for any loss, damage, injury, or expense, whether direct, indirect or consequential, arising out of the provision of information in this report.

Requests for further copies should be directed to:

Publication Adviser
MAF Information Bureau
P O Box 2526
WELLINGTON

Telephone: (04) 474 4100
Facsimile: (04) 474 4111

This publication is also available on the MAF website at www.maf.govt.nz/publications

© Crown Copyright - Ministry of Agriculture and Forestry

Contents

Executive Summary

This report describes the results of a January 2003 survey to provide a baseline inventory of native, non-indigenous and cryptogenic marine species within the Port of Gisborne.

- 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 habitats within the Port of Gisborne. Fouling assemblages were scraped from hard substrata by divers, benthic assemblages were sampled using a sled and benthic grabs, and a gravity corer was used to sample for dinoflagellate cysts. Mobile predators and scavengers were sampled using baited fish, crab, starfish and shrimp traps.

- The distribution of sampling effort in the Port of Gisborne 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 205 species or higher taxa were identified from the Gisborne Port survey. They consisted of 130 native species, 14 non-indigenous species, 17 cryptogenic species (those whose geographic origins are uncertain) and 44 species indeterminata (taxa for which there is insufficient taxonomic or systematic information available to allow identification to species level).

- The 14 non-indigenous organisms described from the Port of Gisborne included representatives of six phyla. The non-indigenous species detected (ordered alphabetically by phylum, class, order, family, genus and species) were: (Annelida) *Euchone limnicola* and *Pseudopolydora paucibranchiata*, (Bryozoa) *Bugula neritina*, *Tricellaria inopinata*, *Cryptosula pallasiana*, *Celleporaria noduosa* and *Watersipora subtorquata*, (Crustacea) *Monocorophium acherusicum* and *Cancer amphioetus*, (Mollusca) *Theora lubrica* and *Polycera hedgpethi*, (Phycophyta) *Undaria pinnatifida*, (Urochordata) *Ascidiella aspersa* and *Cnemidocarpa sp*. Three of these species - the bryozoan *Celleporaria nodulosa*, the crab *Cancer amphioetus*, and the ascidian *Cnemidocarpa sp*. - had not previously been described from New Zealand waters.

- Four species of sponge (*Dysidea* n. sp. 1, *Euryspongia* n. sp. 2, *Halichondria* n. sp. 1, *Haliclona* n. sp. 10), an isopod (*Cirolana* sp. nova), and a pycnogonid (?*Tanystylum* sp. nov. B) found in the Port of Gisborne did not match existing species descriptions from New Zealand or overseas and may be new to science.

- The only species from the Port of Gisborne 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.

- Approximately 64.3 % (nine of 14 species) of NIS in the Port of Gisborne are likely to have been introduced in hull fouling assemblages, 7.1 % via ballast water and 28.6 % could have been introduced by either ballast water or hull fouling vectors.

- The predominance of hull fouling species in the introduced biota of the Port of Gisborne (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.

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

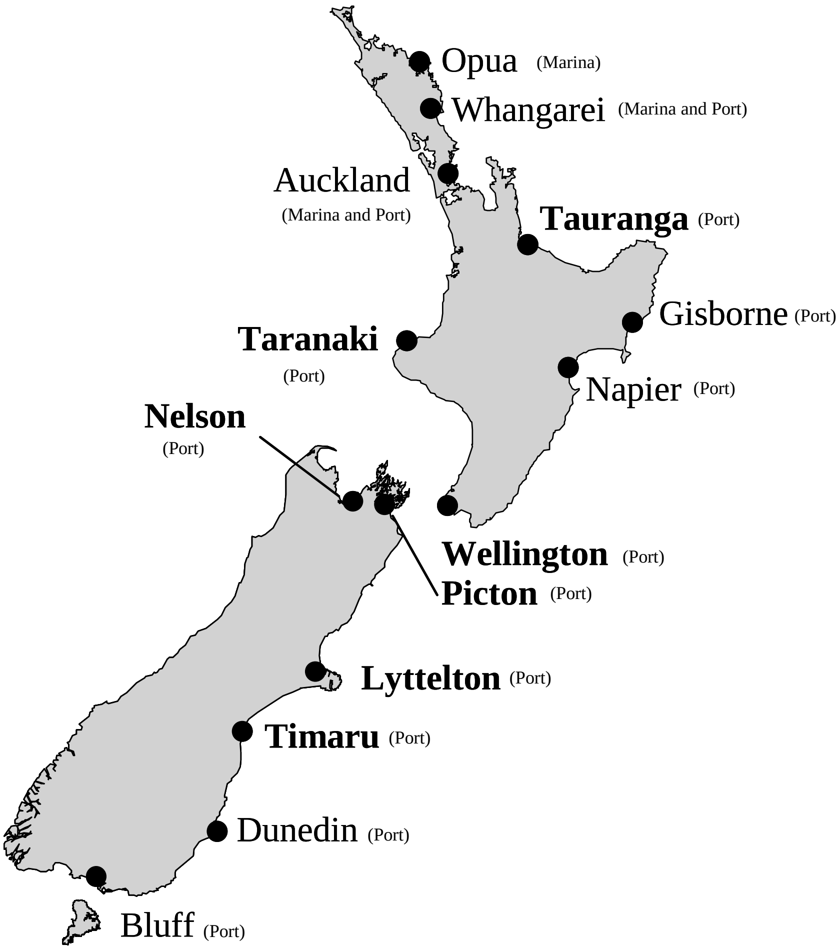

Figure 1: Commercial shipping ports in New Zealand where baseline non-indigenous species surveys have been conducted. Group 1 ports surveyed in the summer of 2001/2002 are indicated in bold and group 2 ports surveyed in the summer of 2002/2003 are indicated in plain font. Marinas were also surveyed for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

The port surveys have two principal objectives:

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.

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 Gisborne 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.

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

DESCRIPTION OF THE PORT OF GISBORNE

The Port of Gisborne (38° 67'S, 178°02'E) is located on the northeastern side of Poverty Bay beside the mouth of the Turanganui River on the east coast of the North Island (Fig. 2). The entrance to Gisborne Harbour is approximately 93 m wide and 10.5 m deep, with a length of 1.6 km leading to the Port. The Port of Gisborne is an important export port for the North Island forestry trade (Inglis 2001).

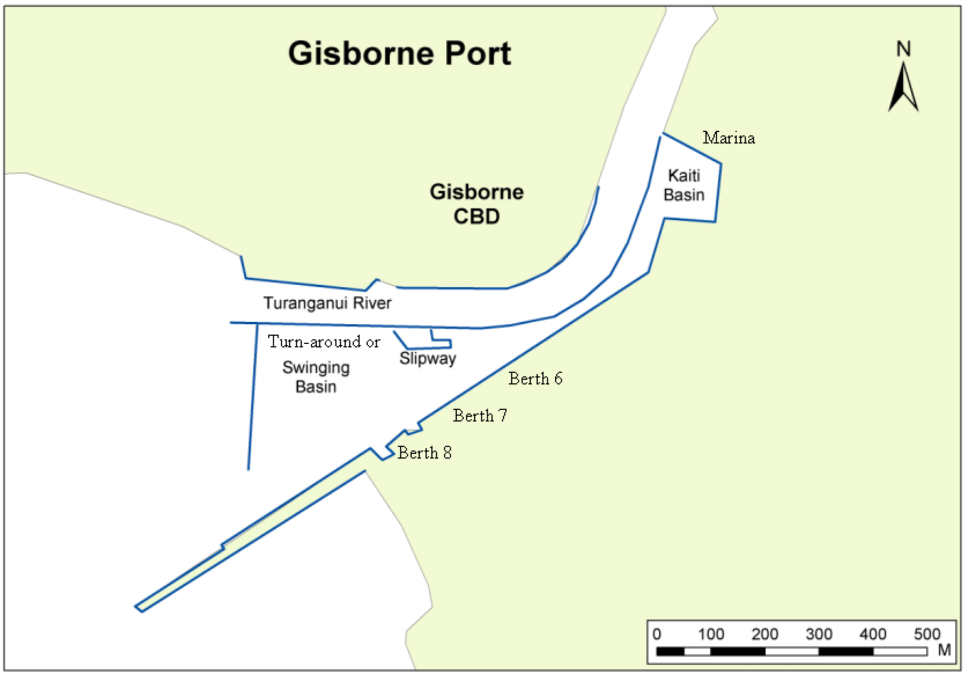

Figure 2: Gisborne Port map.

PORT OPERATION AND SHIPPING MOVEMENTS

The Turanganui River is the landing place of the Horouta canoe from the Great Migration (Halbert 1999). Port construction began in the 1870's with the initial laying-out of the township. Initial trade through the port revolved around the frozen meat industry and coastal lighter trade. The Port of Gisborne had its first major development in the 1920's with the division of the Turanganui River by a diversion wall, to create the current basic port structure. In 1963, the tonnage handled was 93,000 tons, with the main exports being wool, meat, and dairy produce (www.teara.govt.nz). In 1997, improvements were made to Wharf No. 7, and a new Wharf (No. 8) constructed (www.fletcherconstruction.co.nz) to expand container ship berthing and handling facilities.

The port (owned and operated by Eastland Port Ltd, www.e-c.co.nz, which is in turn owned by the Eastland Energy Community Trust, www.eastland.co.nz) currently handles a wide variety of cargoes, including timber, sawdust, cement, fertilizer, seafood and cars, and plays an important economic role in the Gisborne/East coast region, particularly with the increasing importance of the forestry industry in the region. Freight, fishing, cruise-liners and LPG vessels from all over New Zealand and a number of international ports frequent the Port of Gisborne. The physical dimensions of the port allow vessels up to 195 m in overall length to enter the port (www.e-c.co.nz). The Port has a total of eight main wharves that can accommodate ships of a wide variety of sizes, with two international wharves (Fig. 2). The outer port region is largely commercial; with the inner harbour largely a marina for recreational vessels and burgeoning café/restaurant facilities. Berth construction is typically concrete decking uopn a mixture of concrete (at the wharf face) and steel sheet piling (behind the wharf face) with wooden fendering. Details of the berthing facilities available in the Port are provided in Table 1.

Shipping figures supplied by Eastland Port Ltd for 2004 showed a total of 512,000 tonnes of foreign shipping (500,000t international import/export and 12,000t coastal transhipments) and 5,031t in New Zealand shipping (coastal domestic) (source: Gavin Murphy, Eastland Port Ltd). The port usually handles 80-100 trade vessels per annum, the majority of which are forestry-related. In 2000, there were 35 registered fishing vessels in the Port of Gisborne (Sinner et al 2003), which fish for a variety of finfish and spiny lobster. Passenger liners frequenting the port usually arrive from, or depart to other domestic ports such as Lyttelton, Tauranga and Wellington (www.eastland.co.nz).

Recent analyses of shipping arrivals show that the Port of Gisborne received 38 international ship visits during 2002/2003 (36 merchant, 1 pleasure, and 1 barge/tug vessels). During this period, most commercial vessels entering the port arrived from the northwest Pacific (68.1 %), Australia (14.9 %), east Asia (6.4 %), the south Pacific (2.1 %), and the northeast Atlantic (2.1 %) (Campbell 2004).

Vessels unable to be berthed immediately in the port may anchor outside the port at an international anchorage point (38°43.25'S, 177°58.6'E) (Wayne Turner, Eastland Port Ltd, pers. comm.).

Vessels are expected to comply with the Voluntary Controls on the Discharge of Ballast Water in New Zealand (www.fish.govt.nz/sustainability/biosecurity/:); 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. According to Inglis (2001), a total volume of 94,284 m^3 of ballast water was discharged in the Port of Gisborne in 1999, with the largest country-of-origin volumes of 41,469 m^3 from Japan, 8,890 m^3 from Australia, 7,456 m^3 from South Korea, and 30,000 m^3 unspecified.

There is on-going maintenance dredging within the port. This typically results in the removal of approximately 100,000 m^3 of sediment, with spoil disposal approximately 3 nautical miles southwest towards Young Nicks Head. As water depth where spoil disposal occurs is >20 m the spoil ground is not marked on nautical charts, but is regularly monitored for buildup (Wayne Turner, Eastland Port Ltd, pers. comm.).

Port Gisborne Ltd has planned a major expansion of the port to keep up with projected growth in trade in forestry goods, with provision of deep water berths and land reclamation to expand operational space to allow handling of up to 1.2 million tonnes per annum (Turnpenny et al 2003). The proposal is to extend the western breakwater, Wharf No. 8, and outer southern side of the port with an additional breakwater and three berths (at a length of 312m, 200 m, and 284 m respectively). However, this expansion will only take place if certain trade volume triggers are reached. The current emphasis is on optimising the current footprint and improving operational efficiency (Wayne Turner, Eastland Port Ltd, pers. comm.).

PHYSICAL ENVIRONMENT OF GISBORNE HARBOUR

Gisborne Harbour (Fig 2) is a small, narrow harbour separated from the Turanganui river mouth by a diversion wall and small section of reclaimed land. The harbour is approximately 93 m wide and 1.6 km long with a turn-around basin of 225 m. A dredged channel of around 10 m depth is maintained to allow passage to the two international wharves (No. 7 & 8 wharves), and a minimum depth of 8 m is maintained in the turn-around basin. The harbour opens to the south-west and includes a section of breakwall, which provides adequate shelter except in the event of a south-westerly swell. Tidal range within the port is 1.36 m.

EXISTING BIOLOGICAL INFORMATION

Over the last three decades there have been few biological surveys carried out in Gisborne Harbour and Port. We briefly review these studies and their findings below.

Hewitt (1998) reviewed the available information on the effect of the Gisborne sewage outfall on the benthic ecology of the surrounding area in a confidential client report for the Gisborne District Council. The outfall is situated approximately 1.5 km from the Port of Gisborne. One study reviewed in this report found a "polluted" zone occurred within 200 m of the diffusers and a "transitional" zone in the benthic community extending to between 800 and 1,600 m from the Gisborne outfall (Roper et al 1989). They found the number of taxa lowest nearest the outfall, with increasing number of taxa further away from the outfall.

The invasive kelp *Undaria pinnatifida* was identified in the Port of Gisborne in 1999, and this port is deemed in the optimal temperature zone for this macroalga (Forrest et al 2000; Sinner et al 2000).

According to Turnpenny *et al.* (2003), the papa (mudstone) reefs around the port area are typified by mainly flat inter-tidal platforms that become more dissected and complex subtidally. The reefs are inhabited by an array of algae (turfing and crustose intertidally and kelp subtidally), sessile (barnacles and tube worms) and mobile invertebrates (sea urchins, crabs etc.) and fishes common to the east coast of the North Island, although the authors did not examine the area around the port.

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 Port of Gisborne survey. The survey was undertaken between the 22nd and 25th of January 2003. Most sampling was concentrated around 4 locations at Berths 6, 7, 8 and marina Berth 1.

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.

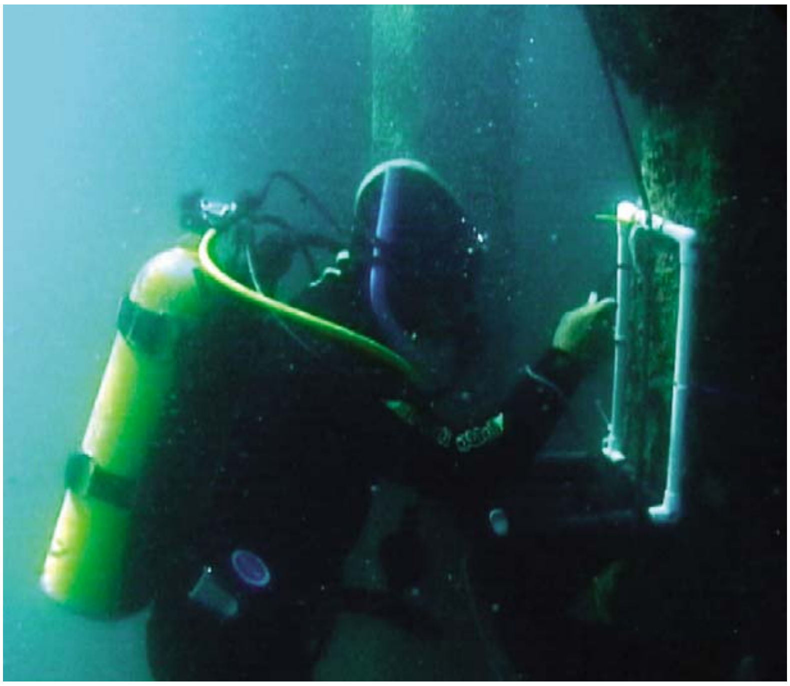

Figure 3: Diver sampling organisms on pier piles.

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 5m 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 *pers obs*). Three grab samples were taken at haphazard locations along each sampled berth. Sediment samples were washed through a 1-

mm mesh sieve and animals retained on the sieve were returned to the field laboratory for sorting and preservation.

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.

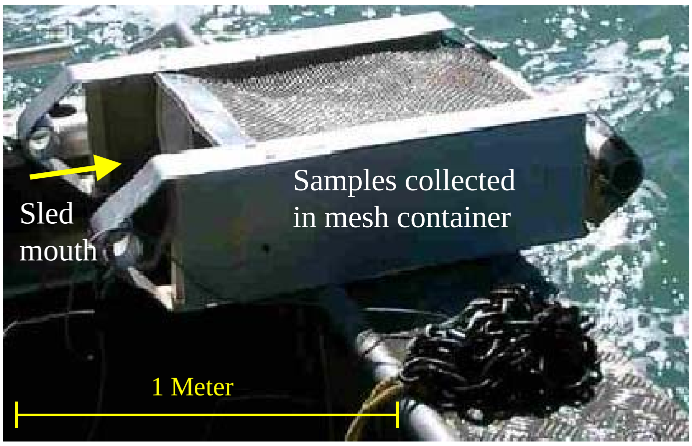

Figure 5: Benthic sled

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).

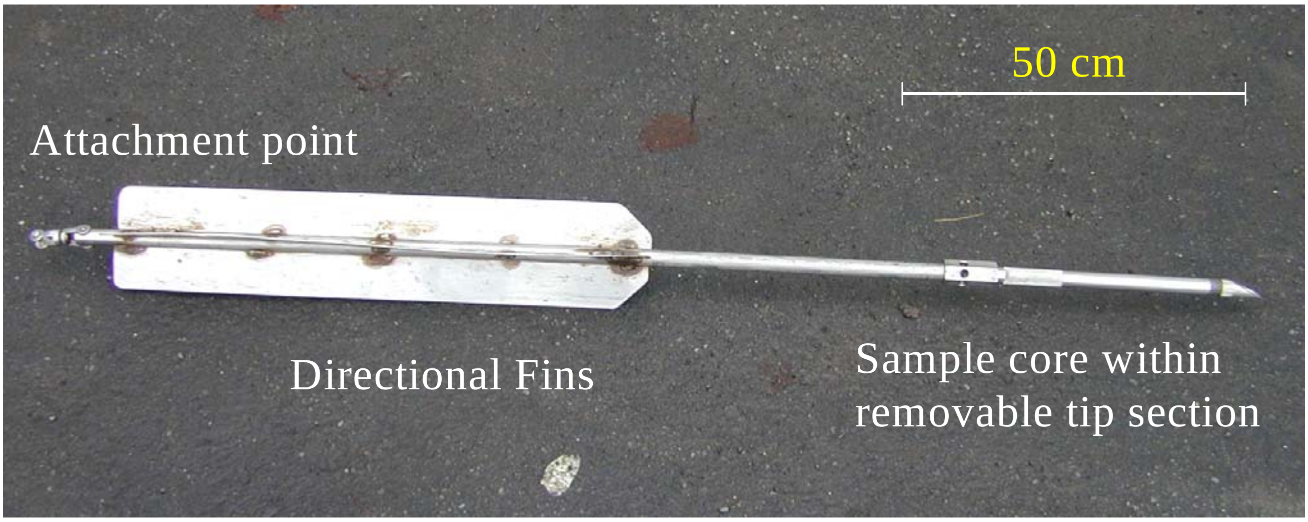

Figure 6: Javelin corer

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 1 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 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. 7). 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.

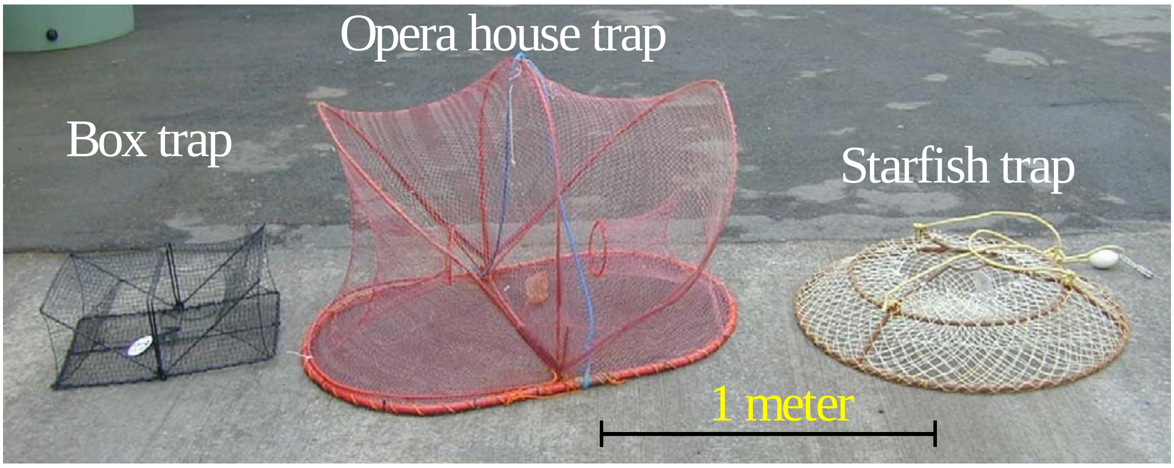

Figure 7: Trap types deployed in the port.

SAMPLING EFFORT

A summary of sampling effort within the Port of Gisborne 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 number of quadrats sampled on each pile relative to 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.

The spatial distribution of sampling effort for each of the sample methods in the Port of Gisborne is indicated in the following figures: diver pile scrapings and dinoflagellate cyst sampling (Fig. 8), benthic sledding and benthic grab sampling (Fig. 9), box, starfish, opera house fish, and shrimp trapping (Fig. 10). 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 in each of the thirteen Ports and three marinas surveyed over two summers is summarised in Table 3c.

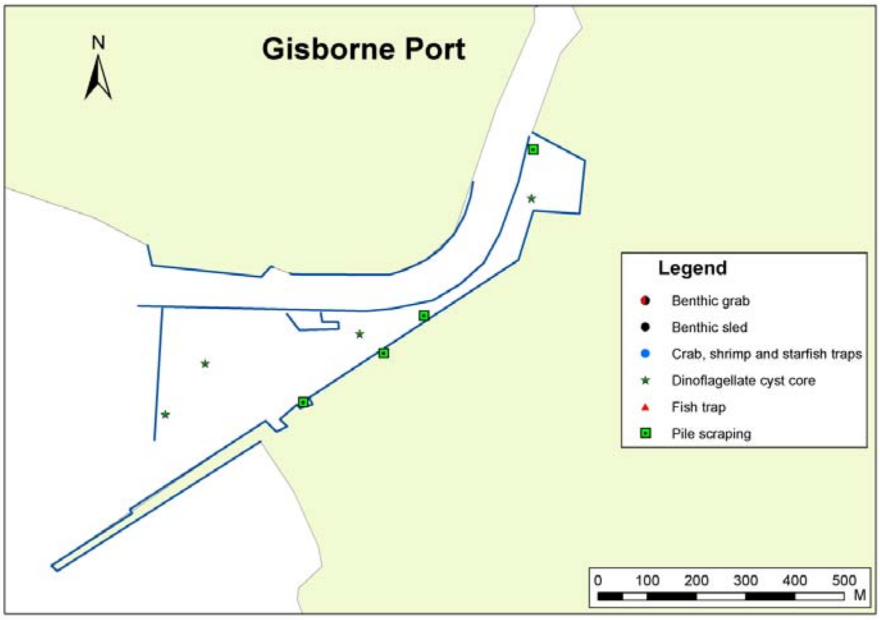

Figure 8: Diver pile scrape sites and dinoflagellate cyst sample sites

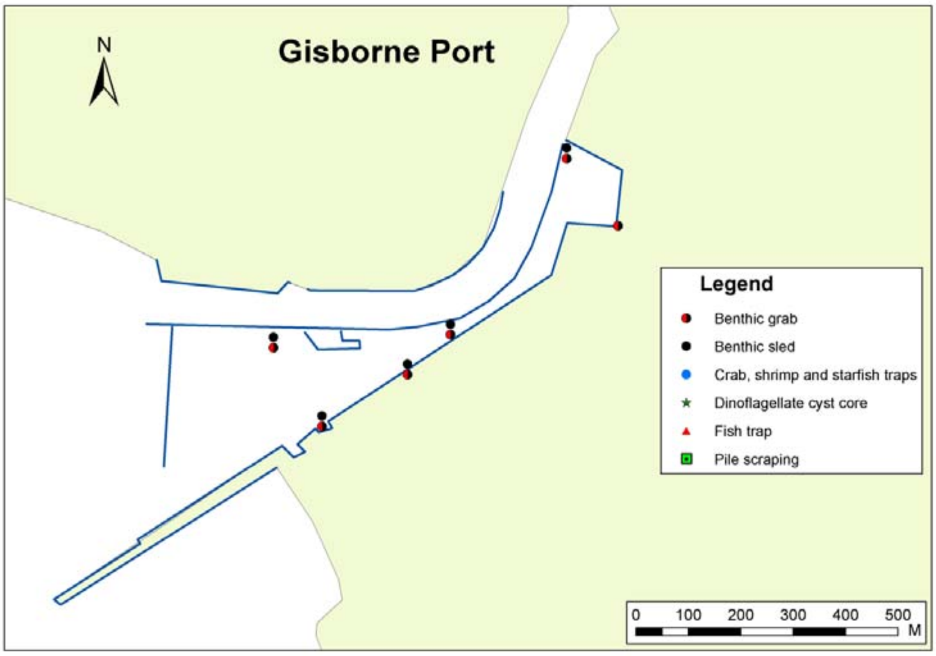

Figure 9: Benthic sled and benthic grab sites.

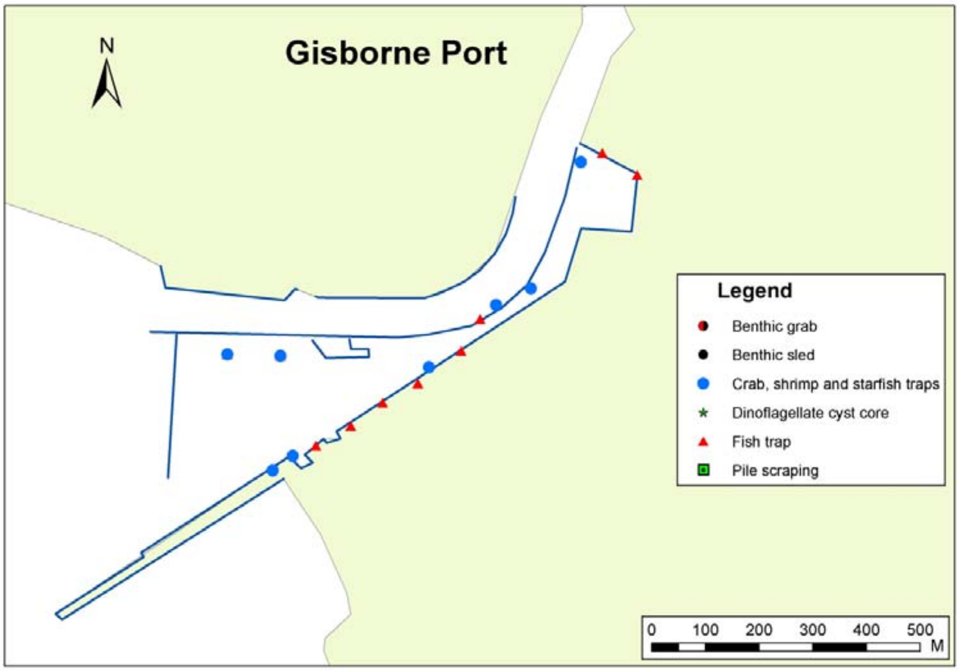

Figure 10: Sites trapped using crab (box), shrimp and starfish traps and opera house fish traps

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 205 species or higher taxa were identified from the Gisborne Port survey. This collection consisted of 130 native (Table 6), 17 cryptogenic (Table 7), 14 non-indigenous species (Table 8) and 44 species indeterminata (Table 9, Fig. 11). The biota included a diverse array of organisms from 12 Phyla (Fig. 12). For general descriptions of the main groups of organisms (Phyla) encountered during this study refer to Appendix 2.

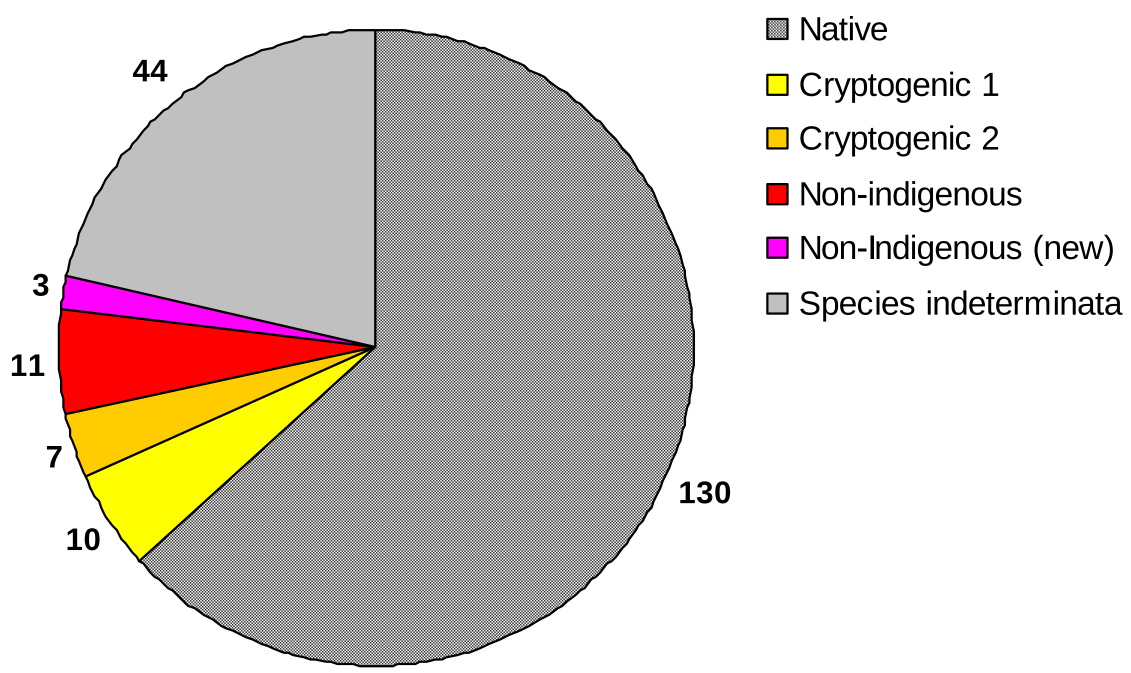

Figure 11: Diversity of marine species sampled in the Port of Gisborne. Values indicate the number of species in native, cryptogenic, non-indigenous and species indeterminata categories.

NATIVE SPECIES

A total of 130 native species was identified from the Port of Gisborne. Native species represent 63.4 % of all species identified from this location (Table 6) and included highly diverse assemblages of annelids (34 species), crustaceans (22 species), molluscs (20 species), phycophyta (16 species) and vertebrata (11 species). A number of other less diverse phyla including bryozoans, cnidarians, echinoderms, porifera, pyrrophycophyta and urochordates were also sampled from the Port (Table 6).

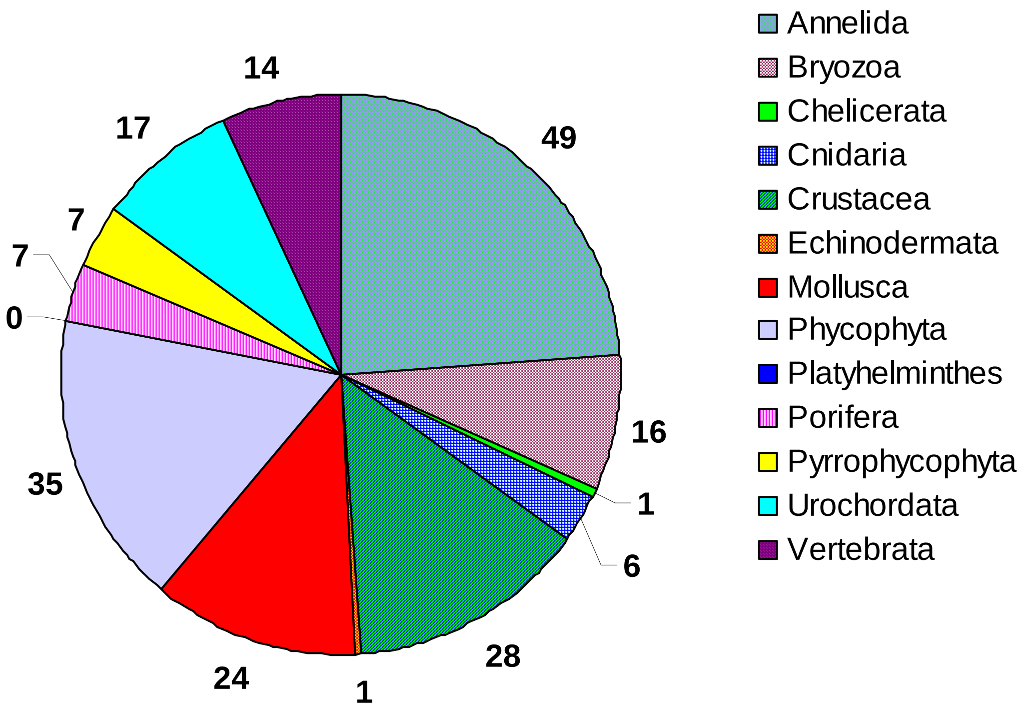

Figure 12: Marine Phyla sampled in the Port of Gisborne. Values indicate the number of species in each of the major taxonomic groups.

CRYPTOGENIC SPECIES

Seventeen cryptogenic species were discovered in the Port of Gisborne. Cryptogenic species represent 8.3 % of all species or higher taxa identified from the Port. The cryptogenic organisms identified included 10 Category 1 and seven Category 2 species as defined in Section 2.9 above. These organisms included two bryozoans (*Rhynchozoon larreyi* and *Scruparia ambigua*), one chelicerata (a pycnogonid ?*Tanystylum* sp. nov. B), two cnidarians (*Bougainvillia muscus* and *Halecium sessile*), an isopod (*Cirolana* sp. nov.), five sponges (Plakina monolopha, *Dysidea* n. sp. 1, *Euryspongia* n. sp. 2, *Halichondria* n. sp. 1, Haliclona n. sp. 10, one dinoflagellate (*Gymnodinium catenatum*), and five ascidian species (*Aplidium phortax*, *Asterocarpa cerea*, *Corella eumyota*, *Diplosoma listerianum*, and *Microcosmus squamiger*; Table 7). Many of the Category 1 cryptogenic species (the ascidians *Aplydium phortax*, *Astereocarpa cerea*, and *Corella eumyota*; and the hydroid *Halecium delicatum*) have been present in New Zealand for more than 100 years but have distributions outside New Zealand that suggest non-native origins (Cranfield et al. 1998).

NON-INDIGENOUS SPECIES

Fourteen non-indigenous species (NIS) were recorded from the Port of Gisborne (Table 8). NIS represented 6.8 % of all identified species from this location. Three of these species - the bryozoan *Celleporaria nodulosa*, the crab *Cancer amphioetus*, and the ascidian, *Cnemidocarpa sp.* – had not previously been recorded from New Zealand. The remaining NIS included two polychaete worms (*Euchone limnicola* and *Pseudopolydora paucibranchiata*), five bryozoans (*Bugula neritina*, *Celleporaria nodulosa*, *Cryptosula pallasiana*, *Tricellaria inopinata*, *Watersipora subtorquata*), an amphipod (*Monocorophium acherusicum*), two molluscs (the bivalve *Theora lubrica* and the nudibranch *Polycera hedgepethi*), a macroalga (*Undaria pinnatifida*) and an ascidian (*Ascidiella aspersa*). 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 species, providing images where available, and indicate what is known about their 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.

***Euchone limnicola* (Reish, 1959)**

Image and information: NIMPIS (2002a)

Euchone limnicola is a sedentary worm, growing to 12 mm in length. The absence of a membranous flap over the anal depression is only seen in *E. limnicola* and is therefore used to distinguish this species from other *Euchone* species. A crown, comprised of 7 pairs of feeding appendages, is seen above the sediment, with the body of the worm in a tube below. *Euchone limnicola* is native to the USA west coast and has been introduced to Australia and New Zealand. It burrows into soft sediments, secreting a mucous layer to enable it to build firm burrow walls. It has been found subtidally to 24 m in Port Phillip Bay, Australia. *Euchone limnicola* establishes dense populations within the sediments, possibly competing with native species for food and space. The process of tube building consolidates the sediments, thereby altering the habitat for other organisms. During the port baseline surveys, *E. limnicola* was recorded from the ports of Gisborne and Timaru. In the Port of Gisborne it occurred in benthic sled samples taken from Berths 6 and 7, and from the Kaiti Basin (Fig. 13).

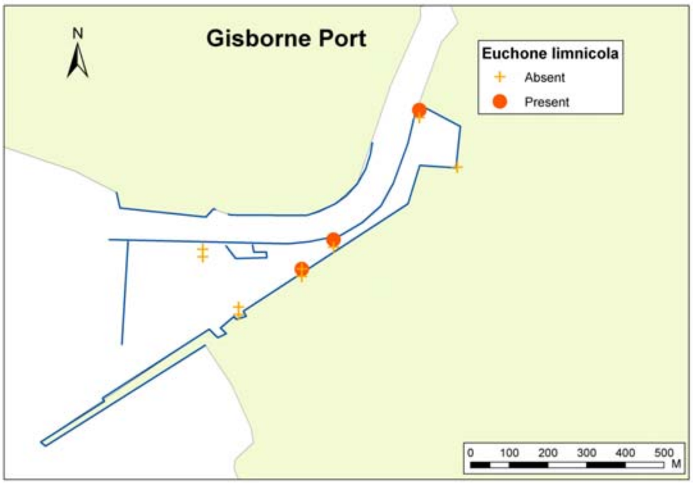

Figure 13: *Euchone limnicola* distribution in the Port of Gisborne

***Pseudopolydora paucibranchiata* (Okuda, 1937)**

No image available.

Pseudopolydora paucibranchiata is a burrowing, sedentary spionid polychaete worm that constructs its tube from sand and silt. It is thought to be native to the north-west Pacific, from China to the coast of Russia, and has been introduced to the north-east Atlantic, the west coast of the U.S.A., southern Australia and New Zealand. *Pseudopolydora paucibranchiata* was first recorded in Australia in 1972, where it was possibly introduced with Pacific oysters (*Crassostrea gigas*) (Australian Faunal Directory 2005). It has been present in New Zealand since at least 1975 (Read 1975).

P. paucibranchiata is a creamy colour, with yellow-white bands. The first segment is reduced, with no hairs (notosetae). The fifth segment is not enlarged or modified, but has distinct parapodial (foot) lobes with major spines placed in a U-shaped line. *Pseudopolydora paucibranchiata* can be found in sand and mudflats (but prefers fine sediments). It is most abundant in the low tidal zone, but also occurs subtidally. This species can be a dominant member of the infaunal community, causing changes in habitat and faunal composition. It is also an inhabitant of oyster shells and fouling communities (NIMPIS 2002b). During the port baseline surveys it was recorded from the Ports of Gisborne and Whangarei. In the Port of Gisborne it occurred in benthic sled samples taken from Berths 6 and 7, and from the Kaiti Basin, in benthic grabs taken near berths 6, 7, and 8, and in pile scrape samples taken within the marina (Fig. 14).

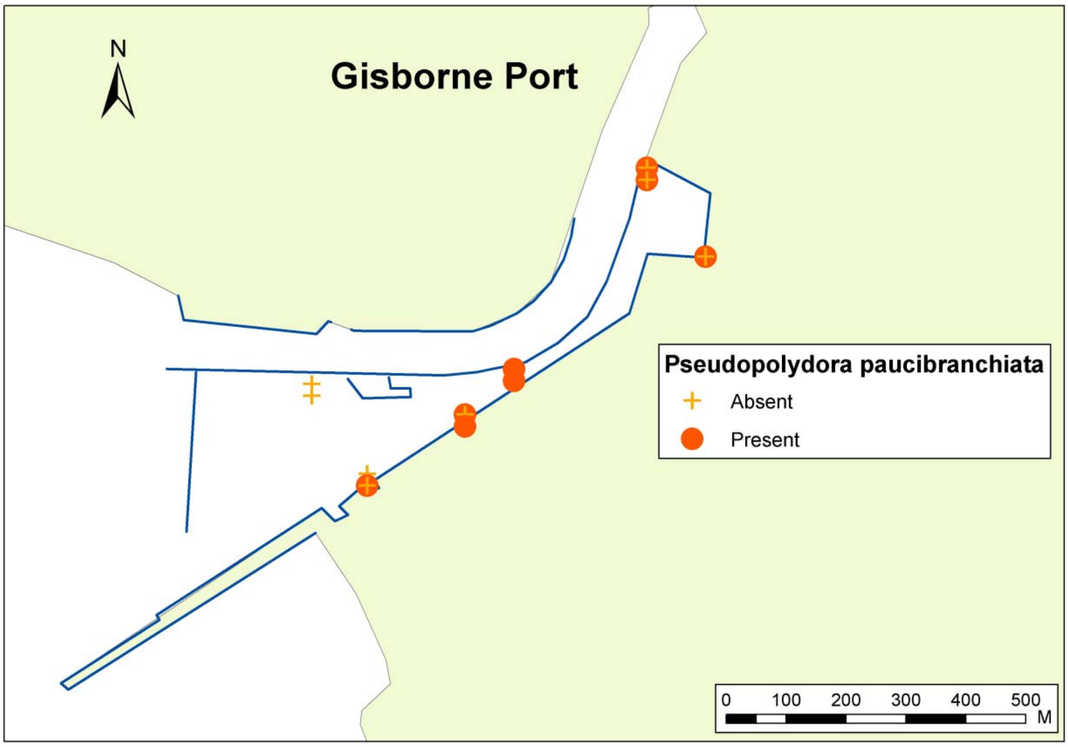

Figure 14: *Pseudopolydora paucibranchiata* distribution in the Port of Gisborne

Bugula neritina **(Linnaeus, 1758)**

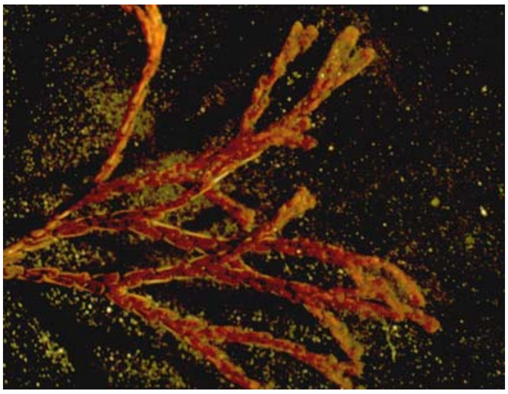

Image and information: NIMPIS (2002c)

Bugula neritina is an erect, bushy, red-purple-brown bryozoan. Branching is dichotomous (in series of two) and zooids alternate in two rows on the branches. Unlike all other species of *Bugula*, *B. neritina* has no avicularia (defensive structures) or spines, but there is a single pointed tip on the outer corner of zooids. Ovicells (reproductive structures) are large, globular and white in colour. They often appear in such high numbers that they resemble small snails or beads. *Bugula neritina* is native to the Mediterranean Sea. It has been introduced to most of North America, Hawaii, India, the Japan and China Seas, Australia and New Zealand. It is cryptogenic in the British Isles. *Bugula neritina* is one of the most abundant bryozoans in ports and harbours and an important member of the fouling community. The species colonises any available substratum and can form extensive monospecific growths. It grows well on pier piles, vessel hulls, buoys and similar submerged surfaces. It even grows heavily in ships' intake pipes and condenser chambers. In North America, *B. neritina* occurs on rocky reefs and seagrass leaves. In Australia, it occurs primarily on artificial substrata. *Bugula neritina* occurs in all New Zealand ports (Gordon and Matawari 1992). In the Port of Gisborne it occurred in pile scrape samples taken from Berths 6, 7, 8, and within the Kaiti Basin (Fig. 15).

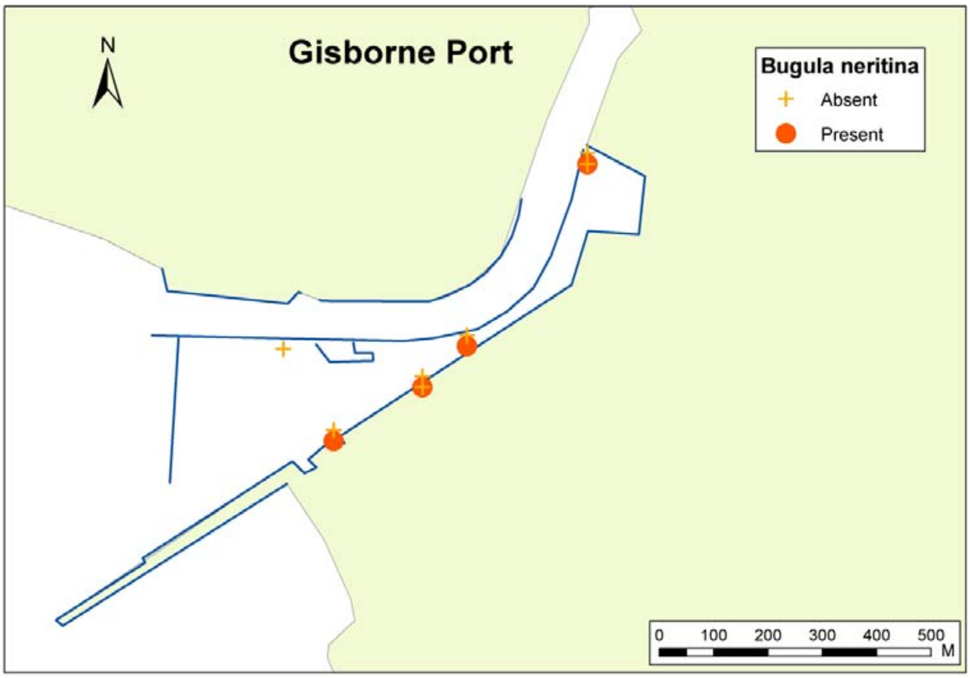

Figure 15: ***Bugula neritina*** **distribution in the Port of Gisborne**

***Tricellaria inopinata* (d'Hondt and Occhipinti Ambrogi, 1985)**

Image: RMIT University, Australia.
Information: Dyrynda et al (2000), Occhipinti Ambrogi (2000), NIMPIS (2002d)

Tricellaria inopinata is an erect bryozoan. An assessment of samples and literature from various global regions suggests that Atlantic and Adriatic *T. inopinata* correspond with a morphospecies known to be invasive in New Zealand, and cryptogenic in Pacific North America, Japan and Australia. The morphospecies in question has usually been referred to as *T. occidentalis* (Trask, 1857) and, in at least one instance, as *T. porteri* (MacGillivray, 1889). *Tricellaria inopinata*'s widespread Pacific distribution and the possibility of anthropogenic dispersal there in historical times precludes the more precise identification of its source region. *Tricellaria inopinata* is a prolific fouling species with a high reproductive output. It has documented impacts on the abundance of native bryozoan species: *T. inopinata*'s invasion of the Laguna di Venezia (Italy) resulted in a sharp decline in the abundance of native bryozoans whose populations had been stable prior to *T. inopinata*'s introduction. During the port baseline surveys, *T. inopinata* was also reported from the ports of Lyttelton and Taranaki. In the Port of Gisborne it occurred in benthic grab samples taken from Berth 8 and within the marina, and in pile scrape samples taken from Berths 6, 7, and 8 (Fig. 16).

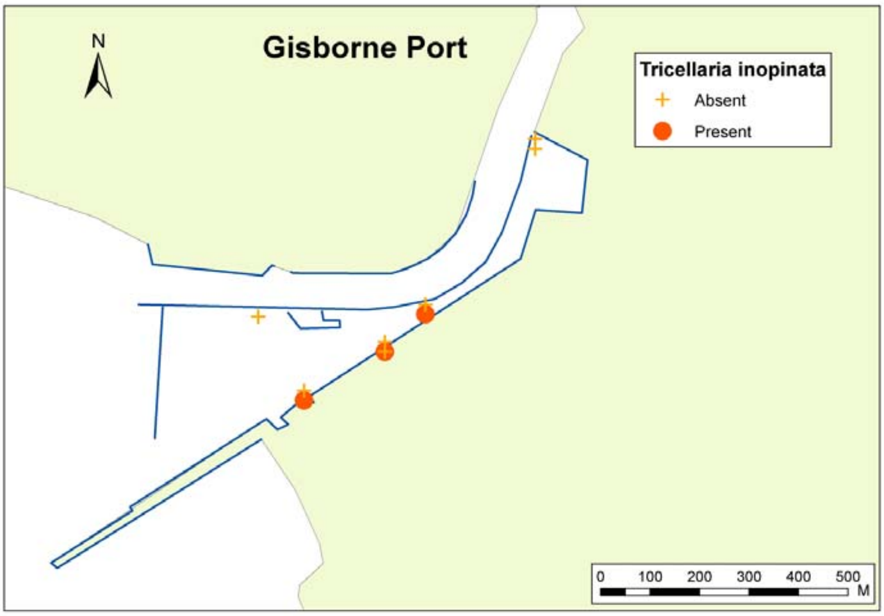

Figure 16: *Tricellaria inopinata* distribution in the Port of Gisborne

***Cryptosula pallasiana* (von Moll, 1803)**

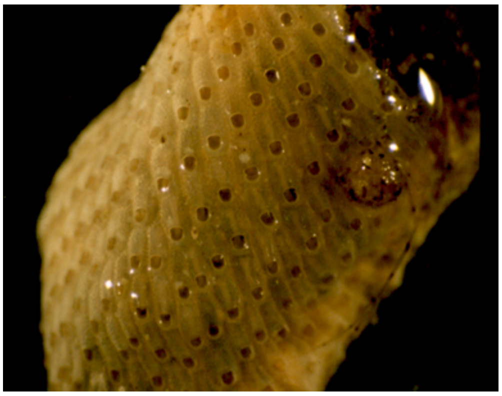

Image and information: NIMPIS (2002e)

Cryptosula pallasiana is an encrusting bryozoan, white-pink with orange crusts. The colonies sometimes rise into frills towards the edges. Zooids are hexagonal in shape, measuring on average 0.8 mm in length and 0.4 mm in width. The frontal surface of the zooid is heavily calcified, and has large pores set into it. Colonies may sometimes appear to have a beaded surface due to zooids having a suboral umbo (ridge). The aperture is bell shaped, and occasionally sub-oral avicularia (defensive structures) are present. There are no ovicells (reproductive structures) or spines present on the colony. *Cryptosula pallasiana* is native to Florida, the east coast of Mexico and the northeast Atlantic. It has been introduced to the northwest coast of the USA, the Sea of Japan, Australia and New Zealand. It is cryptogenic in the Mediterranean. *Cryptosula pallasiana* is a common fouling organism on a wide variety of substrata. Typical habitats include seagrasses, drift algae, oyster reef, artificial structures such as piers and breakwaters, man-made debris, rock, shells, ascidians, glass and vessel hulls. It has been reported from depths of up to 35 m. There have been no recorded impacts of *Cryptosula pallasiana* throughout its introduced range. However, in the USA, it has been noted as one of the most competitive fouling organisms in ports and harbours it occurs in. Within Australia, colonies generally do not reach a large size or cover large areas of substrata.

C. pallasiana has been recorded from all New Zealand ports (Cranfield et al. 1998). In the Port of Gisborne it occurred in pile scrape samples taken from Berth 7 (Fig. 17).

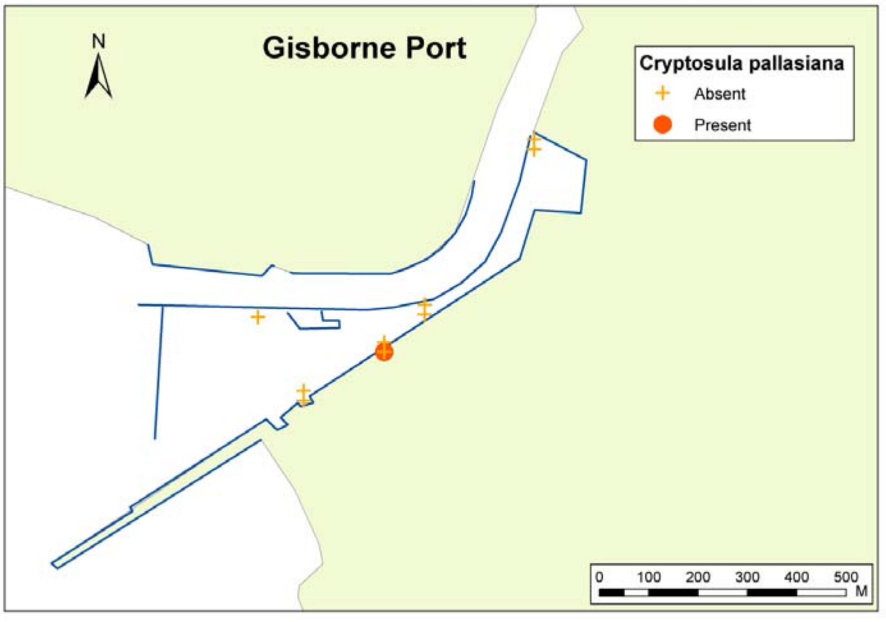

Figure 17: *Cryptosula pallasiana* distribution in the Port of Gisborne

***Celleporaria nodulosa* (Busk, 1881)**

No image available.

Celleporaria nodulosa is an encrusting bryozoan in the family Lepraliellidae. There are more than 100 species in the genus *Celleporaria* world-wide. The type specimen for *C. nodulosa* was first described from the southeastern coast of Australia, where it is widespread. It forms low, flat, spreading colonies that have a blue-green tinge. This is the first record of this species in New Zealand (D. Gordon, pers. comm.). During the port baseline surveys, it was also recorded from the port of Nelson. No information exists on its likely impacts on native species. In the Port of Gisborne *C. nodulosa* occurred in pile scrape samples taken from Berth 8 (Fig. 18).

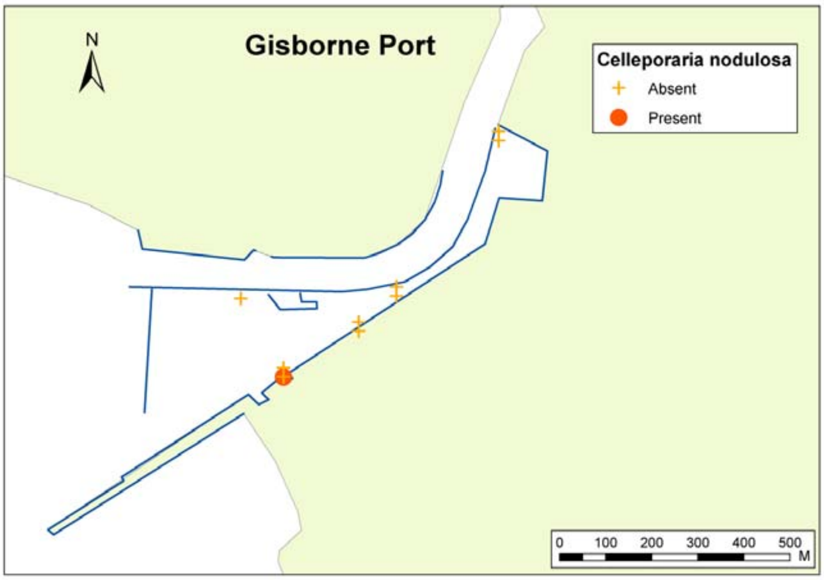

Figure 18: *Celleporaria nodulosa* distribution in the Port of Gisborne

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

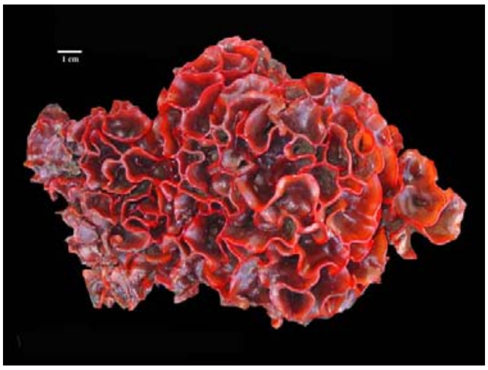

Image: California Academy of Sciences.
Information: Gordon and Matawari (1992)

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 or ovicells. 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-west Pacific, Torres Strait and north-eastern and southern Australia.

Watersipora subtorquata 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. They form 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.

Watersipora subtorquata has been present in New Zealand since at least 1982 and is now present in most ports from Opua to Bluff (Gordon and Matawari 1992). In the Port of Gisborne it occurred in benthic grab samples taken from Berth 6 and in pile scrape samples taken from Berths 6 and 7 (Fig. 19).

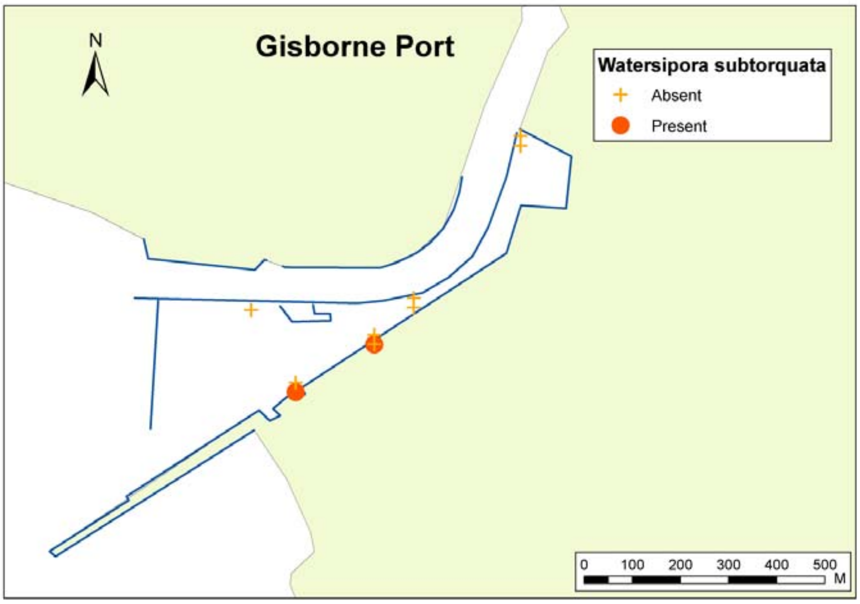

Figure 19: ***Watersipora subtorquata*** **distribution in the Port of Gisborne**

Monocorophium acherusicum **(A. Costa, 1851)**

Image and information:
NIMPIS (2002f)

Monocorophium acherusicum is a flat, yellowish-brown amphipod crustacean that lives amongst assemblages of marine invertebrates and plants or in soft-bottom habitats, and feeds by grazing on bacteria on sediment particles or on organic matter suspended in the water column. *Monocorophium acherusicum* is native to the northeast Atlantic, the Mediterranean and the northwest African coast and has been introduced to Brazil, southeast Africa, India, the Japan and China Seas, Australia and New Zealand. It is cryptogenic in the Baltic Sea, the

Caribbean and the east and northwest coasts of the USA. *Monocrophium acherusicum* occurs subtidally on sediments or where silt and detritus accumulate among fouling communities such as algae, ascidians and bryozoans, and man-made installations eg. wharf pylons, rafts and buoys. It is a tube building species constructing conspicuous, fragile U-shaped tubes of silk, mud and sand particles. It can reach high abundances and tolerate a wide range of salinities. Pilisuctorid cilates are parasites on this species in the Black Sea, but it is unknown whether these parasites could transfer to native species and cause negative impacts in New Zealand. During the baseline prot surveys it was also recorded from the ports of Otago, Gisborne, Lyttelton, Tauranga and Timaru and from the Whangarei Town Basin marina. In the Port of Gisborne it occurred in pile scrape samples taken from within the Kaiti basin marina (Fig. 20).

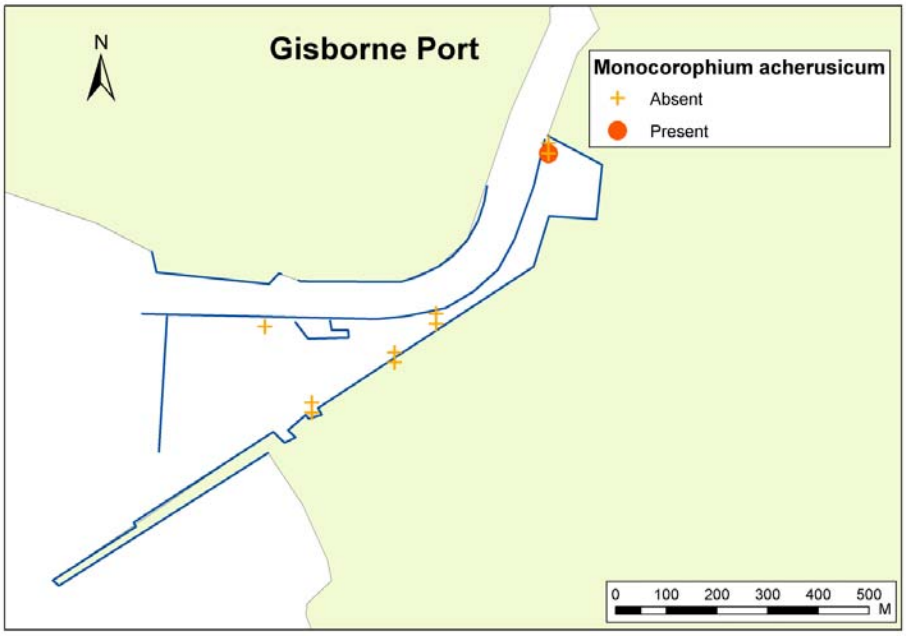

Figure 20: ***Monocorophium acherusicum*** **distribution in the Port of Gisborne**

Cancer amphioetus **(Rathbun, 1898)**

Image: Wei-Rung *et al.* (1999)
Information: Williams *et al.* (1989); Wei-Rung *et al.* (1999); Galysheva (2004)

Cancer amphioetus (bigtooth rock crab) is a small decapod in the family Cancridae. It is native to the north-west Pacific, including Taiwan, China and the Sea of Japan. It has also been recorded from California, but is reportedly uncommon there. In Taiwan, *C. amphioetus* has been recorded to depths between 200 to 260 m. Similarly, in the Gulf of California, is has been recorded in trawls taken from the continental shelf at 25-115 m depth (Hendrickx 1996). Little is known about its ecology or likely impacts in New Zealand. This species is a new record for New Zealand waters. During the port baseline surveys it was recorded in the ports of Gisborne and Bluff. In the Port of Gisborne it occurred in a pile scrape sample taken from Berth 7 (Fig. 21).

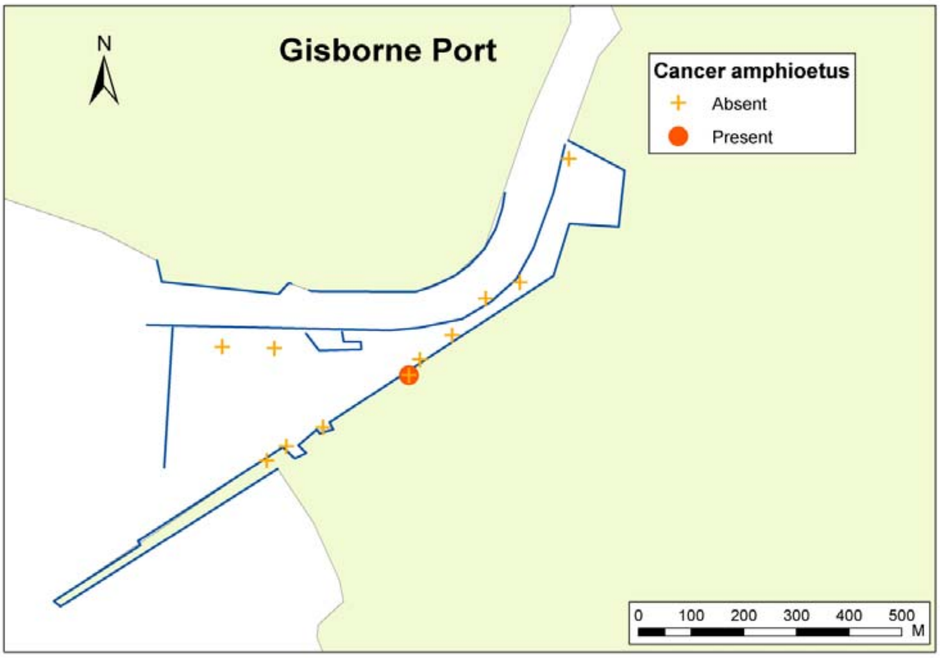

Figure 21: ***Cancer amphioetus*** **distribution in the Port of Gisborne**

Theora lubrica **(Gould, 1861)**

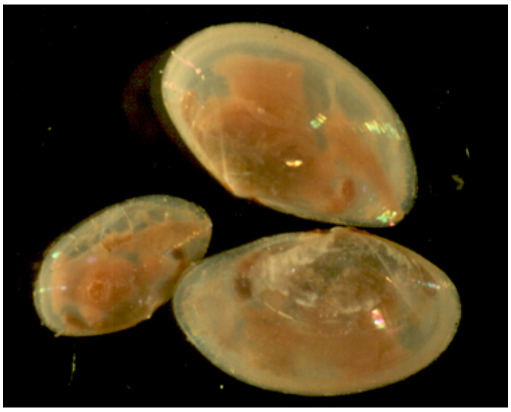

Image and information: NIMPIS (2002g)

Theora lubrica is a small bivalve with an almost transparent shell. The shell is very thin, elongated and has fine concentric ridges. *Theora lubrica* grows to about 15 mm in size, and is characterised by a fine elongate rib extending obliquely across the internal surface of the shell. *Theora lubrica* is native to the Japan and China Seas. It has been introduced to the west coast of the USA, Australia and New Zealand. *Theora lubrica* typically lives in muddy sediments from the low tide mark to 50 m, however it has been found at 100 m. In many localities, *T. lubrica* is an indicator species for eutrophic and anoxic areas. *Theora lubrica* has been present in New Zealand since at least 1971. It occurs in estuaries of the north-east coast of the North Island, including the Bay of Islands, Whangarei Harbour, Waitemata Harbour, Wellington and Pelorus Sound. During the port baseline surveys, it was recovered from Opua, Whangarei port and marina, Gulf Harbour marina, Auckland, Gisborne, Napier, Taranaki, Wellington, Nelson, and Lyttelton. In the Port of Gisborne, *T. lubrica* occurred in benthic grab samples taken near Berth 7, the turning basin and within the Kaiti marina basin, and from benthic sled samples taken near Berths 6, 7, 8, the turning basin and within the Kaiti basin (Fig. 22).

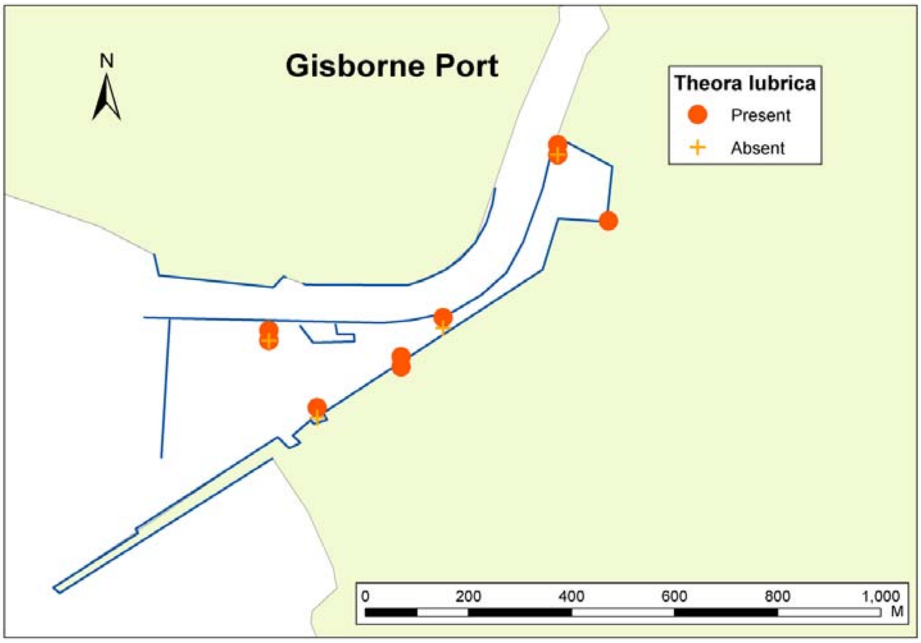

Figure 22: ***Theora lubrica* distribution in the Port of Gisborne**

***Polycera hedgpethi* (Marcus, 1964)**

Image and information:
http://www.seaslugforum.net;
http://www.ciesm.org; Miller (2001)

Polycera hedgpethi is a small Polycerid nudibranch that commonly grows to 20 mm in length (max. 40 mm). It is distinguished by a small frontal veil bearing 4-6 white-tipped pointed processes, black or grey speckled body, with a rhinophore club with black and yellow banding. *Polycera hedgpethi* is native to the west coast of the USA and has been found in Australia, Japan, Mexico, the Mediterranean, New Zealand, South Africa, Spain, and west Africa. It has been known from New Zealand waters (east coast of North Island) since the 1960's. *Polycera hedgpethi* generally occurs on bryozoans, usually species of *Bugula*, which grow as fouling species on ropes, wharf pylons, fouling panels, pontoons and vessel hulls. They can also be found on natural substrata such as rocks, seagrasses and algae in the shallow subtidal to 10 m depth. Its association with major seaports, and common occurrence amongst ship hull biofouling, suggests a distribution from shipping rather than natural causes. It has no known impacts. In the Port of Gisborne, this species occurred in pile scrape samples taken from Berth 6 and the Kaiti basin marina (Fig. 23).

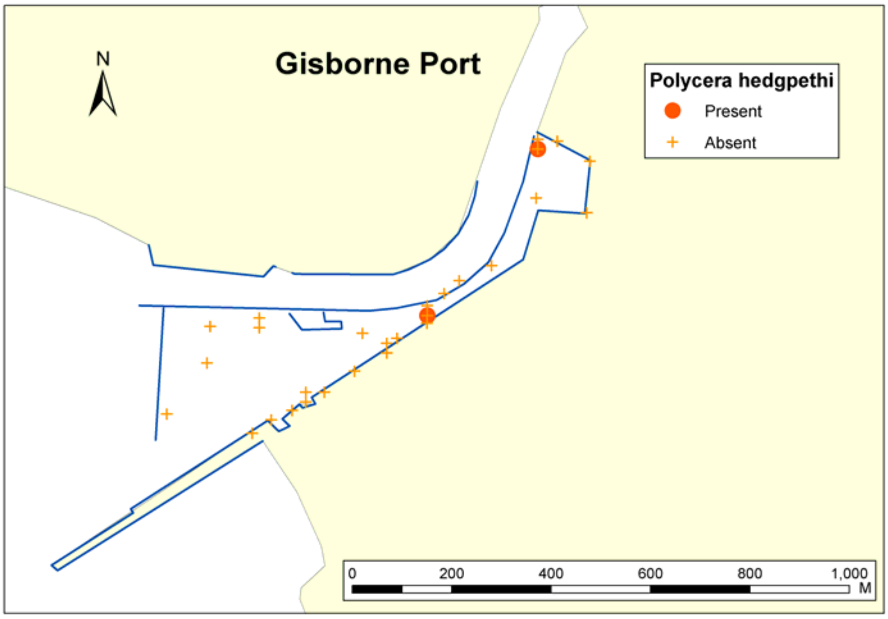

Figure 23: *Polycera hedgpethi* distribution in the Port of Gisborne

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

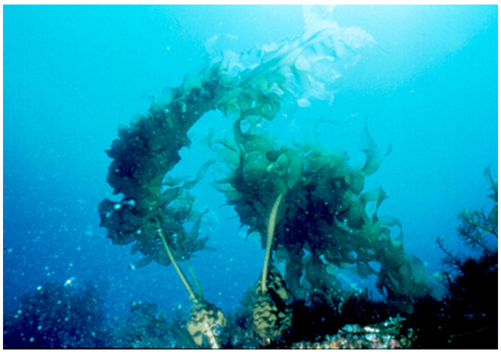

Image and information: NIMPIS (2002h); Fletcher and Farrell (1999)

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. *Undaria pinnatifida* is known to occur in a range of ports and marinas throughout eastern New Zealand, from Gisborne to Stewart Island (Sinner et al 2000). In the Port of Gisborne it occurred in pile scrape samples taken from Berth 8 (Fig. 24).

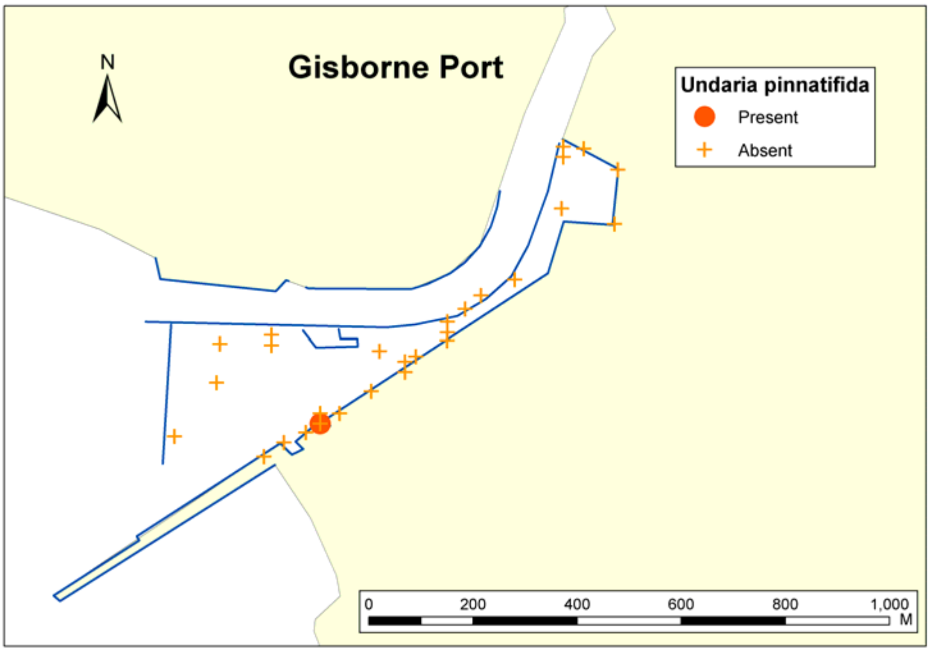

Figure 24: *Undaria pinnatifida* distribution in the Port of Gisborne

***Ascidiella aspersa* (Mueler, 1776)**

Image and information: NIMPIS (2002i).

Ascidiella aspersa is a solitary ascidian that is native to north-western Europe, the British Isles, the Mediterranean Sea and the north-west African coasts. It has been introduced to India, Australia and New Zealand, and is cryptogenic to the east coast of the USA. *Ascidiella aspersa* attaches to the substratum by its entire left side and grows up to 130 mm in length. The inhalant (branchial) siphon is positioned at the top of the body and is conical in shape. The exhalent (atrial) siphon is positioned around one third of the way down the body and both siphons are ridged. The body wall (test) is firm and is transparent with numerous papillae scattered over the surface. Small amounts of pink or orange may be visible inside the siphons. *Ascidiella aspersa* is found from intertidal to shallow subtidal waters to 50m depth attached to clay, stones, rocks, algae and wharf piles, where it can be the dominant fouling species. In the southern hemisphere, populations are particularly abundant in the inner-reaches of estuaries and harbours in protected or semi-enclosed marine embayments. Although it is a solitary ascidian (i.e. not colonial) it is often found in dense clumps. During the baseline surveys it was recovered from the ports of Gisborne and Napier, and from Gulf Harbour Marina. It has no known documented impacts. In the Port of Gisborne *A. aspersa* occurred in benthic sled samples taken near Berth 6 and in pile scrape samples taken from Berths 6 and 8, and from the Kaiti marina (Fig. 25).

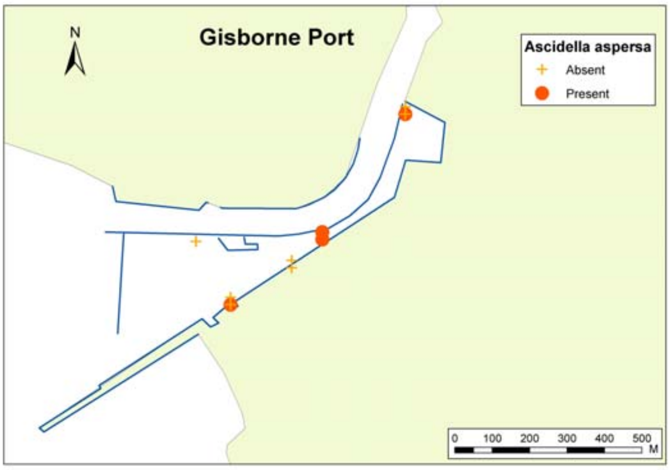

Figure 25: *Ascidiella aspersa* distribution in the Port of Gisborne

***Cnemidocarpa* sp**

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, Picton, Lyttelton and Timaru during the port baseline surveys. In the Port of Gisborne, this species occurred in pile scrape samples taken from Berths 7 and 8 (Fig. 26).

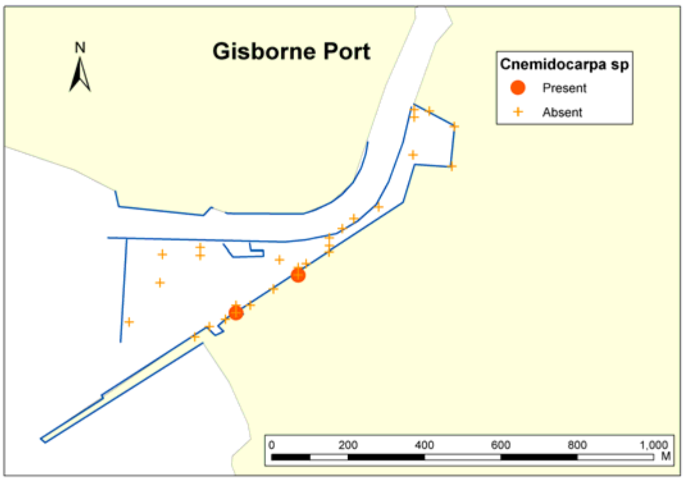

Figure 26: *Cnemidocarpa* sp. distribution in the Port of Gisborne

SPECIES INDETERMINATA

Forty-four organisms from the Port of Gisborne were classified as species indeterminata. If each of these organisms is considered a species of unresolved identity, then together they represent 21.5 % of all species collected from this survey (Fig 15). Species indeterminata from the Port of Gisborne included 13 Annelida, one Bryozoa, three Cnidaria, three Crustacea, two Mollusca, 18 Phycophyta, one Urochordata, and three Vertebrata species (Table 9).

NOTIFIABLE AND UNWANTED SPECIES

Of the 14 non-indigenous species identified from the Port of Gisborne, only *Undaria pinnatifida* is currently listed as an unwanted species on either the New Zealand register of unwanted organisms (Table 5a). Cysts of the toxin-producing dinoflagellate *Gymnodinium catenatum* were detected in sediment samples taken from the port basin. *Gymnodinium catenatum* is one of four toxic dinoflagellate species on the ABWMAC Australian list of pest species (Table 5b). It is considered cryptogenic in New Zealand.

PREVIOUSLY UNDESCRIBED SPECIES IN NEW ZEALAND

Three of the non-indigenous species collected from the Port of Gisborne had not previously been described from New Zealand waters prior to the baseline survey. These were the bryozoan *Celleporaria nodulosa*, the crustacean *Cancer amphioetus*, and the ascidian, *Cnemidocarpa sp.* (Table 8). In addition, four species of sponge (*Dysidea* n. sp. 1, *Euryspongia* n. sp. 2, *Halichondria* n. sp. 1, *Haliclona* n. sp. 10), an isopod (*Cirolana* sp. nova), and a pycnogonid (?*Tanystylum* sp. nov. B) found in Gisborne did not match existing species descriptions and may be new to science.

CYST-FORMING SPECIES

Six native dinoflagellate species were collected as cysts during this survey (Table 6). The cryptogenic dinoflagellate *Gymnodinium catenatum* – was also detected in sediment samples taken from the turning basin and central basin of the Port of Gisborne (Table 7). Toxins produced by the motile form of *G. catenatum* can cause Paralytic Shellfish Poisoning (PSP) and are a significant public health problem. Blooms of *G. catenatum* 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 of Gisborne are thought to have arrived in New Zealand via international shipping. Table 8 indicates the possible vectors for the introduction of each NIS. Likely vectors of introduction are largely derived from Cranfield et al (1998) and indicate that one of the 14 NIS probably arrived via ballast water (7.1%), 9 (64.3 %) via hull fouling, and four (28.6 %) could have arrived via either of these mechanisms.

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 Town Basin Marina (Fig. 27a). The number of species recorded in each location reflects sampling effort (Table 3c) and local patterns of marine biodiversity within the ports and marinas. 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. However differences in sampling effort did not explain differences in the numbers of NIS found in each location ($F_{1,14}$ = 0.77, P = 0.394, R^2 = 0.052). When sample effort was adjusted for, the Port of Gisborne had average numbers of native species, NIS, and Cryptogenic 1 species, and a slightly less than average number of Cryptogenic 2 species relative to the other ports and marinas surveyed in New Zealand (Fig 28). The 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 28c, Studentised residual = 3.87).

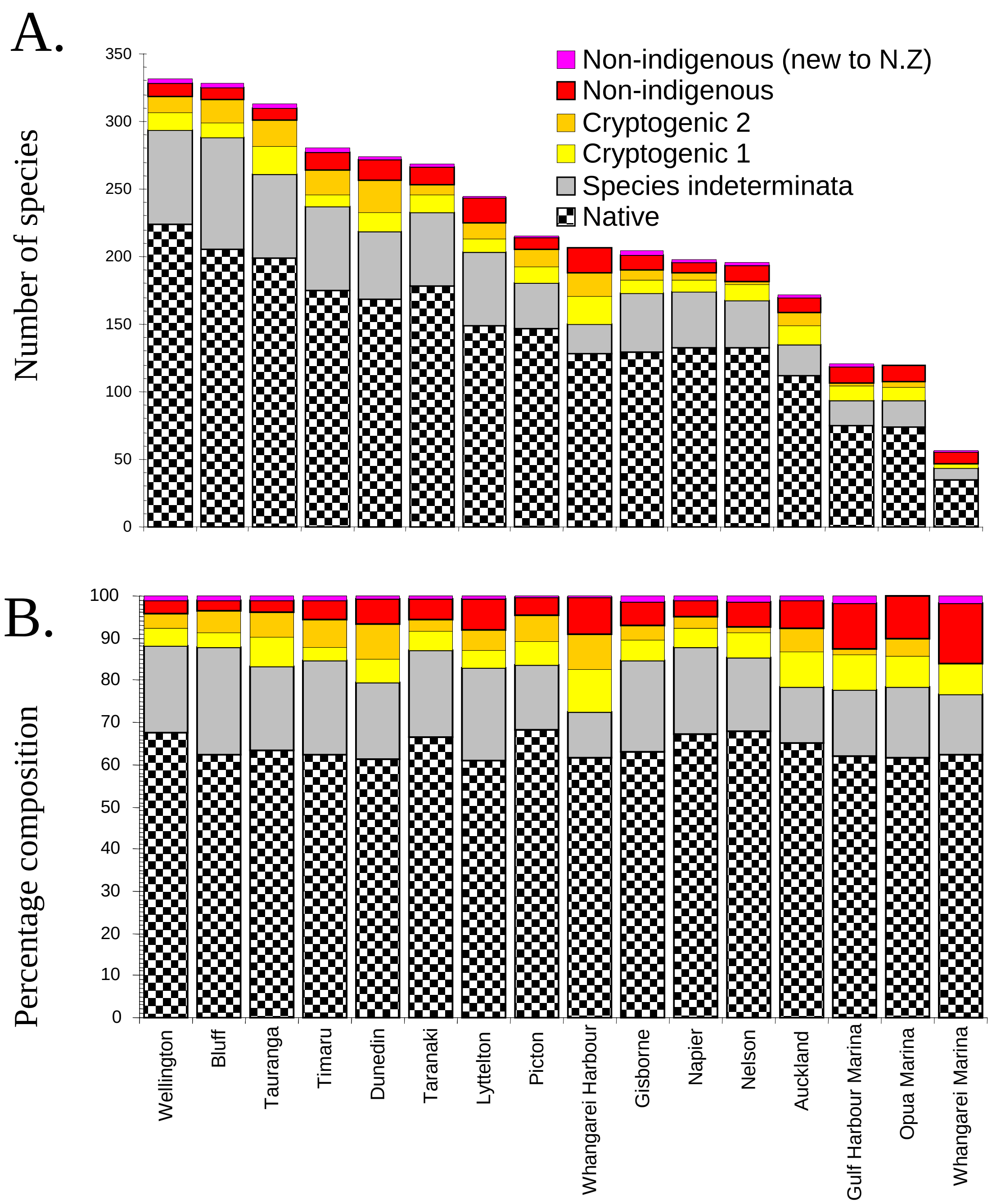

Figure 27: **Differences in (a) the number of species, and (b) the relative proportions of non-indigenous, cryptogenic, species indeterminata and native categories among the sixteen locations sampled over the summers of 2001 – 2002, and 2002-2003. Locations are presented in order of decreasing species diversity sampled.**

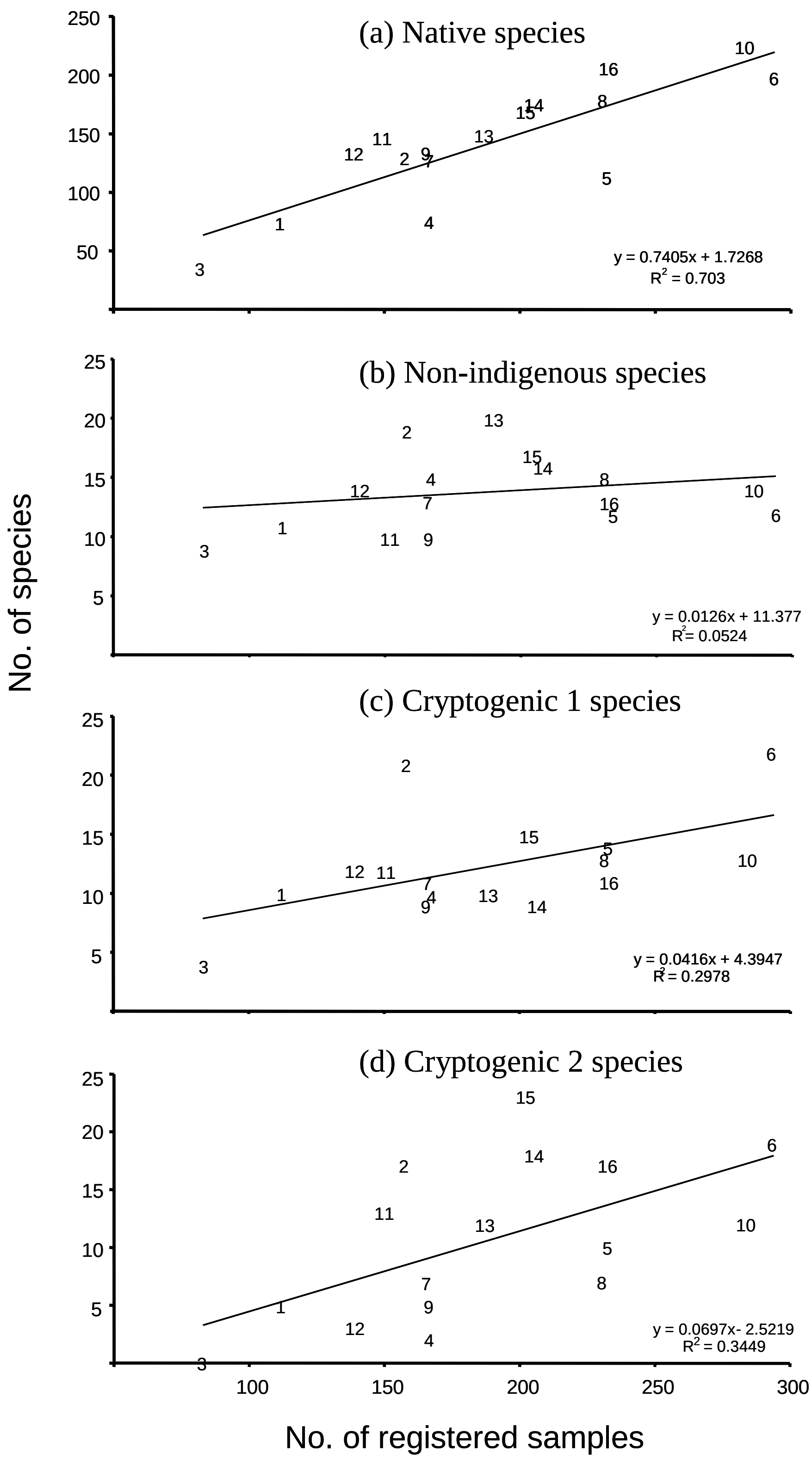

Figure 28: Linear regression equations relating numbers of species detected to sample effort at the 16 locations surveyed nation-wide. Location codes are as follows; 1 = Opua Marina, 2 = Whangarei Port, 3 = Whangarei Marina, 4 = Gulf Harbour Marina, 5 = Auckland Port, 6 = Tauranga Port, 7 = Gisborne 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

Native organisms represented over 60 % of the species diversity sampled in each of the locations surveyed nationwide, with a minimum contribution of 61.0 % in the Port of Lyttelton and a maximum of 68.5 % in Picton (Fig. 27b). Species indeterminata organisms represented between 10.6 % and 25.6 % 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. 27b). Non-indigenous species represented between 3.6 % of all identified species in Bluff and 16.1 % in Whangarei Marina. NIS comprised 6.8 % of the total sampled diversity in the Port of Gisborne (Fig. 27b), ranking it 8th highest in percentage composition of NIS from the sixteen locations surveyed.

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, probably do not survive to establish self-sustaining local populations. Those that do, often come from coastlines that have 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).

Commercial shipping arriving in the port of Gisborne from overseas comes predominantly from temperate regions of the north west Pacific (68.1 %) and southern Australia (14.9 %); environments which are broadly compatible with those in the Port of Gisborne. Relative to other ports in New Zealand, the Port of Gisborne has a high trade volume in exported timber (Statistics NZ 2004). According to Inglis (2001), a total volume of 94,284 m^3 of ballast water was discharged in the Port of Gisborne in 1999, with the largest country-of-origin volumes being 41,469 m^3 from Japan, 8,890 m^3 from Australia, 7,456 m^3 from South Korea, and 30,001 m^3 from unspecified origins. Shipping from these regions presents an on-going risk of introduction of new NIS to the Port of Gisborne.

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

The Port of Gisborne is connected directly to the ports of Wellington, Tauranga and Napier 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 Gisborne survey have been recorded previously in New Zealand, there were three notable exceptions: the crab, *Cancer amphioetus*, the bryozoan, *Celleporaria nodulosa* and the ascidian *Cnemidocarpa sp.* Shipping leaving the Port of Gisborne has the potential to spread these species to other locations where they are not already present.

Cancer amphioetus was found only in Gisborne and Bluff during the port baseline surveys. At this stage, it is unclear if these widely-separated records are the result of two separate introductions or if the species has been spread domestically from one or other port. Only a single specimen of *C. amphioetus* was found during the survey of Gisborne and two specimens were recovered in Bluff, so it is unclear how well-established the crab is in either port. Further surveys, targeting this species, are necessary to determine the true extent of its populations in each location. There is also no information on the risks it poses to New Zealand's native ecosystems and species. New Zealand has an indigenous (but larger) species of cancer crab, *Cancer novaezelandiae*, which is common in many port locations throughout southern New Zealand.

Celleporaria nodulosa was found only in the ports of Gisborne and Nelson, where its impacts remain unknown. In each port, the specimens were recovered from only a single pile scrape sample, so populations do not currently appear to be widely distributed in either location.

In contrast, the ascidian *Cnemidocarpa sp*. appears to be well-established in the Port of Gisborne. *Cnemidocarpa sp* was also detected in Auckland, Gulf Harbour Marina, Nelson, Picton, Tauranga, Taranaki, Timaru and Wellington. Again little is currently known about its effects on native ecosystems, but active management is likely to be impractical as it is already widely distributed throughout New Zealand's shipping ports.

The invasive alga, *Undaria pinnatifida*, has been present in the Port of Gisborne since 1999 (Sinner et al 2000). It has been spread through 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 and the Tauranga Port). A control programme in Bluff Harbour has subsequently removed *Undaria pinnatifida* populations established there. Nevertheless, vessels departing from Gisborne after having spent time at berth within the port may pose a significant risk of spreading this species to other locatiosn within New Zealand that remain uninfested. The risk of translocation of *U. pinnatifida* and other fouling species (including *C. nodulosa*, *C. amphioetus*, and *Cnemidocarpa sp*.) is highest for slow-moving vessels, such as yachts and barges, and vessels that have long residence times in port. In the Port of Gisborne coal barges, recreational craft, and seasonal fishing vessels that are laid up for significant periods of time pose a particular risk for the spread of these species.

The benthic polychaete, *Euchone limnicola*, appears to be a relatively recent arrival in New Zealand (G. Read, pers. comm.) and, at present, is restricted to the ports of Timaru and Gisborne. In each location, it is a common faunal component in port sediments. In dense aggregations, the tubes of *E. limnicola* consolidate the fine sediments, thereby altering the habitat for other organisms. Unlike the fouling species, it is more likely to be spread by ballast water transfer or by the movement of dredges and dredge spoil material.

Management of existing non-indigenous species in the port

For most marine NIS eradication by physical removal or chemical treatment is not yet a cost-effective option. Most of the species recorded in Gisborne (with the exception of *C. amphioetus* and *C. nodulosa*) 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 Gisborne to locations where they do not presently occur. This is particularly relevant to the polychaetes *Euchone limnicola* and *Pseudopolydora paucibranchiata*, *C. amphioetus* and *C. nodulosa* that are not already widely spread in ports and marinas nationwide. To be effective, such efforts will require better understanding of the frequency of movements by vessels of different types from the Port of Gisborne 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 Gisborne 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. 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 Gisborne (probably responsible for 64.3 % 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; 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 if management actions are necessary or possible.

Acknowledgements

We thank Port of Gisborne workers for access to its facilities and assistance during the survey. Thanks also to Wayne Turner and Deane Crawe for providing details on port operations, berth dimensions and their shipping uses. We also thank the following people for field assistance with the diving, boat, trapping and sorting of organisms involved in this survey program: Aleki Taumoepeau, Anna Bradley, Anthony Dugdale, Corina Kemp, Crispin Middleton, Evan Skipworth, Gavin Newmarch, Geoff Holland, Graeme MacKay, Ian Maze, Jeff Forman, John Hunt, Kate Neill, Marty Flanagan, Matt Smith, Mike Page, Neil Blair, Niki Davey, Peter Marriott, Phil James, Rob Stewart, Rob Tasker, Scott Stephens, Sean Handley, Stephen Brown, Todd Williston, Tony Dugdale and Walter Hillman. Many thanks to Don Morrisey for reviewing drafts of this report.

We also extend our thanks to the numerous taxonomists involved in this programme, including: Bruce Marshall, Clive Roberts, Colin McLay, David Staples, Dennis Gordon, Don McKnight, Fukuuoka Kouki, Geoff Read, Hoe Chang, Jan Watson, Lesley Newman, Michelle Kelly, Mike Page, Niel Bruce, Niki Davey, Patricia Kott, Sean Handley and Wendy Nelson.

References

AMOG Consulting (2002). Hull fouling as a vector for the translocation of marine organisms. Phase I: Hull fouling research. Ballast Water Research Series, Report No. 14., Department of Agriculture, Fisheries and Forestry Australia, Canberra.

Andrews, D.; Whayman, G.; Edgar, G. (1996). Assessment of optimal trapping techniques to control densities of the northern Pacific seastars on marine farm leases. Report No. FRDC 95/066

Australian Faunal Directory. (2005). Australian Biological Resources Study. Viewed 22 July 2005. http://www.deh.gov.au/biodiversity/abrs/online-resources/fauna/afd/index.html

Campbell, M. (2004). Analysis of vessel entries into New Zealand between 1998 and 2003. Unpublished report, Ministry of Fisheries, Wellington.

Carlton, J.T. (1985). Transoceanic and inter-oceanic dispersal of coastal marine organisms: the biology of ballast water. *Oceanography and Marine Biology Annual Reviews 23*: 313-371.

Carlton, J.T. (1987). Patterns of transoceanic marine biological invasions in the Pacific Ocean. *Bulletin of Marine Science 41*: 452-465

Carlton, J.T. (1992). Blue immigrants: the marine biology of maritime history. *The Log of Mystic Seaport Museum 44*: 31-36.

Carlton, J.T (1996). Biological invasions and cryptogenic species. *Ecology 77*:1653-1655.

Carlton, J.T. (1999). The scale and ecological consequences of biological invasions in the world's oceans. Pp. 195-212. *In*: Invasive species and biodiversity management. Sandlund, T.; Schei, P.J.; Viken, A. (Eds.). Kluwer Academic, Dordrecht.

Carlton, J.T.; Geller, J. (1993). Ecological roulette: The global transport of non-indigenous marine organisms. *Science 261*: 78-82.

Chapman, J.W.; Carlton, J.T. (1991). A test of criteria for introduced species: the global invasion by the isopod *Synidotea laevidorsalis* (Miers, 1881). *Journal of Crustacean Biology 11*: 386-400.

Chapman, J.W.; Carlton, J.T. (1994). Predicted discoveries of the introduced isopod *Synidotea laevidorsalis* (Miers, 1881). *Journal of Crustacean Biology 14*: 700-714.

Cohen, A.N.; Carlton, J.T. (1995). Non-indigenous Aquatic Species in a United States Estuary: A Case Study of the Biological Invasions of the San Francisco Bay and Delta.

Coutts, A.; Moore, K.; Hewitt, C. (2003). Ships' sea chests: an overlooked transfer mechanisms for non-indigenous marine species? *Marine Pollution Bulletin 46*: 1504-1515.

Cranfield, H.; Gordon, D.; Willan, R.; Marshall, B.; Battershill, C.; Francis, M.; Glasby, G.; Read, G. (1998). Adventive marine species in New Zealand. *NIWA Wellington Technical Report No. 34*.

Dodgshun, T.; Taylor, M.; Forrest, B. (2004). Human-mediated pathways of spread for non-indigenous marine species in New Zealand. Cawthron Report 700. Cawthron Institute, Nelson. 39 pp.

Dyrynda, P.E.J.; Fairall, V.R.; d'Hondt, J.L.; Occhipinti Ambrogi, A. (2000). The distribution, origins and taxonomy of *Tricellaria inopinata* d'Hondt and Occhipinti Ambrogi, 1985, an invasive bryozoan new to the Atlantic. *Journal of Natural History 34*: 1993-2006

Eldredge, L.; Carlton, J.T. (2002). Hawaiian marine bioinvasions: a preliminary assessment. *Pacific Science 56*: 211-212.

Ferrell, D.; Avery, R.; Blount, C.; Hayes, L.; Pratt, R. (1994). The utility of small, baited traps for surveys of snapper (*Pagrus auratus*) and other demersal fishes. NSW Fisheries Research Institute Report. NSW Fisheries Research Institute, Cronulla, NSW, Australia.

Fletcher R.L.; Farrell P. (1999). Introduced brown algae in the North East Atlantic, with particular respect to *Undaria pinnatifida* (Harvey) Suringar. *Helgoländer Meeresuntersuchungen 52*: 259-275

Forrest, B.; Brown, S.; Taylor, M.; Hurd, C.; Hay, C. (2000). The role of natural dispersal mechanisms in the spread of *Undaria pinnatifida* (Laminariales, Phaeophyceae). *Phycologia 39*: 547-553

Galysheva, Y.A. (2004). Subtidal macrobenthos communities of Vostok Bay (Sea of Japan) under conditions of anthropogenic impact. *Russian Journal of Marine Biology 30(6)*: 363-370.

Gordon, D.; Matawari, S. (1992). Atlas of marine fouling bryozoa of New Zealand Ports and Harbours. Miscellaneous Publications of the New Zealand Oceanographic Institute. New Zealand Oceanographic Institute. 52 p.

Grosholz, E. (2002). Ecological and evolutionary consequences of coastal invasions. *Trends in Ecology and Evolution 17*: 22-27.

Gust, N.; Inglis, G.; Hayden, B. (2001). Design of baseline surveys for exotic marine organisms. Final research report for MFISH project ZBS2000/04. National Institute of Water and Atmospheric Research, Christchurch.

Halbert, R.W. (1999). *Horouta – The history of the* Horouta *canoe, Gisborne and East coast*. Reed, Auckland, New Zealand.

Hendrickx, M.E. (1996). Habitats and biodiversity of decapod crustaceans in the SE Gulf of California, Mexico. *Revista de Biologia Tropical* 44: 585-601.

Hewitt, J. (1998). Review of information available on the effect of the Gisborne outfall on benthic ecology. NIWA Client Report GDC-90203.

Hewitt, C.; Campbell, M.; Thresher, R.; Martin, R. (1999). Marine biological invasions of Port Phillip Bay, Victoria. Report No. 20, Centre for Research on Introduced Marine Pests, Hobart.

Hewitt, C.; Martin, R. (1996). Port surveys for introduced marine species - background considerations and sampling protocols. CRIMP technical report no 4. CSIRO Division of Fisheries, Hobart.

Hewitt, C.; Martin, R. (2001). Revised protocols for baseline surveys for introduced marine species- survey design, sampling protocols and specimen handling. Report No. 22, Centre for Research on Introduced Marine Pests, Hobart.

Inglis, G. (2001). Criteria for selecting New Zealand ports and other points of entry that have a high risk of invasion by new exotic marine organisms. Final research report for Ministry of Fisheries research project ZBS2000/01A, objectives 1 & 2. NIWA, Wellington. 27pp.

Leppäkoski, E.; Gollasch, S.; Gruszka, P.; Ojaveer, H.; Olenin, S.; Panov, V. (2002). The Baltic - a sea of invaders. *Canadian Journal of Fisheries and Aquatic Sciences 59*: 1175-1188.

Mack, R.; Simberloff, D.; Lonsdale, W.; Evans, H.; Clout, M.; Bazzaz, F. (2000). Biotic invasions: causes, epidemiology, global consequences and control. *Ecological Applications 10*: 689-710.

Matsuoka, K.; Fukuyo, Y. (2000). Technical guide for modern dinoflagellate cyst study. Report prepared for the WESTPAC-HAB Project. WESTPAC-HAB/WESTPAC/IOC <http://dinos.anesc.u-tokyo.ac.jp/technical_guide/main.pdf> 77p.

Miller, M.C. (2001). Descriptions of the Dorid nudibranchs *Polycera hedpethi* Marcus, 1964 and *P. fujitai* Baba, 1937 in New Zealand (Gastropoda: Opisthobranchia). *Journal of Molluscan Studies 67*: 491-499.

NIMPIS (2002a). *Euchone limnicola* species summary. National Introduced Marine Pest Information System (Eds: Hewitt CL, Martin RB, Sliwa C, McEnnulty FR, Murphy NE, Jones T & Cooper S). Web publication http://crimp.marine.csiro.au/nimpis, Date of access: 3/25/2004.

NIMPIS (2002b). *Pseudopolydora paucibranchiata* species summary. National Introduced Marine Pest Information System (Eds: Hewitt CL, Martin RB, Sliwa C, McEnnulty FR, Murphy NE, Jones T & Cooper S). Web publication http://crimp.marine.csiro.au/nimpis, Date of access: 3/25/2004.

NIMPIS (2002c). *Bugula neritina* species summary. National Introduced Marine Pest Information System. Hewitt, C.L.; Martin, R.B.; Sliwa, C.; McEnnulty, F.R.; Murphy, N.E.; Jones, T.; Cooper, S. (Eds.:). Web publication http://crimp.marine.csiro.au/nimpis Date of access: 3/25/2004.

NIMPIS (2002d). *Tricellaria inopinata* species summary. National Introduced Marine Pest Information System. Hewitt, C.L.; Martin, R.B.; Sliwa, C.; McEnnulty, F.R.; Murphy, N.E.; Jones, T.; Cooper, S. (Eds:.). Web publication http://crimp.marine.csiro.au/nimpis, Date of access: 3/25/2004.

NIMPIS (2002e). *Cryptosula pallasiana* species summary. National Introduced Marine Pest Information System. Hewitt, C.L.; Martin, R.B.; Sliwa, C.; McEnnulty, F.R.; Murphy, N.E.; Jones, T.; Cooper, S. (Eds:.). Web publication http://crimp.marine.csiro.au/nimpis Date of access: 3/25/2004.

NIMPIS (2002f). *Monocorophium acherusicum* species summary. National Introduced Marine Pest Information System. Hewitt, C.L.; Martin, R.B.; Sliwa, C.; McEnnulty, F.R.; Murphy, N.E.; Jones, T.; Cooper, S. (Eds:.). Web publication http://crimp.marine.csiro.au/nimpis, Date of access: 3/25/2004.

NIMPIS (2002g). *Theora lubrica* species summary. National Introduced Marine Pest Information System. Hewitt, C.L.; Martin, R.B.; Sliwa, C.; McEnnulty, F.R.; Murphy,

N.E.; Jones, T.; Cooper, S. (Eds:.). Web publication http://crimp.marine.csiro.au/nimpis, Date of access: 3/24/2004.
NIMPIS (2002h) *Undaria pinnatifida* [ITALICS] species summary. National Introduced Marine Pest Information System (Eds: Hewitt CL, Martin RB, Sliwa C, McEnnulty FR, Murphy NE, Jones T & Cooper S). Web publication
<http://crimp.marine.csiro.au/nimpis>, Date of access: 3/25/2004.
NIMPIS (2002i). *Ascidiella aspersa* species summary. National Introduced Marine Pest Information System (Eds: Hewitt CL, Martin RB, Sliwa C, McEnnulty FR, Murphy NE, Jones T & Cooper S). Web publication http://crimp.marine.csiro.au/nimpis, Date of access: 3/25/2004.
Occhipinti Ambrogi, A. (2000). Biotic Invasions in a Mediterranean Lagoon. *Biological Invasions 2*: 165-176
Parker, I.; Simberloff, D.; Lonsdale, W.; Goodell, K.; Wonham, M.; Kareiva, P.; Williamson, M.; Holle, B.V.; Moyle, P.; Byers, J.; Goldwasser, L. (1999). Impact: Toward a Framework for Understanding the Ecological Effects of Invaders. *Biological Invasions 1*: 3-19.
Read, G.B. (1975). Systematics and biology of polydorid species (Polychaeta: Spionidae) from Wellington Harbour. *Journal of the Royal Society of New Zealand* 5: 395-419.
Ricciardi, A. (2001). Facilitative interactions among aquatic invaders: is an "invasional meltdown" occurring in the Great Lakes? *Canadian Journal of Fisheries and Aquatic Sciences 58*: 2513-2525.
Roper, D.; Smith, D.; Read, G. (1989). Benthos associated with two New Zealand coastal outfalls. *New Zealand Journal of Marine and Freshwater Research 23*: 295-309
Ruiz, G.; Fofonoff, P. Hines, A.; Grosholz, E. (1999). Non-indigenous species as stressors in estuarine and marine communities: assessing invasion impacts and interactions. *Limnology and Oceanography 44*: 950-972.
Sinner, J.; Forrest, B.; Taylor, M. (2000). A strategy for managing the Asian kelp *Undaria:* final report. Cawthron Report 578, 119pp.
Statistics NZ (2004). Overseas Cargo Statistics.
http://www2.stats.govt.nz/domino/external/pasfull/pasfull.nsf/7cf46ae26dcb6800cc256a6200 0a2248/4c2567ef00247c6acc256f16000eb4a4?OpenDocument, accessed 12/05/05
Thrush, S.F.; Schultz, D.; Hewitt, J.E.; Talley, D. (2002). Habitat structure in soft sediment environments and abundance of juvenile snapper *Pagrus auratus*. *Marine Ecology Progress Series 245*: 273-280.
Turnpenny. B.; Tahata, B.; Black, K.; Healy, T.; Beamsley, B. (2003). Planning Port Gisborne's surfing reef within the proposed port expansion. Proceedings of the 3rd International Surfing Reef Symposium, Raglan, New Zealand, June 22-25, 2003, p268-277.
Warwick, R.M. (1996). Marine biodiversity: a selection of papers presented at the conference "Marine Biodiversity: causes and consequences", York, U.K. 30 August - 2 September 1994. *Journal of Experimental Marine Biology and Ecology 202*: IX-X
Wei-Rung, C.; Sen-Hung, L.; Lee-Shing, F. (1999). Benthic crustacean communities in waters of southwestern taiwan and their relationships to environmental characteristics. *Acta Zoologica Taiwanica 10(1)*: 25-33.
Wilcove, D.; Rothstein, D.; Dubow, J.; Phillips, A.; Losos, E. (1998). Quantifying threats to imperiled species in the United States. *Bioscience 48*: 607-615.
Williams, A.B.; Lawrence, G.A.; Felder, D.L.; Hobbs, H.H. Jr.; Manning, R.B. (1989). Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Decapod Crustaceans. *American Fisheries Society Special Publication 17*. 77p.
<www.e-c.co.nz>: Eastland Port website. Accessed 13/06/05.
<www.eastland.co.nz>: Eastland Energy Community Trust website. Accessed 13/06/05.

<www.fish.govt.nz/sustainability/biosecurity/:>: Minsitry of Fisheries website. Accessed 07/06/05.

<www.fletcherconstruction.co.nz>: Fletcher Construction Limited website. Accessed 13/06/05.

<www.teara.govt.nz>: Te Ara encyclopedia of New Zealand. Accessed 13/06/05.

Tables

Table 1: Berthage facilities* in the Port of Gisborne.

Berth	Purpose	Construction	Length of Berth (m)	Depth (m below chart datum)
1	Floating Plant/tug, pilot launch, one fishing vessel	Concrete deck, concrete and steel sheet piling	110	5.0
2	Recreational, (2 marina fingers)	Concrete deck, concrete and steel sheet piling	110	5.0
3	Fishing vessels	Concrete deck, concrete and steel sheet piling	100	5.0
4	Fuel	Concrete deck, concrete and steel sheet piling	60	5.0
5	Fishing vessels	Concrete deck, concrete and steel sheet piling	150	5.0
6	Bulk cement/Fishing vessels/Passenger liner	Concrete deck, concrete and steel sheet piling	150	5.5
7	Container vessels/Passenger liner	Concrete deck, concrete and steel sheet piling	213	10.0
8	Container vessels	Concrete deck, concrete and steel sheet piling	150	10.0

- Berth details provided by Deane Craw, Port Services Coordinator, Eastland Port Limited.

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	20um 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 um 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	
Sedentary / encrusting biota	Quadrat scraping	0.10 m2 quadrats sampled at -0.5 m, -3.0 m and -7.0 m on 3 outer	Quadrat scraping	0.10 m2 quadrats sampled at -0.5 m, -1.5 m, -3.0 m and -7	Workshop recommended extra quadrat in high diversity algal zone (-1.5 m) and to sample inner pilings for shade tolerant species

	CRIMP Protocol		NIWA Method		
Taxa sampled	Survey method	Sample procedure	Survey method	Sample procedure	Notes
		piles per berth		m on 2 inner and 2 outer piles per berth	
Sedentary / encrusting biota	Video / photo transect	Video transect of pile/rockwall facing. Still images taken of the three 0.10 m2 quadrats	Video / photo transect	Video transect of pile/rockwall facing. Still images taken of the four 0.10 m2 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 Gisborne sampling effort.

Sample method	Number of shipping berths sampled	Number of replicate samples taken
Benthic Sled Tows	5	10
Benthic Grab (Shipek)	6	18
Box traps	5	20
Diver quadrat scraping	4	50
Opera house fish traps	5	20
Starfish traps	5	20
Shrimp traps	5	20
Javelin cores	N/A	8

Table 3b: Pile scraping sampling effort in the Port of Gisborne. Number of replicate quadrats scraped on Outer (unshaded) and Inner (shaded) pier piles at four depths. Pile materials scraped are indicated.

Sample Depth (M)	Outer Piles	Inner Piles
0.5	7 concrete, 3 wood	6 concrete
1.5	7 concrete, 3 wood	6 concrete
3.5	7 concrete, 3 wood	6 concrete
7	2 concrete	nil

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 or menthol 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 Gisborne survey.

Phylum, Class	Order	Family	Genus and species
Annelida			
Polychaeta	Eunicida	Dorvilleidae	*Dorvillea australiensis*
Polychaeta	Eunicida	Eunicidae	*Eunice australis*
Polychaeta	Eunicida	Eunicidae	*Lysidice ninetta*
Polychaeta	Eunicida	Lumbrineridae	*Lumbricalus aotearoae*
Polychaeta	Eunicida	Lumbrineridae	*Lumbrineris sphaerocephala*
Polychaeta	Phyllodocida	Glyceridae	*Glycera lamelliformis*
Polychaeta	Phyllodocida	Goniadidae	*Glycinde dorsalis*
Polychaeta	Phyllodocida	Hesionidae	*Ophiodromus angustifrons*
Polychaeta	Phyllodocida	Nephtyidae	*Aglaophamus verrilli*
Polychaeta	Phyllodocida	Nereididae	*Neanthes kerguelensis*
Polychaeta	Phyllodocida	Nereididae	*Nereis falcaria*
Polychaeta	Phyllodocida	Nereididae	*Perinereis camiguinoides*
Polychaeta	Phyllodocida	Nereididae	*Perinereis pseudocamiguina*
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia microphylla*
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus jacksoni*
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus polychromus*
Polychaeta	Phyllodocida	Sigalionidae	*Labiosthenolepis laevis*
Polychaeta	Sabellida	Sabellidae	*Branchiomma curta*
Polychaeta	Sabellida	Sabellidae	*Demonax aberrans*
Polychaeta	Sabellida	Sabellidae	*Megalomma kaikourense*
Polychaeta	Sabellida	Sabellidae	*Pseudopotamilla laciniosa*
Polychaeta	Sabellida	Serpulidae	*Spirobranchus cariniferus*
Polychaeta	Scolecida	Arenicolidae	*Abarenicola affinis*
Polychaeta	Scolecida	Capitellidae	*Heteromastus filiformis*
Polychaeta	Scolecida	Cossuridae	*Cossura consimilis*
Polychaeta	Scolecida	Opheliidae	*Armandia maculata*
Polychaeta	Spionida	Spionidae	*Boccardia syrtis*
Polychaeta	Spionida	Spionidae	*Prionospio multicristata*
Polychaeta	Terebellida	Acrocirridae	*Acrocirrus trisectus*
Polychaeta	Terebellida	Cirratulidae	*Timarete anchylochaetus*
Polychaeta	Terebellida	Flabelligeridae	*Flabelligera affinis*
Polychaeta	Terebellida	Flabelligeridae	*Pherusa parmata*
Polychaeta	Terebellida	Pectinariidae	*Pectinaria australis*
Polychaeta	Terebellida	Trichobranchidae	*Terebellides narribri*
Bryozoa			

Phylum, Class	Order	Family	Genus and species
Gymnolaemata	Cheilostomata	Beaniidae	*Beania magellanica*
Gymnolaemata	Cheilostomata	Beaniidae	*Beania plurispinosa*
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula dentata*
Gymnolaemata	Cheilostomata	Candidae	*Caberea rostrata*
Gymnolaemata	Cheilostomata	Chaperiidae	*Chaperia granulosa*
Gymnolaemata	Cheilostomata	Microporellidae	*Microporella agonistes*
Gymnolaemata	Cheilostomata	Romancheinidae	*Escharoides angela*
Gymnolaemata	Cheilostomata	Smittinidae	*Smittoidea maunganuiensis*
Cnidaria			
Hydrozoa	Hydroida	Sertulariidae	*Sertularella robusta*
Crustacea			
Cirripedia	Thoracica	Balanidae	*Austrominius modestus*
Cirripedia	Thoracica	Balanidae	*Notomegabalanus decorus*
Cirripedia	Thoracica	Chthamalidae	*Chaemosipho columna*
Malacostraca	Amphipoda	Aoridae	*Haplocheira barbimana*
Malacostraca	Amphipoda	Dexaminidae	*Paradexamine pacifica*
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe trailli*
Malacostraca	Amphipoda	Lysianassidae	*Parawaldeckia angusta*
Malacostraca	Amphipoda	Phoxocephalidae	*Torridoharpinia hurleyi*
Malacostraca	Anomura	Paguidae	*Pagurus traversi*
Malacostraca	Brachyura	Cancridae	*Cancer novaezelandiae*
Malacostraca	Brachyura	Hymenosomatidae	*Halicarcinus cookii*
Malacostraca	Brachyura	Hymenosomatidae	*Halicarcinus innominatus*
Malacostraca	Brachyura	Hymenosomatidae	*Halicarcinus varius*
Malacostraca	Brachyura	Majidae	*Notomithrax minor*
Malacostraca	Brachyura	Ocypodidae	*Macrophthalmus hirtipes*
Malacostraca	Isopoda	Cirolanidae	*Cirolana kokoru*
Malacostraca	Isopoda	Cirolanidae	*Cirolana quechso*
Malacostraca	Isopoda	Cirolanidae	*Natatolana narica*
Malacostraca	Isopoda	Cirolanidae	*Natatolana rossi*
Malacostraca	Isopoda	Sphaeromatidae	*Pseudosphaeroma campbellensis*
Malacostraca	Isopoda	Sphaeromatidae	*Sphaeroma laurensi*
Malacostraca	Palinura	Palinuridae	*Jasus edwardsi*
Echinodermata			
Asteroidea	Valvatida	Asterinidae	*Patiriella regularis*

Phylum, Class	Order	Family	Genus and species
Mollusca			
Bivalvia	Myoida	Hiatellidae	*Hiatella arctica*
Bivalvia	Mytiloida	Mytilidae	*Perna canaliculus*
Bivalvia	Mytiloida	Mytilidae	*Xenostrobus pulex*
Bivalvia	Nuculoida	Nuculidae	*Nucula hartvigiana*
Bivalvia	Ostreoida	Ostreidae	*Ostrea chilensis*
Bivalvia	Veneroida	Mactridae	*Zenatia acinaces*
Bivalvia	Veneroida	Semelidae	*Leptomya retiaria*
Bivalvia	Veneroida	Veneridae	*Austrovenus stutchburyi*
Bivalvia	Veneroida	Veneridae	*Dosinia greyi*
Bivalvia	Veneroida	Veneridae	*Irus reflexus*
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella novaezelandiae*
Gastropoda	Neogastropoda	Buccinidae	*Cominella adspersa*
Gastropoda	Nudibranchia	Dorididae	*Rostanga muscula*
Gastropoda	Patellogastropoda	Lottiidae	*Patelloida corticata*
Gastropoda	Patellogastropoda	Nacellidae	*Cellana ornata*
Gastropoda	Systellomatophora	Onchidiidae	*Onchidella nigricans*
Gastropoda	Vetigastropoda	Turbinidae	*Cookia sulcata*
Polyplacophora	Acanthochitonina	Acanthochitonidae	*Acanthochitona violacea*
Polyplacophora	Ischnochitonina	Chitonidae	*Sypharochiton pelliserpentis*
Polyplacophora	Ischnochitonina	Chitonidae	*Sypharochiton sinclairi*
Phycophyta			
Alariaceae	Phaeophyceae	Laminariales	*Ecklonia radiata*
Bryopsidophyceae	Halimediales	Caulerpaceae	*Caulerpa articulata*
Phaeophyceae	Dictyotales	Dictyotaceae	*Glossophora kunthii*
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Ectocarpus siliculosus*
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Hincksia mitchelliae*
Phaeophyceae	Ectocarpales	Scytosiphonaceae	*Scytosiphon lomentaria*
Phaeophyceae	Fucales	Cystoseiraceae	*Cystophora retroflexa*
Phaeophyceae	Fucales	Sargassaceae	*Carpophyllum flexuosum*
Phaeophyceae	Fucales	Sargassaceae	*Carpophyllum maschalocarpum*
Rhodophyceae	Ceramiales	Ceramiaceae	*Anotrichium crinitum*
Rhodophyceae	Ceramiales	Ceramiaceae	*Antithamnion applicitum*
Rhodophyceae	Ceramiales	Delesseriaceae	*Caloglossa leprieurii*
Rhodophyceae	Ceramiales	Rhodomelaceae	*Bostrychia tenuissima*
Rhodophyceae	Gelidiales	Gelidiaceae	*Capreolia implexa*

Phylum, Class	Order	Family	Genus and species
Rhodophyceae	Gigartinales	Phyllophoraceae	*Stenogramme interrupta*
Rhodophyceae	Rhodymeniales	Lomentariaceae	*Lomentaria caespitosa*
Porifera			
Demospongiae	Poecilosclerida	Microcionidae	*Clathria (Isociella) cf. incrustans*
Demospongiae	Poecilosclerida	Mycalidae	*Mycale (Carmia) tasmani*
Pyrrophycophyta			
Dinophyceae	Gymnodiniales	Gymnodiniacea	*Cochlodinium sp.*
Dinophyceae	Peridiniales	Gonyaulacaceae	*Gonyaulax sp.*
Dinophyceae	Peridiniales	Peridiniaceae	*Lingulodinium polyedrum*
Dinophyceae	Peridiniales	Peridiniaceae	*Protoperidinium conicum cf. conicoides*
Dinophyceae	Peridiniales	Peridiniaceae	*Protoperidinium sp.*
Dinophyceae	Peridiniales	Peridiniaceae	*Scrippsiella trochoidea*
Urochordata			
Ascidiacea	Aplousobranchia	Polyclinidae	*Aplidium adamsi*
Ascidiacea	Stolidobranchia	Pyuridae	*Microcosmus australis*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura cancellata*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura carnea*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura rugata*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura spinosissima*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura subuculata*
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa bicornuta*
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa nisiotus*
Vertebrata			
Actinopterygii	Anguilliformes	Congridae	*Conger wilsoni*
Actinopterygii	Gadiformes	Moridae	*Lotella rhacinus*
Actinopterygii	Mugiliformes	Mugilidae	*Aldrichetta forsteri*
Actinopterygii	Perciformes	Carangidae	*Trachurus novaezelandiae*
Actinopterygii	Perciformes	Centrolophidae	*Seriolella brama*
Actinopterygii	Perciformes	Cheilodactylidae	*Nemadactylus macropterus*
Actinopterygii	Perciformes	Labridae	*Notolabrus celidotus*
Actinopterygii	Perciformes	Scorpidinae	*Scorpis lineolata*
Actinopterygii	Perciformes	Sparidae	*Pagrus auratus*
Actinopterygii	Perciformes	Trypterigiidae	*Grahamina capito*
Chondrichthyes	Carcharhiniformes	Triakidae	*Galeorhinus australis*

Table 7. Cryptogenic marine species recorded from the Port of Gisborne 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
Chelicerata				
Pycnogonida	Pantopoda	Ammotheidae	*?Tanystylum sp. nov. B*	C2
Cnidaria				
Hydrozoa	Hydroida	Bougainvilliidae	*Bougainvillia muscus*	C1
Hydrozoa	Hydroida	Haleciidae	*Halecium sessile*	C1
Crustacea				
Malacostraca	Isopoda	Cirolanidae	*Cirolana sp. nov.*	C2
Porifera				
Demospongiae	Dictyoceratida	Dysideidae	*Dysidea n. sp. 1*	C2
Demospongiae	Dictyoceratida	Dysideidae	*Euryspongia n. sp. 2*	C2
Demospongiae	Halichondrida	Halichondriidae	*Halichondria n. sp. 1*	C2
Demospongiae	Haplosclerida	Chalinidae	*Haliclona n. sp. 10*	C2
Demospongiae	Homosclerophorida	Plakinidae	*Plakina monolopha*	C1
Pyrrophycophyta				
Dinophyceae	Gymnodiniales	Gymnodiniacea	*Gymnodinium catenatum*	C1
Urochordata				
Ascidiacea	Aplousobranchia	Didemnidae	*Diplosoma listerianum*	C1
Ascidiacea	Aplousobranchia	Polyclinidae	*Aplidium phortax*	C1
Ascidiacea	Phlebobranchia	Pyuridae	*Microcosmus squamiger*	C2
Ascidiacea	Phlebobranchia	Rhodosomatidae	*Corella eumyota*	C1
Ascidiacea	Stolidobranchia	Styelidae	*Asterocarpa cerea*	C1

Table 8: Non-indigenous marine species recorded from the Port of Gisborne 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	Sabellida	Sabellidae	*Euchone limnicola*	H	Unknown [1]
Polychaeta	Spionida	Spionidae	*Pseudopolydora paucibranchiata*	H or B	Pre-1975
Bryozoa					
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula neritina*	H	1949
Gymnolaemata	Cheilostomata	Candidae	*Tricellaria inopinata*	H	Unknown [1]
Gymnolaemata	Cheilostomata	Cryptosulidae	*Cryptosula pallasiana*	H	1890s
Gymnolaemata	Cheilostomata	Lepraliellidae	*Celleporaria nodulosa* **(NR)**	H	Jan. 2002 [d]
Gymnolaemata	Cheilostomata	Watersiporidae	*Watersipora subtorquata*	H or B	Pre-1982
Crustacea					
Malacostraca	Amphipoda	Corophiidae	*Monocorophium acherusicum*	H	Pre-1921
Malacostraca	Brachyura	Cancridae	*Cancer amphioetus* **(NR)**	H or B	Jan. 2003 [d]
Mollusca					
Bivalvia	Veneroida	Semelidae	*Theora lubrica*	B	1971
Gastropoda	Nudibranchia	Polyceridae	*Polycera hedgpethi*	H	1970s
Phycophyta					
Phaeophyceae	Laminariales	Alariaceae	*Undaria pinnatifida*	H or B	Pre-1987
Urochordata					
Ascidiacea	Phlebobranchia	Ascidiidae	*Ascidiella aspersa*	H	1900s
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 Gisbourne 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	Glyceridae	*Glycera Indet*
Polychaeta	Phyllodocida	Glyceridae	*Glyceridae Indet*
Polychaeta	Phyllodocida	Nereididae	*Perinereis Perinereis-A*
Polychaeta	Phyllodocida	Nereididae	*Platynereis Platynereis_australis_group*
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia Eulalia-NIWA-2*
Polychaeta	Phyllodocida	Phyllodocidae	*Phyllodocidae Indet*
Polychaeta	Phyllodocida	Syllidae	*Syllidae Indet*
Polychaeta	Phyllodocida	Syllidae	*Typosyllis Typosyllis-A*
Polychaeta	Sabellida	Sabellidae	*Branchiomma Branchiomma-A*
Polychaeta	Sabellida	Serpulidae	*Serpula Indet*
Polychaeta	Terebellida	Ampharetidae	*Amphicteis Amphicteis-A*
Polychaeta	Terebellida	Terebellidae	*Artacama Artacama-A*
Polychaeta	Terebellida	Terebellidae	*Terebellidae Indet*
Bryozoa			
Gymnolaemata	Cheilostomata	Aeteidae	*Aetea ?australis*
Cnidaria			
Anthozoa	Corallimorpharia	Corallimorphidae	*Corynactis sp.*
Anthozoa			*Anthozoa sp.*
Hydrozoa	Hydroida	Campanulariidae	*Clytia sp. 1*
Crustacea			
Cirripedia	Thoracica	Chthamalidae	*Chaemosipho columna?*
Malacostraca	Amphipoda	Ischyroceridae	*Jassa sp.*
Malacostraca	Brachyura	Grapsidae	*Plagusia sp.*
Mollusca			
Bivalvia	Nuculoida	Nuculidae	*Linucula sp.*

Phylum, Class	Order	Family	Genus and species
Gastropoda	Cephalaspidea	Acteonidae	*Acteon sp.*
Phycophyta			
Cladophorophyceae	Cladophorales	Cladophoraceae	*Cladophora sp.*
Phaeophyceae	Dictyotales	Dictyotaceae	*Dictyota sp.*
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Ectocarpus sp.*
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Hincksia sp.*
Phaeophyceae	Sphacelariales	Sphacelariaceae	*Sphacelaria sp.*
Rhodophyceae	Acrochaetiales	Acrochaetiaceae	*Audouinella sp.*
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium flaccidum ?*
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium sp.*
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia sp.*
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia teges?*
Rhodophyceae	Ceramiales	Dasyaceae	*Dasya sp.*
Rhodophyceae	Ceramiales	Rhodomelaceae	*Polysiphonia sp.*
Rhodophyceae	Gracilariales	Gracilariceae	*Gracilaria sp.*
Rhodophyceae	Plocamiales	Plocamiaceae	*Plocamium cartilagineum?*
Rhodophyceae	Rhodymeniales	Lomentariaceae	*Lomentaria ? sp.*
Rhodophyceae	Rhodymeniales	Rhodymeniaceae	*Rhodymenia sp.*
Ulvophyceae	Ulvales	Ulvaceae	*Enteromorpha sp.*
Ulvophyceae	Ulvales	Ulvaceae	*Ulva sp.*
Urochordata			
Ascidiacea	Aplousobranchia	Didemnidae	*Didemnum sp.*
Vertebrata			
Actinopterygii	Gonorinchyformes	Gonorynchidae	*Gonorynchus sp.*
Actinopterygii	Perciformes	Eleotridae	*Eleotridae sp.*
Actinopterygii	Perciformes	Serranidae	*Anthiinae sp.*

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

Genus and species	Capture technique in Port of Gisborne	Locations detected in Port of Gisborne	Detected in other locations surveyed in ZBS2000_04
Euchone limnicola	Benthic sled	Berth 6; Berth 7; Kaiti Basin (See Fig 13)	Timaru
Pseudopolydora paucibranchiata	Benthic grab, Benthic sled, Pile scrape	Berth 6; Berth 7; Berth 8; Kaiti Basin (See Fig 14)	Whangarei Harbour
Bugula neritina	Pile scrape	Berth 6; Berth 7; Berth 8; Kaiti Basin (See Fig 15)	Auckland, Dunedin, Gulf Harbour Marina, Lyttleton, Napier, Opua Marina, Taranaki, Tauranga, Timaru, Whangarei Harbour, Whangarei Marina
Tricellaria inopinata	Benthic grab, Pile scrape	Berth 6; Berth 7; Berth 8 (See Fig 16)	Lyttleton, Taranaki, Whangarei Harbour
Cryptosula pallasiana	Pile scrape	Berth 7 (See Fig 17)	Dunedin, Lyttleton, Nelson, Taranaki, Timaru, Whangarei Harbour, Wellington
Celleporaria nodulosa	Pile scrape	Berth 8 (See Fig 18)	Nelson
Watersipora subtorquata	Benthic grab, Pile scrape	Berth 7; Berth 8 (See Fig 19)	Bluff, Dunedin, Gulf Harbour Marina, Lyttleton, Napier, Nelson, Opua Marina, Picton, Taranaki, Tauranga, Timaru, Whangarei Harbour, Wellington
Monocorophium acherusicum	Pile scrape	Kaiti Basin (See Fig 20)	Dunedin, Lyttleton, Tauranga, Timaru, Whangarei Marina
Cancer amphioetus	Pile scrape	Berth 7 (See Fig 21)	Bluff
Theora lubrica	Benthic grab, Benthic sled	Berth 6; Berth 7; Berth 8; Kaiti Basin; Swinging Basin (See Fig 22)	Auckland, Gulf Harbour Marina, Lyttleton, Napier, Nelson, Opua Marina, Taranaki, Whangarei Harbour, Whangarei Marina, Wellington
Polycera hedgpathi	Pile scrape	Berth 6; Kaiti Basin (See Fig 23)	Opua Marina
Undaria pinnatifida	Pile scrape	Berth 8 (See Fig 24)	Dunedin, Lyttleton, Napier, Picton, Timaru, Wellington
Ascidiella aspersa	Benthic sled, Pile scrape	Berth 6; Berth 8; Kaiti Basin (See Fig 25)	Gulf Harbour Marina, Napier
Cnemidocarpa sp.	Pile scrape	Berth 7; Berth 8 (See Fig 26)	Auckland, Gulf Harbour Marina, Nelson, Picton, 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 (Phaecophyceae). 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: Criteria for assigning non-indigenous status to species sampled from the Port of Gisborne.

Criteria that apply to each species are indicated by (+). Criteria (C1-C9) were developed by Chapman and Carlton (1994). Here we apply Cranfield et al's (1998) analysis to species previously known from New Zealand waters. For non-indigenous species 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 criteria.

Phylum and species	C1	C2	C3	C4	C5	C6	C7	C8	C9
Annelida									
Euchone limnicola	+		+		+	+	+	+	
Pseudopolydora paucibranchiata	+		+		+	+	+	+	+
Bryozoa									
Bugula neritina	+				+	+	+	+	+
Tricellaria inopinata	+	+	+		+	+		+	+
Cryptosula pallasiana	+	+	+		+	+	+	+	+
Celleporaria nodulosa	+		+		+		+	+	+
Watersipora subtorquata	+	+	+		+	+	+	+	+
Crustacea									
Monocorophium acherusicum			+		+	+		+	+
Cancer amphioetus	+		+					+	+
Mollusca									
Theora lubrica	+	+			+	+	+	+	+
Polycera hedgpethi	+	+	+	+		+			
Phycophyta									
Undaria pinnatifida	+	+	+		+	+	+	+	+
Urochordata									
Ascidiella aspersa	+	+	+	+	+	+	+	+	+
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 Gisborne

Site	Eastings	Northings	NZ Latitude	NZ Longitude	Survey Method	No. of sample units
6	2947277	6268934	-38.67484	178.02667	BGRB	3
6	2947277	6268954	-38.67466	178.02666	BSLD	2
6	2947341	6269004	-38.67418	178.02737	CRBTP	2
6	2947406	6269035	-38.67387	178.02809	CRBTP	2
6	2947276	6268918	-38.67498	178.02667	FSHTP	2
6	2947311	6268978	-38.67443	178.02704	FSHTP	2
6	2947277	6268934	-38.67484	178.02667	PSC	12
6	2947341	6269004	-38.67418	178.02737	SHRTP	2
6	2947406	6269035	-38.67387	178.02809	SHRTP	2
6	2947341	6269004	-38.67418	178.02737	STFTP	2
6	2947406	6269035	-38.67387	178.02809	STFTP	2
7	2947195	6268858	-38.67557	178.02579	BGRB	3
7	2947195	6268878	-38.67539	178.02577	BSLD	2
7	2947216	6268888	-38.67529	178.02601	CRBTP	4
7	2947130	6268822	-38.67593	178.02506	FSHTP	2
7	2947195	6268858	-38.67557	178.02579	FSHTP	2
7	2947195	6268858	-38.67557	178.02579	PSC	14
7	2947216	6268888	-38.67529	178.02601	SHRTP	4
7	2947216	6268888	-38.67529	178.02601	STFTP	4
8	2947032	6268759	-38.67654	178.02398	BGRB	3
8	2947032	6268779	-38.67636	178.02397	BSLD	2
8	2946925	6268696	-38.67716	178.02279	CRBTP	2
8	2946962	6268723	-38.67690	178.02320	CRBTP	2
8	2947005	6268742	-38.67671	178.02367	FSHTP	2
8	2947070	6268779	-38.67634	178.02440	FSHTP	2
8	2947032	6268759	-38.67654	178.02398	PSC	12
8	2946925	6268696	-38.67716	178.02279	SHRTP	2
8	2946962	6268723	-38.67690	178.02320	SHRTP	2
8	2946925	6268696	-38.67716	178.02279	STFTP	2
8	2946962	6268723	-38.67690	178.02320	STFTP	2
M1	2947499	6269270	-38.67171	178.02901	BGRB	3
M1	2947499	6269290	-38.67153	178.02900	BSLD	2
M1	2947499	6269270	-38.67171	178.02901	CRBTP	4
M1	2947539	6269287	-38.67154	178.02945	FSHTP	2
M1	2947604	6269246	-38.67187	178.03023	FSHTP	2
M1	2947499	6269270	-38.67171	178.02901	PSC	12
M1	2947499	6269270	-38.67171	178.02901	SHRTP	4
M1	2947499	6269270	-38.67171	178.02901	STFTP	4
M2	2947597	6269142	-38.67281	178.03022	BGRB	3
MARINA	2947496	6269172	-38.67259	178.02904	CYST	2
MIDDLE	2947147	6268898	-38.67523	178.02520	CYST	2
TA	2946939	6268909	-38.67523	178.02281	BGRB	3
TA	2946939	6268929	-38.67506	178.02280	BSLD	2
TA	2946840	6268912	-38.67526	178.02167	CRBTP	2
TA	2946939	6268909	-38.67523	178.02281	CRBTP	2
TA	2946840	6268912	-38.67526	178.02167	FSHTP	2

Site	Eastings	Northings	NZ Latitude	NZ Longitude	Survey Method	No. of sample units
TA	2946939	6268909	-38.67523	178.02281	FSHTP	2
TA	2946840	6268912	-38.67526	178.02167	SHRTP	2
TA	2946939	6268909	-38.67523	178.02281	SHRTP	2
TA	2946840	6268912	-38.67526	178.02167	STFTP	2
TA	2946939	6268909	-38.67523	178.02281	STFTP	2
TA 1	2946752	6268735	-38.67690	178.02079	CYST	2
TA 2	2946833	6268838	-38.67593	178.02165	CYST	2

*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	6												7														8
					Pile replicate	1						2						1							2							1
					Pile position	IN			OUT			IN			OUT			IN			OUT				IN			OUT				IN
Class	Orders	Family	Genus	Species	*Status	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	1	2	3	1	2	3	4	1
Anthozoa	Corallimorpharia	Corallimorphidae	*Corynactis*	*sp.*	SI	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Anthozoa			*Anthozoa*	*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
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	0	0	0	0	0	0
Ascidiacea	Aplousobranchia	Didemnidae	*Diplosoma*	*listerianum*	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
Ascidiacea	Aplousobranchia	Polyclinidae	*Aplidium*	*phortax*	C1	0	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Aplousobranchia	Polyclinidae	*Aplidium*	*adamsi*	N	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Phlebobranchia	Ascidiidae	*Ascidiella*	*aspersa*	A	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
Ascidiacea	Phlebobranchia	Pyuridae	*Microcosmus*	*squamiger*	C2	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
Ascidiacea	Phlebobranchia	Rhodosomatidae	*Corella*	*eumyota*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*rugata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*cancellata*	N	0	0	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
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*subuculata*	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
Ascidiacea	Stolidobranchia	Pyuridae	*Microcosmus*	*australis*	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
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*carnea*	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
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*spinosissima*	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
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*nisiotus*	N	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	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	1	1	0	0	1	0	0	0	1	0
Ascidiacea	Stolidobranchia	Styelidae	*Asterocarpa*	*cerea*	C1	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
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*sp.*	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	1	0
Bivalvia	Myoida	Hiatellidae	*Hiatella*	*arctica*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0	0	0	0	0
Bivalvia	Mytiloida	Mytilidae	*Xenostrobus*	*pulex*	N	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Mytiloida	Mytilidae	*Perna*	*canaliculus*	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
Bivalvia	Ostreoida	Ostreidae	*Ostrea*	*chilensis*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	1	1	1	1
Bivalvia	Veneroida	Veneridae	*Irus*	*reflexus*	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	0	0	1
Cladophorophyceae	Cladophorales	Cladophoraceae	*Cladophora*	*sp.*	SI	0	1	0	0	1	0	0	1	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	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	Cancridae	*Cancer*	*amphioetus*	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	1	0
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*cookii*	N	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*innominatus*	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
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	0	0	0	0
Crustacea	Brachyura	Majidae	*Notomithrax*	*minor*	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
Crustacea	Thoracica	Balanidae	*Notomegabalanus*	*decorus*	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	1
Crustacea	Thoracica	Balanidae	*Austrominius*	*modestus*	N	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
Crustacea	Thoracica	Chthamalidae	*Chaemosipho*	*columna*	N	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
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	0	0	0	0
Demospongiae	Dictyoceratida	Dysideidae	*Euryspongia*	*n. sp. 2 (pale blue bushy encrusting)*	C2	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
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	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Homosclerophorida	Plakinidae	*Plakina*	*monolopha*	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
Demospongiae	Poecilosclerida	Microcionidae	*Clathria (Isociella)*	*cf. incrustans*	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
Demospongiae	Poecilosclerida	Mycalidae	*Mycale (Carmia)*	*tasmani*	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
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella*	*novaezelandiae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0
Gastropoda	Nudibranchia	Dorididae	*Rostanga*	*muscula*	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
Gastropoda	Nudibranchia	Polyceridae	*Polycera*	*hedgpathi*	C1	1	1	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Patellogastropoda	Lottiidae	*Patelloida*	*corticata*	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
Gastropoda	Patellogastropoda	Nacellidae	*Cellana*	*ornata*	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
Gastropoda	Systellomatophora	Onchidiidae	*Onchidella*	*nigricans*	N	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
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	0	0	0	0
Gymnolaemata	Cheilostomata	Beaniidae	*Beania*	*plurispinosa*	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	1
Gymnolaemata	Cheilostomata	Beaniidae	*Beania*	*magellanica*	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
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula*	*neritina*	A	0	1	1	0	1	1	0	1	1	0	1	1	0	1	0	0	1	1	0	0	1	1	0	1	1	0	1
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula*	*dentata*	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
Gymnolaemata	Cheilostomata	Candidae	*Tricellaria*	*inopinata*	A	0	1	0	0	1	1	0	1	0	0	0	1	0	1	1	0	0	0	0	0	1	1	0	1	0	0	0
Gymnolaemata	Cheilostomata	Chaperiidae	*Chaperia*	*granulosa*	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
Gymnolaemata	Cheilostomata	Cryptosulidae	*Cryptosula*	*pallasiana*	A	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

*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	6												7														8
					Pile replicate	1						2						1							2							1
					Pile position	IN			OUT			IN			OUT			IN			OUT				IN			OUT				IN
					*Status	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	1	2	3	1	2	3	4	1
Gymnolaemata	Cheilostomata	Lepraliellidae	*Celleporaria*	*nodulosa*	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
Gymnolaemata	Cheilostomata	Microporellidae	*Microporella*	*agonistes*	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
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	0	0	0	0
Gymnolaemata	Cheilostomata	Romancheinidae	*Escharoides*	*angela*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
Gymnolaemata	Cheilostomata	Scrupariidae	*Scruparia*	*ambigua*	C1	0	1	0	0	0	1	0	1	0	0	0	1	0	1	1	0	0	1	0	0	1	1	0	1	1	0	1
Gymnolaemata	Cheilostomata	Smittinidae	*Smittoidea*	*maunganuiensis*	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
Gymnolaemata	Cheilostomata	Watersiporidae	*Watersipora*	*subtorquata*	A	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	1
Hydrozoa	Hydroida	Bougainvilliidae	*Bougainvillia*	*muscus*	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
Hydrozoa	Hydroida	Campanulariidae	*Clytia*	*sp. 1*	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
Hydrozoa	Hydroida	Haleciidae	*Halecium*	*sessile*	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
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	0	0	0	0
Malacostraca	Amphipoda	Aoridae	*Haplocheira*	*barbimana*	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
Malacostraca	Amphipoda	Corophiidae	*Monocorophium*	*acherusicum*	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
Malacostraca	Amphipoda	Dexaminidae	*Paradexamine*	*pacifica*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Malacostraca	Amphipoda	Ischyroceridae	*Jassa*	*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
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe*	*trailli*	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	1	0
Malacostraca	Amphipoda	Lysianassidae	*Parawaldeckia*	*angusta*	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	1	0
Malacostraca	Isopoda	Sphaeromatidae	*Pseudosphaeroma*	*campbellensis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0
Phaeophyceae	Dictyotales	Dictyotaceae	*Dictyota*	*sp.*	SI	0	1	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
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Hincksia*	*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
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Ectocarpus*	*siliculosus*	N	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
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Hincksia*	*mitchelliae*	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
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Ectocarpus*	*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	0	0	0	0
Phaeophyceae	Ectocarpales	Scytosiphonaceae	*Scytosiphon*	*lomentaria*	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
Phaeophyceae	Laminariales	Alariaceae	*Undaria*	*pinnatifida*	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
Phaeophyceae	Laminariales	Alariaceae	*Ecklonia*	*radiata*	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
Phaeophyceae	Sphacelariales	Sphacelariaceae	*Sphacelaria*	*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	0	0	0	0
Polychaeta	Eunicida	Dorvilleidae	*Dorvillea*	*australiensis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	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	1	0	0	0	1	0	0	0	0	0
Polychaeta	Eunicida	Eunicidae	*Eunice*	*australis*	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
Polychaeta	Eunicida	Lumbrineridae	*Lumbrineris*	*sphaerocephala*	N	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Polychaeta	Phyllodocida	Glyceridae	*Glyceridae*	*Indet*	SI	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
Polychaeta	Phyllodocida	Hesionidae	*Ophiodromus*	*angustifrons*	N	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
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
Polychaeta	Phyllodocida	Nereididae	*Platynereis*	*Platynereis_australis_group*	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
Polychaeta	Phyllodocida	Nereididae	*Neanthes*	*kerguelensis*	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
Polychaeta	Phyllodocida	Nereididae	*Nereis*	*falcaria*	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
Polychaeta	Phyllodocida	Nereididae	*Perinereis*	*pseudocamiguina*	N	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
Polychaeta	Phyllodocida	Nereididae	*Perinereis*	*Perinereis-A*	SI	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
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	1	0	0	0	0	0
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia*	*microphylla*	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
Polychaeta	Phyllodocida	Phyllodocidae	*Phyllodocidae*	*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
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*polychromus*	N	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*jacksoni*	N	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	Syllidae	*Syllidae*	*Indet*	SI	1	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Syllidae	*Typosyllis*	*Typosyllis-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	0	0	0	0
Polychaeta	Sabellida	Sabellidae	*Branchiomma*	*curta*	N	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Polychaeta	Sabellida	Sabellidae	*Pseudopotamilla*	*laciniosa*	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
Polychaeta	Sabellida	Sabellidae	*Branchiomma*	*Branchiomma-A*	SI	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
Polychaeta	Sabellida	Sabellidae	*Demonax*	*aberrans*	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
Polychaeta	Sabellida	Sabellidae	*Megalomma*	*kaikourense*	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
Polychaeta	Sabellida	Serpulidae	*Spirobranchus*	*cariniferus*	N	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0
Polychaeta	Sabellida	Serpulidae	*Serpula*	*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
Polychaeta	Scolecida	Opheliidae	*Armandia*	*maculata*	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

*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	6												7														8
					Pile replicate	1						2						1							2							1
					Pile position	IN			OUT			IN			OUT			IN			OUT				IN			OUT				IN
Class	Orders	Family	Genus	Species	*Status	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	1	2	3	1	2	3	4	1
Polychaeta	Spionida	Spionidae	*Pseudopolydora*	*paucibranchiata*	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
Polychaeta	Terebellida	Acrocirridae	*Acrocirrus*	*trisectus*	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	1	0
Polychaeta	Terebellida	Cirratulidae	*Timarete*	*anchylochaetus*	N	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Flabelligeridae	*Pherusa*	*parmata*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0
Polychaeta	Terebellida	Flabelligeridae	*Flabelligera*	*affinis*	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
Polychaeta	Terebellida	Terebellidae	*Terebellidae*	*Indet*	SI	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
Polyplacophora	Acanthochitonina	Acanthochitonidae	*Acanthochitona*	*violacea*	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
Polyplacophora	Ischnochitonina	Chitonidae	*Sypharochiton*	*sinclairi*	N	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	0
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	1	0	0	0	0	0	0	0
Rhodophyceae	Acrochaetiales	Acrochaetiaceae	*Audouinella*	*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	0	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium*	*sp.*	SI	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	*Ceramium*	*flaccidum*	N	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia*	*teges?*	SI	0	1	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
Rhodophyceae	Ceramiales	Ceramiaceae	*Antithamnion*	*applicitum*	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
Rhodophyceae	Ceramiales	Dasyaceae	*Dasya*	*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
Rhodophyceae	Ceramiales	Delesseriaceae	*Caloglossa*	*leprieurii*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
Rhodophyceae	Ceramiales	Rhodomelaceae	*Polysiphonia*	*sp.*	SI	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Rhodomelaceae	*Bostrychia*	*tenuissima*	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
Rhodophyceae	Gelidiales	Gelidiaceae	*Capreolia*	*implexa*	N	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	Gracilariales	Gracilariceae	*Gracilaria*	*sp.*	SI	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
Rhodophyceae	Rhodymeniales	Lomentariaceae	*Lomentaria*	*caespitosa*	N	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
Rhodophyceae	Rhodymeniales	Lomentariaceae	*Lomentaria*	*sp.*	SI	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
Rhodophyceae	Rhodymeniales	Rhodymeniaceae	*Rhodymenia*	*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
Ulvophyceae	Ulvales	Ulvaceae	*Enteromorpha*	*sp.*	SI	1	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

*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													M1											
					Pile replicate								2					1			2			3			4		
					Pile position			OUT			IN			OUT														
Class	Orders	Family	Genus	Species	*Status	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Anthozoa	Corallimorpharia	Corallimorphidae	*Corynactis*	*sp.*	SI	0	1	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Anthozoa			*Anthozoa*	*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
Ascidiacea	Aplousobranchia	Didemnidae	*Didemnum*	*sp.*	SI	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Aplousobranchia	Didemnidae	*Diplosoma*	*listerianum*	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	Aplousobranchia	Polyclinidae	*Aplidium*	*phortax*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Ascidiacea	Aplousobranchia	Polyclinidae	*Aplidium*	*adamsi*	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	Phlebobranchia	Ascidiidae	*Ascidiella*	*aspersa*	A	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1
Ascidiacea	Phlebobranchia	Pyuridae	*Microcosmus*	*squamiger*	C2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ascidiacea	Phlebobranchia	Rhodosomatidae	*Corella*	*eumyota*	C1	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*rugata*	N	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*cancellata*	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*	*subuculata*	N	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Microcosmus*	*australis*	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	Pyuridae	*Pyura*	*carnea*	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*	*spinosissima*	N	0	1	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	1	0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*bicornuta*	N	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ascidiacea	Stolidobranchia	Styelidae	*Asterocarpa*	*cerea*	C1	0	1	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*	*sp.*	A	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Myoida	Hiatellidae	*Hiatella*	*arctica*	N	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Bivalvia	Mytiloida	Mytilidae	*Xenostrobus*	*pulex*	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	Mytiloida	Mytilidae	*Perna*	*canaliculus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Bivalvia	Ostreoida	Ostreidae	*Ostrea*	*chilensis*	N	1	1	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Veneridae	*Irus*	*reflexus*	N	0	1	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	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	1
Crustacea	Anomura	Paguidae	*Pagurus*	*traversi*	N	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Cancridae	*Cancer*	*amphioetus*	A	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	Hymenosomatidae	*Halicarcinus*	*cookii*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*innominatus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*varius*	N	0	0	0	0	0	0	0	1	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	0	0	0	0	0	0	0	0	0	0	1
Crustacea	Thoracica	Balanidae	*Notomegabalanus*	*decorus*	N	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Thoracica	Balanidae	*Austrominius*	*modestus*	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	Thoracica	Chthamalidae	*Chaemosipho*	*columna*	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	Dictyoceratida	Dysideidae	*Dysidea*	*n. sp. 1 (erect cactus)*	C2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Dictyoceratida	Dysideidae	*Euryspongia*	*n. sp. 2 (pale blue bushy encrusting)*	C2	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Homosclerophorida	Plakinidae	*Plakina*	*monolopha*	C1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Poecilosclerida	Microcionidae	*Clathria (Isociella)*	*cf. incrustans*	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	Mycalidae	*Mycale (Carmia)*	*tasmani*	N	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella*	*novaezelandiae*	N	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Nudibranchia	Dorididae	*Rostanga*	*muscula*	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	Nudibranchia	Polyceridae	*Polycera*	*hedgpathi*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Gastropoda	Patellogastropoda	Lottiidae	*Patelloida*	*corticata*	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	Patellogastropoda	Nacellidae	*Cellana*	*ornata*	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	Systellomatophora	Onchidiidae	*Onchidella*	*nigricans*	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	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Beaniidae	*Beania*	*plurispinosa*	N	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Beaniidae	*Beania*	*magellanica*	N	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	Bugulidae	*Bugula*	*neritina*	A	1	0	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	0	0	1	0	1	1
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula*	*dentata*	N	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Gymnolaemata	Cheilostomata	Candidae	*Tricellaria*	*inopinata*	A	0	0	1	1	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Chaperiidae	*Chaperia*	*granulosa*	N	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Cryptosulidae	*Cryptosula*	*pallasiana*	A	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											M1												
					Pile replicate						2					1			2			3			4			
					Pile position			OUT			IN			OUT														
Class	Orders	Family	Genus	Species	*Status	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Gymnolaemata	Cheilostomata	Lepraliellidae	*Celleporaria*	*nodulosa*	A	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Microporellidae	*Microporella*	*agonistes*	N	0	0	1	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Romancheinidae	*Escharoides*	*angela*	N	1	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	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1
Gymnolaemata	Cheilostomata	Smittinidae	*Smittoidea*	*maunganuiensis*	N	1	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	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Hydrozoa	Hydroida	Bougainvilliidae	*Bougainvillia*	*muscus*	C1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrozoa	Hydroida	Campanulariidae	*Clytia*	*sp. 1*	SI	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrozoa	Hydroida	Haleciidae	*Halecium*	*sessile*	C1	0	0	0	0	0	1	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	1	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	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Corophiidae	*Monocorophium*	*acherusicum*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Malacostraca	Amphipoda	Dexaminidae	*Paradexamine*	*pacifica*	N	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Ischyroceridae	*Jassa*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe*	*trailli*	N	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Lysianassidae	*Parawaldeckia*	*angusta*	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	Isopoda	Sphaeromatidae	*Pseudosphaeroma*	*campbellensis*	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	Dictyotales	Dictyotaceae	*Dictyota*	*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
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Hincksia*	*sp*	SI	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	1	0	0
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Ectocarpus*	*siliculosus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Hincksia*	*mitchelliae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0
Phaeophyceae	Ectocarpales	Ectocarpaceae	*Ectocarpus*	*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
Phaeophyceae	Ectocarpales	Scytosiphonaceae	*Scytosiphon*	*lomentaria*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Phaeophyceae	Laminariales	Alariaceae	*Undaria*	*pinnatifida*	A	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaeophyceae	Laminariales	Alariaceae	*Ecklonia*	*radiata*	N	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaeophyceae	Sphacelariales	Sphacelariaceae	*Sphacelaria*	*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
Polychaeta	Eunicida	Dorvilleidae	*Dorvillea*	*australiensis*	N	0	0	0	0	0	0	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	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Eunicida	Eunicidae	*Eunice*	*australis*	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	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Glyceridae	*Glyceridae*	*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	Hesionidae	*Ophiodromus*	*angustifrons*	N	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Nereididae	*Perinereis*	*camiguinoides*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0
Polychaeta	Phyllodocida	Nereididae	*Platynereis*	*Platynereis_australis_group*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Polychaeta	Phyllodocida	Nereididae	*Neanthes*	*kerguelensis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Polychaeta	Phyllodocida	Nereididae	*Nereis*	*falcaria*	N	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Nereididae	*Perinereis*	*pseudocamiguina*	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	Nereididae	*Perinereis*	*Perinereis-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	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
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia*	*microphylla*	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	Phyllodocidae	*Phyllodocidae*	*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
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*polychromus*	N	0	1	0	1	0	0	0	1	0	0	1	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	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Syllidae	*Syllidae*	*Indet*	SI	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Syllidae	*Typosyllis*	*Typosyllis-A*	SI	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Sabellida	Sabellidae	*Branchiomma*	*curta*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0
Polychaeta	Sabellida	Sabellidae	*Pseudopotamilla*	*laciniosa*	N	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Sabellida	Sabellidae	*Branchiomma*	*Branchiomma-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	Sabellida	Sabellidae	*Demonax*	*aberrans*	N	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Sabellida	Sabellidae	*Megalomma*	*kaikourense*	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	*Spirobranchus*	*cariniferus*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
Polychaeta	Sabellida	Serpulidae	*Serpula*	*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
Polychaeta	Scolecida	Opheliidae	*Armandia*	*maculata*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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												M1											
					Pile replicate						2						1			2			3			4		
					Pile position			OUT			IN			OUT														
Class	Orders	Family	Genus	Species	*Status	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Polychaeta	Spionida	Spionidae	*Pseudopolydora*	*paucibranchiata*	A	0	0	0	0	0	0	0	0	0	0	0	0	1	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	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Cirratulidae	*Timarete*	*anchylochaetus*	N	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Flabelligeridae	*Pherusa*	*parmata*	N	0	1	0	1	1	0	1	1	1	0	1	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	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
Polyplacophora	Acanthochitonina	Acanthochitonidae	*Acanthochitona*	*violacea*	N	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polyplacophora	Ischnochitonina	Chitonidae	*Sypharochiton*	*sinclairi*	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	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	Acrochaetiales	Acrochaetiaceae	*Audouinella*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia*	*sp.*	SI	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium*	*flaccidum*	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*	*teges?*	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	Ceramiales	Ceramiaceae	*Antithamnion*	*applicitum*	N	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Dasyaceae	*Dasya*	*sp.*	SI	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Delesseriaceae	*Caloglossa*	*leprieurii*	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	Rhodomelaceae	*Polysiphonia*	*sp.*	SI	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	1	1	0	0	1
Rhodophyceae	Ceramiales	Rhodomelaceae	*Bostrychia*	*tenuissima*	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	Gelidiales	Gelidiaceae	*Capreolia*	*implexa*	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	Gracilariales	Gracilariceae	*Gracilaria*	*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*	*caespitosa*	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	Rhodymeniales	Lomentariaceae	*Lomentaria*	*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	Rhodymeniaceae	*Rhodymenia*	*sp.*	SI	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulvophyceae	Ulvales	Ulvaceae	*Enteromorpha*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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.

					Berth code	6			7			8			M1			M2			TA		
Class	Order	Family	Genus	Species	*Status	1	2	3	1	3	2	1	2	3	1	2	3	1	2	3	1	2	3
Bivalvia	Nuculoida	Nuculidae	*Linucula*	*sp.*	SI	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Bivalvia	Nuculoida	Nuculidae	*Nucula*	*hartvigiana*	N	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0
Bivalvia	Veneroida	Semelidae	*Leptomya*	*retiaria*	N	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Semelidae	*Theora*	*lubrica*	A	0	0	0	1	1	1	0	0	0	1	1	0	1	0	1	1	1	0
Bivalvia	Veneroida	Veneridae	*Austrovenus*	*stutchburyi*	N	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*cookii*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Ocypodidae	*Macrophthalmus*	*hirtipes*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella*	*novaezelandiae*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Candidae	*Caberea*	*rostrata*	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Candidae	*Tricellaria*	*inopinata*	A	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Watersiporidae	*Watersipora*	*subtorquata*	A	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Phoxocephalidae	*Torridoharpinia*	*hurleyi*	N	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Isopoda	Cirolanidae	*Cirolana*	*sp. nov.*	C2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Malacostraca	Isopoda	Sphaeromatidae	*Sphaeroma*	*laurensi*	N	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Polychaeta	Eunicida	Lumbrineridae	*Lumbricalus*	*aotearoae*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Polychaeta	Phyllodocida	Glyceridae	*Glycera*	*Indet*	SI	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Glyceridae	*Glycera*	*lamelliformis*	N	0	0	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0
Polychaeta	Phyllodocida	Goniadidae	*Glycinde*	*dorsalis*	N	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Nephtyidae	*Aglaophamus*	*verrilli*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Polychaeta	Phyllodocida	Sigalionidae	*Labiosthenolepis*	*laevis*	N	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1
Polychaeta	Scolecida	Arenicolidae	*Abarenicola*	*affinis*	N	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Scolecida	Capitellidae	*Heteromastus*	*filiformis*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Polychaeta	Scolecida	Cossuridae	*Cossura*	*consimilis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Polychaeta	Spionida	Spionidae	*Prionospio*	*multicristata*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Spionida	Spionidae	*Boccardia*	*syrtis*	N	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0
Polychaeta	Spionida	Spionidae	*Pseudopolydora*	*paucibranchiata*	A	1	1	1	0	0	1	1	0	0	1	1	1	0	1	0	0	0	0
Polychaeta	Terebellida	Pectinariidae	*Pectinaria*	*australis*	N	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	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.

Appendix 5c. Results from the benthic sled samples.

					Berth code	6		7		8		M1		TA	
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	1	2	1	2
Actinopterygii	Perciformes	Serranidae	*Anthiinae*	*sp.*	SI	0	0	0	0	0	0	0	0	1	0
Ascidiacea	Phlebobranchia	Ascidiidae	*Ascidiella*	*aspersa*	A	0	1	0	0	0	0	0	0	0	0
Bivalvia	Nuculoida	Nuculidae	*Nucula*	*hartvigiana*	N	1	1	0	1	0	0	1	1	0	0
Bivalvia	Nuculoida	Nuculidae	*Linucula*	*sp.*	SI	0	0	0	0	0	0	0	0	0	1
Bivalvia	Veneroida	Mactridae	*Zenatia*	*acinaces*	N	0	0	0	1	0	0	0	0	0	0
Bivalvia	Veneroida	Semelidae	*Theora*	*lubrica*	A	1	1	1	1	1	0	1	1	1	1
Bivalvia	Veneroida	Veneridae	*Austrovenus*	*stutchburyi*	N	1	1	0	0	0	0	1	0	0	0
Bivalvia	Veneroida	Veneridae	*Dosinia*	*greyi*	N	0	0	0	0	1	0	0	0	0	0
Bryopsidophyceae	Halimediales	Caulerpaceae	*Caulerpa*	*articulata*	N	0	0	0	0	0	1	0	0	0	0
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*cookii*	N	0	1	0	1	0	0	0	0	1	0
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*varius*	N	0	0	0	0	0	0	1	0	1	0
Crustacea	Brachyura	Ocypodidae	*Macrophthalmus*	*hirtipes*	N	0	0	0	0	0	0	0	0	1	0
Gastropoda	Cephalaspidea	Acteonidae	*Acteon*	*sp.*	SI	0	1	0	0	0	0	0	0	0	0
Gastropoda	Vetigastropoda	Turbinidae	*Cookia*	*sulcata*	N	0	0	0	0	0	0	0	0	1	0
Malacostraca	Amphipoda	Phoxocephalidae	*Torridoharpinia*	*hurleyi*	N	1	1	0	0	1	1	1	0	0	0
Phaeophyceae	Dictyotales	Dictyotaceae	*Glossophora*	*kunthii*	N	0	0	0	0	0	1	0	0	1	0
Phaeophyceae	Fucales	Cystoseiraceae	*Cystophora*	*retroflexa*	N	0	0	0	0	0	1	0	0	0	0
Phaeophyceae	Fucales	Sargassaceae	*Carpophyllum*	*flexuosum*	N	0	0	0	0	0	1	0	0	0	0
Phaeophyceae	Fucales	Sargassaceae	*Carpophyllum*	*maschalocarpum*	N	0	0	0	0	0	0	0	0	1	0
Phaeophyceae	Laminariales	Alariaceae	*Ecklonia*	*radiata*	N	0	0	0	0	0	0	0	0	1	0
Polychaeta	Phyllodocida	Glyceridae	*Glycera*	*Indet*	SI	0	0	0	0	0	0	0	1	0	0
Polychaeta	Phyllodocida	Nephtyidae	*Aglaophamus*	*verrilli*	N	0	0	0	0	0	0	0	0	1	0
Polychaeta	Phyllodocida	Nereididae	*Platynereis*	*Platynereis_australis_group*	SI	0	0	0	0	0	1	0	0	0	0
Polychaeta	Phyllodocida	Sigalionidae	*Labiosthenolepis*	*laevis*	N	1	1	1	1	1	0	1	1	1	1
Polychaeta	Sabellida	Sabellidae	*Euchone*	*limnicola*	A	1	1	1	0	0	0	0	1	0	0
Polychaeta	Spionida	Spionidae	*Pseudopolydora*	*paucibranchiata*	A	1	1	1	0	0	0	1	0	0	0
Polychaeta	Spionida	Spionidae	*Boccardia*	*syrtis*	N	0	0	0	0	0	0	1	0	0	0
Polychaeta	Terebellida	Ampharetidae	*Amphicteis*	*Amphicteis-A*	SI	0	0	0	0	0	0	0	1	0	0
Polychaeta	Terebellida	Pectinariidae	*Pectinaria*	*australis*	N	1	1	1	1	1	1	0	1	1	1
Polychaeta	Terebellida	Terebellidae	*Artacama*	*Artacama-A*	SI	0	0	1	0	1	0	0	1	0	0
Polychaeta	Terebellida	Trichobranchidae	*Terebellides*	*narribri*	N	0	0	0	1	0	0	0	1	0	0
Pycnogonida	Pantopoda	Ammotheidae	*?Tanystylum*	*sp. nov. B*	C2	0	0	0	0	0	1	0	0	1	1
Rhodophyceae	Ceramiales	Ceramiaceae	*Anotrichium*	*crinitum*	N	0	0	0	0	0	1	0	0	0	0
Rhodophyceae	Gigartinales	Phyllophoraceae	*Stenogramme*	*interrupta*	N	0	0	0	0	0	0	1	0	0	0
Rhodophyceae	Plocamiales	Plocamiaceae	*Plocamium*	*cartilagineum*	N	0	0	0	0	0	0	0	0	1	0
Ulvophyceae	Ulvales	Ulvaceae	*Ulva*	*sp.*	SI	0	0	0	0	0	1	0	0	0	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	MARINA		MIDDLE		TA 1		TA 2	
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	1	2
Dinophyceae	Gymnodiniales	Gymnodiniacea	*Gymnodinium*	*catenatum*	C1	0	0	0	1	1	0	1	0
Dinophyceae	Gymnodiniales	Gymnodiniacea	*Cochlodinium*	*sp.*	N	0	0	0	1	0	0	0	0
Dinophyceae	Peridiniales	Gonyaulacaceae	*Gonyaulax*	*sp.*	N	1	0	0	0	1	0	0	0
Dinophyceae	Peridiniales	Peridiniaceae	*Protoperidinium*	*sp.*	N	1	1	1	0	0	1	0	0
Dinophyceae	Peridiniales	Peridiniaceae	*Scrippsiella*	*trochoidea*	N	1	0	0	1	1	0	1	0
Dinophyceae	Peridiniales	Peridiniaceae	*Protoperidinium conicum*	*cf. conicoides*	N	0	0	0	0	0	1	0	1
Dinophyceae	Peridiniales	Peridiniaceae	*Lingulodinium*	*polyedrum*	N	0	0	0	1	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 5e. Results from the fish trap samples.

				Berth code	6				7				8				M1				TA			
				Line No.	1		2		1		2		1		2		1		2		1		2	
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Actinopterygii	Gonorinchyformes	Gonorynchidae	*Gonorynchus*	*sp.*	SI	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Mugiliformes	Mugilidae	*Aldrichetta*	*forsteri*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Actinopterygii	Perciformes	Carangidae	*Trachurus*	*novaezelandiae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Actinopterygii	Perciformes	Centrolophidae	*Seriolella*	*brama*	N	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Cheilodactylidae	*Nemadactylus*	*macropterus*	N	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Labridae	*Notolabrus*	*celidotus*	N	1	0	0	0	0	1	0	0	0	1	0	1	1	1	1	1	0	0	0	0
Actinopterygii	Perciformes	Scorpidinae	*Scorpis*	*lineolata*	N	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0
Actinopterygii	Perciformes	Sparidae	*Pagrus*	*auratus*	N	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Trypterigiidae	*Grahamina*	*capito*	N	1	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Chondrichthyes	Carcharhiniformes	Triakidae	*Galeorhinus*	*australis*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Crustacea	Brachyura	Grapsidae	*Plagusia*	*sp.*	SI	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
Crustacea	Palinura	Palinuridae	*Jasus*	*edwardsi*	N	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), 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	6				7				8				M1				TA			
					Line no.	1		2		1		2		1		2		1		2		1		2	
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Actinopterygii	Anguilliformes	Congridae	*Conger*	*wilsoni*	N	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Actinopterygii	Gadiformes	Moridae	*Lotella*	*rhacinus*	N	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Eleotridae	*Eleotridae*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Actinopterygii	Perciformes	Labridae	*Notolabrus*	*celidotus*	N	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0	0	0
Actinopterygii	Perciformes	Trypterigiidae	*Grahamina*	*capito*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Asteroidea	Valvatida	Asterinidae	*Patiriella*	*regularis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Chondrichthyes	Carcharhiniformes	Triakidae	*Galeorhinus*	*australis*	N	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Cancridae	*Cancer*	*novaezelandiae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Crustacea	Brachyura	Grapsidae	*Plagusia*	*sp.*	SI	0	0	0	0	1	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0
Crustacea	Palinura	Palinuridae	*Jasus*	*edwardsi*	N	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	0	1	0	0	0
Gastropoda	Neogastropoda	Buccinidae	*Cominella*	*adspersa*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	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 5g. Results from the starfish trap samples.

					Berth code	6				7				8				M1				TA			
					Line No.	1		2		1		2		1		2		1		2		1		2	
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Actinopterygii	Perciformes	Labridae	*Notolabrus*	*celidotus*	N	0	1	0	0	0	0	0	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	0	0	0	0	1	0	0	0	0	1	0
Crustacea	Brachyura	Cancridae	*Cancer*	*novaezelandiae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Crustacea	Brachyura	Grapsidae	*Plagusia*	*sp.*	SI	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Crustacea	Palinura	Palinuridae	*Jasus*	*edwardsi*	N	0	0	0	0	1	0	0	0	0	0	1	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 5h. Results from the shrimp trap samples.

				Berth code	6				7				8				M1				TA			
				Line No.	1		2		1		2		1		2		1		2		1		2	
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Malacostraca	Isopoda	Cirolanidae	*Natatolana*	*rossi*	N	1	0	0	0	1	1	1	0	1	1	0	1	0	0	0	0	1	1	1	1
Malacostraca	Isopoda	Cirolanidae	*Natatolana*	*narica*	N	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Isopoda	Cirolanidae	*Cirolana*	*kokoru*	N	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Malacostraca	Isopoda	Cirolanidae	*Cirolana*	*quechso*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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.

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).