TECHNICAL PAPER

BIOSECURITY NEW ZEALAND

# Port of Wellington

## Second baseline survey for non-indigenous marine species (Research Project ZBS2000/04)

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# Executive summary

- This report describes the results of a repeat port baseline survey of the Port of Wellington undertaken in February 2005. The survey provides a second inventory of native, non indigenous and cryptogenic marine species within the port and compares the biota with the results of an earlier port baseline survey of the Port of Wellington undertaken in November / December 2001.

- 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.

- To allow a direct comparison between the initial baseline survey and the resurvey of the Port of Wellington, the survey used the same methodologies, occurred in the same season, and sampled the same sites used in the initial baseline survey. To improve the description of the biota of the port, some additional survey sites were added during the repeat survey.

- Sampling methods used in both 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. These are described in more detail in the body of the report.

- A wide range of sampling techniques was used to collect marine organisms from habitats within the Port of Wellington. 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.

- Sampling effort was distributed in the Port of Wellington according to priorities identified in the CRIMP protocols, which are designed to maximise the chances of detecting non-indigenous species. Most effort was 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 325 species or higher taxa were identified in the first survey of the Port of Wellington in November / December 2001. They consisted of 225 native species, 13 non-indigenous species (NIS), 36 cryptogenic species (those whose geographic origins are uncertain) and 51 species indeterminata (taxa for which there is insufficient taxonomic or systematic information available to allow identification to species level).

- During the repeat survey, 303 species or higher taxa were recorded, including 196 native species, 13 non-indigenous species, 48 cryptogenic species and 46 species indeterminata. Many species were common to both surveys. Around 64 % of the native species, 69 % of non-indigenous species, and 42 % of cryptogenic species recorded during the repeat survey were also found in the earlier survey.

- The 13 non-indigenous organisms found in the repeat survey of the Port of Wellington included representatives of 11 major taxonomic groups. The non-indigenous species detected were: (Annelida) *Spirobranchus polytrema*, *Polydora hoplura*; (Bryozoa) *Bugula flabellata*, *Cryptosula pallasiana*, *Cyclicopora longipora, Watersipora subtorquata*; (Cnidaria) *Eudendrium generale, Monotheca pulchella*, *Sertularia marginata*; (Crustacea) *Monocorophium acherusicum*; (Mollusca) *Theora lubrica*; (Macroalgae) *Griffithsia crassiuscula*, and *Undaria pinnatifida*. Four of these species - *Eudendrium generale, Monotheca pulchella, Sertularia marginata,* and *Monocorophium acherusicum* - were not recorded in the earlier baseline survey of the Port of Wellington. In addition, four non-indigenous species that were present in the first survey – (Annelida) *Dipolydora armata,* (Cnidaria) *Eudendrium capillare*, (Crustacea) *Cancer gibbosulus* and (Porifera) *Halisarca dujardini* – were not found during the repeat survey.

- Eleven species recorded in the repeat survey were (initially) new records for New Zealand waters. These include one non-indigenous species (the hydroid *Eudendrium generale*), ten cryptogenic sponges (*Adocia* new sp. 1, *Adocia* new sp. 7, *Chalinula* new sp. 1, *Chalinula* new sp. 2, *Dactylia* new sp. 1, *Haliclona* new sp. 1, *Haliclona* new sp. 2, *Haliclona* new sp. 3, *Haliclona* new sp. 11 and *Haliclona* new sp. 16).

- One species from the Port of Wellington is on the New Zealand register of unwanted organisms: the Asian kelp, *Undaria pinnatifida*. This species is now widely distributed in southern and eastern New Zealand.

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

- Approximately 77 % (10 of 13 species) of NIS in the Port of Wellington are likely to have been introduced in hull fouling assemblages, 8 % (1 species) via ballast water and 15 % (2 species) 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 Wellington (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; Carlton 1999; AMOG Consulting 2002; Coutts et al. 2003). Transport by shipping has 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; Leppakoski et al. 2002).

Like many other coastal nations, New Zealand is just beginning to document the numbers, identity, distribution and impacts of non-indigenous species in its coastal waters. A review of existing records suggested that by 1998, at least 148 marine species had been recorded from New Zealand, with around 90 % of these establishing permanent populations (Cranfield et al. 1998). Since that review, an additional 41 non-indigenous species (NIS) or suspected non-indigenous species (i.e. Cryptogenic type I – see "Definitions of species categories", in methods section) have been recorded from New Zealand waters. 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 for vessels entering New Zealand from overseas. 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 (Figure 1). Marine biosecurity functions are now vested in MAF Biosecurity New Zealand.

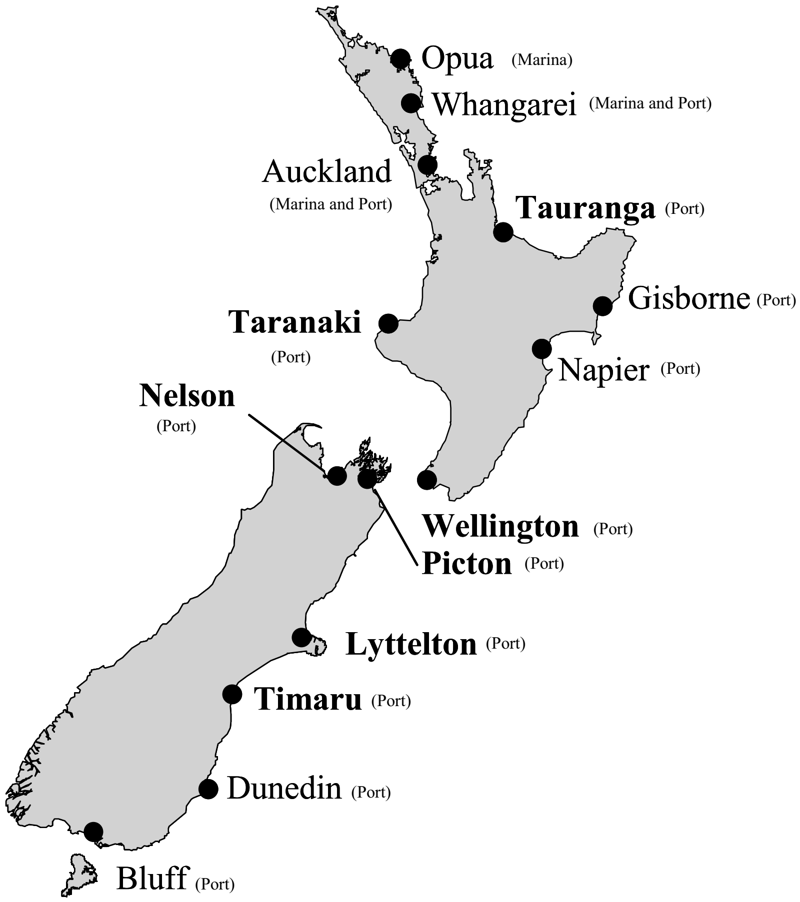



**Figure 1: Commercial shipping ports in New Zealand where baseline non-indigenous species surveys have been conducted. Group 1 ports surveyed in the summer of 2001/2002 and re-surveyed in the summer of 2004/2005 are indicated in bold and Group 2 ports surveyed in the summer of 2002/2003 are indicated in plain font. Marinas were also surveyed for NIS in Auckland, Opua and Whangarei in 2002/2003.**

The New Zealand baseline port surveys were based on protocols developed in Australia by the CSIRO Centre for Research on Introduced Marine Pests (CRIMP) for port surveys of introduced marine species (Hewitt and Martin 1996; Hewitt and Martin 2001). They are best described as "*generalised pest surveys*", as they are broad-based investigations whose primary purpose is to identify and inventory the range of non-indigenous species present in a port (Wittenberg and Cock 2001; Inglis et al. 2003)

The surveys have two stated objectives:

i. To provide a baseline assessment of native, non-indigenous and cryptogenic[1] 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 (Hewitt and Martin 2001).

Initial surveys were completed in New Zealand's 13 major shipping ports and 3 marinas of first entry during the summers of 2001/2002 and 2002/2003 (Figure 1). These surveys recorded more than 1300 species; 124 of which were known or suspected to have been

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

introduced to New Zealand. At least 18 of the non-indigenous species were recorded for the first time in New Zealand in the port baseline surveys. In addition, 106 species that are potentially new to science were discovered during the surveys and await more formal taxonomic description.

Worldwide, port surveys based on the CRIMP protocols have been completed in at least 37 Australian ports, at demonstration sites in China, Brasil, the Ukraine, Iran, South Africa, India, Kenya, and the Seychelles Islands, at six sites in the United Kingdom, and are underway at 10 sites in the Mediterranean (Raaymakers 2003). Despite their wide use, there have been few evaluations of the survey methods or survey design to determine their sensitivity for individual unwanted species or to determine the completeness of biodiversity inventories based upon them. Inglis et al. (2003) used a range of biodiversity metrics to evaluate the adequacy of sample effort and distribution during the initial New Zealand survey of the Port of Wellington and compared the results with those from seven Australian port baseline surveys. In general, they concluded that the surveys provided an adequate description of the richness of the assemblage of non-indigenous species present in the ports, but that the total richness of native and cryptogenic species present in the survey area was likely to be under estimated. The authors made a number of recommendations for future surveys that included increasing the sample effort for benthic infauna, maximising dispersion of samples throughout the survey area (rather than allocation based on CRIMP priorities) and modification of survey methods or design components which had high complementarity in species composition. Both Inglis et al. (2003) and a more recent study by Hayes et al. (2005) on the sensitivity of the survey methods concluded that generalised port surveys, such as these, are likely to under-sample species that are very rare or which have restricted distributions within the port environments and, as such, should not be considered surveys for early detection of unwanted species.

Instead, the port surveys are intended to provide a baseline for monitoring the rate of new incursions by non-indigenous marine species in port environments, and to assist international risk profiling of problem species through the sharing of information with other shipping nations (Hewitt and Martin 2001). Despite the large number of ports that have been surveyed using modifications of the CRIMP protocols, no ports have been completely re-surveyed. This means that there has been no empirical determination of the background rate of new arrivals or of the surveys' ability to detect temporal changes in the composition of native and non-indigenous assemblages.

This report describes the results of a second, repeat survey of the Port of Wellington undertaken in February 2005, approximately 3 years after the initial baseline survey. In the manner of the first survey report(Inglis et al. 2006a), we provide an inventory of species recorded during the survey and their biogeographic status as either native, introduced ("non-indigenous") or cryptogenic. Organisms that could not be identified to species level are also listed as species indeterminata (see "Definitions of species categories", in methods section).

The report is intended as a stand-alone record of the re-survey and, as such, we reiterate background information on the Port of Wellington, including its history, physical environment, shipping and trading patterns, development and maintenance activities, and biological environment. Where available, this information is updated with new data that have become available in the time between the two surveys.

## DESCRIPTION OF THE PORT OF WELLINGTON

### General features

The Port of Wellington (known commercially as CentrePort) is located on the western side of Port Nicholson, a natural deepwater harbour, at the southern tip of New Zealand's North Island (41° 16'S. 174° 51'E; Figure 2).


**Figure 2: Port Nicholson overview map. Insert indicates area of CentrePort**

Wellington harbour was first discovered in approximately 900 A.D. by Polynesian voyagers, Kupe and Ngahue, and went through a variety of colonisation phases by Māori (Neilson 1970; Ballara 1990). The first development of wharf structures occurred in 1862 at Queen's Wharf and the Wellington Harbour Board constituted in 1880. Coastal shipping trade (e.g. flour, cereals, meat and cheese) burgeoned in the 1880's and the first cargo of frozen meat was shipped in 1883. In 1932, the Thorndon Reclamation Scheme was completed which gave an extra 29 ha of land for railways development. In 1940, 33 vessels berthed at the wharves with a total GRT of 226,810. In 1962, the NZ Railways Wellington/Picton service came into operation. In 1967, the Hutt reclamation comprising 54 ha was completed for industrial purposes such as an oil tank farm. In the late 1960's a containerised shipping trade was instigated. In 1990, the exporting of timber from Wellington commenced. In 1998, Port Wellington was relaunched under the name of CentrePort Wellington (www.centreport.co.nz).

Port Nicholson is topographically partially isolated from oceanic influences (Booth 1975). Tidal movement in Port Nicholson is minimal, with a tidal range of 0.9 m and 1.2 m for neap and spring tides, respectively. Poor mixing rates mean that any given body of water within the harbour has a residence time of at least ten days (Northcote 1998). CentrePort experiences restricted tidal circulation patterns (Stoffers et al. 1986; Barnett et al. 1990), with bottom currents averaging a speed of 0.015 m/s (Northcote 1998). Mean monthly sea-surface temperatures range seasonally between 10.5 °C and 18.5 °C, with some stratification observed during summer and winter (Booth 1975). Harbour sediments may be grouped into three broad categories: beach deposits, basinal mud deposits and entrance sand and gravel (Carter and Moore 1992). Within the CentrePort, the sediment consists of mud and fine sand (Northcote 1998). Habitats in the harbour are diverse, ranging from exposed rocky reefs to a sheltered estuary.

**Port operation, development and maintenance activities**

The main commercial operation of the Port of Wellington is currently conducted by CentrePort Ltd, at three sites: CentrePort, Seaview Wharf and Burnham Wharf (Figure 2). Located within one kilometre of SH1 and the main Wellington railhead, CentrePort (Figure 3) is well located to service both import and export business in the central New Zealand region. Most major Port activity is centred on the Aotea Quay Wharf and the Thorndon Container Terminal Wharf at its southern end. Other smaller wharves within CentrePort are Kings Wharf, Glasgow Wharf, the Interisland Terminal Wharf, Waterloo Quay Wharf, Queens Wharf and the Overseas Terminal. Berths here are primarily used for smaller fishing and commercial vessels. Three coastal freight services (The Interisland Line, Pacifica and Strait Shipping), with associated passenger services, currently operate through CentrePort, offering around 4,500 combined annual sailings. Berth construction is predominantly concrete deck on a mixture of Australian hardwood and concrete piles. Berthage facilities at the Port are summarised in Table 1. The port has MAF inspection and quarantine, and customs clearance facilities.

The Seaview Wharf is located at the top northeast of the harbour and is Wellington's main import terminal for bulk petroleum. The wharf can handle tankers up to 50,000 DWT, with no length restrictions. Bulk storage facilities are associated with the wharf on nearby land. Berth construction is concrete deck on steel piles. The upper portion of the steel piles from the waterline up has been wrapped in Denso-tape (Petroleum-pasted) to prevent corrosion. This was conducted over a two-year period and completed at the beginning of 2006. Installation of a cathodic protection system on the Seaview Wharf pile cap beams and deck was conducted over a three year period and completed in 2004 (K. Thomas, CentrePort Ltd., pers comm.).

Burnham Wharf is situated near Wellington Airport at the southern end of Evans Bay. This wharf handles bitumen and aviation fuel imports. Bulk storage facilities are associated with the wharf. Berth construction is concrete deck on concrete piles with a concrete retaining wall. Alongside Burnham Wharf are a small jetty with an associated hazardous waste incinerator facility (now disused), and Miramar Wharf, which acts as a servicing wharf for RV *Tangaroa* and temporary berth for other vessels, as well as being used by amateur fishers.

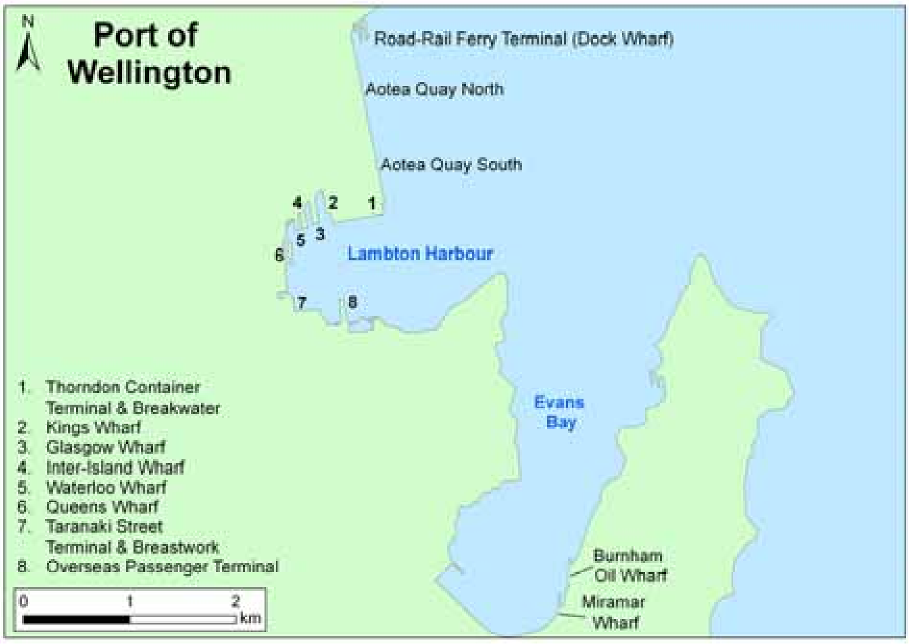



**Figure 3: Port of Wellington map**

There are four recreational marinas within Wellington Harbour: Evans Bay, Clyde Quay, Chaffers, and Seaview. Evans Bay marina has 150 wooden pile berths for boats 8-20 m in length. Clyde Boat Harbour/marina has 75 fore and aft wooden pole moorings for vessels 7-17 m in length. Chaffers marina has approximately 180 floating concrete pier/wooden pile berths for vessels up to 20 m in length. Seaview marina has 131 floating concrete pier/wooden pile berths and 22 wooden pole moorings for vessels up to 20 m in length.

Vessels unable to be berthed immediately in the port may anchor inside the port to the north of Aotea Quay and adjacent to the motorway; exposure to strong southerly swells outside the harbour entrance prevents anchorage outside the harbour. Pilotage is compulsory on vessels over 500 GRT unless the Master holds a current pilot exemption certificate, and the vessel does not exceed 145 m in length or 8,000 GRT (www.centreport.co.nz).

There is no on-going maintenance dredging within the Port, and no capital dredging has been conducted in the period since the initial baseline survey in December 2001. An application for resource consent has been granted for dredging activities, but dredging will only be conducted when there is commercial incentive to do so (K. Thomas, pers comm.).

In the period since the initial baseline survey, there has been no land reclamation, construction of breakwalls or major wharf upgrades (K. Thomas, pers comm.). There is continuous ongoing maintenance works around the ports, with replacements generally being of like material to that being replaced. In January 2003, the InterIsland terminal berth was reconfigured to incorporate a floating barge anchored immediately in front of the terminal's linkspan to service the InterIslands line's new cargo vessel *Purbeck*. The new barge is steel with timber stabilising piles and measures 23 m by 10 m. Restructuring work was conducted on the Glasgow Wharf between February and April 2003. The wharf was strengthened, extended and squared off to provide the flexibility to operate with an extra vehicle access ramp constructed from steel piles. New fenders were also placed as part of this construction (K. Thomas, pers comm.).

Works conducted after the second baseline survey was completed include concrete repairs at Thorndon Wharf and modifications of the Road-Rail Ferry Terminal. The repair works at Thorndon Wharf commenced at the beginning of 2006 and consist of the repair of spalled concrete and the installation of a cathodic protection system to approximately half the structure. Dock Wharf (the Road-Rail Ferry Terminal) was modified in 2005 / 2006 to act as the new berth for the Kaitaki, the InterIslands line's new car and passenger ferry. The in-water works consisted of the construction of a new linkspan (vehicle on/off ramp) with steel encased concrete piles and steel beams and decking and five new unit element Fentek fenders. The fenders were completed in December 2005 and the linkspan in March 2006. Options are also currently being considered for redecking Kings Wharf (K. Thomas, pers comm.).

### Imports and exports

In the year ending June 2004, the CentrePort Ltd recorded 9 % cargo growth to 10.33 million tonnes, and a 23 % growth in container volume (CentrePort Ltd 2004). This increased further in the 2004-2005 financial year, with increased cargo throughput in most cargo sectors and a record 89,000 TEU[2] through the container terminal compared to 77,000 in the previous year (CentrePort Ltd 2005). In the 2003-2004 financial year, containers exported from CentrePort were discharged at 60 international ports in 23 countries, whilst containers unloaded came from 70 international ports in 26 countries (CentrePort Ltd 2004).

[2] TEU = twenty foot equivalent unit. This is a standard size of container and a common measure of capacity in the container logistics business.

The volumes and value of goods imported and exported through the Port of Wellington are summarised below. These data describe only cargo being loaded for, or unloaded from, overseas ports and do not include domestic cargo (Statistics New Zealand 2006b). Also available from Statistics New Zealand (2006a) was a breakdown of cargo value by country of orgin or destination and by commodity for each calendar year; we analysed the data for the period 2002 to 2005 inclusive (ie. the period between the first and second baseline surveys).

***Imports***

The weight of overseas cargo unloaded at the Port of Wellington has increased each year since the 2002 initial baseline survey, with 1,388,288 tonnes gross weight being unloaded in the year ended June 2005 (Statistics New Zealand 2006b). This represents an increase in weight of 57 % compared to the year ending June 2002 (Table 2). The value of cargo unloaded during this period increased by 15 %, reaching $2, 127 million in the year ending June 2005. Overseas cargo unloaded at the Port of Wellington accounted for around 6 to 7 % by weight and 7 to 8 % by value of the total overseas cargo unloaded at New Zealand's seaports (Table 2).

The Port of Wellington imported cargo in 96 different commodity categories between 2002 and 2005 inclusive (Statistics New Zealand 2006a). The dominant commodities by value imported at the Port of Wellington during this time were vehicles (28 %), mineral fuels, oils and their products (23 %), and boilers, machinery and mechanical appliances (7 %; Figure 4). Vehicles ranked first and mineral fuels second every year except 2005, when their ranks were reversed. Machinery ranked third each year, and plastics ranked fourth each year except in 2002 when it ranked fifth.

The Port of Wellington received imports from 128 countries of initial origin[3] between 2002 and 2005 inclusive (Statistics New Zealand 2006a). During this time, the Port of Wellington imported most of its overseas cargo by value from Australia (32 %), Japan (23 %), Singapore (6 %) and the Republic of Korea (6 %; Figure 5). Australia ranked first and Japan ranked second every year. The top nine ranked countries (Figure 5) ranked in the top ten each year.

[3] The country of initial origin is not necessarily the country that the ship carrying the commodity was in immediately before arriving at the Port of Wellington; for ship movements see the section on "Shipping movements and ballast discharge patterns"

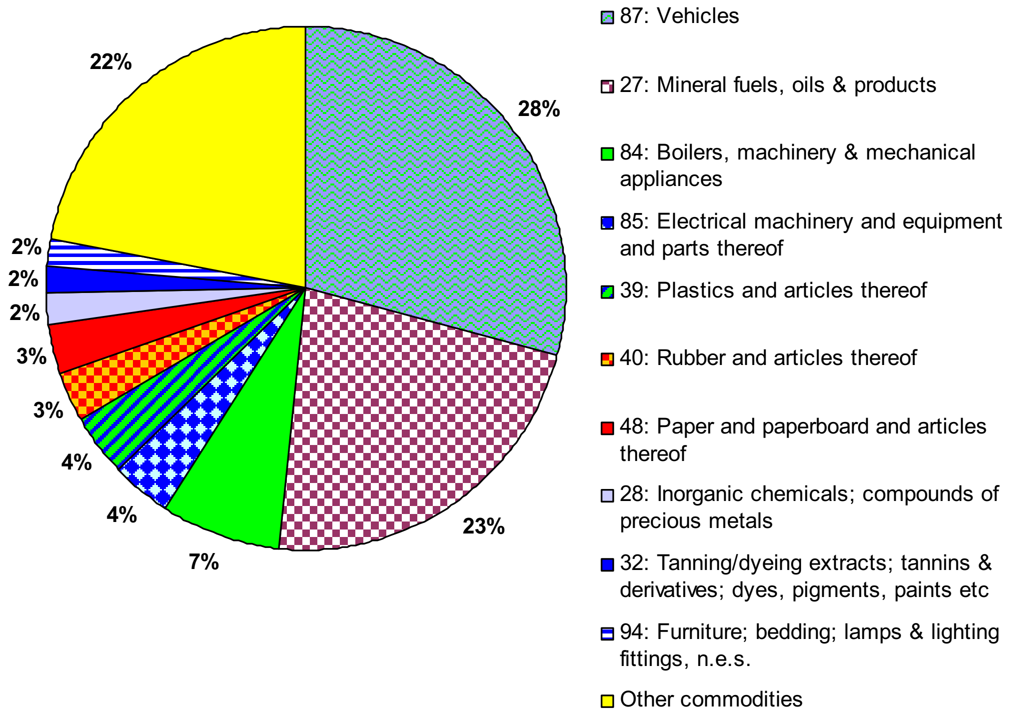



**Figure 4: Top 10 commodities by value unloaded at the Port of Wellington summed over the period January 2002 to December 2005 inclusive (data sourced from Statistics New Zealand 2006a). Commodity category descriptions have been summarised for brevity; category numbers are provided in the legend and full descriptions are available at Statistics New Zealand (2006a).**

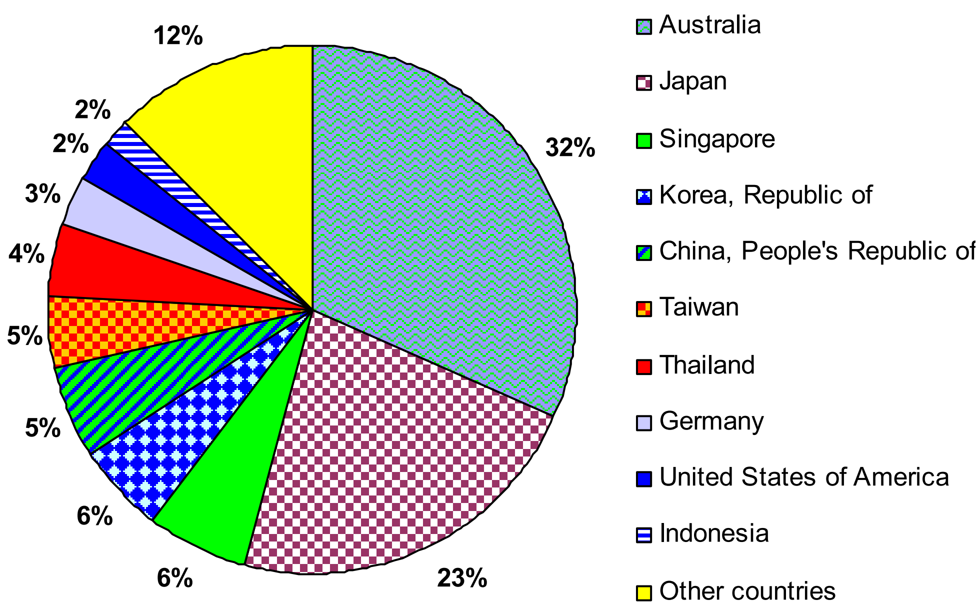



**Figure 5: Top 10 countries of initial origin that cargo was unloaded from at the Port of Wellington. The data are percentages of the total volume of cargo unloaded in the period January 2002 to December 2005 inclusive (data sourced from Statistics New Zealand 2006a).**

*Exports*

In the year ending June 2005, the Port of Wellington loaded 761,329 tonnes of cargo for export (Statistics New Zealand 2006b). This represented an increase of 22.5 % compared to the year ending June 2002 (Table 3). However, despite the weight increase the value declined by 28 % over this period, with most of the decline occurring in the 2002-2003 year and an increase occurring in the 2004-2005 year. For the financial years ending June 2002 to 2005, overseas cargo loaded at the Port of Wellington accounted for 2.5 to 3.5 % by weight and 3 to 5 % by value of the total overseas cargo loaded at New Zealand's seaports (Table 3).

The Port of Wellington exported cargo in 93 different commodity categories between 2002 and 2005 inclusive (Statistics New Zealand 2006a). The dominant commodity categories by value loaded at the Port of Wellington for export during this time were wood and wooden articles (13 %), meat and edible meat offal (11 %), dairy produce, bird's eggs, natural honey and other edible animal products (9 %), soap, cleaning preparations and waxes (8 %), wood pulp and waste paper (8 %) and fish, crustaceans, molluscs and other aquatic invertebrates (7 %; Figure 6). Wood ranked first all years except in 2002, when it ranked second after meat. Meat, dairy and soap all ranked in the top five each year except in 2003, when meat ranked eighth.

The Port of Wellington loaded cargo for export to 129 countries of final destination[4] between 2002 and 2005 inclusive (Statistics New Zealand 2006a). During this time, the Port of Wellington exported most of its overseas cargo by value to Australia (38 %), Japan (14 %), China (9 %) and the USA (7 %; Figure 7). Australia ranked first every year. Japan ranked second each year and China ranked third, except in 2002 when the USA ranked second and Japan ranked third.

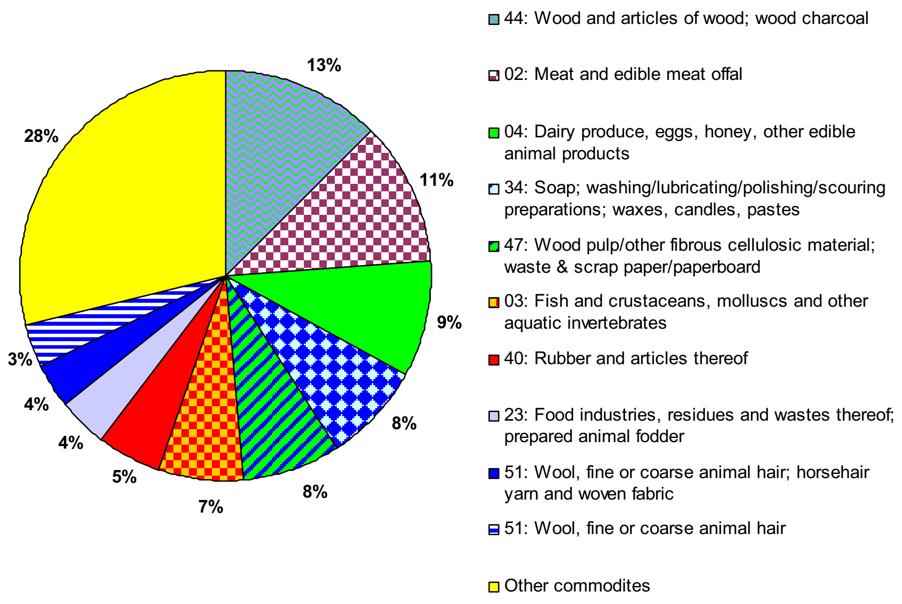



**Figure 6: Top 10 commodities by value loaded at the Port of Wellington summed over the period January 2002 to December 2005 inclusive (data sourced from Statistics New Zealand 2006a). Commodity category descriptions have been summarised for brevity; category numbers are provided in the legend and full descriptions are available at Statistics New Zealand (2006a).**

[4] The country of final destination is not necessarily the country that the ship carrying the commodity goes to immediately after departing from the Port of Wellington; it is the final destination of the goods. For ship movements see "Shipping movements and ballast discharge patterns"

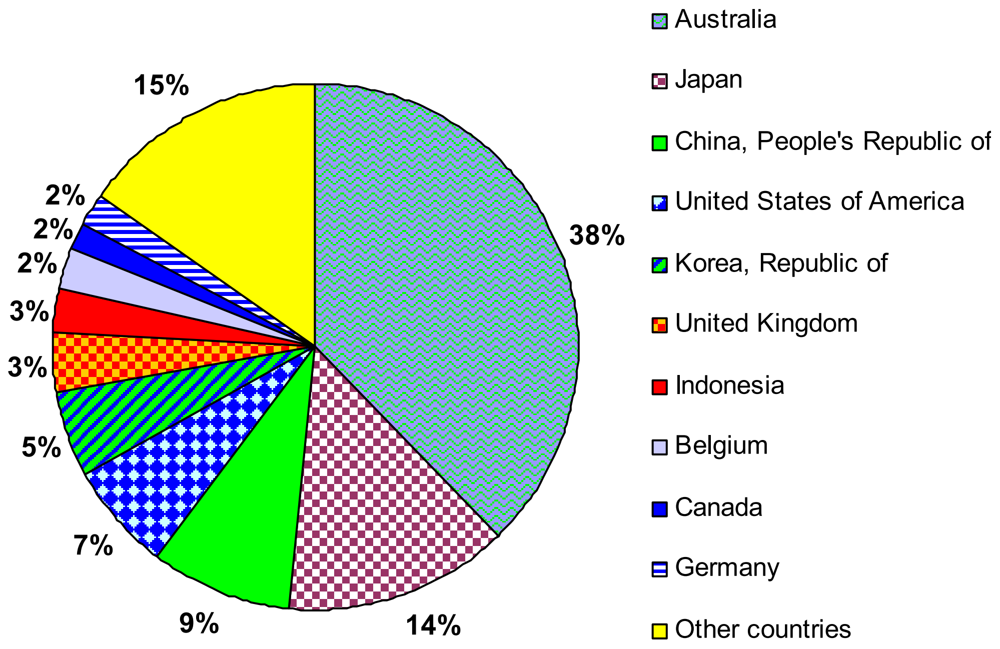



**Figure 7: Top 10 countries of final destination that the Port of Wellington loaded overseas cargo for summed over the period January 2002 to December 2005 inclusive (data sourced from Statistics New Zealand 2006a).**

**Shipping movements and ballast discharge patterns**

A total volume of 14,536 $m^3$ of ballast water was discharged in the Port of Wellington in 1999, with the largest country-of-origin volumes of 7,371 $m^3$ from Japan, 3,117 $m^3$ from Australia, 763 $m^3$ from South Korea, and 2,937 $m^3$ unspecified (Inglis 2001b). Since June 2005, vessels have been required to comply with the Import Health Standard for Ships' Ballast Water from All Countries (www.fish.govt.nz/sustainability/biosecurity). No ballast water is allowed to be discharged without the express permission of an MAF (Ministry of Agriculture and Forestry) inspector. To allow discharge, vessels Masters are responsible for providing the inspector with evidence of either: discharging ballast water at sea (200 nautical miles from the nearest land, and at least 200m depth); demonstrating ballast water is fresh (2.5 ppt sodium chloride) or having the ballast water treated by a MAF approved treatment system.

CentrePort Ltd recorded 5,028 ship visits in the year ending June 2002, and 5,026 in the year ending June 2004 (www.centreport.co.nz). There was an increase in cruise ship visits to 20 in the 2004-2005 financial year, and 25 visits have been confirmed for 2005-2006 (CentrePort Ltd 2005).

To gain a more detailed understanding of international and domestic vessel movements to, and from, the Port of Wellington between 2002 and 2005 inclusive, we analysed a database of vessel movements generated and updated by Lloyds Marine Intelligence Unit (LMIU), called 'SeaSearcher.com'. Drawing on real-time information from a network of Lloyd's agents and other sources around the world, the database contains arrival and departure details of all ocean going merchant vessels larger than 99 gross tonnes for all of the ports in the Group 1 and Group 2 surveys. The database does not include movement records for domestic or international ferries plying scheduled routes, small domestic fishing vessels or recreational vessels. Cruise ships, coastal cargo vessels and all other vessels over 99 gross tonnes are included in the database. The database therefore gives a good indication of the movements of international and domestic vessels involved in trade. Definitions of geographical area and vessel type categories are given in Appendix 1.

### *International vessel movements*

Based on an analysis of the LMIU "Seaseacher.com" database, there were 339 vessel arrivals to the Port of Wellington from overseas ports between 2002 and 2005 inclusive (Table 4). These arrived from 29 different countries represented by most regions of the world (but not from the North European Atlantic coast). The greatest number of overseas arrivals during this period came from the following areas: Australia (144), east Asian seas (42), Japan (39), Pacific Islands (37) and the South American Pacific coast (27; Table 4). The previous ports of call for six of the international arrivals were not stated in the database. Vessels arriving from Australia came mostly from ports in Queensland (66 arrivals), Victoria (33), New South Wales (21), and Tasmania (13; Table 5). The major vessel types arriving from overseas at the Port of Wellington were general cargo vessels (85 arrivals), passenger / vehicle / livestock carriers (71), container ships and ro/ro (56), and tankers (55; Table 4).

According to the LMIU "Seaseacher.com" database, during the same period 429 vessels departed from the Port of Wellington to 24 different countries, also represented by most regions of the world (but not to the North European Atlantic coast). The greatest number of departures for overseas went to Australian ports as their next port of call (203 movements) followed by Japan (94), the northwest Pacific (52) and east Asian seas (47; Table 6). The major vessel types departing to overseas ports from the Port of Wellington were container ships and ro/ro (136 movements), general cargo vessels (107), tankers (58), passenger / vehicle / livestock carriers (55) and bulk / cement carriers (53; Table 6).

### *Domestic vessel movements*

The LMIU "Seaseacher.com" database contains movement records for 2,640 vessel arrivals to the Port of Wellington from New Zealand ports between 2002 and 2005 inclusive. These arrived from 17 ports in both the North and South Islands (Table 7). The greatest number of domestic arrivals during this period came from Lyttelton (613 arrivals), Auckland (545 arrivals), Nelson (439 arrivals), Napier (209 arrivals), and Tauranga (197 arrivals). Container ships and ro/ro's were by far the dominant vessel type arriving at the Port of Wellington from other New Zealand ports (1145 arrivals) followed by general cargo vessels (453 arrivals), passenger / vehicle / livestock carriers (424 arrivals), and bulk / cement carriers (258 arrivals; Table 7).

During the same period, the LMIU "Seaseacher.com" database contains movement records for 2,541 vessel departures from the Port of Wellington to 18 New Zealand ports in both the North and South Islands. The largest numbers of domestic movements departed the Port of Wellington for Lyttelton (784 movements), Nelson (761), Napier (227), New Plymouth (131 and Timaru (129; Table 8). As with domestic arrivals to the port, container ships and ro/ro's dominated the vessel types leaving the Port of Wellington on domestic voyages (1,065 movements), followed by passenger / vehicle / livestock carriers (443), general cargo vessels (430), bulk / cement carriers (246 movements) and tankers (224; Table 8).

The reader is reminded that the above data does not include scheduled ferry movements, or vessels under 99 gross tonnes including fishing and recreational vessels. The Port of Wellington facilitates a significant interisland passenger / freight service to Picton involving two companies: The Interisland Line and Strait Shipping. Each year Interislander vessels operate over 5,700 sailings (www.interislander.co.nz) and Strait Shipping runs 1,300 return trips between Picton and Wellington (www.strait.co.nz). Just seven movement records for these ferries are included in the LMIU "Seaseacher.com" database, signifying the origination or cancellation of a route for a particular vessel. Numerous fishing vessels are also registered in the Port of Wellington (30 in the year 2000, Sinner et al. 2000).

## EXISTING BIOLOGICAL INFORMATION

Many biological and physical studies have been previously undertaken in Port Nicholson (see Pedersen 1974; Wear and Haddon 1992; Northcote 1998 for comprehensive bibliographies), but there are few published data available for the area encompassing CentrePort itself and the flora and fauna found therein. Much of the early work (pre-1995) published on the marine life of Port Nicholson and environs is systematic or taxonomic in nature, and describes and classifies species, new species records and revises taxonomic groups. Later work has related to the environmental impacts of proposed development projects (Pedersen 1974; Wear and Haddon 1992; Northcote 1998). In addition, the supplement of information from the initial NIWA baseline survey of Wellington Harbour (Inglis et al. 2006a) has made a valuable addition to the biological information available in the area. This is explained further in the next section. In addition, the NIWA Client Report by Inglis et al. (Inglis et al. 2006b) describes marine communties in Wellington Harbour, with particular emphasis on surveillance for early detection of unwanted organisims in New Zealand Ports.

Brickell Moss Rankine and Hill (1975) reported on the effects on the fauna and flora of the proposed development of the Thorndon Container Terminal, as part of an environmental impact report. The area was said to contain 'no unique aquatic life' nor species which 'would not be expected to occur in such a location'. However, no species lists or more detailed information was provided.

Stoffers et al. (1986) examined the contaminant content of Port Nicholson sediments, in particular concentrations of heavy metals. They noted that sediments within the Port were strongly contaminated with high values of lead, zinc and copper, probably derived from antifouling paint fragments of vessels residing in the port. The metal concentrations were found to be highest adjacent to the wharves and at the southern end of the wharf complex where the Thorndon Container Terminal is located. They note that earlier oceanographic studies of CentrePort have indicated that the area suffers from restricted tidal circulation patterns, which may facilitate the build up of contaminants there.

Hay and Luckens (1987) reported on the discovery of the non-indigenous Asian kelp *Undaria pinnatifida*, growing in the CentrePort. The kelp was found growing subtidally on steep breakwaters and walls, where it formed a dense, continuous forest of sporophytes at heights of up to 1.3 metres tall. It was also recorded growing over a 4 km stretch of the Port Nicholson shoreline, in sheltered and exposed habitats, and on many different types of substrate such as ropes, boulders and in gravel. This was the first record of its occurrence in the Southern Hemisphere. Any attempts at removal were thought to be ultimately futile, with successful eradication requiring the complete elimination of gametophytes. The Port of Wellington is in the optimal temperature zone for this macroalga (Sinner et al. 2000).

Northcote (1998) reviewed all the scientific and technical studies of Port Nicholson to 1997. The study provides a comprehensive assessment of all aspects of the harbour environment including geology, hydrology and ecology. Extensive species lists of all major taxonomic groups recorded from the harbour were included. These lists include numerous non-indigenous species. Non-indigenous algae listed were: *Cutleria multifida*, *Punctaria latifolia*, *Striaria attenuata, Undaria pinnatifida*, *Antithamnionella ternifolia, Polysiphonia brodiaei* (op. cit.) and *Polysiphonia senticulosa*. Non-indigenous porifera listed were: *Clathrina coriacea*, *Cliona celata*, *Hymeniacidon perleve* and *Tethya aurantium*. Non-indigenous cnidarians included *Ectopleura larynx* and *Sarsia japonica*. The only non-indigenous amphipod listed was *Chelura terebrans*. Non-indigenous decapods were *Dromia wilsoni* and *Plagusia chabrus*. Non-indigenous mollusca listed were: *Crassostrea gigas*, *Lyrodus pedicellatus* and *Nototeredo edax*. There were three non-indigenous bryozoans: *Bugula flabellata*, *Cryptosula pallasiana* and *Watersipora subtorquata*. Non-indigenous ascidians included *Asterocarpa cerea*, *Botryllus schlosseri*, *Corella eumyota*, *Didemnum candidum* and *Diplosoma listerianum*.

Taylor and MacKenzie (2001) tested the Port of Wellington for the presence of the toxic blooming dinoflagellate *Gymnodinium catenatum*, and detected both resting cysts (sediment samples) and motile cells (phytoplankton samples).

Since the initial baseline survey was completed in late 2001, the only environmental study or report on the Port's biology appears to be the Assessment of Effects on the Environment that formed part of CentrePort's application for resource consents to dredge the entrance channel (Sinclair Knight Merz Ltd 2002). The biological sampling component of the study consisted of the collection of five replicate grab samples from each of three sites along the Entrance Channel. Taxa collected were identified mostly to family or order level. The report considered that the faunal communities showed no signs of uniqueness. No reference was made to whether any non-indigenous taxa were encountered.

## RESULTS OF THE FIRST BASELINE SURVEY

An initial baseline survey of the Port of Wellington was completed in November / December 2001 (Inglis et al. 2006a). The report identified a total of 336 species or higher taxa. They consisted of 227 native species, 14 non-indigenous species, 26 cryptogenic species (those whose geographic origins are uncertain) and 69 species indeterminata (taxa for which there is insufficient taxonomic or systematic information available to allow identification to species level). Sixteen species of marine organisms collected from the Port of Wellington had not previously been described from New Zealand waters. Three of these were newly discovered non-indigenous species (a crab, *Cancer gibbosulus,* a polychaete worm, *Spirobranchus polytrema* and a hydroid *Eudendrium capillare*). A fourth, the ascidian *Cnemidocarpa* sp., was thought to be non-indigenous. The 12 other new species did not match existing species descriptions and may be new to science.

Since the first survey was completed, several species recorded in it have been re-classified as a result of new information or re-examination of specimens during identification of material from the repeat baseline survey. For example, the ascidian, *Cnemidocarpa* sp., was subsequently re-identified as a native species (*Cnemidocarpa nisiotus*). The revised summary statistics for the initial baseline survey of the Port of Wellington following re-classification was a total of 325 species, consisting of 225 native species, 13 non-indigenous species, 36 cryptogenic species and 51 species indeterminata. These revisions have been incorporated into the comparison of data from the two surveys below.

The 13 non-indigenous organisms recorded from the Port of Wellington included representatives of seven major taxonomic groups. The non-indigenous species detected were: *Dipolydora armata, Polydora hoplura*, *Spirobranchus polytrema* (Annelida), *Bugula flabellata, Cryptosula pallasiana, Cyclicopora longipora, Watersipora subtorquata* (Bryozoa), *Eudendrium capillare* (Cnidaria), *Cancer gibbosulus* (Crustacea), *Theora lubrica* (Mollusca), *Undaria pinnatifida, Griffithsia crassiuscula* (Macroalgae), and *Halisarca dujardini* (Porifera). The only species on the New Zealand register of unwanted organisms found in the Port of Wellington initial baseline survey was the Asian kelp, *Undaria pinnatifida*. This alga is known to now have a wide distribution in southern and eastern New Zealand. Approximately 64 % (nine of 14 species) of non-indigenous species recorded in the Port of Wellington initial baseline survey were likely to have been introduced in hull fouling assemblages, 7 % (one species) via ballast water and 29 % (four species) could have been introduced by either ballast water or hull fouling vectors.

# Methods

### SURVEY METHOD DEVELOPMENT

To allow a direct comparison between the initial baseline survey and the resurvey of the Port of Wellington, the survey used the same methodologies, occurred in the same season, and sampled the same sites used in the initial baseline survey (as requested by Biosecurity NZ). To improve the description of the biota of the port, some additional survey sites were added during the repeat survey. These are described below.

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; Hewitt and Martin 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 9. 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 second baseline survey of the Port of Wellington. The survey was undertaken between February 14$^{th}$ and 18$^{th}$, 2005.

### 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 (Figure 8). 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.

**BENTHIC FAUNA**

Benthic infauna was sampled using a Shipek grab sampler deployed from a research vessel moored adjacent to the berth (Figure 9), with samples collected from within 5 m of the edge of the berth. The Shipek grab removes a sediment sample of ~3 *l* and covers an area of approximately 0.04 $m^2$ on the seafloor to a depth of about 10 cm. It is designed to sample unconsolidated sediments ranging from fine muds and sands to hard-packed clays and small cobbles. Because of the strong torsion springs and single, rotating scoop action, the Shipek grab is generally more efficient at retaining samples intact than conventional VanVeen or Smith McIntyre grabs with double jaws (Fenwick *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.

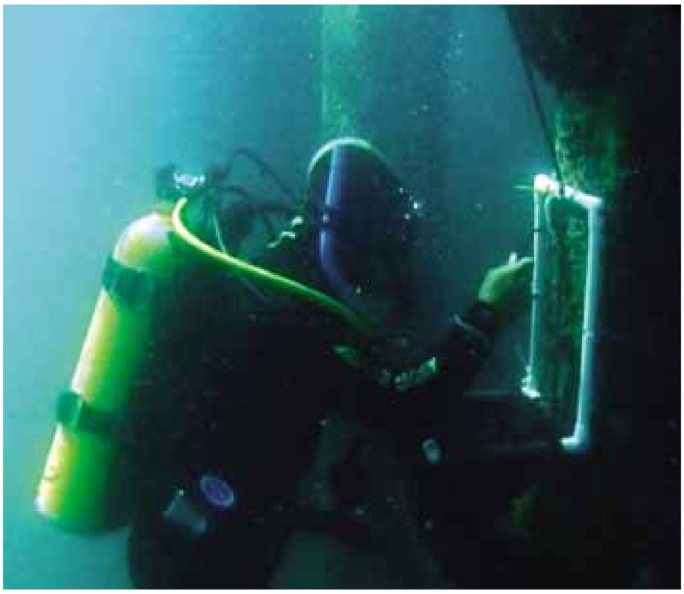


**Figure 8: Diver sampling organisms on pier piles.**


**Figure 9: 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 and height of 0.2 m. A short yoke of heavy chain connects the sled to a tow line (Figure 10). 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 2 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.

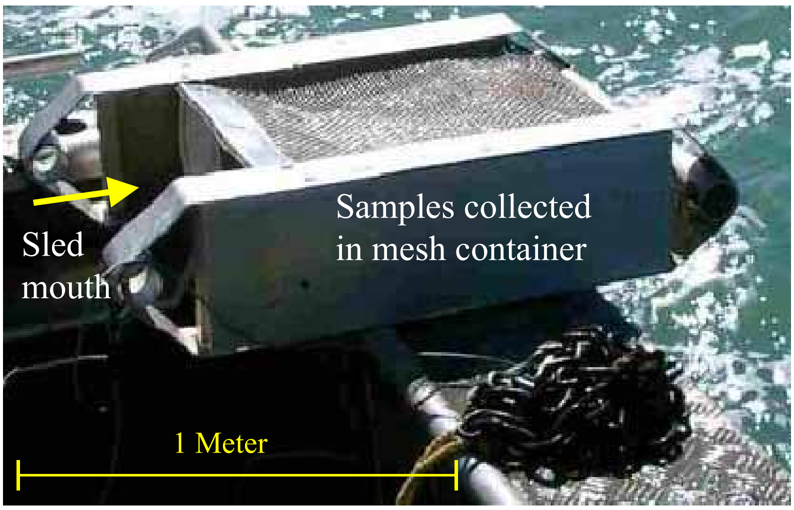



**Figure 10: Benthic sled**

## 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 (Figure 11). 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).

## MOBILE EPIBENTHOS

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

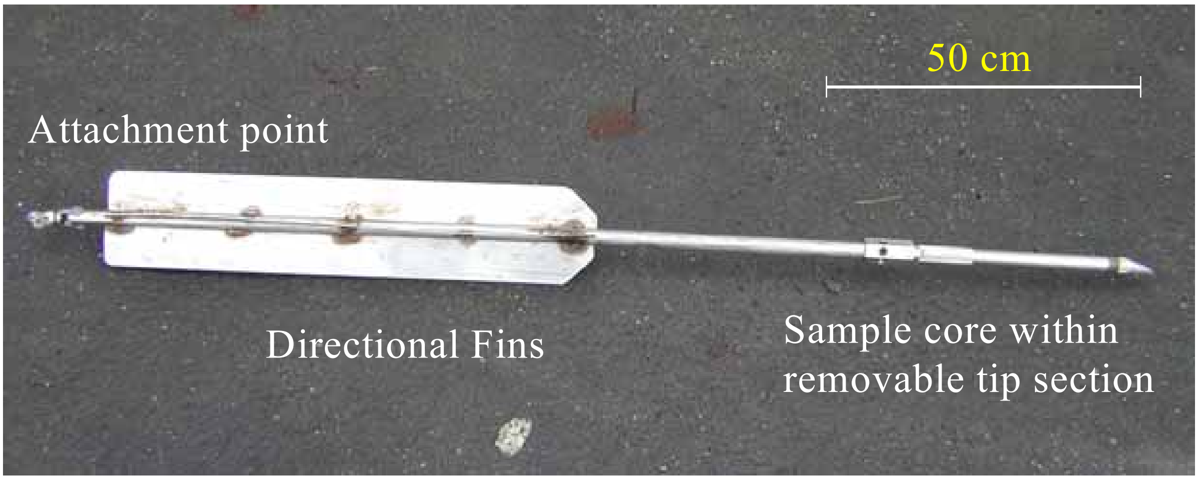



**Figure 11: Javelin corer**

### 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 (Figure 12). 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 (Figure 12). 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 (Figure 12). 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.

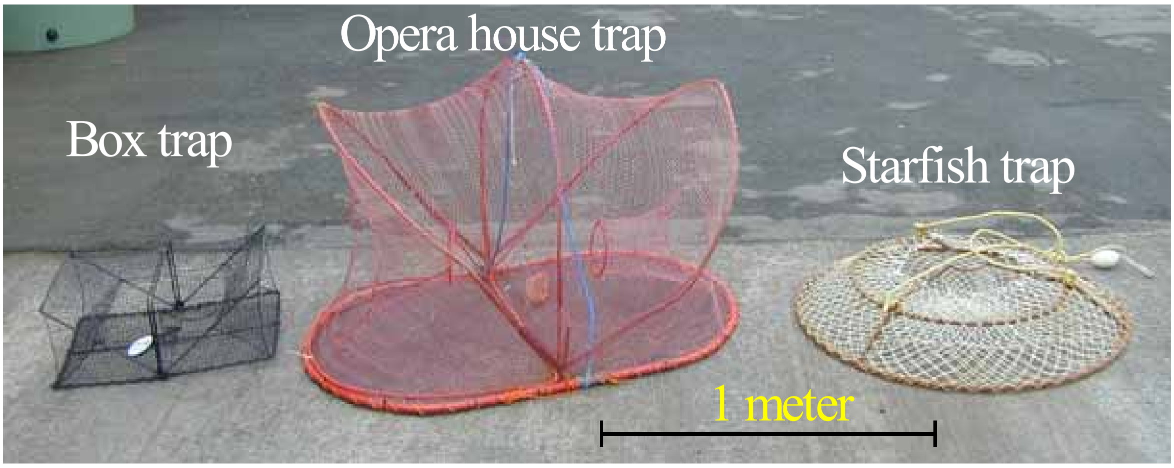



**Figure 12: Trap types deployed in the port.**

## SAMPLING EFFORT

A summary of sampling effort during the second baseline survey of the Port of Wellington is provided in Table 10, and the exact geographic locations of sample sites are given in Appendix 2. The distribution of effort 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.

During the initial baseline survey, most sample effort was concentrated around six berths – Aotea Quay North, Aotea Quay South, Burnham Wharf, Kings Wharf, Thorndon Container

Wharf and the Overseas Passenger Terminal - that were spread throughout the port and which represented a range of active berths and lay-up areas (Figure 3). Additional sampling using traps, benthic sleds and cyst cores was conducted at several other sites throughout the Port (Table 10). The same six main locations were sampled during the re-survey of the port, but because of shipping movements at the time of the survey, we were unable to take pile scrape samples from the Thorndon Container Wharf. Instead, pile scrape samples were taken from an additional site at Queens Wharf. To improve description of the flora and fauna in the resurvey, we also surveyed two additional sites each for benthic sled, benthic grab and crab, shrimp and starfish trap samples. One additional site was sampled with fish traps and five additional sites were sampled for dinoflagellate cysts using the javelin corer (Table 10).

The spatial distribution of sampling effort for each of the sample methods in the Port of Wellington is indicated in the following figures: diver pile scrapings (Figure 13), benthic sledding (Figure 14), box, starfish and shrimp trapping (Figure 15), opera house fish trapping (Figure 16), shipek grab sampling (Figure 17) and javelin cyst coring (Figure 18).

## 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 11. Specimens were subsequently sent to over 25 taxonomic experts (Appendix 3) 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 12) and the marine pest list produced by the Australian Ballast Water Management Advisory Council (Table 13).

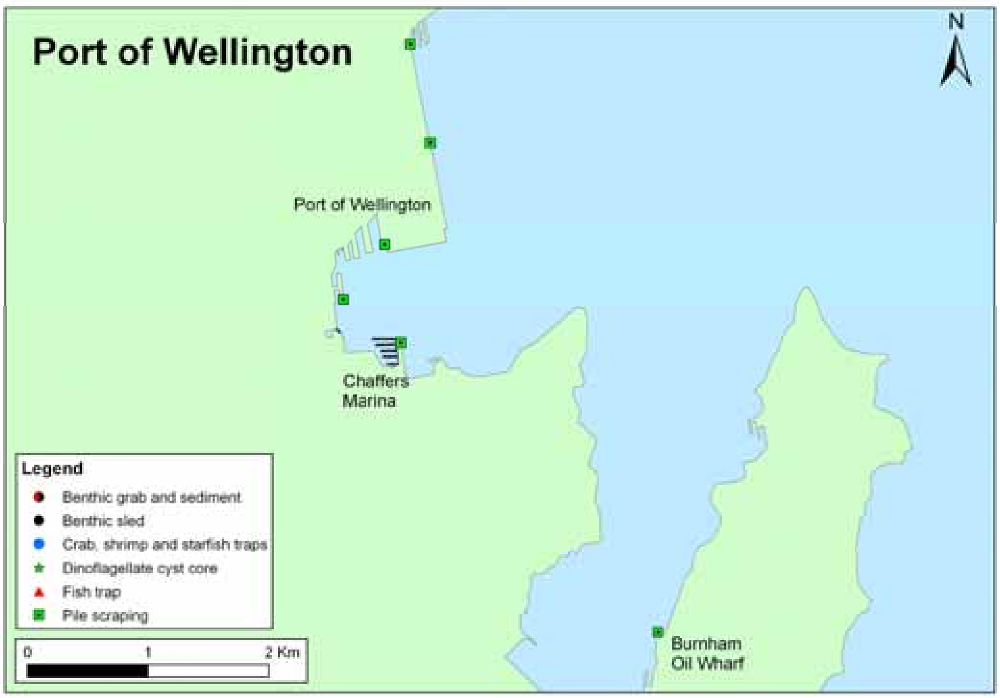



**Figure 13: Diver pile scraping sites**

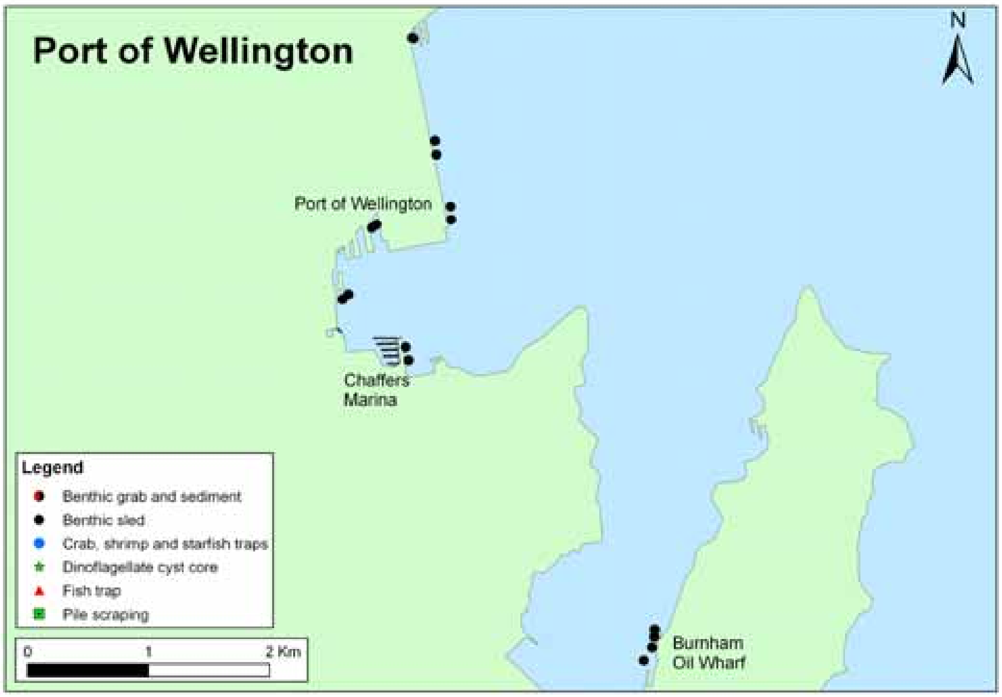



**Figure 14:** **Benthic sled sites**


**Figure 15:** **Sites trapped using box (crab), shrimp and starfish traps**

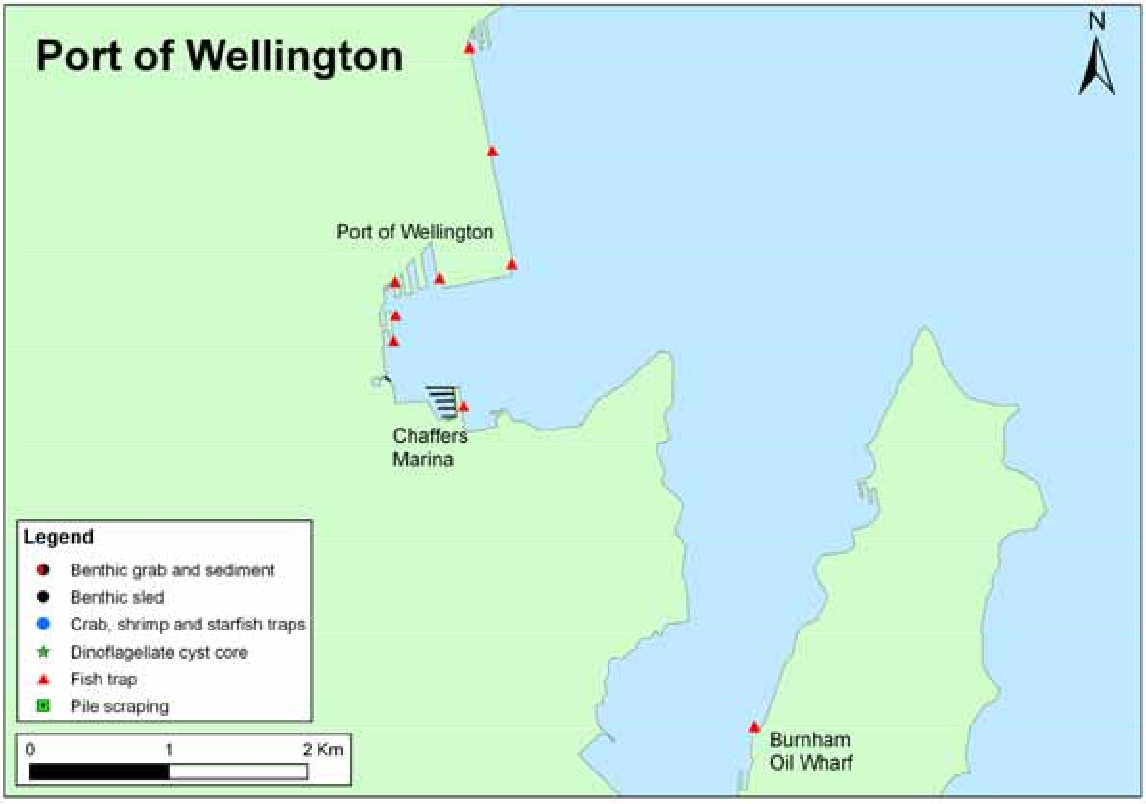



**Figure 16: Opera house (fish) trapping sites**

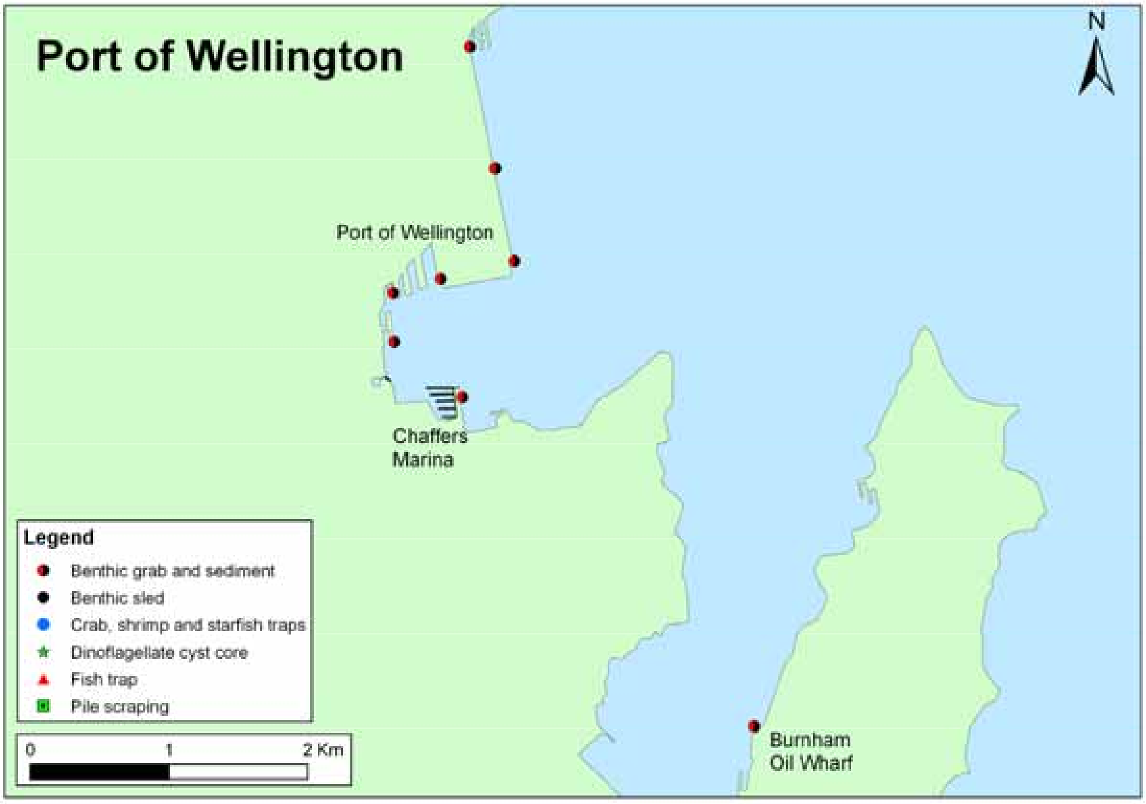



**Figure 17: Shipek benthic grab sites**

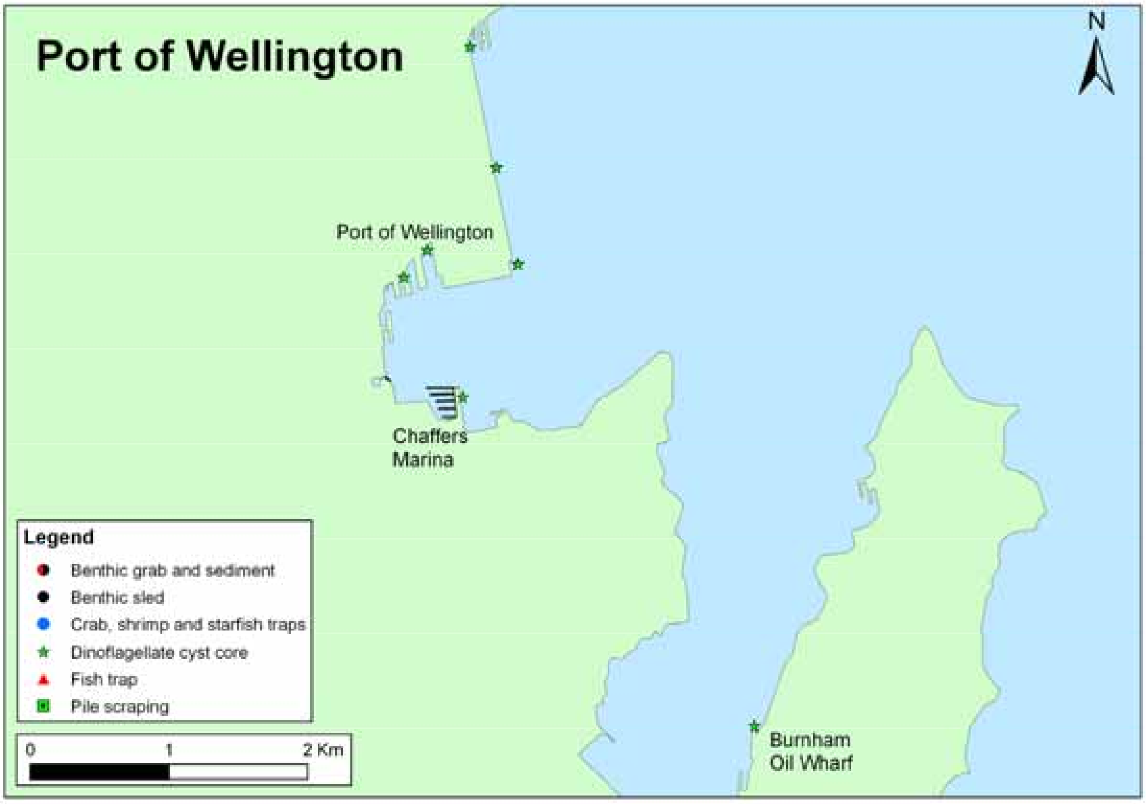



**Figure 18: Javelin core sites**

## 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. 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 have occurred within the New Zealand biogeographical region historically 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 as a guide 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.

## DATA ANALYSIS

### Comparison with the initial baseline survey

Several approaches were used to compare the results of the current survey with the earlier baseline survey of the Port of Wellington, completed in late 2001 (Inglis et al. 2006a).

Summary statistics were compiled on the total number of species and major taxonomic groups found in each survey and on the numbers of species in each biogeographic category (i.e. native, non-indigenous, etc) recovered by each survey method. Several taxa (Order Tanaidacea (tanaids), Class Scyphozoa (jellyfish), Phylum Platyhelminthes (flatworms) and Class Anthozoa (sea anemones)) were specifically excluded from analyses as, at the time the reports were prepared, we had been unable to secure identification of specimens from the resurvey.

While these summary data give the numbers of species actually observed in each survey they do not, by themselves, provide a robust basis for comparison, since they do not account for differences in sample effort between the surveys, variation in the relative abundance of species at the time of each survey (for a discussion of these issues, see Gotelli and Colwell 2001), or the actual species composition of the recorded assemblages. The latter is important if port surveys are to be used to estimate and monitor the rate of new incursions by non-indigenous species.

In any single survey, the number of species observed will always be less than the actual number present at the site. This is because a proportion of species remain undetected due to bias in the survey methods, local rarity, or insufficient sampling effort. A basic tenet of sampling biological assemblages is that the number of species observed will increase as more samples are taken, but that the rate at which new species are added to the survey tends to decline and gradually approaches an asymptote that represents the total species richness of the assemblage (Colwell and Coddington 1994). In very diverse assemblages, however, where a large proportion of the species are rare, this asymptote is not reached, even when very large numbers of samples are taken. In these circumstances, comparisons between surveys are complicated by the large number of species that remain undetected in each survey. This issue has received considerable attention in recent literature and new statistical methods have been developed to allow better comparisons among surveys (Gotelli and Colwell 2001; Colwell et al. 2004; Chao et al. 2005). We use several of these new techniques – sample-based rarefaction curves (Colwell et al. 2004), non-parametric species richness estimators (Colwell and Coddington 1994), and bias-adjusted similarity indices (Chao et al. 2005) - to compare results from the two surveys of the Port of Wellington.

### Sample-based rarefaction curves

Sample-based rarefaction curves depict the number of species that would be expected in a given number of samples ($n$) taken from the survey area, where $n_{(max)}$ is the total number of samples taken in the field survey. The shape of the curves and the number of species expected for a given $n$ can be used as the basis for comparing the surveys and evaluating the benefit of reducing or increasing sample effort in subsequent surveys (Gotelli and Colwell 2001). For each baseline survey we computed separate sample-based rarefaction curves (Gotelli and Colwell 2001) for each survey method. The curves were computed from the presence or absence of each recorded species in each sample unit (i.e. replicated incidence data) using the analytical formula developed by Colwell et al. (2004) (the Mau Tau index) and the software EstimateS (Colwell 2005).

Separate curves were computed for each of six methods: pile scraping, benthic sleds, benthic grabs, crab traps, fish traps and starfish traps. The remaining methods did not usually recover enough taxa to allow meaningful analyses. For pile scrapes, only quadrat samples were used; specimens collected on qualitative visual searches of piles were not included. Since the purpose of the port surveys is primarily inventory of non-indigenous species, we generated separate curves for native species, cryptogenic category 2 species, and the combined species pool of non-indigenous and cryptogenic category 1 taxa, where there were sufficient numbers of taxa to produce meaningful curves (arbitrarily set at > 8 taxa per category). This was possible for pile scrapes and benthic sleds; for the other survey methods, all taxa (excluding species indeterminata) were pooled in order to have sufficient numbers of taxa.

Note that, by generating rarefaction curves we are assuming that the samples can reasonably be considered a random sample from the same universe (Gotelli and Colwell 2001). Strictly, this does not represent the way that sample units were allocated in the survey. For example quadrat samples were taken from fixed depths on inner and outer pilings at each berth, rather than distributed randomly throughout the 'universe' of pilings in the port. Previously, we showed that there is greater dissimilarity between assemblages in these strata than between replicates taken within each stratum, although the difference is marginal (range of average similarity between strata = 22%-30% and between samples = 25%-35 %, Inglis et al. 2003). This stratification is an example of the common tension in biodiversity surveys between optimising the complementarity of samples (i.e. reducing overlap or redundancy in successive samples so that the greatest number of species is included) and adequate description of diversity within a particular stratum (Colwell and Coddington 1994). In practice, no strategy for sampling biodiversity is completely random or unbiased. The effect of the stratification is likely to be an increase in the heterogeneity of the samples, equivalent to increasing the patchiness of species distribution across quadrats. This is likely to mean slower initial rate of accumulation of new species and slower accumulation of rare species (Chazdon et al. 1998). Because the same survey strategy was used in both port surveys, this systematic bias should not unduly affect comparisons between the two surveys. Furthermore, preliminary trials, where we pooled quadrat samples to form more homogenous units (e.g. piles or berths as the sample unit) and compared the curves to total randomisation of the smallest unit (quadrats), had little effect on the rate of accumulation (Inglis et al. 2003).

### Estimates of total species richness

Estimates of total species richness (or more appropriately total "species density") in each survey were calculated using the Chao 2 estimator. This is a non-parametric estimate of the true number of species in an assemblage that is calculated using the numbers of rare species (those that occur in just one or two sample units) in the sample (Colwell and Coddington 1994). That is, it estimates the total number of species present, including the proportion that was present, but not detected by the survey ("unseen" species). As recommended by Chao (in Colwell 2005), we used the bias-corrected Chao 2 formula, except when the CV > 0.5, in which case the estimates were recalculated using the Chao 2 classic formula, and the higher of the Chao 2 classic and the ICE (Incidence-based Coverage Estimator)was reported.

Plots of the relationship between the species richness estimates and sample size were compared with the sample-based rarefaction curve for each combination of survey, method, and species category. Convergence of the observed (the rarefaction curve) and estimated (Chao 2 or ICE curve) species richness provides evidence of a relatively thorough inventory (Longino et al. 2002).

### Similarity analyses

A range of indices is available to measure the compositional similarity of samples from biological assemblages using presence-absence data (Koleff et al. 2003). Many of these are based on the relative proportions of species that are common to both samples ("shared species") or which occur in only a single sample. The classic indices typically perform poorly for species rich assemblages and are sensitive to sample size, since they do not account for the detection probabilities of rare ("unseen") species. Chao et al. (2005) have recently developed new indices based on the classic Jaccard and Sorenson similarity measures that incorporate the effects of unseen species. We used the routines in EstimateS (Colwell 2005) to compare samples from the two surveys using the new Chao estimators, but also report the classic Jaccard and Sorenson measures. Separate comparisons were done for each combination of survey method and species category where there were sufficient taxa (see above).

## Survey results

A total of 303 species or higher taxa were identified from the re-survey of the Port of Wellington. This collection consisted of 196 native (Table 14), 48 cryptogenic (Table 15), and 13 non-indigenous species (Table 16), with the remaining 46 taxa being made up of species indeterminata. By comparison, 325 taxa were recorded from the initial survey of the port, comprising 225 native, 36 cryptogenic, 13 non-indigenous species and 51 species indeterminata. The biota in the re-survey included a diverse array of organisms from 11 major taxonomic groups (Figure 20). For general descriptions of the main groups of organisms (major taxonomic groups) encountered during this study refer to Appendix 4, and for detailed species lists collected using each method refer to Appendix 6.

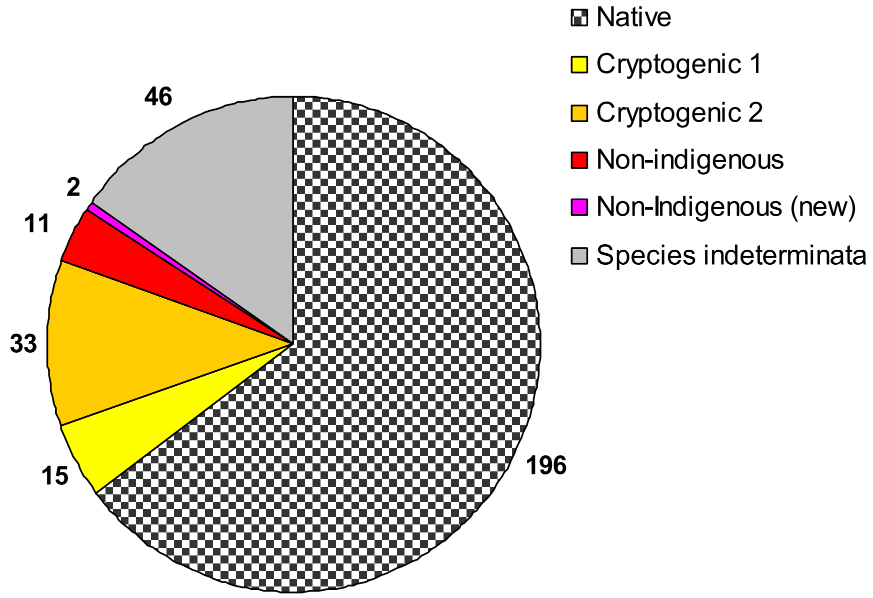



**Figure 19: Diversity of marine species sampled in the Port of Wellington. Values indicate the number of taxa in each category.**

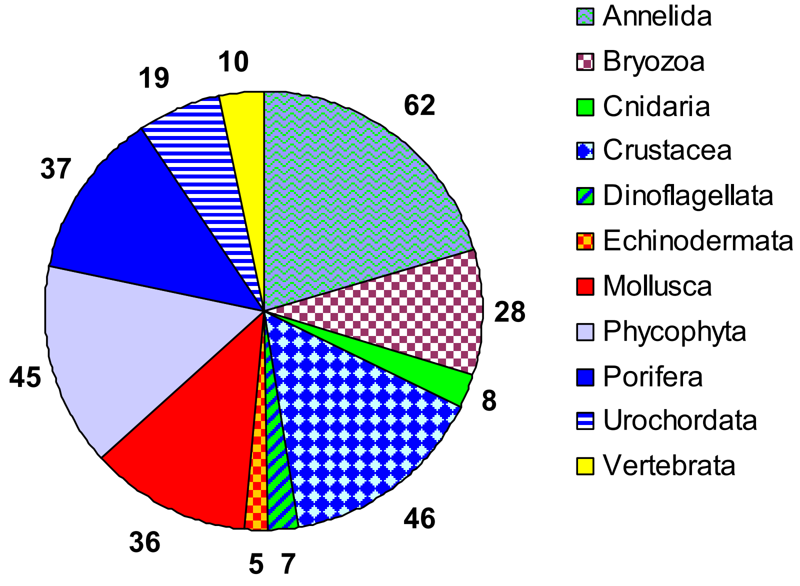



**Figure 20: Major taxonomic groups sampled in the Port of Wellington. Values indicate the number of taxa in each of the major taxonomic groups**

## NATIVE SPECIES

The 196 native species (Table 14) recorded during the resurvey of the Port of Wellington represented 65 % of all species identified from this location and included diverse assemblages of annelids (40 species), crustaceans (36 species), molluscs (32 species), algae (22 species), bryozoans (20 species), ascidians (13 species) and sponges (12 species). A number of other less diverse major taxonomic groups including vertebrates, cnidarians, echinoderms and dinoflagellates were also recorded from the Port (Table 14).

## CRYPTOGENIC SPECIES

Cryptogenic species ($n = 48$) represented 16 % of all species or higher taxa identified from the Port. The cryptogenic organisms identified included 15 Category 1 and 33 Category 2 species as defined in "Definitions of species categories" above. These organisms included 11 species of annelid worm, 2 bryozoans, 2 cnidarians, 1 crustacean, 1 phycophyte, 1 mollusc, 24 sponges and 6 ascidian species (Table 15). Four of the 15 Category 1 cryptogenic species (the hydroids *Clytia hemisphaerica* and *Plumularia setacea*; the ascidian *Aplidium phortax* and the sponge *Pseudosuberites sulcatus*) were not recorded in the initial baseline survey of the port. Eight of the 19 Category 1 species recorded in the initial baseline survey of the Port of Wellington were not found during the re-survey.  These were the hydroids, *Bougainvillia muscus* and *Obelia dichotoma,* the amphipods, *Aora typica* and *Stenothoe ?miersii,* the dinoflagellate, *Gymnodinium catenatum,* the sponge, *Plakina trilopha,* and the ascidians, *Microcosmus australis* and *Styela plicata*. Several of the Category 1 cryptogenic species (e.g the hydroid *Plumularia setacea* and the ascidians *Aplidium phortax, Astereocarpa cerea*, *Botrylloides leachii* and *Corella eumyota*) 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).

The *Didemnum* species group, which we have included in cryptogenic category 1, warrants further discussion. This genus includes at least two species that have recently been reported from within New Zealand (*D. vexillum* and *D. incanum*) and two related, but distinct species from Europe (*D. lahillei*) and the north Atlantic (*D. vestum* sp. nov.) that have displayed invasive charactertistics (i.e. sudden appearance and rapid spread, Kott 2004a; Kott 2004b).

All can be dominant habitat modifiers. The taxonomy of the Didemnidae is complex and it is difficult to identify specimens to species level. The colonies do not display many distinguishing characters at either species or genus level and are comprised of very small, simplified zooids with few distinguishing characters (Kott 2004a). Six species have been described in New Zealand (Kott 2002) and 241 in Australia (Kott 2004a). Most are recent descriptions and, as a result, there are few experts who can distinguish the species reliably.

Specimens of *Didemnum* obtained during the initial port baseline surveys were examined by the world authority on this group, Dr Patricia Kott (Queensland Museum). She identified *D. vexillum* among specimens taken from the initial baseline surveys of Nelson and Tauranga, and *D. incanum* from the ports of Tauranga, Picton and Bluff. A third species, *D. tuberatum*, which Dr Kott described as native to New Zealand, was also recorded from Bluff. None of these species was recorded from Wellington. Several specimens of *Didemnum* were recovered from Wellington during the initial survey, but these did not fit any of the existing descriptions and were identified only to genus level. At the time that this report was prepared, we had been unable to secure Dr Kott's services to examine specimens from the repeat-baseline surveys, and all *Didemnum* specimens were identified only to genus level. We have reported these species collectively, as a species group (*Didemnum* sp.; Table 15). During the second baseline survey, *Didemnum sp.* was recorded on wharf pilings at Aotea Quay North, the Overseas Passenger Terminal, Queens Wharf and Burnham Wharf.

**NON-INDIGENOUS SPECIES**

The 13 non-indigenous species (NIS) recorded in the re-survey of the Port of Wellington included 2 annelid worms, 4 bryozoans, 3 cnidarians, 1 crustacean, 1 mollusc, and 2 phycophytes (Table 16). Four species found in the re-survey were not recorded during the initial Wellington baseline survey in late 2001. They were the hydroids, *Eudendrium generale, Monotheca pulchella* and *Sertularia marginata,* and the amphipod, *Monocorophium acherusicum*. Four NIS recorded in the initial survey (the polychaete *Dipolydora armata,* the sponge *Halisarca dujardini,* the hydroid *Eudendrium capillare* and the crab *Cancer gibbosulus*) were not recorded in the re-survey. *Cancer gibbosulus* was recorded from just a single site in the initial baseline survey, but the other three species were recorded from several sites, and their absence during the re-survey may suggest that their populations have declined in size.

Two of the NIS (the polychaete worm *Spirobranchus polytrema* and the hydroid *Eudendrium generale*) are new records for Wellington. *Spirobranchus polytrema* was recorded for the first time during the initial baseline port surveys of Dunedin, Napier and Wellington and has since been reported from Lyttelton, Picton and Timaru. *E. generale* was recorded for the first time during the initial baseline port survey of Napier (see the species descriptions below). A list of Chapman and Carlton's (1994) criteria (see "Definitions of species categories", above) that were met by the non-indigenous species sampled in this survey is given in Appendix 5.

Below we summarise available information on the biology of each of the recorded NIS, 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 3 and from regional databases on non-indigenous marine species in Australia (National Introduced Marine Pest Information System, Hewitt et al. 2002) and the USA (National Exotic Marine and Estuarine Species Information System, Fofonoff et al. 2003). 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 major taxonomic groups in the same order as Table 16.

***Spirobranchus polytrema* (Philippi, 1844)**
No image available.

*Spirobranchus polytrema* is a serpulid tubeworm most commonly found along the continental shelf, intertidal, rock bottom, and sublittoral habitats, and on the underside of stones around the low water mark (Australian Faunal Directory 2005). Its impacts are unknown. *S. polytrema* is widely distributed, with a recorded distribution from Australia, Lord Howe Island, Solomon Islands, Sri Lanka, Japan, the Indo-west Pacific and the Mediterranean. The type specimen for this species was recorded from the Mediterranean, but there is continued uncertainty over the synonymy of Mediterranean and Indo-Pacific forms of this species complex. During the initial port baseline surveys, *S. polytrema* was recorded from the ports of Wellington, Napier and Dunedin (Table 18). These findings were the first time the species had been recorded in New Zealand (G. Read, NIWA, pers. comm.). In the initial baseline survey of the Port of Wellington *S. polytrema* was recorded from Aotea Quay 3 (i.e. "Aotea Quay North") and Aotea Quay 6 ("Aotea Quay South"; Figure 21). During the second baseline surveys of Group 1 ports it was recorded from the ports of Wellington, Picton, Lyttelton and Timaru. In the second baseline survey of the Port of Wellington it occurred in pile scrape samples from Aotea Quay South and Burnham Wharf and in a benthic sled sample from Queens Wharf (Figure 22).

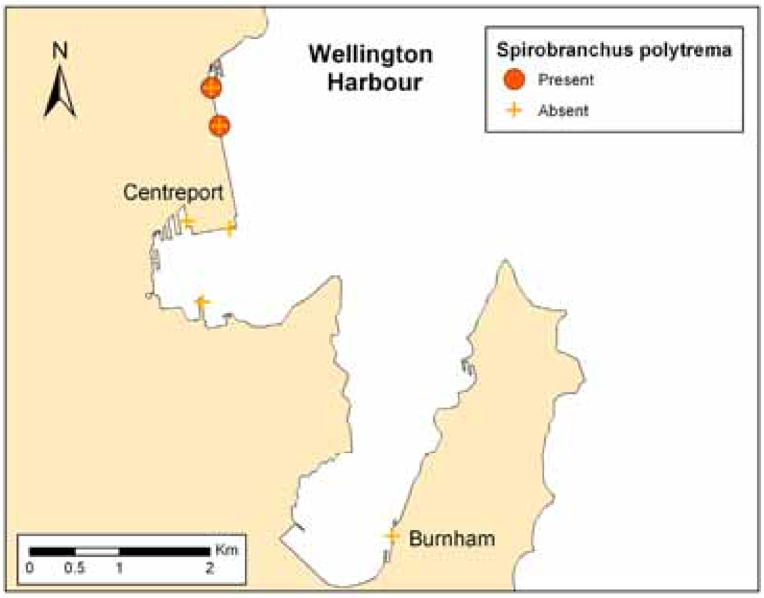



**Figure 21: *Spirobranchus polytrema* distribution in the initial baseline survey of the Port of Wellington (November / December 2001).**

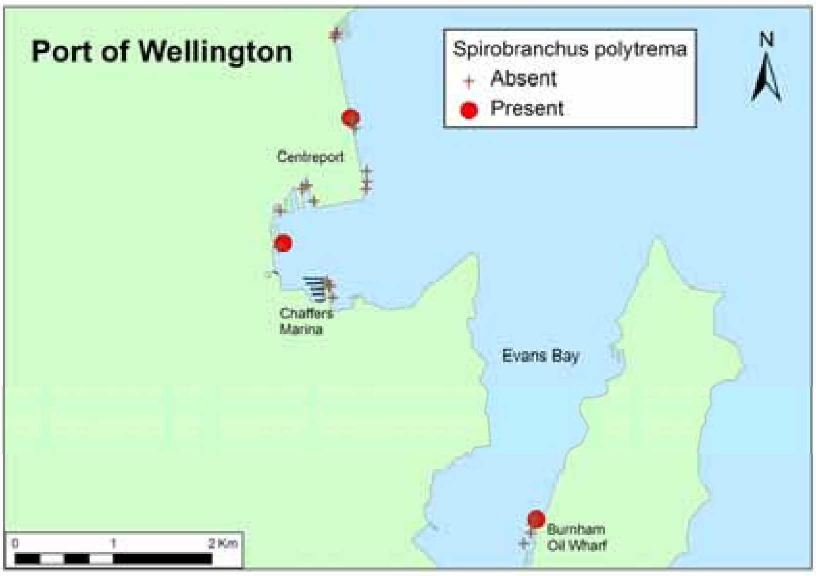
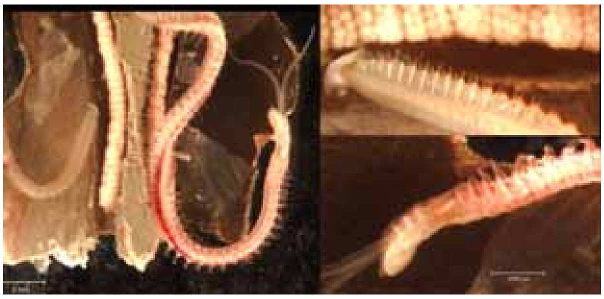



**Figure 22:** ***Spirobranchus polytrema*** **distribution in the re-survey of the Port of Wellington (February 2005).**

### *Polydora hoplura* Claparède, 1870



(Left) with eggmass in an opened blister; (top R) posterior; (bottom R) lateral head

Image: Read (2004)

*Polydora hoplura* is a spionid polychaete worm that bores into the shells of molluscs. It is a common pest of shellfish mariculture as its burrows cause blisters in the shells of farmed oysters, mussels and abalone (Pregenzer 1983; Handley 1995; Read 2001; Lleonart et al. 2003). It is considered one of New Zealand's worst pest worms (Read 2004). It is often found below the tide mark on jetty piles (Australian Faunal Directory 2005). The type specimen for this species was recorded from the Gulf of Naples, Italy (Claparède, E. 1870). Its native range is thought to be the Atlantic coast of Europe and the Mediterranean (Cranfield et al. 1998). *P. hoplura* has also been recorded from South Africa, southeastern Australia (Bass Strait and Victoria, central east coast, southern gulf coast, and Tasmania) and New Zealand where it is thought to have been introduced (Australian Faunal Directory 2005). It is not known when *P. hoplura* first arrived in New Zealand (Read 2001). In Europe and New Zealand, *P. hoplura* is often associated with shells of the introduced Pacific oyster *Crassostrea gigas* (Handley 1995).

*Polydora hoplura* had previously been recorded from Wellington and the Marlborough Sounds (Cranfield et al. 1998) and was recorded from Whangarei (Marsden Point), Tauranga, Wellington, Picton, Nelson and Dunedin during the initial baseline port surveys (Table 18). In the Port of Wellington it was recorded during the initial baseline survey from Aotea Quay 3 (= North), Aotea Quay 6 (= South), Burnham, Kings Wharf, the Overseas Passenger Terminal and Thorndon Container Terminal (Figure 23). During the second baseline surveys of Group 1 ports *P. hoplura* was recorded from the ports of Wellington, Lyttelton and Timaru. In the Port of Wellington it occurred in a pile scrape sample taken from Queens Wharf (Figure 24).

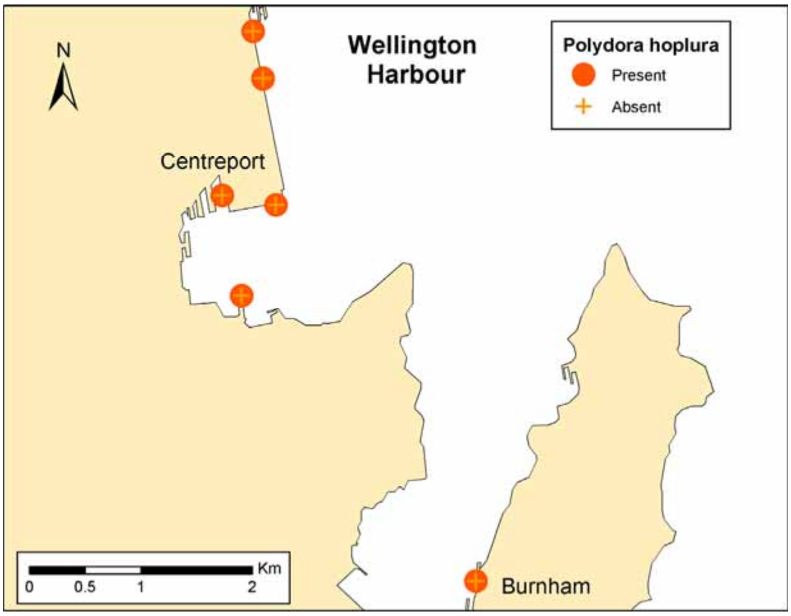



**Figure 23: *Polydora hoplura* distribution in the initial baseline survey of the Port of Wellington (November / December 2001).**

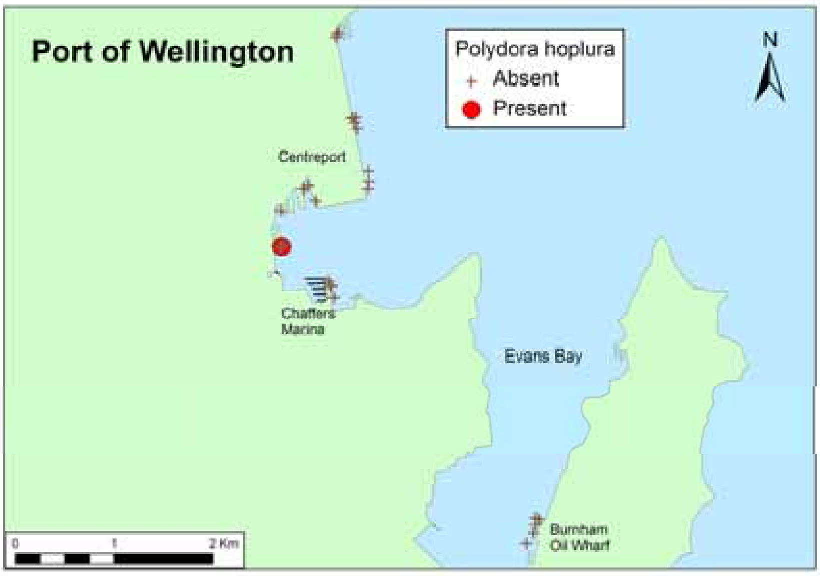



**Figure 24: *Polydora hoplura* distribution in the re-survey of the Port of Wellington (February 2005).**

***Bugula flabellata* (Thompson in Gray, 1848)**

Image and information: NIMPIS (2002a)

*Bugula flabellata* is an erect bryozoan with broad, flat branches. It is a colonial organism and consists of numerous 'zooids' connected to one another. It is pale pink and can grow to about 4 cm high and attaches to hard surfaces such as rocks, pilings and pontoons or the shells of other marine organisms. It is often found growing with other erect bryozoan species such as *B. neritina* or growing on encrusting bryozoans. Vertical, shaded, sub-littoral rock surfaces also form substrata for this species. It has been recorded down to 35 m. *Bugula flabellata* is native to the British Isles and North Sea and has been introduced to Chile, Florida and the Caribbean and the northern east and west coasts of the USA, as well as Australia and New Zealand. It is cryptogenic on the Atlantic coasts of Spain, Portugal and France. *Bugula flabellata* is a major fouling bryozoan in ports and harbours, particularly on vessel hulls, pilings and pontoons and has also been reported from offshore oil platforms. *Bugula flabellata* has been present in New Zealand since at least 1949 and is present in most New Zealand ports. There have been no recorded impacts from *B. flabellata.* During the initial port baseline surveys it was recorded from Opua marina, Whangarei (Marsden Point and Whangarei Port), and the ports of Auckland, Tauranga, Napier, Taranaki, Wellington, Picton, Nelson, Lyttelton, Timaru, Dunedin and Bluff (Table 18). In the Port of Wellington it was recorded during the initial baseline survey from Aotea Quay 3 (= North), Aotea Quay 6 (= South), Burnham, Kings Wharf, the Overseas Passenger Terminal, Waterloo Wharf and Thorndon Container Terminal and Breakwall (Figure 25). During the second baseline surveys of Group 1 ports it was recorded from the ports of Tauaranga, Taranaki, Wellington, Picton, Nelson, Lyttelton and Timaru. During the second baseline survey of the Port of Wellington *B. flabellata* occurred in pile scrape samples taken from Aotea Quay North and South, Kings, Queens and Burnham wharves and the Overseas Passenger Terminal. It also occurred in benthic sled samples from Kings Wharf, the Road-Rail Ferry Terminal and Thorndon Container Wharf (Figure 26).

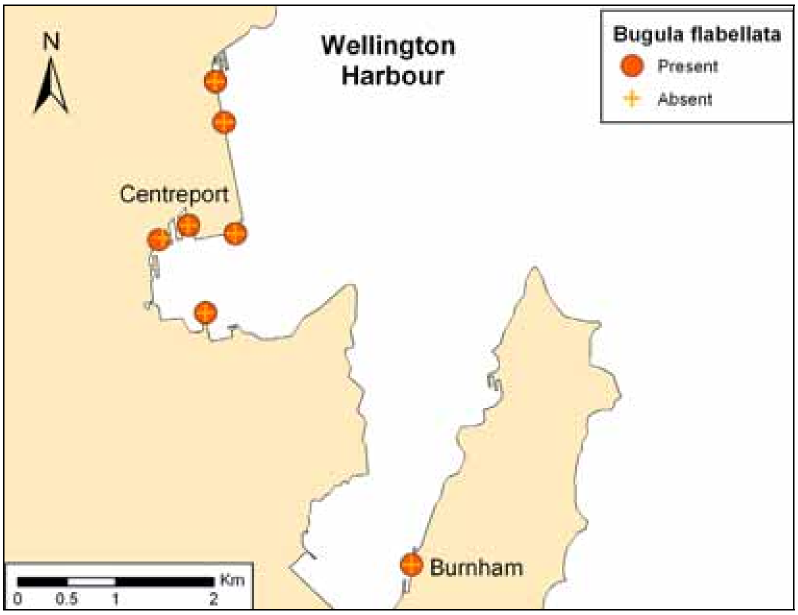



**Figure 25:** ***Bugula flabellata*** **distribution in the initial baseline survey of the Port of Wellington (November / December 2001).**

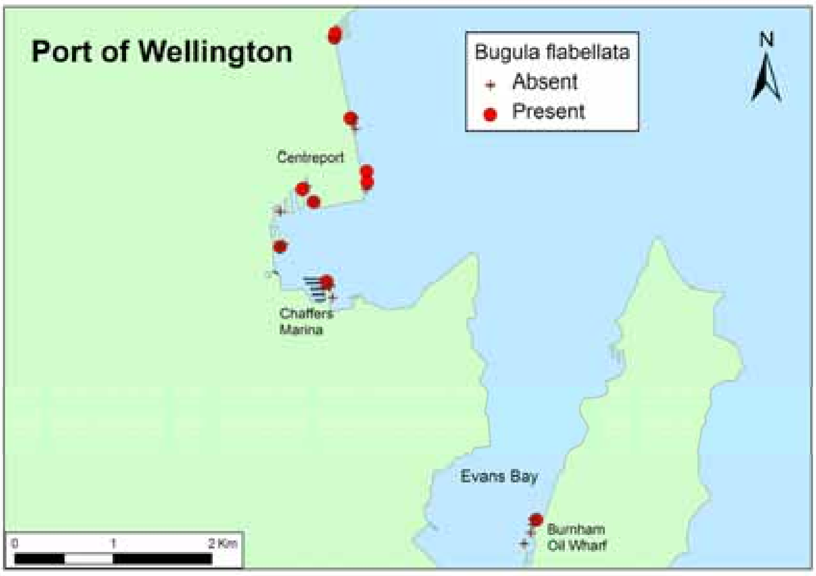



**Figure 26:** ***Bugula flabellata*** **distribution in the re-survey of the Port of Wellington (February 2005).**

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

Image and information: NIMPIS (2002b)

*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 Japanese Sea, 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 known in New Zealand waters since at least the 1890's (Gordon and Mawatari 1992) and has been recorded from all New Zealand ports (Cranfield et al. 1998). During the initial port baseline surveys it was recorded from Whangarei (Marsden Point), Taranaki, Gisborne, Wellington, Nelson, Lyttelton, Timaru and Dunedin (Table 18). In the Port of Wellington it was recorded during the initial baseline survey from the southern end of Aotea Quay 3 (ie. "Aotea Quay North") and Thorndon Container Terminal (Figure 27). During the second baseline surveys of Group 1 ports it was recorded from the ports of Taranaki, Wellington, Picton, Nelson, Lyttelton and Timaru. In the Port of Wellington it occurred in a pile scrape sample taken from the Overseas Passenger Terminal (Figure 28).

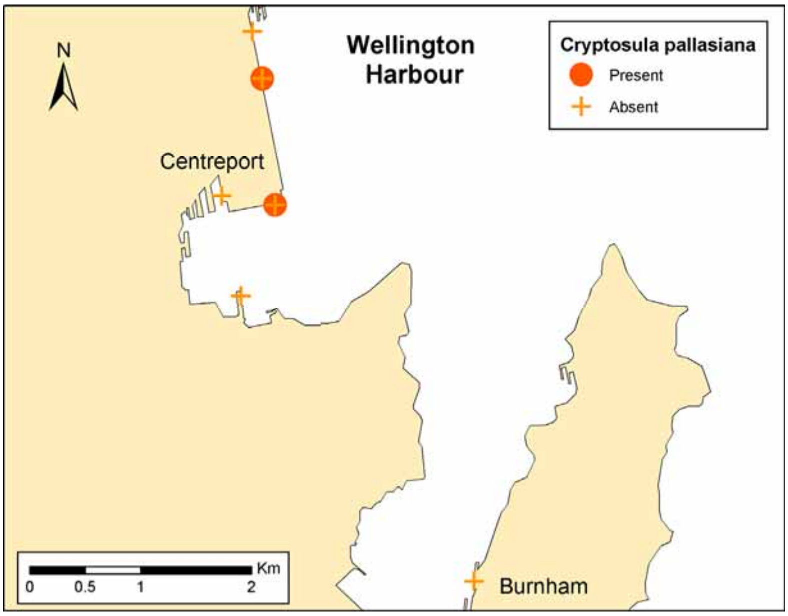



**Figure 27:** ***Cryptosula pallasiana*** **distribution in the initial baseline survey of the Port of Wellington (November / December 2001).**

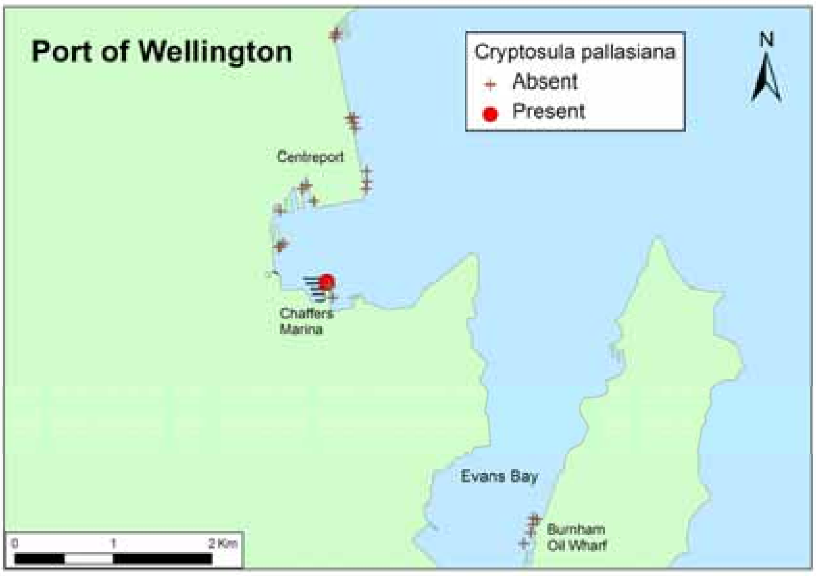



**Figure 28:** ***Cryptosula pallasiana*** **distribution in the re-survey of the Port of Wellington (February 2005).**

***Cyclicopora longipora* (MacGillivray, 1882)**

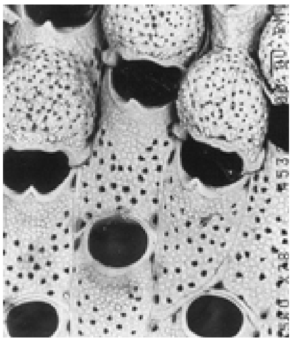


Image: Bock (2000)

*Cyclicopora longipora* is a bryozoan in the family Cyclicoporidae. It is an encrusting species that is commonly found growing on shells, rocks and other bryozoans. The type locality for this species is Port Phillip Heads, Victoria, Australia, but it is common throughout southern Australia and has also been recorded from the northeast Pacific (Bock 1982). *C. longipora* does not appear to have been present in New Zealand prior to at least 1992 (Gordon and Mawatari 1992). During the initial port baseline surveys of Group 1 and Group 2 ports, *C. longipora* was recorded only from the Port of Wellington, in samples taken from Aotea Quay 3 (i.e "Aotea Quay North"), Aotea Quay 6 ("Aotea Quay South"), the Overseas Passenger Terminal and Thorndon Container Terminal (Table 18, Figure 29). During the second baseline surveys of Group 1 ports it was again recorded only from Wellington, where it occurred in pile scrape samples from Aotea Quay North and South, Kings Wharf, Queens Wharf, the Overseas Passenger Terminal and in a benthic sled sample from the Road-Rail Ferry Terminal (Figure 30).

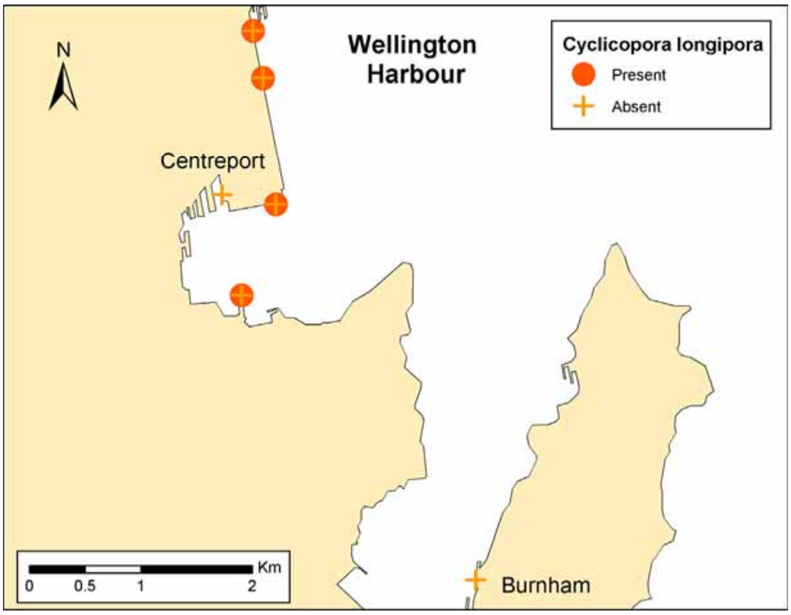



**Figure 29: *Cyclicopora longipora* distribution in the initial baseline survey of the Port of Wellington (November / December 2001)**

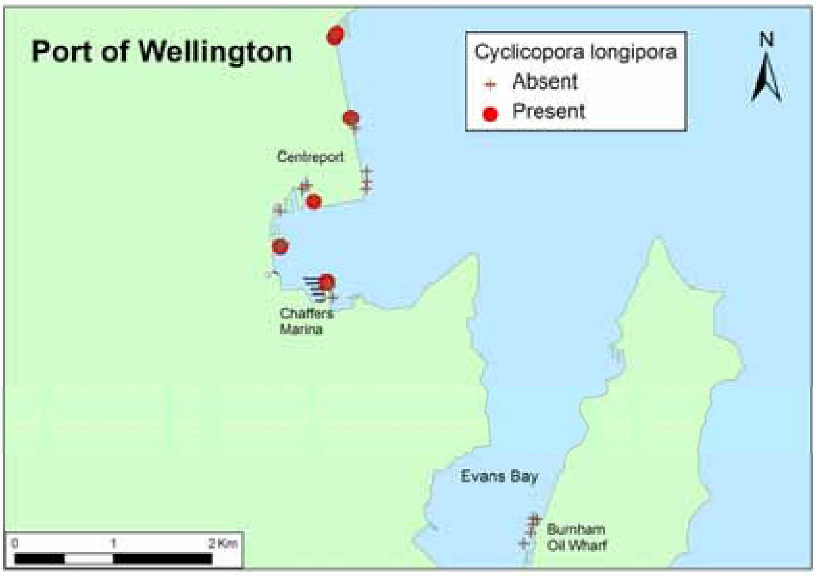



**Figure 30:** ***Cyclicopora longipora*** **distribution in the re-survey of the Port of Wellington (February 2005).**

***Watersipora subtorquata*** **(d'Orbigny, 1852)**

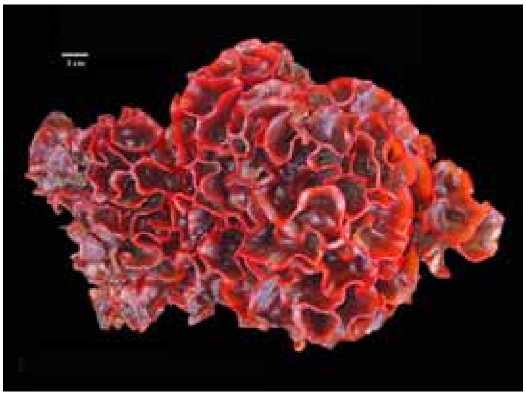


Image: Cohen (2005)
Information: Gordon and Matawari (1992)

*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. *W. 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. It also occurs in the northwest Pacific, Torres Strait and northeastern and southern Australia.

*Watersipora subtorquata* is a common 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. *W. 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. During the initial port baseline surveys, it was recorded from the Opua and Gulf Harbour marinas, Whangarei Harbour (Marsden Point and Whangarei Port) and the ports of Tauranga, Gisborne, Napier, Taranaki, Wellington, Picton, Nelson, Lyttelton, Timaru, Dunedin and Bluff (Table 18). In the Port of Wellington it was recorded during the initial baseline survey from Aotea Quay 3 (= North), Aotea Quay 6 (= South), Burnham, Kings Wharf, the Overseas Passenger Terminal and Thorndon Container Terminal (Figure 31). During the second baseline surveys of Group 1 ports *W. subtorquata* was recorded from the ports of Tauranga, Taranaki, Wellington, Picton, Nelson, Lyttelton and Timaru. During the second baseline survey of the the Port of Wellington it occurred in pile scrape samples taken from Aotea Quay South, Kings, Queens and Burnham wharves and the Overseas Passenger Terminal (Figure 32).

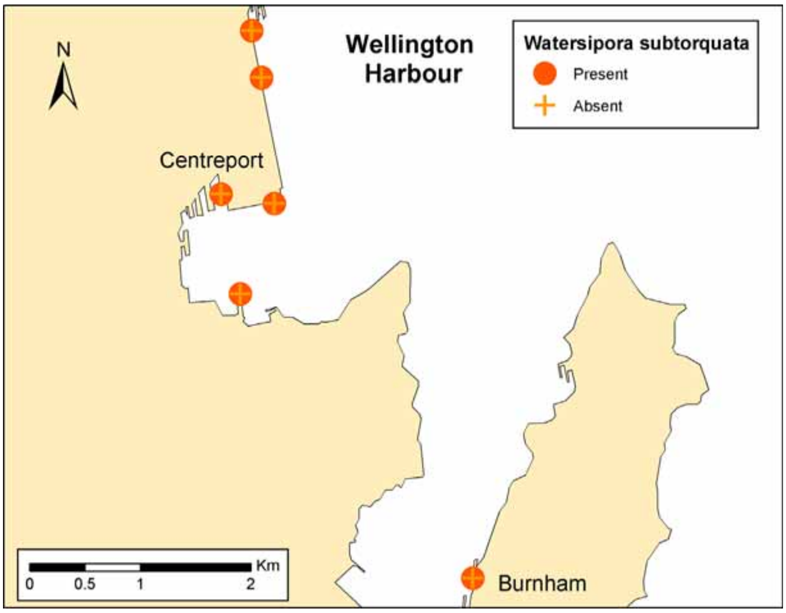



**Figure 31:** ***Watersipora subtorquata*** **distribution in the initial baseline survey of the Port of Wellington (November / December 2001).**

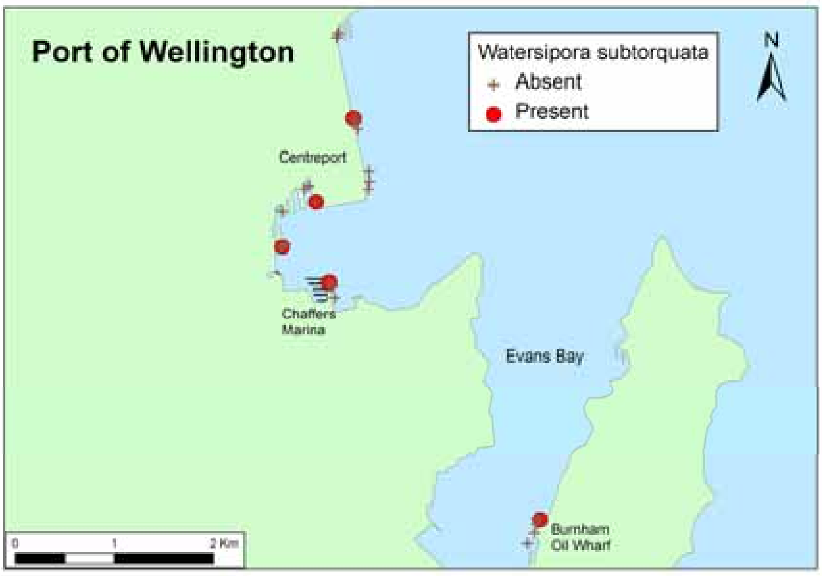



**Figure 32:** ***Watersipora subtorquata*** **distribution in the re-survey of the Port of Wellington (February 2005).**

***Eudendrium generale*** **Lendenfeld, 1885**

No image available

*Eudendrium generale* is a small hydroid from the family Eudendriidae. It forms bushy, erect colonies, 2-30 cm high. *Eudendrium generale* typically occurs in the deep ocean or sheltered waters, often attached to calcareous bryozoa or rocks (Southcott and Thomas 1982). The type specimen was described from southern Australia, but it has also recently been reported from the Antarctic (Puce et al. 2002). During the initial port baseline surveys, *E. generale* was recorded only from the Port of Napier, and the specimens obtained were the first known records of this species in New Zealand. During the second baseline surveys of Group 1 ports *E. generale* was recorded from the ports of Wellington and Picton (Table 18). In the Port of Wellington it occurred in pile scrape samples taken from Aotea Quay North and South, Burnham Wharf and the Overseas Passenger Terminal (Figure 33).

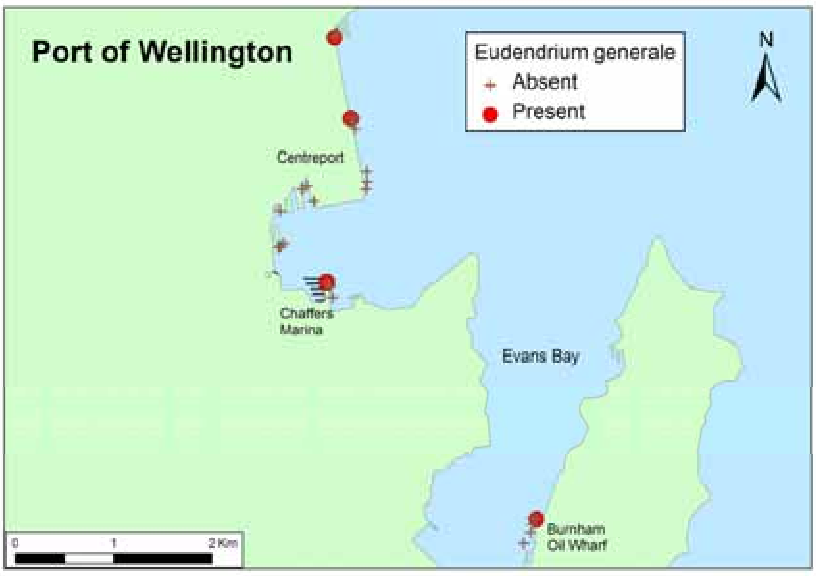



**Figure 33:** ***Eudendrium generale*** **distribution in the re-survey of the Port of Wellington (February 2005).**

***Monotheca pulchella*** **(Bale, 1882)**

No image available.

*Monotheca pulchella* is a hydroid in the family Plumulariidae. Its forms fine, flexible, monosiphonic, occasionally branched colonies 10 to 15 mm high, rising from tubular stolons (Vervoort and Watson 2003). It attaches to algae, bryozoans and other hydroids. The type locality is Queenscliff, Victoria, Australia. Its distribution is in temperate and subtropical parts of eastern and western Atlantic including the Mediterranean, South African coastal waters, coastal waters of southern Australia and eastern coastal waters of New Zealand (Vervoort and Watson 2003). It was first recorded in New Zealand from Bluff in 1928 (see Vervoort and Watson 2003). *Monotheca pulchella* was not recorded during the initial port baseline surveys. During the second baseline surveys of Group 1 ports it was recorded from the ports of Tauranga, Taranaki, Wellington, Lyttelton and Timaru (Table 18). None of these records are extensions to the known range of the species in New Zealand. In the Port of Wellington, *M. pulchella* occurred in a pile scrape sample from Aotea Quay South (Figure 34).

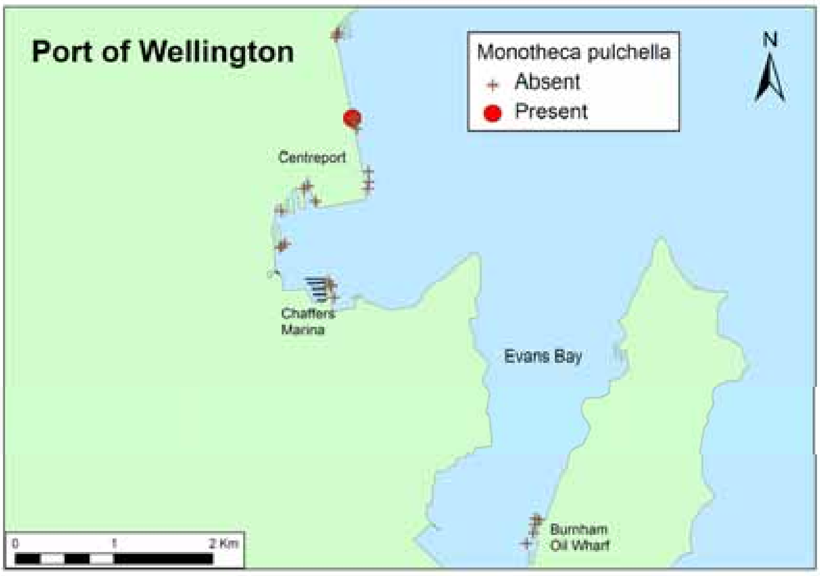



**Figure 34:** ***Monotheca pulchella*** **distribution in the re-survey of the Port of Wellington (February 2005).**

### ***Sertularia marginata*** **(Kirchenpauer, 1864)**

Medusoid of *Sertularia marginata* being liberated from gonotheca

Image: Migotto (1998)
Information: Vervoort and Watson (2003)

*Sertularia marginata* is a hydroid in the family Sertulariidae. Stems are pinnate, monosiphonic and rise to 30 mm high from creeping stolons. The species has a circumglobal distribution in tropical and subtropical seas, including the western and eastern Atlantic Ocean, Indian Ocean, and the western and eastern Pacific (Medel and Vervoort 1998, in Vervoort and Watson 2003). There are few records from New Zealand, but they include North Cape (from 1930), Poor Knights Islands, Russell, Bay of Isalnds, Auckland, the Tasman Sea near Lord Howe Island, the Pacific off South Island, and Doubtful Sound. *Sertularia marginata* was not recorded during the initial baseline surveys. During the second baseline surveys of Group 1 ports it was recorded from the ports of Tauranga and Wellington (Table 18). These records are probably extensions to the known range of this species in New Zealand (J. Watson, Hydrozoan Research Laboratory, pers. comm.). In the Port of Wellington *S. marginata* occurred in a pile scrape sample taken from Aotea Quay South (Figure 35).

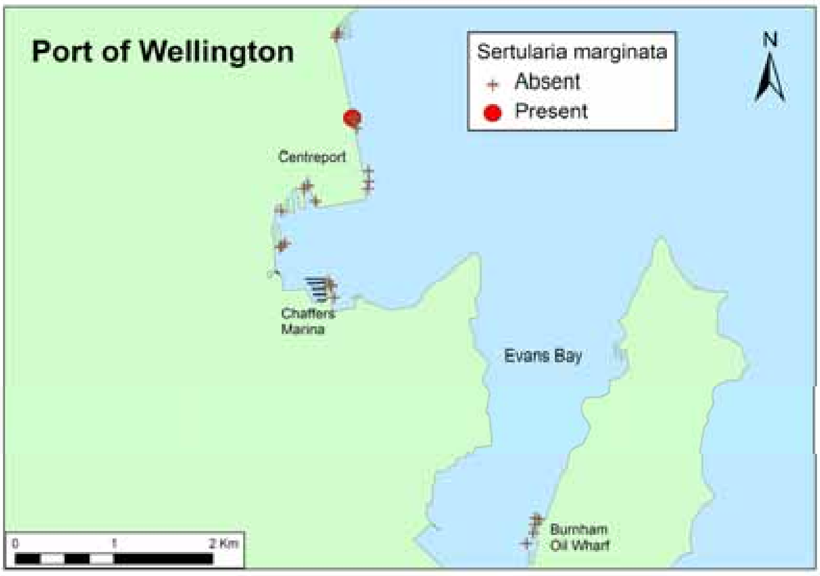



**Figure 35:** ***Sertularia marginata*** **distribution in the re-survey of the Port of Wellington (February 2005).**

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

Image and information: NIMPIS (2002c)

*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. It is native to the northeast Atlantic, the Mediterranean and the northwest African coast and has been introduced to Brazil, southeast Africa, India, the Japanese 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. *Monocorophium 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 can tolerate a wide range of salinities. Pilisuctorid ciliates 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 initial port baseline surveys, *M. acheruscium* was recorded from the ports of Tauranga, Gisborne, Lyttelton, Timaru, Dunedin and the Whangarei Town Basin marina. During the second baseline surveys of Group 1 ports it was recorded from the ports of Wellington, Timaru and Lyttelton (Table 18). In the Port of Wellington it occurred in a pile scrape sample taken from Kings Wharf (Figure 36).

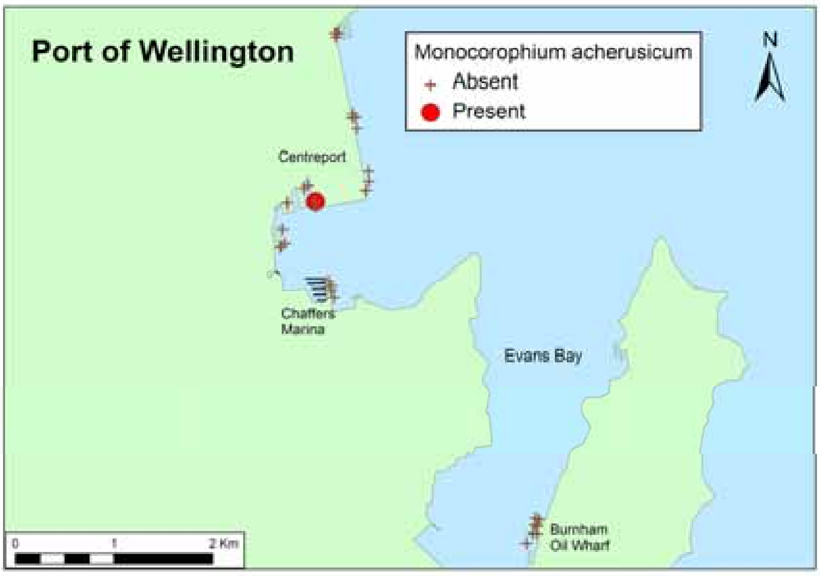



**Figure 36:** ***Monocorophium acherusicum*** **distribution in the re-survey of the Port of Wellington (February 2005).**

### *Theora lubrica* Gould, 1861

Image and information: NIMPIS (2002d)

*Theora lubrica* is a small bivalve with an almost transparent shell. The shell is very thin, elongated and has fine concentric ridges. *T. 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 Japanese 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, but it has been found as deep as 100 m. In many localities, *T. lubrica* is an indicator species for eutrophic and anoxic areas. *T. lubrica* has been present in New Zealand since at least 1971. It occurs in estuaries of the northeast coast of the North Island, including the Bay of Islands, Whangarei Harbour, Waitemata Harbour, Wellington and Pelorus Sound. During the initial port baseline surveys, *T. lubrica* was recorded from Opua marina, Whangarei port and marina, Gulf Harbour marina, and the ports of Auckland, Gisborne, Napier, Taranaki, Wellington, Nelson, and Lyttelton (Table 18). In the Port of Wellington it was recorded during the initial baseline survey from Burnham and the Thorndon Container Terminal (Figure 37). During the second baseline surveys of Group 1 ports *T. lubrica* was recorded from the ports of Taranaki, Wellington, Picton, Nelson and Lyttelton. In the Port of Wellington it occurred in benthic sled samples taken from the Road-Rail Ferry Terminal and Queens, Burnham and Miramar wharves, and from a benthic grab sample taken from Kings Wharf (Figure 38).

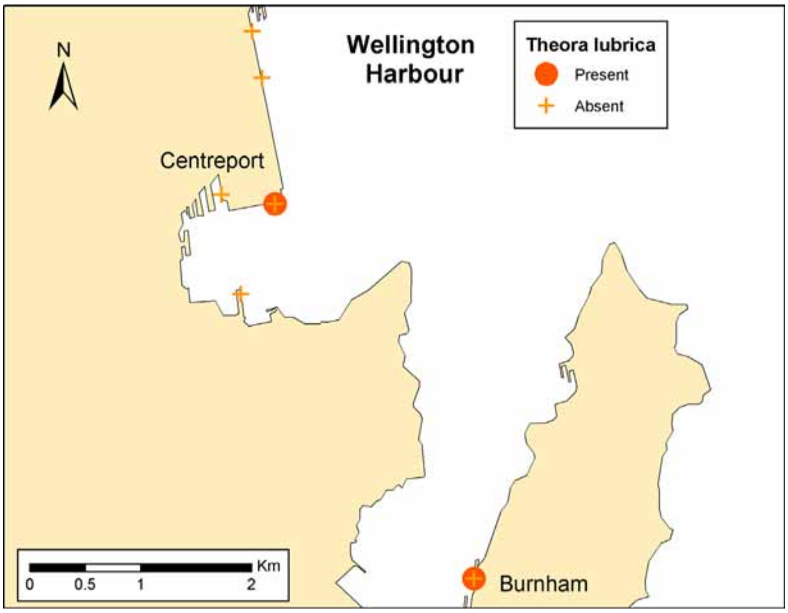



**Figure 37:** ***Theora lubrica*** **distribution in the initial baseline survey of the Port of Wellington (November / December 2001).**

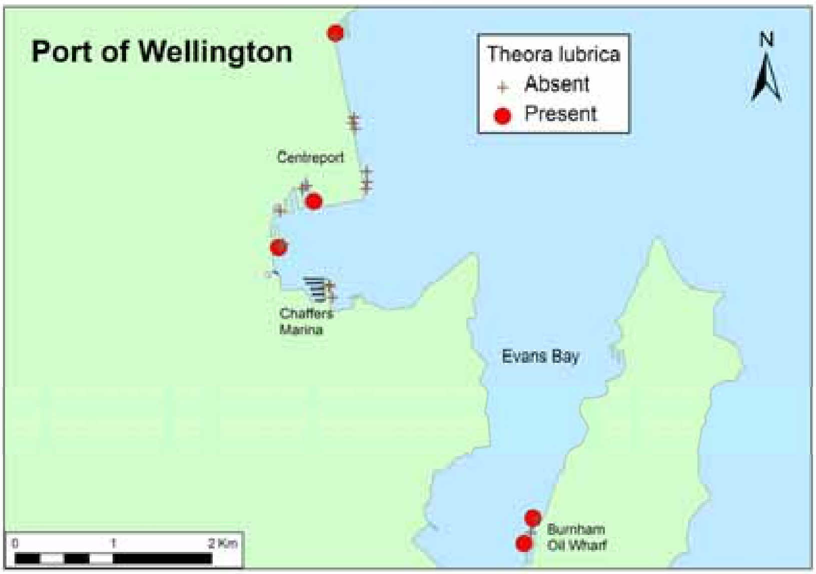



**Figure 38:** ***Theora lubrica*** **distribution in the re-survey of the Port of Wellington (February 2005).**

***Griffithsia crassiuscula*** **C.Agardh 1824**

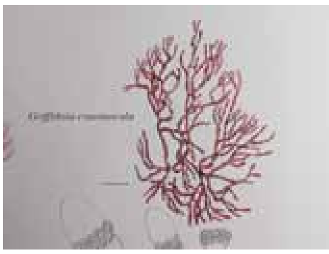


Image and information: Adams (1994)

*Griffithsia crassiuscula* is a small filamentous red alga. Plants are up to 10 cm high, dichotomously branched, with holdfasts of copious rhizoids. This species is bright rosy red to pink and of a turgid texture. Its native origin is thought to be southern Australia. *Griffithsia* *crassiuscula* is found subtidally and is mainly epiphytic on other algae and shells, but can also be found on rocks and pebbles. It has no known impacts. During the initial port baseline surveys, *G. crassiuscula* was recorded from the ports of Taranaki (an extension of its known range), Wellington, Picton, Lyttelton, Timaru and Bluff (Table 18). In the Port of Wellington it was recorded during the initial baseline survey from Aotea Quay North, Aotea Quay South, Burnham, the Overseas Passenger Terminal and Thorndon Container Terminal and Breakwall (Figure 39). During the second baseline surveys of Group 1 ports *G. crassiuscula* was recorded from the ports of Taranaki, Wellingon, Picton, Lyttelton and Timaru. In the second baseline survey of the Port of Wellington it occurred in pile scrape samples taken from Aotea Quay North and South and Kings, Queens and Burnham wharves. It also occurred in benthic sled samples taken from Aotea Quay South, Kings Wharf and Thorndon Container Terminal (Figure 40).

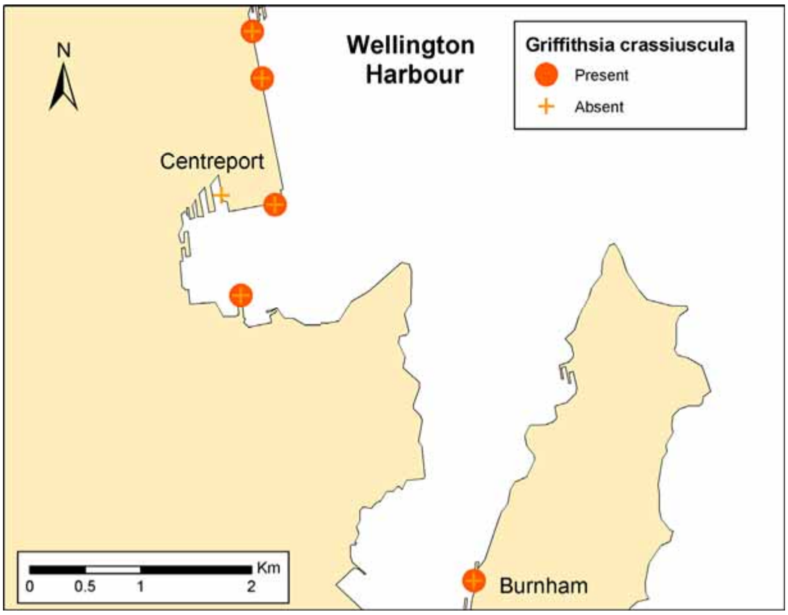



**Figure 39: *Griffithsia crassiuscula* distribution in the initial baseline survey of the Port of Wellington (November / December 2001).**

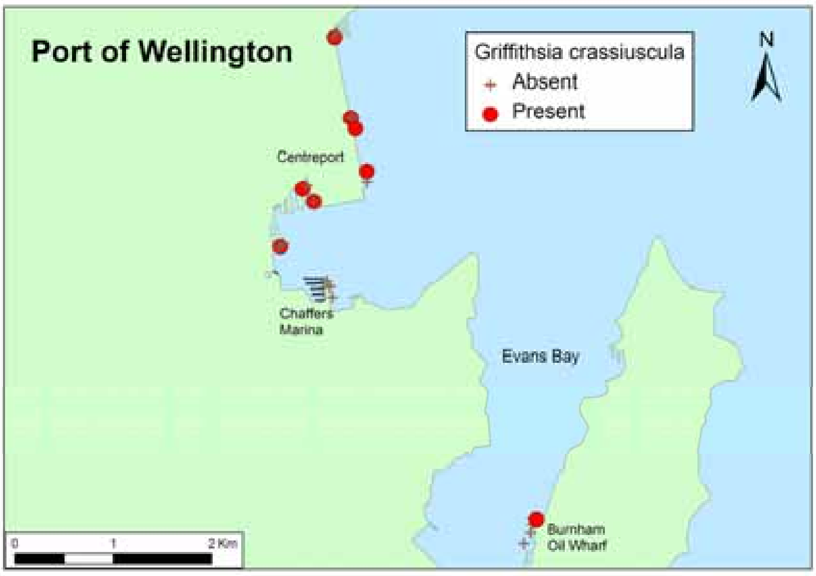



**Figure 40: *Griffithsia crassiuscula* distribution in the re-survey of the Port of Wellington (February 2005).**

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

Image: NIMPIS (2002e)
Information: 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 *U. pinnatifida* 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, southern California, Argentina parts of the coastline of Tasmania and Victoria (Australia), and New Zealand. 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. *U. 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. During the initial port baseline surveys, it was recorded from the ports of Gisborne, Napier, Wellington, Picton, Lyttelton, Timaru and Dunedin (Table 18). In the Port of Wellington it was recorded during the intial baseline survey from Aotea Quay 3 (Aotea Quay North), Aotea Quay 6 (Aotea Quay South), Burnham, Kings Wharf, the Overseas Passenger Terminal and Thorndon Container Terminal (Figure 41). During the second baseline surveys of Group 1 ports *U. pinnatifida* was recorded from the ports of Taranaki, Wellington, Picton, Nelson, Lyttelton, Waitemata Harbour, Auckland, Tauranga Harbour and Timaru. During the second baseline survey of the Port of Wellington *U. pinnatifida* occurred on wharf pilings at Aotea Quay North, Aotea Quay South, Kings, Queens and Burnham Wharves and the Overseas Passenger Terminal, and in a benthic sled sample from Kings Wharf (Figure 42).

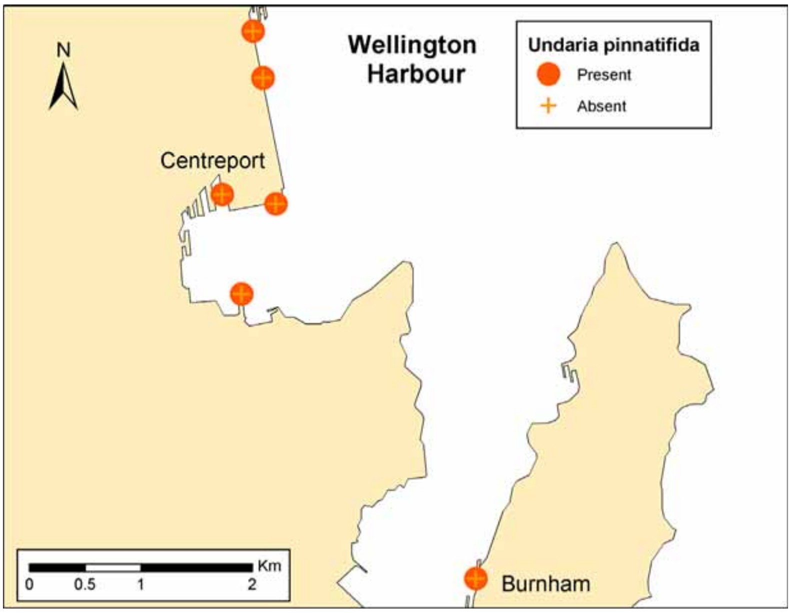



**Figure 41:** ***Undaria pinnatifida* distribution in the initial baseline survey of the Port of Wellington (November / December 2001).**

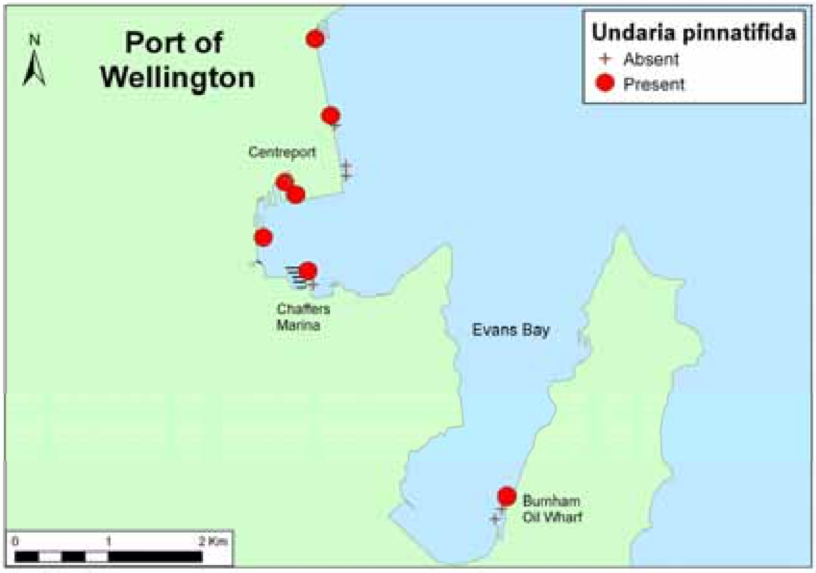



**Figure 42:** ***Undaria pinnatifida* distribution in the re-survey of the Port of Wellington (February 2005).**

## SPECIES INDETERMINATA

Forty-six organisms from the Port of Wellington were classified as species indeterminata. If each of these organisms is considered a species of unresolved identity, then together they represent almost 16 % of all species collected from this survey (Figure 19). Species indeterminata from the Port of Wellington included 20 phycophytes, nine annelid worms, eight crustaceans, two bryozoans, two fish, two molluscs, a hydroid, a dinoflagellate, and a sponge (Table 17).

## NOTIFIABLE AND UNWANTED SPECIES

One species recorded from the Port of Wellington, the Asian seaweed *Undaria pinnatifida*, is currently listed on the New Zealand Register of Unwanted Organisms (Table 12). None of the species listed on the ABWMAC Australian list of marine pest species was recorded from the re-survey of the Port of Wellington (Table 13). The toxic dinoflagellate *Gymnodinium catenatum* is one of four toxic dinoflagellates listed on the ABWMAC Australian list of marine pest species. Although cysts of *G. catenatum* were detected in the first baseline survey of the Port of Wellington, none were recovered during the repeat survey of the port.

Australia has recently prepared an expanded list of priority marine pests that includes 53 non-indigenous species that have already established in Australia and 37 potential pests that have not yet reached its shores (Hayes et al. 2004). A similar watch list for New Zealand is currently being prepared by Biosecurity NZ. Six of the 53 Australian priority domestic pests were recorded during the second baseline survey of the Port of Wellington. These are listed in descending order of the impact potential ranking attributed to them by Hayes et al. (2004): *Bugula flabellata*, *Undaria pinnatifida*, *Watersipora subtorquata*, *Theora lubrica, Cryptosula pallasiana* and *Monocorophium acherusicum*. None of the 37 priority international pests identified by Hayes et al. (2004) were recorded during this survey.

## PREVIOUSLY UNDESCRIBED SPECIES IN NEW ZEALAND

Ten species recorded from the re-survey of the Port of Wellington were new records from New Zealand waters. These include ten cryptogenic category two sponges (*Adocia* new sp. 1, *Adocia* new sp. 7, *Chalinula* new sp. 1, *Chalinula* new sp. 2, *Dactylia* new sp. 1, *Haliclona* new sp. 1, *Haliclona* new sp. 2, *Haliclona* new sp. 3, *Haliclona* new sp. 11 and *Haliclona* new sp. 16). A further 13 species recorded in this survey were described for the first time during the initial port baseline surveys. These include 2 non-indigenous species; the polychaete worm *Spirobranchus polytrema* and the hydroid *Eudendrium generale*, the native sponge *Phorbas* cf. *anchorata*, the native isopod *Ischyromene kokotahi* and nine cryptogenic category two species (the amphipod *Leucothoe* sp. 1, the ascidian *Pyura* sp. and the sponges *Adocia* new sp. 2, *Amorphinopsis* new sp. 1, *Dysidea* new sp. 1, *Euryspongia* new sp. 1, *Euryspongia* new sp. 2, *Halichondria* new sp. 1 and *Halichondria* new sp. 2. Four of these species - *Spirobranchus polytrema*, *Dysidea* new sp. 1, *Euryspongia* new sp. 1 and *Halichondria* new sp. 1– were recorded during the earlier port baseline survey of the Port of Wellington. The remainder represent new records for this location.

## CYST-FORMING SPECIES

Cysts of seven species of dinoflagellate were collected during this survey. Six of these are considered native species (Table 14) and one is indeterminate (Table 17). Two of the native species are known to produce toxins. *Protoceratium reticulatum* produces yessotoxin, a toxin in the Diarrhetic Shellfish Poisioning group of toxins (see Hay et al. 2000; New Zealand Food Safety Authority 2003). *Lingulodinium polyedrum* can form blooms known as “red tides” which have been associated throughout the world with fish and shellfish mortality events (Faust and Gulledge 2002). The presence of a paralytic shellfish poison (PSP) toxin, saxitoxin, has also been reported in water samples taken during a bloom of *L. polyedrum* (Bruno 1990, in Faust and Gulledge 2002). However, it is not listed as a marine biotoxin by either of the recent reviews of the non-commercial marine biotoxin monitoring programme in New Zealand (Hay et al. 2000; New Zealand Food Safety Authority 2003).

Another toxin-producing species, *Gymnodinium catenatum*, was recorded in the initial baseline survey from two sites for the Port of Wellington but was not recorded during the second survey.

## COMPARISON OF RESULTS FROM THE INITIAL AND REPEAT BASELINE SURVEYS OF THE PORT OF WELLINGTON

### Pile scrape samples

#### *Native species*

Rarefaction curves and estimates of total species richness in pile scrape samples taken from the two baseline surveys of the Port of Wellington are presented in Figure 43a. Curves for the native species assemblage were concordant in each survey, with very similar rates of species accumulation relative to sampling effort. Slightly more native species were observed in the repeat survey ($S_{obs}$ = 151) than in the initial baseline survey ($S_{obs}$ = 138), but the difference was within the 95% confidence intervals of the rarefaction curves (Figure 43a). While neither rarefaction curve reached an asymptote the rate of species accumulation slowed as more samples were taken. For the first 50 samples an average of 120 species was recorded in the first survey and 121 in the second survey, whilst the subsequent 40 samples (in the first survey) and 44 samples (in the second survey) recovered 18 (Survey 1) to 30 species (Survey 2). Estimates of total richness in the assemblages suggested that the first survey was relatively comprehensive while the second survey was less so, despite amost identical sample effort (Figure 43a). In the first survey, the richness estimator reached an asymptote at around 153 species, so that the observed species density accounted for almost 90% of the estimated total number of species. In contrast, the estimate of total species richness for the repeat survey continued to increase steadily as more samples were added and the observed number of species comprised only 74% of its final value (Figure 43a), indicating a higher proportion of unsampled species in the assemblage in the second survey. Indeed, as sample size increased in the second survey, more unique species (i.e. those that occurred in only one sample) were added to the inventory. In the first survey, however, the mean number of uniques reached a maximum after 18 samples and thereafter declined as more samples were taken. Nevertheless, these ‘rare’ species comprised relatively small proportions of the sampled assemblage in each survey (20% of the observed assemblage in the first survey and 32% in the second survey; Table 19).

Only 92 of the 197 native species (47%) recorded in pile scrape samples from Wellington occurred in both surveys (Table 19). Again, this reflects the number of comparatively rare species in the assemblage, with non-detection of many of these probably accounting for much of the difference observed between the two surveys. For example, the classic Jaccard (0.469) and Sorenson (0.639) measures of compositional similarity indicate only moderate similarity between the assemblages recorded in the initial and repeat baseline surveys of the Port of Wellington (Table 19). The new Chao similarity indices, however, which adjust for the effects of non-detection of rare species, suggest much closer resemblance of the two samples (Chao bias-adjusted Jaccard = 0.805; Chao bias-adjusted Sorenson = 0.878; Table 19).

#### *Cryptogenic category 2 species*

A total of 38 cryptogenic category two species were observed in the pile scrape samples over the two baseline surveys. Average per sample densities of these species were much greater in the repeat survey than in the initial survey (Figure 43b), with more than twice as many species observed (Survey 1, $S_{obs}$ = 15 species; Survey 2, $S_{obs}$ = 31 species; Table 19). Rarefaction curves for neither survey reached an asymptote, with that from the second survey increasing more steeply with sample size than the curve for the intial survey (Figure 43b). Nevertheless, richness estimators for the two surveys suggested a more complete inventory in the repeat survey, where the observed species density accounted for ~84% of the estimated species richness. In contrast, richness estimates for the first baseline survey were unstable and continued to increase steeply as more samples were taken. In the first baseline survey, the observed species density accounted for less than half (45%) of the estimated richness of the assemblage (Figure 43b).

The compositional similarity between samples from the two surveys was relatively low. Only 8 of the 38 cryptogenic category 2 species (21%) were common to both surveys, resulting in comparatively low similarity indices, even when potentially undetected species were taken into account (Chao bias-adjusted Jaccard = 0.321; Chao bias-adjusted Sorenson = 0.474; Table 19).

***Non-indigenous and cryptogenic category 1 species***

Similar numbers of non-indigenous and cryptogenic category 1 species were detected in the pile-scrape samples in the first ($S_{obs}$ = 28 species) and second ($S_{obs}$ = 27 species; Table 19) surveys, but fewer than half of the species were common to both surveys (18 of 37 species in total; Table 19). Despite this, the Chao bias-adjusted Jaccard (0.922) and Chao bias-adjusted Sorenson (0.908) indices pointed to relatively similar species compositions in the two assemblages (Table 19), reflecting perhaps the comparatively small estimated number of undetected species in the first baseline survey. Sample-based rarefaction curves for the two surveys were almost identical and both converged with the total assemblage richness estimated from samples taken in the first survey (Mean Chao 2 bias-corrected richness = 31.7 species; Figure 43c). Figure 43c is, however, dominated by the unstable and steeply increasing richness estimator for the second survey, which reached a maximum value 3.6 x the observed richness. Because the Chao estimators are calculated using the ratio of the number of species that occur in just one ("uniques") and two samples ("duplicates"), this instability can occur when there are few, or no, duplicates relative to uniques. For example, in the second baseline survey, only one duplicate and 12 unique species were recorded, meaning that, as sample size increased, the mean number of unique species added continued to increase, while the mean number of duplicates declined, leading to a steeply increasing richness estimate. In these circumstances, the estimate is likely to be unreliable.

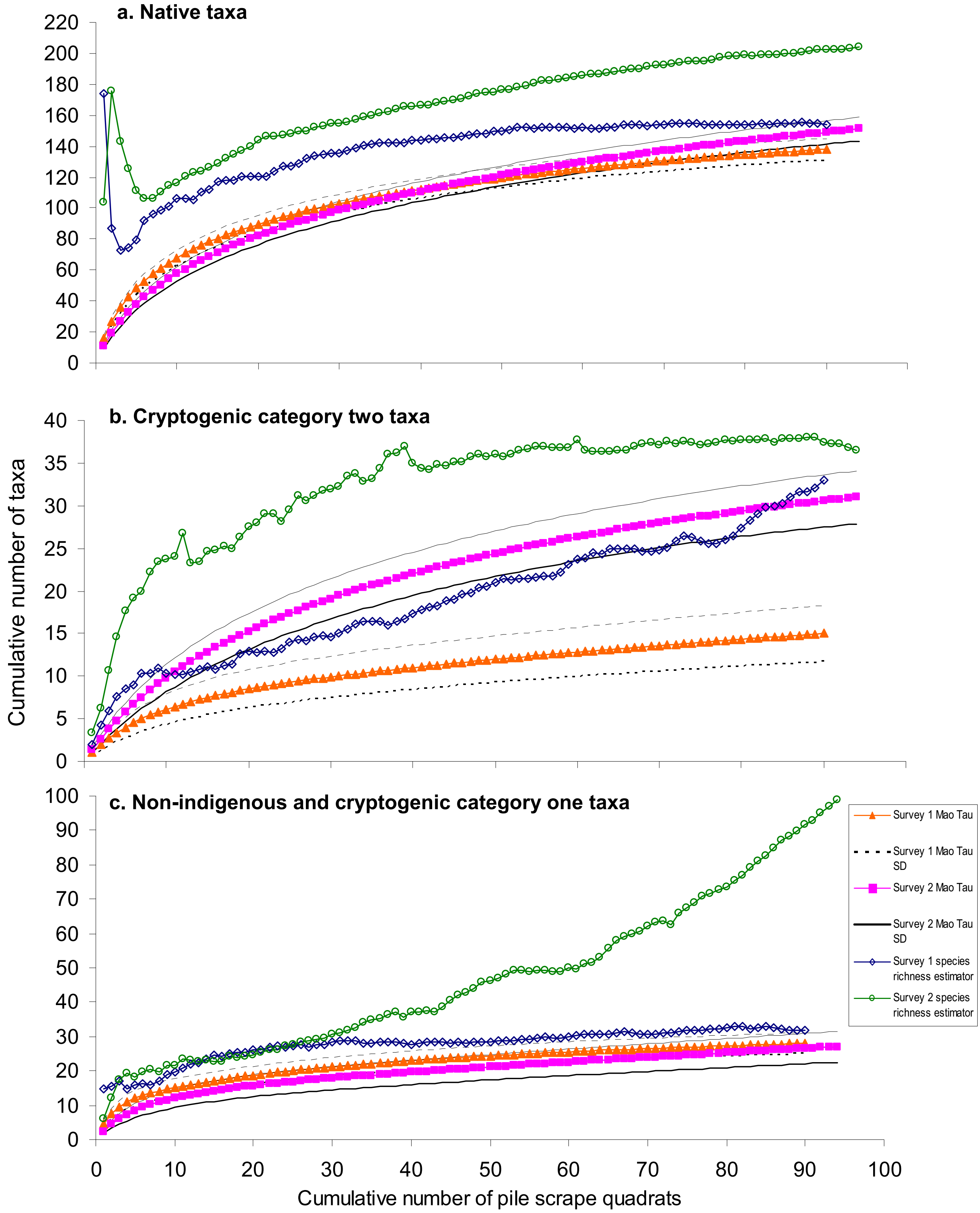



**Figure 43: Rarefaction curves (Mao Tau) for native (top), cryptogenic category two (middle) and non-indigenous and cryptogenic category one (bottom) taxa from pile scrape quadrats for the first survey (full triangles, ± SD (dashed lines)) and second survey (full squares, ± SD (solid lines)). Species richness estimators are also shown for the first survey (empty diamonds) and second survey (empty circles); the Chao 2 classic formula was used for C2 taxa in the first survey and for NIS & C1 taxa in the second survey, the ICE formula was used for native taxa in the second survey, and the Chao 2 bias-corrected formula was used in all other instances.**

## Benthic sled samples

### *Native species*

Ninety-six native species were recorded in total from benthic sled samples taken during the two baseline surveys of the Port of Wellington, with similar numbers of species recorded in each survey (Table 19). Rarefaction curves for each survey exhibited similar rates of species accumulation with sample size, with only slightly higher species density in the initial survey (Figure 44a). Neither curve approached an asymptote. Similarly, richness estimators for both surveys continued to increase as more samples were taken and were substantially greater (1.8 x and 2.3 x, respectively) than the observed richness in each survey, reflecting the quite large numbers of uniques recorded from the sled samples (34 and 33 species in each survey, respectively;  Table 19). The large number of uniques is an indication of the extremely patchy distributions of species sampled by the benthic sled. Less than ¼ of the species sampled using this method occurred in both surveys (Table 19). As a result, both the sampled (Classic Jaccard Index = 0.240, Classic Sorenson Index = 0.387) and estimated species assemblages in each survey had low similarity (Chao bias-adjusted Jaccard = 0.490; Chao bias-adjusted Sorenson = 0.544; Table 19).

### *Cryptogenic category 2 species*

More cryptogenic category 2 species occurred in the benthic sled samples during the seond survey ($S_{obs}$ = 7 species) than in the initial baseline survey ($S_{obs}$ = 2 species). In each survey, the observed species density converged with the estimate of total species richness, indicating relatively complete inventories of this group on each occasion (Figure 44b). In each case, however, the rarefaction curves had not reached a plateau and species continued to be accumulated as more samples were added. Only one species in this group was found in sled samples in both surveys, and there were relatively large proportions of uniques on each occasion resulting in low similarity of both the sampled (Classic Jaccard Index = 0.125, Classic Sorenson Index = 0.222) and estimated assemblages (Chao bias-adjusted Jaccard = 0.167; Chao bias-adjusted Sorenson = 0.286; Table 19).

### *Non-indigenous and cryptogenic category 1 species*

Fourteen non-indigenous and cryptogenic category 1 species were found in the benthic sled samples, with identical numbers of species recorded from each survey ($S_{obs}$ = 10 species; Table 19) and, consequently, similar rates of species accumulation (Figure 44c). Neither rarefaction curve reached an asymptote. The number of species observed in the surveys accounted for between 68% (repeat baseline survey) and 74% (initial survey) of the estimated richness of the assemblage and there was moderate-to-high similarity in the species composition of the estimated assemblages on each occasion (Chao bias-adjusted Jaccard = 0.863; Chao bias-adjusted Sorenson = 0.728; Table 19).

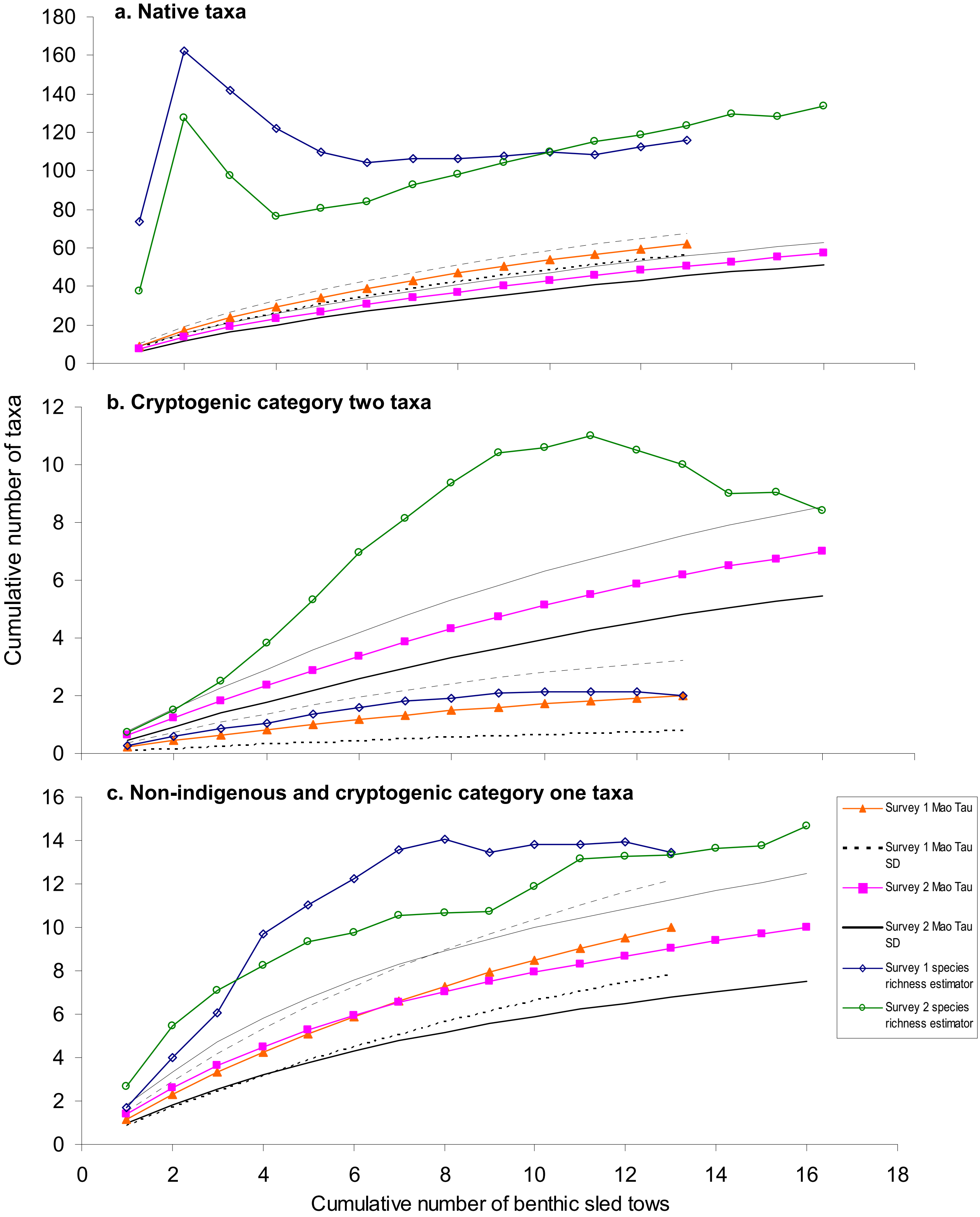



**Figure 44:** **Rarefaction curves (Mao Tau) for native (top), cryptogenic category two (middle) and non-indigenous and cryptogenic category one (bottom) taxa from benthic sled tows for the first survey (full triangles, ± SD (dashed lines)) and second survey (full squares, ± SD (solid lines)). Species richness estimators are also shown for the first survey (empty diamonds) and second survey (empty circles); the ICE formula was used for native taxa in both surveys and the Chao 2 bias-corrected formula was used in all other instances.**

**Benthic grab samples**

Too few cryptogenic category 2 (2 species) and non-indigenous and cryptogenic category 1 species (2 species) were recorded in the benthic grab samples for separate analysis. Instead, comparisons were made using the pooled data for all species (Table 19). In total, 35 species occurred in benthic grab samples from the two surveys. Few species (7 in total) were common to both surveys. Many of those recorded occurred in just a single sample (59% and 80% of the observed assemblages, respectively; Table 19). Nevertheless, the density of species recorded in each survey was roughly similar, with almost equal numbers of species observed (Table 19). This pattern of prevalence indicates highly patchy distributions of the benthic assemblage sampled by the benthic grab and comparatively large numbers of unsampled species. Data from the first survey produced a relatively stable estimate of the richness of the assemblage at around 50 species (i.e. ~2.5 x the observed number), but estimates obtained for the second survey were unreliable (Figure 45). Again, this was because only a single duplicate species was recorded (*c.f.* 16 uniques) leading to an inflated Chao 2 estimate.

**Crab trap samples**

Rarefaction curves and richness estimates for samples taken from the crab traps are shown in Figure 46. No cryptogenic or non-indigenous species were recorded in the crab trap samples in either survey, so analyses are limited to native species (Table 19). The per-sample density of species observed in each survey was quite different, with more than twice as many species observed in the first baseline survey, despite 30% fewer samples (Table 19). Only 3 species (19% of the total) were common to both surveys. Neither rarefaction curve asymptoted, but the richness estimator for the repeat survey reached an asymptote at around 8 species; just 2 species more than the number observed in the survey, but 5 species fewer than was recorded in the first survey (Figure 46). Only a single duplicate species was recorded in the first survey (compared with 7 uniques) so that the Chao 2 richness estimate continued to increase steeply as more traps were sampled (Figure 46). There was only moderate similarity in species composition between the estimated assemblages sampled by the two surveys (Chao bias-adjusted Jaccard = 0.557; Chao bias-adjusted Sorenson = 0.716; Table 19).

**Fish trap samples**

Rarefaction curves and richness estimates for samples taken from the fish traps are depicted in Figure 47. No cryptogenic or non-indigenous species were recorded in the fish trap samples in either survey, so analyses are limited to native species (Table 19). As with the crab trap samples, the density of observed species was greater in the initial baseline survey with, on average, 5 more species being recorded for the same number of samples. In the repeat baseline survey, the richness estimate stabilised at around 20 species. At the slow rate of species accumulation observed in that survey, a further 60 crab traps would need to be sampled to capture that total estimated richness (Figure 47). In contrast, richness estimates for the initial baseline survey did not plateau and continued to increase as more samples were added. Similarity indices calculated for the two assemblages indicated moderate-to-high similarity in estimated species composition (Chao bias-adjusted Jaccard = 0.667; Chao bias-adjusted Sorenson = 0.766; Table 19).

**Starfish trap samples**

Too few cryptogenic category 2 (1 species) and non-indigenous and cryptogenic category 1 species (7 species) were recorded in the starfish trap samples for separate analysis. Instead, comparisons were made using the pooled data for all species (Table 19). In total, 33 species were recorded from the two surveys using this sample method. Most of these (29 species) were recovered during the initial baseline survey, with just 1 species occurring in both surveys (Table 19). The low diversity of the sample from the second survey meant a very slow rate of species accumulation and close association between the observed (5 species) and estimated richness (6.5 species; Figure 48). In contrast, the estimated richness of the species assemblage sampled in the first survey was more than 5 x the number of observed species (Figure 48); the result of a very large proportion of uniques relative to duplicates in the sample (Ratio = 7.7). Consequently, the estimated similarity between assemblages sampled by the first and second surveys was very low (Chao bias-adjusted Jaccard = 0.023; Chao bias-adjusted Sorenson = 0.044; Table 19).

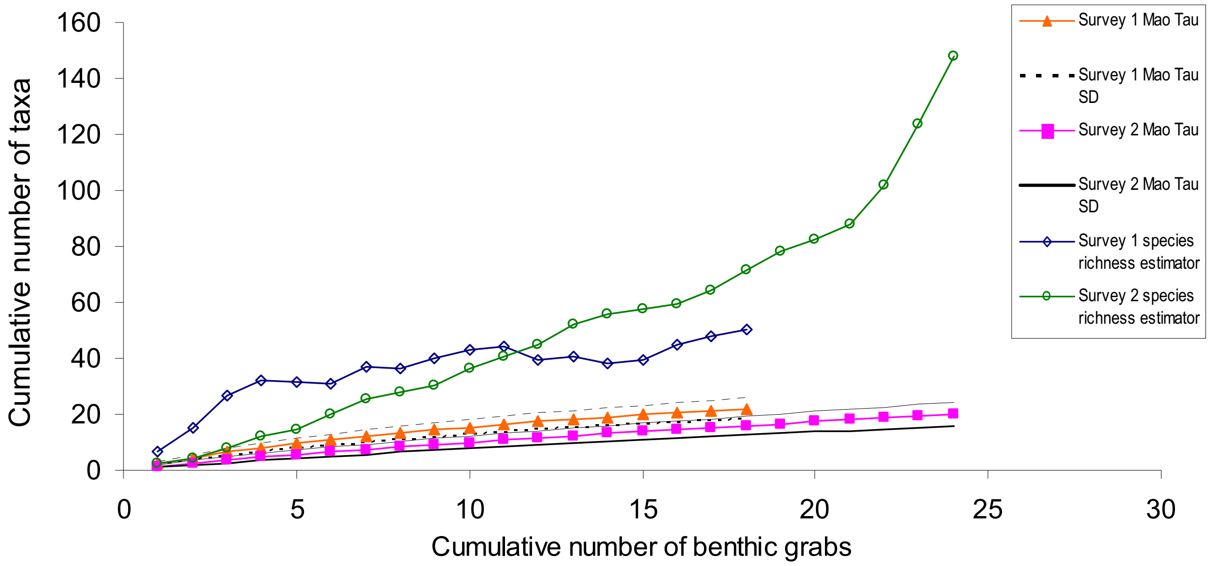



**Figure 45: Rarefaction curves (Mao Tau) for native, cryptogenic and non-indigenous taxa combined from benthic grabs for the first survey (full triangles, ± SD (dashed lines)) and second survey (full squares, ± SD (solid lines)). Species richness estimators (Chao 2 classic formula) are also shown for the first survey (empty diamonds) and second survey (empty circles).**

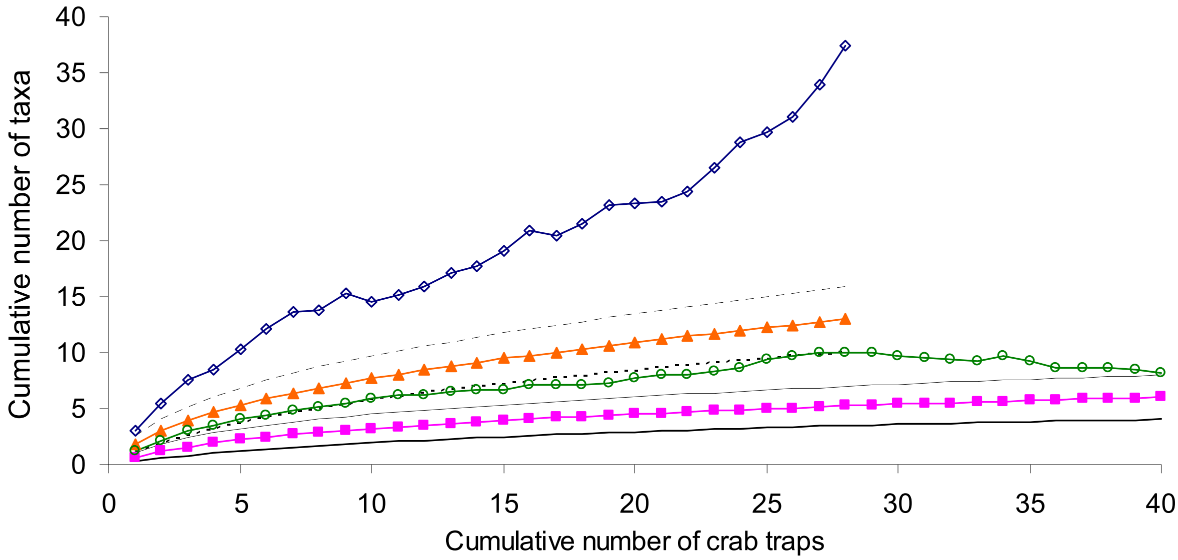



**Figure 46: Rarefaction curves (Mao Tau) for native taxa from crab traps for the first survey (full triangles, ± SD (dashed lines)) and second survey (full squares, ± SD (solid lines)). No non-indigenous or cryptogenic taxa were encountered during either survey. Species richness estimators are also shown for the first survey (empty diamonds, Chao 2 classic formula) and second survey (empty circles, ICE formula).**

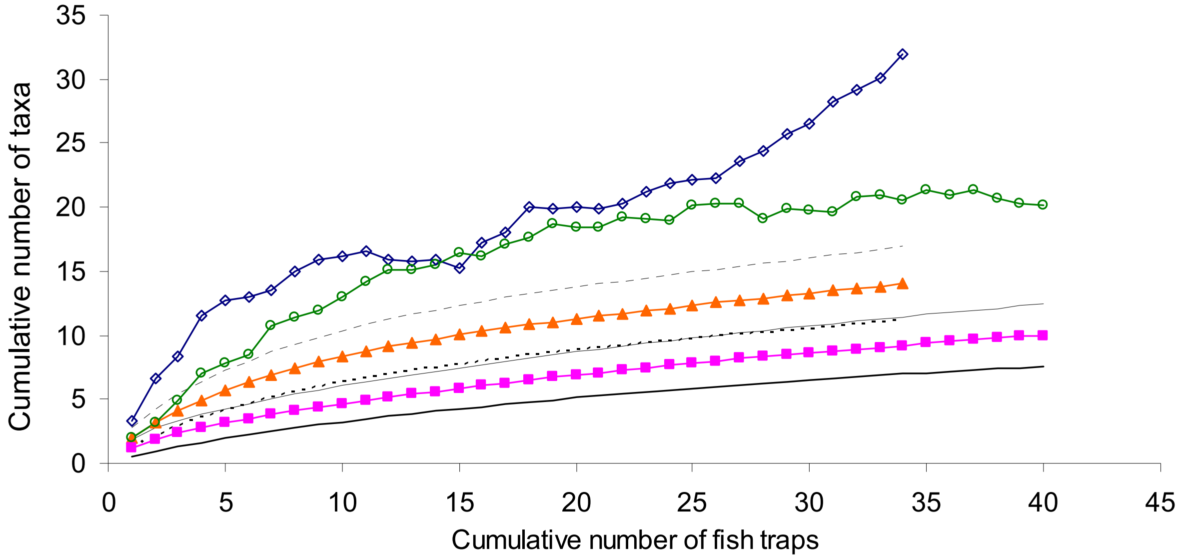



**Figure 47:** **Rarefaction curves (Mao Tau) for native taxa from fish traps for the first survey (full triangles, ± SD (dashed lines)) and second survey (full squares, ± SD (solid lines)). No non-indigenous or cryptogenic taxa were encountered in either survey. Species richness estimators are also shown for the first survey (empty diamonds, Chao 2 classic formula) and second survey (empty circles, ICE formula).**

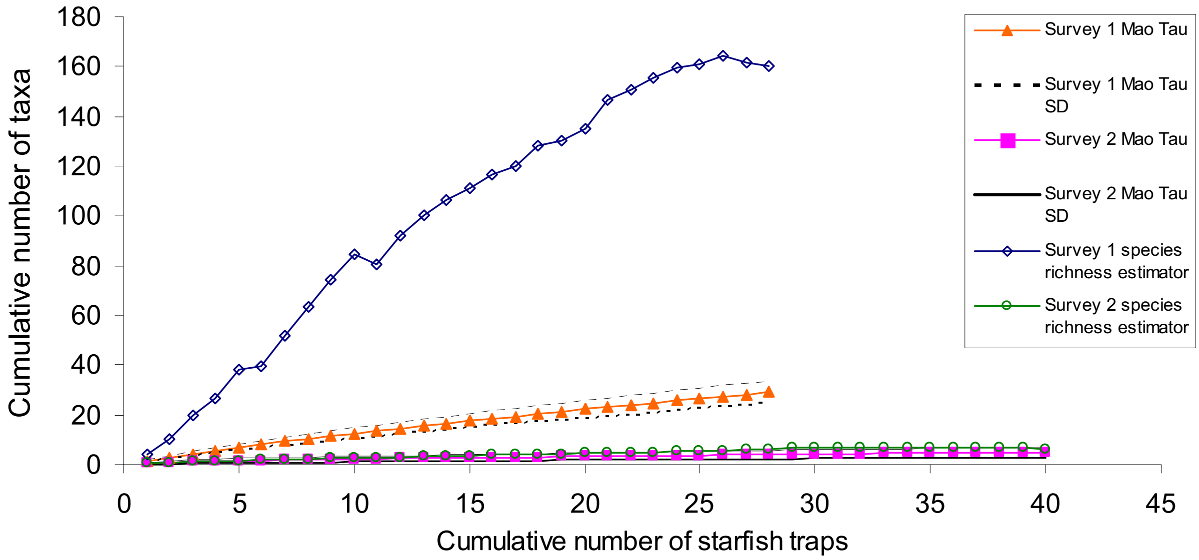



**Figure 48:** **Rarefaction curves (Mao Tau) for native, cryptogenic and non-indigenous taxa from starfish traps for the first survey (full triangles, ± SD (dashed lines)) and second survey (full squares, ± SD (solid lines)). Species richness estimators are also shown for the first survey (empty diamonds, ICE formula) and second survey (empty circles, Chao 2 bias-corrected formula).**

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

The non-indigenous species located in the Port of Wellington are thought to have arrived in New Zealand via international shipping. They may have reached the Port of Wellington directly from overseas or through domestic spread (natural and/or anthropogenic) from other New Zealand ports. Table 16 indicates the possible vectors for the introduction of each NIS recorded from the Port of Wellington during the baseline port surveys. Likely vectors of introduction are largely derived from Cranfield et al. (1998) and expert opinion. They suggest that only 1 of the 13 NIS (8 %) probably arrived via ballast water, 10 species (77 %) were most likely to be associated with hull fouling, and 2 species (15 %) could have arrived via either of these mechanisms.

## Assessment of the risk of new introductions to the port

Many of the non-indigenous species introduced to New Zealand ports by shipping do not 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 northwest Pacific, and southern Australia (Cranfield et al. 1998).

Between 2002 and 2005, there were 339 vessel arrivals from overseas to the Port of Wellington. The greatest number of these came from southeast Australia (72) and other parts of Australia (72), followed by the east Asian seas (42), Japan (39) and the Pacific Islands (37; Table 4). Approximately half of this trade is with ports from other temperate regions that have coastal environments similar to New Zealand's (for example, southern Australia, Japan and the northwest Pacific). Vessels arriving from tropical areas with coastal environments strongly dissimilar to New Zealand's (e.g. the Pacific Islands and east Asian seas) may present less of a risk.

Bulk carriers and tankers that arrive empty carry the largest volumes of ballast water. In the Port of Wellington these came predominantly from Australia (44 visits), the north-west Pacific (20 visits), east Asian seas (14 visits) and Japan (10 visits; Table 4). The Port of Wellington receives a below-average amount of ballast water (of international origin) annually compared to other New Zealand ports; in 1999 it ranked eleventh (14,536 $m^3$) out of 15 ports that were analysed (Inglis 2001a). One reason for the relatively low volume of ballast water discharge in Wellington compared to other locations is that the port imports almost twice the weight of cargo from overseas that it exports. Thus, most vessels coming from overseas are carrying cargo and have little ballast water on board. In 1999 the majority of ballast water discharged in Wellington originated from Australia (21 %) and Japan (51 %, Inglis 2001a).

Smaller, slower moving vessels, such as barges and fishing boats, tend to carry a greater density of fouling organisms than faster cargo vessels. There were only 17 visits to the Port of Wellington by these vessels recorded in the 'Seasearcher.com' database, with the greatest number (4) arriving from the Pacific Islands (Table 4).

Shipping from southern Australia, Japan and the northwest Pacific (predominantly China, Korea, Russia and Taiwan) present the greatest risk of introducing new non-indigenous species to the Port of Wellington. These countries have similar temperate marine environments to New Zealand, and are the source of the largest numbers of vessel visits to Wellington (for southern Australia and Japan), including visits by vessel types that carry large volumes of ballast water. Because of the relatively short transit time, shipping originating in southern Australia (particularly Victoria and Tasmania) carries, perhaps, the greatest overall risk. Furthermore, six of the eight marine pests on the New Zealand Register of Unwanted Organisms are already present there (*Carcinus maenas*, *Asterias amurensis*, *Undaria pinnatifida*, *Sabella spallanzanii*, *Caulerpa taxifolia*, and *Styela clava*). The native range of the other two species – *Eriocheir sinensis* and *Potamocorbula amurensis* – is the northwestern Pacific, including China and Japan.

# Assessment of translocation risk for introduced species found in the port

Between 2002 and 2005, vessels departing from the Port of Wellington travelled to 17 ports throughout New Zealand. Lyttelton, Nelson, Napier, New Plymouth and Timaru were the next ports of call for the most domestic vessel movements from Wellington (Table 8). Although many of the non-indigenous species found in the re-survey of the Port of Wellington have been recorded in other locations throughout New Zealand (Table 18), they were not detected in all of the other ports surveyed.. There is, therefore, a risk that species established in the Port of Wellington could be spread to other New Zealand locations.

Of particular note is the one species present in Wellington that is on the New Zealand Register of Unwanted Species, the invasive alga *Undaria pinnatifida*. *U. pinnatifida* has been present in New Zealand since at least 1987 and has 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 Tauranga Port). Until recently, it was absent from the Ports of Taranaki (New Plymouth) and Tauranga. Mature sporophytes were discovered in the Port of Taranaki during the repeat baseline port survey there in March 2005. Some isolated sporophytes have also been discovered independently on rocky reefs near the Port of Tauranga (Environment Bay of Plenty, pers. comm.), but the alga does not appear to be established in the port itself. There is an established coastal trade route between the ports of Wellington and Tauranga (91 vessels departed for Tauranga from Wellington between 2002 and 2005; Table 8), and some vessels also travel from Wellington to ports north of Auckland where *U. pinnatifida* has not yet become established. There is, therefore, a risk that it could be spread to these locations by shipping from Wellington.

One non-indigenous species recorded during the second baseline survey (the bryozoan *Cyclicopora longipora*) has not been recorded in any other ports and two others (the hydroids *Eudendrium generale* and *Sertularia marginata*) have relatively restricted distributions nationwide (Table 18). These could, therefore, be spread from Wellington to other locations. Information on the ecology of these species is limited, but none is known to have potential for significant impacts.

The small Japanese cancrid crab, *Cancer gibbosulus*, which was recorded from Wellington during the initial baseline survey, was not found during the re-survey. It is known only from a few specimens recovered from Lyttelton, Timaru and Wellington during the initial port baseline surveys. *C. gibbosulus* was not recovered from any of these locations during the recent re-surveys. At this stage it is unclear whether this is due to sampling error as a consequence of very small population densities in each port, or because the initial populations that were discovered were not viable. In either case, it appears a small risk of translocation at current levels of abundance.

# Management of existing non-indigenous species in the port

More than half of the NIS detected in this survey appear to be well established in the port. However, there were five NIS recorded in this survey that were recorded from only one site (Table 18). They were all recorded in only one sample. Three of these species were not recorded during the intial baseline survey of Wellington (the hydroids *Monotheca pulchella* and *Sertularia marginata* and the amphipod *Monocorophium acherusicum*) while the remaining two species (the polychaete worm *Polydora hoplura* and the bryozoan *Cryptosula* *pallasiana*) were considerably more prevalent in the initial survey. These five species may not be well established in the Port of Wellington. However, based on survey results, all except *Sertularia marginata* are present in many other New Zealand ports (Table 18) and thus appear to be well established in New Zealand.

Efforts to control or eradicate marine pests should be undertaken only where such a programme can be shown to have significant benefits to New Zealand's natural environments, economy, or cultural or spiritual values. For most marine NIS, eradication by physical removal or chemical treatment is not yet a cost-effective option. Local population controls are unlikely to be effective for species that are widespread in the Port of Wellington. They may be worth considering for the more restricted species noted above, but a more detailed delimitation survey is needed for these species to determine their current distribution and abundance more accurately before any control measures are considered. The potential impacts of these species on New Zealand's core environmental values are also unknown, but based on current information are likely to be no more than minor. It is recommended that management activity be directed toward preventing spread of potentially harmful species established in the port to locations where they do not presently occur. Such management will require better description of its distribution within the Port and of the location and frequency of movements of potential vectors that might spread it from Wellington to other domestic and international locations.

# Prevention of new introductions

Interception of unwanted species transported by shipping is best achieved offshore, through control and treatment of ships destined for Wellington 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. MAF 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. Until effective risk mitigation options are developed, it is recommended that local authorities and port companies assess the risk of activities such as in-water cleaning of vessel hulls and sea-chests. These activities can increase the likelihood of non-indigenous fouling species being released and potentially becoming established within the port. They should be discouraged where the risk is considered unacceptable.Slow moving barges or vessels that are laid up in overseas ports for long periods before travelling to New Zealand can carry large densities of non-indigenous marine organisms with them. Cleaning and maintenance of these vessels should be encouraged by port authorities and shipping companies prior to their departure for New Zealand waters.

Studies of historical patterns of invasion 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; Hayden et al. in review). 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 and native 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 to be introduced to New Zealand waters by shipping. There is a need for continued monitoring of non-indigenous marine species 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.

The repeat survey of the Port of Wellington recorded 303 species or higher taxa, including 13 non-indigenous species. Although many species also occurred in the initial, November / December 2001 baseline survey of the port, the degree of overlap was not high. Around 35 % of the native species, 31 % of non-indigenous species, and 58 % of cryptogenic species recorded during the repeat survey were not found in the earlier survey. This is not simply attributable to greater sampling effort in the second survey. The species assemblage in each survey was characterised by high diversity, a comparatively large proportion of uncommon species, and patchy local distributions that are typical of marine biota. As a consequence, the estimated numbers of undetected species were comparatively high. In the initial baseline survey, for example, 6 of the 13 non-indigenous species (46 %) were each found in five or fewer samples. Whilst the increased sampling effort in the second survey recorded four non-indigenous species that were not found in the first survey, it did not markedly improve the rate of recovery of the six species recorded infrequently in the first survey. Four of these six were again detected in five or fewer samples and two of them (*Eudendrium capillare* and *Cancer gibbosulus*) were not recorded in the second survey. Furthermore, of the four non-indigenous species that were detected in the second survey, but not the first, 3 (75 %) were present in just a single sample (*Monotheca pulchella, Monocorophium acherusicum* and *Sertularia marginata*). This makes it difficult to determine if the new records in the second survey represent incursions that occurred after the first survey or, rather, are species that were present, but undetected during the first survey due to their sparse densities or distribution. Similarly, the absence of the non-indigenous annelid *Dipolydora armata,* hydroid *Eudendrium capillare,* Japanese cancer crab *Cancer gibbosulus*, and sponge *Halisarca dujardini* in the second survey could be explained either by sampling error or local extinction since the initial baseline survey.

In each case, additional information can be used to address this problem. Two of the four non-indigenous species recorded only in the second survey (*Monotheca pulchella* and *Monocorophium acherusicum*) have been present in New Zealand for more than 70 years and their presence in Wellington Harbour does not represent an extension to their known range. Both these species were recorded from only a single sample. It seems likely, therefore, that they were present in Wellington during the first survey, albeit at small densities, and were not detected by the survey because of their rarity. The remaining two species – *Eudendrium generale* and *Sertularia marginata* – have been described only recently from New Zealand, have relatively limited national distributions and are new records for Wellington Harbour. Although the evidence is only circumstantial, these two species are the most likely to represent recent introduction. Similarly, of the four non-indigenous species that were not recorded in the second survey of Wellington, *Dipolydora armata* has been recorded in other studies from Wellington Harbour (Read 1975) and *Halisarca dujardini* is considered to be truly cosmopolitan (Bergquist 1996) and was recorded in 21 samples in the initial survey, suggesting that it is likely that both these species were present, but undetected, during the repeat survey. The other two non-indigenous species recorded in the first but not the second survey – *Cancer gibbosulus* and *Eudendrium capillare* – were new records for New Zealand. In Wellington Harbour only a single specimen of *C. gibbosulus* and five specimens of *E. capillare* were recovered. It is possible that these populations have not persisted, although more detailed studies of their distribution and abundance are required to confirm this.

As several recent analyses have shown, the large area of habitat available for marine organisms within shipping ports and the logistic difficulties of sampling in these environments mean that detection probabilities are likely to be comparatively low for species with low prevalence, even when species-specific survey methods are used (Inglis 2003; Inglis et al. 2003; Hayes et al. 2005; Gust et al. 2006; Inglis et al. in press). In generalised pest surveys, such as the baseline port surveys, this problem is compounded by the high cost of identifying all specimens (native and non-indigenous) which constrains the total number of samples that can be taken (Inglis 2003). A consequence is that a high proportion of comparatively rare species will remain undetected by any single survey. This problem is not limited to non-indigenous species, as approximately one third of native species recorded in the Wellington surveys also occurred in just a single sample (32 % in the initial survey and 34 % in the re-survey). Nor is it unique to marine assemblages. These results reflect the spatial and temporal variability that are features of marine biological assemblages (Morrisey et al. 1992a, b) and the difficulties that are involved in characterising diversity within hyper-diverse assemblages (Gray 2000; Gotelli and Colwell 2001; Longino et al. 2002).

Nevertheless, the baseline surveys continue to reveal new records of non-indigenous species in New Zealand ports and, with repetition, the cumulative number of undetected species should decline over time. This type of sequential analysis of occupancy and detection probability requires a series of three (or more) surveys, which should allow more accurate estimates of the rate of new incursions and extinctions (MacKenzie et al. 2004). Hewitt and Martin (2001) recommend repeating the baseline surveys on a regular basis to ensure they remain current. It may also be prudent to repeat at least components of a survey over a shorter time frame to achieve better estimates of occupancy without the confounding effects of temporal variation and new incursions.

This survey, alone, cannot determine the threat to New Zealand's native ecosystems that is presented by the non-indigenous species encountered in this port. It does, however, provide a starting point for further investigations of the distribution, abundance and ecology of the species described within it. Non-indigenous marine species can have a range of adverse impacts through interactions with native organisms. These include competition with native species, predator-prey interactions, hybridisation, parasitism or toxicity and modification of the physical environment (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 their 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).

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# Tables

## Table 1: Berthage facilities in the Port of Wellington

| Berth | Berth No. | Purpose | Construction | Length of berth (m) | Max least depth (m) |
|---|---|---|---|---|---|
| **Queens Wharf** | 1 | Fishing and commercial vessels | Concrete deck/wood piles | 224 | 8.3 |
| **Waterloo Quay** | 2 | Fishing and commercial vessels | Concrete deck/wood piles | 99 | 7.0 |
| **Interisland Quay** | 2 | Fishing and commercial vessels | Concrete deck/wood piles | 150 | 7.8 |
| | 3 | | Concrete deck/wood piles | 213 | 9.3 |
| **Glasgow wharf** | 1 | Fishing and commercial vessels | Concrete deck/wood piles | 84 | 4.7 |
| | 2 | | Concrete deck/wood piles | 218 | 9.3 |
| | 3 | | Concrete deck/wood piles | 240 | 9.3 |
| **Kings Wharf** | 2 | Fishing and commercial vessels | Wood deck/wood piles | 251 | 9.4 |
| **Thorndon Container Terminal & Breakwall** | 1 | Cargo import and export - logs, containers, cars etc | Concrete deck/concrete piles | 293 | 11.9 |
| | 2 | | Concrete deck/concrete piles | 293 | 11.6 |
| **Aotea Quay** | 1 | Cargo import and export - logs, containers, cars etc | Concrete deck/concrete piles | 183 | 10.6 |
| | 2 | | Concrete deck/concrete piles | 183 | 9.9 |
| | 3 | | Concrete deck/concrete piles | 183 | 10.1 |
| | 4 | | Concrete deck/concrete piles | 183 | 10.4 |
| | 5 | | Concrete deck/concrete piles | 182 | 9.2 |
| | 6 | | Concrete deck/concrete piles | 201 | 9.3 |
| **Seaview (Lower Hutt)** | | Bulk petroleum | Concrete deck/steel piles | 250 | 11.1 |
| **Burnham Oil Wharf** | | Bitumen and aviation fuel imports | Concrete deck/concrete piles | 257 | 9.1 |
| **Miramar Wharf** | East | Bitumen and aviation fuel imports | Concrete deck/wood piles | 170 | 5.9 |
| | West | | Concrete deck/wood piles | 170 | 9.6 |
| **Overseas Passenger Terminal** | | | Concrete deck/wood piles | 259 | 10.1 |
| **Taranaki St Breastwork** | | | Concrete deck/wood piles | 233 | 8.4 |
| **Taranaki St Terminal** | | | Concrete deck/wood piles | 152 | 8.3 |

**Table 2: Weight and value of overseas cargo unloaded at the Port of Wellington between the 2001-2002 and 2004-2005 financial years (data from Statistics New Zealand (2006b))**

| Year ended June | Gross weight (tonnes) | % weight change from previous year | Value (CIF[1]) ($million) | % value change from previous year | Proportion by weight of all NZ Seaports | Proportion by value of all NZ Seaports |
|---|---|---|---|---|---|---|
| 2002 | 882,947 | | 1,845 | | 5.7 | 7.6 |
| 2003 | 1,009,075 | 14.3 | 1,876 | 1.7 | 6.3 | 7.6 |
| 2004 | 1,231,877 | 22.1 | 1,868 | -0.4 | 7.0 | 7.4 |
| 2005[P] | 1,388,228 | 12.7 | 2,127 | 13.9 | 7.3 | 7.7 |
| Change from 2002 to 2005 | 505,281 | 57.2 | 282 | 15.3 | | |

[1] CIF: Cost including insurance and freight

[P] Provisional statistics – at the time of access, data for the final two months of the 2005 year were provisional

**Table 3: Weight and value of overseas cargo loaded at the Port of Wellington between the 2001-2002 and 2004-2005 financial years (data from Statistics New Zealand (2006b))**

| Year ended June | Gross weight (tonnes) | % weight change from previous year | Value (FOB[1]) ($million) | % value change from previous year | Proportion by weight of all NZ Seaports | Proportion by value of all NZ Seaports |
|---|---|---|---|---|---|---|
| 2002 | 621,665 | | 1,280 | | 2.5 | 4.6 |
| 2003 | 634,727 | 2.1 | 850 | -33.6 | 2.5 | 3.3 |
| 2004 | 689,982 | 8.7 | 838 | -1.4 | 3.1 | 3.3 |
| 2005[P] | 761,329 | 10.3 | 922 | 10.0 | 3.5 | 3.5 |
| Change from 2002 to 2005 | 139,664 | 22.5 | -358 | -28.0 | | |

[1] FOB: Free on board

[P] Provisional statistics – at the time of access, data for the final two months of the 2005 year were provisional

**Table 4: Number of vessel arrivals from overseas to the Port of Wellington by each general vessel type and previous geographical area, between 2002 and 2005 inclusive (data from LMIU "SeaSearcher.com" database)**

| Geographical area of previous port of call | Bulk/ cement carrier | Bulk/ oil carrier | Dredge | Fishing | General cargo | LPG/ LNG | Passenger/ vehicle/ livestock | Other (inc pontoons, barges, mining & supply ships, etc) | Passenger ro/ro | Research | Tanker (inc chemical/ oil and ashphalt) | Container/ unitised carrier and ro/ro | Tug | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Australia** | 12 | | | | 15 | | 33 | 2 | | 2 | 32 | 47 | 1 | 144 |
| **East Asian seas** | 4 | | | | 24 | | | | | | 10 | 4 | | 42 |
| **Japan** | 6 | | | 1 | 6 | | 21 | 1 | | | 4 | | | 39 |
| **Pacific Islands** | 6 | | | 3 | 5 | 1 | 16 | 1 | 2 | 3 | | | | 37 |
| **South America Pacific coast** | | | | 3 | 23 | | | | | | | 1 | | 27 |
| **Northwest Pacific** | 12 | | | | 3 | | | | | | 8 | 2 | | 25 |
| **West coast North America inc USA, Canada & Alaska** | 1 | | | 2 | 5 | | 1 | | | 1 | | 2 | | 12 |
| **Unknown (not stated in database)** | | | | 2 | | | | | | | | | 4 | 6 |
| **South America Atlantic coast** | | | | 1 | 1 | | | | | | | | | 2 |
| **South & East African coasts** | | | | 1 | 1 | | | | | | | | | 2 |
| **Central America inc Mexico to Panama** | | | | | 1 | | | | | | | | | 1 |
| **Red Sea coast inc up to the Persian Gulf** | | | | | | | | | | | 1 | | | 1 |
| **Gulf of Mexico** | | | | | 1 | | | | | | | | | 1 |
| **Total** | 41 | 0 | 0 | 13 | 85 | 1 | 71 | 4 | 2 | 6 | 55 | 56 | 5 | 339 |

**Table 5: Number of vessel arrivals to the Port of Wellington from Australia by each general vessel type and Australian state, between 2002 and 2005 inclusive (data from LMIU "SeaSearcher.com" database)**

| Australian state of previous port of call | Bulk/ cement carrier | Bulk/ oil carrie r | Dredge | Fishing | General cargo | LPG/ LNG | Passenger/ vehicle/ livestock | Other (inc pontoons, barges, mining & supply ships, etc) | Passenger ro/ro | Research | Tanker (inc chemical/ oil and ashphalt) | Container/ unitised carrier and ro/ro | Tug | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Queensland** | 1 | | | | 1 | | 20 | | | | 8 | 35 | 1 | 66 |
| **Victoria** | 3 | | | | 2 | | 8 | 1 | | | 15 | 4 | | 33 |
| **New South Wales** | 5 | | | | 2 | | 2 | | | | 5 | 7 | | 21 |
| **Tasmania** | 1 | | | | 6 | | 1 | 1 | | 2 | 1 | 1 | | 13 |
| **Western Australia** | | | | | | | 1 | | | | 3 | | | 4 |
| **South Australia** | 1 | | | | 3 | | 1 | | | | | | | 5 |
| **Northern Territory** | 1 | | | | 1 | | | | | | | | | 2 |
| **Total** | 12 | 0 | 0 | 0 | 15 | 0 | 33 | 2 | 0 | 2 | 32 | 47 | 1 | 144 |

**Table 6: Number of vessel departures from the Port of Wellington to overseas ports, by each general vessel type and next geographical area, between 2002 and 2005 inclusive (data from LMIU "SeaSearcher.com" database)**

| Geographical area of next port of call | Bulk/ cement carrier | Bulk/ oil carrier | Dredge | Fishing | General cargo | LPG/ LNG | Passenger/ vehicle/ livestock | Other (inc pontoons, barges, mining & supply ships, etc) | Passenger ro/ro | Research | Tanker (inc chemical/ oil and ashphalt) | Container/ unitised carrier and ro/ro | Tug | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 9 | | | 1 | 21 | | 5 | 3 | 1 | 3 | 36 | 123 | 1 | 203 |
| Japan | 1 | | | | 52 | | 36 | | | | 2 | 3 | | 94 |
| Northwest Pacific | 31 | | | 2 | 5 | | 12 | | | | 1 | 1 | | 52 |
| East Asian seas | 6 | | | | 27 | | 1 | 1 | | | 11 | 1 | | 47 |
| Pacific Islands | 1 | | | 1 | 1 | 2 | 1 | | | | 1 | 1 | | 8 |
| West coast North America inc USA, Canada & Alaska | | | | 2 | | | | 1 | | | 2 | 2 | | 7 |
| South America Atlantic coast | 1 | | | 1 | 1 | | | | | | 2 | | | 5 |
| Central Indian Ocean | 4 | | | | | | | | | | | | | 4 |
| Caribbean Islands | | | | | | | | | | | | 2 | | 2 |
| U.S, Atlantic coast including part of Canada | | | | | | | | | | | | 2 | | 2 |
| North African coast | | | | | | | | | | | 1 | | | 1 |
| South & East African coasts | | | | | | | | | | | 1 | | | 1 |
| Black Sea coast | | | | | | | | | | | 1 | | | 1 |
| Scandinavia inc Baltic, Greenland, Iceland etc | | | | | | | | | | | | 1 | | 1 |
| Spain / Portugal inc Atlantic Islands | | | | 1 | | | | | | | | | | 1 |
| Total | 53 | 0 | 0 | 8 | 107 | 2 | 55 | 5 | 1 | 3 | 58 | 136 | 1 | 429 |

**Table 7: Number of vessel arrivals from New Zealand ports to the Port of Wellington by each general vessel type and previous port, between 2002 and 2005 inclusive (data from LMIU "SeaSearcher.com" database)**

| Previous port of call | Bulk/ cement carrier | Bulk/ oil carrier | Dredge | Fishing | General cargo | LPG/ LNG | Passenger/ vehicle/ livestock | Other (includes pontoons, barges, mining & supply ships, etc) | Passenger ro/ro | Research | Tanker (including chemical/ oil and ashphalt) | Container/ unitised carrier and ro/ro | Tug | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lyttelton** | 18 | | | 9 | 22 | 1 | 71 | | | | 40 | 448 | 4 | 613 |
| **Auckland** | 13 | | | 2 | 204 | | 228 | 3 | | 7 | 22 | 65 | 1 | 545 |
| **Nelson** | 18 | | | 6 | 2 | | 7 | | | | 6 | 396 | 4 | 439 |
| **Napier** | 20 | | | | 7 | | 85 | | | 2 | 30 | 63 | 2 | 209 |
| **Tauranga** | 25 | | | | 58 | | 17 | | | | 83 | 14 | | 197 |
| **Dunedin** | 11 | | | | 2 | | 1 | | | | 9 | 96 | | 119 |
| **Wellington** | 7 | | | 59 | 2 | | 7 | 3 | 1 | 17 | 1 | 5 | | 102 |
| **New Plymouth** | 15 | | | | 23 | 4 | | | | 1 | 4 | 52 | | 99 |
| **Timaru** | 8 | | | 1 | 59 | | | | | | 16 | 4 | | 88 |
| **Whangarei** | 31 | | | | 17 | | | | | | 16 | | | 64 |
| **Westport** | 58 | | | | | | | | | | | | | 58 |
| **Gisborne** | 8 | | | | 45 | | | | | | | | | 53 |
| **Bluff** | 8 | | | | 12 | | | | | | 1 | 1 | | 22 |
| **Picton** | 7 | | | | | | 7 | 1 | 4 | | | | | 19 |
| **Onehunga** | 11 | | | | | | | | | | | | | 11 |
| **Opua** | | | | | | | 1 | | | | | | | 1 |
| **Port Chalmers** | | | | | | | | | | | | 1 | | 1 |
| **Total** | 258 | 0 | 0 | 77 | 453 | 5 | 424 | 7 | 5 | 27 | 228 | 1145 | 11 | 2640 |

**Table 8: Number of vessel departures from the Port of Wellington to New Zealand ports by each general vessel type and next port of call, between 2002 and 2005 inclusive (data from LMIU "SeaSearcher.com" database)**

| Next port of call | Bulk/ cement carrier | Bulk/ oil carrier | Dredge | Fishing | General cargo | LPG/ LNG | Passenger / vehicle/ livestock | Other (includes pontoons, barges, mining & supply ships, etc) | Passeng er ro/ro | Research | Tanker (including chemical/ oil and ashphalt) | Container/ unitised carrier and ro/ro | Tug | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lyttelton** | 18 | | | 8 | 161 | 3 | 321 | | | | 74 | 198 | 1 | 784 |
| **Nelson** | 21 | | | 6 | 33 | | 65 | | | | 19 | 609 | 8 | 761 |
| **Napier** | 32 | | | | 45 | | 16 | | | 1 | 12 | 119 | 2 | 227 |
| **New Plymouth** | 31 | | | | 45 | 1 | | | | | 48 | 6 | | 131 |
| **Timaru** | 2 | | | 1 | 25 | | 2 | | | | 45 | 54 | | 129 |
| **Wellington** | 7 | | | 59 | 2 | | 7 | 3 | 1 | 17 | 1 | 5 | | 102 |
| **Tauranga** | 10 | | | | 35 | | 3 | | | 2 | 8 | 32 | 1 | 91 |
| **Westport** | 61 | | | | | | | | | | | | | 61 |
| **Bluff** | 6 | | | | 53 | | | | | | 1 | | | 60 |
| **Auckland** | 3 | | | 3 | 6 | | 15 | 2 | | 9 | 2 | 19 | | 59 |
| **Whangarei** | 20 | | | | 19 | | | | | | 7 | | | 46 |
| **Dunedin** | 4 | | | | 1 | | 4 | | | | 7 | 22 | | 38 |
| **Picton** | 13 | | | | | | 8 | 1 | 4 | | | | | 26 |
| **Onehunga** | 12 | | | | | | | | | | | | | 12 |
| **Gisborne** | 6 | | | | 5 | | | | | | | | | 11 |
| **Chatham Islands** | | | | | | | 1 | | | | | | | 1 |
| **Bay of Islands** | | | | | | | 1 | | | | | | | 1 |
| **Port Chalmers** | | | | | | | | | | | | 1 | | 1 |
| **Total** | 246 | 0 | 0 | 77 | 430 | 4 | 443 | 6 | 5 | 29 | 224 | 1065 | 12 | 2541 |

**Table 9: Comparison of survey methods used in this study with the CRIMP protocols (Hewitt and Martin 2001), indicating modifications made to the protocols following recommendations from a workshop of New Zealand scientists. Full details of the workshop recommendations can be found in Gust et al. (2001).**

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

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

**Table 10: Summary of sampling effort in the Port of Wellington. Exact geographic locations of survey sites are provided in Appendix 2.**

| | Sampling method and survey (T1 = first survey; T2 = second survey) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Crab traps** | | **Fish traps** | | **Shrimp traps** | | **Starfish traps** | | **Benthic grabs** | | **Benthic sleds** | | **Pile scrape quadrats** | | **Photo stills and video** | | **Qualitative visual searches (on wharf pilings)** | | **Javelin cores (for cysts)** | |
| **Site name** | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 |
| Aotea Quay 3* (Nth in T2) | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | | | 14 | 16 | 14 | 16 | 4 | 4 | | 2 |
| Aotea Quay 6^ (Sth in T2) | 4 | 4 | 6 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 2 | 2 | 15 | 16 | 15 | 16 | 4 | 4 | | 2 |
| Burnham Wharf | 4 | 4 | 4 | 8 | 4 | 3 | 4 | 4 | 4 | 3 | 2 | 2 | 14 | 16 | 14 | 16 | 4 | 4 | | 2 |
| Kings Wharf | 4 | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 3 | 3 | 2 | 2 | 15 | 16 | 15 | 16 | 4 | 4 | | 2 |
| Mid Bay | | | | | | | | | | | | | | | | | | | 4 | |
| Miramar Wharf | | 4 | | | | 4 | | 4 | | | | 2 | | | | | | | | |
| Overseas Passenger Terminal | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 2 | 3 | | 2 | 16 | 16 | 16 | 16 | 4 | 4 | | 2 |
| Queens Wharf | | 8 | | 8 | | 4 | | 8 | | 3 | | 2 | | 14 | | 14 | | 4 | | |
| Rail Ferry Terminal | | | | | | | | | | | | 2 | | | | | | | | |
| Thorndon Breakwall | 4 | | 8 | | 4 | | 4 | | | | 1 | | | | | | | | 2 | |
| Thorndon Container Wharf | 4 | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 3 | 3 | 4 | 2 | 16 | | 16 | | 4 | | | 2 |
| Waterloo Wharf | | 4 | | 4 | | 1 | | 4 | | 3 | 2 | | | | | | | | | 2 |
| Total | 28 | 40 | 34 | 40 | 28 | 27 | 28 | 40 | 18 | 24 | 13 | 16 | 90 | 94 | 90 | 94 | 24 | 24 | 6 | 14 |

* also recorded as Aotea Quay North (T2)
^ also recorded as Aotea Quay South (T2)

**Table 11: Preservatives used for the major taxonomic groups of organisms collected during the port survey. [1] indicates photographs were taken before preservation, [2] indicates they were relaxed in menthol prior to preservation and [3] indicates a formalin fix was carried out before final preservation took place.**

| 5 % Formalin solution | 10 % Formalin solution | 70 % Ethanol solution | 80 % Ethanol solution | 100 % Ethanol solution |
|---|---|---|---|---|
| Macroalgae | Ascidiacea (colonial) [1, 2] | Alcyonacea [2] | Ascidiacea (solitary) [1] | Bryozoa |
| | Asteroidea | Crustacea (small) | | |
| | Brachiopoda | Holothuria [1, 2] | | |
| | Crustacea (large) | Mollusca (with shell) | | |
| | Ctenophora [1] | Mollusca [1, 2] (without shell) | | |
| | Echinoidea | Platyhelminthes [1, 3] | | |
| | Hydrozoa | Porifera [1] | | |
| | Nudibranchia [1] | Zoantharia [1, 2] | | |
| | Ophiuroidea | | | |
| | Polychaeta | | | |
| | Scleractinia | | | |
| | Scyphozoa [1, 2] | | | |
| | Vertebrata [1] (pisces) | | | |

NB: Changes since the first survey:
Ascidians now considered separately as colonial and solitary species, and preserved in different solutions. The solitary species are no longer relaxed prior to preservation and the strength of preservative for these species has been increased. The colonials are now preserved in formalin as opposed to ethanol.
The Bryozoa are now initially preserved in 100% ethanol, then air dried at a later date prior to identification.
Platyhelminthes are now fixed in formalin, rather than relaxed, before preservation in ethanol.

Table 12: 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 | Sabellida | *Sabella spallanzanii* |
| Arthropoda | Malacostraca | Decapoda | *Carcinus maenas* |
| Arthropoda | Malacostraca | Decapoda | *Eriocheir sinensis* |
| Echinodermata | Asteroidea | Forcipulatida | *Asterias amurensis* |
| Mollusca | Bivalvia | Myoida | *Potamocorbula amurensis* |
| Chlorophyta | Ulvophyceae | Caulerpales | *Caulerpa taxifolia* |
| Ochrophyta | Phaeophyceae | Laminariales | *Undaria pinnatifida* |
| Chordata | Ascidiacea | Pleurogona | *Styela clava*[1] |

[1]*Styela clava* was added to the list of unwanted organisms in 2005, following its discovery in Auckland Harbour

**Table 13: 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* |
| Dinophyta | Dinophyceae | *Alexandrium catenella* |
| Dinophyta | Dinophyceae | *Alexandrium minutum* |
| Dinophyta | Dinophyceae | *Alexandrium tamarense* |
| Dinophyta | Dinophyceae | *Gymnodinium catenatum* |

**Table 14: Native species recorded from the Port of Wellington in the first (T1) and second (T2) surveys.**

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| **Annelida** | | | | | |
| Polychaeta | Eunicida | Dorvilleidae | *Dorvillea australiensis* | 1 | 1 |
| Polychaeta | Eunicida | Dorvilleidae | *Schistomeringos loveni* | 1 | 1 |
| Polychaeta | Eunicida | Eunicidae | *Eunice australis* | 1 | 1 |
| Polychaeta | Eunicida | Eunicidae | *Eunice laticeps* | 0 | 1 |
| Polychaeta | Eunicida | Lumbrineridae | *Abyssoninoe galatheae* | 1 | 0 |
| Polychaeta | Eunicida | Lumbrineridae | *Lumbricalus aotearoae* | 1 | 0 |
| Polychaeta | Eunicida | Lumbrineridae | *Lumbrineris sphaerocephala* | 1 | 1 |
| Polychaeta | Eunicida | Onuphidae | *Onuphis aucklandensis* | 1 | 0 |
| Polychaeta | Phyllodocida | Aphroditidae | *Aphrodita talpa* | 1 | 0 |
| Polychaeta | Phyllodocida | Glyceridae | *Glycera lamelliformis* | 1 | 1 |
| Polychaeta | Phyllodocida | Glyceridae | *Hemipodus simplex* | 1 | 0 |
| Polychaeta | Phyllodocida | Goniadidae | *Glycinde trifida* | 1 | 0 |
| Polychaeta | Phyllodocida | Nephtyidae | *Aglaophamus verrilli* | 1 | 1 |
| Polychaeta | Phyllodocida | Nereididae | *Neanthes kerguelensis* | 1 | 1 |
| Polychaeta | Phyllodocida | Nereididae | *Nereis falcaria* | 1 | 1 |
| Polychaeta | Phyllodocida | Nereididae | *Perinereis amblyodonta* | 1 | 1 |
| Polychaeta | Phyllodocida | Nereididae | *Perinereis camiguinoides* | 1 | 1 |
| Polychaeta | Phyllodocida | Nereididae | *Platynereis Platynereis_australis_group* | 1 | 1 |
| Polychaeta | Phyllodocida | Phyllodocidae | *Eteone platycephala* | 1 | 0 |
| Polychaeta | Phyllodocida | Phyllodocidae | *Eulalia capensis* | 1 | 1 |
| Polychaeta | Phyllodocida | Phyllodocidae | *Eulalia microphylla* | 0 | 1 |
| Polychaeta | Phyllodocida | Phyllodocidae | *Pterocirrus brevicornis* | 1 | 0 |
| Polychaeta | Phyllodocida | Polynoidae | *Lepidastheniella comma* | 1 | 1 |
| Polychaeta | Phyllodocida | Polynoidae | *Lepidonotus jacksoni* | 1 | 1 |
| Polychaeta | Phyllodocida | Polynoidae | *Lepidonotus polychromus* | 1 | 1 |
| Polychaeta | Phyllodocida | Polynoidae | *Ophiodromus angustifrons* | 1 | 1 |
| Polychaeta | Phyllodocida | Sigalionidae | *Labiosthenolepis laevis* | 1 | 1 |
| Polychaeta | Phyllodocida | Syllidae | *Haplosyllis spongicola* | 1 | 1 |
| Polychaeta | Phyllodocida | Syllidae | *Trypanosyllis gigantea* | 0 | 1 |
| Polychaeta | Sabellida | Oweniidae | *Owenia petersenae* | 1 | 0 |
| Polychaeta | Sabellida | Sabellidae | *Megalomma suspiciens* | 1 | 1 |
| Polychaeta | Sabellida | Sabellidae | *Pseudopotamilla laciniosa* | 1 | 0 |
| Polychaeta | Sabellida | Serpulidae | *Galeolaria Galeolaria-A* | 1 | 0 |
| Polychaeta | Sabellida | Serpulidae | *Galeolaria hystrix* | 1 | 1 |
| Polychaeta | Sabellida | Serpulidae | *Neovermilia sphaeropomatus* | 0 | 1 |
| Polychaeta | Sabellida | Serpulidae | *Simplaria ovata* | 0 | 1 |
| Polychaeta | Sabellida | Serpulidae | *Spirobranchus cariniferus* | 1 | 0 |
| Polychaeta | Scolecida | Maldanidae | *Asychis trifilosus* | 1 | 0 |
| Polychaeta | Scolecida | Maldanidae | *Maldane theodori* | 1 | 1 |
| Polychaeta | Scolecida | Opheliidae | *Armandia maculata* | 1 | 1 |
| Polychaeta | Scolecida | Orbiniidae | *Phylo novazealandiae* | 1 | 1 |
| Polychaeta | Scolecida | Orbiniidae | *Proscoloplos bondi* | 1 | 0 |

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| Polychaeta | Scolecida | Orbiniidae | *Scoloplos cylindrifer* | 1 | 0 |
| Polychaeta | Scolecida | Orbiniidae | *Scoloplos simplex* | 1 | 0 |
| Polychaeta | Scolecida | Scalibregmatidae | *Hyboscolex longiseta* | 1 | 0 |
| Polychaeta | Spionida | Spionidae | *Boccardia acus* | 1 | 0 |
| Polychaeta | Spionida | Spionidae | *Boccardia chilensis* | 1 | 0 |
| Polychaeta | Spionida | Spionidae | *Boccardia knoxi* | 1 | 0 |
| Polychaeta | Spionida | Spionidae | *Boccardia lamellata* | 1 | 0 |
| Polychaeta | Spionida | Spionidae | *Carazziella quadricirrata* | 1 | 0 |
| Polychaeta | Spionida | Spionidae | *Dipolydora dorsomaculata* | 0 | 1 |
| Polychaeta | Terebellida | Acrocirridae | *Acrocirrus trisectus* | 1 | 1 |
| Polychaeta | Terebellida | Cirratulidae | *Dodecaceria berkeleyi* | 1 | 0 |
| Polychaeta | Terebellida | Cirratulidae | *Protocirrineris nuchalis* | 1 | 1 |
| Polychaeta | Terebellida | Cirratulidae | *Timarete anchylochaetus* | 1 | 1 |
| Polychaeta | Terebellida | Flabelligeridae | *Flabelligera affinis* | 1 | 1 |
| Polychaeta | Terebellida | Flabelligeridae | *Pherusa parmata* | 1 | 1 |
| Polychaeta | Terebellida | Pectinariidae | *Pectinaria australis* | 1 | 1 |
| Polychaeta | Terebellida | Terebellidae | *Nicolea armilla* | 1 | 1 |
| Polychaeta | Terebellida | Terebellidae | *Pista pegma* | 1 | 1 |
| Polychaeta | Terebellida | Terebellidae | *Pseudopista rostrata* | 1 | 1 |
| Polychaeta | Terebellida | Terebellidae | *Streblosoma toddae* | 1 | 1 |
| Polychaeta | Terebellida | Trichobranchidae | *Terebellides narribri* | 1 | 1 |
| | | | | | |
| **Bryozoa** | | | | | |
| Gymnolaemata | Cheilostomata | Aeteidae | *Aetea ligulata* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Aeteidae | *Aetea truncata* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Arachnopusiidae | *Arachnopusia unicornis* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Beaniidae | *Beania discodermiae* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Beaniidae | *Beania new sp. [whitten]* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Beaniidae | *Beania sp.* | 0 | 1 |
| Gymnolaemata | Cheilostomata | Bitectiporidae | *Bitectipora rostrata* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Bitectiporidae | *Schizosmittina cinctipora* | 0 | 1 |
| Gymnolaemata | Cheilostomata | Buffonellodidae | *Buffonellodes rhomboidale* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Calloporidae | *Crassimarginatella fossa* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Calloporidae | *Crassimarginatella papulifera* | 0 | 1 |
| Gymnolaemata | Cheilostomata | Candidae | *Caberea rostrata* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Candidae | *Scrupocellaria ornithorhyncus* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Chaperiidae | *Chaperia granulosa* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Chaperiidae | *Chaperiopsis cervicornis* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Chaperiidae | *Chaperiopsis rubida* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Crepidacanthidae | *Crepidacantha crinispina* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Electridae | *Villicharixa strigosa* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Eurystomellidae | *Eurystomella biperforata* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Eurystomellidae | *Eurystomella foraminigera* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Hippothoidae | *Celleporella bathamae* | 0 | 1 |
| Gymnolaemata | Cheilostomata | Hippothoidae | *Celleporella tongima* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Hippothoidae | *Hippothoa flagellum* | 1 | 0 |

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| Gymnolaemata | Cheilostomata | Lacernidae | *Rogicka biserialis* | 0 | 1 |
| Gymnolaemata | Cheilostomata | Microporellidae | *Fenestrulina thyreophora* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Microporellidae | *Microporella agonistes* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Microporellidae | *Microporella speculum* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Romancheinidae | *Escharoides angela* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Romancheinidae | *Exochella conjuncta* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Smittinidae | *Smittina rosacea* | 1 | 1 |
| Gymnolaemata | Cheilostomata | Steginoporellidae | *Steginoporella magnifica* | 1 | 1 |
| Stenolaemata | Cyclostomata | Crisiidae | *Crisia tenuis* | 0 | 1 |
| Stenolaemata | Cyclostomata | Tubuliporidae | *Tubulipora cf. connata* | 1 | 0 |
| | | | | | |
| **Cnidaria** | | | | | |
| Anthozoa | Actiniaria | Aiptasiomorphidae | *Aiptasiomorpha minima* | 1 | 0 |
| Anthozoa | Actiniaria | Diadumenidae | *Diadumene neozelandica* | 1 | 0 |
| Hydrozoa | Hydroida | Campanulariidae | *Clytia elongata* | 0 | 1 |
| Hydrozoa | Hydroida | Campanulariidae | *Obelia geniculata* | 1 | 0 |
| Hydrozoa | Hydroida | Sertulariidae | *Sertularella robusta* | 1 | 1 |
| | | | | | |
| **Crustacea** | | | | | |
| Cirripedia | Thoracica | Balanidae | *Austrominius modestus* | 1 | 1 |
| Cirripedia | Thoracica | Balanidae | *Notomegabalanus decorus* | 0 | 1 |
| Cirripedia | Thoracica | Chthamalidae | *Chaemosipho columna* | 1 | 1 |
| Malacostraca | Amphipoda | Ampeliscidae | *Ampelisca chiltoni* | 1 | 0 |
| Malacostraca | Amphipoda | Aoridae | *Haplocheira barbimana* | 1 | 1 |
| Malacostraca | Amphipoda | Dexaminidae | *Paradexamine pacifica* | 1 | 0 |
| Malacostraca | Amphipoda | Eusiridae | *Gondogeneia danai* | 1 | 1 |
| Malacostraca | Amphipoda | Eusiridae | *Paramoera chevreuxi* | 0 | 1 |
| Malacostraca | Amphipoda | Isaeidae | *Gammaropsis typica* | 0 | 1 |
| Malacostraca | Amphipoda | Leucothoidae | *Leucothoe trailli* | 1 | 0 |
| Malacostraca | Amphipoda | Lysianassidae | *Parawaldeckia vesca* | 1 | 1 |
| Malacostraca | Amphipoda | Melitidae | *Ceradocus rubromaculatus* | 0 | 1 |
| Malacostraca | Amphipoda | Melitidae | *Melita inaequistylis* | 1 | 1 |
| Malacostraca | Anomura | Diogenidae | *Paguristes setosus* | 0 | 1 |
| Malacostraca | Anomura | Paguridae | *Diacanthurus spinulimanus* | 1 | 0 |
| Malacostraca | Anomura | Paguridae | *Lophopagurus (Australeremus) kirkii* | 0 | 1 |
| Malacostraca | Anomura | Paguridae | *Lophopagurus (L.) thompsoni* | 1 | 0 |
| Malacostraca | Anomura | Paguridae | *Pagurus traversi* | 1 | 1 |
| Malacostraca | Anomura | Porcellanidae | *Petrolisthes elongatus* | 1 | 1 |
| Malacostraca | Anomura | Porcellanidae | *Petrolisthes novaezelandiae* | 1 | 1 |
| Malacostraca | Brachyura | Cancridae | *Metacarcinus novaezelandiae* | 1 | 0 |
| Malacostraca | Brachyura | Goneplacidae | *Neommatocarcinus huttoni* | 0 | 1 |
| Malacostraca | Brachyura | Grapsidae | *Hemigrapsus sexdentatus* | 0 | 1 |
| Malacostraca | Brachyura | Hymenosomatidae | *Halicarcinus cookii* | 1 | 1 |
| Malacostraca | Brachyura | Hymenosomatidae | *Halicarcinus innominatus* | 1 | 1 |
| Malacostraca | Brachyura | Hymenosomatidae | *Halicarcinus varius* | 1 | 1 |
| Malacostraca | Brachyura | Hymenosomatidae | *Neohymenicus pubescens* | 0 | 1 |

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| Malacostraca | Brachyura | Majidae | *Leptomithrax longimanus* | 0 | 1 |
| Malacostraca | Brachyura | Majidae | *Leptomithrax longipes* | 1 | 0 |
| Malacostraca | Brachyura | Majidae | *Notomithrax minor* | 1 | 1 |
| Malacostraca | Brachyura | Majidae | *Notomithrax peronii* | 1 | 1 |
| Malacostraca | Brachyura | Majidae | *Notomithrax ursus* | 1 | 1 |
| Malacostraca | Brachyura | Ocypodidae | *Macrophthalmus hirtipes* | 1 | 1 |
| Malacostraca | Brachyura | Pinnotheridae | *Pinnotheres atrinocola* | 0 | 1 |
| Malacostraca | Brachyura | Pinnotheridae | *Pinnotheres novaezelandiae* | 1 | 1 |
| Malacostraca | Brachyura | Portunidae | *Nectocarcinus antarcticus* | 1 | 0 |
| Malacostraca | Brachyura | Xanthidae | *Pilumnus lumpinus* | 1 | 1 |
| Malacostraca | Brachyura | Xanthidae | *Pilumnus novaezealandiae* | 1 | 1 |
| Malacostraca | Caridea | Alpheidae | *Betaeopsis aequimanus* | 1 | 0 |
| Malacostraca | Caridea | Crangonidae | *Nauticaris marionis* | 0 | 1 |
| Malacostraca | Caridea | Crangonidae | *Pontophilus australis* | 1 | 1 |
| Malacostraca | Caridea | Hippolytidae | *Hippolyte bifidirostris* | 1 | 0 |
| Malacostraca | Caridea | Palemonidae | *Periclimenes yaldwyni* | 0 | 1 |
| Malacostraca | Isopoda | Cirolanidae | *Natatolana rossi* | 1 | 1 |
| Malacostraca | Isopoda | Pseudojaniridae | *Schottea sp.* | 1 | 0 |
| Malacostraca | Isopoda | Sphaeromatidae | *Ischyromene kokotahi* | 0 | 1 |
| Malacostraca | Isopoda | Sphaeromatidae | *Pseudosphaeroma campbellensis* | 0 | 1 |
| | | | | | |
| **Dinophyta** | | | | | |
| Dinophyceae | Gymnodiniales | Polykrikaceae | *Polykrikos schwartzii* | 0 | 1 |
| Dinophyceae | Peridinales | Gonyaulacaceae | *Gonyaulax grindleyi* | 1 | 0 |
| Dinophyceae | Peridinales | Gonyaulacaceae | *Gonyaulax spinifera* | 1 | 1 |
| Dinophyceae | Peridinales | Gonyaulacaceae | *Protoceratium reticulatum* | 0 | 1 |
| Dinophyceae | Peridinales | Peridiniaceae | *Lingulodinium polyedrum* | 1 | 1 |
| Dinophyceae | Peridinales | Peridiniaceae | *Protoperidinium conicum* | 1 | 0 |
| Dinophyceae | Peridinales | Peridiniaceae | *Protoperidinium oblongum* | 0 | 1 |
| Dinophyceae | Peridinales | Peridiniaceae | *Protoperidinium pentagonum* | 1 | 0 |
| Dinophyceae | Peridinales | Peridiniaceae | *Protoperidinium conicum cf. conicoides* | 1 | 0 |
| Dinophyceae | Peridinales | Peridiniaceae | *Scrippsiella trochoidea* | 1 | 1 |
| | | | | | |
| **Echinodermata** | | | | | |
| Asteroidea | Valvatida | Asterinidae | *Meridiastra mortenseni* | 0 | 1 |
| Asteroidea | Valvatida | Asterinidae | *Patiriella regularis* | 1 | 1 |
| Echinoidea | Spatangoida | Loveniidae | *Echinocardium cordatum* | 1 | 0 |
| Holothuroidea | Apodid | Chiridotidae | *Chirodota nigra* | 0 | 1 |
| Holothuroidea | Apodida | Synaptidae | *Rynkatorpa uncinata* | 1 | 1 |
| Holothuroidea | Aspidochirotida | Stichopodidae | *Stichopus mollis* | 1 | 1 |
| | | | | | |
| **Mollusca** | | | | | |
| Bivalvia | Arcoida | Arcidae | *Barbatia novaezelandiae* | 1 | 0 |
| Bivalvia | Myoida | Corbulidae | *Corbula zelandica* | 1 | 1 |
| Bivalvia | Myoida | Hiatellidae | *Hiatella arctica* | 1 | 1 |
| Bivalvia | Mytiloida | Mytilidae | *Aulacomya atra maoriana* | 1 | 1 |

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| Bivalvia | Mytiloida | Mytilidae | *Modiolarca impacta* | 1 | 1 |
| Bivalvia | Mytiloida | Mytilidae | *Modiolus areolatus* | 1 | 0 |
| Bivalvia | Mytiloida | Mytilidae | *Perna canaliculus* | 1 | 1 |
| Bivalvia | Mytiloida | Mytilidae | *Xenostrobus pulex* | 0 | 1 |
| Bivalvia | Nuculoida | Nuculidae | *Nucula hartvigiana* | 0 | 1 |
| Bivalvia | Ostreoida | Ostreidae | *Ostrea chilensis* | 1 | 1 |
| Bivalvia | Pholadomyoida | Thraciidae | *Thracia vitrea* | 1 | 0 |
| Bivalvia | Pterioida | Anomiidae | *Pododesmus zelandicus* | 1 | 1 |
| Bivalvia | Pterioida | Pectinidae | *Pecten novaezelandiae* | 1 | 0 |
| Bivalvia | Pterioida | Pectinidae | *Talochlamys zelandiae* | 1 | 1 |
| Bivalvia | Veneroida | Cardiidae | *Pratulum pulchellum* | 1 | 0 |
| Bivalvia | Veneroida | Lasaeidae | *Arthritica bifurca* | 1 | 0 |
| Bivalvia | Veneroida | Lasaeidae | *Borniola reniformis* | 1 | 0 |
| Bivalvia | Veneroida | Lasaeidae | *Lasaea hinemoa* | 0 | 1 |
| Bivalvia | Veneroida | Semelidae | *Leptomya retiaria* | 1 | 1 |
| Bivalvia | Veneroida | Veneridae | *Dosinia greyi* | 1 | 0 |
| Bivalvia | Veneroida | Veneridae | *Dosinia lambata* | 1 | 1 |
| Bivalvia | Veneroida | Veneridae | *Irus reflexus* | 0 | 1 |
| Bivalvia | Veneroida | Veneridae | *Tawera spissa* | 1 | 1 |
| Gastropoda | Littorinimorpha | Calyptraeidae | *Sigapatella tenuis* | 1 | 1 |
| Gastropoda | Littorinimorpha | Capulidae | *Trichosirius inornatus* | 0 | 1 |
| Gastropoda | Littorinimorpha | Littorinidae | *Risellopsis varia* | 0 | 1 |
| Gastropoda | Neogastropoda | Buccinidae | *Buccinulum linea* | 0 | 1 |
| Gastropoda | Neogastropoda | Muricidae | *Xymene plebeius* | 1 | 1 |
| Gastropoda | Neogastropoda | Muricidae | *Xymene pusillus* | 1 | 0 |
| Gastropoda | Notaspidea | Pleurobranchidae | *Berthella medietas* | 0 | 1 |
| Gastropoda | Nudibranchia | Chromodorididae | *Chromodoris aureomarginata* | 0 | 1 |
| Gastropoda | Patellogastropoda | Lottiidae | *Notoacmea helmsi* | 0 | 1 |
| Gastropoda | Patellogastropoda | Lottiidae | *Notoacmea parviconoidea* | 0 | 1 |
| Gastropoda | Patellogastropoda | Nacellidae | *Cellana ornata* | 0 | 1 |
| Gastropoda | Vetigastropoda | Fissurellidae | *Tugali suteri* | 1 | 1 |
| Gastropoda | Vetigastropoda | Trochidae | *Cantharidus purpureus* | 1 | 0 |
| Gastropoda | Vetigastropoda | Trochidae | *Melagraphia aethiops* | 1 | 0 |
| Gastropoda | Vetigastropoda | Trochidae | *Trochus tiaratus* | 1 | 1 |
| Gastropoda | Vetigastropoda | Trochidae | *Trochus viridus* | 1 | 0 |
| Gastropoda | Vetigastropoda | Turbinidae | *Turbo smaragdus* | 1 | 0 |
| Polyplacophora | Acanthochitonina | Acanthochitonidae | *Acanthochitona violacea* | 1 | 0 |
| Polyplacophora | Acanthochitonina | Acanthochitonidae | *Acanthochitona zelandica* | 1 | 1 |
| Polyplacophora | Acanthochitonina | Acanthochitonidae | *Cryptoconchus porosus* | 1 | 1 |
| Polyplacophora | Ischnochitonina | Chitonidae | *Onithochiton neglectus* | 1 | 0 |
| Polyplacophora | Ischnochitonina | Chitonidae | *Rhyssoplax aerea* | 1 | 0 |
| Polyplacophora | Ischnochitonina | Chitonidae | *Sypharochiton pelliserpentis* | 0 | 1 |
| Polyplacophora | Ischnochitonina | Chitonidae | *Sypharochiton sinclairi* | 0 | 1 |
| Polyplacophora | Ischnochitonina | Mopaliidae | *Plaxiphora caelata* | 1 | 0 |
| Polyplacophora | Ischnochitonina | Mopaliidae | *Plaxiphora obtecta* | 1 | 1 |
| | | | | | |

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| **Macroalgae** | | | | | |
| Florideophyceae | Ceramiales | Ceramiaceae | *Anotrichium crinitum* | 0 | 1 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Antithamnionella adnata* | 1 | 0 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Callithamnion consanguineum* | 1 | 0 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Ceramium apiculatum* | 1 | 0 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Ceramium flaccidum* | 1 | 1 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Ceramium rubrum* | 0 | 1 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Medeiothamnion lyallii* | 1 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Acrosorium decumbens* | 1 | 0 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Apoglossum montagneanum* | 0 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Erythroglossum undulatissimum* | 1 | 0 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Hymenena variolosa* | 1 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Myriogramme denticulata* | 1 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Phycodrys quercifolia* | 1 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Schizoseris dichotoma* | 1 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Schizoseris griffithsia* | 1 | 1 |
| Florideophyceae | Ceramiales | Rhodomelaceae | *Bostrychia harveyi* | 0 | 1 |
| Florideophyceae | Ceramiales | Rhodomelaceae | *Chondria macrocarpa* | 0 | 1 |
| Florideophyceae | Ceramiales | Rhodomelaceae | *Cladhymenia oblongifolia* | 1 | 0 |
| Florideophyceae | Ceramiales | Rhodomelaceae | *Laurencia thyrsifera* | 0 | 1 |
| Florideophyceae | Ceramiales | Rhodomelaceae | *Polysiphonia strictissima* | 1 | 0 |
| Florideophyceae | Corallinales | Corallinaceae | *Haliptilon roseum* | 0 | 1 |
| Florideophyceae | Gigartinales | Cystocloniaceae | *Rhodophyllis centrocarpa* | 1 | 0 |
| Florideophyceae | Gigartinales | Gigartinaceae | *Gigartina atropurpurea* | 1 | 1 |
| Florideophyceae | Gigartinales | Gigartinaceae | *Gigartina decipiens* | 1 | 0 |
| Florideophyceae | Gigartinales | Kallymeniaceae | *Callophyllis variegata* | 1 | 0 |
| Florideophyceae | Gracilariales | Gracilariaceae | *Gracilaria truncata* | 0 | 1 |
| Florideophyceae | Rhodymeniales | Faucheaceae | *Gloiocladia saccata* | 1 | 0 |
| Florideophyceae | Rhodymeniales | Rhodomeniaceae | *Rhodymenia leptophylla* | 1 | 0 |
| Florideophyceae | Rhodymeniales | Rhodomeniaceae | *Rhodymenia novazelandica* | 0 | 1 |
| Phaeophyceae | Ectocarpales | Adenocystaceae | *Adenocystis utricularis* | 0 | 1 |
| Phaeophyceae | Ectocarpales | Scytothamnaceae | *Scytothamnus australis* | 1 | 0 |
| Phaeophyceae | Ectocarpales | Splachnidiaceae | *Splachnidium rugosum* | 1 | 0 |
| Phaeophyceae | Fucales | Cystoseiraceae | *Cystophora scalaris* | 0 | 1 |
| Phaeophyceae | Laminariales | Lessoniaceae | *Macrocystis pyrifera* | 0 | 1 |
| Ulvophyceae | Bryopsidales | Codiaceae | *Codium dichotomum* | 1 | 0 |
| Ulvophyceae | Bryopsidales | Codiaceae | *Codium fragile* | 1 | 0 |
| Ulvophyceae | Cladophorales | Cladophoraceae | *Cladophora feredayi* | 1 | 1 |
| Ulvophyceae | Cladophorales | Siphonocladaceae | *Cladophoropsis herpestica* | 0 | 1 |
| Ulvophyceae | Ulvales | Ulvaceae | *Ulva spathulata* | 1 | 0 |
| | | | | | |
| **Porifera** | | | | | |
| Demospongiae | Dictyoceratida | Irciniidae | *Ircinia akaroa* | 1 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Adocia cf. parietalioides* | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Haliclona cf. isodictyale* | 1 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Haliclona cf. punctata* | 1 | 1 |

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| Demospongiae | Haplosclerida | Chalinidae | *Haliclona glabra* | 1 | 1 |
| Demospongiae | Poecilosclerida | Crellidae | *Crella (Pytheas) affinis* | 1 | 1 |
| Demospongiae | Poecilosclerida | Hymedesmiidae | *Phorbas cf. anchorata* | 0 | 1 |
| Demospongiae | Poecilosclerida | Hymedesmiidae | *Phorbas fulva* | 1 | 1 |
| Demospongiae | Poecilosclerida | Microcionidae | *Clathria (Microciona) dendyi* | 1 | 1 |
| Demospongiae | Poecilosclerida | Microcionidae | *Ophlitospongia reticulata* | 1 | 1 |
| Demospongiae | Poecilosclerida | Mycalidae | *Mycale (Carmia) tasmani* | 1 | 1 |
| Demospongiae | Poecilosclerida | Tedaniidae | *Tedania battershilli* | 0 | 1 |
| | | | | | |
| **Urochordata** | | | | | |
| Ascidiacea | Aplousobranchia | Didemnidae | *Lissoclinum notti* | 0 | 1 |
| Ascidiacea | Aplousobranchia | Polyclinidae | *Aplidium adamsi* | 0 | 1 |
| Ascidiacea | Stolidobranchia | Molgulidae | *Molgula mortenseni* | 1 | 1 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura cancellata* | 1 | 1 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura pachydermatina* | 1 | 0 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura picta* | 1 | 1 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura pulla* | 1 | 1 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura rugata* | 1 | 1 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura spinosissima* | 0 | 1 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura subuculata* | 1 | 1 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura suteri* | 0 | 1 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura trita* | 1 | 0 |
| Ascidiacea | Stolidobranchia | Styelidae | *Asterocarpa coerulea* | 1 | 1 |
| Ascidiacea | Stolidobranchia | Styelidae | *Cnemidocarpa bicornuta* | 1 | 1 |
| Ascidiacea | Stolidobranchia | Styelidae | *Cnemidocarpa nisiotus* | 1 | 1 |
| Ascidiacea | Stolidobranchia | Styelidae | *Cnemidocarpa otagoensis* | 1 | 0 |
| Ascidiacea | Stolidobranchia | Styelidae | *Cnemidocarpa regalis* | 1 | 0 |
| | | | | | |
| **Vertebrata** | | | | | |
| Actinopterygii | Gadiformes | Moridae | *Lotella rhacinum* | 0 | 1 |
| Actinopterygii | Gadiformes | Moridae | *Pseudophycis bachus* | 1 | 1 |
| Actinopterygii | Mugiliformes | Mugilidae | *Parapercis colias* | 1 | 1 |
| Actinopterygii | Perciformes | Carangidae | *Caranx georgianus* | 1 | 1 |
| Actinopterygii | Perciformes | Cheilodactylidae | *Nemadactylus macropterus* | 1 | 0 |
| Actinopterygii | Perciformes | Gobiesocidae | *Dellichthys morelandi* | 1 | 0 |
| Actinopterygii | Perciformes | Labridae | *Notolabrus celidotus* | 1 | 1 |
| Actinopterygii | Perciformes | Labridae | *Notolabrus fucicola* | 0 | 1 |
| Actinopterygii | Perciformes | Labridae | *Notolabrus miles* | 1 | 1 |
| Actinopterygii | Perciformes | Plesiopidae | *Acanthoclinus fuscus* | 1 | 0 |
| Actinopterygii | Perciformes | Scorpidinae | *Scorpis lineolata* | 0 | 1 |
| Actinopterygii | Perciformes | Trypterigiidae | *Grahamina capito* | 1 | 0 |
| Actinopterygii | Perciformes | Trypterigiidae | *Grahamina gymnota* | 1 | 0 |
| Actinopterygii | Pleuronectiformes | Pleuronectidae | *Peltorhamphus latus* | 1 | 0 |

* 1 = Present, 0 = Absent

**Table 15: Cryptogenic marine species recorded from the Port of Wellington in the first (T1) and second (T2) surveys. Category 1 cryptogenic species (C1); Category 2 cryptogenic species (C2). Refer to "Definitions of species categories" for definitions.**

| Major taxonomic group, Class | Order | Family | Genus and species | Status | T1* | T2* |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Annelida** | | | | | | |
| Polychaeta | Phyllodocida | Nereididae | *Neanthes Neanthes-A* | C2 | 1 | 0 |
| Polychaeta | Phyllodocida | Phyllodocidae | *Eulalia Eulalia-NIWA-2* | C2 | 1 | 1 |
| Polychaeta | Phyllodocida | Phyllodocidae | *Pirakia Pirakia-A* | C2 | 1 | 1 |
| Polychaeta | Phyllodocida | Polynoidae | *Lepidonotus Lepidonotus-A* | C2 | 1 | 0 |
| Polychaeta | Phyllodocida | Syllidae | *Eusyllin-unknown Eusyllin-unknown-A* | C2 | 1 | 1 |
| Polychaeta | Phyllodocida | Syllidae | *Eusyllis Eusyllis-A* | C2 | 1 | 1 |
| Polychaeta | Phyllodocida | Syllidae | *Eusyllis Eusyllis-C* | C2 | 1 | 0 |
| Polychaeta | Phyllodocida | Syllidae | *Typosyllis Typosyllis-A* | C2 | 0 | 1 |
| Polychaeta | Phyllodocida | Syllidae | *Typosyllis Typosyllis-B* | C2 | 0 | 1 |
| Polychaeta | Sabellida | Sabellidae | *Pseudopotamilla Pseudopotamilla-A* | C2 | 1 | 0 |
| Polychaeta | Sabellida | Serpulidae | *Serpula Serpula-C* | C2 | 1 | 1 |
| Polychaeta | Sabellida | Serpulidae | *Serpula Serpula-D* | C2 | 0 | 1 |
| Polychaeta | Spionida | Spionidae | *Paraprionospio Paraprionospio-A [pinnata]* | C2 | 1 | 1 |
| Polychaeta | Terebellida | Cirratulidae | *Cirratulus Cirratulus-A* | C2 | 1 | 0 |
| Polychaeta | Terebellida | Terebellidae | *Lanassa Lanassa-A* | C2 | 0 | 1 |
| Polychaeta | Terebellida | Terebellidae | *Terebella Terebella-B* | C2 | 0 | 1 |
| | | | | | | |
| **Bryozoa** | | | | | | |
| Gymnolaemata | Cheilostomata | Phidoloporidae | *Rhynchozoon larreyi* | C1 | 1 | 1 |
| Gymnolaemata | Cheilostomata | Scrupariidae | *Scruparia ambigua* | C1 | 1 | 1 |
| | | | | | | |
| **Cnidaria** | | | | | | |
| Hydrozoa | Hydroida | Bougainvilliidae | *Bougainvillia muscus* | C1 | 1 | 0 |
| Hydrozoa | Hydroida | Campanulariidae | *Clytia hemisphaerica* | C1 | 0 | 1 |
| Hydrozoa | Hydroida | Campanulariidae | *Obelia dichotoma* | C1 | 1 | 0 |
| Hydrozoa | Hydroida | Plumulariidae | *Plumularia setacea* | C1 | 0 | 1 |
| | | | | | | |
| **Crustacea** | | | | | | |
| Malacostraca | Amphipoda | Aoridae | *Aora typica* | C1 | 1 | 0 |
| Malacostraca | Amphipoda | Corophiidae | *Meridiolembos sp. aff. acherontis* | C2 | 1 | 0 |
| Malacostraca | Amphipoda | Isaeidae | *Gammaropsis sp. 1* | C2 | 1 | 0 |
| Malacostraca | Amphipoda | Leucothoidae | *Leucothoe sp. 1* | C2 | 0 | 1 |
| Malacostraca | Amphipoda | Stenothoidae | *Stenothoe ?miersii* | C1 | 1 | 0 |
| Malacostraca | Brachyura | Portunidae | *Nectocarcinus sp. nov.* | C2 | 1 | 0 |
| | | | | | | |
| **Dinophyta** | | | | | | |
| Dinophyceae | Gymnodiniales | Gymnodiniaceae | *Gymnodinium catenatum* | C1 | 1 | 0 |
| | | | | | | |
| **Mollusca** | | | | | | |

| Major taxonomic group, Class | Order | Family | Genus and species | Status | T1* | T2* |
|---|---|---|---|---|---|---|
| Bivalvia | Mytiloida | Mytilidae | *Mytilus galloprovincialis* | C1 | 1 | 1 |
| | | | | | | |
| **Macroalgae** | | | | | | |
| Florideophyceae | Ceramiales | Delesseriaceae | *Valeriemaya undescribed* | C2 | 0 | 1 |
| | | | | | | |
| **Porifera** | | | | | | |
| Demospongiae | Dendroceratida | Darwinellidae | *Darwinella cf. gardineri* | C1 | 1 | 1 |
| Demospongiae | Dictyoceratida | Dysideidae | *Dysidea new sp. 1* | C2 | 1 | 1 |
| Demospongiae | Dictyoceratida | Dysideidae | *Euryspongia new sp. 1* | C2 | 1 | 1 |
| Demospongiae | Dictyoceratida | Dysideidae | *Euryspongia new sp. 2* | C2 | 0 | 1 |
| Demospongiae | Dictyoceratida | Dysideidae | *Pleraplysilla new sp. 1* | C2 | 0 | 1 |
| Demospongiae | Hadromerida | Clionaidae | *Cliona new sp. 1* | C2 | 0 | 1 |
| Demospongiae | Hadromerida | Suberitidae | *Pseudosuberites sulcatus* | C1 | 0 | 1 |
| Demospongiae | Halichondrida | Halichondriidae | *Amorphinopsis new sp. 1* | C2 | 0 | 1 |
| Demospongiae | Halichondrida | Halichondriidae | *Halichondria new sp. 1* | C2 | 1 | 1 |
| Demospongiae | Halichondrida | Halichondriidae | *Halichondria new sp. 2* | C2 | 0 | 1 |
| Demospongiae | Halichondrida | Halichondriidae | *Halichondria panicea* | C1 | 1 | 1 |
| Demospongiae | Haplosclerida | Callyspongiidae | *Callyspongia diffusa* | C1 | 1 | 1 |
| Demospongiae | Haplosclerida | Callyspongiidae | *Dactylia new sp. 1* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Adocia new sp. 1* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Adocia new sp. 2* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Adocia new sp. 7* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Chalinula new sp. 1* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Chalinula new sp. 2* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Haliclona new sp. 1* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Haliclona new sp. 2* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Haliclona new sp. 3* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Haliclona new sp. 11* | C2 | 0 | 1 |
| Demospongiae | Haplosclerida | Chalinidae | *Haliclona new sp. 16* | C2 | 0 | 1 |
| Demospongiae | Homosclerophorida | Plakinidae | *Plakina trilopha* | C1 | 1 | 0 |
| Demospongiae | Poecilosclerida | Crellidae | *Crella (Pytheas) incrustans* | C1 | 1 | 1 |
| | | | | | | |
| **Urochordata** | | | | | | |
| Ascidiacea | Aplousobranchia | Didemnidae | *Didemnum* species group *(includes D.vexillum, D. incanum, and other Didemnum species)* | C1 | 1 | 1# |
| Ascidiacea | Aplousobranchia | Polyclinidae | *Aplidium phortax* | C1 | 0 | 1 |
| Ascidiacea | Phlebobranchia | Rhodosomatidae | *Corella eumyota* | C1 | 1 | 1 |
| Ascidiacea | Stolidobranchia | Botryllinae | *Botrylliodes leachii* | C1 | 1 | 1 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Microcosmus australis* | C1 | 1 | 0 |
| Ascidiacea | Stolidobranchia | Pyuridae | *Pyura sp.* | C2 | 0 | 1 |
| Ascidiacea | Stolidobranchia | Styelidae | *Asterocarpa cerea* | C1 | 1 | 1 |
| Ascidiacea | Stolidobranchia | Styelidae | *Styela plicata* | C1 | 1 | 0 |

* 1 = Present, 0 = Absent

\# Because of the complex taxonomy of this genus, *Didemnum* specimens from the second survey could not be identified to species level, but are reported here collectively as a species group "*Didemnum* sp."

**Table 16: Non-indigenous marine species recorded from the Port of Wellington during the first survey (T1) and second survey (T2). 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.**

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* | Probable means of introduction | Date of introduction or detection ([d]) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **Annelida** | | | | | | | |
| Polychaeta | Sabellida | Serpulidae | *Spirobranchus polytrema* ***(NR)*** | 1 | 1 | H | Nov 2001[d] |
| Polychaeta | Spionida | Spionidae | *Dipolydora armata* | 1 | 0 | H | ~1900 |
| Polychaeta | Spionida | Spionidae | *Polydora hoplura* | 1 | 1 | H | Unknown[1] |
| | | | | | | | |
| **Bryozoa** | | | | | | | |
| Gymnolaemata | Cheilostomata | Bugulidae | *Bugula flabellata* | 1 | 1 | H | Pre-1949 |
| Gymnolaemata | Cheilostomata | Cryptosulidae | *Cryptosula pallasiana* | 1 | 1 | H | 1890s |
| Gymnolaemata | Cheilostomata | Cyclicoporidae | *Cyclicopora longipora* | 1 | 1 | H | Unknown[1] |
| Gymnolaemata | Cheilostomata | Watersiporidae | *Watersipora subtorquata* | 1 | 1 | H or B | Pre-1982 |
| | | | | | | | |
| **Cnidaria** | | | | | | | |
| Hydrozoa | Hydroida | Eudendriidae | *Eudendrium capillare* **(NR)** | 1 | 0 | H | Nov 2001[d] |
| Hydrozoa | Hydroida | Eudendriidae | *Eudendrium generale* | 0 | 1 | H[2] | Jan 2003[d] |
| Hydrozoa | Hydroida | Plumulariidae | *Monotheca pulchella* | 0 | 1 | H | 1928 |
| Hydrozoa | Hydroida | Sertulariidae | *Sertularia marginata* | 0 | 1 | H | 1930 |

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* | Probable means of introduction | Date of introduction or detection ([d]) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **Crustacea** | | | | | | | |
| Malacostraca | Amphipoda | Corophiidae | *Monocorophium acherusicum* | 0 | 1 | H | Pre-1921 |
| Malacostraca | Brachyura | Cancridae | *Cancer gibbosulus* ***(NR)*** | 1 | 0 | H or B | Nov 2001[d] |
| | | | | | | | |
| **Mollusca** | | | | | | | |
| Bivalvia | Veneroida | Semelidae | *Theora lubrica* | 1 | 1 | B | 1971 |
| | | | | | | | |
| **Macroalgae** | | | | | | | |
| Florideophyceae | Ceramiales | Ceramiaceae | *Griffithsia crassiuscula* | 1 | 1 | H | Pre-1954 |
| Phaeophyceae | Laminariales | Alariaceae | *Undaria pinnatifida* | 1 | 1 | H or B | Pre-1987 |
| | | | | | | | |
| **Porifera** | | | | | | | |
| Demospongiae | Halisarcida | Halisarcidae | *Halisarca dujardini* | 1 | 0 | H or B | Pre-1973 |

* 1 = Present, 0 = Absent
[1] Date of introduction currently unknown but species had been encountered in New Zealand prior to the present survey.
[2] Based on Cranfield et al's (1998) estimation for a congeneric species *Eudendrium ritchiei*.

**Table 17: Species indeterminata recorded from the Port of Wellington in the first (T1) and second (T2) surveys. 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.**

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| **Annelida** | | | | | |
| Polychaeta | Eunicida | Dorvilleidae | *Unknown sp_undet* | 0 | 1 |
| Polychaeta | Eunicida | Lumbrineridae | *Scoletoma sp_undet* | 0 | 1 |
| Polychaeta | Phyllodocida | Glyceridae | *Glycera Indet* | 1 | 0 |
| Polychaeta | Phyllodocida | Nereididae | *Nereididae indet* | 1 | 0 |
| Polychaeta | Phyllodocida | Phyllodocidae | *Phyllodocidae Indet* | 1 | 0 |
| Polychaeta | Phyllodocida | Polynoidae | *Harmothoinae Indet* | 1 | 0 |
| Polychaeta | Phyllodocida | Polynoidae | *Not_Lepidonotinae Indet* | 1 | 0 |
| Polychaeta | Phyllodocida | Polynoidae | *Polynoidae indet* | 1 | 0 |
| Polychaeta | Phyllodocida | Syllidae | *Autolytin-unknown sp.* | 1 | 0 |
| Polychaeta | Phyllodocida | Syllidae | *Syllidae Indet* | 1 | 0 |
| Polychaeta | Phyllodocida | Syllidae | *Typosyllis sp_undet* | 0 | 1 |
| Polychaeta | Sabellida | Sabellidae | *Sabellidae Indet* | 1 | 1 |
| Polychaeta | Sabellida | Serpulidae | *Serpula Indet* | 0 | 1 |
| Polychaeta | Sabellida | Serpulidae | *Serpulidae Indet* | 1 | 1 |
| Polychaeta | Sabellida | Serpulidae | *Spirobranchus Indet* | 1 | 1 |
| Polychaeta | Sabellida | Serpulidae | *Spirorbinae Indet* | 1 | 0 |
| Polychaeta | Sabellida | Serpulidae | *spirorbins genus undet sp_undet* | 0 | 1 |
| Polychaeta | Scolecida | Capitellidae | *Notomastus Indet* | 1 | 0 |
| Polychaeta | Scolecida | Maldanidae | *Euclymene Indet* | 1 | 0 |
| Polychaeta | Spionida | Chaetopteridae | *Chaetopteridae Indet* | 1 | 0 |
| Polychaeta | Spionida | Spionidae | *Boccardia Indet* | 1 | 0 |
| Polychaeta | Spionida | Spionidae | *Polydora Indet* | 1 | 0 |
| Polychaeta | Terebellida | Cirratulidae | *Chaetozone Indet* | 1 | 0 |
| Polychaeta | Terebellida | Terebellidae | *Terebellidae Indet* | 1 | 1 |
| | | | | | |
| **Bryozoa** | | | | | |
| | | | *Unidentified Bryozoa* | 0 | 1 |
| Gymnolaemata | Cheilostomata | Aeteidae | *Aetea ?australis* | 1 | 0 |
| Gymnolaemata | Cheilostomata | Hippothoidae | *Celleporella sp.* | 1 | 0 |
| Stenolaemata | Cyclostomata | Tubuliporidae | *Tubulipora sp.* | 0 | 1 |
| | | | | | |
| **Cnidaria** | | | | | |

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| Anthozoa | Actiniaria | | *Acontiaria sp.* | 1 | 0 |
| Anthozoa | Actiniaria | Sagartiidae | *Anthothoe sp.* | 1 | 0 |
| Hydrozoa | Hydroida | Eudendriidae | *Eudendrium sp. ?* | 0 | 1 |
| Hydrozoa | Hydroida | Lafoeidae | *Filellum sp. indeterminate* | 1 | 0 |
| Scyphozoa | | | *Unidentified Scyphozoa* | 1 | 0 |
| | | | | | |
| **Crustacea** | | | | | |
| Malacostraca | Amphipoda | | *Unidentified Amphipoda* | 0 | 1 |
| Malacostraca | Amphipoda | Corophiidae | *Meridiolembos sp.* | 1 | 0 |
| Malacostraca | Amphipoda | Isaeidae | *Gammaropsis indet sp.* | 0 | 1 |
| Malacostraca | Amphipoda | Leucothoidae | *Paraleucothoe sp. A* | 0 | 1 |
| Malacostraca | Anomura | Paguridae | *Pagurus sp.* | 0 | 1 |
| Malacostraca | Brachyura | Grapsidae | *Hemigrapsus sp.* | 0 | 1 |
| Malacostraca | Brachyura | Majidae | *Notomithrax sp.* | 1 | 1 |
| Malacostraca | Isopoda | | *Isopoda sp.* | 0 | 1 |
| Malacostraca | Isopoda | Janiridae | *Iathrippa ?longicauda* | 1 | 0 |
| Malacostraca | Isopoda | Sphaeromatidae | *Joeropsis ?neozealandica* | 1 | 0 |
| Malacostraca | Mysida | Mysidae | *Heteromysis or Mysidetes sp.* | 1 | 0 |
| Malacostraca | Mysidacea | | *Unidentified Mysidacea* | 0 | 1 |
| | | | | | |
| **Dinophyta** | | | | | |
| Dinophyceae | Peridinales | Peridiniaceae | *Protoperidinium sp.* | 1 | 1 |
| | | | | | |
| **Echinodermata** | | | | | |
| Asteroidea | Valvatida | Asterinidae | *Patiriella sp.* | 1 | 0 |
| | | | | | |
| **Mollusca** | | | | | |
| Gastropoda | Neogastropoda | Turridae | *Neoguraleus sp.* | 0 | 1 |
| Polyplacophora | Ischnochitonina | Chitonidae | *Chitonidae sp.* | 0 | 1 |
| | | | | | |
| **Macroalgae** | | | | | |
| | | | *Unidentified Phycophyta* | 0 | 1 |
| Florideophyceae | | | *Unidentified Rhodophyceae* | 0 | 1 |
| Florideophyceae | Acrochaetiales | Acrochaetiaceae | *Audouinella sp.* | 1 | 0 |
| Florideophyceae | Bangiales | Bangiaceae | *Porphyra sp.* | 1 | 0 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Anotrichium?* | 0 | 1 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Callithamnion sp.* | 0 | 1 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Ceramium sp.* | 1 | 1 |
| Florideophyceae | Ceramiales | Ceramiaceae | *Griffithsia sp.* | 1 | 1 |

| Major taxonomic group, Class | Order | Family | Genus and species | T1* | T2* |
|---|---|---|---|---|---|
| Florideophyceae | Ceramiales | Ceramiaceae | *Pterothamnion sp.* | 0 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Unidentified Delesseriaceae* | 0 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Erythroglossum sp.* | 1 | 0 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Hymenena sp.* | 0 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Myriogramme sp.* | 1 | 0 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Phycodrys sp.* | 1 | 0 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Phycodrys?* | 0 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Schizoseris sp.* | 0 | 1 |
| Florideophyceae | Ceramiales | Delesseriaceae | *Valeriemaya sp.* | 1 | 0 |
| Florideophyceae | Ceramiales | Rhodomelaceae | *Polysiphonia sp.* | 1 | 1 |
| Florideophyceae | Corallinales | Corallinaceae | *Unidentified Corallinaceae* | 1 | 1 |
| Florideophyceae | Gigartinales | Cystocloniaceae | *Rhodophyllis sp.* | 0 | 1 |
| Florideophyceae | Gigartinales | Kallymeniaceae | *Callophyllis sp.* | 0 | 1 |
| Florideophyceae | Rhodymeniales | Rhodomeniaceae | *Rhodymenia sp.* | 1 | 1 |
| Phaeophyceae | | | *Unidentified Phaeophyceae* | 1 | 1 |
| Phaeophyceae | Ectocarpales | Scytosiphonaceae | *Colpomenia sp.* | 1 | 0 |
| Phaeophyceae | Fucales | Cystoseiraceae | *Cystophora sp.* | 0 | 1 |
| Ulvophyceae | Cladophorales | Cladophoraceae | *Cladophora sp.* | 0 | 1 |
| Ulvophyceae | Ulvales | Ulvaceae | *Enteromorpha sp.* | 1 | 0 |
| Ulvophyceae | Ulvales | Ulvaceae | *Ulva sp.* | 1 | 1 |
| | | | | | |
| **Platyhelminthes** | | | | | |
| Turbellaria | Polycladida | | *Unidentified Polycladida* | 1 | 0 |
| Turbellaria | Polycladida | Stylochidae | *Enterogonia sp.* | 1 | 0 |
| Turbellaria | Polycladida | Stylochidae | *Planocera? sp.* | 1 | 0 |
| | | | | | |
| **Porifera** | | | | | |
| | | | *Unidentified Porifera* | 0 | 1 |
| | | | | | |
| **Vertebrata** | | | | | |
| Actinopterygii | Perciformes | Plesiopidae | *Acanthoclinus sp.* | 0 | 1 |
| Actinopterygii | Perciformes | Tripterygiidae | *Tripterygiidae sp.* | 0 | 1 |
| Actinopterygii | Perciformes | Trypterigiidae | *Forsterygion sp. post larva* | 1 | 0 |

* 1 = Present, 0 = Absent

**Table 18: Non-indigenous marine organisms recorded from the Port of Wellington survey and the techniques used to capture each species. Species distributions throughout the port and in other ports and marinas around New Zealand are indicated.**

| Genus & species | Capture techniques in the Port of Wellington | Locations detected in the Port of Wellington | | Detected in other locations surveyed in ZBS2000_04 |
|---|---|---|---|---|
| | | First survey* | Second survey* | |
| **Annelida** | | | | |
| *Spirobranchus polytrema* | Benthic sled, pile scrape, starfish trap | Aotea Quay 3, Aotea Quay 6 (See Figure 21) | Aotea Quay South, Burnham (See Figure 22) | Dunedin, Lyttelton, Napier, Picton, Timaru |
| *Dipolydora armata* | Pile scrape | Aotea Quay 3, Aotea Quay 6, Thorndon Container Wharf | | Picton |
| *Polydora hoplura* | Pile scrape | Aotea Quay 3, Aotea Quay 6, Burnham, Kings Wharf, Overseas Passenger Terminal, Thorndon Container Wharf (See Figure 23) | Queens Wharf (See Figure 24) | Dunedin, Lyttelton, Nelson, Picton, Tauranga, Timaru, Whangarei |
| | | | | |
| **Bryozoa** | | | | |
| *Bugula flabellata* | Benthic sled, pile scrape, star fish trap, visual | Aotea Quay 3, Aotea Quay 6, Burnham, Kings Wharf, Overseas Passenger Terminal, Thorndon breakwall, Thorndon Container Wharf, Waterloo Wharf (See Figure 25) | Aotea Quay North, Aotea Quay South, Burnham, Kings Wharf, Overseas Passenger Terminal, Queens Wharf, Rail Ferry Terminal, Thorndon Container Wharf (See Figure 26) | Auckland, Bluff, Dunedin, Lyttelton, Napier, Nelson, New Plymouth, Opua, Picton, Tauranga, Timaru, Whangarei |
| *Cryptosula pallasiana* | Pile scrape | Aotea Quay 3, Thorndon Container Wharf (See Figure 27) | Overseas Passenger Terminal (See Figure 28) | Dunedin, Gisborne, Lyttelton, Nelson, New Plymouth, Picton, Timaru, Whangarei |
| *Cyclicopora longipora* | Benthic sled, pile scrape | Aotea Quay 3, Aotea Quay 6, Overseas Passenger Terminal, Thorndon Container Wharf (See Figure 29) | Aotea Quay North, Aotea Quay South, Kings Wharf, Overseas Passenger Terminal, Queens Wharf, Rail Ferry Terminal (See Figure 30) | |
| *Watersipora subtorquata* | Pile scrape | Aotea Quay 3, Aotea Quay 6, Burnham, Kings Wharf, Overseas Passenger Terminal, Thorndon Container Wharf (See Figure 31) | Aotea Quay South, Burnham, Kings Wharf, Overseas Passenger Terminal, Queens Wharf (See Figure 32) | Auckland, Bluff, Dunedin, Gisborne, Lyttelton, Napier, Nelson, New Plymouth, Opua, Picton, Tauranga, Timaru, Whangarei |
| | | | | |
| **Cnidaria** | | | | |
| *Eudendrium capillare* | Pile scrape | Aotea Quay 3, Overseas Passenger | | New Plymouth, |

| Genus & species | Capture techniques in the Port of Wellington | Locations detected in the Port of Wellington | | Detected in other locations surveyed in ZBS2000_04 |
|---|---|---|---|---|
| | | First survey* | Second survey* | |
| | | Terminal, Thorndon Container Wharf | | Tauranga |
| *Eudendrium generale* | Pile scrape | | Aotea Quay North, Aotea Quay South, Burnham, Overseas Passenger Terminal (See Figure 33) | Napier, Picton |
| *Monotheca pulchella* | Pile scrape | | Aotea Quay South (See Figure 34) | Lyttelton, New Plymouth, Tauranga Timaru, |
| *Sertularia marginata* | Pile scrape | | Aotea Quay South (See Figure 35) | Tauranga |
| | | | | |
| **Crustacea** | | | | |
| *Monocorophium acherusicum* | | | Kings Wharf (See Figure 36) | Dunedin, Gisborne, Lyttelton, Tauranga, Timaru, Whangarei |
| *Cancer gibbosulus* | Pile scrape | Aotea Quay 3 | | Lyttelton, Timaru |
| | | | | |
| **Mollusca** | | | | |
| *Theora lubrica* | Benthic sled, benthic grab | Burnham, Thorndon Container Wharf (See Figure 37) | Burnham, Kings Wharf, Miramar, Queens Wharf, Rail Ferry Terminal (See Figure 38) | Auckland, Gisborne, Lyttelton, Napier, Nelson, New Plymouth, Opua, Picton, Whangarei |
| | | | | |
| **Macroalgae** | | | | |
| *Griffithsia crassiuscula* | Benthic sled, pile scrape, pile visual, star fish trap | Aotea Quay 3, Aotea Quay 6, Burnham, Overseas Passenger Terminal, Thorndon breakwall, Thorndon Container Wharf (See Figure 39) | Aotea Quay North, Aotea Quay South, Burnham, Kings Wharf, Queens Wharf, Thorndon Container Wharf (See Figure 40) | Bluff, Lyttelton, New Plymouth, Picton, Timaru |
| *Undaria pinnatifida* | Benthic sled, pile scrape, star fish trap | Aotea Quay 3, Aotea Quay 6, Burnham, Kings Wharf, Overseas Passenger Terminal, Thorndon Container Wharf (See Figure 41) | Aotea Quay North, Aotea Quay South Kings Wharf, Overseas Passenger Terminal, Queens Wharf, Burnham (See Figure 42) | Dunedin, Gisborne, Lyttelton, Napier, Nelson, New Plymouth, Picton, Timaru |
| | | | | |
| **Porifera** | | | | |
| *Halisarca dujardini* | Benthic sled, pile scrape, | Aotea Quay 3, Aotea Quay 6, Burnham, Kings Wharf, Overseas Passenger Terminal, Thorndon Container Wharf | | Auckland, Bluff, Dunedin, Lyttelton, New Plymouth, Picton |

* NB. “Aotea Quay 3” (first survey) is the same site as “Aotea Quay North” (second survey) and “Aotea Quay 6” (first survey) is the same site as “Aotea Quay South” (second survey).

**Table 19: Summary statistics for taxon assemblages collected in the Port of Wellington using six different methods, and similarity indices comparing assemblages between the first and second survey. See "Definitions of species categories" for definitions of Native, C1 and C2 (cryptogenic category 1 and 2) and NIS (non-indigenous species) taxa.**

| | No. of samples in first survey | No. of samples in second survey | No. of taxa in first survey | No. of taxa in second survey | No. (%) of taxa shared between surveys | No. of taxa in first survey only | No. of taxa in second survey only | No. (%) of taxa in only one sample in first survey | No. (%) of taxa in only one sample in second survey | Chao Shared Esimated | Jaccard Classic | Sorensen Classic | Chao-Jaccard-Est Incidence-based | Chao-Sorensen-Est Incidence-based |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pile scrape quadrats** | | | | | | | | | | | | | | |
| **Native** | 90 | 94 | 138 | 151 | 92 (47%) | 46 | 59 | 28 (20%) | 48 (32%) | 106.835 | 0.467 | 0.637 | 0.805 | 0.878 |
| **C2** | 90 | 94 | 15 | 31 | 8 (21%) | 7 | 23 | 6 (40%) | 10 (32%) | 8.361 | 0.211 | 0.348 | 0.321 | 0.474 |
| **NIS & C1** | 90 | 94 | 28 | 27 | 18 (49%) | 10 | 9 | 6 (21%) | 12 (44%) | 26.533 | 0.486 | 0.655 | 0.922 | 0.908 |
| **Benthic sleds** | | | | | | | | | | | | | | |
| **Native** | 13 | 16 | 62 | 57 | 23 (24%) | 39 | 34 | 34 (55%) | 33 (58%) | 46.193 | 0.24 | 0.387 | 0.49 | 0.544 |
| **C2** | 13 | 16 | 2 | 7 | 1 (13%) | 1 | 6 | 1 (50%) | 4 (57%) | 1 | 0.125 | 0.222 | 0.167 | 0.286 |
| **NIS & C1** | 13 | 16 | 10 | 10 | 6 (43%) | 4 | 4 | 6 (60%) | 5 (50%) | 10.769 | 0.429 | 0.6 | 0.863 | 0.728 |
| **Benthic grabs** | | | | | | | | | | | | | | |
| **Native** | 18 | 24 | 21 | 17 | 7 (23%) | 14 | 10 | 12 (57%) | 13 (76%) | See analysis for all taxa combined | | | | |
| **C2** | 18 | 24 | 1 | 1 | 0 (0%) | 1 | 1 | 1 (100%) | 1 (100%) | Not enough taxa encountered for a meaningful analysis | | | | |
| **NIS & C1** | 18 | 24 | 0 | 2 | 0 (0%) | 0 | 2 | 0 (0%) | 2 (100%) | Not enough taxa encountered for a meaningful analysis | | | | |
| **Native, C2, NIS & C1 taxa combined** | 18 | 24 | 22 | 20 | 7 (20%) | 15 | 13 | 13 (59%) | 16 (80%) | 18.034 | 0.2 | 0.333 | 0.505 | 0.468 |

| | No. of samples in first survey | No. of samples in second survey | No. of taxa in first survey | No. of taxa in second survey | No. (%) of taxa shared between surveys | No. of taxa in first survey only | No. of taxa in second survey only | No. (%) of taxa in only one sample in first survey | No. (%) of taxa in only one sample in second survey | Chao Shared Esimated | Jaccard Classic | Sorensen Classic | Chao-Jaccard-Est Incidence-based | Chao-Sorensen-Est Incidence-based |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Crab traps** | | | | | | | | | | | | | | |
| **Native** | 28 | 40 | 13 | 6 | 3 (19%) | 10 | 3 | 7 (54%) | 2 (33%) | 3 | 0.188 | 0.316 | 0.557 | 0.716 |
| **C2** | 28 | 40 | 0 | 0 | 0 (0%) | 0 | 0 | 0 (0%) | 0 (0%) | No taxa encountered | | | | |
| **NIS & C1** | 28 | 40 | 0 | 0 | 0 (0%) | 0 | 0 | 0 (0%) | 0 (0%) | No taxa encountered | | | | |
| **Fish traps** | | | | | | | | | | | | | | |
| **Native** | 34 | 40 | 14 | 10 | 6 (33%) | 8 | 4 | 6 (43%) | 5 (50%) | 10.201 | 0.333 | 0.5 | 0.667 | 0.766 |
| **C2** | 34 | 40 | 0 | 0 | 0 (0%) | 0 | 0 | 0 (0%) | 0 (0%) | No taxa encountered | | | | |
| **NIS & C1** | 34 | 40 | 0 | 0 | 0 (0%) | 0 | 0 | 0 (0%) | 0 (0%) | No taxa encountered | | | | |
| **Starfish traps** | | | | | | | | | | | | | | |
| **Native** | 28 | 40 | 22 | 4 | 1 (4%) | 21 | 3 | 17 (77%) | 2 (50%) | See analysis for all taxa combined | | | | |
| **C2** | 28 | 40 | 0 | 1 | 0 (0%) | 0 | 1 | 0 (0%) | 1 (100%) | Not enough taxa encountered for a meaningful analysis | | | | |
| **NIS & C1** | 28 | 40 | 7 | 0 | 0 (0%) | 7 | 0 | 6 (86%) | 0 (0%) | Not enough taxa encountered for a meaningful analysis | | | | |
| **Native, C2, NIS & C1 taxa combined** | 28 | 40 | 29 | 5 | 1 (3%) | 28 | 4 | 23 (79%) | 3 (60%) | 0 | 0.03 | 0.059 | 0.023 | 0.044 |

# Appendices

## Appendix 1: Definitions of vessel types and geographical areas used in analyses of the LMIU shipping movements database

**A. Groupings of countries into geographical areas. A country may be included in more than one geographical area category if different parts of that country are considered (by LMIU) to belong to different geographical areas (for example, Canada occurs in the NE Canada and Great Lakes area and in the West Coast North America area). Only countries that occur in the database are listed in the table below.**

| Geographical area | Countries/locations included |
|---|---|
| Africa Atlantic coast | Angola |
| | The Congo |
| | Nigeria |
| Antarctica (includes Southern Ocean) | Antarctica |
| | Australia (Macquarie Island) |
| Australia | Australia (general) |
| | Australia (VIC) |
| | Australia (QLD) |
| | Australia (NSW) |
| | Australia (TAS) |
| | Australia (WA) |
| | Australia (NT) |
| | Australia (SA) |
| Black Sea coast | Russian Federation |
| Caribbean Islands | Bahamas |
| | Cuba |
| | Jamaica |
| | Puerto Rico |
| Central America inc Mexico to Panama | Costa Rica |
| | El Salvador |
| | Guatemala |
| | Mexico |
| | Panama |
| Central Indian Ocean | Bangladesh |
| | India |
| | Pakistan |
| | Sri Lanka |
| East Asian seas | Indonesia |
| | Malaysia |
| | Philippines |
| | Republic of Singapore |
| | Sultanate of Brunei |
| | Thailand |
| Eastern Mediterranean inc Cyprus, Turkey | Turkey |

| Geographical area | Countries/locations included |
|---|---|
| European Mediterranean coast | France |
| | Gibraltar |
| | Italy |
| | Malta |
| | Spain |
| Gulf of Mexico | United States of America |
| Gulf States | Iran |
| | Kuwait |
| | Saudi Arabia |
| | State of Qatar |
| | Sultanate of Oman |
| | United Arab Emirates |
| Japan | Japan |
| N.E. Canada and Great Lakes | Canada |
| New Zealand | New Zealand |
| Northwest Pacific | People's Republic of China |
| | Republic of Korea |
| | Russian Federation |
| | Taiwan |
| | Vietnam |
| North African coast | Algeria |
| | Arab Republic of Egypt |
| | Morocco |
| | Spain |
| | Tunisia |
| | Western Sahara |
| North European Atlantic coast | Belgium |
| | France |
| | Germany |
| | Netherlands |
| Pacific Islands | American Samoa |
| | Cook Islands |
| | Fiji |
| | French Polynesia |
| | Guam |
| | Independent State of Samoa |
| | Kiribati |
| | Marshall Islands |
| | New Caledonia |
| | Niue Island |
| | Norfolk Island |
| | Northern Marianas |
| | Papua New Guinea |
| | Pitcairn Islands |

| Geographical area | Countries/locations included |
|---|---|
| | Solomon Islands |
| | Tokelau Islands |
| | Tonga |
| | Tuvalu |
| | Vanuatu |
| | Wallis & Futuna |
| Red Sea coast inc up to the Persian Gulf | Arab Republic of Egypt |
| | Saudi Arabia |
| | Sudan |
| | Yemeni Republic |
| Scandinavia inc Baltic, Greenland, Iceland etc | Denmark |
| | Norway |
| | Poland |
| | Russian Federation |
| South & East African coasts | Heard & McDonald Islands |
| | Kenya |
| | Mauritius |
| | Mozambique |
| | Republic of Djibouti |
| | Republic of Namibia |
| | Reunion |
| | South Africa |
| South America Atlantic coast | Argentina |
| | Aruba |
| | Brazil |
| | Colombia |
| | Falkland Islands |
| | Netherlands Antilles |
| | Uruguay |
| | Venezuela |
| South America Pacific coast | Chile |
| | Ecuador |
| | Peru |
| Spain / Portugal inc Atlantic Islands | Canary Islands |
| | Portugal |
| | Spain |
| U.S, Atlantic coast including part of Canada | United States of America |
| United Kingdom inc Eire | United Kingdom |
| West coast North America inc USA, Canada & Alaska | Canada |
| | United States of America |

## B. Groupings of vessel sub-types according to LMIU definitions.

| Vessel type definition in this report | General type as listed in LMIU database | Sub type code from LMIU database | Definition of sub type in LMIU database |
|---|---|---|---|
| Bulk/ cement carrier | B | BU | bulk |
| | B | CB | bulk/c.c. |
| | B | CE | cement |
| | B | OR | ore |
| | B | WC | wood-chip |
| Bulk/ oil carrier | C | BO | bulk/oil |
| | C | OO | ore/oil |
| Dredge | D | BD | bucket dredger |
| | D | CH | cutter suction hopper dredger |
| | D | CS | cutter suction dredger |
| | D | DR | dredger |
| | D | GD | grab dredger |
| | D | GH | grab hopper dredger |
| | D | HD | hopper dredger |
| | D | SD | suction dredger |
| | D | SH | suction hopper dredger |
| | D | SS | sand suction dredger |
| | D | TD | trailing suction dredger |
| | D | TS | trailing suction hopper dredger |
| Fishing | F | FC | fish carrier |
| | F | FF | fish factory |
| | F | FP | fishery protection |
| | F | FS | fishing |
| | F | TR | trawler |
| | F | WF | whale factory |
| | F | WH | whaler |
| General cargo | G | CT | cargo/training |
| | G | GC | general cargo |
| | G | PC | part c.c. |
| | G | RF | ref |
| LPG / LNG | L | FP | floating production |
| | L | FS | floating storage |
| | L | NG | Lng |
| | L | NP | Lng/Lpg |
| | L | PG | Lpg |
| Passenger/ vehicle/ livestock | M | LV | livestock |
| | M | PR | passenger |
| | M | VE | vehicle |
| Other (includes pontoons, barges, mining & supply ships, etc) | O | BA | barge |
| | O | BS | buoy ship/supply |
| | O | BY | buoy ship |
| | O | CL | cable |
| | O | CP | cable pontoon |
| | O | CS | crane ship |
| | O | CX | crane barge |

| Vessel type definition in this report | General type as listed in LMIU database | Sub type code from LMIU database | Definition of sub type in LMIU database |
|---|---|---|---|
| | O | DE | depot ship |
| | O | DS | diving support |
| | O | ES | exhibition ship |
| | O | FL | floating crane |
| | O | FY | ferry |
| | O | HB | hopper barge |
| | O | HF | hydrofoil |
| | O | HL | semi-sub HL vessel |
| | O | HS | hospital ship |
| | O | HT | semi-sub HL/tank |
| | O | IB | icebreaker |
| | O | IF | icebreaker/ferry |
| | O | IS | icebreaker/supply |
| | O | IT | icebreaker/tender |
| | O | LC | landing craft |
| | O | LT | lighthouse tender |
| | O | MN | mining ship |
| | O | MS | mission ship |
| | O | MT | maintenance |
| | O | OS | offshore safety |
| | O | PA | patrol ship |
| | O | PC | pollution control vessel |
| | O | PD | paddle |
| | O | PI | pilot ship |
| | O | PL | pipe layer |
| | O | PO | pontoon |
| | O | PP | pipe carrier |
| | O | RD | radio ship |
| | O | RN | ro/ro pontoon |
| | O | RP | repair ship |
| | O | RX | repair barge |
| | O | SB | storage barge |
| | O | SC | sludge carrier |
| | O | SP | semi-sub pontoon |
| | O | SS | storage ship |
| | O | SU | support |
| | O | SV | salvage |
| | O | SY | supply |
| | O | SZ | standby safety vessel |
| | O | TB | tank barge |
| | O | TC | tank cleaning ship |
| | O | TN | tender |
| | O | TR | training |
| | O | WA | waste ship |
| | O | WO | work ship |
| | O | YT | yacht |
| Passenger ro/ro | P | RR | passenger ro/ro |
| Research | R | HR | hydrographic research |
| | R | MR | meteorological research |
| | R | OR | oceanographic research |

| Vessel type definition in this report | General type as listed in LMIU database | Sub type code from LMIU database | Definition of sub type in LMIU database |
|---|---|---|---|
| | R | RB | research/buoy ship |
| | R | RE | research |
| | R | RS | research/supply ship |
| | R | SR | seismographic research |
| Tanker (including chemical/ oil / ashphalt etc) | T | AC | acid tanker |
| | T | AS | asphalt tanker |
| | T | BK | bunkering tanker |
| | T | CH | chem.tank |
| | T | CO | chemical/oil carrier |
| | T | CR | crude oil tanker |
| | T | EO | edible oil tanker |
| | T | FJ | fruit juice tanker |
| | T | FO | fish oil tanker |
| | T | FP | floating production |
| | T | FS | floating storage |
| | T | MO | molasses tanker |
| | T | NA | naval auxiliary |
| | T | PD | product tanker |
| | T | TA | non specific tanker |
| | T | WN | wine tank |
| | T | WT | water tanker |
| Container/ unitised carrier and ro/ro | U | BC | barge carrier/c.c. |
| | U | BG | barge carrier |
| | U | CC | c.c. container/unitised carrier |
| | U | CR | c.c.ref |
| | U | RC | ro/ro/c.c. |
| | U | RR | ro/ro |
| Tug | X | AA | anchor handling salvage tug |
| | X | AF | anchor handling firefighting tug/supply |
| | X | AG | anchor handling firefighting tug |
| | X | AH | anchor handling tug/supply |
| | X | AT | anchor handling tug |
| | X | CT | catamaran tug |
| | X | FF | firefighting tug |
| | X | FS | firefighting tug/supply |
| | X | FT | firefighting tractor tug |
| | X | PT | pusher tug |
| | X | ST | salvage tug |
| | X | TG | tug |
| | X | TI | tug/icebreaker |
| | X | TP | tug/pilot ship |
| | X | TR | tractor tug |
| | X | TS | tug/supply |
| | X | TT | tug/tender |
| | X | TX | tug/support |

# Appendix 2. Geographic locations of sample sites in the Port of Wellington second baseline survey (NZGD49)

| Site | Eastings | Northings | NZ Latitude | NZ Longitude | Survey Method* | Number of sample units |
|---|---|---|---|---|---|---|
| Aotea Quay North | 2659648 | 5991863 | -41.265783 | 174.786167 | BGRB | 3 |
| Aotea Quay North | 2659638 | 5991903 | -41.2653 | 174.78595 | CRBTP | 2 |
| Aotea Quay North | 2659642 | 5991901 | -41.265317 | 174.786 | CRBTP | 2 |
| Aotea Quay North | 2659648 | 5991863 | -41.265783 | 174.786167 | CYST | 2 |
| Aotea Quay North | 2659645 | 5991856 | -41.26585 | 174.786217 | FSHTP | 4 |
| Aotea Quay North | 2659647 | 5991857 | -41.265833 | 174.786233 | PSC | 16 |
| Aotea Quay North | 2659638 | 5991903 | -41.2653 | 174.78595 | SHRTP | 2 |
| Aotea Quay North | 2659642 | 5991901 | -41.265317 | 174.786 | SHRTP | 2 |
| Aotea Quay North | 2659638 | 5991903 | -41.2653 | 174.78595 | STFTP | 2 |
| Aotea Quay North | 2659642 | 5991901 | -41.265317 | 174.786 | STFTP | 2 |
| Aotea Quay South | 2659833 | 5990985 | -41.274017 | 174.788467 | BGRB | 3 |
| Aotea Quay South | 2659845 | 5991042 | -41.2735 | 174.788583 | BSLD | 1 |
| Aotea Quay South | 2659859 | 5990925 | -41.27455 | 174.788783 | BSLD | 1 |
| Aotea Quay South | 2659817 | 5991080 | -41.273167 | 174.78825 | CRBTP | 4 |
| Aotea Quay South | 2659837 | 5990990 | -41.273967 | 174.788517 | CYST | 2 |
| Aotea Quay South | 2659810 | 5991110 | -41.2729 | 174.788167 | FSHTP | 4 |
| Aotea Quay South | 2659813 | 5991035 | -41.273433 | 174.78835 | PSC | 16 |
| Aotea Quay South | 2659817 | 5991080 | -41.273167 | 174.78825 | SHRTP | 4 |
| Aotea Quay South | 2659817 | 5991080 | -41.273167 | 174.78825 | STFTP | 4 |
| Burnham | 2661699 | 5986950 | -41.3118 | 174.811783 | BGRB | 3 |
| Burnham | 2661661 | 5986902 | -41.312233 | 174.811333 | BSLD | 1 |
| Burnham | 2661663 | 5986967 | -41.31165 | 174.811333 | BSLD | 1 |
| Burnham | 2661685 | 5986885 | -41.312383 | 174.811633 | CRBTP | 4 |
| Burnham | 2661699 | 5986950 | -41.3118 | 174.811783 | CYST | 2 |
| Burnham | 2661699 | 5986948 | -41.311817 | 174.811783 | FSHTP | 8 |
| Burnham | 2661699 | 5986950 | -41.3118 | 174.811783 | PSC | 16 |
| Burnham | 2661685 | 5986885 | -41.312383 | 174.811633 | SHRTP | 3 |
| Burnham | 2661685 | 5986885 | -41.312383 | 174.811633 | STFTP | 4 |
| Kings Wharf | 2659438 | 5990186 | -41.281283 | 174.78395 | BGRB | 3 |
| Kings Wharf | 2659323 | 5990314 | -41.28015 | 174.78255 | BSLD | 1 |
| Kings Wharf | 2659364 | 5990345 | -41.279483 | 174.783267 | BSLD | 1 |
| Kings Wharf | 2659435 | 5990128 | -41.277933 | 174.78395 | CRBTP | 4 |
| Kings Wharf | 2659339 | 5990392 | -41.27945 | 174.782717 | CYST | 2 |
| Kings Wharf | 2659429 | 5990190 | -41.28125 | 174.78385 | FSHTP | 4 |
| Kings Wharf | 2659438 | 5990182 | -41.281317 | 174.78395 | PSC | 16 |
| Kings Wharf | 2659435 | 5990128 | -41.277933 | 174.78395 | SHRTP | 2 |
| Kings Wharf | 2659435 | 5990128 | -41.277933 | 174.78395 | STFTP | 4 |
| Miramar | 2661574 | 5986704 | -41.314033 | 174.81035 | BSLD | 1 |
| Miramar | 2661641 | 5986815 | -41.313017 | 174.811133 | BSLD | 1 |
| Miramar | 2661641 | 5986803 | -41.313133 | 174.811133 | CRBTP | 2 |
| Miramar | 2661683 | 5986802 | -41.313133 | 174.811633 | CRBTP | 2 |
| Miramar | 2661641 | 5986803 | -41.313133 | 174.811133 | SHRTP | 2 |
| Miramar | 2661683 | 5986802 | -41.313133 | 174.811633 | SHRTP | 2 |

| Site | Eastings | Northings | NZ Latitude | NZ Longitude | Survey Method* | Number of sample units |
|---|---|---|---|---|---|---|
| Miramar | 2661641 | 5986803 | -41.313133 | 174.811133 | STFTP | 2 |
| Miramar | 2661683 | 5986802 | -41.313133 | 174.811633 | STFTP | 2 |
| Overseas Passenger Terminal | 2659595 | 5989329 | -41.288967 | 174.786033 | BGRB | 3 |
| Overseas Passenger Terminal | 2659602 | 5989323 | -41.289017 | 174.786117 | BSLD | 1 |
| Overseas Passenger Terminal | 2659626 | 5989214 | -41.29 | 174.786417 | BSLD | 1 |
| Overseas Passenger Terminal | 2659598 | 5989285 | -41.289367 | 174.786067 | CRBTP | 4 |
| Overseas Passenger Terminal | 2659595 | 5989329 | -41.288967 | 174.786033 | CYST | 2 |
| Overseas Passenger Terminal | 2659601 | 5989263 | -41.289567 | 174.786117 | FSHTP | 4 |
| Overseas Passenger Terminal | 2659569 | 5989364 | -41.288567 | 174.7854 | PSC | 16 |
| Overseas Passenger Terminal | 2659598 | 5989285 | -41.289367 | 174.786067 | SHRTP | 3 |
| Overseas Passenger Terminal | 2659598 | 5989285 | -41.289367 | 174.786067 | STFTP | 4 |
| Queens Wharf | 2659103 | 5989729 | -41.28575 | 174.7802 | BGRB | 3 |
| Queens Wharf | 2659081 | 5989721 | -41.285767 | 174.779983 | BSLD | 1 |
| Queens Wharf | 2659129 | 5989760 | -41.285183 | 174.7798 | BSLD | 1 |
| Queens Wharf | 2659107 | 5989904 | -41.283883 | 174.780067 | CRBTP | 4 |
| Queens Wharf | 2659113 | 5989920 | -41.283733 | 174.780133 | FSHTP | 4 |
| Queens Wharf | 2659094 | 5989729 | -41.28575 | 174.780083 | PSC | 14 |
| Queens Wharf | 2659107 | 5989904 | -41.283883 | 174.780067 | SHRTP | 2 |
| Queens Wharf | 2659107 | 5989904 | -41.283883 | 174.780067 | STFTP | 4 |
| Queens Wharf South | 2659094 | 5989728 | -41.285767 | 174.780083 | CRBTP | 2 |
| Queens Wharf South | 2659098 | 5989729 | -41.28575 | 174.780133 | CRBTP | 2 |
| Queens Wharf South | 2659094 | 5989728 | -41.285767 | 174.780083 | SHRTP | 1 |
| Queens Wharf South | 2659098 | 5989729 | -41.28575 | 174.780133 | SHRTP | 1 |
| Queens Wharf South | 2659094 | 5989728 | -41.285767 | 174.780083 | STFTP | 2 |
| Queens Wharf South | 2659098 | 5989729 | -41.28575 | 174.780133 | STFTP | 2 |
| Queens Wharf Southeast | 2659098 | 5989733 | -41.2857 | 174.7802 | FSHTP | 4 |
| Rail Ferry Terminal | 2659656 | 5991904 | -41.265417 | 174.786333 | BSLD | 1 |
| Rail Ferry Terminal | 2659668 | 5991899 | -41.26545 | 174.786483 | BSLD | 1 |
| Thorndon Container Wharf | 2659970 | 5990314 | -41.280033 | 174.790267 | BGRB | 3 |
| Thorndon Container Wharf | 2659974 | 5990495 | -41.2784 | 174.790267 | BSLD | 1 |
| Thorndon Container Wharf | 2659979 | 5990386 | -41.279383 | 174.790367 | BSLD | 1 |
| Thorndon Container Wharf | 2659949 | 5990294 | -41.280217 | 174.790017 | CRBTP | 4 |
| Thorndon Container Wharf | 2659992 | 5990294 | -41.280117 | 174.790267 | CYST | 1 |
| Thorndon Container Wharf | 2659995 | 5990292 | -41.280117 | 174.790267 | CYST | 1 |
| Thorndon Container Wharf | 2659949 | 5990294 | -41.280217 | 174.790017 | FSHTP | 4 |

| Site | Eastings | Northings | NZ Latitude | NZ Longitude | Survey Method* | Number of sample units |
|---|---|---|---|---|---|---|
| Thorndon Container Wharf | 2659949 | 5990294 | -41.280217 | 174.790017 | SHRTP | 2 |
| Thorndon Container Wharf | 2659949 | 5990294 | -41.280217 | 174.790017 | STFTP | 4 |
| Waterloo Wharf | 2659095 | 5990083 | -41.27825 | 174.780517 | BGRB | 3 |
| Waterloo Wharf | 2659155 | 5990170 | -41.281483 | 174.780583 | CRBTP | 4 |
| Waterloo Wharf | 2659170 | 5990197 | -41.281233 | 174.78075 | CYST | 2 |
| Waterloo Wharf | 2659107 | 5990163 | -41.28155 | 174.78 | FSHTP | 4 |
| Waterloo Wharf | 2659155 | 5990170 | -41.281483 | 174.780583 | SHRTP | 1 |
| Waterloo Wharf | 2659155 | 5990170 | -41.281483 | 174.780583 | STFTP | 4 |

*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 3: Specialists engaged to identify specimens obtained from the New Zealand port surveys

| Major taxonomic group | Class | Specialist Survey 1 samples | Specialist Survey 2 samples | Institution |
|---|---|---|---|---|
| **Annelida** | Polychaeta | Geoff Read[1], Jeff Forman[1] | Geoff Read[1], Jeff Forman[1] | [1]NIWA Greta Point |
| **Bryozoa** | Gymnolaemata | Dennis Gordon[1] | Dennis Gordon[1] | [1]NIWA Greta Point |
| **Chelicerata** | Pycnogonida | David Staples[2] | David Staples[2] | [2]Melbourne Museum, Victoria, Australia |
| **Cnidaria** | Anthozoa | Adorian Ardelean[3] | No specialist available as yet | [3]West University of Timisoara, Timisoara, 1900, Romania |
| **Cnidaria** | Hydrozoa | Jan Watson[4] | Jan Watson[4] | [4]Hydrozoan Research Laboratory, Clifton Springs, Victoria, Australia |
| **Crustacea** | Amphipoda | Graham Fenwick[5] | Graham Fenwick[5] | [5]NIWA Christchurch |
| **Crustacea** | Cirripedia | Graham Fenwick[5], Isla Fitridge[5] John Buckeridge[6] | Isla Fitridge[5] | [5]NIWA Christchurch and [6]Auckland University of Technology |
| **Crustacea** | Decapoda | Colin McLay[7] Graham Fenwick[5], Nick Gust[5] | Colin McLay[7] | [7]University of Canterbury and [5]NIWA Christchurch |
| **Crustacea** | Isopoda | Niel Bruce[1] | Niel Bruce[1] | [1]NIWA Greta Point |
| **Crustacea** | Mysidacea | Fukuoka Kouki[8] | Niel Bruce[1] | [1]NIWA Greta Point and [8]National Science Museum, Tokyo |
| **Echinodermata** | Asteroidea | Don McKnight[1] | Niki Davey[9] | [1]NIWA Greta Point and [9]NIWA Nelson |
| **Echinodermata** | Echinoidea | Don McKnight[1] | Niki Davey[9] | [1]NIWA Greta Point and [9]NIWA Nelson |
| **Echinodermata** | Holothuroidea | Niki Davey[9] | Niki Davey[9] | [9]NIWA Nelson |
| **Echinodermata** | Ophiuroidea | Don McKnight[1], Helen Rottman[1] | Niki Davey[9] | [1]NIWA Greta Point and [9]NIWA Nelson |
| **Echiura** | Echiuroidea | Geoff Read[1] | Geoff Read[1] | [1]NIWA Greta Point |
| **Mollusca** | Bivalvia. Cephalopoda, Gastropoda, Polyplacophora | Bruce Marshall[10] | Bruce Marshall[10] | [10]Museum of NZ Te Papa Tongarewa |
| **Nemertea** | Anopla, Enopla | Geoff Read[1] | Geoff Read[1] | [1]NIWA Greta Point |
| **Macroalgae** | Phaeophyceae, Rhodophyceae, Ulvophyceae | Wendy Nelson[1], Kate Neill[1] | Wendy Nelson[1], Kate Neill[1] | [1]NIWA Greta Point |
| **Platyhelminthes** | Turbellaria | Sean Handley[9] | Sean Handley[9] | [9]NIWA Nelson |
| **Porifera** | Demospongiae, Calcarea | Michelle Kelly-Shanks[11] | Michelle Kelly-Shanks[11] | [11]NIWA Auckland |
| **Priapula** | Priapulidae | Geoff Read[1] | Geoff Read[1] | [1]NIWA Greta Point |
| **Pyrrophycophyta** | Dinophyceae | Hoe Chang[1], Rob Stewart[1] | Hoe Chang[1], Rob Stewart[1] | [1]NIWA Greta Point |
| **Urochordata** | Ascidiacea | Mike Page[e], Anna Bradley[e] Patricia Kott[12] | Mike Page[9], Anna Bradley[9] | [9]NIWA Nelson and [12]Queensland Museum |
| **Vertebrata** | Osteichthyes | Clive Roberts[10], Andrew Stewart[10] | Clive Roberts[10], Andrew Stewart[10] | [10]Museum of NZ Te Papa Tongarewa |

## Appendix 4: 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 Arthropoda

The Arthropoda is a very large group of organisms, with well-known members including crustaceans, insects and spiders.

**Crustaceans:** The crustaceans (including Classes Malacostra, Cirripedia and other smaller classes) represent one of the sea's most diverse groups of organisms, including shrimps, crabs, lobsters, amphipods, tanaids and several other groups. 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.

**Pycnogonids:** The pycnogonids, or sea spiders, are 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.

### Phyla Chlorophyta, Rhodophyta and Ochrophyta

**Macroalgae:** Marine macroalgae are highly diverse and are grouped under several phyla. The green algae are in Phylum Chlorophyta; red algae are in Phylum Rhodophyta, and the brown algae are in Phylum Ochrophyta. Whilst the green and red algae fall under Kingdom Plantae, the brown algae (Phylum Ochrophyta) are grouped in the Kingdom Chromista. Despite their disparate systematics, red, green and brown algae perform many similar ecological functions. 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.

### Phylum Chordata

**Ascidiacea:** Ascidians are sometimes referred to as 'sea squirts' or 'tunicates'. 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.

**Actinopterygii:** The Class Actinopterygii refers to the ray-finned fishes. This is an extremely diverse group. 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. They can be classified ecologically according to depth habitat preferences; for example, fish that live on or near the sea floor are considered demersal while those living in the upper water column are termed pelagics.

**Elasmobranchii:** The Class Elasmobranchii are one of two classes of cartilaginous fishes, including sharks, skates and rays.

**Phylum Cnidaria**
**Anthozoa:** The Class Anthozoa includes the true corals, sea anemones and sea pens.
**Hydrozoa:** The Class Hydrozoa includes hydroids, fire corals and many medusae. Of these, only hydroids were recorded in the port surveys. 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.
**Scyphozoa:** Scyphozoans are the true jellyfish.

**Phylum Dinophyta**
**Dinoflagellates:** Dinoflagellates are a large group of unicellular algae that live in the water column or within the sediments. 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 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 Ectoprocta**
**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  Magnoliophyta**
**Seagrasses:** The Magnoliophyta are the flowering plants, or angiosperms. Most of these are terrestrial, but the Magnoliophyta also include marine representatives – the seagrasses. The only Mangnoliophyte encountered in the port surveys was the seagrass *Zostera*.

**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 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.

## Appendix 5: Criteria for assigning non-indigenous status to species sampled from the Port of Wellington in the second survey.

**List of Chapman and Carlton's (1994) nine criteria (C1 – C9) for assigning non-indigenous species status that were met by the non-indigenous species sampled in the Port of Wellington in the second survey. Criteria that apply to each species are indicated by (+). Cranfield et al's (1998) analysis was used for species previously known from New Zealand waters. For non-indigenous species that were first detected during the present study, criteria were assigned using advice from the taxonomists that identified them. Refer to footnote for a full description of C1 – C9.**

| Major taxonomic group and Species | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **Annelida** | | | | | | | | | |
| *Spirobranchus polytrema* | + | | + | | + | | | + | |
| *Polydora hoplura* | | | + | | + | + | + | + | + |
| | | | | | | | | | |
| **Bryozoa** | | | | | | | | | |
| *Bugula flabellata* | + | + | + | | + | + | + | + | + |
| *Cryptosula pallasiana* | + | + | + | | + | + | + | + | + |
| *Cyclicopora longipora* | + | | + | | + | + | | + | + |
| *Watersipora subtorquata* | + | + | + | | + | + | + | + | + |
| | | | | | | | | | |
| **Cnidaria** | | | | | | | | | |
| *Monotheca pulchella* | + | | + | | + | | + | + | |
| *Sertularia marginata* | + | | + | | + | | + | + | |
| *Eudendrium generale* | + | | + | | + | + | | + | |
| | | | | | | | | | |
| **Crustacea** | | | | | | | | | |
| *Monocorophium acherusicum* | | | + | | + | + | | + | + |
| | | | | | | | | | |
| **Mollusca** | | | | | | | | | |
| *Theora lubrica* | + | + | | | + | + | + | + | + |
| | | | | | | | | | |
| **Macroalgae** | | | | | | | | | |
| *Griffithsia crassiuscula* | + | + | | | | + | | + | + |
| *Undaria pinnatifida* | + | + | + | | + | + | + | + | + |

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 6a. Results from the pile scraping quadrates (replicates 1 to 4) and diver pile observations (replicates labelled "0").

Appendix 6a. Results from the diver collections and pile scrapings.

| | | | | | | Site code | Aotea Quay North | | | | | | | | | | | | | | | | | | Aotea Quay South | | | | | | | | | | | | | | | | | | Burnham | | | | | | | | | | | | | | | | | | Kings Wharf | | | | | | | | | | | | | | | | | | | Overseas Passenger Terminal | | | | | | | | | | | | | | | | | | | | Queens Wharf | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Pile replicate | 1 | | | | | | | | | 2 | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | | | 1 | | | | | | | | | | 2 | | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | |
| | | | | | | Pile position | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | | OUT | | | | | IN | | | | | OUT | | | | | IN | | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | | OUT | | | |
| phylum | class | order | family | genus | species | *class_code |1|2|3|4|0|1|2|3|4|1|2|3|4|0|1|2|3|4|1|2|3|4|0|1|2|3|4|1|2|3|4|0|1|2|3|4|1|2|3|4|0|1|2|3|4|1|2|3|4|0|1|2|3|4|1|2|3|4|0|1|2|3|4|0|1|2|3|4|0|1|2|3|4|0|1|2|3|4|0|1|2|3|4|0|1|2|3|4|0|1|2|3|4|0|1|2|3|0|1|2|3|4|0|1|2|3|4|0|1|2|3|
| Annelida | Polychaeta | Eunicida | Dorvilleidae | Dorvillea | australiensis | N |0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|1|0|0|1|0|1|0|0|0|0|0|0|0|1|0|1|0|0|0|0|1|0|1|1|0|0|0|0|1|1|0|1|1|0|0|0|0|0|0|0|0|1|0|1|0|0|1|1|0|0|0|1|0|0|0|0|1|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|
| Annelida | Polychaeta | Eunicida | Dorvilleidae | Schistomeringos | loveni | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Eunicida | Dorvilleidae | Unknown | sp_undet | SI |0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Eunicida | Eunicidae | Eunice | australis | N |0|0|1|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Eunicida | Eunicidae | Eunice | laticeps | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Eunicida | Lumbrineridae | Lumbrineris | sphaerocephala | N |0|1|0|1|0|0|0|1|1|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|1|0|1|0|0|0|0|1|1|0|0|1|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|1|1|0|0|0|1|0|0|0|1|0|0|0|0|1|1|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|
| Annelida | Polychaeta | Phyllodocida | Nereididae | Neanthes | kerguelensis | N |0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|1|1|1|0|0|0|0|0|0|0|1|1|0|1|1|1|0|0|1|0|1|0|0|1|1|0|0|0|1|1|0|1|1|1|0|0|1|0|1|0|0|1|1|0|0|0|0|0|0|0|1|1|1|0|0|1|1|1|0|0|0|0|0|0|0|0|0|0|0|1|1|1|0|0|1|0|0|0|0|0|1|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|
| Annelida | Polychaeta | Phyllodocida | Nereididae | Nereis | falcaria | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Nereididae | Perinereis | amblyodonta | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|1|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|1|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | 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|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Nereididae | Platynereis | Platynereis_australis_group | N |0|0|0|0|0|1|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Eulalia | capensis | 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|0|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|0|0|0|0|0|0|0|0|0|0|0|1|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Eulalia | Eulalia-NIWA-2 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|1|0|0|0|0|1|0|0|0|1|0|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|1|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Pirakia | Pirakia-A | C2 |0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Polynoidae | Lepidastheniella | comma | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Polynoidae | Lepidonotus | jacksoni | N |0|0|1|1|0|0|0|1|0|0|1|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|1|1|0|0|0|1|0|0|0|1|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|1|0|0|0|1|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Polynoidae | Lepidonotus | polychromus | N |0|1|0|0|0|0|0|0|1|0|0|0|0|0|0|1|1|0|0|0|1|0|0|0|0|1|0|0|1|0|0|0|0|1|0|0|1|1|0|1|0|0|1|0|1|0|1|1|0|0|1|1|0|1|0|1|1|0|0|0|0|0|0|0|0|0|1|0|0|0|1|1|0|0|0|1|0|0|0|0|1|1|1|0|0|1|1|0|0|0|1|1|1|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|
| Annelida | Polychaeta | Phyllodocida | Polynoidae | Ophiodromus | angustifrons | N |0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|0|0|1|0|0|0|0|0|1|0|0|0|0|1|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|
| Annelida | Polychaeta | Phyllodocida | Syllidae | Eusyllin-unknown | Eusyllin-unknown-A | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|1|0|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Syllidae | Eusyllis | Eusyllis-A | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Syllidae | Haplosyllis | spongicola | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Syllidae | Trypanosyllis | gigantea | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Syllidae | Typosyllis | sp_undet | SI |0|0|0|1|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Syllidae | Typosyllis | Typosyllis-A | C2 |0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Phyllodocida | Syllidae | Typosyllis | Typosyllis-B | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Sabellidae | Megalomma | suspiciens | N |0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|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|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Serpulidae | Galeolaria | hystrix | N |0|1|0|1|0|0|1|0|1|0|1|1|1|0|0|1|0|1|0|0|0|0|0|0|1|0|1|0|1|0|1|0|0|1|0|0|0|1|0|1|0|0|0|1|0|0|0|1|0|0|0|1|1|1|0|1|0|1|0|0|0|0|0|0|0|0|1|1|0|0|0|1|0|0|0|0|1|0|0|0|1|0|1|0|0|1|1|0|0|0|1|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Serpulidae | Neovermilia | sphaeropomatus | N |0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | 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|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Serpulidae | Serpula | Serpula-C | C2 |0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Serpulidae | Serpula | Serpula-D | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Serpulidae | Serpulidae | Indet | SI |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Serpulidae | Simplaria | ovata | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Serpulidae | Spirobranchus | Indet | SI |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Serpulidae | Spirobranchus | polytrema | A |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Sabellida | Serpulidae | spirorbins genus undet | sp_undet | SI |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|
| Annelida | Polychaeta | Spionida | Spionidae | Dipolydora | dorsomaculata | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Spionida | Spionidae | Polydora | hoplura | A |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Annelida | Polychaeta | Terebellida | Acrocirridae | Acrocirrus | trisectus | N |0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Terebellida | Cirratulidae | Protocirrineris | nuchalis | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Terebellida | Cirratulidae | Timarete | anchylochaetus | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|1|0|0|1|0|1|0|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Terebellida | Flabelligeridae | Pherusa | parmata | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Terebellida | Terebellidae | Lanassa | Lanassa-A | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Annelida | Polychaeta | Terebellida | Terebellidae | Nicolea | armilla | 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|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|1|0|1|1|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|1|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|
| Annelida | Polychaeta | Terebellida | Terebellidae | Pista | pegma | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Annelida | Polychaeta | Terebellida | Terebellidae | Pseudopista | rostrata | N |0|0|0|1|0|0|0|1|1|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|1|0|1|0|0|1|1|0|0|1|1|1|0|0|0|1|1|0|0|1|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|0|0|1|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|
| Annelida | Polychaeta | Terebellida | Terebellidae | Streblosoma | toddae | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | Polychaeta | Terebellida | Terebellidae | Terebella | Terebella-B | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Annelida | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | | | | | | SI |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|1|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Arachnopusiidae | Arachnopusia | unicornis | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Beaniidae | Beania | sp. | N |0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|1|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|1|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Bitectiporidae | Schizosmittina | cinctipora | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Ectoprocta | Gymnolaemata | Cheilostomata | Bugulidae | Bugula | flabellata | A |0|1|1|1|0|0|0|1|0|0|0|1|1|0|0|0|0|0|0|0|1|1|0|1|0|1|1|0|0|1|0|0|0|0|1|1|0|0|1|0|0|0|0|1|0|0|0|0|0|1|0|0|0|0|0|1|0|0|0|0|0|1|1|0|0|0|1|1|0|0|0|0|1|0|0|1|1|0|0|0|0|0|1|0|0|0|1|0|0|0|0|1|1|0|0|1|0|0|0|0|0|0|0|0|0|0|1|0|0|1|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Calloporidae | Crassimarginatella | papulifera | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Candidae | Caberea | rostrata | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|1|1|0|0|0|1|1|0|1|1|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Candidae | Scrupocellaria | ornithorhyncus | 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|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | 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|0|0|0|0|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Chaperiidae | Chaperiopsis | cervicornis | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Ectoprocta | Gymnolaemata | Cheilostomata | Crepidacanthidae | Crepidacantha | crinispina | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Cyclicoporidae | Cyclicopora | longipora | A |0|0|0|1|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|1|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|1|1|1|0|0|0|1|1|0|0|1|1|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Eurystomellidae | Eurystomella | foraminigera | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|1|0|0|1|0|0|0|1|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Hippothoidae | Celleporella | bathamae | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Hippothoidae | Celleporella | tongima | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Lacernidae | Rogicka | biserialis | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Microporellidae | Fenestrulina | thyreophora | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Ectoprocta | Gymnolaemata | Cheilostomata | Microporellidae | Microporella | speculum | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Ectoprocta | Gymnolaemata | Cheilostomata | Romancheinidae | Escharoides | angela | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|0|0|0|1|1|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Romancheinidae | Exochella | conjuncta | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Ectoprocta | Gymnolaemata | Cheilostomata | Scrupariidae | Scruparia | ambigua | C1 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Smittinidae | Smittina | rosacea | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Steginoporellidae | Steginoporella | magnifica | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Gymnolaemata | Cheilostomata | Watersiporidae | Watersipora | subtorquata | A |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|1|0|0|0|1|0|0|1|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|1|1|1|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|0|0|0|0|1|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Stenolaemata | Cyclostomata | Crisiidae | Crisia | tenuis | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ectoprocta | Stenolaemata | Cyclostomata | Tubuliporidae | Tubulipora | sp. | SI |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|
| Cnidaria | Hydrozoa | Hydroida | Campanulariidae | Clytia | elongata | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Cnidaria | Hydrozoa | Hydroida | Campanulariidae | Clytia | hemisphaerica | 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|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Cnidaria | Hydrozoa | Hydroida | Eudendriidae | Eudendrium | generale | A |0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|1|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|1|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|

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

Appendix 6a. Results from the diver collections and pile scrapings.

| | | | | | | Site code | Aotea Quay North | | | | | | | | | | | | | | | | | | Aotea Quay South | | | | | | | | | | | | | | | | | | Burnham | | | | | | | | | | | | | | | | | | Kings Wharf | | | | | | | | | | | | | | | | | | | Overseas Passenger Terminal | | | | | | | | | | | | | | | | | | | | Queens Wharf | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Pile replicate | 1 | | | | | | | | | 2 | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | | | 1 | | | | | | | | | | 2 | | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | |
| | | | | | | Pile position | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | | OUT | | | | | IN | | | | | OUT | | | | | IN | | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | | OUT | | | |
| Cnidaria | Hydrozoa | Hydroida | Plumulariidae | Monotheca | pulchella | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cnidaria | Hydrozoa | Hydroida | Plumulariidae | Plumularia | setacea | C1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cnidaria | 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 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| Cnidaria | Hydrozoa | Hydroida | Sertulariidae | Sertularia | marginata | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Cirripedia | Thoracica | Balanidae | Austrominius | modestus | N | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| Arthropoda | Cirripedia | Thoracica | Balanidae | Notomegabalanus | decorus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Cirripedia | Thoracica | Chthamalidae | Chaemosipho | columna | N | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | | | | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | 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 | 0 | 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 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | Eusiridae | Gondogeneia | danai | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | Eusiridae | Paramoera | chevreuxi | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | Isaeidae | Gammaropsis | indet sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | Isaeidae | Gammaropsis | typica | N | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | Leucothoidae | Leucothoe | sp. 1 | C2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Arthropoda | Malacostraca | Amphipoda | Leucothoidae | Paraleucothoe | sp. 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | Lysianassidae | Parawaldeckia | vesca | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | Melitidae | Melita | inaequistylis | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 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 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Anomura | Paguridae | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Anomura | Porcellanidae | Petrolisthes | elongatus | N | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| Arthropoda | Malacostraca | Anomura | Porcellanidae | Petrolisthes | novaezelandiae | N | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| Arthropoda | Malacostraca | Brachyura | Hymenosomatidae | Halicarcinus | cookii | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Hymenosomatidae | Halicarcinus | innominatus | N | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 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 |
| Arthropoda | Malacostraca | Brachyura | Hymenosomatidae | Halicarcinus | varius | 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 | 0 | 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 | 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 | 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 | 1 | 0 |
| Arthropoda | Malacostraca | Brachyura | Hymenosomatidae | Neohymenicus | pubescens | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Leptomithrax | longimanus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Notomithrax | minor | N | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Notomithrax | ursus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Ocypodidae | Macrophthalmus | hirtipes | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Pinnotheridae | Pinnotheres | novaezelandiae | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Xanthidae | Pilumnus | lumpinus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Xanthidae | Pilumnus | novaezealandiae | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Isopoda | Sphaeromatidae | Ischyromene | kokotahi | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Isopoda | Sphaeromatidae | Pseudosphaeroma | campbellensis | N | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Mysidacea | | Mysidacea | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Echinodermata | Asteroidea | Valvatida | Asterinidae | Meridiastra | mortenseni | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Echinodermata | Asteroidea | Valvatida | Asterinidae | Patiriella | regularis | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 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 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Myoida | Hiatellidae | Hiatella | arctica | N | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 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 | 0 |
| Mollusca | Bivalvia | Mytiloida | Mytilidae | Aulacomya | atra maoriana | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Mytiloida | Mytilidae | Modiolarca | impacta | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Mytiloida | Mytilidae | Mytilus | galloprovincialis | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 |
| Mollusca | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Ostreoida | Ostreidae | Ostrea | chilensis | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Pterioida | Anomiidae | Pododesmus | zelandicus | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Mollusca | Bivalvia | Pterioida | Pectinidae | Talochlamys | zelandiae | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 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 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Veneroida | Lasaeidae | Lasaea | hinemoa | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Veneroida | Semelidae | Leptomya | retiaria | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Veneroida | Veneridae | Irus | reflexus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Veneroida | Veneridae | Tawera | spissa | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Littorinimorpha | Littorinidae | Risellopsis | varia | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Neogastropoda | Buccinidae | Buccinulum | linea | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Neogastropoda | Muricidae | Xymene | plebeius | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Notaspidea | Pleurobranchidae | Berthella | medietas | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Nudibranchia | Chromodorididae | Chromodoris | aureomarginata | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Patellogastropoda | Lottiidae | Notoacmea | helmsi | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Patellogastropoda | Lottiidae | Notoacmea | parviconoidea | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Vetigastropoda | Fissurellidae | Tugali | suteri | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Vetigastropoda | Trochidae | Trochus | tiaratus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Polyplacophora | Acanthochitonina | Acanthochitonidae | Acanthochitona | zelandica | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Polyplacophora | Acanthochitonina | Acanthochitonidae | Cryptoconchus | porosus | N | 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 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 0 | 0 | 0 |
| Mollusca | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Polyplacophora | Ischnochitonina | Mopaliidae | Plaxiphora | obtecta | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Algae (Unidentified) | | | | | | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | | | | | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Anotrichium | crinitum | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Anotrichium? | | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Callithamnion | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Ceramium | rubrum | N | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Griffithsia | crassiuscula | A | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Griffithsia | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Medeiothamnion | lyallii | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Pterothamnion | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | | | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Apoglossum | montagneanum | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Hymenena | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Hymenena | variolosa | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Myriogramme | denticulata | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Phycodrys | quercifolia | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Phycodrys? | | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Schizoseris | dichotoma | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

Appendix 6a. Results from the diver collections and pile scrapings.

| | | | | | | Site code | Aotea Quay North | | | | | | | | | | | | | | | | | | Aotea Quay South | | | | | | | | | | | | | | | | | | Burnham | | | | | | | | | | | | | | | | | | Kings Wharf | | | | | | | | | | | | | | | | | | | Overseas Passenger Terminal | | | | | | | | | | | | | | | | | | | | Queens Wharf | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Pile replicate | 1 | | | | | | | | | 2 | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | | | 1 | | | | | | | | | | 2 | | | | | | | | | | 1 | | | | | | | | | 2 | | | | | | | | |
| | | | | | | Pile position | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | | OUT | | | | | IN | | | | | OUT | | | | | IN | | | | | OUT | | | | | IN | | | | OUT | | | | | IN | | | | | OUT | | | |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Schizoseris | griffithsia | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Schizoseris | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Valeriemaya | undescribed | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Ceramiales | Rhodomelaceae | Bostrychia | harveyi | N |1|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Rhodophyta | Florideophyceae | Ceramiales | Rhodomelaceae | Polysiphonia | sp. | SI |0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Corallinales | Corallinaceae | | | SI |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Corallinales | Corallinaceae | Haliptilon | roseum | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Gigartinales | Cystocloniaceae | Rhodophyllis | sp. | SI |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Gigartinales | Gigartinaceae | Gigartina | atropurpurea | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Gigartinales | Kallymeniaceae | Callophyllis | sp. | SI |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Gracilariales | Gracilariaceae | Gracilaria | truncata | N |0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Rhodymeniales | Rhodomeniaceae | Rhodymenia | novazelandica | N |0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Rhodophyta | Florideophyceae | Rhodymeniales | Rhodomeniaceae | 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|1|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ochrophyta | Phaeophyceae | | | | | SI |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|
| Ochrophyta | Phaeophyceae | Ectocarpales | Adenocystaceae | Adenocystis | utricularis | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Ochrophyta | Phaeophyceae | Laminariales | Alariaceae | Undaria | pinnatifida | A |0|0|0|0|1|0|1|1|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|0|0|1|0|0|0|1|1|0|0|0|0|1|0|1|1|0|0|0|0|0|0|1|0|0|1|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|1|0|0|0|0|1|0|0|0|0|1|0|0|1|
| Chlorophyta | Ulvophyceae | Cladophorales | Cladophoraceae | Cladophora | feredayi | N |0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chlorophyta | Ulvophyceae | Cladophorales | Cladophoraceae | Cladophora | sp. | SI |0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chlorophyta | Ulvophyceae | Cladophorales | Siphonocladaceae | Cladophoropsis | herpestica | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chlorophyta | Ulvophyceae | Ulvales | Ulvaceae | Ulva | sp. | SI |0|1|0|0|0|1|1|0|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|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|1|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|
| Porifera | Demospongiae | Dendroceratida | Darwinellidae | Darwinella | cf. gardineri | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Dictyoceratida | Dysideidae | Dysidea | new sp. 1 | C2 |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|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Dictyoceratida | Dysideidae | Euryspongia | new sp. 1 | C2 |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|0|0|0|0|0|0|0|0|0|0|0|0|1|1|0|0|0|1|0|0|1|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Dictyoceratida | Dysideidae | Euryspongia | new sp. 2 | C2 |0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Dictyoceratida | Dysideidae | Pleraplysilla | new sp. 1 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Dictyoceratida | Irciniidae | Ircinia | akaroa | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Hadromerida | Suberitidae | Pseudosuberites | sulcatus | 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|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Halichondrida | Halichondriidae | Amorphinopsis | new sp. 1 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Halichondrida | Halichondriidae | Halichondria | new sp. 1 | C2 |0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|1|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|1|0|0|0|0|0|0|1|0|0|1|0|
| Porifera | Demospongiae | Halichondrida | Halichondriidae | Halichondria | new sp. 2 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|
| Porifera | Demospongiae | Halichondrida | Halichondriidae | Halichondria | panicea | C1 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Callyspongiidae | Callyspongia | diffusa | C1 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|1|0|0|1|0|1|0|1|0|1|0|0|1|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Callyspongiidae | Dactylia | new sp. 1 | C2 |0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Adocia | cf. parietalioides | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Adocia | new sp. 1 | C2 |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|1|0|0|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|0|0|0|1|0|0|0|0|0|0|0|1|1|0|0|0|1|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Adocia | new sp. 2 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Adocia | new sp. 7 | C2 |0|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|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|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Chalinula | new sp. 1 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Chalinula | new sp. 2 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | cf. isodictyale | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|1|1|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | cf. punctata | 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|1|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | new sp. 1 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|1|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | new sp. 11 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | new sp. 16 | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | new sp. 2 | C2 |0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | new sp. 3 | C2 |0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Poecilosclerida | Crellidae | Crella (Pytheas) | affinis | N |0|0|0|0|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|1|0|0|0|0|1|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Poecilosclerida | Crellidae | Crella (Pytheas) | incrustans | C1 |0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|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|1|1|0|0|0|1|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Poecilosclerida | Hymedesmiidae | Phorbas | cf. anchorata | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|1|
| Porifera | Demospongiae | Poecilosclerida | Hymedesmiidae | Phorbas | fulva | N |0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|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|
| Porifera | Demospongiae | Poecilosclerida | Microcionidae | Clathria (Microciona) | dendyi | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | Demospongiae | Poecilosclerida | Microcionidae | Ophlitospongia | reticulata | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Porifera | 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|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|
| Porifera | Demospongiae | Poecilosclerida | Tedaniidae | Tedania | battershilli | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | Ascidiacea | Aplousobranchia | Didemnidae | Didemnum | sp. | C1 |0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|1|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|1|0|1|1|0|1|1|1|1|0|1|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|1|0|0|0|
| Chordata | Ascidiacea | Aplousobranchia | Didemnidae | Lissoclinum | notti | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | 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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | Ascidiacea | Aplousobranchia | Polyclinidae | Aplidium | phortax | 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|0|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | Ascidiacea | Phlebobranchia | Rhodosomatidae | Corella | eumyota | C1 |0|1|1|0|0|0|0|1|1|0|0|1|1|0|0|1|1|1|0|0|0|0|0|0|0|1|0|0|1|1|1|0|1|1|0|0|0|1|1|0|0|0|0|1|1|0|1|1|1|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|1|1|1|0|0|0|1|0|0|0|1|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | Ascidiacea | Stolidobranchia | Botryllinae | Botrylloides | leachii | C1 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|1|0|1|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|1|1|1|0|0|1|1|0|0|0|1|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|
| Chordata | Ascidiacea | Stolidobranchia | Molgulidae | Molgula | mortenseni | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | Ascidiacea | Stolidobranchia | Pyuridae | Pyura | cancellata | N |0|0|0|0|0|0|0|0|0|0|1|0|1|0|0|1|0|0|0|0|0|0|0|0|0|1|0|1|1|0|0|0|0|0|0|0|0|1|0|1|0|0|0|1|0|0|0|1|0|0|0|0|1|1|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|0|0|0|0|0|0|0|0|1|0|1|0|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|1|
| Chordata | Ascidiacea | Stolidobranchia | Pyuridae | Pyura | picta | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|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|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | Ascidiacea | Stolidobranchia | Pyuridae | Pyura | pulla | N |0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|1|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|1|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|
| Chordata | Ascidiacea | Stolidobranchia | Pyuridae | Pyura | rugata | N |0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|1|1|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|
| Chordata | Ascidiacea | Stolidobranchia | Pyuridae | Pyura | sp. | C2 |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | 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|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | Ascidiacea | Stolidobranchia | Pyuridae | Pyura | subuculata | N |0|0|0|0|0|0|0|0|0|0|0|1|1|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|0|0|1|1|0|0|1|1|0|0|0|1|1|0|0|0|1|0|0|0|0|0|0|0|1|0|0|0|0|0|1|0|1|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|
| Chordata | Ascidiacea | Stolidobranchia | Pyuridae | Pyura | suteri | N |0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|1|1|0|0|1|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|1|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|0|0|0|0|1|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|
| Chordata | Ascidiacea | Stolidobranchia | Styelidae | Asterocarpa | cerea | C1 |0|1|0|0|0|0|0|0|1|0|1|1|0|0|0|1|1|1|0|0|1|0|0|0|0|0|0|1|1|0|0|0|1|1|1|0|0|0|1|1|0|0|0|0|0|0|1|1|1|0|0|0|1|0|0|1|0|0|0|0|0|0|0|0|1|1|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|1|0|0|0|0|1|0|0|0|0|1|1|1|0|0|1|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|
| Chordata | Ascidiacea | Stolidobranchia | Styelidae | Asterocarpa | coerulea | N |0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|0|
| Chordata | Ascidiacea | Stolidobranchia | Styelidae | Cnemidocarpa | bicornuta | N |0|1|0|0|0|0|0|0|1|0|0|0|1|0|0|0|1|0|0|0|1|0|0|0|0|1|0|0|0|1|1|0|1|0|0|1|0|1|1|1|0|0|0|0|1|0|1|0|1|0|0|0|1|0|0|0|1|1|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|1|0|0|0|0|0|0|0|0|1|1|0|0|0|0|0|0|0|1|0|0|0|0|0|0|0|1|
| Chordata | Ascidiacea | Stolidobranchia | Styelidae | Cnemidocarpa | nisiotus | N |0|1|1|0|0|0|0|1|1|0|0|0|1|0|0|0|1|1|0|0|1|0|0|0|0|0|0|0|0|0|1|1|0|1|1|1|1|0|0|1|1|0|0|0|1|1|0|0|1|1|0|0|0|1|1|0|1|1|1|0|0|0|0|0|0|0|0|1|1|0|0|0|1|1|0|0|0|0|0|0|0|0|0|1|0|0|0|1|1|0|0|0|1|1|0|0|0|0|0|0|0|1|0|0|0|1|0|0|0|0|0|1|

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

## Appendix 6b. Results from the benthic grab samples.

Appendix 6b. Results from the benthic grab samples.

| | | | | | | Site code | Aotea Quay North | | | Aotea Quay South | | | Burnham | | | Kings Wharf | | | Overseas Passenger Terminal | | | Queens Wharf | | | Thorndon Container Wharf | | | Waterloo Wharf | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **phylum** | **class** | **order** | **family** | **genus** | **species** | ***class_code** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** |
| Annelida | Polychaeta | Eunicida | Lumbrineridae | Scoletoma | sp_undet | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Annelida | Polychaeta | Phyllodocida | Glyceridae | Glycera | lamelliformis | N | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Annelida | Polychaeta | Phyllodocida | Nephtyidae | Aglaophamus | verrilli | 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 |
| Annelida | Polychaeta | Phyllodocida | Sigalionidae | Labiosthenolepis | laevis | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Annelida | Polychaeta | Scolecida | Orbiniidae | Phylo | novazealandiae | 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 |
| Annelida | Polychaeta | Terebellida | Trichobranchidae | Terebellides | narribri | 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 |
| Ectoprocta | Gymnolaemata | Cheilostomata | Chaperiidae | Chaperiopsis | cervicornis | 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 |
| Ectoprocta | Gymnolaemata | Cheilostomata | Phidoloporidae | Rhynchozoon | larreyi | C1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | Melitidae | Ceradocus | rubromaculatus | 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 |
| Arthropoda | Malacostraca | Anomura | Porcellanidae | Petrolisthes | novaezelandiae | 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 |
| Arthropoda | Malacostraca | Brachyura | Goneplacidae | Neommatocarcinus | huttoni | 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 |
| Arthropoda | Malacostraca | Brachyura | Ocypodidae | Macrophthalmus | hirtipes | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| Echinodermata | Holothuroidea | Apodid | Chiridotidae | Chirodota | nigra | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Echinodermata | Holothuroidea | Apodida | Synaptidae | Rynkatorpa | uncinata | 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 |
| Mollusca | Bivalvia | Nuculoida | Nuculidae | Nucula | hartvigiana | N | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Veneroida | Semelidae | Theora | lubrica | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Neogastropoda | Buccinidae | Buccinulum | linea | N | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | | | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Apoglossum | montagneanum | 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 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Phycodrys | quercifolia | 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 |
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Adocia | new sp. 1 | 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 |
| Chordata | Ascidiacea | Stolidobranchia | Styelidae | Cnemidocarpa | nisiotus | 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 |

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

## Appendix 6c. Results from the benthic sled samples.

Appendix 6c. Results from the benthic sled samples.

| | | | | | | Site code | Aotea Quay South | | Burnham | | Kings Wharf | | Miramar | | Overseas Passenger Terminal | | Queens Wharf | | Rail Ferry Terminal | | Thorndon Container Wharf | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **phylum** | **class** | **order** | **family** | **genus** | **species** | ***class_code** | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Annelida | Polychaeta | Eunicida | Dorvilleidae | Dorvillea | australiensis | N | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Annelida | Polychaeta | Phyllodocida | Nephtyidae | Aglaophamus | verrilli | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Annelida | Polychaeta | Phyllodocida | Polynoidae | Ophiodromus | angustifrons | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Annelida | Polychaeta | Phyllodocida | Sigalionidae | Labiosthenolepis | laevis | N | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| Annelida | Polychaeta | Sabellida | Sabellidae | Sabellidae | Indet | SI | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Annelida | Polychaeta | Sabellida | Serpulidae | Spirobranchus | polytrema | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Annelida | Polychaeta | Scolecida | Maldanidae | Maldane | theodori | N | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Annelida | Polychaeta | Spionida | Spionidae | Paraprionospio | Paraprionospio-A [pinnata] | C2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Annelida | Polychaeta | Terebellida | Pectinariidae | Pectinaria | australis | N | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Annelida | Polychaeta | Terebellida | Terebellidae | Pista | pegma | N | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Annelida | Polychaeta | Terebellida | Trichobranchidae | Terebellides | narribri | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Ectoprocta | Gymnolaemata | Cheilostomata | Bugulidae | Bugula | flabellata | A | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| Ectoprocta | Gymnolaemata | Cheilostomata | Candidae | Caberea | rostrata | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ectoprocta | Gymnolaemata | Cheilostomata | Candidae | Scrupocellaria | ornithorhyncus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Ectoprocta | Gymnolaemata | Cheilostomata | Cyclicoporidae | Cyclicopora | longipora | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Ectoprocta | Gymnolaemata | Cheilostomata | Microporellidae | Fenestrulina | thyreophora | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Ectoprocta | Gymnolaemata | Cheilostomata | Microporellidae | Microporella | speculum | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Cnidaria | Hydrozoa | Hydroida | Eudendriidae | Eudendrium | sp. ? | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Arthropoda | Malacostraca | Amphipoda | Eusiridae | Paramoera | chevreuxi | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Anomura | Diogenidae | Paguristes | setosus | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Anomura | Paguridae | Lophopagurus (Australeremus) | kirkii | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Anomura | Porcellanidae | Petrolisthes | elongatus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Anomura | Porcellanidae | Petrolisthes | novaezelandiae | N | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Hymenosomatidae | Halicarcinus | varius | N | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Notomithrax | minor | N | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Notomithrax | ursus | N | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Ocypodidae | Macrophthalmus | hirtipes | N | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Pinnotheridae | Pinnotheres | atrinocola | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Caridea | Crangonidae | Nauticaris | marionis | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Arthropoda | Malacostraca | Caridea | Crangonidae | Pontophilus | australis | N | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Arthropoda | Malacostraca | Caridea | Palemonidae | Periclimenes | yaldwyni | N | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Echinodermata | Asteroidea | Valvatida | Asterinidae | Meridiastra | mortenseni | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Echinodermata | Asteroidea | Valvatida | Asterinidae | Patiriella | regularis | N | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| Echinodermata | Holothuroidea | Aspidochirotida | Stichopodidae | Stichopus | mollis | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Mollusca | Bivalvia | Myoida | Corbulidae | Corbula | zelandica | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Mytiloida | Mytilidae | Perna | canaliculus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Nuculoida | Nuculidae | Nucula | hartvigiana | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Mollusca | Bivalvia | Pterioida | Pectinidae | Talochlamys | zelandiae | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Veneroida | Semelidae | Theora | lubrica | A | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Veneroida | Veneridae | Dosinia | lambata | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| Mollusca | Bivalvia | Veneroida | Veneridae | Tawera | spissa | N | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Littorinimorpha | Calyptraeidae | Sigapatella | tenuis | N | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Littorinimorpha | Capulidae | Trichosirius | inornatus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Neogastropoda | Buccinidae | Buccinulum | linea | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Neogastropoda | Muricidae | Xymene | plebeius | N | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| Mollusca | Gastropoda | Neogastropoda | Turridae | Neoguraleus | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Gastropoda | Vetigastropoda | Trochidae | Trochus | tiaratus | N | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| Mollusca | Polyplacophora | Acanthochitonina | Acanthochitonidae | Cryptoconchus | porosus | N | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | | | | | SI | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Ceramium | rubrum | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Ceramium | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Griffithsia | crassiuscula | A | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Griffithsia | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Rhodophyta | Florideophyceae | Ceramiales | Ceramiaceae | Medeiothamnion | lyallii | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Myriogramme | denticulata | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Delesseriaceae | Phycodrys | quercifolia | N | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Rhodophyta | Florideophyceae | Ceramiales | Rhodomelaceae | Chondria | macrocarpa | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Ceramiales | Rhodomelaceae | Laurencia | thyrsifera | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Gigartinales | Cystocloniaceae | Rhodophyllis | sp. | SI | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Gracilariales | Gracilariaceae | Gracilaria | truncata | N | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Rhodymeniales | Rhodomeniaceae | Rhodymenia | novazelandica | N | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhodophyta | Florideophyceae | Rhodymeniales | Rhodomeniaceae | Rhodymenia | sp. | SI | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Ochrophyta | Phaeophyceae | Fucales | Cystoseiraceae | Cystophora | scalaris | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ochrophyta | Phaeophyceae | Fucales | Cystoseiraceae | Cystophora | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ochrophyta | Phaeophyceae | Laminariales | Alariaceae | Undaria | pinnatifida | A | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ochrophyta | Phaeophyceae | Laminariales | Lessoniaceae | Macrocystis | pyrifera | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chlorophyta | Ulvophyceae | Ulvales | Ulvaceae | Ulva | sp. | SI | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Porifera | Demospongiae | Dictyoceratida | Dysideidae | Dysidea | new sp. 1 | C2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Porifera | Demospongiae | Dictyoceratida | Dysideidae | Euryspongia | new sp. 1 | C2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Porifera | Demospongiae | Hadromerida | Clionaidae | Cliona | new sp. 1 | C2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Porifera | Demospongiae | Halichondrida | Halichondriidae | Halichondria | panicea | C1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Adocia | new sp. 1 | C2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Adocia | new sp. 2 | C2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | cf. isodictyale | N | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | glabra | N | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | new sp. 2 | C2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Porifera | Demospongiae | Poecilosclerida | Crellidae | Crella (Pytheas) | incrustans | C1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Porifera | Demospongiae | Poecilosclerida | Mycalidae | Mycale (Carmia) | tasmani | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Porifera | Porifera | | | | | SI | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chordata | Ascidiacea | Stolidobranchia | Botryllinae | Botrylliodes | leachii | C1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Chordata | Ascidiacea | Stolidobranchia | Pyuridae | Pyura | cancellata | N | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chordata | Ascidiacea | Stolidobranchia | Pyuridae | Pyura | pulla | N | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chordata | Ascidiacea | Stolidobranchia | Styelidae | Asterocarpa | cerea | C1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Chordata | Ascidiacea | Stolidobranchia | Styelidae | Cnemidocarpa | bicornuta | N | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Chordata | Ascidiacea | Stolidobranchia | Styelidae | Cnemidocarpa | nisiotus | N | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |

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

## Appendix 6d. Results from the dinoflagellate cyst core samples.

Appendix 6d. Results from the dinoflagellate cyst samples.

| | | | | | | Site code | Aotea Quay North | | Aotea Quay South | | Burnham | | Kings Wharf | | Overseas Passenger Terminal | | Thorndon Container Wharf | | Waterloo Wharf | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **phylum** | **class** | **order** | **family** | **genus** | **species** | ***class_code** | **1** | **2** | **1** | **2** | **1** | **2** | **1** | **2** | **1** | **2** | **1** | **2** | **1** | **2** |
| Dinophyta | Dinophyceae | Gymnodiniales | Polykrikaceae | Polykrikos | schwartzii | N | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dinophyta | Dinophyceae | Peridinales | Gonyaulacaceae | Gonyaulax | spinifera | N | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dinophyta | Dinophyceae | Peridinales | Gonyaulacaceae | Protoceratium | reticulatum | N | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dinophyta | Dinophyceae | Peridinales | Peridiniaceae | Lingulodinium | polyedrum | N | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dinophyta | Dinophyceae | Peridinales | Peridiniaceae | Protoperidinium | oblongum | N | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dinophyta | Dinophyceae | Peridinales | Peridiniaceae | Protoperidinium | sp. | SI | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Dinophyta | Dinophyceae | Peridinales | Peridiniaceae | Scrippsiella | trochoidea | N | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

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

## Appendix 6e. Results from the fish trap samples.

Appendix 6e. Results from the fish trap samples.

| | | | | | | Site code | Aotea Quay North | | | | Aotea Quay South | | | | Burnham | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Trap line | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 3 | | 4 | |
| phylum | class | order | family | genus | species | *class_code | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Notomithrax | peronii | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Notomithrax | sp. | SI | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Echinodermata | Asteroidea | Valvatida | Asterinidae | Patiriella | regularis | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Mollusca | Polyplacophora | Acanthochitonina | Acanthochitonidae | Cryptoconchus | porosus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Vertebrata | Actinopterygii | Gadiformes | Moridae | Lotella | rhacinum | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Mugiliformes | Mugilidae | Parapercis | colias | N | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Carangidae | Caranx | georgianus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Labridae | Notolabrus | celidotus | N | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Labridae | Notolabrus | fucicola | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Labridae | Notolabrus | miles | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Scorpidinae | Scorpis | lineolata | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Tripterygiidae | Tripterygiidae | sp. | SI | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | | Kings Wharf | | | | Overseas Passenger Terminal | | | | Queens Wharf | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | |
| genus | species | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Notomithrax | peronii | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Notomithrax | sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Patiriella | regularis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cryptoconchus | porosus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lotella | rhacinum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parapercis | colias | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Caranx | georgianus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Notolabrus | celidotus | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| Notolabrus | fucicola | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Notolabrus | miles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scorpis | lineolata | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tripterygiidae | sp. | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | | Queens Wharf Southeast | | | | Thorndon Container Wharf | | | | Waterloo Wharf | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | |
| genus | species | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Notomithrax | peronii | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Notomithrax | sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Patiriella | regularis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Cryptoconchus | porosus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lotella | rhacinum | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parapercis | colias | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Caranx | georgianus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Notolabrus | celidotus | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| Notolabrus | fucicola | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Notolabrus | miles | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Scorpis | lineolata | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tripterygiidae | sp. | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |

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

## Appendix 6f. Results from the crab trap samples.

Appendix 6f. Results from the crab trap samples.

| | | | | | | Site code | Aotea Quay North | | | | Aotea Quay South | | | | Burnham | | | | Kings Wharf | | | | Miramar | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Trap line | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | |
| **phylum** | **class** | **order** | **family** | **genus** | **species** | ***class_code** | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Arthropoda | Malacostraca | Anomura | Paguridae | Pagurus | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Grapsidae | Hemigrapsus | sexdentatus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Arthropoda | Malacostraca | Brachyura | Grapsidae | Hemigrapsus | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Notomithrax | sp. | SI | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Ocypodidae | Macrophthalmus | hirtipes | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Echinodermata | Asteroidea | Valvatida | Asterinidae | Patiriella | regularis | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| Mollusca | Polyplacophora | Acanthochitonina | Acanthochitonidae | Cryptoconchus | porosus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Polyplacophora | Ischnochitonina | Chitonidae | | | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Gadiformes | Moridae | Pseudophycis | bachus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Labridae | Notolabrus | celidotus | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Vertebrata | Actinopterygii | Perciformes | Plesiopidae | Acanthoclinus | | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Tripterygiidae | Tripterygiidae | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

| | | | Overseas Passenger Terminal | | | | Queens Wharf | | | | Queens Wharf South | | | | Thorndon Container Wharf | | | | Waterloo Wharf | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | |
| **family** | **genus** | **species** | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Paguridae | Pagurus | sp. | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Grapsidae | Hemigrapsus | sexdentatus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Grapsidae | Hemigrapsus | sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Majidae | Notomithrax | sp. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Ocypodidae | Macrophthalmus | hirtipes | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asterinidae | Patiriella | regularis | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| Acanthochitonidae | Cryptoconchus | porosus | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chitonidae | | | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Moridae | Pseudophycis | bachus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Labridae | Notolabrus | celidotus | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plesiopidae | Acanthoclinus | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tripterygiidae | Tripterygiidae | sp. | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

## Appendix 6g. Results from the starfish trap samples.

Appendix 6g. Results from the starfish trap samples.

| | | | | | | Site code | Aotea Quay North | | | | Aotea Quay South | | | | Burnham | | | | Kings Wharf | | | | Miramar | | | | Overseas Passenger Terminal | | | | Queens Wharf | | | | Queens Wharf South | | | | Thorndon Container Wharf | | | | Waterloo Wharf | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Trap line | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | | 1 | | 2 |
| phylum | class | order | family | genus | species | *class_code | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 |
| Arthropoda | Malacostraca | Anomura | Paguridae | Pagurus | sp. | SI | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 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 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Notomithrax | sp. | SI | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Echinodermata | Asteroidea | Valvatida | Asterinidae | Patiriella | regularis | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Echinodermata | Holothuroidea | Aspidochirotida | Stichopodidae | Stichopus | mollis | N | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | 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 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mollusca | Polyplacophora | Ischnochitonina | Chitonidae | | | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | new sp. 1 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Labridae | Notolabrus | celidotus | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Tripterygiidae | Tripterygiidae | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

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

## Appendix 6h. Results from the shrimp trap samples.

Appendix 6g. Results from the starfish trap samples.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Site code** | |
| | | | | | | **Trap line** | **2** |
| **phylum** | **class** | **order** | **family** | **genus** | **species** | ***class_code** | **2** |
| Arthropoda | Malacostraca | Anomura | Paguridae | Pagurus | sp. | SI | 0 |
| Arthropoda | Malacostraca | Brachyura | Majidae | Notomithrax | sp. | SI | 0 |
| Echinodermata | Asteroidea | Valvatida | Asterinidae | Patiriella | regularis | N | 0 |
| Echinodermata | Holothuroidea | Aspidochirotida | Stichopodidae | Stichopus | mollis | N | 0 |
| Mollusca | Bivalvia | Mytiloida | Mytilidae | Perna | canaliculus | N | 0 |
| Mollusca | Polyplacophora | Ischnochitonina | Chitonidae | | | SI | 0 |
| Porifera | Demospongiae | Haplosclerida | Chalinidae | Haliclona | new sp. 1 | C2 | 0 |
| Vertebrata | Actinopterygii | Perciformes | Labridae | Notolabrus | celidotus | N | 0 |
| Vertebrata | Actinopterygii | Perciformes | Tripterygiidae | Tripterygiidae | sp. | SI | 0 |
| | | | | | | | |

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

Appendix 6h. Results from the shrimp trap samples.

| | | | | | | Site code | Aotea Quay North | | | | Aotea Quay South | | | | Burnham | | | Kings Wharf | | Miramar | | | | Overseas Passenger Terminal | | | Queens Wharf | | Queens Wharf South | | Thorndon Container Wharf | | Waterloo Wharf |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Trap line** | 1 | | 2 | | 1 | | 2 | | 1 | 2 | | 1 | 2 | 1 | | 2 | | 1 | | 2 | 2 | | 1 | 2 | 1 | 2 | 1 |
| **phylum** | **class** | **order** | **family** | **genus** | **species** | ***class_code** | **1** | **2** | **1** | **2** | **1** | **2** | **1** | **2** | **1** | **1** | **2** | **1** | **1** | **1** | **2** | **1** | **2** | **1** | **2** | **1** | **1** | **2** | **1** | **1** | **1** | **1** | **1** |
| Arthropoda | Malacostraca | Brachyura | Ocypodidae | Macrophthalmus | hirtipes | 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 |
| Arthropoda | Malacostraca | Isopoda | | Isopoda | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arthropoda | Malacostraca | Isopoda | Cirolanidae | Natatolana | rossi | N | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Echinodermata | Asteroidea | Valvatida | Asterinidae | Patiriella | regularis | 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 |
| Vertebrata | Actinopterygii | Mugiliformes | Mugilidae | Parapercis | colias | 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 |
| Vertebrata | Actinopterygii | Perciformes | Tripterygiidae | Tripterygiidae | sp. | SI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

# Addendum

Recent revision by one of the authors (G.F.) of the status of amphipods identified in this survey has lead to a change in status of two that were classed as species indeterminata in this report. *Paraleucothoe* sp. A should instead be considered cryptogenic category two, on the basis that only one other species of *Paraleucothoe* has been described world-wide (from Australia) and *Paraleucothoe* sp. A does not match its description. *Paraleucothoe* sp. A has not previously been recorded in New Zealand. The other amphipod, *Meridiolembos* sp., appears to be different to the other species in this genus, but as the genus is endemic to New Zealand, it can be safely regarded as a native species that is a new record for New Zealand. This taxon was recorded from the first baseline survey of the Port of Wellington but not in the re-survey.

KEEPING WATCH

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