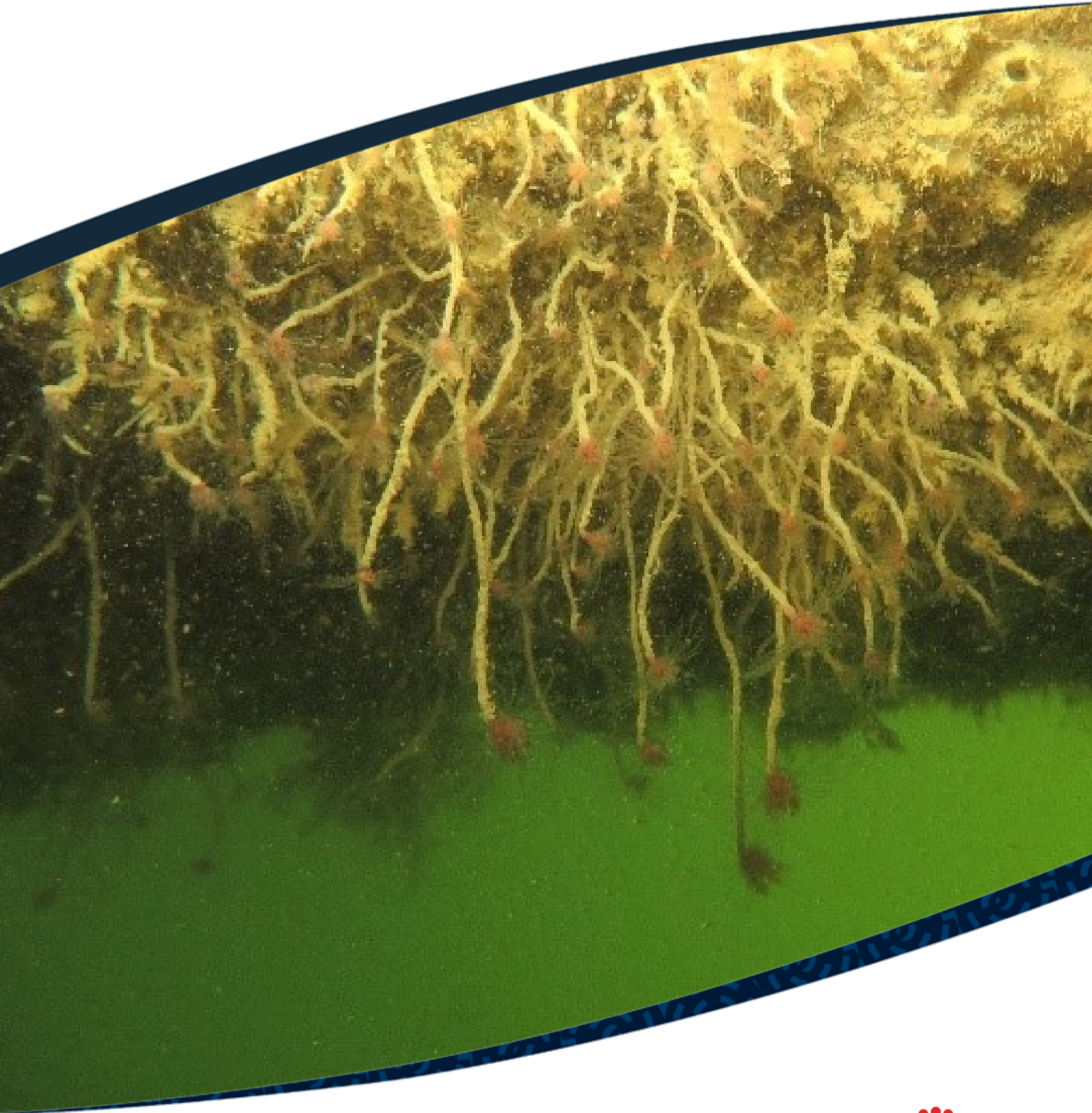


Manukau Harbour Targeted Marine Pest Survey May 2019

M. Tupe, C. Woods, S. Happy and C. Boyes

February 2020

Technical Report 2020/003





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Executive summary

The introduction of new species to an environment in which they did not evolve has been recognised as one of the top threats to ecosystem function and biodiversity. Non-indigenous marine species (NIMS) have the ability to spread quickly once established and compete with native species for food or habitat. These species can negatively impact ecological, socio-cultural and economic marine values. Within the marine environment, there are limited tools to manage NIMS incursions, so early detection of NIMS is essential for improving management outcomes.

In June 2006, a baseline survey of biota, including NIMS, was carried out in the Manukau Harbour by Golder Associates (NZ) Ltd (Campbell, et al., 2009). The survey identified 342 taxa, (none of which were unwanted organisms), 317 of which were considered native (indigenous), 16 introduced (non-indigenous) and 9 cryptogenic (origin unknown). No further surveys have been completed since 2006. Auckland Council staff identified that a new survey of the Manukau Harbour would be beneficial to update information including any incursions that may have happened since.

The National Institute of Water and Atmospheric Research Ltd (NIWA) was engaged to carry out a targeted marine pest survey in April-May 2019 to detect current NIMS present in the harbour. The survey methodology used aligns with the national Marine High-Risk Site Surveillance (MHRSS) programme which surveys 11 New Zealand ports and marinas bi-annually, using five sampling methodologies (crab condos, crab (box) traps, benthic sled tows, diver searches and shore searches) (Woods, et al., 2018).

The present survey focused on the detection of primary and secondary target species, as outlined by Biosecurity New Zealand (Woods, et al., 2018). A total of 239 sites were surveyed during the 2019 survey and 15 NIMS were detected (1 target and 14 non-target species). No primary target species and only one secondary target species, the Asian date mussel (*Arcuatula senhousia*) was detected, at numerous locations throughout the harbour. Twenty specimen samples from the survey were sent to the Marine Invasive Taxonomic Service (MITS) (funded by Ministry for Primary Industries and services provided by NIWA) for formal identification, and nine NIMS were confirmed from these samples. Three of these non-target NIMS, the nudibranch *Okenia pellucida*, the Asian paddle crab *Charybdis japonica* and the pink-mouthed hydroid *Ectopleura crocea*, were documented as known range extensions (recorded for the first time in Manukau Harbour), and indicates that the species distribution is expanding into new locations.

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1.0 Introduction

The spread of Non-Indigenous Marine Species (NIMS) outside their natural range can negatively impact ecological, socio-cultural and economic marine values. It has been identified as one of the most important pressures on coastal marine habitats and ecosystems in the *Our marine environment 2019* report (prepared by the Ministry for the Environment and Statistics New Zealand under the Environmental Reporting Act 2015). A wide range of NIMS are transported via vessels in ballast water, in sea chests, and as hull biofouling, enabling the spread of species outside their natural range. Other vectors for NIMS spread include aquaculture equipment and stock, and fishing equipment.

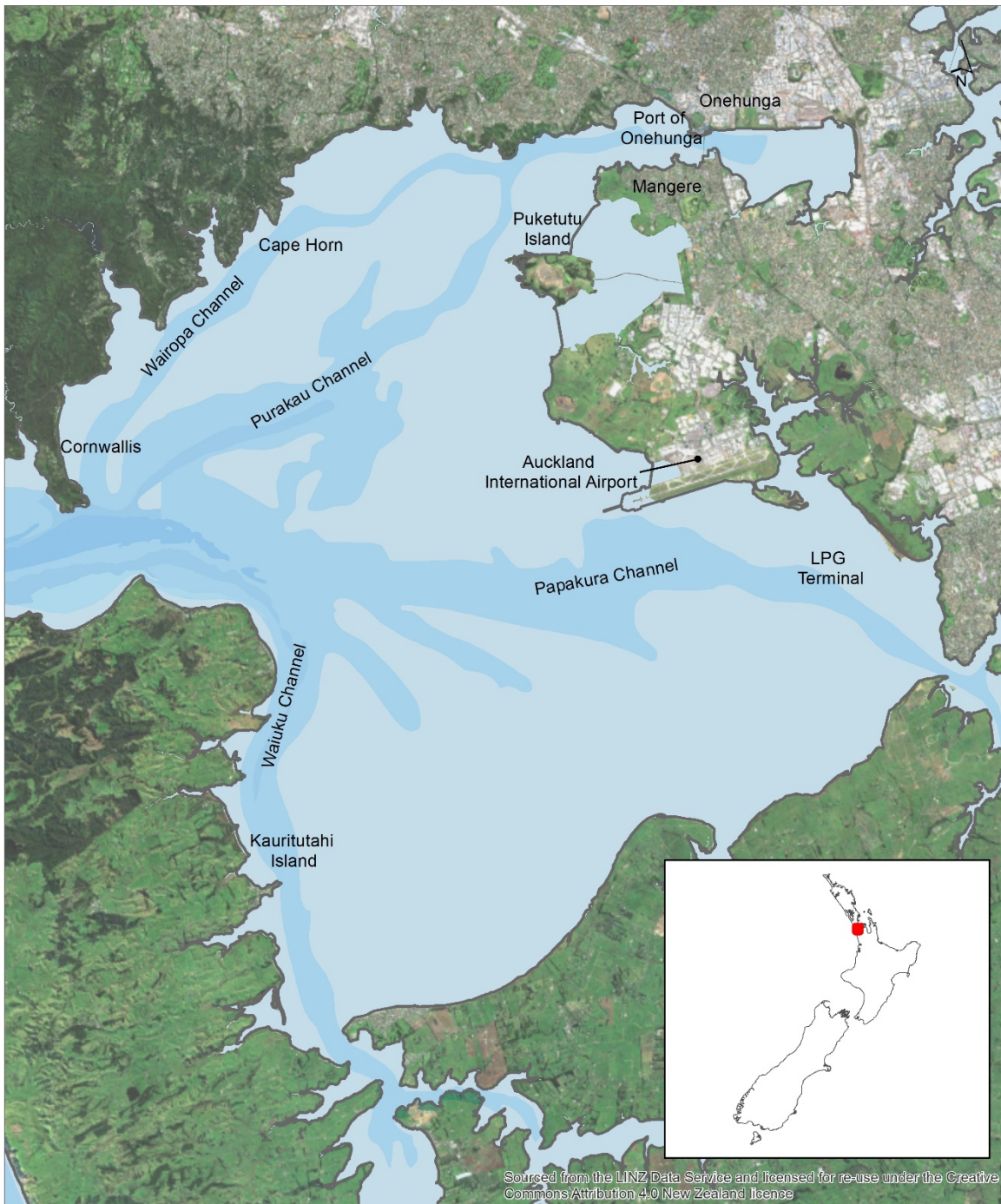
Auckland Council (AC) has a statutory responsibility to manage the risk of NIMS and requires an understanding of both the pathways and the presence of species in its jurisdictional areas in order to inform management decisions. Data on the presence of NIMS in the Manukau Harbour are limited, with the last baseline survey completed in 2006 (Campbell et al., 2009).

In 2019, AC commissioned the National Institute of Water and Atmospheric Research Ltd (NIWA) to carry out a targeted marine pest survey in the Manukau Harbour with an aim to provide an update on the current presence of NIMS in the harbour. This report provides the results of the 2019 survey.

1.1 Description of the harbour

Manukau Harbour is situated on the west coast of Auckland, New Zealand's largest city (Figure 1). It is New Zealand's second largest harbour, covering an area of approximately 365km² and has more than 460km of coastline (NIWA, 2007). The harbour is relatively shallow (average depth of 6.1m), with 62% of the harbour intertidal (Kelly, 2008). Navigation is generally restricted to four main channels in the central harbour. The main channels are clearly defined at low tide, with extensive highly productive and ecologically important intertidal sandbanks and mudflats. The coastline is fringed with mangroves, rocky crops, and sandy beaches in addition to the coastal rural settlements and highly modified coastal area for port and industrial activities (Kelly, 2008).

International shipping continues to grow, and Auckland's Port of Onehunga has regular arrivals of vessels from around New Zealand and the world. Between 2000 and 2005, 279 commercial vessels arrived at the Port of Onehunga (Hayden et al., 2009). With the port recently acquired by AC, there is a vision to transform the space into new homes, cafes, retail and public space, while retaining its functionality for vessels (Panuku, 2018).



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Manukau Harbour Location Map

0 0.5 1 1.5 2
 Kilometers
 Scale @ A4
 = 1:127,000
 Date Printed:
 3/02/2020



Document Path: U:\COO\IES\ESU\Geospatial_ESU\Projects\02_Biosecurity\2019\02_0053_19_MarineBiosecurity_Mar19\3_Workspaces\02_0053_19 Manukau Harbour Survey Location Map.mxd

Figure 1 Manukau Harbour Location Map

1.2 Background – previous survey results

The 2006 baseline survey of Port of Onehunga, marina and surrounding areas, carried out by Golder Associates (NZ) Ltd and commissioned by the Ministry for Primary Industries (MPI), surveyed 44 sites within Port Onehunga and surrounding areas using both quantitative and qualitative methods to sample soft and hard substrates, and pelagic communities. The Marine Invasive Taxonomic Service completed their analysis of 2,690 specimen samples collected during the 2006 survey in 2008. Approximately 78% of samples were identified to species level. Of the identified samples, 342 taxa were noted, of which 317 were considered native, 16 introduced (i.e., non-indigenous), and nine cryptogenic¹ (Table 1) (Campbell et al., 2009).

¹Cryptogenic species are those whose geographic origins are uncertain, and therefore whose identify as either indigenous or non-indigenous is ambiguous.

Table 1 Non-indigenous and cryptogenic species detected during the Onehunga Port and surrounding areas 2006 baseline survey (Campbell, et al., 2009)

Type of organism	Species found	Status
Algae	<i>Solieria</i> sp.	Introduced
Algae	<i>Sphacelaria</i> sp.	Cryptogenic
Arthropod	<i>Pyromaia tuberculata</i>	Introduced
Arthropod	<i>Jassa slatteryi</i>	Introduced
Arthropod	<i>Monocorophium acherusicumi</i>	Introduced
Arthropod	<i>Lysmata vittata</i>	Cryptogenic
Ascidian	<i>Molgula manhattensis</i>	Introduced
Ascidian	<i>Conopeum seurati</i>	Introduced
Ascidian	<i>Diplosoma listerianum</i>	Introduced
Ascidian	<i>Microcosmus squamiger</i>	Cryptogenic
Bryozoan	<i>Amathia distans</i>	Introduced
Bryozoan	<i>Cryptosula pallasiana</i>	Introduced
Bryozoan	<i>Conopeum seurati</i>	Introduced
Bryozoan	<i>Bugula neritina</i>	Introduced
Cnidarian	Diadumenidae	Cryptogenic
Mollusc	<i>Crassostrea gigas</i>	Introduced
Polychaete	<i>Polydora cornuta</i>	Introduced
Polychaete	<i>Barantolla lepte</i>	Introduced
Polychaete	<i>Polydora hoplura</i>	Introduced
Polychaete	<i>Neanthes</i> aff. <i>succinea</i>	Introduced
Polychaete	<i>Paradoneis lyra</i>	Cryptogenic
Polychaete	<i>Capitella capitata</i>	Cryptogenic
Polychaete	Sabellariidae	Cryptogenic
Polychaete	Sabellidae	Cryptogenic

2.0 Methods

2.1 Target species

The survey was designed to align with the national Marine High-Risk Site Surveillance (MHRSS) programme carried out for the early detection of NIMS which is part of the MPI (Ministry of Primary Industries) wider marine biosecurity programme. Currently, 11 high-risk ports and marinas around New Zealand are surveyed in winter and summer each year to capture biological changes of species throughout the year (Woods et al., 2018).

The NIMS of most concern to Manukau Harbour are those listed by Biosecurity NZ, as **primary target species** from the MHRSS. These are species which are not present in New Zealand, including:

1. The northern Pacific sea star *Asterias amurensis**
2. The European shore crab *Carcinus maenas**
3. The green alga *Caulerpa taxifolia**
4. The Chinese mitten crab *Eriocheir sinensis**
5. The Asian clam *Potamocorbula amurensis**

In addition to the primary target species, there are four **secondary target species** known to be established in localised areas within New Zealand's coastal waters and their detection will help monitor their distribution, including:

1. The Australian droplet tunicate *Eudistoma elongatum*
2. The Asian date mussel *Arcuatula senhousia*
3. The Mediterranean fanworm *Sabella spallanzanii**
4. The clubbed tunicate *Styela clava*.

*Notifiable organism under Biosecurity (Notifiable Organisms) Order 2016

The primary and secondary target species were the focus of the Manukau Harbour 2019 survey. All other non-target NIMS that were detected were also recorded and reported, along with cryptogenic and indigenous species where known.

2.2 Survey area and sites

Pre-allocated sampling sites were developed pre-survey through discussion between AC and NIWA. The intention of the pre-allocated site selection was to achieve thorough survey coverage of all "likely" locations where NIMS could occur. This includes artificial

structures such as jetties, wharfs, marine farms, and navigational buoys/markers. A representation of the sampling sites from the 2006 baseline survey and areas of previous unconfirmed NIMS reports were also included. All pre-allocated site locations were mapped using a Geographic Information System (Appendix A). In some instances, the conditions or location of the preferred sampling point prevented access, and the site was relocated to another nearby location and new coordinates recorded.

2.3 Survey methods

The primary objective of the MHRSS programme is to detect incursions of new-to-New Zealand NIMS on the Unwanted Organisms Register at High Risk Sites throughout New Zealand. The secondary objective is to detect new-to-New Zealand non-indigenous or cryptogenic organisms not listed throughout New Zealand, and to detect range extensions¹ of known established non-indigenous or cryptogenic organisms (Woods et al., 2018). Refer to www.marinebiosecurity.org.nz for further detail about the national surveys.

A variety of methodologies were used to sample a range of soft and hard habitat types such as mud and gravel bottoms, intertidal rocky shores, and artificial structures including pilings, moorings, jetties, and commercial vessel berths. The sampling methodologies included benthic sled tows, crab (box) traps, crab condos, benthic sled tows, diver searches and shore searches. For further detail around the sampling methodology, refer to Woods, et al., 2018 and Appendix A which shows the locations of each sampling method.

The following survey sampling effort was planned:

- 100 benthic sled tows (Figure 10)
- 80 crab (box) trap lines (Figure 11)
- 8 crab condo lines (Figure 12)
- 25 shore searches (Figure 13)
- 20 diver searches (Figure 14).

2.3.1 Specimen samples

All survey samples were sorted on site and individuals of primary and secondary target species recorded and enumerated on sample datasheets against the sample location where they were found.

¹ The term 'range extension' is frequently applied when a NIMS is detected at a geographic location where it has not been documented as previously occurring. They represent expansions to the known geographic distribution of a NIMS, but do not implicitly equate to actual geographic spread of a NIMS.

Specimens retained include all primary target species, representative samples of secondary target species at locations where they were not previously known to occur (i.e., range extensions) and any suspect organisms whose identities were uncertain.

Each specimen collected was allocated a waterproof label with a unique identifying number (the “sample lot code” including the identity of the survey location). The sample lot code is recorded on the sample data sheet against the site in which it was found, linking the specimen to its exact location and date of collection. The sample lot code, date of collection, method of sampling, sample number, number of specimens retained and a description of the specimens (minimally the relevant taxon) are also recorded on a field sample register sheet, providing a list of all specimens retained during the survey, by date and type of sample (benthic sled, crab (box) trap, crab condo, diver search, and shore search).

At the end of each day, all specimens retained are returned to the field laboratory and their labels and sample lot codes checked against the sample register. Where the sample container contains more than one taxon, specimens are separated into taxa and placed in separate containers (suitable for intermediate-term storage i.e., until they are processed by MITS) with a label bearing the sample lot code and a two-letter taxon code (which will thereafter form part of the unique identifier for that specimen). Specimens are preserved in the chemical appropriate to that taxon, and all samples are entered in a sample record sheet, showing the number of individuals of each taxon present in that sample (as identified by the sample lot code). Where appropriate, photographic images of specimens were also taken to aid in their identification. All specimens collected were sent to Marine Invasive Taxonomic Services (MITS) for formal taxonomic identification.

All significant marine pest observations that could be confirmed in the field were immediately reported to Auckland Council and MPI via the MPI pest and disease hotline (0800 80 99 66). Where formal taxonomic identification was required for a suspect organism, significant marine pest observations were immediately reported to AC and MPI via MITS upon taxonomic confirmation.

3.0 Survey results

The survey was carried out from Monday 29th April through to Friday 3rd May 2019.

3.1 Sampling effort

Sampling effort saw 239 sites searched through a variety of methods using benthic sled tows, crab condo lines, crab (box) trap lines, diver searches and shore searches. Table 2 displays the number of sites searched

Table 2 Sampling collection summary

Sampling method	Target number	Number collected	% of target
Benthic sled tows	100	100	100
Crab condo lines	8	8	100
Crab (box) trap lines	80	80	100
Diver searches	20	20	100
Shore searches	25	31	124
TOTAL	233	239	103

3.2 Specimens submitted to Marine Invasive Taxonomic Services

Twenty sample lots of specimens were collected for submission to MITS. These included known (where positive identification is required for confirming range extensions) and suspected NIMS, as well as unknown specimens (which can include native organisms). Refer to Appendix B for the sample register confirmed by MITS taxonomic experts.

Expert formal taxonomic identification confirmed a range extension for three NIMS included in these samples: the nudibranch *Okenia pellucida*, the Asian paddle crab *Charybdis japonica* and the pink-mouthed hydroid *Ectopleura crocea*. All three species were found at numerous locations throughout the harbour (Table 3).

3.3 Non-indigenous species detected

Fifteen NIMS were detected in the surveys and are explained in sections 3.1.2.1 and 3.1.2.2. Of these, five species were detected during the 2006 baseline survey: the red alga *Solieria* sp.; the colonial ascidian *Diplosoma listerianum*; the solitary ascidian *Molgula manhattensis*; the bivalve *Magallana gigas* (previously *Crassostrea gigas*) and the tuberculate pear crab *Pyromaia tuberculata*. Appendix C contains the results of all species identified during the 2019 survey and their recorded number or abundance.

3.3.1.1 Primary and secondary target species

No primary target species were detected in the survey. One secondary target species, the Asian date mussel *Arcuatula senhousia* was detected at numerous locations throughout the harbour (18 of 100 benthic sled locations and at 1 diver search location). The locations included Port of Onehunga, Papakura Channel, Wairopa Channel, and Waiuku Channel. These comprised instances of beds (mats) of live mussels as well as loose/empty dead shells. A sample was collected for MITS submission, and taxonomic identity was confirmed. Previous reported detections include from AC soft sediment ecology monitoring programme, where *A. senhousia* was observed to be present at Cape Horn in December 2013, however, monitoring in February 2015 noted that the species had since cleared from the site, but did remain in the surrounding area (Greenfield, et al., 2016).



Figure 2: Example of a bed (mat) of *Arcuatula senhousia* detected in Manukau Harbour (Image: C. Woods/NIWA).

3.3.1.2 Selected non-target species

Fourteen non-target NIMS were detected at various locations throughout the harbour and are outlined. Range extensions have been confirmed for the three species *Charybdis japonica*, *Ectopleura crocea* and *Okenia pellucida*.

Table 3 Non-target non-indigenous marine species (NIMS) detected

Non-target NIMS detected	Locations detected
<i>Amathia verticillata</i> (Spaghetti bryozoan)	Port of Onehunga, Auckland Airport Jetty, LiquiGas Terminal, Puponga Point, Cornwallis Wharf, Big Bay, Orua Bay, Karore Bank, Papakura Channel, Purakau Channel, Wairopa Channel, Waiuku Channel
<i>Chaetopterus</i> sp. (parchment worm)	Waiuku Channel
<i>Charybdis</i> (<i>Charybdis japonica</i> ** (Asian paddle crab)	Port of Onehunga, Purakau Channel, Wairopa Channel, Taumatarea Point
<i>Codium fragile</i> (dead man's fingers)	Kauri Point, Wairopa Channel
<i>Diplosoma listerianum</i>	Auckland Airport Jetty, LiquiGas Terminal, Papakura Channel, Purakau Channel, Wairopa Channel
<i>Ectopleura crocea</i> ** (pink-mouthed hydroid)	Port of Onehunga, Auckland Airport Jetty, LiquiGas Terminal, Wairopa Channel, Waiuku Channel
<i>Magallana gigas</i> (Pacific oyster)	Port of Onehunga, Auckland Airport Jetty, LiquiGas Terminal, near Clarks Beach
<i>Molgula manhattensis</i> (sea grapes)	Kauri Point, Wairopa Channel
<i>Okenia pellucida</i> ** (nudibranch)	Wairopa Channel
<i>Polyandrocarpa zorritensis</i>	Port of Onehunga, LiquiGas Terminal
<i>Pyromaia tuberculata</i> (fire crab)	Papakura Channel, Purakau Channel, Wairopa Channel, Waiuku Channel
<i>Solieria</i> sp. (red alga)	Papakura Channel
<i>Theora lubrica</i> (Asian Semele)	Port of Onehunga, Wairopa Channel
<i>Tritia burchardi</i> (Burchard's dog whelk)	Port of Onehunga

Note: ** indicates species with a confirmed range extension.

A non-indigenous spaghetti bryozoan *Amathia verticillata* was detected at numerous locations throughout the harbour (29 of 100 benthic sled locations, 2 of 80 crab trap locations and 7 of 20 diver search locations). A sample was taken for submission to MITS to confirm taxonomic identity and an identity of *A. verticillata* confirmed. The

related non-indigenous *A. distans* has also previously been recorded from Manukau Harbour (Campbell et al., 2009).



Figure 3 Example of *Amathia verticillata* detected in Manukau Harbour (image: C. Woods/NIWA)

The non-indigenous parchment tube worm *Chaetopterus* sp. (most like *Chaetopterus chaetopterus-A*, the northern sub-type), was detected at one location in the Waiuku Channel (1 of 100 benthic sled locations).

The non-indigenous Asian paddle crab *Charybdis japonica* was detected at several locations from the Port of Onehunga to Taumatarea Point (3 of 80 crab trap locations, 3 of 20 diver search locations and 1 of 31 shore search locations). A cheliped of (possible) *C. japonica* (sample taken for MITS ID) was also detected at Kauritutahi Island. Both male and female crabs were detected (n=7), ranging in carapace width from 55 to 96 mm; no ovigerous females were detected. All specimens detected were euthanised. Two samples were taken for submission to MITS to confirm taxonomic identity and an identity of *C. japonica* was confirmed. This detection is a range extension for this species (detection logged with MPI 0800 hotline in the field on 1/05/2019).



Figure 4 Example of *Charybdis (Charybdis) japonica* detected in Manukau Harbour (image: C. Woods/NIWA)

The non-indigenous green alga *Codium fragile* was detected at one location at Kauri Point and two locations in the Wairopa Channel (2 of 100 benthic sled locations and 1 of 31 shore search locations).

The non-indigenous colonial ascidian *Diplosoma listerianum* was detected at numerous locations throughout the harbour (19 of 100 benthic sled locations, 4 of 80 crab trap locations and 8 of 20 diver search locations).

The non-indigenous pink-mouthed hydroid *Ectopleura crocea* was detected at several locations throughout the harbour, and on a vessel berthed at Port of Onehunga (10 of 20 diver search locations). A sample was taken for submission to MITS to confirm taxonomic identity and an identity of *E. crocea* confirmed. This detection is a range extension for *E. crocea* (notified to MPI via MITS).



Figure 5 Example of *Ectopleura crocea* detected in Manukau Harbour on a vessel at Port of Onehunga (image: C. Woods/NIWA)

The non-indigenous bivalve *Magallana gigas* (Pacific oyster) was detected at several locations at the Port of Onehunga, Auckland Airport Jetty, LiquiGas LPG Terminal and near Clarks Beach (14 of 20 diver search locations and 3 of 31 shore search locations).



Figure 6 Example of *Magallana gigas* detected in Manukau Harbour at Port of Onehunga (image C. Woods/NIWA)

The non-indigenous nudibranch, *Okenia pellucida* was detected in the Wairopa Channel during a benthic sled tow. A sample was taken and sent to MITS for taxonomic identity and *O. pellucida* was confirmed. This detection is a range extension for this species (notified to MPI via MITS).



Figure 7 Example of *Okenia pellucida* (centre of image) detected in Manukau Harbour associated with the spaghetti bryozoan *Amathia verticillata* (image: C Woods/NIWA)

The non-indigenous colonial ascidian *Polyandrocarpa zorritensis*² was detected on a vessel berthed at the Port of Onehunga and the LiquiGas LPG Terminal (8 of 20 diver search locations). A sample was taken for submission to MITS to confirm taxonomic identity and an identify of *P. zorritensis* confirmed.



Figure 8 Examples of *Polyandrocarpa zorritensis* detected in Manukau Harbour on a wharf pile at the Port of Onehunga (left) and taken from biofouling on the LiquiGas LPG Terminal (right) (images: C Woods/NIWA)

² *Polyandrocarpa zorritensis* is a colonial ascidian of order Stolidobranchia (family Styelidae, subfamily Polyzoinae). The colony appears as a group of zooids of various sizes closely crowded together, but without the tests merging them as seen in other colonial ascidians.

The non-indigenous tuberculate pear crab *Pyromaia tuberculata* was detected at numerous locations throughout the channels of the harbour (43 of 100 benthic sled locations).



Figure 9 Example of *Pyromaia tuberculata* detected in Manukau Harbour (image: C. Woods/NIWA)

The non-indigenous red alga *Solieria* sp. was detected during a benthic sled tow in the Papakura Channel on shelly gravel (1 of 100 benthic sled locations). A sample was taken for submission to MITS to confirm taxonomic identity and an identity of *Solieria* sp. confirmed.

The non-indigenous Asian semele *Theora lubrica* was detected at several locations at the Port of Onehunga and one location in the Wairopa Channel near Cornwallis in muddy sediment (5 of 100 benthic sled locations). A sample was taken for submission to MITS to confirm taxonomic identity and an identity of *T. lubrica* confirmed.

The non-indigenous Burchard's dog whelk *Tritia burchardi* was detected at the Port of Onehunga at one location (1 of 100 benthic sled tow locations). A sample was taken for submission to MITS to confirm taxonomic identity and was an identity of *T. burchardi* confirmed.

4.0 Discussion

The presence of NIMS in the Manukau Harbour is likely to have originated from hull biofouling or ballast water discharge from vessels visiting the harbour and the Port of Onehunga. In the 2006 baseline survey, the introduced and cryptogenic species detected were recognised as having been transferred to New Zealand in both historic and modern time and considered to not pose a significant economic or environmental threat to the harbour (Campbell, et al., 2009).

No primary target species were detected in the 2019 surveys. Fifteen non-indigenous species were detected in the 2019 surveys. Of the NIMS detected, five species had been previously detected during the 2006 baseline survey (*Solieria* sp., *Diplosoma listerianum*, *Molgula manhattensis*, *Magallana gigas* (previously *Crassostrea gigas*) and *Pyromaia tuberculata*). All NIMS detected, except for the colonial ascidian *Polyandrocarpa zorritensis*, have known established populations within the Auckland region.

Confirmed range extensions were recorded for three species, the nudibranch *Okenia pellucida*, the Asian paddle crab *Charybdis japonica* and the pink-mouthed hydroid *Ectopleura crocea*. However, due to the infrequent marine biosecurity monitoring within the harbour it is not known how long these three species have been present in Manukau Harbour. In particular, the detection of *C. japonica* at multiple locations throughout the harbour is of concern. This species is an aggressive opportunistic omnivore (tending towards carnivory) with rapid growth to maturity, high fecundity, high competitive ability and broad environmental tolerances that may have significant ecotrophic impacts in New Zealand (Fowler et al., 2013; Townsend, et al., 2017 and Weaver, 2017).

It is encouraging to note that no primary target species were detected, and notably that no Mediterranean fanworm *Sabella spallanzanii* were detected in Manukau Harbour. Mediterranean fanworm became established in the Waitemata in 2009, rapidly becoming widespread and abundant within the harbour and has slowly been spreading within the inner Hauraki Gulf. This species is a dominant filter-feeding organism that can have important ecotrophic effects in its introduced range (e.g. Holloway and Keough, 2002) and its spread on to aquaculture farms has potentially serious impacts for the New Zealand aquaculture industry (Soliman and Inglis, 2018). This highlights the biosecurity risk and importance of preventative measures to reduce the risk of NIS introduction from where they are established on the east coast of the North Island, to the relatively isolated west coast.

Auckland Council along with Northland, Waikato and Bay of Plenty Toi Moana Regional Councils are working together to develop an integrated marine pest pathway management plan that will implement consistent rules across the regions to reduce the spread of marine pest species on vectors such as boat hulls and help to protect New Zealand's marine environment from NIMS.

Manukau Harbour would benefit from more regular monitoring to ensure that NIMS are detected early if they become introduced to the harbour. This will enhance the window of opportunity to undertake successful management actions, before becoming established.

5.0 Acknowledgements

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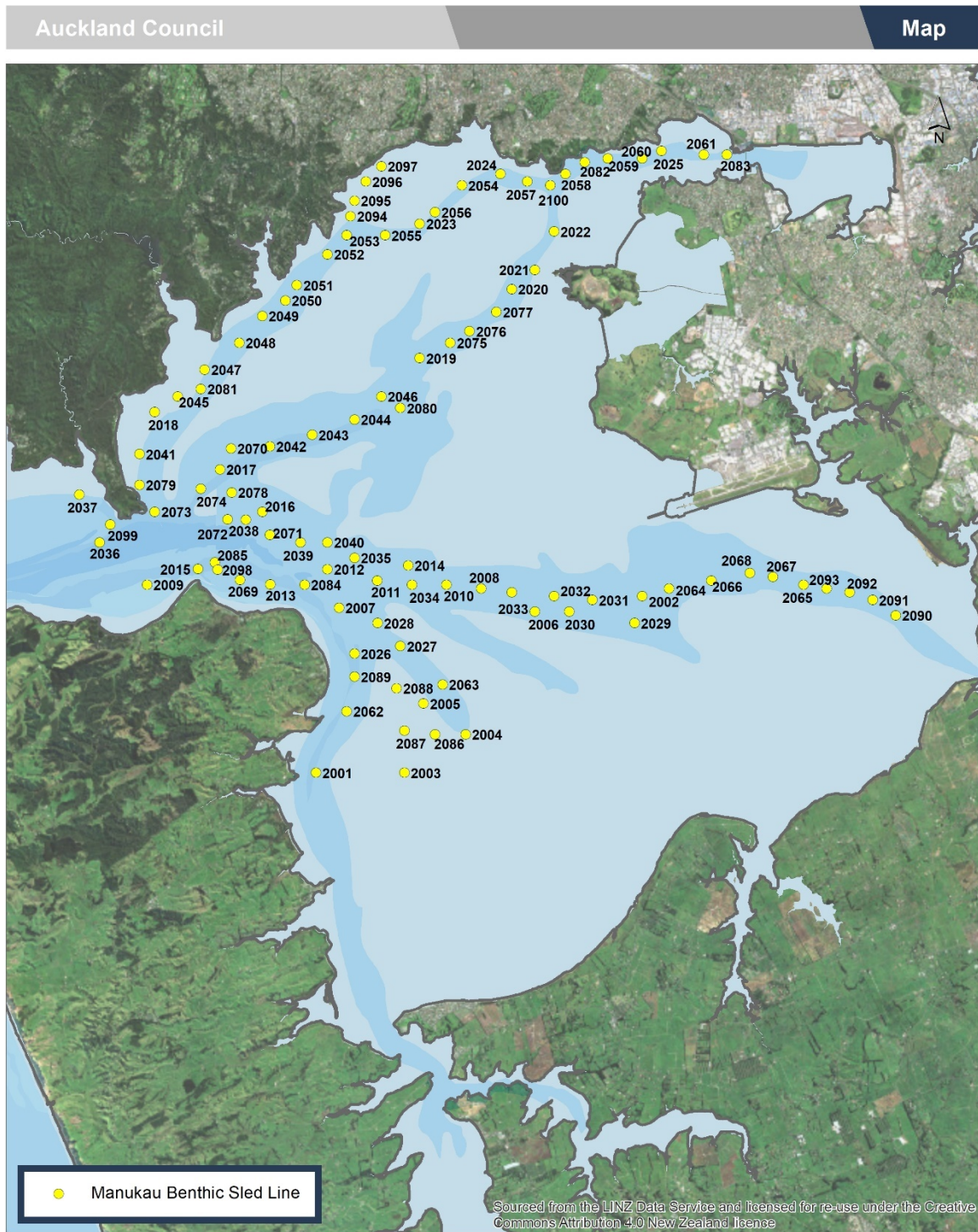
We also appreciated the support of mana whenua and stakeholders who contributed input to site selection, and Brian Hodson at Onehunga Ports who helped with access and logistics around the port during the survey.

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Appendix A Survey sampling maps



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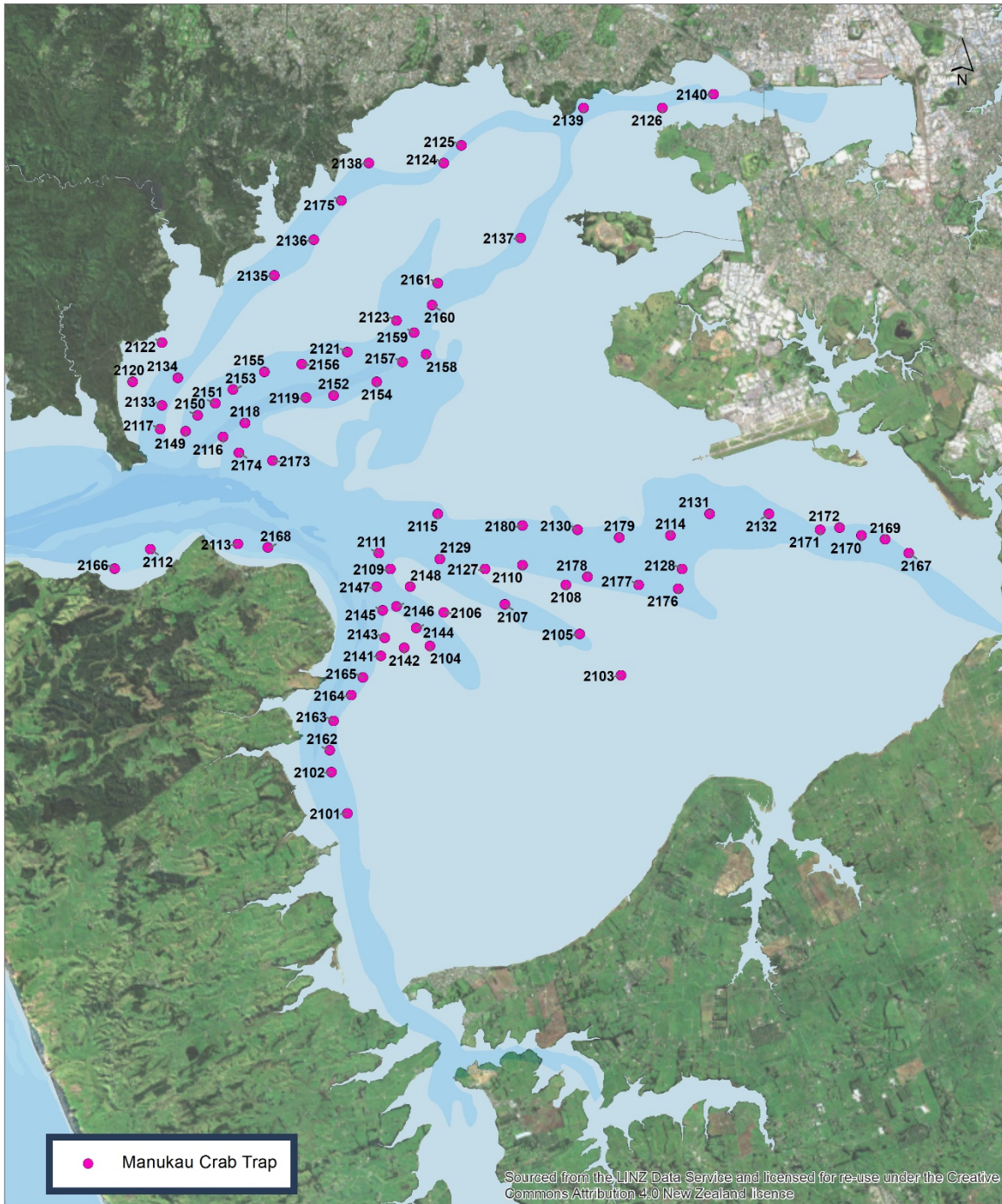
Manukau Harbour Marine Pest Survey
Benthic Sled Line

0 0.5 1 1.5 2
 Kilometers
 Scale @ A4
 = 1:127,000
 Date Printed:
 18/12/2019



Document Path: U:\COO\ESU\Geospatial_ESU\Projects\02_Biosecurity\2019\02_0053_19_MarineBiosecurity_Mar19\3_Workspaces\02_0053_19 Manukau Harbour- Site\DM\maps-sled.mxd

Figure 10 Benthic sled tow locations



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Manukau Harbour Marine Pest Survey
Crab (Box) Trap

0 0.5 1 1.5 2
 Kilometers
 Scale @ A4
 = 1:127,000
 Date Printed:
 18/12/2019



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Figure 11 Crab (box) trap site locations



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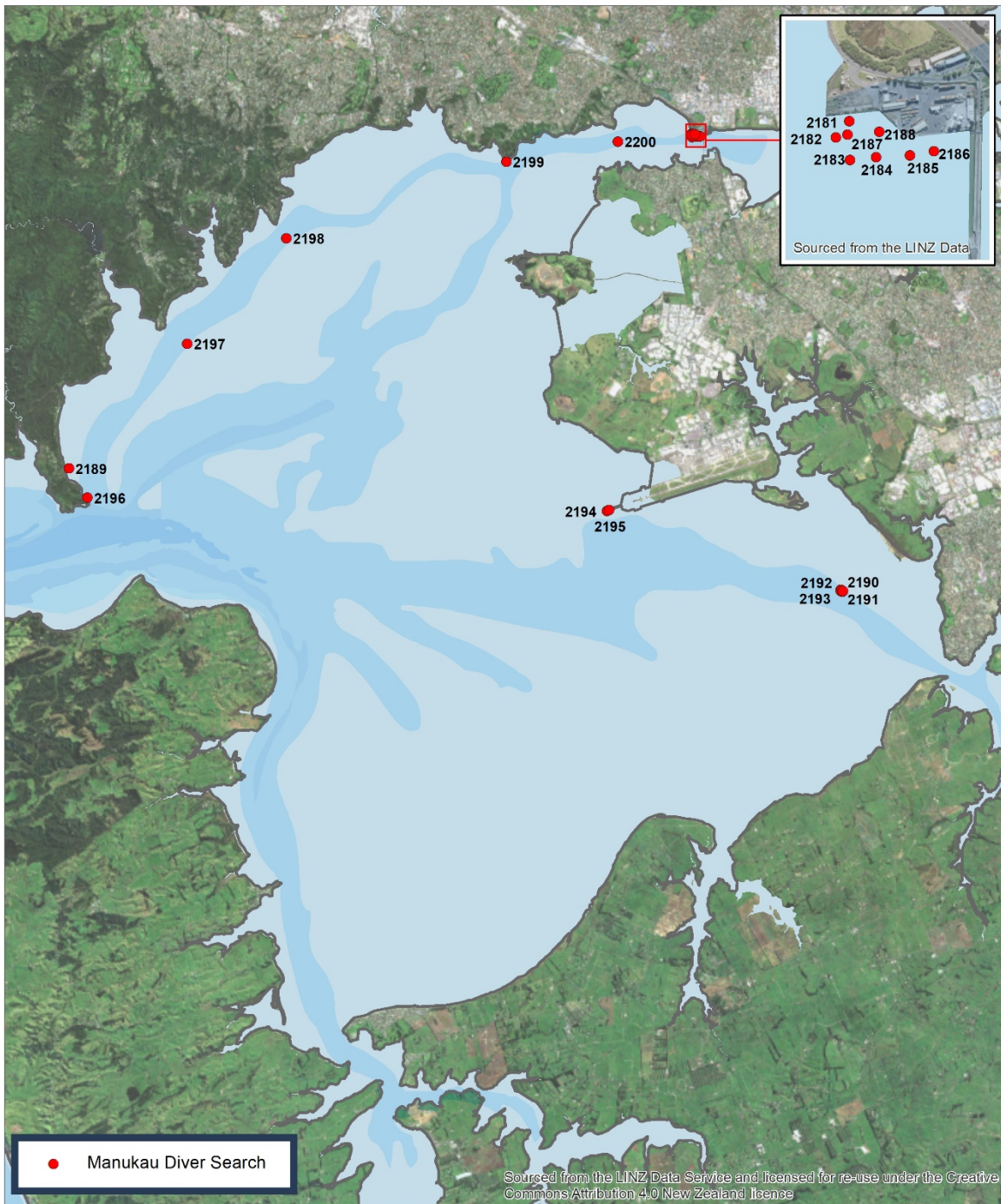
Manukau Harbour Marine Pest Survey
Crab Condo Line

0 0.6 1.2 1.8 2.4
 Kilometers
 Scale @ A4
 = 1:150,000
 Date Printed:
 18/12/2019



Document Path: U:\COO\IES\ESU\Geospatial_ESU\Projects\02_Biosecurity\2019\02_0053_19_MarineBiosecurity_Mar19\3_Workspaces\02_0053_19 Manukau Harbour - Site\DMape-condo.mxd

Figure 12 Crab condo trap site locations



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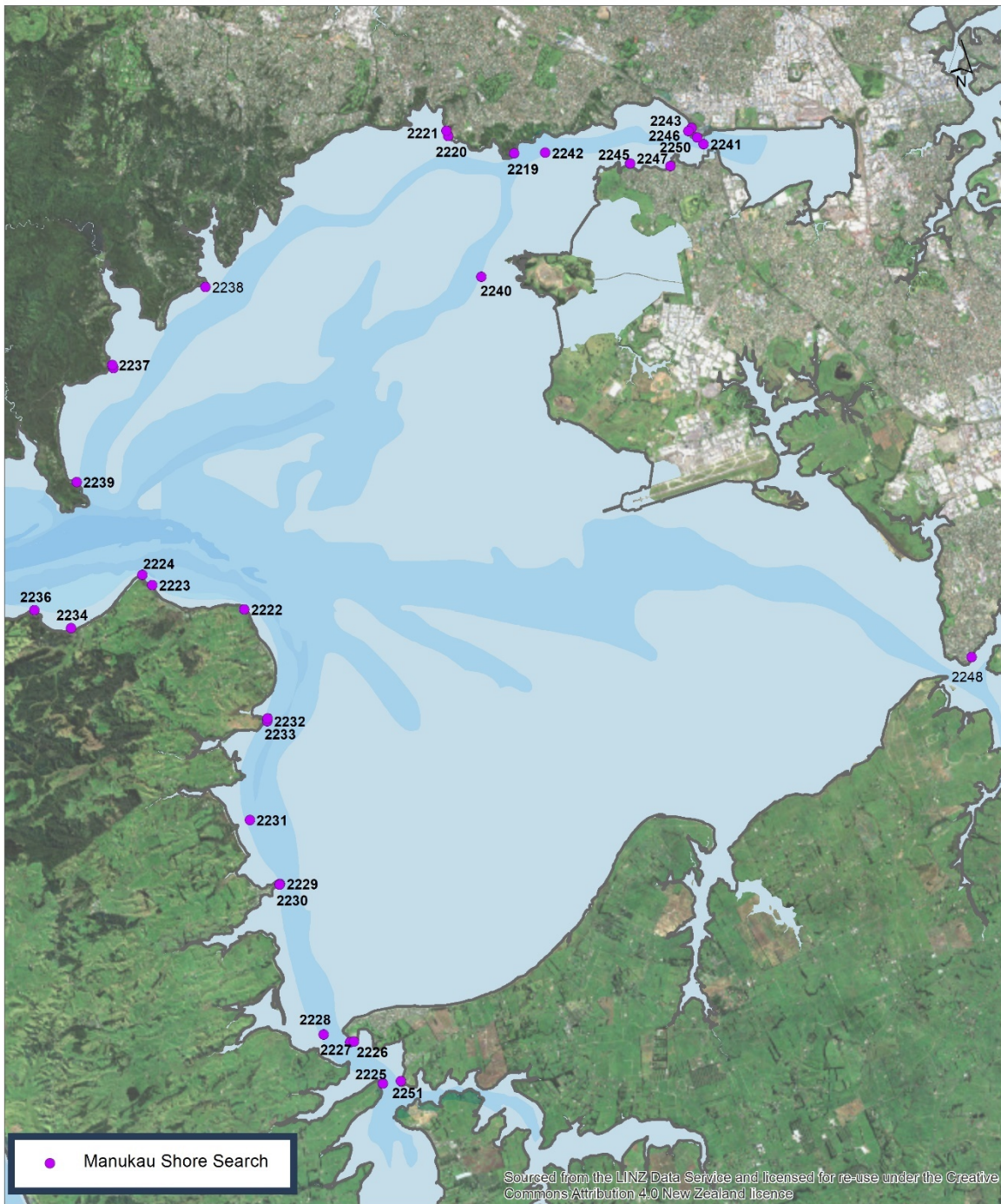
Manukau Harbour Marine Pest Survey
Diver Search

0 0.5 1 1.5 2
 Kilometers
 Scale @ A4
 = 1:127,000
 Date Printed:
 18/12/2019



Document Path: U:\COO\IES\ESU\Geospatial_ESU\Projects\02_Biosecurity\2019\02_0053_19_MarineBiosecurity_Mar19\3_Workspaces\02_0053_19 Manukau Harbour - Site\DMape-diver.mxd

Figure 13 Diver search site locations



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Manukau Harbour Marine Pest Survey
Shore Search

0 0.5 1 1.5 2
 Kilometers
 Scale @ A4
 = 1:127,000
 Date Printed:
 18/12/2019



Document Path: U:\COO\IES\ESU\Geospatial_ESU\Projects\02_Biosecurity\2019\02_0053_19_MarineBiosecurity_Mar19\3_Workspaces\02_0053_19 Manukau Harbour - SiteID\Map-shore search.mxd

Figure 14 Shore search locations

Appendix B Marine Invasive Taxonomic Services, MITS specimen samples

Table 4 Information of organisms collected during the survey and sent to the Marine Invasive Taxonomic Service (MITS) for identification. Associated environmental data are also shown (n=not recorded). Species in bold are non-indigenous. Range extensions are highlighted in blue. 2006 presence is noted in the final column.

Site ID (SVONE ¹)	Latitude	Longitude	Date	Method	Type of organism and number of individuals retained	MITS ID	Biosecurity status	Water temperature (°C)	Salinity	Secchi depth (m)	Habitat	Estimated prevalence of incursion	Present in 2006
ONE2083	-36.93385	174.78063	29/04/19	Benthic sled	3 x bivalves	<i>Theora lubrica</i>	Non-indigenous	17.9	35	2.7	Muddy sand	1-10 per 100-m sled	No
ONE2083	-36.93386	174.78063	29/04/19	Benthic sled	2 x gastropods	<i>Tritia burcharidi</i>	Non-indigenous	17.9	35	2.7	Muddy sand	1-10 per 100-m sled	No
ONE2025	-36.9332	174.7615	29/04/19	Benthic sled	2 x <i>Arcuatula senhousia</i>	<i>Arcuatula senhousia</i>	Non-indigenous	17.9	32	1.6	Muddy sand	2 per 100-m sled	No
ONE2025	-36.9332	174.7615	29/04/19	Benthic sled	1 x <i>Amathia</i> sp.	<i>Amathia verticillata</i>	Non-indigenous	17.9	32	1.6	Muddy sand	1-10 per 100-m sled	No
ONE2082	-36.93627	174.73914	29/04/19	Benthic sled	1 x crab	<i>Hemigrapsus crenulatus</i>	Indigenous	18.1	32	1.3	Muddy sand	1 per 100-m sled	Yes
ONE2057	-36.94057	174.72098	29/04/19	Benthic sled	1 x nudibranch	<i>Philine auriformis</i>	Indigenous	18.2	32	1.3	Muddy sand	1 per 100-m sled	No
ONE2095	-36.94625	174.67199	29/04/19	Benthic sled	3 x nudibranchs	<i>Okenia pellucida</i>	Non-indigenous	18.1	34	1.3	Sand	3 per 100-m sled	No
ONE2095	-36.94625	174.67199	29/04/19	Benthic sled	2 x ascidians	<i>Cnemidocarpa madagascariensis</i> var. <i>regalis</i>	Indigenous	18.1	34	1.3	Sand	2 per 100-m sled	No
ONE2030	-37.04176	174.73705	30/04/19	Benthic sled	1 x alga	<i>Alcyonidiidae</i> sp. (bryozoan) with some red alga (<i>Solferia</i> sp.)	Bryozoan – cryptogenic Alga - non-indigenous	17.2	35	0.9	Shelly gravel	1 per 100-m sled	<i>Solferia</i> sp. - Yes
ONE2158	-36.99398	174.69130	30/04/19	Crab trap	1 x <i>Charybdis japonica</i>	<i>Charybdis (Charybdis) japonica</i>	Non-indigenous	18.5	35	3	Unknown benthos	1 per trap line	No

¹ ONE (Onehunga) was the original location code for the Manukau Harbour Baseline survey in 2006.

Site ID (SVONE1)	Latitude	Longitude	Date	Method	Type of organism and number of individuals retained	MITS ID	Biosecurity status	Water temperature (°C)	Salinity	Secchi depth (m)	Habitat	Estimated prevalence of incursion	Present in 2006
ONE2182	-36.9329	174.7824	1/05/19	Diver search	1 x <i>Polyandrocarpa zorritensis</i>	<i>Polyandrocarpa zorritensis</i>	Non-indigenous	16.3	35	1.2	Vessel hull	<1% cover	No
ONE2182	-36.9329	174.7824	1/05/19	Diver search	1 x <i>Ectopleura</i> sp.	<i>Ectopleura crocea</i>	Non-indigenous	16.3	35	1.2	Vessel hull	<1% cover	No
ONE2183	-36.93338	174.78285	1/05/19	Diver search	1 x colonial ascidian	<i>Botrylloides leachii</i>	Cryptogenic	16	35	1.2	Wharf pile	<1% cover	No
ONE2194	-36.9329	174.76054	1/05/19	Diver search	1 x colonial ascidian (possibly <i>Didemnum vexillum</i>)	<i>Didemnum lambitum</i>	Indigenous	16.5	35	1	Wharf pile	2 of 8 piles	No
ONE2192	-36.93338	174.82821	1/05/19	Diver search	1 x solitary ascidian (possibly <i>Styela plicata</i>)	<i>Styela plicata</i>	Cryptogenic	16.6	35	1.2	Wharf pile	1 of 10 piles	No
ONE2191	-37.01937	174.82780	1/05/19	Diver search	1 x barnacle	<i>Notomegabalanus decorus</i>	Indigenous	16.6	35	1.2	Wharf pile	1 of 10 piles	No
ONE2196	-37.0368	174.6122	1/05/19	Diver search	1 x egg mass (possibly from <i>Tanea zelandica</i> gastropod)	<i>Cabestana spengleri</i>	Indigenous	17.4	35	2.6	Sandy benthos	1 from 50-m search	No
ONE2235	-37.03664	174.6601	1/05/19	Shore search	1 x ascidian	<i>Styela plicata</i>	Cryptogenic	nr	nr	nr	Muddy rocks	1 from 50-m search	No
ONE2235	-37.0184	174.6601	1/05/19	Shore search	1 crab claw (possibly <i>Charybdis</i>)	<i>Charybdis (Charybdis) japonica</i>	Non-indigenous	nr	nr	nr	Muddy rocks	1 from 50-m search	No
ONE2037	-37.0916	174.59296	2/05/19	Benthic sled	1 x crab	<i>Liocarcinus corrugatus</i>	Indigenous	17.4	35	2.7	Shelly gravel	1 per 100-m sled	No

Appendix C Manukau Harbour 2019 survey results – species detected by site

Table 5 Manukau Harbour introduced species results - species detected by site.

For Site ID, replicate numbers are denoted by lowercase letters (i.e., traps 1-3 on a crab trap or crab condo trapline are a, b and c, divers 1-2 in a buddy pair are a and b).

For number or abundance metric, these are qualified as either: number of piles searched (#p) followed by the number of piles on which the organism was detected; abundance per-m²(m2); actual number (ActNum); abundance category (AbundCat (1-10 =1, 11-100=2, >101 =3)); or percent cover (%cover))

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2001	2001	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	1	No
SVONE2003	2003	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2004	2004	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2004	2004	Benthic sled	<i>Pagurus</i> sp.	AbundCat	2	No
SVONE2004	2004	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2005	2005	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2005	2005	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2005	2005	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2007	2007	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2007	2007	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2007	2007	Benthic sled	<i>Pagurus</i> sp.	AbundCat	2	No
SVONE2008	2008	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2009	2009	Benthic sled	<i>Halicarinus</i> sp.	AbundCat	2	No
SVONE2009	2009	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2012	2012	Benthic sled	<i>Fellaster zelandiae</i>	AbundCat	1	No
SVONE2013	2013	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2013	2013	Benthic sled	<i>Fellaster zelandiae</i>	AbundCat	1	No
SVONE2014	2014	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2014	2014	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2016	2016	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2016	2016	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2016	2016	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2016	2016	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2016	2016	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2017	2017	Benthic sled	<i>Fellaster zelandiae</i>	AbundCat	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2018	2018	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2018	2018	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2018	2018	Benthic sled	<i>Theora lubrica</i>	AbundCat	1	No
SVONE2018	2018	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2018	2018	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2018	2018	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2018	2018	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2018	2018	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2019	2019	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2019	2019	Benthic sled	<i>Petrolisthes elongatus</i>	AbundCat	1	No
SVONE2019	2019	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2019	2019	Benthic sled	<i>Notomegabalanus decorus</i>	AbundCat	1	No
SVONE2020	2020	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2020	2020	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2020	2020	Benthic sled	<i>Pagurus</i> sp.	AbundCat	2	No
SVONE2021	2021	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2021	2021	Benthic sled	<i>Hemiplax hirtipes</i>	AbundCat	1	No
SVONE2021	2021	Benthic sled	<i>Halicarcinus</i> sp.	AbundCat	1	No
SVONE2021	2021	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2021	2021	Benthic sled	<i>Forsterygion</i> sp.	AbundCat	1	No
SVONE2022	2022	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2022	2022	Benthic sled	<i>Halicarcinus</i> sp.	AbundCat	1	No
SVONE2023	2023	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2023	2023	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2023	2023	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2023	2023	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2024	2024	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	3	No
SVONE2024	2024	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2024	2024	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2024	2024	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	2	No
SVONE2024	2024	Benthic sled	<i>Hemiplax hirtipes</i>	AbundCat	1	No
SVONE2024	2024	Benthic sled	<i>Pagurus</i> sp.	AbundCat	2	No
SVONE2024	2024	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2024	2024	Benthic sled	<i>Diplosoma listerianum listerianum</i>	AbundCat	1	No
SVONE2024	2024	Benthic sled	<i>Pilumnopeus serratifrons</i>	AbundCat	1	No
SVONE2025	2025	Benthic sled	<i>Arcuatula senhousia</i>	AbundCa	2	Yes
SVONE2025	2025	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	Yes
SVONE2025	2025	Benthic sled	<i>Coscinasterias muricata</i>	AbundCa	1	No
SVONE2025	2025	Benthic sled	<i>Theora lubrica</i>	AbundCat	1	No
SVONE2025	2025	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2025	2025	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2028	2028	Benthic sled	<i>Pagurus</i> sp.	AbundCat	2	No
SVONE2029	2029	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	1	No
SVONE2029	2029	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2030	2030	Benthic sled	<i>Pecten novaezelandiae</i>	AbundCat	1	No
SVONE2030	2030	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2030	2030	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2030	2030	Benthic sled	<i>Solieria</i> sp.	AbundCa	1	Yes
SVONE2030	2030	Benthic sled	<i>Alcyonidiidae</i> sp.	AbundCa	1	Yes
SVONE2031	2031	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2031	2031	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2031	2031	Benthic sled	<i>Liocarcinus corrugatus</i>	AbundCat	1	No
SVONE2032	2032	Benthic sled	<i>Pagurus</i> sp	AbundCat	1	No
SVONE2036	2036	Benthic sled	<i>Pagurus</i> sp	AbundCat	2	No
SVONE2037	2037	Benthic sled	<i>Liocarcinus corrugatus</i>	AbundCat	1	Yes
SVONE2037	2037	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2037	2037	Benthic sled	<i>Pagurus</i> sp	AbundCat	1	No
SVONE2037	2037	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2038	2038	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2038	2038	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2041	2041	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2041	2041	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2041	2041	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2041	2041	Benthic sled	<i>Halicarcinus</i> sp.	AbundCat	1	No
SVONE2045	2045	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2045	2045	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2045	2045	Benthic sled	<i>Pecten novaezelandiae</i>	AbundCat	1	No
SVONE2046	2046	Benthic sled	<i>Halicarcinus</i> sp.	AbundCat	1	No
SVONE2047	2047	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	1	No
SVONE2047	2047	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2047	2047	Benthic sled	<i>Molgula manhattensis</i>	AbundCat	1	No
SVONE2047	2047	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2047	2047	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2047	2047	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2047	2047	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2047	2047	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2048	2048	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	1	No
SVONE2048	2048	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2048	2048	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2049	2049	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2049	2049	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2049	2049	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2049	2049	Benthic sled	<i>Amathia verticillata</i>	AbundCat	2	No
SVONE2049	2049	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2049	2049	Benthic sled	<i>Pecten novaezelandiae</i>	AbundCat	1	No
SVONE2050	2050	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2050	2050	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2050	2050	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2050	2050	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2050	2050	Benthic sled	<i>Pecten novaezelandiae</i>	AbundCat	1	No
SVONE2050	2050	Benthic sled	<i>Australostichopus mollis</i>	AbundCat	1	No
SVONE2051	2051	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2051	2051	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2051	2051	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2051	2051	Benthic sled	<i>Amathia verticillata</i>	AbundCat	2	No
SVONE2051	2051	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2051	2051	Benthic sled	<i>Styela plicata</i>	AbundCat	1	No
SVONE2052	2052	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2052	2052	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2052	2052	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2052	2052	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2052	2052	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2053	2053	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2053	2053	Benthic sled	<i>Codium fragile</i>	AbundCat	1	No
SVONE2053	2053	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2053	2053	Benthic sled	<i>Halicarcinus</i> sp.	AbundCat	1	No
SVONE2053	2053	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2053	2053	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2053	2053	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2054	2054	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2054	2054	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2054	2054	Benthic sled	<i>Pilumnopeus serratifrons</i>	AbundCat	1	No
SVONE2055	2055	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2055	2055	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2055	2055	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2056	2056	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2056	2056	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	2	No
SVONE2056	2056	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2056	2056	Benthic sled	<i>Pilumnopeus serratifrons</i>	AbundCat	1	No
SVONE2056	2056	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2057	2057	Benthic sled	<i>Philine auriformis</i>	AbundCat	1	Yes
SVONE2057	2057	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	1	No
SVONE2057	2057	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2057	2057	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	2	No
SVONE2057	2057	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2057	2057	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2057	2057	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2058	2058	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	2	No
SVONE2058	2058	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2058	2058	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2058	2058	Benthic sled	<i>Pagurus</i> sp.	AbundCat	2	No
SVONE2059	2059	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2059	2059	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2060	2060	Benthic sled	<i>Coscinasterias muricata</i>	AbundCa	1	No
SVONE2060	2060	Benthic sled	<i>Theora lubrica</i>	AbundCat	1	No
SVONE2060	2060	Benthic sled	<i>Codium fragile</i>	AbundCat	1	No
SVONE2060	2060	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	2	No
SVONE2060	2060	Benthic sled	<i>Pilumnopeus serratifrons</i>	AbundCat	1	No
SVONE2061	2061	Benthic sled	<i>Theora lubrica</i>	AbundCat	1	No
SVONE2061	2061	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2062	2062	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2063	2063	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2065	2065	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2065	2065	Benthic sled	<i>Linucula hartvigiana</i>	AbundCat	1	No
SVONE2065	2065	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	1	No
SVONE2065	2065	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2066	2066	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2066	2066	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2066	2066	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2067	2067	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2067	2067	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2067	2067	Benthic sled	<i>Halicarcinus</i> sp.	AbundCat	1	No
SVONE2067	2067	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2067	2067	Benthic sled	<i>Alpheus richardsoni</i>	AbundCat	1	No
SVONE2067	2067	Benthic sled	<i>Linucula hartvigiana</i>	AbundCat	1	No
SVONE2067	2067	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2068	2068	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2068	2068	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2068	2068	Benthic sled	<i>Linucula hartvigiana</i>	AbundCat	1	No
SVONE2068	2068	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2069	2069	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2069	2069	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2069	2069	Benthic sled	<i>Fellaster zelandiae</i>	AbundCat	1	No
SVONE2070	2070	Benthic sled	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2070	2070	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2070	2070	Benthic sled	<i>Amalda australis</i>	AbundCat	1	No
SVONE2072	2072	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2072	2072	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2072	2072	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2072	2072	Benthic sled	<i>Liocarcinus corrugatus</i>	AbundCat	1	No
SVONE2072	2072	Benthic sled	<i>Amalda australis</i>	AbundCat	1	No
SVONE2074	2074	Benthic sled	<i>Fellaster zelandiae</i>	AbundCat	2	No
SVONE2075	2075	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2075	2075	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2076	2076	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2076	2076	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2077	2077	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2077	2077	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2078	2078	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2080	2080	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2080	2080	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2080	2080	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2080	2080	Benthic sled	<i>Austrohelice crassa</i>	AbundCat	1	No
SVONE2080	2080	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2080	2080	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2081	2081	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2081	2081	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2081	2081	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2081	2081	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2081	2081	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2081	2081	Benthic sled	<i>Linucula hartvigiana</i>	AbundCat	1	No
SVONE2082	2082	Benthic sled	<i>Hemigrapsus crenulatus</i>	AbundCat	1	No
SVONE2082	2082	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	2	No
SVONE2082	2082	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2082	2082	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2082	2082	Benthic sled	<i>Pilumnopus serratifrons</i>	AbundCat	1	No
SVONE2083	2083	Benthic sled	<i>Theora lubrica</i>	AbundCat	1	Yes
SVONE2083	2083	Benthic sled	<i>Tritia burchardi</i>	AbundCat	1	Yes

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2084	2084	Benthic sled	<i>Fellaster zelandiae</i>	AbundCat	2	No
SVONE2086	2086	Benthic sled	<i>Halicarcinus</i> sp.	AbundCat	1	No
SVONE2086	2086	Benthic sled	<i>Pagurus</i> sp.	AbundCat	2	No
SVONE2086	2086	Benthic sled	<i>Austrohelice crassa</i>	AbundCat	1	No
SVONE2087	2087	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2087	2087	Benthic sled	<i>Patriella regularis</i>	AbundCat	1	No
SVONE2087	2087	Benthic sled	<i>Chaetopterus</i> sp.	AbundCa	1	No
SVONE2087	2087	Benthic sled	<i>Pagurus</i> sp.	AbundCat	2	No
SVONE2087	2087	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2088	2088	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	2	No
SVONE2088	2088	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2088	2088	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2088	2088	Benthic sled	<i>Pagurus</i> sp.	AbundCat	2	No
SVONE2088	2088	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2089	2089	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2090	2090	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2090	2090	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2090	2090	Benthic sled	<i>Hemigrapsus crenulatus</i>	AbundCat	1	No
SVONE2090	2090	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2091	2091	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2091	2091	Benthic sled	<i>Hemigrapsus crenulatus</i>	AbundCat	1	No
SVONE2091	2091	Benthic sled	<i>Halicarcinus</i> sp.	AbundCat	1	No
SVONE2091	2091	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2091	2091	Benthic sled	<i>Linucula hartvigiana</i>	AbundCat	1	No
SVONE2091	2091	Benthic sled	<i>Pilumnopeus serratifrons</i>	AbundCat	1	No
SVONE2092	2092	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2092	2092	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2092	2092	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2092	2092	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	1	No
SVONE2092	2092	Benthic sled	<i>Linucula hartvigiana</i>	AbundCat	1	No
SVONE2093	2093	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2093	2093	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	2	No
SVONE2093	2093	Benthic sled	<i>Hemiplax hirtipes</i>	AbundCat	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2093	2093	Benthic sled	<i>Halicarcinus</i> sp.	AbundCat	1	No
SVONE2093	2093	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2093	2093	Benthic sled	<i>Notomithrax</i> sp.	AbundCat	2	No
SVONE2093	2093	Benthic sled	<i>Linucula hartvigiana</i>	AbundCat	1	No
SVONE2094	2094	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2094	2094	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2094	2094	Benthic sled	<i>Halicarcinus</i> sp.	AbundCa	1	No
SVONE2094	2094	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2094	2094	Benthic sled	<i>Alpheus richardsoni</i>	AbundCat	1	No
SVONE2095	2095	Benthic sled	<i>Styela plicata</i>	AbundCat	1	Yes
SVONE2095	2095	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	1	No
SVONE2095	2095	Benthic sled	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2095	2095	Benthic sled	<i>Hemiplax hirtipes</i>	AbundCat	1	No
SVONE2095	2095	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2095	2095	Benthic sled	<i>Okenia pellucida</i>	AbundCat	1	Yes
SVONE2095	2095	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2096	2096	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	1	No
SVONE2096	2096	Benthic sled	<i>Molgula manhattensis</i>	AbundCat	1	No
SVONE2096	2096	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2097	2097	Benthic sled	<i>Molgula manhattensis</i>	AbundCat	1	No
SVONE2098	2098	Benthic sled	<i>Diplosoma listerianum</i>	AbundCat	1	No
SVONE2098	2098	Benthic sled	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2099	2099	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2100	2100	Benthic sled	<i>Arcuatula senhousia</i>	AbundCat	2	No
SVONE2100	2100	Benthic sled	<i>Pyromaia tuberculata</i>	AbundCat	1	No
SVONE2100	2100	Benthic sled	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2100	2100	Benthic sled	<i>Pilumnopeus serratifrons</i>	AbundCat	1	No
SVONE2101a	2101	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2101b	2101	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2101b	2101	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2102b	2102	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2102c	2102	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2102c	2102	Crab trap	<i>Amalda australis</i>	ActNum	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2104b	2104	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2104c	2104	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2106a	2106	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2106b	2106	Crab trap	<i>Cominella</i> sp.	ActNum	14	No
SVONE2107a	2107	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2107b	2107	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2108b	2108	Crab trap	<i>Cominella</i> sp.	ActNum	6	No
SVONE2108b	2108	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2109a	2109	Crab trap	<i>Ovalipes catharus</i>	ActNum	1	No
SVONE2110a	2110	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2112a	2112	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2112b	2112	Crab trap	<i>Patiriella regularis</i>	ActNum	1	No
SVONE2112b	2112	Crab trap	<i>Notomithrax</i> sp.	ActNum	1	No
SVONE2112c	2112	Crab trap	<i>Patiriella regularis</i>	ActNum	1	No
SVONE2113c	2113	Crab trap	<i>Ovalipes catharus</i>	ActNum	2	No
SVONE2114c	2114	Crab trap	<i>Sparus auratus</i>	ActNum	5	No
SVONE2115a	2115	Crab trap	<i>Coscinasterias muricata</i>	ActNum	2	No
SVONE2115a	2115	Crab trap	<i>Pagurus</i> sp.	ActNum	1	No
SVONE2115b	2115	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2115c	2115	Crab trap	<i>Coscinasterias muricata</i>	ActNum	2	No
SVONE2116a	2116	Crab trap	<i>Amathia verticillata</i>	ActNum	1	No
SVONE2116a	2116	Crab trap	<i>Amathia verticillata</i>	ActNum	1	No
SVONE2116b	2116	Crab trap	<i>Diplosoma listerianum</i>	ActNum	1	No
SVONE2116b	2116	Crab trap	<i>Diplosoma listerianum</i>	ActNum	1	No
SVONE2116c	2116	Crab trap	<i>Ovalipes catharus</i>	ActNum	2	No
SVONE2117a	2117	Crab trap	<i>Amathia verticillata</i>	ActNum	1	No
SVONE2117a	2117	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2117b	2117	Crab trap	<i>Cominella</i> sp.	ActNum	4	No
SVONE2117b	2117	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2117c	2117	Crab trap	<i>Cominella</i> sp.	ActNum	3	No
SVONE2119c	2119	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2120a	2120	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2120b	2120	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2120c	2120	Crab trap	<i>Sparus auratus</i>	ActNum	2	No
SVONE2121a	2121	Crab trap	<i>Forsterygion</i> sp.	ActNum	1	No
SVONE2121a	2121	Crab trap	<i>Cominella</i> sp.	ActNum	3	No
SVONE2121b	2121	Crab trap	<i>Cominella</i> sp.	ActNum	3	No
SVONE2122c	2122	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2123a	2123	Crab trap	<i>Cominella</i> sp.	ActNum	5	No
SVONE2123b	2123	Crab trap	<i>Cominella</i> sp.	ActNum	20	No
SVONE2123c	2123	Crab trap	<i>Sparus auratus</i>	ActNum	3	No
SVONE2123c	2123	Crab trap	<i>Cominella</i> sp.	ActNum	5	No
SVONE2124a	2124	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2124b	2124	Crab trap	<i>Cominella</i> sp.	ActNum	4	No
SVONE2124c	2124	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2125a	2125	Crab trap	<i>Ovalipes catharus</i>	ActNum	1	No
SVONE2125a	2125	Crab trap	<i>Cominella</i> sp.	ActNum	7	No
SVONE2125c	2125	Crab trap	<i>Ovalipes catharus</i>	ActNum	3	No
SVONE2125c	2125	Crab trap	<i>Cominella</i> sp.	ActNum	3	No
SVONE2126a	2126	Crab trap	<i>Hemiplax hirtipes</i>	ActNum	1	No
SVONE2126a	2126	Crab trap	<i>Hemiplax hirtipes</i>	ActNum	2	No
SVONE2126a	2126	Crab trap	<i>Hemiplax hirtipes</i>	ActNum	2	No
SVONE2126b	2126	Crab trap	<i>Cominella</i> sp.	ActNum	13	No
SVONE2126b	2126	Crab trap	<i>Cominella</i> sp.	ActNum	6	No
SVONE2126b	2126	Crab trap	<i>Cominella</i> sp.	ActNum	65	No
SVONE2128a	2128	Crab trap	<i>Ovalipes catharus</i>	ActNum	1	No
SVONE2128c	2128	Crab trap	<i>Ovalipes catharus</i>	ActNum	1	No
SVONE2130a	2130	Crab trap	<i>Cominella</i> sp.	ActNum	4	No
SVONE2130b	2130	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2130c	2130	Crab trap	<i>Cominella</i> sp.	ActNum	5	No
SVONE2132a	2132	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2133a	2133	Crab trap	<i>Sparus auratus</i>	ActNum	2	No
SVONE2133a	2133	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2133b	2133	Crab trap	<i>Amathia verticillata</i>	ActNum	1	No
SVONE2133b	2133	Crab trap	<i>Diplosoma listerianum</i>	ActNum	1	No
SVONE2133c	2133	Crab trap	<i>Sparus auratus</i>	ActNum	3	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2134a	2134	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2134b	2134	Crab trap	<i>Coscinasterias muricata</i>	ActNum	2	No
SVONE2135a	2135	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2135b	2135	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2136a	2136	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2136c	2136	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2137a	2137	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2137a	2137	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2137b	2137	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2137c	2137	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2138a	2138	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2138b	2138	Crab trap	<i>Cominella</i> sp.	ActNum	4	No
SVONE2138c	2138	Crab trap	<i>Cominella</i> sp.	ActNum	8	No
SVONE2139a	2139	Crab trap	<i>Cominella</i> sp.	ActNum	7	No
SVONE2139b	2139	Crab trap	<i>Cominella</i> sp.	ActNum	3	No
SVONE2139c	2139	Crab trap	<i>Cominella</i> sp.	ActNum	15	No
SVONE2139c	2139	Crab trap	<i>Charybdis (Charybdis) japonica</i>	ActNum	1	No
SVONE2139c	2139	Crab trap	<i>Charybdis (Charybdis) japonica</i>	ActNum	1	No
SVONE2140a	2140	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2140b	2140	Crab trap	<i>Cominella</i> sp.	ActNum	6	No
SVONE2141a	2141	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2141b	2141	Crab trap	<i>Coscinasterias muricata</i>	ActNum	2	No
SVONE2142a	2142	Crab trap	<i>Cominella</i> sp.	ActNum	14	No
SVONE2142b	2142	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2142c	2142	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2142c	2142	Crab trap	<i>Amalda australis</i>	ActNum	1	No
SVONE2143a	2143	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2143b	2143	Crab trap	<i>Ovalipes catharus</i>	ActNum	1	No
SVONE2144a	2144	Crab trap	<i>Coscinasterias muricata</i>	ActNum	2	No
SVONE2144a	2144	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2144a	2144	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2144c	2144	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2146a	2146	Crab trap	<i>Sparus auratus</i>	ActNum	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2146a	2146	Crab trap	<i>Ovalipes catharus</i>	ActNum	1	No
SVONE2148b	2148	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2148b	2148	Crab trap	<i>Patiriella regularis</i>	ActNum	1	No
SVONE2149a	2149	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2149b	2149	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2149c	2149	Crab trap	<i>Amathia verticillata</i>	ActNum	1	No
SVONE2150a	2150	Crab trap	<i>Cominella</i> sp.	ActNum	4	No
SVONE2150b	2150	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2150c	2150	Crab trap	<i>Cominella</i> sp.	ActNum	6	No
SVONE2151a	2151	Crab trap	<i>Cominella</i> sp.	ActNum	7	No
SVONE2151c	2151	Crab trap	<i>Cominella</i> sp.	ActNum	14	No
SVONE2152b	2152	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2155a	2155	Crab trap	<i>Cominella</i> sp.	ActNum	3	No
SVONE2155b	2155	Crab trap	<i>Cominella</i> sp.	ActNum	50	No
SVONE2155c	2155	Crab trap	<i>Cominella</i> sp.	ActNum	7	No
SVONE2156b	2156	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2157b	2157	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2157c	2157	Crab trap	<i>Pagurus</i> sp.	ActNum	1	No
SVONE2158a	2158	Crab trap	<i>Cominella</i> sp.	ActNum	10	No
SVONE2158b	2158	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2158c	2158	Crab trap	<i>Charybdis (Charybdis) japonica</i>	ActNum	1	Yes
SVONE2159a	2159	Crab trap	<i>Pagurus</i> sp.	ActNum	1	No
SVONE2159a	2159	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2159a	2159	Crab trap	<i>Diplosoma listerianum</i>	ActNum	1	No
SVONE2159a	2159	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2159b	2159	Crab trap	<i>Pagurus</i> sp.	ActNum	1	No
SVONE2159b	2159	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2159c	2159	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2160a	2160	Crab trap	<i>Halicarcinus</i>	ActNum	1	No
SVONE2160b	2160	Crab trap	<i>Forsterygion</i> sp.	ActNum	1	No
SVONE2160c	2160	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2160c	2160	Crab trap	<i>Diplosoma listerianum</i>	ActNum	1	No
SVONE2161a	2161	Crab trap	<i>Cominella</i> sp.	ActNum	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2161b	2161	Crab trap	<i>Pagurus</i> sp.	ActNum	1	No
SVONE2161b	2161	Crab trap	<i>Cominella</i> sp.	ActNum	20	No
SVONE2161c	2161	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2162a	2162	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2164a	2164	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2167a	2167	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2168a	2168	Crab trap	<i>Ovalipes catharus</i>	ActNum	3	No
SVONE2168b	2168	Crab trap	<i>Ovalipes catharus</i>	ActNum	1	No
SVONE2168b	2168	Crab trap	<i>Pagurus</i> sp.	ActNum	1	No
SVONE2168c	2168	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2169a	2169	Crab trap	<i>Cominella</i> sp.	ActNum	3	No
SVONE2169b	2169	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2169c	2169	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2170a	2170	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2170b	2170	Crab trap	<i>Conger</i> sp.	ActNum	1	No
SVONE2170b	2170	Crab trap	<i>Cominella</i> sp.	ActNum	4	No
SVONE2171a	2171	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2172a	2172	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2172b	2172	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2172c	2172	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2173a	2173	Crab trap	<i>Coscinasterias muricata</i>	ActNum	3	No
SVONE2173b	2173	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2173c	2173	Crab trap	<i>Coscinasterias muricata</i>	ActNum	3	No
SVONE2174a	2174	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2174c	2174	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2175a	2175	Crab trap	<i>Cominella</i> sp.	ActNum	1	No
SVONE2175a	2175	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2175c	2175	Crab trap	<i>Ovalipes catharus</i>	ActNum	1	No
SVONE2175c	2175	Crab trap	<i>Cominella</i> sp.	ActNum	3	No
SVONE2176a	2176	Crab trap	<i>Cominella</i> sp.	ActNum	3	No
SVONE2176a	2176	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2176b	2176	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2176b	2176	Crab trap	<i>Cominella</i> sp.	ActNum	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2176c	2176	Crab trap	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2177b	2177	Crab trap	<i>Sparus auratus</i>	ActNum	1	No
SVONE2177c	2177	Crab trap	<i>Sparus auratus</i>	ActNum	2	No
SVONE2179a	2179	Crab trap	<i>Cominella</i> sp.	ActNum	4	No
SVONE2179b	2179	Crab trap	<i>Cominella</i> sp.	ActNum	28	No
SVONE2179c	2179	Crab trap	<i>Cominella</i> sp.	ActNum	2	No
SVONE2181b	2181	Diver search	<i>Amathia verticillata</i>	5p	1	No
SVONE2182a	2182	Diver search	<i>Ectopleura crocea</i>	%cover	1	Yes
SVONE2182b	2182	Diver search	<i>Polyandrocarpa zorritensis</i>	%cover	1	Yes
SVONE2182b	2182	Diver search	<i>Ectopleura crocea</i>	%cover	1	No
SVONE2183a	2183	Diver search	<i>Botrylloides leachii</i>	5p	1	Yes
SVONE2183b	2183	Diver search	<i>Polyandrocarpa zorritensis</i>	5p	3	No
SVONE2184a	2184	Diver search	<i>Polyandrocarpa zorritensis</i>	5p	3	No
SVONE2184b	2184	Diver search	<i>Polyandrocarpa zorritensis</i>	5p	4	No
SVONE2185a	2185	Diver search	<i>Polyandrocarpa zorritensis</i>	5p	2	No
SVONE2185a	2185	Diver search	<i>Ectopleura crocea</i>	5p	2	No
SVONE2185a	2185	Diver search	<i>Charybdis (Charybdis) japonica</i>	5p	1	No
SVONE2185b	2185	Diver search	<i>Polyandrocarpa zorritensis</i>	5p	4	No
SVONE2185b	2185	Diver search	<i>Ectopleura crocea</i>	5p	3	No
SVONE2186a	2186	Diver search	<i>Polyandrocarpa zorritensis</i>	5p	5	No
SVONE2186a	2186	Diver search	<i>Ectopleura crocea</i>	5p	1	No
SVONE2186b	2186	Diver search	<i>Polyandrocarpa zorritensis</i>	5p	5	No
SVONE2186b	2186	Diver search	<i>Ectopleura crocea</i>	5p	5	No
SVONE2186b	2186	Diver search	<i>Charybdis (Charybdis) japonica</i>	5p	1	No
SVONE2187a	2187	Diver search	<i>Arcuatula senhousia</i>	5p	2	No
SVONE2189a	2189	Diver search	<i>Amathia verticillata</i>	5p	5	No
SVONE2189b	2189	Diver search	<i>Amathia verticillata</i>	5p	3	No
SVONE2190a	2190	Diver search	<i>Amathia verticillata</i>	5p	1	No
SVONE2190a	2190	Diver search	<i>Ectopleura crocea</i>	5p	5	No
SVONE2190a	2190	Diver search	<i>Polyandrocarpa zorritensis</i>	5p	1	No
SVONE2190a	2190	Diver search	<i>Diplosoma listerianum</i>	5p	3	No
SVONE2190b	2190	Diver search	<i>Ectopleura crocea</i>	5p	5	No
SVONE2190b	2190	Diver search	<i>Polyandrocarpa zorritensis</i>	5p	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2190b	2190	Diver search	<i>Diplosoma listerianum</i>	10p	5	No
SVONE2191a	2191	Diver search	<i>Ectopleura crocea</i>	10p	10	No
SVONE2191a	2191	Diver search	<i>Diplosoma listerianum</i>	10p	10	No
SVONE2191a	2191	Diver search	<i>Notomegabalanus decorus</i>	10p	1	Yes
SVONE2191b	2191	Diver search	<i>Ectopleura crocea</i>	10p	10	No
SVONE2191b	2191	Diver search	<i>Diplosoma listerianum</i>	10p	10	No
SVONE2192a	2192	Diver search	<i>Ectopleura crocea</i>	10p	10	No
SVONE2192a	2192	Diver search	<i>Polyandrocarpa zorritensis</i>	10p	1	No
SVONE2192a	2192	Diver search	<i>Diplosoma listerianum</i>	10p	10	No
SVONE2192a	2192	Diver search	<i>Styela plicata</i>	10p	1	Yes
SVONE2192b	2192	Diver search	<i>Ectopleura crocea</i>	10p	10	No
SVONE2192b	2192	Diver search	<i>Diplosoma listerianum</i>	10p	10	No
SVONE2193a	2193	Diver search	<i>Ectopleura crocea</i>	%cover	70	No
SVONE2193a	2193	Diver search	<i>Polyandrocarpa zorritensis</i>	%cover	1	No
SVONE2193b	2193	Diver search	<i>Ectopleura crocea</i>	%cover	70	No
SVONE2193b	2193	Diver search	<i>Polyandrocarpa zorritensis</i>	%cover	1	No
SVONE2194a	2194	Diver search	<i>Ectopleura crocea</i>	4p	4	No
SVONE2194a	2194	Diver search	<i>Didemnum lambitum</i>	4p	2	Yes
SVONE2194b	2194	Diver search	<i>Ectopleura crocea</i>	4p	4	No
SVONE2194b	2194	Diver search	<i>Diplosoma listerianum</i>	4p	4	No
SVONE2195a	2195	Diver search	<i>Didemnum lambitum</i>	4p	2	No
SVONE2195a	2195	Diver search	<i>Ectopleura crocea</i>	4p	4	No
SVONE2195a	2195	Diver search	<i>Diplosoma listerianum</i>	4p	4	No
SVONE2195a	2195	Diver search	<i>Amathia verticillata</i>	4p	1	No
SVONE2195b	2195	Diver search	<i>Didemnum lambitum</i>	4p	3	No
SVONE2195b	2195	Diver search	<i>Ectopleura crocea</i>	4p	4	No
SVONE2195b	2195	Diver search	<i>Diplosoma listerianum</i>	4p	4	No
SVONE2196a	2196	Diver search	<i>Caestana spengleri</i> egg mass		1	Yes
SVONE2196b	2196	Diver search	<i>Amathia verticillata</i>	%cover	1	No
SVONE2196b	2196	Diver search	<i>Ectopleura crocea</i>	%cover	1	No
SVONE2197a	2197	Diver search	<i>Charybdis (Charybdis) japonica</i>	5p	1	No
SVONE2197b	2197	Diver search	<i>Diplosoma listerianum</i>	%cover	1	No
SVONE2199a	2199	Diver search	<i>Amathia verticillata</i>	%cover	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2199b	2199	Diver search	<i>Amathia verticillata</i>	%cover	1	No
SVONE2199b	2199	Diver search	<i>Diplosoma listerianum</i>	%cover	1	No
SVONE2200a	2200	Diver search	<i>Diplosoma listerianum</i>	1p	1	No
SVONE2200b	2200	Diver search	<i>Amathia verticillata</i>	1p	1	No
SVONE2211b	2211	Crab condo	<i>Halicarinus</i> sp.	ActNum	1	No
SVONE2211c	2211	Crab condo	<i>Pilumnopeus serratifrons</i>	ActNum	1	No
SVONE2212b	2212	Crab condo	<i>Pilumnopeus serratifrons</i>	ActNum	1	No
SVONE2212c	2212	Crab condo	<i>Coscinasterias muricata</i>	ActNum	1	No
SVONE2214a	2214	Crab condo	<i>Pilumnopeus serratifrons</i>	ActNum	1	No
SVONE2215a	2215	Crab condo	<i>Halicarinus</i> sp.	ActNum	1	No
SVONE2216a	2216	Crab condo	<i>Hemiplax hirtipes</i>	ActNum	1	No
SVONE2219	2219	Shore search	<i>Pilumnopeus serratifrons</i>	AbundCat	2	No
SVONE2219	2219	Shore search	<i>Alpheus richardsoni</i>	AbundCat	1	No
SVONE2222	2222	Shore search	<i>Arcuatula senhousia</i>	AbundCat	2	No
SVONE2222	2222	Shore search	<i>Codium fragile</i>	AbundCat	2	No
SVONE2222	2222	Shore search	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2222	2222	Shore search	<i>Molgula manhattensis</i>	AbundCat	1	No
SVONE2223	2223	Shore search	<i>Arcuatula senhousia</i>	AbundCat	2	No
SVONE2223	2223	Shore search	<i>Hemigrapsus crenulatus</i>	AbundCat	1	No
SVONE2223	2223	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	3	No
SVONE2223	2223	Shore search	<i>Amathia verticillata</i>	AbundCat	2	No
SVONE2224	2224	Shore search	<i>Hemigrapsus sexdentatus</i>	AbundCat	2	No
SVONE2224	2224	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	3	No
SVONE2224	2224	Shore search	<i>Leptograpsus variegatus</i>	AbundCat	1	No
SVONE2225	2225	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	3	No
SVONE2226	2226	Shore search	<i>Hemiplax hirtipes</i>	AbundCat	3	No
SVONE2226	2226	Shore search	<i>Pilumnopeus serratifrons</i>	AbundCat	1	No
SVONE2227	2227	Shore search	<i>Coscinasterias muricata</i>	AbundCat	1	No
SVONE2228	2228	Shore search	<i>Hemiplax hirtipes</i>	AbundCat	3	No
SVONE2228	2228	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	3	No
SVONE2229	2229	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	2	No
SVONE2229	2229	Shore search	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2229	2229	Shore search	<i>Pilumnopeus serratifrons</i>	AbundCat	1	No

Site ID	Sample Number	Survey Method	Taxon Name	Number or abundance metric	Number or abundance	Sample kept?
SVONE2231	2231	Shore search	<i>Pagurus</i> sp.	AbundCat	1	No
SVONE2231	2231	Shore search	<i>Guinisia chabrus</i>	AbundCat	1	No
SVONE2231	2231	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	1	No
SVONE2232	2232	Shore search	<i>Arcuatula senhousia</i>	AbundCat	1	No
SVONE2233	2233	Shore search	<i>Hemiplax hirtipes</i>	AbundCat	1	No
SVONE2233	2233	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	1	No
SVONE2233	2233	Shore search	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2233	2233	Shore search	<i>Pilumnopeus serratifrons</i>	AbundCat	1	No
SVONE2234	2234	Shore search	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2234	2234	Shore search	<i>Leptograpsus variegatus</i>	AbundCat	1	No
SVONE2235	2235	Shore search	<i>Patiriella regularis</i>	AbundCat	1	No
SVONE2235	2235	Shore search	<i>Styela plicata</i>	AbundCat	1	Yes
SVONE2235	2235	Shore search	<i>Charybdis (Charybdis) japonica</i>	AbundCat	1	Yes
SVONE2236	2236	Shore search	<i>Hemiplax hirtipes</i>	AbundCat	3	No
SVONE2236	2236	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	2	No
SVONE2237	2237	Shore search	<i>Hemiplax hirtipes</i>	AbundCat	3	No
SVONE2237	2237	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	1	No
SVONE2237	2237	Shore search	<i>Amathia verticillata</i>	AbundCat	1	No
SVONE2238	2238	Shore search	<i>Magallana gigas</i>	AbundCat	3	No
SVONE2247	2247	Shore search	<i>Hemigrapsus crenulatus</i>	AbundCat	1	No
SVONE2247	2247	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	3	No
SVONE2247	2247	Shore search	<i>Pilumnopeus serratifrons</i>	AbundCat	2	No
SVONE2248	2248	Shore search	<i>Petrolisthes elongatus</i>	AbundCat	3	No
SVONE2248	2248	Shore search	<i>Pilumnopeus serratifrons</i>	AbundCat	2	No
SVONE2083	2083	Shore search	<i>Cnemidocarpa madagascariensis</i> var. <i>regalis</i>	AbundCat	1	Yes

Find out more: phone 09 301 0101, email biosecurity@aucklandcouncil.govt.nz or visit aucklandcouncil.govt.nz and knowledgeauckland.org.nz