



National Marine High Risk Site Surveillance

**Annual Synopsis Report for all High Risk Sites 2023–24
(SOW23030)**

Biosecurity New Zealand Technical Paper No: 2024/03

Prepared for the Ministry for Primary Industries

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ISBN No: 978-1-991308-51-1 (online)

ISSN No: 2624-019X (online)

June 2024

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Cover image: Non-indigenous Asian semele *Theora lubrica*, detected in a benthic sled sample from Picton Harbour. (Image: C. Woods/NIWA)

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1 Executive Summary

The National Marine High Risk Site Surveillance (NMHRSS) is a national programme of surveys targeted at the early detection of high-risk marine non-indigenous species (NIS). The primary objective of the NMHRSS programme is to detect incursions of new-to-New Zealand non-indigenous organisms in Aotearoa New Zealand's ports and marinas previously identified as being highest risk for the introduction and establishment of marine NIS. The programme has two secondary objectives: (1) to detect incursions of marine NIS or cryptogenic organisms not previously recorded in New Zealand, and; (2) to detect range extensions by marine NIS or cryptogenic organisms that are already established in New Zealand waters. The NMHRSS programme is designed to detect the presence of five primary target NIS (*Asterias amurensis*, *Carcinus maenas*, *Caulerpa taxifolia*, *Eriocheir sinensis*, and *Potamocorbula amurensis*) and four secondary target NIS (*Arcuatula senhousia*, *Eudistoma elongatum*, *Sabella spallanzanii*, and *Styela clava*). Each High Risk Site is surveyed bi-annually (hereafter referred to as the Winter and Summer surveys).

This Annual Synopsis Report details the targeted surveillance surveys at 12 High Risk Sites during the periods May to September 2023 (the Winter 2023 surveys) and November 2023 to April 2024 (the Summer 2023–24 surveys).

The number of survey locations sampled at each High Risk Site met or exceeded survey targets. A total of 3198 locations (101.7 % of target 3146) were surveyed during the Winter 2023 surveys. A total of 3185 locations (101.6 % of target 3135) were surveyed during the Summer 2023–24 surveys.

No primary target species were detected, but all four secondary target species were detected during both rounds of surveys.

- *A. senhousia* was detected during the following surveys:
 - o Waitematā Harbour (Winter 2023);
 - o Whangārei Harbour (Winter 2023, Summer 2023–24).
- *E. elongatum* was detected during the following surveys:
 - o Ōpua Marina/Waikare Inlet (Winter 2023, Summer 2023–24);
 - o Whangārei Harbour (Winter 2023, Summer 2023–24).
- *S. spallanzanii* was detected during the following surveys:
 - o Lyttelton Harbour/Whakaraupō (Winter 2023, Summer 2023–24);
 - o Ōpua Marina/Waikare Inlet (Winter 2023, Summer 2023–24);
 - o Tauranga Harbour (Summer 2023–24);
 - o Waitematā Harbour (Winter 2023, Summer 2023–24);
 - o Whangārei Harbour (Winter 2023, Summer 2023–24).
- *S. clava* was detected during the following surveys:
 - o Lyttelton Harbour/Whakaraupō (Winter 2023, Summer 2023–24);
 - o Nelson Harbour (Winter 2023, Summer 2023–24);
 - o Ōpua Marina/Waikare Inlet (Winter 2023, Summer 2023–24);
 - o Otago Harbour (Summer 2023–24);
 - o Picton Harbour (Summer 2023–24);
 - o Tauranga Harbour (Winter 2023);
 - o Waitematā Harbour (Winter 2023, Summer 2023–24);
 - o Whangārei Harbour (Winter 2023, Summer 2023–24).

These secondary target species have previously been detected at the respective High Risk Sites during NMHRSS programme surveys.

The number of specimens collected and sent to the Marine Invasives Taxonomic Service (MITS) for formal identification ranged from 0 to 7 per survey. The total numbers of specimens sent to MITS were 20 for the Winter 2023 survey round and 30 for the Summer 2023–24 survey round.

Eight of the 20 specimens sent to MITS from the Winter 2023 surveys were marine NIS (40.0 %) and 3 were cryptogenic (15.0 %). Non-indigenous species included the colonial ascidians *Clavelina lepadiformis* (Tauranga Harbour) and *Lissoclinum perforatum* (Napier Port and Ahuriri Inner Harbour), the solitary ascidian *Ascidia aspersa* (Waitematā Harbour), the bryozoans *Alcyonidium verrilli* (Lyttelton Harbour/Whakaraupō) and *Celleporaria nodulosa* (Ōpua Marina/Waikare and Port Taranaki), the decapod *Oratosquilla oratoria* (Waitematā Harbour), the fish *Parablennius tasmanianus* (Tauranga Harbour), and gastropod (nudibranch) *Thecacera pennigera* (Whangārei Harbour).

- The record of *L. perforatum* from Napier Port and Ahuriri Inner Harbour represents a detected **range extension** (previously detected in Port Taranaki);
- The record of *A. verrilli* from Lyttelton Harbour/Whakaraupō represents a **new-to-New Zealand** detection;
- The record of *C. nodulosa* from Ōpua Marina/Waikare Inlet represents a detected **range extension** (previously detected in Port Taranaki, Gisborne, Tauranga, Timaru, Waitematā, and Whangārei harbours);
- The record of *P. tasmanianus* from Tauranga Harbour represents a detected **range extension** (previously detected in Napier Port and Ahuriri Inner Harbour).

Ten of the 30 specimens sent to MITS from the Summer 2023–24 surveys were marine NIS (33.3 %) and 5 were cryptogenic (16.7 %). Non-indigenous species included the alga *Griffithsia crassiuscula* (Port Taranaki), the amphipod *Caprella scauroides* (Ōpua Marina/Waikare Inlet), the colonial ascidians *Didemnum patulum* (Bluff Harbour) and *Symplegma rubra* (Whangārei Harbour), the solitary ascidians *Ciona savignyi* (Whangārei Harbour) and *S. clava* (Picton Harbour), the decapod *O. oratoria* (Whangārei Harbour), and the gastropods (nudibranchs) *Polycera hedgpethi* (Tauranga Harbour) and *T. pennigera* (Ōpua Marina/Waikare Inlet and Tauranga Harbour).

- The record of *O. oratoria* from Whangārei Harbour represents a detected **range extension** (previously detected in Bay of Islands (including Ōpua Marina/Waikare Inlet), Hokianga, Kaipara, Mangōnui, Raglan, Waitematā, Whangaroa, and Whitianga harbours);
- The record of *S. rubra* from Whangārei Harbour represents a detected **range extension** (previously detected in Waitematā Harbour);
- The record of *T. pennigera* from both Ōpua Marina/Waikare Inlet and Tauranga Harbour represent (two) detected **range extensions** (previously detected in Waitematā and Whangārei harbours).

In total, one marine **new-to-New Zealand** species and seven marine NIS **range extensions** (all non-target species previously recorded from New Zealand waters) were detected. These significant detections were communicated to Biosecurity New Zealand through the MITS reporting procedure.

2 Introduction

The National Marine High Risk Site Surveillance (NMHRSS) is a national programme of surveys targeted at the early detection of high-risk marine non-indigenous species (NIS) and is part of Biosecurity New Zealand's¹ wider marine biosecurity system. The NMHRSS programme, delivered by NIWA Taihoro Nukurangi under contract to Biosecurity New Zealand, repeats targeted surveillance surveys developed and undertaken by NIWA from 2002 to the present at Aotearoa New Zealand's ports and marinas previously identified as being the highest risk for the introduction and establishment of marine NIS (Figure 1). Repeat surveys by an experienced team, the core of which includes observers who have surveyed the sites on multiple occasions (often for several years), builds capability and increases the likelihood of detecting temporal changes in species' assemblages. Each site is surveyed in winter and summer each year (i.e., bi-annually) because some organisms have life cycles that prevent macroscopic detection during certain times of the year.

The 12 High Risk Sites^{2,3} for the NMHRSS programme are (from north to south):

1. Ōpua Marina/Waikare Inlet (Te Moana o Pikopiko-i-Whiti, including waters to the south of Bampton Bank);
2. Whangārei Harbour (Whangārei-te-rerenga-parāoa);
3. Waitematā Harbour (Auckland; including the Viaduct Basin and Hobson West Marina area⁴, Westhaven Marina, Bayswater Marina, Devonport, and Kauri Point/Te Mātā-rae-o-Mana defence areas);
4. Tauranga Harbour (Te Awanui);
5. Napier Port and Ahuriri Inner Harbour;
6. Port Taranaki (New Plymouth, Ngāmotu);
7. Wellington Harbour (Te Whanganui-a-Tara);
8. Nelson Harbour (including Port Nelson and Waimea Inlet) (within Te Tai-o-Aorere/Tasman Bay);
9. Picton Harbour (including Shakespeare and Waikawa bays, and Havelock Marina);
10. Lyttelton Harbour/Whakaraupō;
11. Otago Harbour;
12. Bluff Harbour (Awarua).

¹ Biosecurity New Zealand is a business unit within the Ministry for Primary Industries.

² High Risk Site is the terminology used in the Ministry for Primary Industries Statement of Work (SOW23030) for the National Marine High Risk Site Surveillance programme.

³ Where appropriate, High Risk Site names follow official names listed in: 1) the New Zealand Gazetteer of place names (<http://www.lin.govt.nz/regulatory/place-names/find-place-name/new-zealand-gazetteer-place-names>); 2) Reed, A.W. (2016, revised by Dowling, P.) *Māori place names: their meanings and origins*, Oratia Books, 152p.; 3) Kā Huru Manu (<http://www.kahurumanu.co.nz/ka-ara-tawhito>); 4) '1000 Māori place names', URL: <https://nzhistory.govt.nz/culture/maori-language-week/1000-maori-place-names>, (Ministry for Culture and Heritage), updated 7-Nov-2023; and 5), and as advised by tangata whenua. Otherwise, High Risk Site names follow those listed in the Biosecurity New Zealand's Statement of Work (SOW23030) for the National Marine High Risk Site Surveillance programme.

⁴ Collectively referred to as Viaduct Harbour, encompassing: 1) Lighter Basina Marina; 2) Viaduct Port; 3) Waitemata Plaza West Marina; 4) Waitemata Plaza Marina; 5) Eastern Viaduct Marina; 6) Te Wero (North and South Island); and 7) Hobson West Marina.

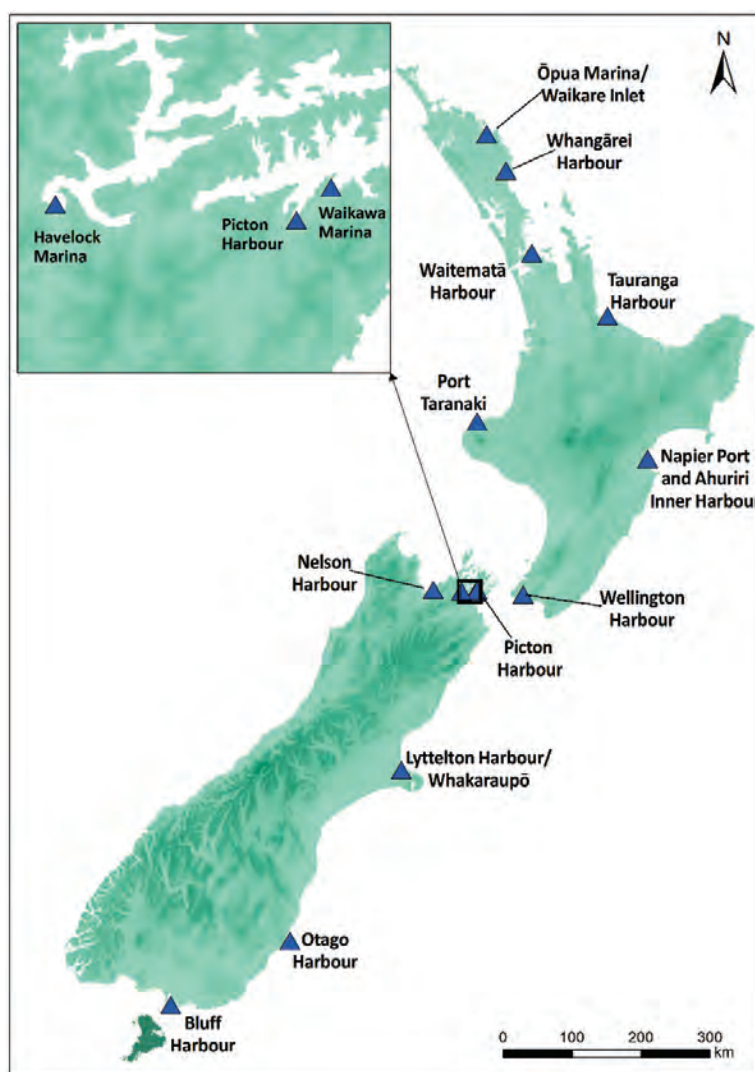


Figure 1: Locations of the 12 High Risk Sites covered by the National Marine High Risk Site Surveillance (NMHRSS) programme during 2023–24.

2.1 Objectives of the National Marine High Risk Site Surveillance (NMHRSS) programme

The primary objective of the NMHRSS programme is:

- To detect incursions of new-to-New Zealand non-indigenous organisms listed as unwanted organisms on the Official New Zealand Pest Register at High Risk Sites throughout New Zealand.

The secondary objectives of the NMHRSS programme are:

- To detect incursions of new-to-New Zealand non-indigenous or cryptogenic organisms not listed as unwanted organisms on the Official New Zealand Pest Register at High Risk Sites throughout New Zealand.
- To detect incursions (i.e., range extensions⁵) of established non-indigenous or cryptogenic organisms that exhibit characteristics of pests.

⁵ The term 'range extension' is applied when a NIS 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 NIS, but do not implicitly equate to actual geographic spread of a NIS (i.e., a NIS may be present at a location for a period before it is detected). Hence, they are referred to in this report as 'detected range extensions'. Recorded distributions for NIS in New Zealand are referenced in the Marine Biosecurity Porthole (<https://www.marinebiosecurity.org>).

2.2 Target species

Biosecurity New Zealand has identified five primary target species for the NMHRSS programme that are listed as unwanted organisms on the Official New Zealand Pest Register. These species have not yet been detected in New Zealand's coastal waters.

1. Northern Pacific seastar *Asterias amurensis**.
2. European green crab *Carcinus maenas**.
3. Aquarium Caulerpa *Caulerpa taxifolia**.
4. Chinese mitten crab *Eriocheir sinensis**.
5. Asian clam *Potamocorbula amurensis**.

Additionally, four secondary target organisms are known to be established in New Zealand's coastal waters.

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

*Notifiable organism under Biosecurity (Notifiable Organisms) Order 2016

<http://www.legislation.govt.nz/regulation/public/2016/0073/9.0/whole.html>

This Annual Synopsis Report details the targeted surveillance at the 12 High Risk Sites covered by the NMHRSS programme in the survey rounds of Winter 2023 and Summer 2023–24.

3 Summary of Survey Activity/Methods

3.1 Dates of National Marine High Risk Site Surveillance (NMHRSS) programme survey activity

The targeted surveillance surveys of the 12 High Risk Sites covered by the NMHRSS programme took place during the periods May to September 2023 (the Winter 2023 round of surveys) and November 2023 to April 2024⁶ (the Summer 2023–24 round of surveys). Dates for each survey are provided in Table 1.

Table 1: Survey dates for the Winter 2023 and Summer 2023–24 National Marine High Risk Site Surveillance (NMHRSS) programme.

High Risk Site	Winter 2023 survey	Summer 2023–24 survey
Bluff Harbour	4–8 September 2023	18–22 March 2024
Lyttelton Harbour/Whakaraupō	12–16 June 2023	20–24 November 2023
Napier Port and Ahuriri Inner Harbour	25–29 September 2023	18–22 March and 12 April 2024
Nelson Harbour	22–31 May 2023	30 October–10 November 2023
Ōpua Marina/Waikare Inlet	26–30 June 2023	13–17 November 2023
Otago Harbour	21–25 August 2023	26 February–1 March 2024
Picton Harbour	7–11 August 2023	1–15 March 2024
Port Taranaki	11–15 September 2023	19–23 February 2024
Tauranga Harbour	12–16 June 2023	11–15 December 2023
Waitematā Harbour	21–31 August 2023	12–23 February 2024
Wellington Harbour	10–14 July 2023	11–15 December 2023
Whangārei Harbour	17–21 July 2023	4–8 March 2024

3.2 National Marine High Risk Site Surveillance (NMHRSS) programme survey methods

Survey sampling for the NMHRSS programme uses a variety of methods designed to sample a range of soft and hard habitat types such as mud and gravel bottoms, intertidal rocky shores, and artificial structures including marina pontoons, pilings, moorings, jetties, and commercial vessel berths. The sampling methods (Figure 2) used are:

- benthic sled tows;
- crab condos (non-baited habitat collectors);
- crab (box) traps (baited traps);
- diver searches;
- shore searches.

The habitats and species targeted by each sampling method are detailed in Appendix 1.

⁶ Normally the summer season would end in March, however, a misidentification of a suspected specimen of *Styela clava* in situ within Napier Port (but without sample collection) necessitated a return trip for divers to confirm that *S. clava* was not present at this site (this would have been a detected range extension if so).

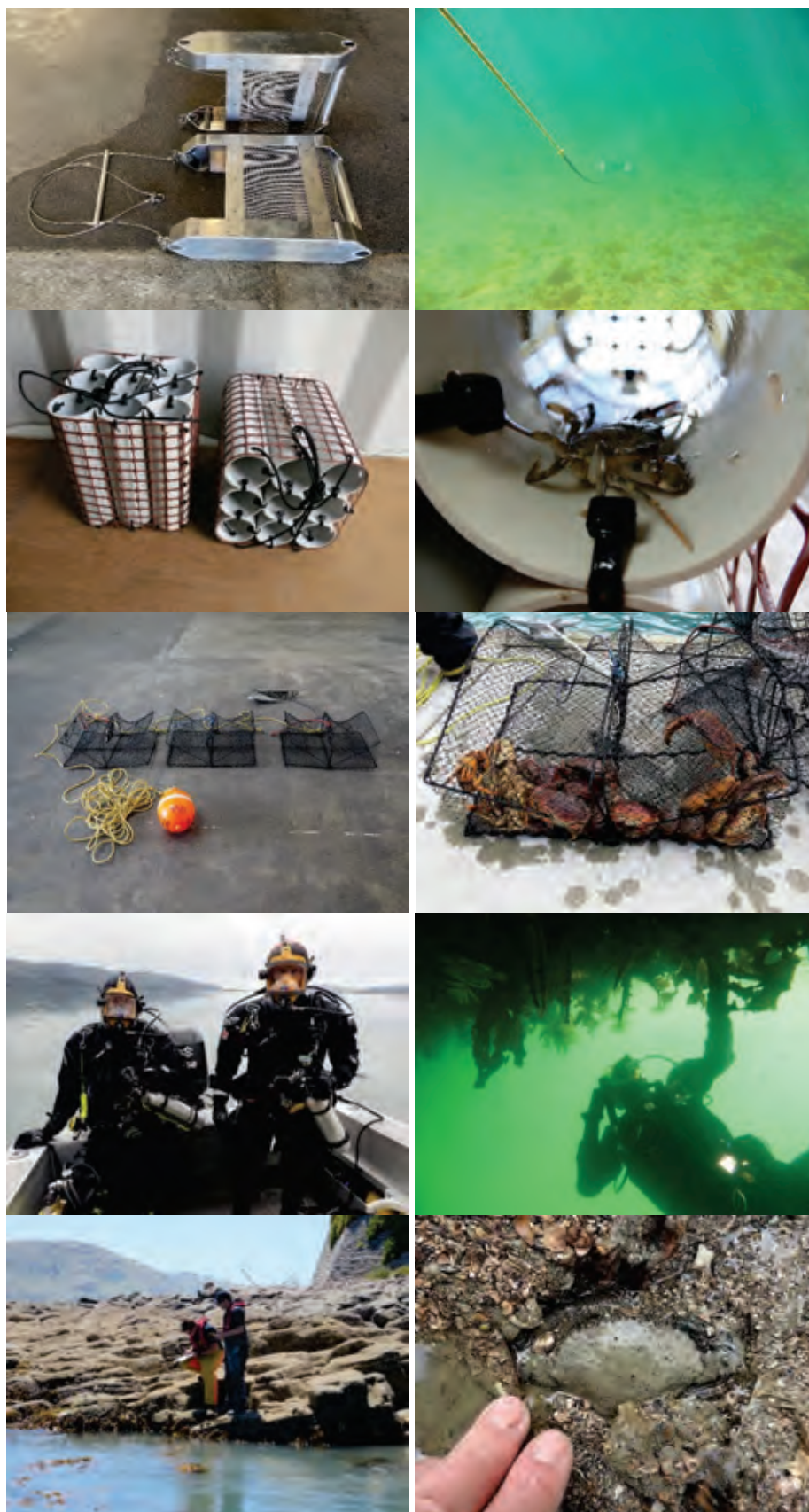


Figure 2: Sampling methods used in the National Marine High Risk Site Surveillance (NMHRSS) programme. From top to bottom: benthic sled; crab condo; crab (box) trap; diver search; and shore search. (Images: C. Woods/NIWA).

A documented process for the selection of sampling methods and allocation of sampling effort for the target species was developed at the start of a previous phase of the NMHRSS programme (Inglis et al, 2006a) and includes information on the biology and behaviour of the target marine NIS, as well as sampling methods used for the same or similar species in other parts of their range. Sample plans for the targeted marine pest surveillance programme were developed using a combination of niche models for the target species and particle dispersion models (to simulate dispersal of propagules from the point of release). The niche models were based on Habitat Suitability Indices derived from expert opinion. Their performance was compared with niche models derived statistically from independent data on the distribution of representative marine NIS (Inglis et al, 2006b). Sensitivity (efficiency of the survey method), cost-effectiveness, impacts on native species and environments, feasibility and consistency with safe field-working practice were also evaluated when selecting sampling methods. Stochastic Scenario Tree modelling was also used to evaluate and optimise confidence of target species detection and identify the resources needed to achieve the required detection outcomes (Morrissey et al, 2012a, b) and was most recently used to determine survey effort and methods for the inclusion of Napier Port and Ahuriri Inner Harbour as the 12th NMHRSS High Risk Site in 2021 (Woods et al, 2021).

Sampling locations for benthic sled tows, crab (box) trap lines, and diver searches were pre-allocated prior to each survey by using a grid overlaid on the survey area in Geographic Information Systems (GIS). Where a pre-allocated sampling point was not accessible at the time of the survey (e.g., port berth occupied by a vessel, unfavourable weather conditions, port operations underway), the sample was relocated to a nearby suitable location and the new coordinates recorded. Field teams also noted any sampling locations that were not appropriate or were unsafe, so that these could be removed from the grid of potential sampling locations for future surveys. Such locations included areas where high vessel traffic make diving too hazardous, areas that are not suitable for trapping because they are above the low water tide mark or have underwater hazards, seafloor cable zones and other restricted areas.

3.2.1 Specimen identification

All survey samples collected are sorted on-site and taxonomic identities confirmed (where possible) by field team members trained in identification of target species, and who have experience with the biota normally found at each High Risk Site.

Survey specimens to be retained for formal identification include all primary target species, representative samples of secondary target species at locations where they are not currently known to occur (i.e., potential range extensions) and any suspect organisms whose identities are uncertain. These specimens, preserved in the chemical appropriate to that taxon and with corresponding sampling information (i.e., sample date, location, taxon, and collection method), are sent to the Marine Invasives Taxonomic Service (MITS) (the NIWA centralised, clearinghouse service for taxonomic identification of marine organisms under contract to Biosecurity New Zealand) as soon as is practicable following each survey. Species identities are checked for correct naming via the World Register of Marine Species (<http://www.marinespecies.org/>), which provides an authoritative and comprehensive list of names of marine organisms, including information on synonymy.

Upon any suspicion or initial identification of the presence of what appears to be an organism not normally seen or otherwise detected in New Zealand, NIWA ensures:

- the MPI pest and disease hotline 0800 80 99 66 is called:
 - within 60 min of the initial detection for primary target species;
 - as soon as practicable, and within 48 h of the initial detection, for other species.
- all contact details and necessary information are provided to the MPI phone operator and the submitter remains available for contact from the incursion investigator;
- the MPI Biosecurity Surveillance Group Manager is notified as soon as practical (within 48 h of detection);
- a written report is received by the MPI Biosecurity Surveillance Group Manager within 4 weeks of the initial verbal report (coordinated via MITS), including detailed information on depth, habitat, substrate, etc, of the detection.

Any suspected range extensions of secondary target species are reported by NIWA to Biosecurity New Zealand as soon as practicable (within 48 h), with confirmation as to taxonomic identity provided by MITS to Biosecurity New Zealand through their contracted reporting procedure. Range extension and new-to-New Zealand status are checked via the Marine Biosecurity Porthole (www.marinebiosecurity.org.nz).

As per Open Nomenclature (Sigovini et al, 2016), the following taxonomic terminology used in this report applies:

- aff. (affinis = affinity with) – used to indicate that the specimen has some affinity to a known species, but it is not identical to it. The qualifier can imply distinction more than a possible identity, in contrast to the meaning usually given to the term confer (see below);
- cf. (confer = compares with) – used to indicate that a specimen resembles the named species very closely but has certain characters that are unclear or not found on the type specimen(s);
- n. sp. (nova species = new species) – the specimen is considered to belong to a new, previously undescribed species;
- sp. (species) – used after the genus name when the specimen has not been identified down to the species level (for various reasons) or it has not been related to any known species;
- spp. (species in plural form) – used to describe the presence of more than one species of the same genus.

3.3 Biosecurity New Zealand National Marine High Risk Site Surveillance (NMHRSS) programme team contacts

The NMHRSS programme is administered and funded by Biosecurity New Zealand's Biosecurity Surveillance Group. Queries relating to the NMHRSS programme should be directed to Biosecurity New Zealand. The Biosecurity New Zealand Operational Liaison for NMHRSS programme surveillance activity is Abraham Growcott, Principal Advisor, Marine Surveillance (tel: 04 894 2433, email: Abraham.Growcott@mpi.govt.nz).

3.4 NIWA National Marine High Risk Site Surveillance (NMHRSS) programme team contacts

The NMHRSS programme surveys were designed by NIWA and implemented by the NIWA personnel listed in the *Field team list and stakeholder communications log* submitted to the Biosecurity New Zealand Operational Liaison prior to each NMHRSS programme survey. The NIWA project manager for the NMHRSS programme is Dr Chris Woods (tel: 03 343 7820, email: Chris.Woods@niwa.co.nz).

4 Results

4.1 Sample collection

Total numbers of locations surveyed in each NMHRSS programme survey round (Winter 2023 and Summer 2023–24) at each High Risk Site are shown in Table 2. Numbers of survey locations sampled at each High Risk Site met or exceeded survey targets. A total of 3198 locations (101.7 % of target 3146) were surveyed during the Winter 2023 surveys. A total of 3185 locations (101.6 % of target 3135) were surveyed during the Summer 2023–24 surveys.

Numbers of locations sampled with each survey sampling method at each High Risk Site are shown in Appendix 2, by survey round. The achieved sample locations for each sampling method at each High Risk Site are shown in Appendix 3, by survey sampling round.

Table 2: Summary of target and achieved numbers of locations sampled at each National Marine High Risk Site Surveillance (NMHRSS) programme High Risk Site for the Winter 2023 and Summer 2023–24 survey rounds.

High Risk Site	Sampling round	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
Bluff Harbour ⁷	Winter 2023	225	228	101.3
	Summer 2023–24	225	228	101.3
Lyttelton Harbour/Whakaraupō	Winter 2023	243	247	101.6
	Summer 2023–24	243	246	101.2
Napier Port and Ahuriri Inner Harbour	Winter 2023	243	245	100.8
	Summer 2023–24	243	246	101.2
Nelson Harbour	Winter 2023	243	246	101.2
	Summer 2023–24	243	243	100.0
Ōpua Marina/Waikare Inlet ⁸	Winter 2023	248	253	102.0
	Summer 2023–24	248	252	101.6
Otago Harbour	Winter 2023	243	245	100.8
	Summer 2023–24	243	246	101.2
Picton Harbour	Winter 2023	243	246	101.2
	Summer 2023–24	243	246	101.2
Port Taranaki ⁹	Winter 2023	243	246	101.2
	Summer 2023–24	232	235	101.3
Tauranga Harbour	Winter 2023	243	247	101.6
	Summer 2023–24	243	244	100.4
Waitematā Harbour ¹⁰	Winter 2023	486	503	103.5
	Summer 2023–24	486	506	104.1
Wellington Harbour	Winter 2023	243	247	101.6
	Summer 2023–24	243	248	102.1
Whangārei Harbour	Winter 2023	243	245	100.8
	Summer 2023–24	243	245	100.8
All sites	Winter 2023	3146	3198	101.7
All sites	Summer 2023–24	3135	3185	101.6

⁷By agreement with Biosecurity New Zealand, the total target number of sampling locations in Bluff Harbour has been reduced compared to earlier surveys (from 243 down to 225), due to the presence of a sub-surface oyster farm lease north of Tikore Island which has resulted in the immediate area being inaccessible for safe sampling using crab traps and benthic sled tows. The numbers of crab traps and benthic sled locations have been reduced (from 80 to 68, and from 100 to 84, respectively), and the number of diver search locations increased (from 30 to 40), with several of those dives taking place in the oyster farming area.

⁸By agreement with Biosecurity New Zealand, the total target number of benthic sled locations increased to 105 following Stochastic Scenario Tree modelling, with increased survey allocation around Hermione Rock (nearby to where cruise ships anchor) to improve survey sensitivity for *P. amurensis*.

⁹By agreement with Biosecurity New Zealand, from the Summer 2023–24 onwards the total target number of sampling locations in Port Taranaki has been reduced compared to earlier surveys (from 243 down to 232), due to the relatively small size of the port in relation to benthic sled sampling effort. The number of benthic sled locations has been reduced (from 100 to 80), number of crab trap and diver search locations increased (from 80 to 84, and from 30 to 35, respectively), with several of those diver search locations taking place in a recreational vessel swing mooring area which is difficult to sample with the benthic sled due to rocky benthos and associated entanglement hazards.

¹⁰Due to the large survey area and complexity of habitats within Waitematā Harbour, sampling effort is doubled at this High Risk Site.

4.2 Target species collection

4.2.1 Primary target species detected

No primary target species were detected.

4.2.2 Secondary target species detected

All four secondary target species were detected during both rounds of surveys.

- *A. senhousia* was detected during the following surveys:
 - Waitematā Harbour (Winter 2023);
 - Whangārei Harbour (Winter 2023, Summer 2023–24).
- *E. elongatum* was detected during the following surveys:
 - Ōpua Marina/Waikare Inlet (Winter 2023, Summer 2023–24);
 - Whangārei Harbour (Winter 2023, Summer 2023–24).
- *S. spallanzanii* was detected during the following surveys:
 - Lyttelton Harbour/Whakaraupō (Winter 2023, Summer 2023–24);
 - Ōpua Marina/Waikare Inlet (Winter 2023, Summer 2023–24);
 - Tauranga Harbour (Summer 2023–24);
 - Waitematā Harbour (Winter 2023, Summer 2023–24);
 - Whangārei Harbour (Winter 2023, Summer 2023–24).
- *S. clava* was detected during the following surveys:
 - Lyttelton Harbour/Whakaraupō (Winter 2023, Summer 2023–24);
 - Nelson Harbour (Winter 2023, Summer 2023–24);
 - Ōpua Marina/Waikare Inlet (Winter 2023, Summer 2023–24);
 - Otago Harbour (Summer 2023–24);
 - Picton Harbour (Summer 2023–24);
 - Tauranga Harbour (Winter 2023);
 - Waitematā Harbour (Winter 2023, Summer 2023–24);
 - Whangārei Harbour (Winter 2023, Summer 2023–24).

4.3 Number of specimens collected and sent to MITS

The number of specimens collected and sent to the Marine Invasives Taxonomic Service (MITS) for formal identification ranged from 0 to 7 per survey. The total numbers of specimens sent to MITS were 20 for the Winter 2023 survey round and 30 for the Summer 2023–24 survey round (Table 3 and Table 4).

Eight of the 20 specimens sent to MITS from the Winter 2023 surveys were marine NIS (40.0 %) and 3 were cryptogenic (15.0 %) (Table 5). Non-indigenous species included the colonial ascidians *Clavelina lepadiformis* (Tauranga Harbour) and *Lissoclinum perforatum* (Napier Port and Ahuriri Inner Harbour), the solitary ascidian *Asciidiella aspersa* (Waitematā Harbour), the bryozoans *Alcyonidium verrilli* (Lyttelton Harbour/Whakaraupō) and *Celleporaria nodulosa* (Ōpua Marina/Waikare and Port Taranaki), the decapod *Oratosquilla oratoria* (Waitematā Harbour), the fish *Parablennius tasmanianus* (Tauranga Harbour), and gastropod (nudibranch) *Thecacera pennigera* (Whangārei Harbour).

- The record of *L. perforatum* from Napier Port and Ahuriri Inner Harbour represents a detected **range extension** (previously detected in Port Taranaki);
- The record of *A. verrilli* from Lyttelton Harbour/Whakaraupō represents a **new-to-New Zealand** detection;
- The record of *C. nodulosa* from Ōpua Marina/Waikare Inlet represents a detected **range extension** (previously detected in Port Taranaki, Gisborne, Tauranga, Timaru, Waitematā, and Whangārei harbours);
- The record of *P. tasmanianus* from Tauranga Harbour represents a detected **range extension** (previously detected in Napier Port and Ahuriri Inner Harbour).

Ten of the 30 specimens sent to MITS from the Summer 2023–24 surveys were marine NIS (33.3 %) and 5 were cryptogenic (16.7 %) (Table 6). Non-indigenous species included the alga *Griffithsia crassiuscula* (Port Taranaki), the amphipod *Caprella scauroides* (Ōpua Marina/Waikare Inlet), the colonial ascidians *Didemnum patulum* (Bluff Harbour) and *Symplegma rubra* (Whangārei Harbour), the solitary ascidians *Ciona savignyi* (Whangārei Harbour) and *S. clava* (Picton Harbour), the decapod *O. oratoria* (Whangārei Harbour), and the gastropods (nudibranchs) *Polycera hedgpethi* (Tauranga Harbour) and *T. pennigera* (Ōpua Marina/Waikare Inlet and Tauranga Harbour).

- The record of *O. oratoria* from Whangārei Harbour represents a detected **range extension** (previously detected in Bay of Islands (including Ōpua Marina/Waikare Inlet), Hokianga, Kaipara, Mangōnui, Raglan, Waitematā, Whangaroa, and Whitianga harbours);
- The record of *S. rubra* from Whangārei Harbour represents a detected **range extension** (previously detected in Waitematā Harbour);
- The record of *T. pennigera* from both Ōpua Marina/Waikare Inlet and Tauranga Harbour represent (two) detected **range extensions** (previously detected in Waitematā and Whangārei harbours).

In total, one marine **new-to-New Zealand** species and seven marine NIS **range extensions** (all non-target species previously recorded from New Zealand waters) were detected. These significant detections were communicated to Biosecurity New Zealand through the MITS reporting procedure.

Table 3: Summary of numbers and types of specimens collected for formal identification during the National Marine High Risk Site Surveillance (NMHRSS) programme Winter 2023 survey round.

Organism type	Bluff Harbour	Lyttelton Harbour/Whakaraupō	Napier Port and Ahuriri Inner Harbour	Nelson Harbour	Ōpua Marina/Waikare Inlet	Otago Harbour	Picton Harbour	Port Taranaki	Tauranga Harbour	Waitematā Harbour	Wellington Harbour	Whangārei Harbour	Total	% of total
Algae													0	0.0
Annelid				2									2	10.0
Amphipod													0	0.0
Anthozoan								1					1	5.0
Ascidian		2	1	1					2	1	1	1	9	45.0
Barnacle													0	0.0
Bivalve									1				1	5.0
Bryozoan		1			1			1					3	15.0
Crab													0	0.0
Decapod										1			1	5.0
Echinoderm													0	0.0
Fish									1				1	5.0
Gastropod ¹¹												1	1	5.0
Hydroid							1						1	5.0
Isopod													0	0.0
Sponge													0	0.0
Other													0	0.0
Total	0	3	1	3	1	0	1	2	4	2	1	2	20	100.0

¹¹ Includes Subclass Heterobranchia (e.g., nudibranchs, pleurobranchs, saccoglossans) of the Class Gastropoda.

Table 4: Summary of numbers and types of specimens collected for formal identification during the National Marine High Risk Site Surveillance (NMHRSS) programme Summer 2023–24 survey round.

Organism type	Bluff Harbour	Lyttelton Harbour/Whakaraupō	Napier Port and Ahuriri Inner Harbour	Nelson Harbour	Ōpua Marina/Waikare Inlet	Otago Harbour	Picton Harbour	Port Taranaki	Tauranga Harbour	Waitematā Harbour	Wellington Harbour	Whangārei Harbour	Total	% of total
Algae		3						5					8	26.7
Annelid													0	0.0
Amphipod					1								1	3.3
Anthozoan				1									1	3.3
Ascidian	1					1	1				2	3	8	26.7
Barnacle													0	0.0
Bivalve													0	0.0
Bryozoan													0	0.0
Crab			1					2					3	10.0
Decapod												1	1	3.3
Echinoderm													0	0.0
Fish													0	0.0
Gastropod					1				5				6	20.0
Hydroid													0	0.0
Isopod													0	0.0
Sponge			1										1	3.3
Other					1								1	3.3
Total	1	3	2	1	3	1	1	7	5	0	2	4	30	100.0

Table 5: Specimens collected for formal identification during the National Marine High Risk Site Surveillance (NMHRSS) programme Winter 2023 survey round.

Marine non-indigenous species are in bold type. Specimens are ordered alphabetically by High Risk Site, then by organism type, taxon and (field) sample number. Cryptogenic = species that are not demonstrably indigenous (native) or non-indigenous (non-native) (this includes: cryptogenic species category 1 – species previously recorded from New Zealand whose identity as either indigenous or non-indigenous is ambiguous, and which may include newly described species that have exhibited invasive behaviour in New Zealand, but for which there are no known records outside the New Zealand region; 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 indigenous range and which may include previously undescribed species that are new to New Zealand and/or science); Indeterminate = specimens that could not be reliably identified to genus or species level. This group includes: (1) organisms that were damaged, propagule or juvenile stage, 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. Note: where an organism cannot be identified to genus or species level there may still be certain diagnostic characters present or absent to enable a biosecurity status to be assigned to that organism. Detected range extensions are highlighted in blue. New-to-New Zealand detections (non-indigenous and cryptogenic) are highlighted in orange.

High Risk Site	Organism type	Taxon	Biosecurity status	Sample number	MITS code	Survey method
Lyttelton Harbour/Whakaraupō	Ascidian	<i>Didemnum</i> sp.	Indeterminate	LYT37009	75899	Benthic sled
Lyttelton Harbour/Whakaraupō	Ascidian	<i>Diplosoma listerianum</i>	Non-indigenous	LYT37128	75900	Crab trap
Lyttelton Harbour/Whakaraupō	Bryozoan	<i>Alcyonidium verrilli</i>	Non-indigenous	LYT37181	75898	Diver search
Napier Port and Ahuriri Inner Harbour	Ascidian	<i>Lissoclinum perforatum</i>	Non-indigenous	NPE37204	75937	Diver search
Nelson Harbour	Annelid	<i>Chaetopterus chaetopterus-A</i>	Cryptogenic	NSN37188	75896	Diver search
Nelson Harbour	Annelid	Sabellidae	Indeterminate	NSN37239	75895	Shore search
Nelson Harbour	Ascidian	<i>Agnezia glacata</i>	Indigenous	NSN37003	75894	Benthic sled
Ōpua Marina/Waikare Inlet	Bryozoan	<i>Celleporaria nodulosa</i>	Non-indigenous	OPX37188	75905	Diver search
Picton Harbour	Hydroid	<i>Hybocodon prolifer</i>	Cryptogenic	PCN37204	75921	Diver search
Port Taranaki	Anthozoan	<i>Epizoanthus</i> sp.	Indigenous	NPL37184	75930	Diver search
Port Taranaki	Bryozoan	<i>Celleporaria nodulosa</i>	Non-indigenous	NPL37185	75929	Diver search
Tauranga Harbour	Ascidian	<i>Clavelina lepadiformis</i>	Non-indigenous	TRG37195	75902	Diver search
Tauranga Harbour	Ascidian	<i>Molgula mortenseni</i>	Cryptogenic	TRG37181	75901	Diver search
Tauranga Harbour	Bivalve	<i>Venerupis largillierti</i>	Indigenous	TRG37197	75903	Diver search
Tauranga Harbour	Fish	<i>Parablennius tasmanianus</i>	Non-indigenous	TRG37186	75904	Diver search
Waitematā Harbour	Ascidian	<i>Ascidella aspersa</i>	Non-indigenous	AKL37393	75925	Diver search
Waitematā Harbour	Decapod	<i>Oratosquilla oratoria</i>	Non-indigenous	AKL37201	75924	Crab trap
Wellington Harbour	Ascidian	<i>Corella</i> sp.	Indeterminate	WLG37190	75907	Diver search
Whangārei Harbour	Ascidian	<i>Cnemidocarpa</i> sp.	Indeterminate	WRE37210	75913	Diver search
Whangārei Harbour	Gastropod	<i>Thecacera pennigera</i>	Non-indigenous	WRE37194	75914	Diver search

Table 6: Specimens collected for formal identification during the National Marine High Risk Site Surveillance (NMHRSS) programme Summer 2023–24 survey round.

Marine non-indigenous species are in bold type. Specimens are ordered alphabetically by High Risk Site, then by organism type, taxon and (field) sample number. Cryptogenic = species that are not demonstrably indigenous (native) or non-indigenous (non-native) (this includes: cryptogenic species category 1 – species previously recorded from New Zealand whose identity as either indigenous or non-indigenous is ambiguous, and which may include newly described species that have exhibited invasive behaviour in New Zealand, but for which there are no known records outside the New Zealand region; 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 indigenous range and which may include previously undescribed species that are new to New Zealand and/or science); Indeterminate = specimens that could not be reliably identified to genus or species level. This group includes: (1) organisms that were damaged, propagule or juvenile stage, 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. Note: where an organism cannot be identified to genus or species level there may still be certain diagnostic characters present or absent to enable a biosecurity status to be assigned to that organism. Detected range extensions are highlighted in blue. New-to-New Zealand detections (non-indigenous and cryptogenic) are highlighted in orange.

High Risk Site	Organism type	Taxon	Biosecurity status	Sample number	MITS code	Survey method
Bluff Harbour	Ascidian	<i>Didemnum patulum</i>	Non-indigenous	BLU38199	76003	Diver search
Lyttelton Harbour/Whakaraupō	Algae	<i>Cladophora albida</i>	Indigenous	LYT38240	75957	Shore search
Lyttelton Harbour/Whakaraupō	Algae	<i>Cladophora laetevirens</i>	Indigenous	LYT38240	75952	Shore search
Lyttelton Harbour/Whakaraupō	Algae	<i>Cladophora vagabunda</i>	Cryptogenic	LYT38240	75958	Shore search
Napier Port and Ahuriri Inner Harbour	Crab	<i>Ebalia laevis</i>	Indigenous	NPE38087	76002	Benthic sled
Napier Port and Ahuriri Inner Harbour	Sponge	<i>Halichondria</i> sp.	Indigenous	NPE38235	76001	Shore search
Nelson Harbour	Anthozoan	<i>Anthopleura</i> sp.	Indigenous	NSN38169	75934	Crab trap
Ōpua Marina/Waikare Inlet	Amphipod	<i>Caprella scauroides</i>	Non-indigenous	OPX38087	75946	Benthic sled
Ōpua Marina/Waikare Inlet	Gastropod	<i>Thecacera pennigera</i>	Non-indigenous	OPX38206	75947	Diver search
Ōpua Marina/Waikare Inlet	Other (freshwater macrophyte fragments)	Unknown	Indeterminate	OPX38009	75948	Benthic sled
Otago Harbour	Ascidian	<i>Polyclinum sluiteri</i>	Indigenous	DUD38041	75983	Benthic sled
Picton Harbour	Ascidian	<i>Styela clava</i>	Non-indigenous	PCN38011	75997	Benthic sled
Port Taranaki	Algae	<i>Cladostephus</i> sp.	Cryptogenic	NPL38040	75975	Benthic sled
Port Taranaki	Algae	<i>Dictyota papenfussii</i>	Indigenous	NPL38032	75978	Benthic sled
Port Taranaki	Algae	<i>Griffithsia crassiuscula</i>	Non-indigenous	NPL38075	75977	Benthic sled
Port Taranaki	Algae	<i>Plocamium</i> sp.	Indigenous	NPL38033	75979	Benthic sled
Port Taranaki	Algae	<i>Sporochnus moorei</i>	Indigenous	NPL38040	75976	Benthic sled
Port Taranaki	Crab	<i>Metadromia wilsoni</i>	Indigenous	NPL38198	75981	Diver search
Port Taranaki	Crab	<i>Nectocarcinus antarcticus</i>	Indigenous	NPL38045	75980	Benthic sled
Tauranga Harbour	Gastropod	<i>Aphelodoris luctuosa</i>	Indigenous	TRG38209	75962	Diver search
Tauranga Harbour	Gastropod	<i>Jorunna pantherina</i>	Indigenous	TRG38209	75963	Diver search

High Risk Site	Organism type	Taxon	Biosecurity status	Sample number	MITS code	Survey method
Tauranga Harbour	Gastropod	<i>Onchidella nigricans</i>	Indigenous	TRG38207	75961	Diver search
Tauranga Harbour	Gastropod	<i>Polycera hedgpethi</i>	Non-indigenous	TRG38185	75965	Diver search
Tauranga Harbour	Gastropod	<i>Thecacera pennigera</i>	Non-indigenous	TRG38184	75964	Diver search
Wellington Harbour	Ascidian	<i>Corella</i> sp.	Cryptogenic	WLG38193	75959	Diver search
Wellington Harbour	Ascidian	<i>Corella</i> sp.	Cryptogenic	WLG38245	75956	Diver search
Whangārei Harbour	Ascidian	<i>Ciona savignyi</i>	Non-indigenous	WRE38182	75986	Diver search
Whangārei Harbour	Ascidian	<i>Molgula mortenseni</i>	Cryptogenic	WRE38198	75987	Diver search
Whangārei Harbour	Ascidian	<i>Symplegma rubra</i>	Non-indigenous	WRE38204	75985	Diver search
Whangārei Harbour	Decapod	<i>Oratosquilla oratoria</i>	Non-indigenous	WRE38111	75988	Crab trap

4.4 Distribution of target and non-target marine non-indigenous species

Distribution maps are plotted for target and selected non-target marine NIS detected during the Winter 2023 and Summer 2023–24 survey rounds for the following three categories:

1. Species that are new-to-New Zealand.
2. Species that have not previously been reported in specific locations (i.e., detected range extensions according to Marine Biosecurity Porthole records).
3. Species that currently have a restricted distribution.

The distribution maps show locations where each selected species was detected and locations where it was absent (Appendix 4), based on appropriate sampling methods for each species (see Appendix 1). Records are shown for both the Winter 2023 and Summer 2023–24 survey rounds. Species plotted (and the survey methods by which they might be collected) are shown in Table 7. Some marine NIS listed in Table 7 may not be targeted by a particular sampling method but may occasionally be detected incidentally by that method (e.g., *S. clava* attached to masking (decorator) crabs collected in crab traps, or *A. senhousia* collected in crab condos that have been partially embedded in soft sediments and scooped up as the crab condos are retrieved).

Table 7: Selected target and non-target marine non-indigenous species for which distribution maps are plotted at each National Marine High Risk Site Surveillance (NMHRSS) programme High Risk Site and the sampling methods by which they may be detected.

Taxon	Sampling method
<i>Acentrogobius pflaumii</i>	Benthic sled, crab trap, diver search
<i>Agnezia</i> sp. ¹²	Benthic sled, crab trap, diver search
<i>Alcyonidium verrilli</i>	Benthic sled, diver search, shore search
<i>Amathia verticillata</i>	Benthic sled, crab trap, crab condo, diver search, shore search
<i>Arcuatula senhousia</i>	Benthic sled, crab condo, diver search, shore search
<i>Arenigobius bifrenatus</i>	Benthic sled, crab trap, diver search
<i>Ascidia latesiphonica</i>	Benthic sled, diver search, shore search
<i>Ascidella aspersa</i>	Benthic sled, diver search, shore search
<i>Botrylloides diegensis</i>	Benthic sled, diver search, shore search
<i>Botrylloides giganteus</i>	Benthic sled, diver search, shore search
<i>Caprella mutica</i>	Benthic sled, diver search, shore search
<i>Caprella scauroidea</i>	Benthic sled, diver search, shore search
<i>Celleporaria nodulosa</i>	Benthic sled, crab trap, diver search, shore search
<i>Celleporaria umbonatoidea</i>	Benthic sled, crab trap, diver search, shore search
<i>Charybdis (Charybdis) japonica</i>	Benthic sled, crab trap, crab condo, diver search, shore search
<i>Ciona intestinalis</i>	Benthic sled, diver search, shore search
<i>Ciona robusta</i>	Benthic sled, diver search, shore search

¹² Undescribed non-indigenous species.

Taxon	Sampling method
<i>Ciona savignyi</i>	Benthic sled, diver search, shore search
<i>Ciona</i> spp. ¹³	Benthic sled, diver search, shore search
<i>Clavelina lepadiformis</i>	Benthic sled, crab trap, diver search, shore search
<i>Dactylosiphon bulbosus</i>	Benthic sled, diver search, shore search
<i>Didemnum patulum</i>	Benthic sled, diver search, shore search
<i>Didemnum vexillum</i>	Benthic sled, diver search, shore search
<i>Diplosoma listerianum</i>	Benthic sled, diver search, shore search
<i>Ectopleura</i> spp. ¹⁴	Benthic sled, diver search, shore search
<i>Eudistoma elongatum</i>	Benthic sled, diver search, shore search
<i>Ficopomatus enigmaticus</i>	Benthic sled, diver search, shore search
<i>Fushitsunagia catenata</i>	Benthic sled, crab trap, diver search, shore search
<i>Grateloupia turuturu</i>	Benthic sled, crab trap, diver search, shore search
<i>Limaria orientalis</i>	Benthic sled, crab trap
<i>Lissoclinum perforatum</i>	Benthic sled, diver search, shore search
<i>Magallana gigas</i>	Benthic sled, crab condo, diver search, shore search
<i>Metapenaeus bennettiae</i>	Benthic sled, crab condo, crab trap, diver search
<i>Omobranchus anoliis</i>	Benthic sled, crab condo, crab trap, diver search, shore search
<i>Oratosquilla oratoria</i>	Benthic sled, crab trap, diver search, shore search
<i>Pachymeniopsis lanceolata</i>	Benthic sled, diver search, shore search
<i>Parablennius tasmanianus</i>	Benthic sled, crab condo, crab trap, diver search, shore search
<i>Polyandrocarpa zorritensis</i>	Benthic sled, diver search, shore search
<i>Polycera fujitai</i>	Benthic sled, diver search, shore search
<i>Polycera hedgpethi</i>	Benthic sled, diver search, shore search
<i>Pyromaia tuberculata</i>	Benthic sled, crab trap
<i>Sabella spallanzanii</i>	Benthic sled, crab trap, crab condo, diver search, shore search
<i>Schizymenia apoda</i>	Benthic sled, diver search, shore search
<i>Styela clava</i>	Benthic sled, crab trap, diver search, shore search
<i>Symplegma brakenhielmi</i>	Benthic sled, diver search, shore search
<i>Symplegma rubra</i>	Benthic sled, diver search, shore search
<i>Thalamoporella californica</i>	Benthic sled, crab trap, diver search shore search
<i>Thecacera pennigera</i>	Benthic sled, diver search, shore search
<i>Theora lubrica</i>	Benthic sled
<i>Tritia burchardi</i>	Benthic sled, crab trap, crab condo, diver search, shore search
<i>Undaria pinnatifida</i>	Benthic sled, crab trap, diver search, shore search

In the location descriptions that follow for target and selected non-target marine NIS detected during the Winter 2023 and Summer 2023–24 survey rounds, approximate detection locations are described in a sequential manner from the upper (inner) to lower (outer) regions (and entrance) of each High Risk Site (harbour/port/marina).

4.4.1 Secondary target marine non-indigenous species

Arcuatula senhousia

Detected (predominantly in benthic sled tows) in Whangārei Harbour during both surveys, and Waitematā Harbour during the winter survey (Figure 3). Distributions within each High Risk Site were as follows:

- Waitematā Harbour – main channel west of the Auckland Harbour Bridge, near Kauri Point/Te Mātā-rae-o-Mana and Birkenhead. Recorded at a total of 2 out of 503 (0.4 %) sampling

¹³ Includes *Ciona intestinalis*, *C. robusta*, and *C. savignyi*. All three species are classified as non-indigenous and can be found co-occurring. Where siphon pigmentation and tubercular prominences are present, physical differentiation between *Ciona* species in the field is possible and has been confirmed via expert taxonomic and molecular identification. However, distinguishing external morphological characters may not be present in all individuals of a given type and, in these instances, definitive assignment of an individual to species level requires reliable molecular analyses, but such analyses currently need to be treated with some caution due to the historic taxonomic uncertainty within *Ciona* spp. and potential misattribution of genetic library sequences to species. Molecular sequencing has been successfully used to differentiate *Ciona* spp. in some NMHRSS programme specimen submissions but has been unsuccessful in other instances.

¹⁴ Includes *Ectopleura crocea* and *E. larynx*. Both are non-indigenous and have been recorded previously in New Zealand. There are native *Ectopleura* spp. in New Zealand, but their polyp colouration is markedly different, allowing *E. crocea* and *E. larynx* to be differentiated from the native species in situ. Physical differentiation between *E. crocea* and *E. larynx* in the field is problematic and normally requires formal expert identification and/or molecular sequencing.

locations during the winter survey. This reflects a similar sparse distribution and abundance relative to other recent NMHRSS programme surveys;

- Whangārei Harbour – upper and lower harbour from Town Basin Marina to near harbour entrance, Port Nikau, Portland Reach, Matakohe (Limestone Island), Wellington Reach, Tamaterau Reach, Shell Cut Reach, Shoal Bay, Marsden Cove Marina, and Northport Berth. Recorded at a total of 13 out of 245 (5.3 %) sampling locations during the winter survey and at 28 out of 245 (11.4 %) sampling locations during the summer survey. This reflects a similar distribution and abundance relative to other recent NMHRSS programme surveys for the winter survey, albeit somewhat increased for the summer survey.



Figure 3: *Arcuatula senhousia* (buried in sediment) in situ (left) and ex situ in Whangārei Harbour (right, scale bar in mm). (Images: C. Woods/NIWA)

Eudistoma elongatum

Detected (predominantly during diver and shore searches) in Ōpua Marina/Waikare Inlet and Whangārei Harbour during both surveys (Figure 4). Distributions within each High Risk Site were as follows:

- Ōpua Marina/Waikare Inlet – Ōpua Marina, near Paihia, Waitangi, and Hermione Rock. Recorded at a total of 56 out of 253 (22.1 %) sampling locations during the winter survey and at 32 out of 252 (13.5 %) sampling locations during the summer survey. This reflects a similar distribution and abundance relative to other recent NMHRSS programme surveys, however, inter-year seasonal fluctuations in detections are common;
- Whangārei Harbour – Port Nikau, Mangapai River channel, Portland Wharf, Portland Reach, Matakohe (Limestone Island), Wellington Reach, around the entrance to Parua Bay, and Marsden Cove Marina. Recorded at a total of 6 out of 245 (2.4 %) sampling locations during the winter survey and at 29 out of 245 (11.8 %) sampling locations during the summer survey. This reflects a similar distribution and abundance relative to other recent NMHRSS programme surveys, however, inter-year seasonal fluctuations in detections are common.



Figure 4: *Eudistoma elongatum* ex situ (left) and on an intertidal rock (right) in Whangārei Harbour. (Images: C. Woods/NIWA)

Sabella spallanzanii

Detected (predominantly during diver and shore searches) in Ōpua Marina/Waikare Inlet, Lyttelton, Waitematā, and Whangārei harbours during both surveys, and Tauranga Harbour during the summer survey (Figure 5). Distributions within each High Risk Site were as follows:

- Lyttelton Harbour/Whakaraupō – Magazine Bay Marina and Port of Lyttelton (including Cashin Quay). Recorded at a total of 39 out of 247 (15.8 %) sampling locations during the winter survey and at 27 out of 246 (11.0 %) sampling locations during the summer survey. This reflects the continuing recent increase in distribution and abundance relative to other recent NMHRSS programme surveys following the MPI-funded 2009 *Sabella* removal programme, which saw *S. spallanzanii* numbers significantly reduced until 2019–20 when detection rates started to increase. Targeted removal operations by Environment Canterbury (ECan) and Lyttelton Port Company (LPC) have been undertaken episodically during 2021–23, with a delimitation programme undertaken in 2023 by these two agencies in partnership with Biosecurity New Zealand. Recent detections by the NMHRSS programme and ECan/LPC/Biosecurity New Zealand indicate that the gradual spread of *S. spallanzanii* outside of the port's Inner Harbour confines is occurring. All specimens detected during NMHRSS programme surveys were removed for disposal to landfill. LPC initiated the removal of derelict wharves No. 4 and 5 in 2023; these wharves have been inaccessible to diver inspections in recent years for safety reasons, and have likely represented a population refuge for *S. spallanzanii* in the port;
- Ōpua Marina/Waikare Inlet – Ōpua Marina. Recorded at a total of 11 out of 253 (4.3 %) sampling locations during the winter survey and at 30 out of 252 (11.9 %) of sampling locations during the summer survey. This reflects an increase in distribution and abundance relative to the lowest detection records in the preceding 2022–23 survey year, and more similar to the greatest detection rates in the survey years of 2019–20 and 2020–21. This species was detected at this High Risk Site in July 2018 by contractors inspecting mooring blocks for Northland Regional Council (NRC) and has been subject to a NRC/Biosecurity New Zealand delimitation and removal survey programme. All specimens detected were removed for disposal to landfill;
- Tauranga Harbour – Tauranga Marina. Recorded at a total of 2 out of 244 (0.8 %) sampling locations during the summer survey. This continues to reflect infrequent and restricted detections for *S. spallanzanii* at this site. This species is subject to ongoing delimitation and removal surveys by Bay of Plenty Regional Council (BoPRC). All specimens detected were removed for disposal to landfill;
- Waitematā Harbour – main channels in upper and lower harbour from Beach Haven to harbour entrance, Hobsonville Marina, Kauri Point/Te Mātā-rae-o-Mana, Whau River channel, Te Tokaroa (Meola) Reef, Chelsea Wharf, Birkenhead Wharf, Westhaven Marina, Bayswater Marina, Freemans Bay, Viaduct Harbour, Port of Auckland, Devonport Naval Base, Devonport Wharf, Outboard Boating Club, and Orakei Marina. Recorded at a total of 173 out of 503 (34.3 %) sampling locations during the winter survey and at 180 out of 506 (35.5 %) sampling locations during the summer survey. This reflects a similar distribution and abundance relative to other recent NMHRSS programme surveys, other than 2018–19 and 2022–23 where distribution and abundance were lower;
- Whangārei Harbour – upper and lower harbour from Kissing Point Marina to harbour entrance, Port Nikau, Mangapai River channel, Portland Wharf, Portland Reach, Matakōhe (Limestone Island), Wellington Reach, Parua Bay, Marsden Cove Marina, McLeod Bay, Northport Berth, Motukaroro Island, and Marsden Point Oil Refinery Wharf. Recorded at a total of 42 out of 245 (17.1 %) sampling locations during the winter survey and at 57 out of 245 (23.2 %) sampling locations during the summer survey. This reflects a similar distribution and abundance relative to other recent NMHRSS programme surveys. This species was subject to delimitation and removal surveys by NRC until several years ago, and recent increased distribution and abundance reflect the effects of discontinuation of removal efforts.



Figure 5: *Sabella spallanzanii* in situ on wharf piles in Lyttelton Harbour/Whakaraupō. (Images: C. Woods/NIWA)

Styela clava

Detected (predominantly during diver and shore searches) in Ōpua Marina/Waikare Inlet, Lyttelton, Nelson, Waitematā, and Whangārei harbours during both surveys, Tauranga Harbour during the winter survey, and Otago and Picton harbours during the summer survey (Figure 6). Distributions within each High Risk Site were as follows:

- Lyttelton Harbour/Whakaraupō – Sandy Beach (Governors Bay), Motu-kauati-rahi/Cass Bay, Motu-kauati-iti/Corsair Bay, Magazine Bay Marina, Naval Point, Port of Lyttelton (including Cruise Berth and Cashin Quay), Te Wharau/Charteris Bay, Te Waipapa/Diamond Harbour, and Purau Bay. Recorded at a total of 56 out of 247 (22.7 %) sampling locations during the winter survey and at 53 out of 246 (21.5 %) sampling locations during the summer survey. This reflects a similar distribution and abundance relative to other recent NMHRSS programme surveys, with a continued increase in recruitment observed at certain locations along the southwestern margin of the harbour (e.g., into Te Waipapa/Diamond Harbour associated with a new ferry pontoon);
- Nelson Harbour – Nelson Haven, Nelson Marina, Port Nelson, main channel, The Cut, and near Haulashore Island. Recorded at a total of 50 out of 246 (20.3 %) sampling locations during the winter survey and at 38 out of 243 (15.6 %) sampling locations during the summer survey. This reflects a somewhat increased distribution and abundance relative to other recent NMHRSS programme surveys;
- Ōpua Marina/Waikare Inlet – Ōpua Marina, Ōpua Wharf, and Kororāreka Bay (Russell). Recorded at a total of 25 out of 253 (9.9 %) sampling locations during the winter survey and at 31 out of 252 (12.3 %) sampling locations during the summer survey. This reflects an increase in distribution and abundance relative to the lowest recent detection records in the preceding survey year (2022–23), and being more similar to detection rates to more recent survey years;
- Otago Harbour – Leith Marina. Recorded at a total of 2 out of 246 (0.8 %) sampling locations during the summer survey. This reflects the continued decrease in distribution and abundance of *S. clava* in Otago Harbour since 2017–18. All *S. clava* detected were removed for disposal to landfill;
- Picton Harbour – Picton and Havelock marinas. Detected at a total of 2 of 246 (0.8 %) sampling locations during the summer survey. This reflects a similar sparse distribution and abundance relative to other recent NMHRSS programme surveys within Picton Harbour due to ongoing delimitation and removal surveys by Marlborough District Council (MDC) and the Top of the South Biosecurity Partnership. The detection of a single specimen (detached, detected in a benthic sled tow) in Havelock Marina represents the first detection in this marina (previously detected at several locations within Pelorus Sound).
- Tauranga Harbour – Tauranga Bridge Marina. Recorded at a total of 1 out of 247 (0.4 %) sampling locations during the winter survey. This continues to reflect infrequent and restricted detections for *S. clava* at this site. This species is subject to ongoing delimitation and removal surveys by BoPRC. All specimens detected were removed for disposal to landfill;
- Waitematā Harbour – upper and lower harbour from Kauri Point/Te Mātā-rae-o-Mana to harbour entrance, Chelsea Wharf, Birkenhead Wharf, Westhaven Marina, Bayswater Marina, Viaduct Harbour, Port of Auckland, Devonport Naval Base, Devonport Wharf, Outboard Boating Club, and Orakei Marina. Recorded at a total of 57 out of 503 (11.3 %) sampling locations during the winter survey and at 73 out of 506 (14.4 %) sampling locations during the summer survey. This reflects a similar distribution and abundance relative to other recent NMHRSS programme surveys, other 2022–23 where distribution and abundance were lower;

- Whangārei Harbour – Marsden Cove Marina and Northport Berth. Recorded at a total of 9 out of 245 (3.7 %) sampling locations during the winter survey and at 7 out of 245 (2.9 %) sampling locations during the summer survey. This continues to reflect a more restricted distribution, but similar abundance relative to other recent NMHRSS programme surveys. This species has been subject to delimitation and removal surveys by NRC. All *S. clava* detected were removed for disposal to landfill during the summer survey.



Figure 6: *Styela clava* in situ on a marina pontoon (left) and underneath an overturned intertidal rock (right) in Lyttelton Harbour/Whakaraupō. (Images: C. Woods/NIWA)

4.4.2 Non-target, marine non-indigenous species

Acentrogobius pflaumii

Detected in Ōpua Marina/Waikare Inlet, Nelson, Waitematā and Whangārei harbours during both surveys.

- Nelson Harbour – Nelson Marina, Port Nelson, near Boulder Bank, and near Haulashore Island;
- Ōpua Marina/Waikare Inlet – Ōpua Marina and Kororāreka Bay;
- Waitematā Harbour – Viaduct Harbour (Halsey Street Wharf) and Port of Auckland;
- Whangārei Harbour – Port Nikau, Portland Reach, Shell Cut Reach, Parua Bay, and Marsden Cove Marina.

Agnezia sp.

Detected in Ōpua Marina/Waikare Inlet during the summer survey near Waitangi and around Hermione Rock. This small, undescribed non-indigenous solitary ascidian was first detected at this site during the Summer 2019–20 survey as a new-to-New Zealand detection.

Alcyonidium verrilli

Detected in Lyttelton Harbour/Whakaraupō during the winter survey at Cashin Quay (Port of Lyttelton). This record represents a **new-to-New Zealand** detection.

Alcyonidium verrilli is an erect, uncalcified branching bryozoan. It has a firm gelatinous texture with a thick opaque surface cuticle, hence the common name of 'jelly bryozoan'. Individual zooids are box-like with a subterminal or terminal orifice that can be puckered or papillate, although zooids can be difficult to distinguish in older colonies. Colonies of *A. verrilli* are yellowish tan to greyish brown in colour, paling to whitish at growing tips of branches and branched (Figure 7). When fully grown, branches (up to 2–3 cm diameter) are round or flattened, irregularly dichotomous, with the surface relatively smooth. Colonies can grow to 40 cm in height. *Alcyonidium* species are considered cryptic and difficult to identify. This is the first confirmed record of this species outside of its native range in the Northeast USA (Northwest Atlantic).

A near-identical specimen was previously collected during the Summer 2010–11 NMHRSS programme survey of Lyttelton Harbour/Whakaraupō from the riprap wall along Godley Quay near the port's Inner Harbour entrance, but this specimen could not be identified to species at the time. Following confirmation of the Winter 2023 specimen as *A. verrilli* via molecular and histological analyses, subsequent histological re-examination of the preserved 2011 sample has also confirmed this as *A. verrilli*. Thus, this species appears to have been present in Lyttelton Harbour/Whakaraupō

since 2011. As the native range of this species is from subtidal temperate to cooler waters, this species has the potential to become established in New Zealand. Potential impacts of this species are unknown.



Figure 7: *Alcyonidium verrilli* ex situ in Lyttelton Harbour/Whakaraupō. (Images: C. Woods/NIWA)

Amathia verticillata

Detected in Whangārei Harbour during both surveys, Nelson and Tauranga harbours during the winter survey, and Waitematā Harbour during the summer survey. As in recent rounds of surveys this species appears to exhibit a marked seasonality at these sites, with more frequent detections in summer.

- Nelson Harbour – Nelson Marina;
- Tauranga Harbour – Tauranga Marina;
- Waitematā Harbour – Westhaven Marina, Bayswater Marina, Viaduct Harbour (Waitematā Plaza Marina), and Port of Auckland;
- Whangārei Harbour – Kissing Point Marina, Port Nikau, Marsden Cove Marina, Northport Berth, and Marsden Point Oil Refinery Wharf.

Arenigobius bifrenatus

Detected in Whangārei Harbour during both surveys in Hātea River channel and Marsden Cove Marina.

Ascidia latesiphonica

Detected in Waitematā Harbour during both surveys in upper and lower harbour from Kauri Point/Te Mātā-rae-o-Mana to harbour entrance, Westhaven Marina, Bayswater Marina, Freemans Bay, Viaduct Harbour, Port of Auckland, Devonport Naval Base, Devonport Wharf, Outboard Boating Club, and Orakei Marina. *Ascidia latesiphonica* was detected as a new-to-New Zealand species in the Waitematā Harbour the previous survey year (2022–23), and this distinctive, yellow-coloured solitary ascidian has continued to expand in distribution within the harbour this survey year.

Ascidella aspersa

Detected in Lyttelton and Otago harbours during both surveys, Waitematā Harbour during the winter survey, and Bluff Harbour during the summer survey.

- Bluff Harbour – channel leading to Awarua Bay;
- Lyttelton Harbour/Whakaraupō – upper harbour from Rāpaki to Magazine Bay, Te Wharau/Charteris Bay, and Port of Lyttelton;
- Otago Harbour – upper harbour, Port Otago, Victoria Channel, Sawyers Bay, Port Chalmers, Portobello Bay, and Deborah Bay;
- Waitematā Harbour – west of the Auckland Harbour Bridge near Little Shoal Bay and Westhaven Marina.

Botrylloides diegensis

Detected in Napier Port and Ahuriri Inner Harbour, Bluff, Lyttelton, Nelson, Otago, Picton, Tauranga, Waitematā, Whangārei, and Wellington harbours during both surveys, Port Taranaki during the winter survey, and Ōpua Marina/Waikare Inlet during the summer survey (Figure 8).

- Bluff Harbour – Island Harbour, Fishing Boat piers, Tiwai Wharf, and Town Wharf;

- Lyttelton Harbour/Whakaraupō – Naval Point (by Magazine Bay Marina), Port of Lyttelton (including Cashin Quay), and Te Waipapa/Diamond Harbour;
- Napier Port and Ahuriri Inner Harbour – Spriggs Park/Te Karaka (Perfume Point) Reserve shoreline and Port of Napier;
- Nelson Harbour – Nelson Haven, Nelson Marina, Port Nelson, and The Cut;
- Ōpua Marina/Waikare Inlet – Kororāreka Bay (Russell);
- Otago Harbour – Port Otago, Leith Marina, Ravensbourne Wharf, and Careys Bay;
- Picton Harbour – Picton Marina, Picton Port, Queen Charlotte Yacht Club, Westshore, Shakespeare Bay, and Waikawa Marina;
- Port Taranaki – Newton King Tanker Terminal and Blyde Wharf;
- Tauranga Harbour – Trinity Wharf Tauranga (hotel pontoon), Tauranga Bridge Marina, Port of Tauranga, Tauranga Marina, and Matakana Island;
- Waitematā Harbour – Hobsonville Marina, Chelsea Wharf, Westhaven Marina, Bayswater Marina, Viaduct Harbour, Port of Auckland, Devonport Naval Base, Outboard Boating Club, and Orakei Marina;
- Wellington Harbour – Seaview Marina, CentrePort (Aotea Quay), Lambton Harbour, Chaffers Marina, Evans Bay Marina, Miramar Wharf, and Burnham Wharf;
- Whangārei Harbour – Port Nikau, Portland Reach, Shell Cut Reach, Marsden Cove Marina, Northport Berth, and Marsden Point Oil Refinery Wharf.



Figure 8: *Botrylloides diegensis* in situ on marina pontoons in Lyttelton Harbour/Whakaraupō. (Images: C. Woods/NIWA)

Botrylloides giganteus

Detected in Whangārei Harbour during the winter survey, and Tauranga Harbour during the summer survey.

- Tauranga Harbour – Tauranga Bridge Marina and Tauranga Marina;
- Whangārei Harbour – Tamaterau Reach, Shell Cut Reach, Northport Berth, and Marsden Point Oil Refinery Wharf.

Caprella mutica

Detected in Bluff and Lyttelton harbours during both surveys, and Picton Harbour during the summer survey.

- Bluff Harbour – vessels in mooring channel south of Greenpoint;
- Lyttelton Harbour/Whakaraupō – Motu-kauati-rahi/Cass Bay, Magazine Bay Marina, Naval Point, Te Ana Marina (Port of Lyttelton), Te Waipapa/Diamond Harbour, and Purau Bay;
- Picton Harbour – Waikawa Marina.

Caprella scauroides

Detected in Ōpua Marina/Waikare Inlet during the summer survey in Kororāreka Bay.

Celleporaria nodulosa

Detected in Ōpua Marina/Waikare Inlet, Port Taranaki, Nelson, Tauranga, Waitematā, and Whangārei harbours during both surveys (Figure 9). This species generally appears to be gradually increasing in distribution at most sites where it is detected.

- Nelson Harbour – Nelson Marina and Port Nelson;

- Ōpua Marina/Waikare Inlet – Ōpua Marina. The winter record represents a detected **range extension** (previously detected in Port Tarakohe, Port Taranaki, Gisborne, Tauranga, Timaru, Waitematā, and Whangārei harbours);
- Port Taranaki – Moturoa Wharf, Newton King Tanker Terminal, Blyde Wharf, near Ocean View Parade reclamation, and Lee Breakwater;
- Tauranga Harbour – Tauranga Bridge Marina, Port of Tauranga, and Tauranga Marina;
- Waitematā Harbour – upper and lower harbour from Hobsonville Marina to near harbour entrance, Kauri Point/Te Mātā-rae-o-Mana, Chelsea Wharf, Little Shoal Bay, Westhaven Marina, Bayswater Marina, Freemans Bay, Viaduct Harbour, Port of Auckland, Devonport Naval Base, Devonport Wharf, Outboard Boating Club, and Orakei Marina;
- Whangārei Harbour – Port Nikau, Portland Wharf, Wellington Reach, Marsden Cove Marina, Northport Berth, and Marsden Point Oil Refinery Wharf.

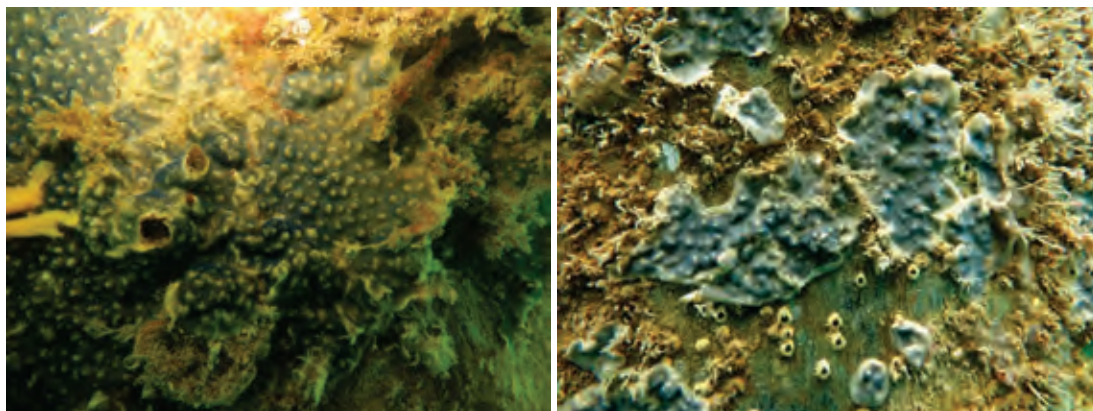


Figure 9: *Celleporaria nodulosa* in situ on wharf piles in Tauranga Harbour. (Images: C. Woods/NIWA)

Celleporaria umbonatoidea

Detected in Nelson Harbour during both surveys, and Napier Port and Ahuriri Inner Harbour and Waitematā Harbour during the winter survey.

- Napier Port and Ahuriri Inner Harbour – Ahuriri Inner Harbour;
- Nelson Harbour – Nelson Haven, Nelson Marina, Port Nelson, near the Boulder Bank, The Cut, near Haulashore Island, and near Tahunanui Beach;
- Waitematā Harbour – Westhaven Marina.

Charybdis (Charybdis) japonica

Detected in Tauranga, Waitematā, and Whangārei harbours during both surveys.

- Tauranga Harbour – Welcome Bay, reach from Maungatapu to Tauranga Harbour Bridge, Tauranga Bridge Marina, Port of Tauranga, and Tauranga Marina. This species is subject to control programmes by BoPRC and Manaaki Te Awanui. This survey year's number of detections represents a recent increase in distribution and abundance. All crabs detected were removed for disposal to landfill;
- Waitematā Harbour – upper and lower harbour from Paremomoremo Creek to harbour entrance, Lucas Creek, Hobsonville Marina, Henderson River channel, Kauri Point/Te Mātā-rae-o-Mana, Whau River channel, Te Tokaroa (Meola) Reef, Chelsea Wharf, Birkenhead Wharf, Bayswater Marina, Westhaven Marina, Freemans Bay, Viaduct Harbour, Port of Auckland, Devonport Naval Base, Devonport Wharf, Outboard Boating Club, Orakei Marina, and North Head;
- Whangārei Harbour – Hatea River Channel, Kissing Point Marina, Port Nikau, Mangapai River channel, Portland Wharf, and Northport Berth.

Ciona intestinalis

Detected in Napier Port and Ahuriri Inner Harbour, Lyttelton, Nelson, Otago, Picton, Tauranga, Waitematā, Wellington, and Whangārei harbours during both surveys.

- Lyttelton Harbour/Whakaraupō – Magazine Bay Marina, Naval Point, Port of Lyttelton (including Cashin Quay), and Te Waipapa/Diamond Harbour;
- Napier Port and Ahuriri Inner Harbour – Ahuriri Inner Harbour and Napier Port;
- Nelson Harbour – Nelson Marina and Port Nelson;
- Otago Harbour – Port Otago, Leith Marina, Ravensbourne Wharf, and Back Beach;

- Picton Harbour – Picton Marina, Picton Port, Queen Charlotte Yacht Club, and Waikawa Marina;
- Tauranga Harbour – Tauranga Marina;
- Waitematā Harbour – Westhaven Marina, Freemans Bay, Viaduct Harbour, and Outboard Boating Club;
- Wellington Harbour – Seaview Marina and Chaffers Marina;
- Whangārei Harbour – Kissing Point Marina and Marsden Cove Marina.

Ciona robusta

Detected in Lyttelton, Nelson, Otago, Picton, and Wellington harbours during both surveys (Figure 10).

- Lyttelton Harbour/Whakaraupō – Magazine Bay Marina, Naval Point, Port of Lyttelton (including Cashin Quay), Te Waipapa/Diamond Harbour, and Purau Bay;
- Nelson Harbour – Nelson Marina and Port Nelson;
- Otago Harbour – Port Otago, Leith Marina, Back Beach, Port Chalmers, Careys Bay, and Deborah Bay;
- Picton Harbour – Picton Marina, Picton Port, Queen Charlotte Yacht Club, and Waikawa Marina;
- Wellington Harbour – Seaview Marina and Chaffers Marina.



Figure 10: *Ciona robusta* in situ amongst extensive pontoon biofouling in Otago Harbour. (Images: C. Woods/NIWA)

Ciona savignyi

Detected in Napier Port and Ahuriri Inner Harbour, Lyttelton, Nelson, Otago, Picton, Tauranga, Waitematā, Wellington, and Whangārei harbours during both surveys.

- Lyttelton Harbour/Whakaraupō – Magazine Bay Marina, Naval Point, Port of Lyttelton (including Cashin Quay), Te Waipapa/Diamond Harbour, and Purau Bay;
- Napier Port and Ahuriri Inner Harbour – Ahuriri Inner Harbour and Napier Port;
- Nelson Harbour – Nelson Marina and Port Nelson;
- Otago Harbour – Port Otago, Leith Marina, Back Beach, and Careys Bay;
- Picton Harbour – Picton Marina, Picton Port, and Waikawa Marina;
- Tauranga Harbour – Tauranga Marina;
- Waitematā Harbour – near Kauri Point/Te Mātā-rae-o-Mana, Westhaven Marina, and Viaduct Harbour;
- Wellington Harbour – Seaview Marina;
- Whangārei Harbour – Town Basin Marina, Kissing Point Marina, and Marsden Cove Marina.

Ciona spp.

Detected in Nelson and Whangārei harbours during both surveys, Waitematā Harbour during the winter survey, and Picton Harbour during the summer survey.

- Nelson Harbour – Nelson Marina;
- Picton Harbour – Waikawa Marina;
- Waitematā Harbour – Viaduct Harbour and Devonport Naval Base;
- Whangārei Harbour – Kissing Point Marina, Parua Bay, and Marsden Cove Marina.

Clavelina lepadiformis

Detected in Lyttelton, Nelson, Otago, Picton, Tauranga, Waitematā, Wellington, and Whangārei harbours during both surveys (Figure 11). As in recent rounds of surveys this species appears to exhibit a marked seasonality, with more frequent detections in summer, and generally appears to be gradually increasing in distribution at most sites where it is detected.

- Lyttelton Harbour/Whakaraupō – Te Ana Marina (Port of Lyttelton);
- Nelson Harbour – Nelson Marina and Port Nelson;
- Otago Harbour – Port Otago, Leith Marina, Back Beach, Careys Bay, and Deborah Bay;
- Picton Harbour – Picton Marina, Picton Port, Queen Charlotte Yacht Club, Westshore, and Waikawa Marina;
- Tauranga Harbour – Tauranga Marina;
- Waitematā Harbour – Westhaven Marina, Viaduct Harbour, and Orakei Marina;
- Wellington Harbour – Seaview Marina, Taranaki Street Breastworks, Chaffers Marina, and Clyde Quay Marina;
- Whangārei Harbour – Marsden Cove Marina and Northport Berth.



Figure 11: *Clavelina lepadiformis* in situ on a rope (left) and wharf pile (right) in Otago Harbour. (Images: C. Woods/NIWA)

Dactylosiphon bullosus

Detected in Picton and Wellington harbours during the winter survey.

- Picton Harbour – Picton Marina (Water Taxi wharves);
- Wellington Harbour – Kau Bay and Māhanga Bay.

Didemnum patulum

Detected in Bluff Harbour during both surveys in the main channel leading to Awarua Bay, Island Harbour, Fishing Boat piers, and Town Wharf.

Didemnum vexillum

Detected in Napier Port and Ahuriri Inner Harbour, Lyttelton, Nelson, Otago, Picton, Tauranga, Waitematā, and Wellington harbours during both surveys, and Port Taranaki and Whangārei Harbour during the winter survey.

- Lyttelton Harbour/Whakaraupō – Motu-kauati-rahi/Cass Bay, Magazine Bay Marina, Naval Point, Port of Lyttelton (including Cashin Quay), Ōtamahua/Quail Island, Te Waipapa/Diamond Harbour, and Purau Bay;
- Napier Port and Ahuriri Inner Harbour – Ahuriri Inner Harbour and Napier Port;
- Nelson Harbour – Nelson Marina and Port Nelson;
- Otago Harbour – Port Otago, Leith Marina, Ravensbourne Wharf, Back Beach, Careys Bay, and Deborah Bay;
- Picton Harbour – Picton Marina, Picton Port, Westshore, Shakespeare Bay, and Waikawa Marina;
- Port Taranaki – Blyde Wharf;
- Tauranga Harbour – Trinity Wharf Tauranga (hotel pontoon), Tauranga Bridge Marina, Port of Tauranga, Tauranga Marina, and Rangiwaia Island;
- Waitematā Harbour – Kauri Point/Te Mātā-rae-o-Mana, Chelsea Wharf, Birkenhead Wharf, Auckland Harbour Bridge, Westhaven Marina, Bayswater Marina, Freemans Bay, Viaduct

Harbour, Port of Auckland, Devonport Naval Base, Devonport Wharf, Outboard Boating Club, Orakei Marina, and North Head;

- Wellington Harbour – Seaview Marina, Lambton Harbour, Chaffers Marina, Evans Bay Marina, Miramar Wharf, and Burnham Wharf;
- Whangārei Harbour – Portland Wharf, Matakōhe (Limestone Island), Reserve Point, and Marsden Cove Marina.

Diplosoma listerianum

Detected in Napier Port and Ahuriri Inner Harbour, Port Taranaki, Lyttelton, Picton, Waitematā, and Whangārei harbours during both surveys, Tauranga and Wellington harbours during the winter survey, and Ōpua Marina/Waikare Inlet, Bluff, Nelson, and Otago harbours during the summer survey (Figure 12).

- Bluff Harbour – channel leading to Awarua Bay, main channel, Fishing Boat piers, and Tiwai Wharf;
- Lyttelton Harbour/Whakaraupō – Te Ana Marina (Port of Lyttelton);
- Napier Port and Ahuriri Inner Harbour – Napier Port;
- Nelson Harbour – Port Nelson;
- Ōpua Marina/Waikare Inlet – Kororāreka Bay (Russell);
- Otago Harbour – Leith Marina and Back Beach;
- Picton Harbour – Picton Marina and Waikawa Marina;
- Port Taranaki – Moturoa Wharf, Newton King Tanker Terminal, Blyde Wharf, near Ocean View Parade reclamation, and Lee Breakwater;
- Tauranga Harbour – Port of Tauranga and Tauranga Marina;
- Waitematā Harbour – Westhaven Marina, Bayswater Marina, Viaduct Harbour, Port of Auckland, Devonport Naval Base, and Devonport Wharf;
- Wellington Harbour – CentrePort (Aotea Quay);
- Whangārei Harbour – Matakōhe (Limestone Island) and Marsden Cove Marina.



Figure 12: *Diplosoma listerianum* in situ on mussels in Lyttelton Harbour/Whakaraupō. (Images: C. Woods/NIWA)

Ectopleura spp.

Detected in Napier Port and Ahuriri Inner Harbour, Ōpua Marina/Waikare Inlet, Nelson, Picton, Tauranga, and Whangārei harbours during both surveys, Lyttelton and Waitematā harbours during the winter survey, and Port Taranaki during the summer survey.

- Lyttelton Harbour/Whakaraupō – Motu-kauati-iti/Corsair Bay;
- Napier Port and Ahuriri Inner Harbour – Ahuriri Inner Harbour and Napier Port;
- Nelson Harbour – Port Nelson;
- Ōpua Marina/Waikare Inlet – Ōpua Marina, Ōpua Wharf, and Kororāreka Bay (Russell);
- Picton Harbour – Waikawa Marina and Havelock Marina;
- Port Taranaki – Blyde Wharf, near Ocean View Parade reclamation, and Lee Breakwater;
- Tauranga Harbour – Tauranga Bridge Marina, Port of Tauranga, Sulphur Point, and Ōmokoroa;
- Waitematā Harbour – Chelsea Wharf, Bayswater Marina, Freemans Bay, Port of Auckland, Devonport Naval Base, and Devonport Wharf;
- Whangārei Harbour – Kissing Point Marina, Port Nikau, Portland Wharf, Matakōhe (Limestone Island), Marsden Cove Marina, Northport Berth, Motukaroro Island, and Marsden Point Oil Refinery Wharf.

Ficopomatus enigmaticus

Detected in Napier Port and Ahuriri Inner Harbour and Whangārei Harbour during both surveys.

- Napier Port and Ahuriri Inner Harbour – Te Whanganui-a-Orotū (Ahuriri Estuary) west of Pandora Road Bridge and Ahuriri Inner Harbour;
- Whangārei Harbour – Town Basin Marina, Hātea River channel, Kissing Point Marina, and Port Nikau. An increase in distribution and abundance was noted this survey year.

Fushitsunagia catenata

Detected in Lyttelton Harbour/Whakaraupō during both surveys at Te Ana Marina, Tug Berth, and Lyttelton Port Company Waterfront House pontoon (Figure 13).



Figure 13: *Fushitsunagia catenata* in situ on marina pontoon (left) and ex situ in Lyttelton Harbour/Whakaraupō. (Images: C. Woods/NIWA)

Grateloupia turuturu

Detected in Picton and Wellington harbours during both surveys, Napier Port and Ahuriri Inner Harbour and Nelson Harbour during the winter survey, and Port Taranaki during the summer survey.

- Napier Port and Ahuriri Inner Harbour – Ahuriri Inner Harbour;
- Nelson Harbour – Nelson Marina;
- Picton Harbour – Picton Marina and Westshore;
- Port Taranaki – near Ocean View Parade reclamation and Lee Breakwater;
- Wellington Harbour – Seaview Marina, Kaiwharawhara development, Māhanga Bay, and Scorching Bay.

Limaria orientalis

Detected in Ōpua Marina/Waikare Inlet during the summer survey at Hermione Rock.

Lissoclinum perforatum

Detected in Napier Port and Ahuriri Inner Harbour during both surveys, and Port Taranaki during the winter survey.

- Napier Port and Ahuriri Inner Harbour – Napier Port. The winter record of *L. perforatum* from Napier Port (Geddes (No. 3) and Herrick (No. 4) wharves) represents a detected **range extension** (previously detected in Port Taranaki);
- Port Taranaki – Moturoa Wharf, Newton King Tanker Terminal, Blyde Wharf, and Lee Breakwater.

Magallana gigas

Detected in Lyttelton Harbour/Whakaraupō during the winter survey at Motu-kauati-iti/Corsair Bay. Whilst this NIS (a commercially important aquaculture species) is widely distributed throughout central and northern New Zealand, Lyttelton Harbour/Whakaraupō currently represents the southern limit of its known distribution.

Metapenaeus bennettiae

Detected in Waitematā and Whangārei harbours during both surveys.

- Waitematā Harbour – Beach Haven, Birkenhead Wharf, and Port of Auckland;

- Whangārei Harbour – Town Basin Marina, Hātea River channel, and Port Nikau.

Omobranchus anolius

Detected in Ōpua Marina/Waikare Inlet and Whangārei Harbour during both surveys, and Waitematā Harbour during the summer survey (Figure 14).

- Ōpua Marina/Waikare Inlet – Ōpua Marina and Waitangi;
- Waitematā Harbour – Westhaven Marina, Bayswater Marina, Outboard Boating Club, and Orakei Marina;
- Whangārei Harbour – Portland Wharf, Parua Bay, and Marsden Cove Marina.

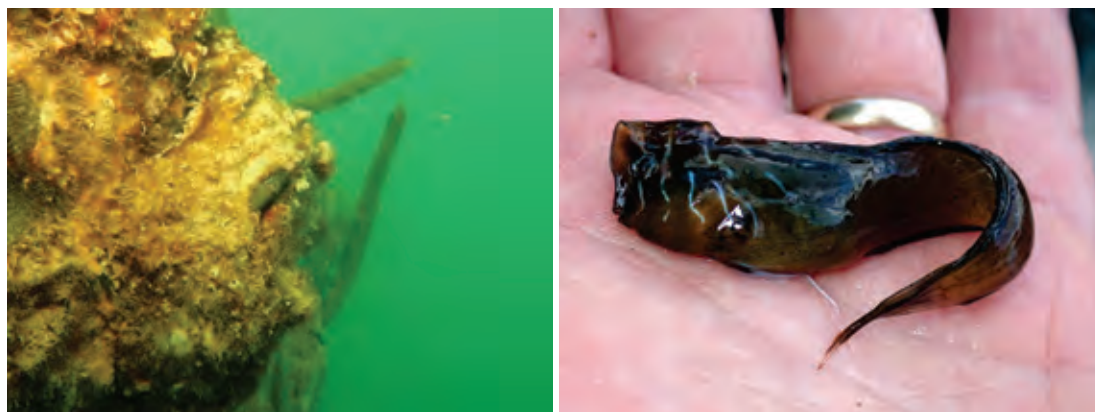


Figure 14: Male *Omobranchus anolius* in situ looking out from an oyster shell (left, centre of image) and ex situ (right) from Waitematā Harbour. (Images: C. Woods/NIWA)

Oratosquilla oratoria

Detected in Waitematā Harbour during both surveys, and Ōpua Marina/Waikare Inlet and Whangārei Harbour during the summer survey.

- Ōpua Marina/Waikare Inlet – Motuarahi Island;
- Waitematā Harbour – Hobsonville Marina and Westhaven Marina;
- Whangārei Harbour – minor channel to immediate north of Tamaterau Channel, near Tamaterau. This record represents a detected **range extension** (previously detected in Bay of Islands (including Ōpua Marina/Waikare Inlet), Hokianga, Kaipara, Mangōnui, Raglan, Waitematā, Whangaroa, and Whitianga harbours).

Pachymeniopsis lanceolata

Detected in Lyttelton Harbour/Whakaraupō during both surveys and Port Taranaki during the summer survey.

- Lyttelton Harbour – Motu-kauati-iti/Corsair Bay and Te Ana Marina (Port of Lyttelton);
- Port Taranaki – Newton King Tanker Terminal and Lee Breakwater.

Parablennius tasmanianus

Detected in Tauranga Harbour during the winter survey in Port of Tauranga, hand-caught by a diver as the specimen tried to hide inside a dead oyster shell near berths 5 and 6 (Figure 15). This record represents a detected **range extension** (previously detected in Napier Port and Ahuriri Inner Harbour as a new-to-New Zealand detection in the Winter 2022 survey).



Figure 15: *Parablennius tasmanianus* ex situ in Tauranga Harbour. (Images: O. Evans/NIWA)

Polyandrocarpa zorritensis

Detected in Nelson and Whangārei harbours during both surveys, and Waitematā Harbour during the summer survey.

- Nelson Harbour – Nelson Marina;
- Waitematā Harbour – Westhaven Marina;
- Whangārei Harbour – Town Basin Marina, Kissing Point Marina, Tamaterau Reach, and Marsden Cove Marina.

Polycera fujitai

Detected in Waitematā Harbour during the summer survey in Bayswater Marina.

Polycera hedgpethi

Detected in Nelson, Picton, and Wellington harbours during both surveys, Port Taranaki, Waitematā and Whangārei harbours during the winter survey, and Napier Port and Ahuriri Inner Harbour, Ōpua Marina/Waikare Inlet, and Tauranga Harbour during the summer survey.

- Napier Port and Ahuriri Inner Harbour – Napier Port;
- Nelson Harbour – Nelson Marina and Port Nelson;
- Ōpua Marina/Waikare Inlet – Ōpua Marina and Kororāreka Bay (Russell);
- Picton Harbour – Picton Marina, Shakespeare Bay, and Waikawa Marina;
- Port Taranaki – Lee Breakwater;
- Tauranga Harbour – Port of Tauranga;
- Waitematā Harbour – Westhaven Marina;
- Wellington Harbour – Lambton Harbour, Taranaki Street Breastworks, and Evans Bay Marina;
- Whangārei Harbour – Northport Berth.

Pyromaia tuberculata

Detected in Napier Port and Ahuriri Inner Harbour, Ōpua Marina/Waikare Inlet, Port Taranaki, Nelson, Tauranga, Waitematā, and Whangārei harbours during both surveys.

- Napier Port and Ahuriri Inner Harbour – Ahuriri Inner Harbour, port approach channel, and Napier Port;
- Nelson Harbour – from Nelson Haven through the main channel to near The Cut;
- Ōpua Marina/Waikare Inlet – Waikare Inlet, Waitangi, Kororāreka Bay, and Hermione Rock;
- Port Taranaki – near Moturoa Wharf, centre of port dredged area, and port entrance;
- Tauranga Harbour – channel south of Matapihi Rail Bridge, Port of Tauranga, Pilot Bay, and Western Channel;
- Waitematā Harbour – main channels in upper and lower harbour from Lucas Creek to harbour entrance, Bayswater Marina, Port of Auckland, Devonport Naval Base, and Devonport Wharf;
- Whangārei Harbour – main channels from Matakōhe (Limestone Island) to harbour entrance, Shoal Bay, Northport Berth, Marsden Point Oil Refinery Wharf, and Calliope Bay.

Schizymenia apoda

Detected in Otago Harbour during the winter survey in Port Otago (basin landing pontoon).

Symplegma brakenhielmi

Detected in Waitematā and Whangārei harbours during both surveys. As in recent rounds of surveys this species appears to exhibit a marked seasonality, with more frequent detections in summer.

- Waitematā Harbour – main channels in upper and lower harbour from Beach Haven to harbour entrance, Kauri Point/Te Mātā-rae-o-Mana, Chelsea Wharf, Westhaven Marina, Bayswater Marina, Viaduct Harbour, Port of Auckland, Devonport Wharf, Outboard Boating Club, and Orakei Marina. Last survey year, a new white colour morph of this species was detected at numerous survey locations;
- Whangārei Harbour – Port Nikau, Portland Wharf, Portland Reach, Matakohē (Limestone Island), and Marsden Cove Marina.

Symplegma rubra

Detected in Whangārei Harbour during the summer survey in Town Basin Marina, Port Nikau, and Marsden Cove Marina (Figure 16). This record represents a detected **range extension** (previously detected in Waitematā Harbour). *Symplegma rubra* was detected as a new-to-New Zealand detection in the Waitematā Harbour the previous survey year (2022–23). *Symplegma rubra* is a bright raspberry-red colonial ascidian that can be confused with *S. brakenhielmi* but is distinguished by its characteristic opaque red colouration (*S. brakenhielmi* zooids are more transparent and colours more variable).



Figure 16: *Symplegma rubra* in situ (left) and ex situ (right) from Waitemata Harbour. (Images: C. Woods/NIWA)

Thalamoporella californica

Detected in Waitematā and Whangārei harbours during both surveys.

- Waitematā Harbour – Henderson Creek channel, Whau River channel, Westhaven Marina, and Bayswater Marina.
- Whangārei Harbour – Wellington Reach, Tamaterau Reach, Shell Cut Reach, Marsden Cove Marina, Shoal Bay, Northport Berth, and Marsden Point Oil Refinery Wharf.

Thecacera pennigera

Detected in Whangārei Harbour during the winter survey, and Ōpua Marina/Waikare Inlet and Tauranga Harbour during the summer survey. *Thecacera pennigera* can be easily confused with another non-indigenous nudibranch, *P. fujitai*, due to similar size and colouration, but is distinguished by its flared rhinophore sheaths and extra-branchial appendages.

- Ōpua Marina/Waikare Inlet – Ōpua Marina. This record represents a detected **range extension** (previously detected in Waitematā and Whangārei harbours);
- Tauranga Harbour – Port of Tauranga. This record also represents a detected **range extension** (previously detected in Waitematā and Whangārei harbours);
- Whangārei Harbour – Northport Berth.

Theora lubrica

Detected in Napier Port and Ahuriri Inner Harbour, Ōpua Marina/Waikare Inlet, Port Taranaki, Lyttelton, Nelson, Picton, Waitematā, Wellington, and Whangārei harbours during both surveys (Figure 17).

- Lyttelton Harbour/Whakaraupō – upper harbour from Governors Bay to Port of Lyttelton Inner Harbour entrance, Ōtamahua/Quail Island, Te Waipapa/Diamond Harbour, and Purau Bay;

- Napier Port and Ahuriri Inner Harbour – Ahuriri Inner Harbour, port approach channel, and Napier Port;
- Nelson Harbour – Nelson Marina and Port Nelson;
- Ōpua Marina/Waikare Inlet – Ōpua Marina, entrance to Waikare Inlet, Veronica Channel, Waitangi, Kororāreka Bay, and Hermione Rock;
- Picton Harbour – Picton Marina, Picton Port, Picton Harbour, Shakespeare Bay, Waikawa Marina, Waikawa Bay, and Havelock Marina;
- Port Taranaki – main dredged channel of port area inside of the Main Breakwater, near to all main port wharves, near Lee Breakwater, and port entrance;
- Waitematā Harbour – upper and lower harbour from Beach Haven to harbour entrance, Hobsonville Marina, Henderson Creek channel, Kauri Point/Te Mātā-rae-o-Mana, Whau River channel, Westhaven Marina, Bayswater Marina, Freemans Bay, Viaduct Harbour, Port of Auckland, Devonport Naval Base, near Devonport Wharf, and Outboard Boating Club;
- Wellington Harbour – Seaview Marina, near Seaview Wharf, from Kaiwharawhara past Ngauranga, CentrePort, Lambton Harbour, and Evans Bay;
- Whangārei Harbour – Town Basin Marina, Hātea River channel, Port Nikau, Onerahi, Portland Reach, Matakoho (Limestone Island), Wellington Reach, Tamaterau Reach, Parua Bay, Shoal Bay, and Marsden Cove Marina.



Figure 17: *Theora lubrica ex situ* from Picton Harbour. (Image: C. Woods/NIWA)

Tritia burchardi

Detected in Ōpua Marina/Waikare Inlet, Waitematā, and Whangārei harbours during both surveys, and Tauranga Harbour during the winter survey.

- Ōpua Marina/Waikare Inlet – Ōpua Marina, entrance to Waikare Inlet, Veronica Channel, Waitangi River channel, Waitangi, and Hermione Rock;
- Tauranga Harbour – Tauranga Marina.
- Waitematā Harbour – upper and lower harbour from Hobsonville Marina to harbour entrance, Henderson Creek channel, Kauri Point/Te Mātā-rae-o-Mana, Whau River channel, Chelsea Wharf, Westhaven Marina, Bayswater Marina, Freemans Bay, Viaduct Harbour, Port of Auckland, Devonport Naval Base, near Devonport Wharf, Outboard Boating Club, and Whakatakataka Bay;
- Whangārei Harbour – upper and lower harbour from Town Basin Marina to Shoal Bay, Hātea River channel, Port Nikau, Portland Reach, Matakoho (Limestone Island), Tamaterau Reach, Parua Bay, Shoal Bay, and Marsden Cove Marina.

Undaria pinnatifida

Detected in Napier Port and Ahuriri Inner Harbour, Port Taranaki, Bluff, Lyttelton, Nelson, Otago, Picton, and Wellington harbours during both surveys, Waitematā Harbour during the winter survey, and Tauranga Harbour during the summer survey (Figure 18).

- Bluff Harbour – western side of harbour from Colyers Island to Tikore Island, Awarua Bay, main channel, Island Harbour, Fishing Boat piers, Tiwai Wharf, Town Wharf, and Stirling Point;
- Lyttelton Harbour/Whakaraupō – upper harbour from near Governors Bay to Purau Bay, Rāpaki, Motu-kauati-rahi/Cass Bay, Motu-kauati-iti/Corsair Bay, Magazine Bay Marina, Naval Point, Port of Lyttelton, Ōtamahua/Quail Island, Te Wharau/Charteris Bay, and Te Waipapa/Diamond Harbour;

- Napier Port and Ahuriri Inner Harbour – Ahuriri Inner Harbour, in-between Te Karaka (Perfume Point) and Napier Port, and Napier Port;
- Nelson Harbour – Nelson Marina, Port Nelson, The Cut, near Haulashore Island, and foreshore near Tahunanui Beach;
- Otago Harbour – upper and lower harbour from Port Otago to Aramoana Spit, Leith Marina, Ravensbourne Wharf, Victoria Channel, St. Leonards, Macandrew Bay, Company Bay, Raynbirds Bay, Broad Bay, Goat Island/Rakiriri, Quarantine Island/Kamau Taurua, Back Beach, Portobello Bay, Port Chalmers, Careys Bay, Deborah Bay, Otafelo Point, Omate Beach, and Te Rauone Beach;
- Picton Harbour – Picton Marina, Picton Port, Queen Charlotte Yacht Club, Westshore, Shakespeare Bay, Waikawa Marina, and Havelock Marina;
- Port Taranaki – Moturoa Wharf, Newton King Tanker Terminal, Blyde Wharf, and Lee Breakwater. Since 2015, this species has been subject to an annual removal and survey programme by commercial divers as commissioned by Port Taranaki Ltd;
- Tauranga Harbour – Port of Tauranga and Tauranga Marina;
- Waitematā Harbour – Harrier Point, Beach Haven, Birkenhead Wharf, Westhaven Marina, Bayswater Marina, Port of Auckland, Devonport Wharf, Outboard Boating Club, and Orakei Marina;
- Wellington Harbour – Seaview Marina and throughout the south-western margin of the harbour from CentrePort (Ferry Terminal) to Scorching Bay.



Figure 18: *Undaria pinnatifida* in situ in the intertidal zone near Napier Port. (Image: C. Woods/NIWA)

5 Discussion

The Winter 2023 and Summer 2023–24 rounds of NMHRSS programme surveys exceeded overall target numbers of survey sampling locations at the 12 High Risk Sites. Any operational obstacles to planned survey activities encountered were successfully managed, allowing contracted target survey effort to be achieved at each High Risk Site (see Other section).

No primary target species were detected during the surveys. However, all four secondary target species were detected during the surveys at High Risk Sites where they have been detected during previous surveys.

Removal of secondary target species from High Risk Sites during survey activities was implemented where practicable, and where population density was low enough that removal would have a potential management effect. All *S. spallanzanii* detected in Ōpua Marina/Waikare Inlet and Lyttelton Harbour were removed and disposed of to landfill. All *S. clava* detected in Otago (summer survey only) and Whangārei harbours were also removed and disposed of to landfill. In addition, all non-target NIS *C. japonica* detected in Tauranga, Waitematā, and Whangārei harbours were removed and disposed of to landfill, as were *P. tuberculata* detected in Napier Port and Ahuriri Inner Harbour, Port Taranaki, and Nelson Harbour.

There was one **new-to-New Zealand** detection, being the bryozoan *Alcyonidium verrilli* from Lyttelton Harbour/Whakaraupō (Winter 2023).

Seven marine NIS **range extensions** (all non-target species previously recorded from New Zealand waters) were detected as follows:

- Ascidian *Lissoclinum perforatum* (Napier Port and Ahuriri Inner Harbour, Winter 2023);
- Ascidian *Symplegma rubra* (Whangārei Harbour, Summer 2023–24);
- Bryozoan *Celleporaria nodulosa* (Ōpua Marina/Waikare Inlet, Winter 2023);
- Decapod *Oratosquilla oratoria* (Whangārei Harbour, Summer 2023–24);
- Fish *Parablennius tasmanianus* (Tauranga Harbour, Winter 2023);
- Nudibranch *Thecacera pennigera* (Ōpua Marina/Waikare Inlet and Tauranga Harbour, Summer 2023–24).

These significant detections were communicated to Biosecurity New Zealand through the MITS reporting procedure.

6 Recommendations

6.1 Survey sampling methods

Survey sampling methods currently employed in the NMHRSS programme still reflect international (proven) best practice for effective detection of the NMHRSS programme primary and secondary target species. NMHRSS programme survey results indicate that these sampling methods are also effective at detecting non-target marine NIS. However, continued evaluation of the effectiveness of alternative or emergent detection tools or methods is recommended (see items on remotely operated vehicles (ROVs) and eDNA in the following Innovations/Efficiencies section).

6.2 Survey sampling effort

The distribution of sampling effort in Ōpua Marina/Waikare Inlet, as proposed in the revised design report (Morrisey et al, 2012a) and based on stochastic scenario tree (SST) modelling (Morrisey et al, 2012b), will continue to be used in future rounds of Ōpua surveys. Stochastic scenario trees were also developed for all other NMHRSS programme High Risk Sites (Morrisey et al, 2012b) to estimate the detection sensitivity of different strategies for allocating samples, and to explore the optimisation of sample allocation for individual target species and estimate current levels of sensitivity. More recently, SST modelling was used in the Design Report underpinning the inclusion of Napier Port and Ahuriri Inner Harbour into the NMHRSS programme for 2021–22 onwards (Woods et al, 2021). As SST modelling is an adaptive tool, it would be advantageous to re-evaluate current method sensitivity and risk zone assumptions, and potentially further optimising spatial allocation of sampling effort within the NMHRSS programme with Biosecurity New Zealand.

As highlighted during Biosecurity New Zealand's recent *Optimising New Zealand's biosecurity surveillance programme* in association with the Centre of Excellence for Biosecurity Risk Analysis (CEBRA) and NIWA, periodic analysis of vessel movements to, and between High Risk Sites, is important to inform evaluation as to where targeted surveillance activities should be focused according to maritime vectors and pathways for NIS (e.g., relative likelihood of the risk of NIS entry to New Zealand ports). For example, Hatami et al (2021) identified Napier Port as a site that has a high relative likelihood of marine NIS exposure from both vessel ballast water discharge and biofouling, and this consequently led to the inclusion of Napier Port and Ahuriri Inner Harbour into the NMHRSS programme in the 2021–22 survey year, with several detected range extensions being recorded already for this new High Risk Site.

Periodic evaluation of infrastructure developments within High Risk Sites should also be considered where appropriate as to their potential effects on invasion dynamics. For example, the recent development of the pontoon berth Te Ana Marina in Lyttelton Harbour/Whakaraupō has seen the proliferation of several NIS within the marina compared to the predecessor pile mooring marina due to changes in both marina substratum and associated vessel movement patterns. Recent extensions to Waikawa Marina in Picton and Seaview Marina in Wellington Harbour potentially also change the relative risk profile of these marinas regarding the introduction and proliferation of marine NIS, and accordingly some precautionary minor adjustments in survey effort associated with these marinas have been made in consultation with Biosecurity New Zealand. Likewise, in Lyttelton Harbour/Whakaraupō deconstruction of a significant portion of the old Magazine Bay Marina pier structure and installation of two new fixed pontoon boat landings near the public boat ramp associated with SailGP events has resulted in minor adjustments to sampling locations around the Naval Point area.

7 Innovations/Efficiencies

7.1 Marine Biosecurity Porthole

NIWA continues to invest co-funding in the Marine Biosecurity Porthole ([Home » Marine Biosecurity Porthole](#)). The Marine Biosecurity Porthole was created in 2010 as a collaboration between Biosecurity New Zealand and NIWA to provide greater access to information and data on marine NIS in New Zealand. It draws upon data compiled from a range of funded surveys for marine NIS (e.g., the NMHRSS programme), records reported via the passive surveillance system through MITS and observations of marine NIS made through taxonomic and ecological research undertaken by NIWA. The Porthole includes an interactive mapping application that allows verified observations on the distribution of marine species within New Zealand to be displayed, identification guides for non-indigenous and native marine species, videos and information on marine pests and their management, and information on marine biosecurity research being undertaken in New Zealand. The Porthole is continually being updated with new and improved content in consultation with Biosecurity New Zealand and stakeholders. For example, in 2023 a marine pest by location map page was added to make it easier for any interested party to determine which NIS had already been detected at any given location. In 2024, the interactive mapping application will be rewritten for the Porthole. In 2024/25, the Porthole needs to be upgraded to Silverstripe V5 to ensure continued functionality; NIWA has negotiated a contract with Catalyst to undertake this upgrade.

7.2 Māori collaborative partnerships

NIWA, through its Māori Environmental Research team, Te Kūwaha, is working in collaborative partnerships with Māori businesses, and whānau, hapū and iwi throughout New Zealand, combining their skills in scientific enquiry with mātauranga Māori expertise, within the frame of tikanga Māori. Demand for this capability in New Zealand is growing, and the pathways for early career researchers are few, resulting in a scarcity of expertise. As part of NIWA's commitment to building Māori research capability and capacity, Te Piko o te Māhuri is a development initiative that provides pathways and opportunities for young Māori researchers across NIWA's climate, freshwater and oceans platforms. Each journey is customised to support aspiring researchers in reaching their full potential in the environmental research sector. NIWA's Māori Graduate Internship programme is part of Te Piko o te Māhuri and its purpose is to encourage Māori science graduates to consider ongoing postgraduate study and Māori environmental research as a career pathway.

- Jessie Scarrott (Ngāti Hako, Ngāti Tara Tokonui rātou ko Ngāti Māhanga) was part of the third intake of Te Kūwaha Graduate Interns. She graduated with a BSc in Ecology and Zoology at Massey University. During their internship Jessie catalogued species for NIWA's national invertebrate collection, mapped seafloor habitats, and surveyed upper North Island ports for invasive marine pests. Jessie completed a MSc through the University of Auckland working alongside mana whenua to build new knowledge around the implications of a recently arrived marine invasive species on kaitiakitanga and the sustainability of te Taiao. Now employed as an Environmental Researcher - Marine Biosecurity/Biology within NIWA's Te Kūwaha team, Jessie is working alongside NIWA taxonomists and biosecurity scientists to develop a new NIWA e-guide to certain invasive species of ports and harbours around New Zealand, *Adventurous Adventives*. In the 2023–24 survey year, Jessie was a team member on NMHRSS programme surveys of Napier Port and Ahuriri Inner Harbour, Ōpua Marina/Waikare Inlet, Tauranga, Waitematā, and Whangārei harbours, as well as being involved within NIWA's fieldwork for MPI as part of the exotic *Caulerpa* Response programme. Jessie is a candidate for Scientific Diver training in 2024–25.
- Natalie Taufa was part of the Te Kūwaha summer internship programme in 2022 and returned for the graduate internship of 2023. Natalie is currently enrolled in a MSc in Ecology and Biodiversity at the University of Waikato. Natalie's research interest includes our taonga species in freshwater and marine environments. Working alongside iwi to apply Mātauranga Māori coupled with western science to support environmental research and kaitiakitanga of our unique ecosystem biodiversity is Natalie's passion. In the 2023–24 survey year, Natalie was a team member on NMHRSS programme surveys of Tauranga and Waitematā harbours, as well as being involved within NIWA's fieldwork for MPI as part of the exotic *Caulerpa* Response programme. Natalie's internship concluded at the end of 2023.

7.3 Remotely operated vehicle (ROV) and real time pest detection

NIWA continued research optimising and operationalising ROVs for marine biosecurity surveillance during 2023–24. In 2023, NIWA purchased and received a second state-of-the-art Boxfish ROV, the Boxfish Luna, delivering 8K video and 50MP image capture at depths of up to 1000 m. This new unit adds additional capacity to our national teams and is equipped with additional features which aim to improve autonomous capabilities and better enable observation of finer details to improve species level identification. With the Boxfish ROVs, NIWA has been testing the utility of computer vision algorithms for detecting marine pests in real time. To date, real time computer vision detection tools have been successfully tested for both *S. spallanzanii* and *S. clava*.

During the recent exotic Caulerpa (*Caulerpa brachypus* and *C. parvifolia*) response programme, as part of a partnership between MPI and Ngāti Paoa, NIWA carried out a preliminary trial to detect and GPS-locate exotic Caulerpa, in real time using the Boxfish ROV at Waiheke Island. Whilst the training of a robust exotic Caulerpa detection model is in its early stages, the results from this trial showed accurate detections with very few false positives and demonstrated both our capabilities in developing artificial intelligence algorithms, and in robust application of novel tools in demanding field settings (Figure 19).



Figure 19: A screen grab from the exotic Caulerpa output detection video. The inset (added later) shows the data that was logged on the laptop via the ROV tether – a row for each frame (date/time/location/target species/number of instances detected within each frame). The target here is the exotic Caulerpa leaf (caul_if). (Image: L. Tait/NIWA)

7.4 Environmental DNA (eDNA) capability

Previously, in 2022–23, laboratory validation of probes for *C. japonica* had been completed on both real-time polymerase chain reaction (qPCR) and digital droplet PCR (ddPCR) platforms, including measurements of analytical specificity and sensitivity, reproducibility, and repeatability. Manaaki Te Awanui was approached to assist with survey design to validation field detection of *C. japonica* and are interested in partnering with NIWA to improve detection of this species in their rohe moana. During 2023–24, a preliminary field trial of an eDNA passive sampling tool for *C. japonica* was conducted during the Whangārei Harbour summer survey.

7.5 Field tablets

Deployment of ruggedised field tablets to NMHRSS programme survey teams has streamlined recording of the geolocation of samples and upload of field data via ArcCollector software, and ArcFieldMaps App. These data management systems can also be used on secure smart phones by field personnel for mapping. They have significantly improved efficiency of data collection and assisted in mitigating the potential for transcription error that is associated with manual entry of data, particularly with positional coordinates. ArcFieldMaps has now been integrated with Survey 123 on the NMHRSS programme survey maps for mobile data collection, and the functionality of this was first trialled during the 2022–23 survey year. For some less demanding survey situations (e.g., crab condo retrievals or shore searching), with less data to be recorded, and in calm weather, organism detection and environmental data could be reliably entered into the tablets. However, for more demanding

survey situations (e.g., diver searches from boats in busy ports and marinas), with more data to be recorded, and in more arduous weather, organism detection and environmental data entry to the tablets could be more problematic (e.g., problems with wet touchscreens, higher task-loading that could compromise situational awareness) and hard copy data entry is still the preferred method therein.

7.6 Non-indigenous ascidians review

Non-indigenous ascidians contribute a significant proportion of the new incursions and range extensions detected within the NMHRSS programme. NIWA's (and New Zealand's only) ascidian expert, Mike Page, is currently undertaking a review of detected incursions of non-indigenous ascidians into New Zealand since 2000. This review seeks to clarify which non-indigenous ascidians have been detected within our waters to date and consequently improve the accuracy of determining future detected ascidian range extensions and new-to-New Zealand incursions. During 2023–24, up-to-date species distribution maps have been produced for the review and work is ongoing on the review text.

7.7 3D scanning of non-indigenous species as an identification tool

Advancements in 3D technology bring the potential to scan morphologically suitable specimens for rendering into digital 3D objects that can then be viewed in suitable online resources and application programs (e.g., Sketchfab) to facilitate reliable provisional field identification of suspect organisms. During 2023–24, NIWA conducted some trials into scanning organisms of varying morphological complexity (e.g., crabs, gastropods, and starfish) for rendering into digital 3D models using a handheld scanner (EinScan Pro 2x Plus). Whilst overall rendering of specimens scanned was reasonably accurate (e.g., Figure 20), the technology used did not provide sufficient high-quality fine detail to facilitate reliable taxonomic identification for specimens with complex morphology (e.g., fine carapace spines or patches of setae). However, such application of 3D technology is worth pursuing further.



Figure 20: Representative 3-D scans of the non-indigenous crab *Charybdis* (*Charybdis*) *japonica*.

8 Acknowledgements

We thank our Māori partners and stakeholders at each High Risk Site surveyed for facilitating the NMHRSS programme surveys. Their co-operation and assistance are greatly appreciated. We also thank the Biosecurity New Zealand Operational Liaison, Abraham Growcott, and Senior Adviser, Laura Nichols for their partnership in facilitating the NMHRSS programme. Thank you to the many NIWA field team members (Adrian Aarsen, Owen Anderson, Finn Barry, Charlotte Bodie, Amber Brooks, Jules Burchardt, Martin Bylsma, Martyn Chew, Caroline Chin, Amelia Connell, Mark Fenwick, Roberta D'Archino, Oonagh Daly, Niki Davey, Oliver Evans, Jeff Forman, Jason Hamill, Sean Handley, Richard Hughes, Christian Hyde, Kate Johnson, Serena Keeler, Brooke Madden, Jade Maggs, Peter Marriott, Jay McMillan, Irene Middleton, Andrew Miller, Graeme Moss, Pete Notman, Pamela Olmedo-Rojas, Mike Page, Darren Parsons, Pete Pattinson, Maren Preuss, Alex Rose, Jeremy Rutherford, Jessie Scarrott, Kareen Schnabel, Jon Stead, Rob Stewart, Colin Sutton, Natalie Taufa, Rikki Taylor, and John Mark Woolley) for their mahi in delivering the NMHRSS programme. Thank you to Sarah Allen and Serena Keeler for managing the MITS specimen identifications.

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10 Appendix 1. Summary of sampling methods, target species and habitats in the National Marine High Risk Site Surveillance (NMHRSS) programme

Note: underlined species have been collected using this method during the present or previous target-species surveillance programmes in New Zealand.

Method	Target species	Non-target species	Habitat	Spatial coverage	Effectiveness	Cost effectiveness	Feasibility	Previous targeted surveillance in New Zealand?	Previous targeted surveillance overseas?
Benthic sled ¹⁵	<u>Arcuatula senhousia</u> <i>Asterias amurensis</i> <i>Caulerpa taxifolia</i> <i>Carcinus maenas</i> <u>Eudistoma elongatum</u> <i>Potamocorbula amurensis</i> <i>Sabella spallanzanii</i> <u>Styela clava</u>	<u>Acentrogobius pflaumii</u> <u>Chaetopterus</u> sp. <u>Charybdis (Charybdis) japonica</u> <u>Didemnum vexillum</u> <i>Grateloupia turuturu</i> <u>Metapenaeus bennettiae</u> <u>Pyromaia tuberculata</u> <u>Theora lubrica</u> <u>Tritia burchardi</u> <u>Undaria pinnatifida</u>	Subtidal soft sediments Focus on known shellfish beds (for <i>Asterias</i>), shipping channels and areas next to public access (e.g., wharves, boat ramps, marinas)	Narrow width but 100-m tow length and high replication (100+ per location) enables a reasonably large area to be sampled (ca 3500 m ² per location)	Reliable sample collection including asteroids, infaunal and epifaunal bivalves and polychaetes and macroalgae, as well as some crab and fish species	Processing of sled contents can be time consuming	Feasible on all soft-sediment habitats under reasonable weather conditions. Can be limited by the presence of large amounts of benthic macroalgae, rocky substratum or soft mud that block the mouth of sled	Yes	Yes (e.g., Currie and Crookes 1997)

¹⁵ Similar in design to an Ockelmann (1964) detritus-sledge. May also be referred to as an epibenthic sled.

Method	Target species	Non-target species	Habitat	Spatial coverage	Effectiveness	Cost effectiveness	Feasibility	Previous targeted surveillance in New Zealand?	Previous targeted surveillance overseas?
Crab (box) traps	<i>Asterias amurensis</i>	<i>Acentrogobius pflaumii</i>	Adjacent to wharf pilings and other artificial habitats	Sampled area is dependent on dispersion of bait odour. High replication possible	Effectively samples other species of crabs (e.g., <i>Hemiplax hirtipes</i> , <i>Notomithrax</i> spp., <i>Ovalipes catharus</i> , <i>Metacarcinus novaezelandiae</i>) and echinoderms (e.g., <i>Patiriella regularis</i> , <i>Coscinasterias muricata</i>). Also samples a wide range of fish species. Biofouling species may also be incidentally captured with this method if attached to mobile organisms attracted to the traps (e.g., <i>Styela clava</i> attached to masking crabs)	Quick to deploy and recover, so high replication possible	Feasible in most locations and weather conditions	Yes	Yes (e.g., Hewitt and Martin, 2001; May and Brown, 2001; Pollard and Rankin, 2003; Thresher et al, 2003; Yamada et al, 2005; Bernier et al 2020)
	<i>Carcinus maenas</i>	<i>Charybdis (Charybdis) japonica</i>	Intertidal and shallow subtidal rocky shores, breakwaters, and saltmarsh						
	<i>Eriocheir sinensis</i>	<i>Metapenaeus bennettiae</i>	Focus on habitats with complex physical structure (e.g., mussel beds, seagrass beds)						
		<i>Oratosquilla oratoria</i>							
		<i>Pyromaia tuberculata</i>							
		<i>Styela clava</i> ¹⁶							
Crab condos	<i>Carcinus maenas</i>	<i>Acentrogobius pflaumii</i>	Intertidal and shallow subtidal banks of rivers	High replication possible	Effectively samples other species of crabs (e.g., <i>Austrohelice crassa</i> , <i>Hemigrapsus crenulatus</i> , <i>Hemiplax hirtipes</i>). Higher rates of detection of crabs than baited traps in muddy riverbanks (Veldhuizen, 2000)	Quick to deploy and recover, so high replication possible	Feasible where access to appropriate habitat is possible; access problems at some locations (shallow water, deep mud, extensive mud flats, private land)	Yes	Yes (e.g., Veldhuizen, 2000; Hewitt and McDonald, 2013; Mabin et al, 2017)
	<i>Eriocheir sinensis</i>	<i>Charybdis (Charybdis) japonica</i>	Availability of suitable estuarine habitat may limit deployment						
		<i>Metapenaeus bennettiae</i>	Focus on brackish water habitats with complex physical structure (e.g., saltmarsh or fringing vegetation)						
		<i>Pyromaia tuberculata</i>							
		<i>Tritia burchardi</i>							

¹⁶ Incidentally, as specimens attached to masking crabs (*Notomithrax* spp.) caught in traps.

Method	Target species	Non-target species	Habitat	Spatial coverage	Effectiveness	Cost effectiveness	Feasibility	Previous targeted surveillance in New Zealand?	Previous targeted surveillance overseas?
Diver searches	<u><i>Arcuatula senhousia</i></u> <i>Asterias amurensis</i> <i>Carcinus maenas</i> <i>Caulerpa taxifolia</i> <i>Eriocheir sinensis</i> <u><i>Eudistoma elongatum</i></u> <u><i>Sabella spallanzanii</i></u> <u><i>Styela clava</i></u>	<u><i>Amathia verticillata</i></u> <u><i>Caprella mutica</i></u> <u><i>Chaetopterus</i> sp.</u> <u><i>Charybdis (Charybdis) japonica</i></u> <u><i>Clavelina lepadiformis</i></u> <u><i>Didemnum vexillum</i></u> <u><i>Grateloupia turuturu</i></u> <i>Hypnea</i> sp. <i>Pyromaia tuberculata</i> <u><i>Undaria pinnatifida</i></u>	Wharf piles and berth walls, marina piles/ pontoons and other artificial structures, breakwaters and riprap, intertidal and shallow subtidal reefs	Large numbers of piles or lengths of hard substratum can be searched in detail	Dependent on water clarity and level of biofouling Used effectively in delimitation studies of <i>S. spallanzanii</i> and <i>S. clava</i> . Allows for in situ selective sampling of suspect organisms	Cost-effective in reasonable water clarity; can be time-consuming under poor underwater visibility conditions	Feasibility dependent on water currents, weather, water clarity and safety issues for divers	Yes	Yes (e.g., Currie and Crookes, 1997; Pollard and Rankin, 2003; McDonald and Wells, 2009; McKenzie et al, 2016)

Method	Target species	Non-target species	Habitat	Spatial coverage	Effectiveness	Cost effectiveness	Feasibility	Previous targeted surveillance in New Zealand?	Previous targeted surveillance overseas?
Shoreline searches	<u><i>Arcuatula senhousia</i></u> <u><i>Asterias amurensis</i></u> <u><i>Carcinus maenas</i></u> <u><i>Caulerpa taxifolia</i></u> <u><i>Eriocheir sinensis</i></u> <u><i>Eudistoma elongatum</i></u> <u><i>Sabella spallanzanii</i></u> <u><i>Styela clava</i></u>	<u><i>Amathia verticillata</i></u> <u><i>Chaetopterus</i> sp.</u> <u><i>Charybdis (Charybdis) japonica</i></u> <u><i>Clavelina lepadiformis</i></u> <u><i>Didemnum vexillum</i></u> <u><i>Grateloupia turuturu</i></u> <u><i>Hypnea</i> sp.</u> <u><i>Undaria pinnatifida</i></u>	Sloping sandy shorelines, intertidal rocky reefs, and areas where drift material is likely to accumulate, in addition to marine infrastructure (e.g., marina piles/pontoons) Prevailing winds on preceding days are a useful guide to where material (i.e., 'beach wrack') may accumulate on shorelines	Can cover long stretches of intertidal habitat quickly	Used effectively in delimitation studies of <i>S. clava</i>	High	Feasible where access to shoreline and marine infrastructure is possible	Yes	Yes (e.g., Minchin, 2007a, b; Nall et al, 2015; Mabin et al, 2017)

11 Appendix 2. Summaries of target versus achieved number of sampling locations for Winter 2023 and Summer 2023–24 National Marine High Risk Site Surveillance (NMHRSS) programme surveys

BLUFF HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	84	85	101.2
Crab condo lines	8	8	100.0
Crab (box) trap lines	68	70	102.9
Diver searches	40	40	100.0
Shore searches	25	25	100.0
Sample total	225	228	101.3
SUMMER 2023–24			
Benthic sled tows	84	86	102.4
Crab condo lines	8	8	100.0
Crab (box) trap lines	68	68	100.0
Diver searches	40	40	100.0
Shore searches	25	26	104.0
Sample total	225	228	101.3

LYTTELTON HARBOUR/WHAKARAUPŌ

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	100	100	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	81	101.3
Diver searches	30	32	106.7
Shore searches	25	26	104.0
Sample total	243	247	101.6
SUMMER 2023–24			
Benthic sled tows	100	101	101.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	31	103.3
Shore searches	25	26	104.0
Sample total	243	246	101.2

NAPIER PORT AND AHURIRI INNER HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	100	101	101.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	26	104.0
Sample total	243	245	100.8
SUMMER 2023–24			
Benthic sled tows	100	100	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	33	110.0
Shore searches	25	25	100.0
Sample total	243	246	101.2

NELSON HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	100	101	101.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	31	103.3
Shore searches	25	26	104.0
Sample total	243	246	101.2
SUMMER 2023–24			
Benthic sled tows	100	100	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	243	243	100.0

ŌPUA MARINA/WAIKARE INLET

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	105	105	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	30	120.0
Sample total	248	253	102.0
SUMMER 2023–24			
Benthic sled tows	105	105	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	29	116.0
Sample total	248	252	101.6

OTAGO HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	100	101	101.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	26	104.0
Sample total	243	245	100.8
SUMMER 2023–24			
Benthic sled tows	100	102	102.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	26	104.0
Sample total	243	246	101.2

PICTON HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	100	101	101.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	31	103.3
Shore searches	25	26	104.0
Sample total	243	246	101.2
SUMMER 2023–24			
Benthic sled tows	100	101	101.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	31	103.3
Shore searches	25	26	104.0
Sample total	243	246	101.2

PORT TARANAKI

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	100	101	101.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	50	100.0
Diver searches	30	31	103.3
Shore searches	25	26	104.0
Sample total	243	246	101.2
SUMMER 2023–24			
Benthic sled tows	80	81	101.3
Crab condo lines	8	8	100.0
Crab (box) trap lines	84	84	100.0
Diver searches	35	35	100.0
Shore searches	25	27	108.0
Sample total	232¹⁷	235	101.3

¹⁷ By agreement with Biosecurity New Zealand, from the Summer 2023–24 onwards the total target number of sampling locations in Port Taranaki has been reduced compared to earlier surveys (from 243 down to 232), due to the relatively small size of the port in relation to benthic sled sampling effort. The number of benthic sled locations has been reduced (from 100 to 80), number of crab trap and diver search locations increased (from 80 to 84, and from 30 to 35, respectively).

TAURANGA HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	100	100	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	29	116.0
Sample total	243	247	101.6
SUMMER 2023–24			
Benthic sled tows	100	100	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	26	104.0
Sample total	243	244	100.4

WAITEMATĀ HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	200	204	102.0
Crab condo lines	16	16	100.0
Crab (box) trap lines	160	160	100.0
Diver searches	60	60	100.0
Shore searches	50	63	126.0
Sample total	486	503	103.5
SUMMER 2023–24			
Benthic sled tows	200	200	100.0
Crab condo lines	16	16	100.0
Crab (box) trap lines	160	160	100.0
Diver searches	60	60	100.0
Shore searches	50	70	140.0
Sample total	486	506	104.1

WELLINGTON HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	100	100	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	32	106.7
Shore searches	25	27	108.0
Sample total	243	247	101.6
SUMMER 2023–24			
Benthic sled tows	100	100	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	32	106.7
Shore searches	25	28	112.0
Sample total	243	248	102.1

WHANGĀREI HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2023			
Benthic sled tows	100	100	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	27	108.0
Sample total	243	245	100.8
SUMMER 2023–24			
Benthic sled tows	100	100	100.0
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Diver searches	30	30	100.0
Shore searches	25	27	108.0
Sample total	243	245	100.8

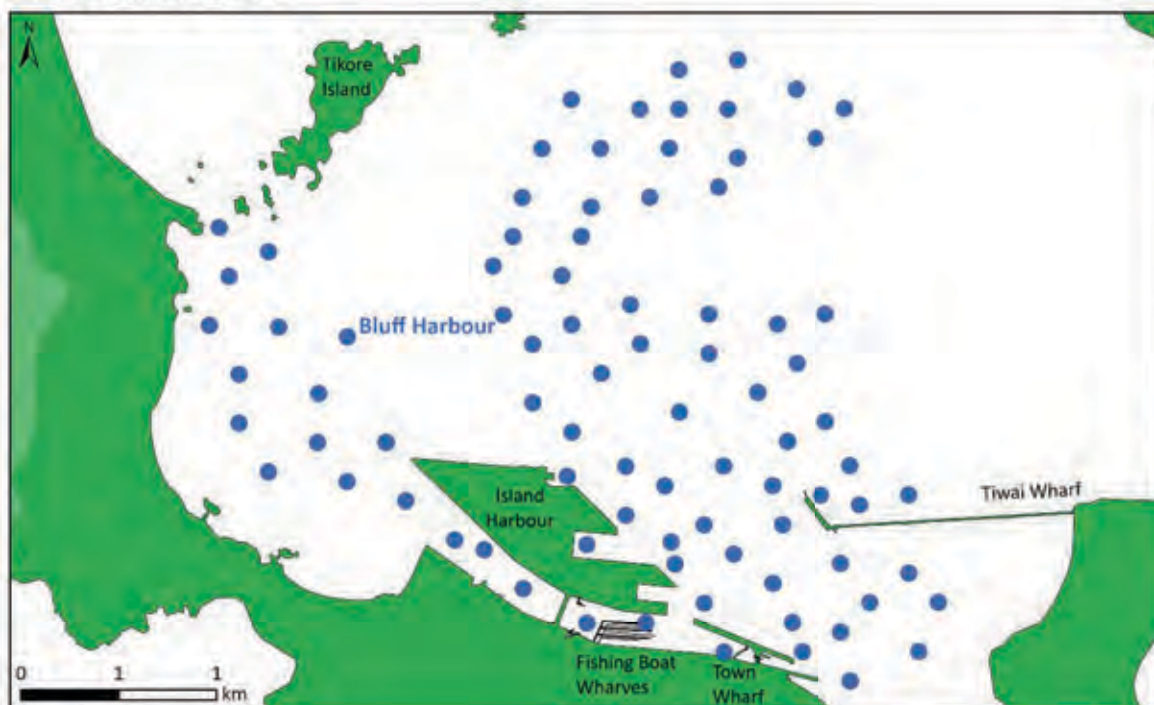
12 Appendix 3. Maps showing locations sampled in Winter 2023 and Summer 2023–24 National Marine High Risk Site Surveillance (NMHRSS) programme surveys

Note: numbers of locations plotted may appear smaller than those shown in Appendix 2 Tables due to points plotting on top of each other because of the spatial resolution of the maps.

Bluff Harbour

Winter 2023

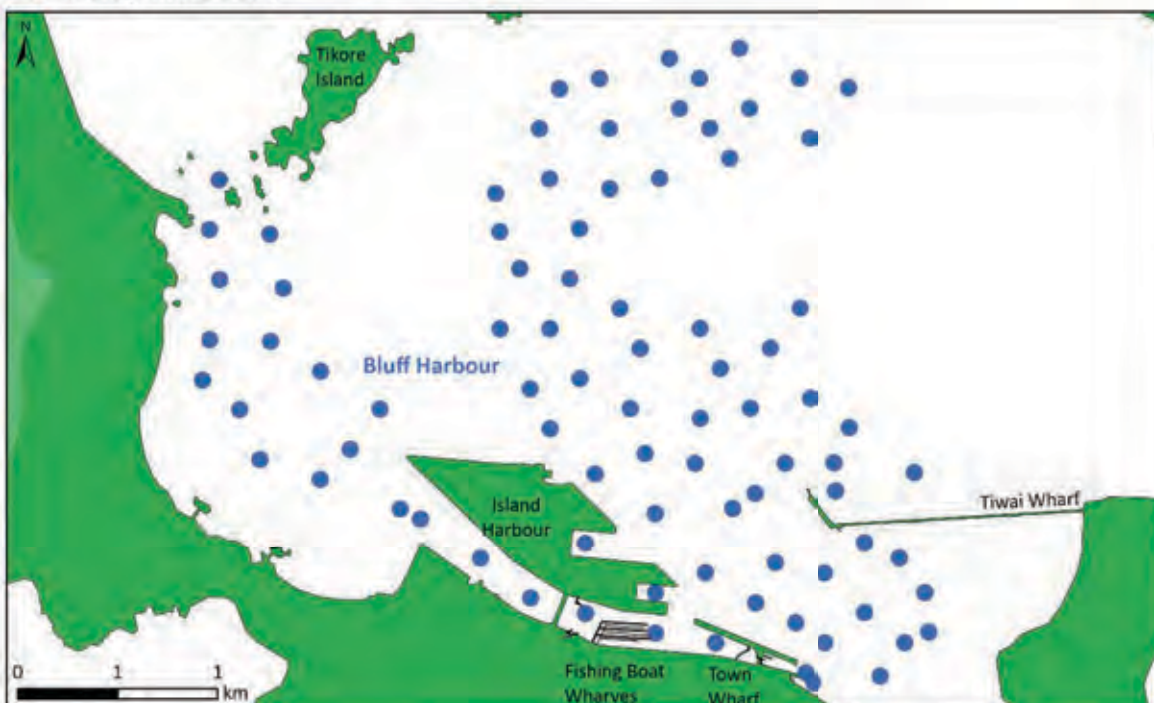
Benthic sled (BSLD) locations



Bluff Harbour

Summer 2023-24

Benthic sled (BSLD) locations



Bluff Harbour

Winter 2023

Crab condo (CONDO) locations



Bluff Harbour

Summer 2023-24

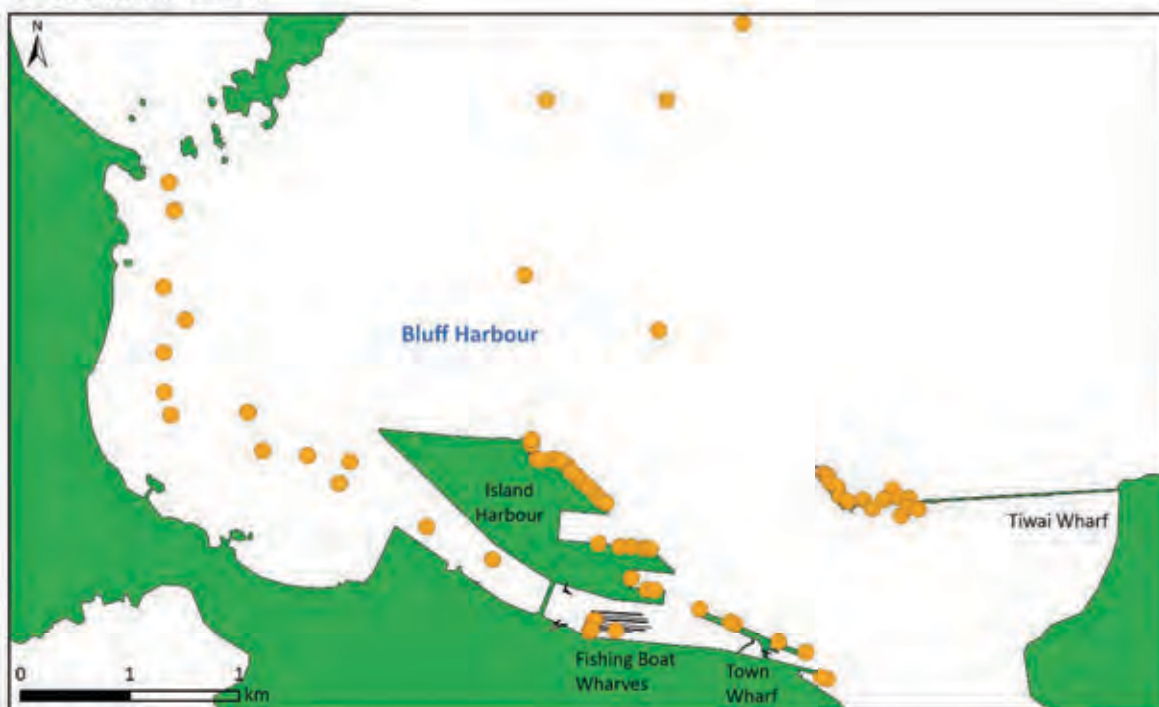
Crab condo (CONDO) locations



Bluff Harbour

Winter 2023

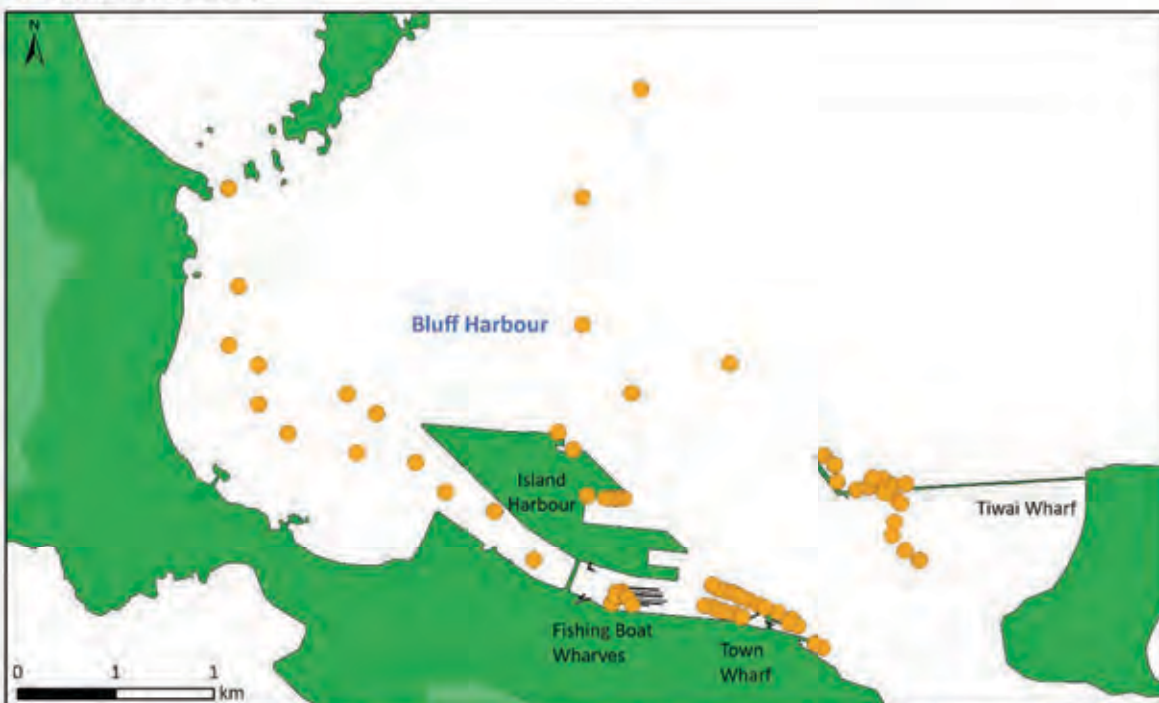
Crab trap (CRBTP) locations



Bluff Harbour

Summer 2023-24

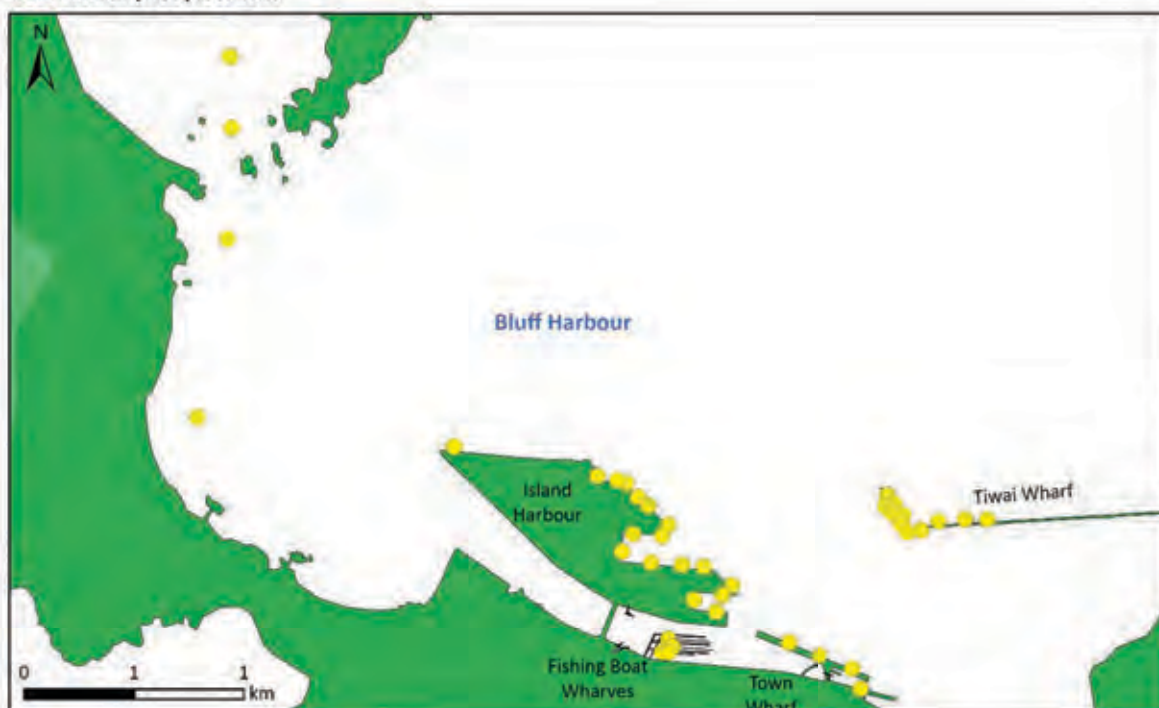
Crab trap (CRBTP) locations



Bluff Harbour

Winter 2023

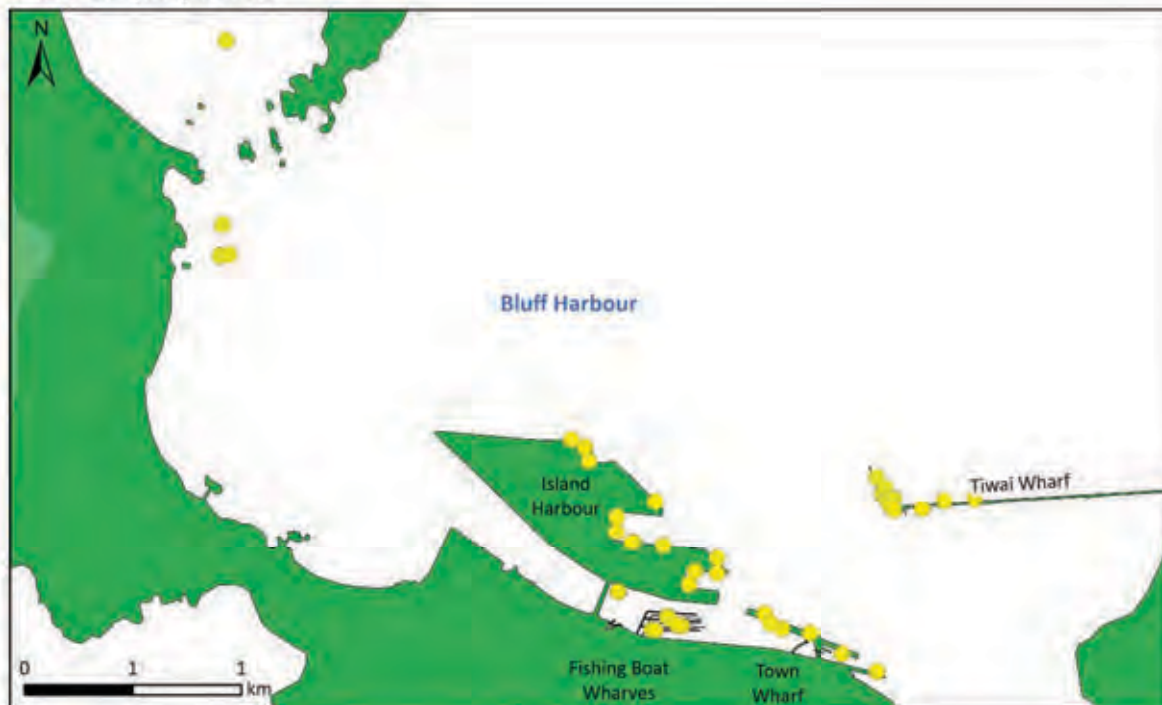
Diver search (VISD) locations



Bluff Harbour

Summer 2023-24

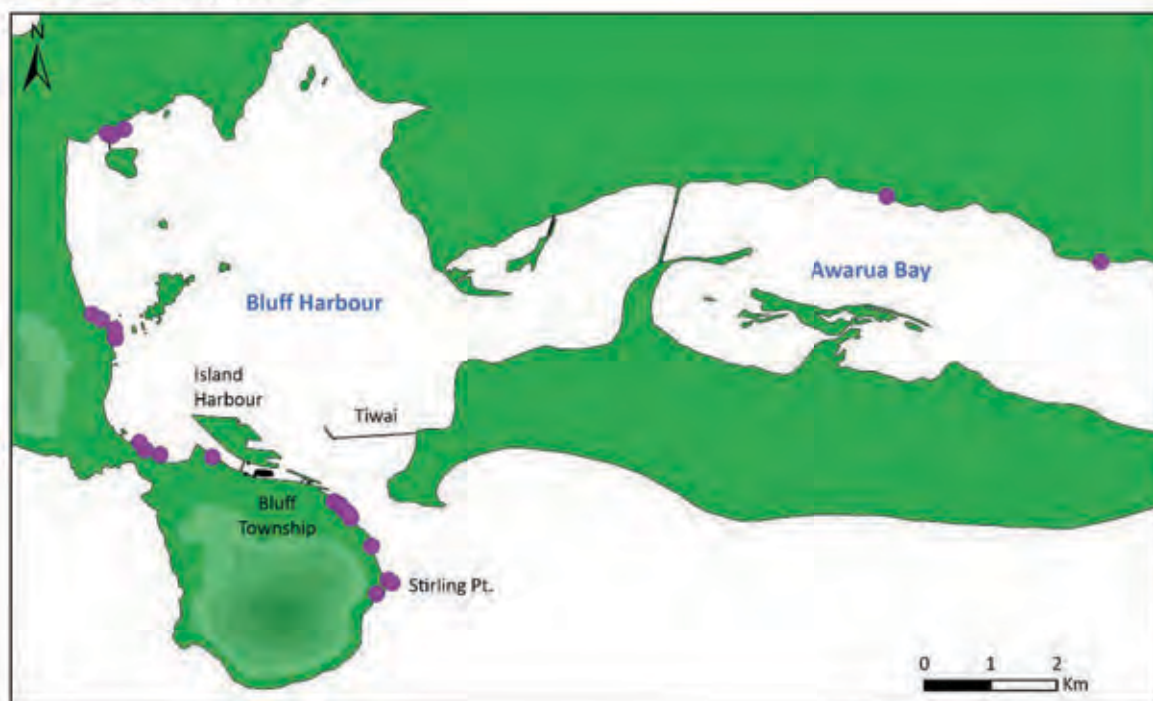
Diver search (VISD) locations



Bluff Harbour

Winter 2023

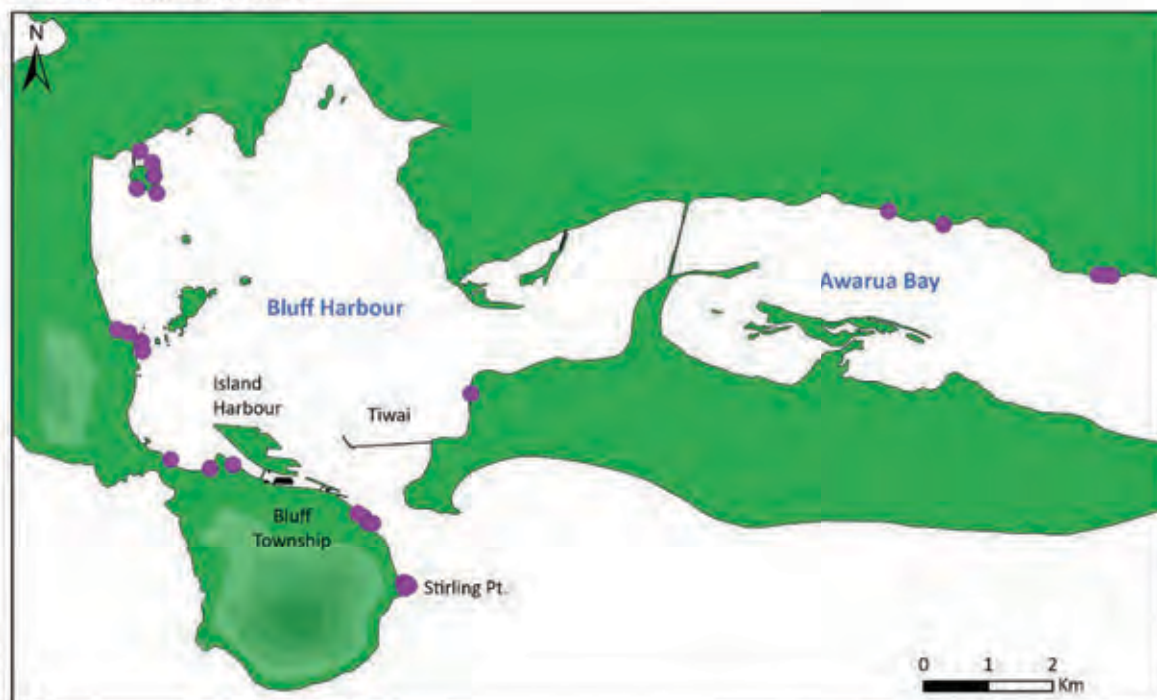
Shore search (WRACK) locations



Bluff Harbour

Summer 2023-24

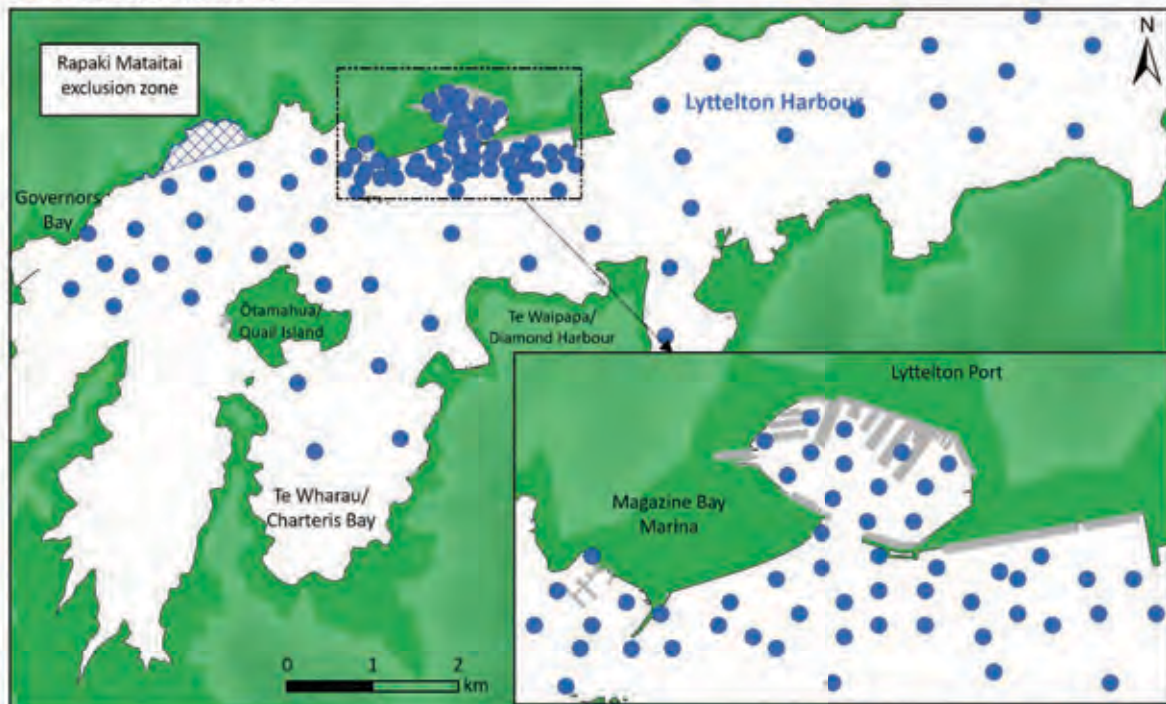
Shore search (WRACK) locations



Lyttelton Harbour/ Whakaraupō

Winter 2023

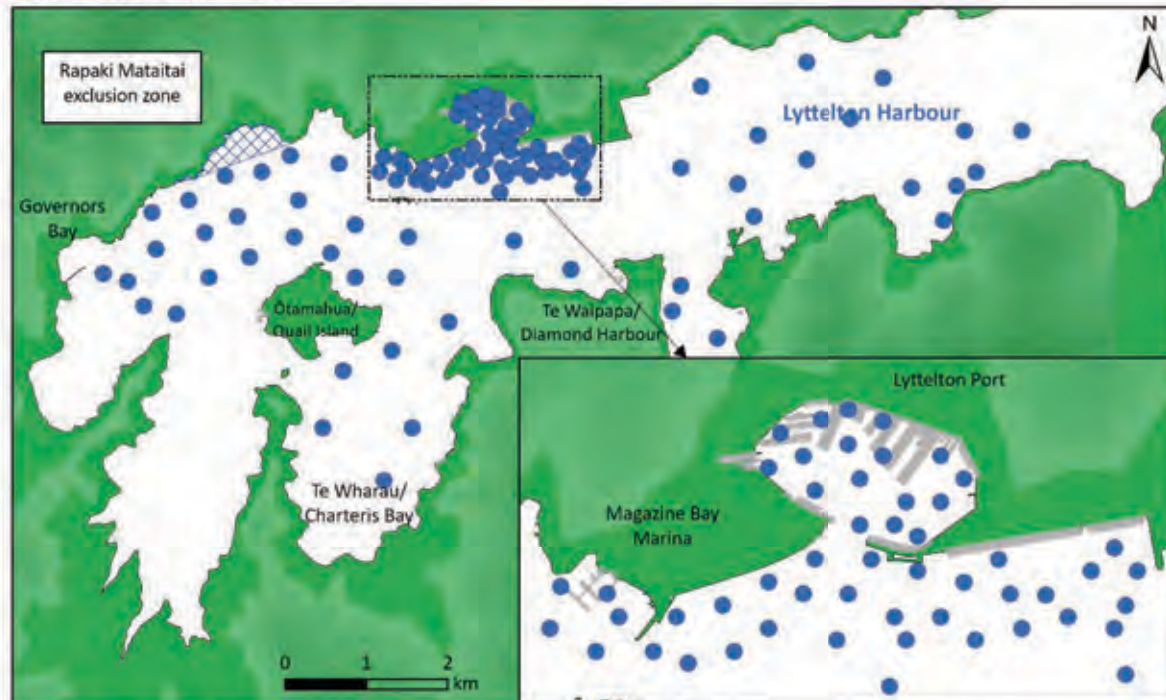
Benthic sled (BSLD) locations



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

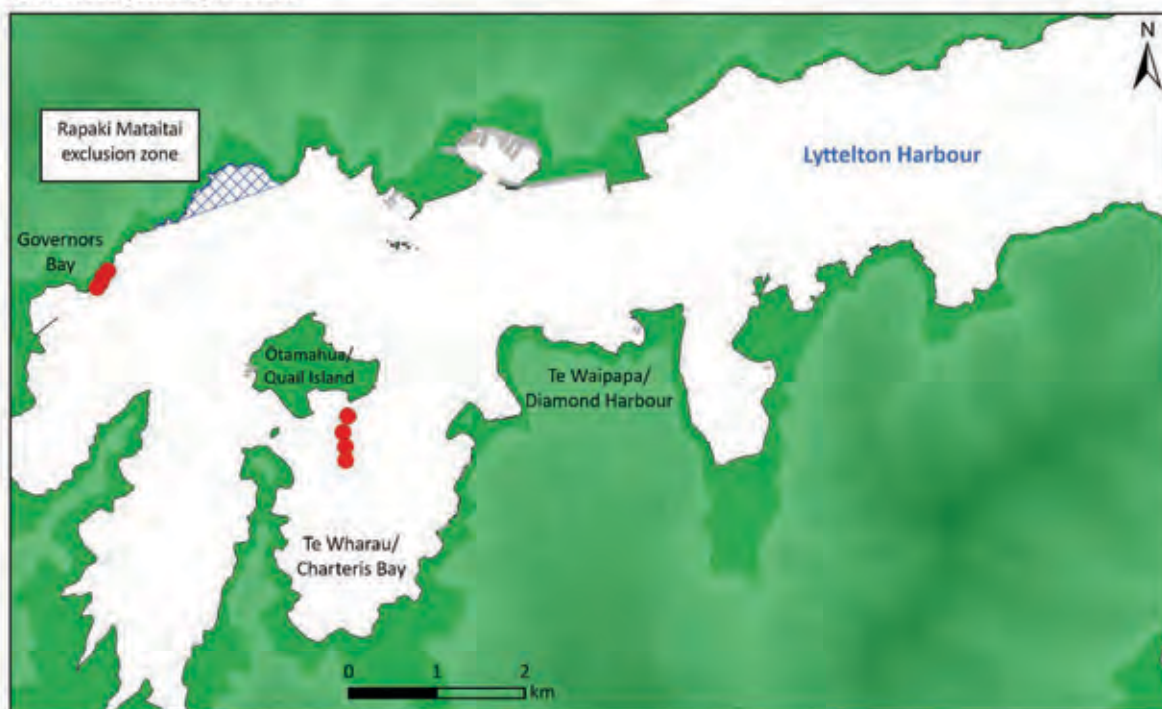
Benthic sled (BSLD) locations



Lyttelton Harbour/ Whakaraupō

Winter 2023

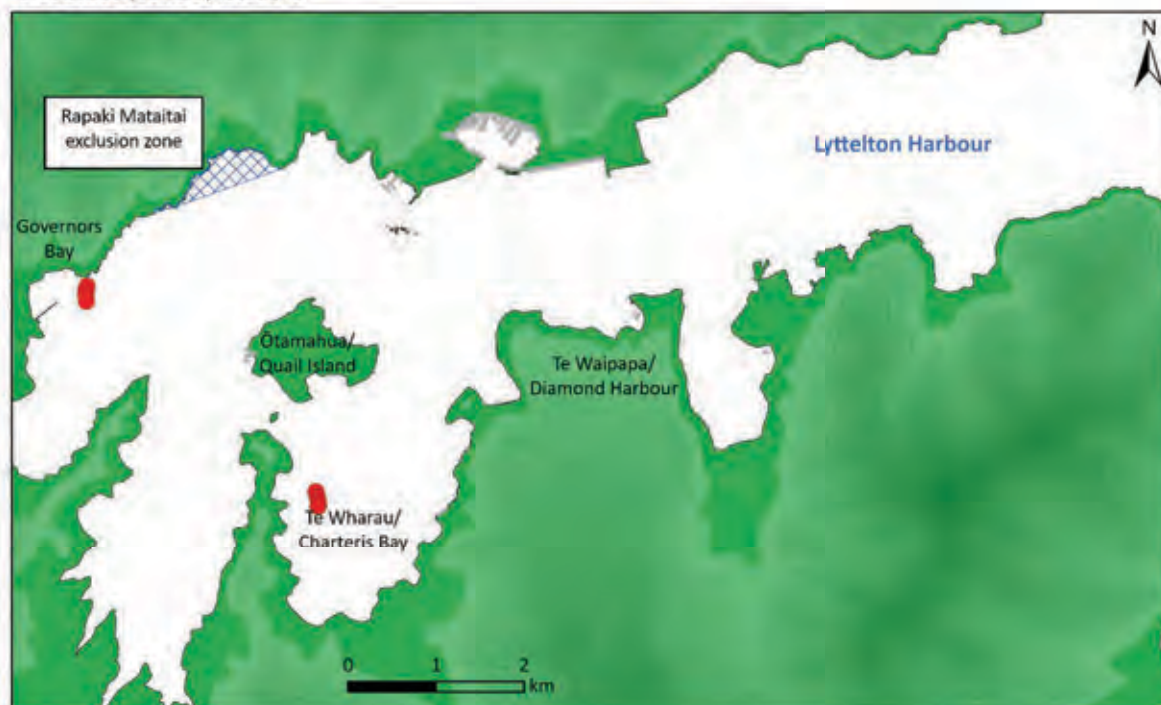
Crab condo (CONDO) locations



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

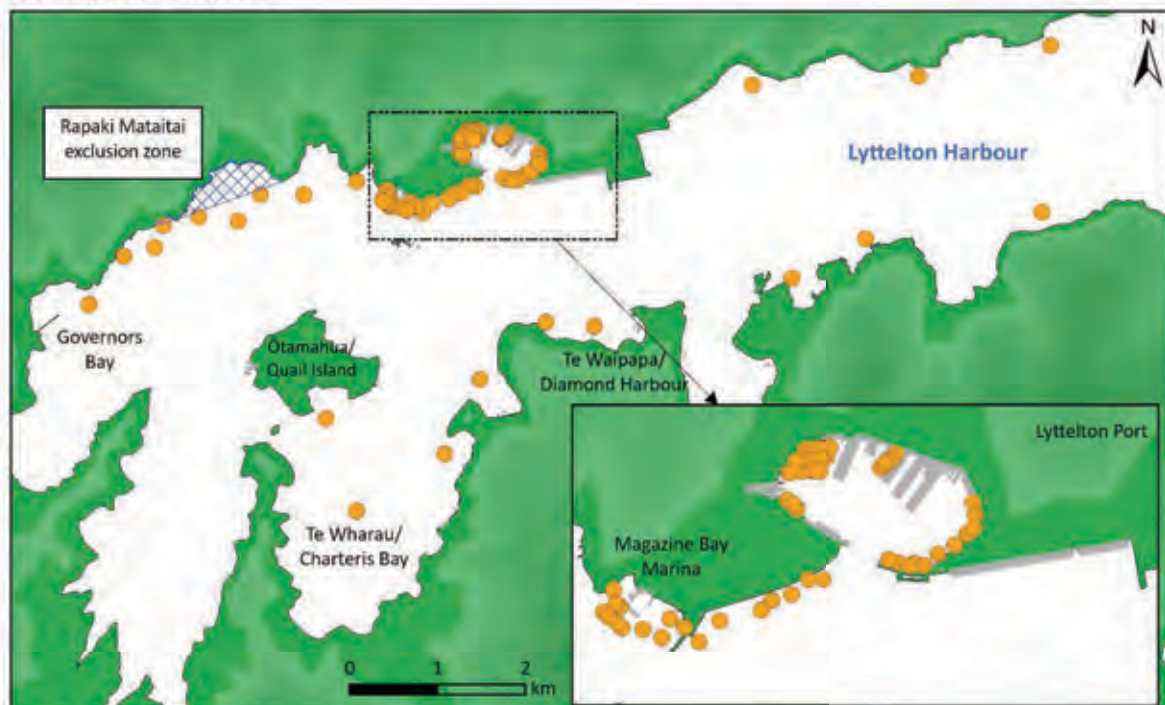
Crab condo (CONDO) locations



Lyttelton Harbour/ Whakaraupō

Winter 2023

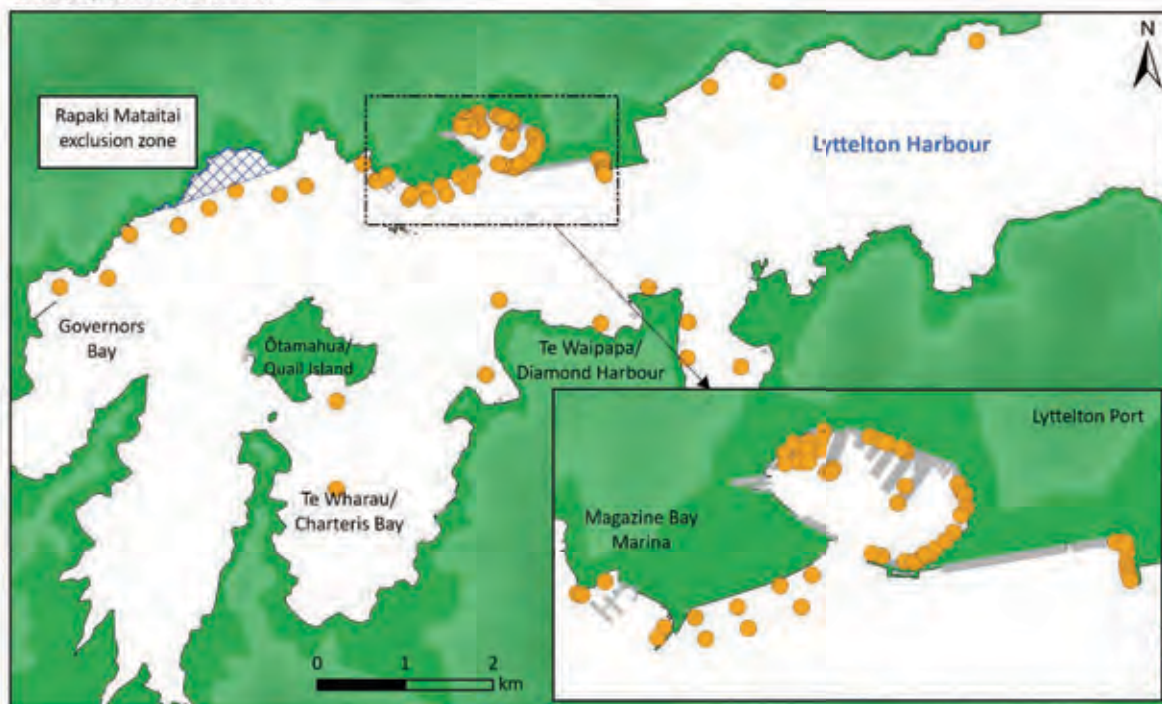
Crab trap (CRBTP) locations



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

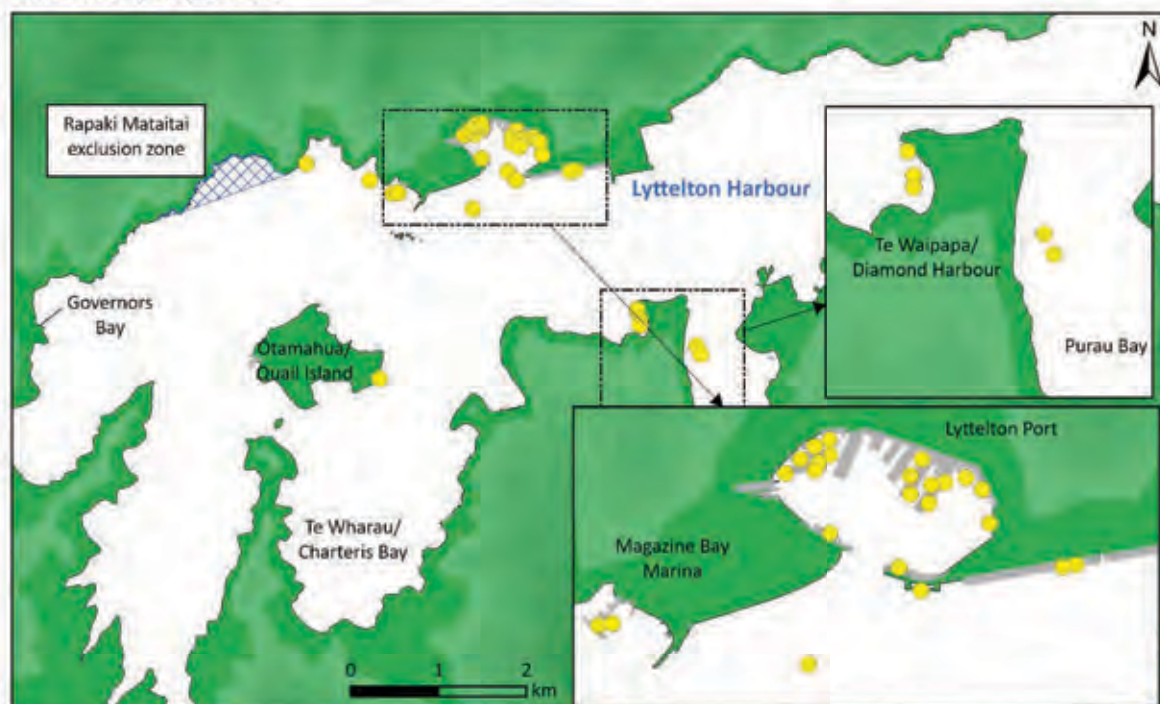
Crab trap (CRBTP) locations



Lyttelton Harbour/ Whakaraupō

Winter 2023

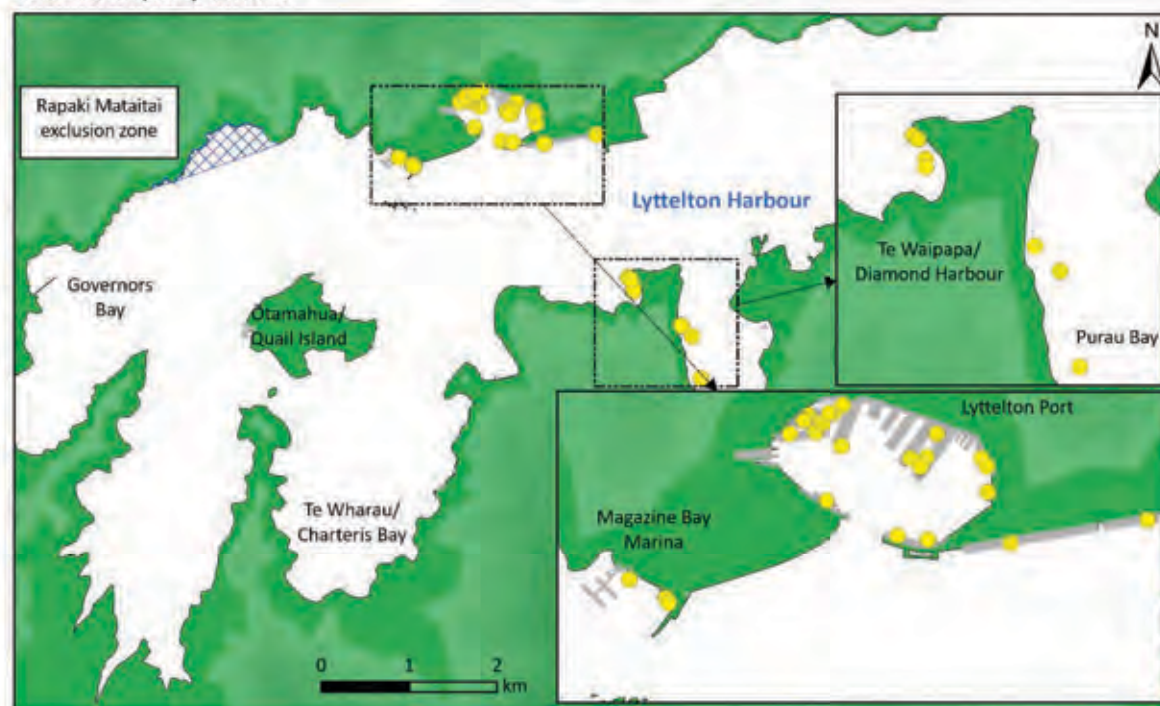
Diver search (VISD) locations



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

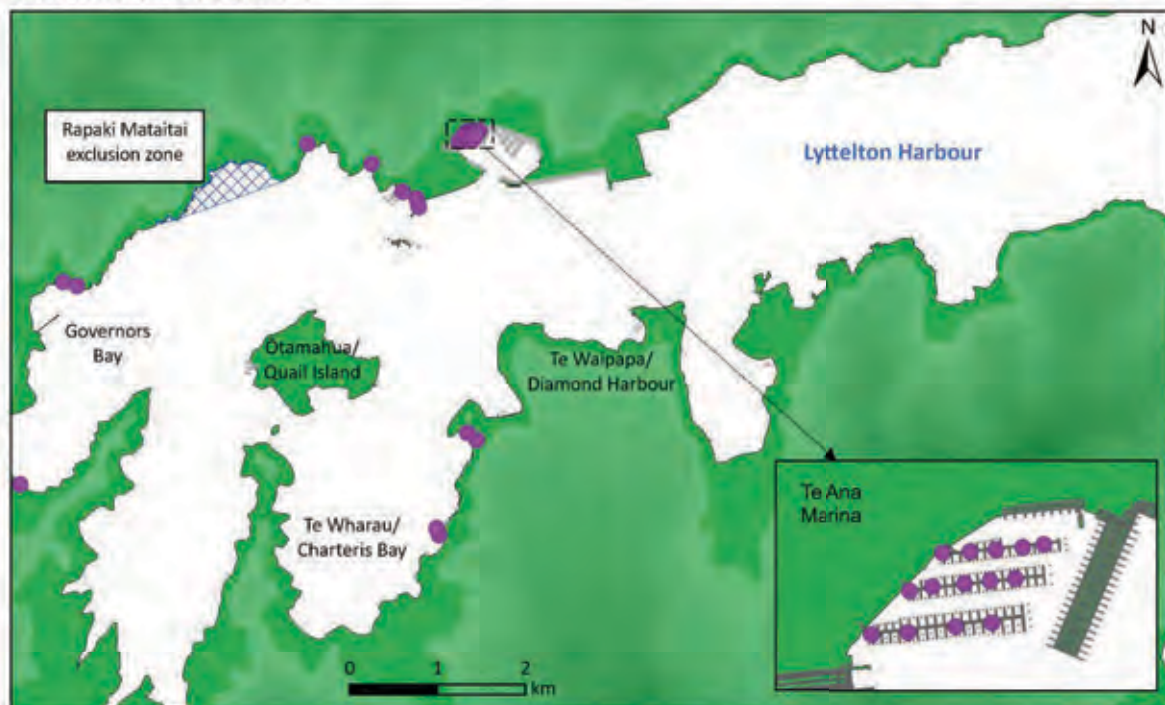
Diver search (VISD) locations



Lyttelton Harbour/ Whakaraupō

Winter 2023

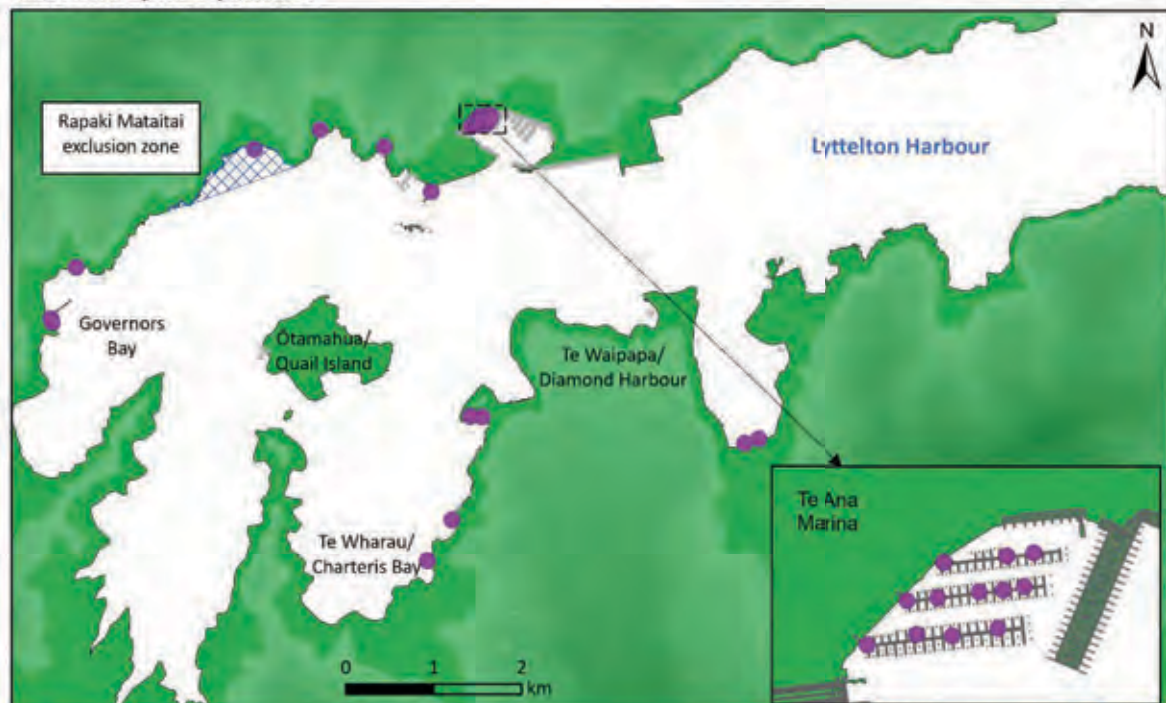
Shore search (WRACK) locations



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

Shore search (WRACK) locations



Napier Port and Ahuriri Inner Harbour

Winter 2023

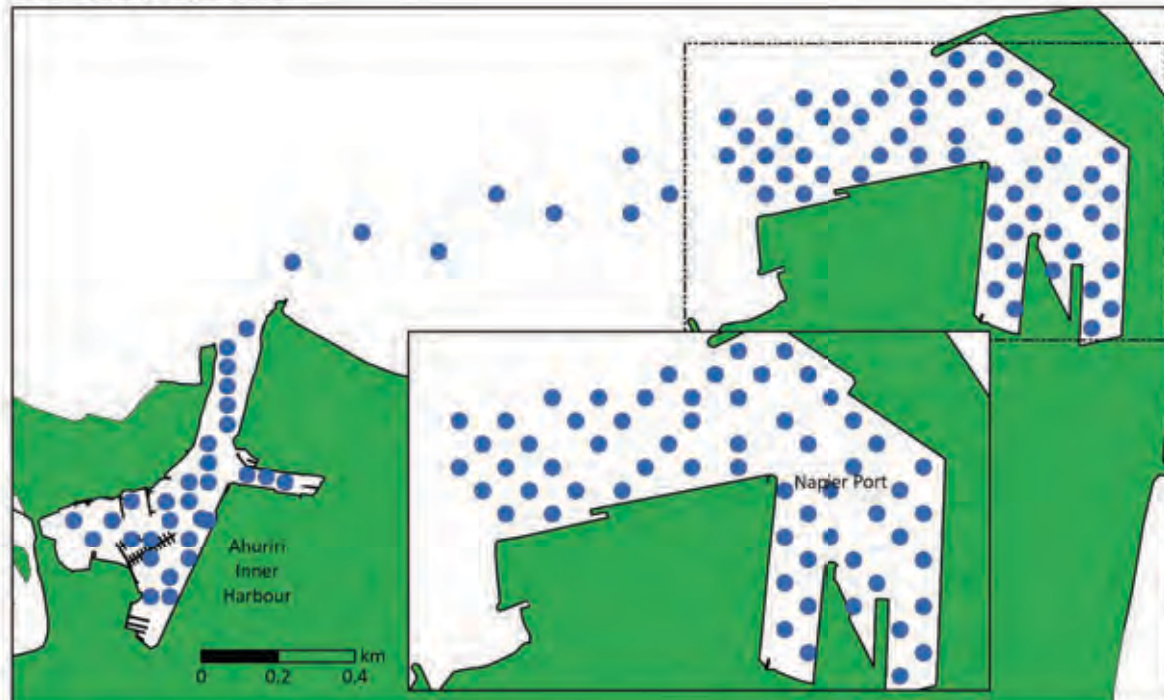
Benthic sled (BSLD) locations



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

Benthic sled (BSLD) locations



Napier Port and Ahuriri Inner Harbour

Winter 2023

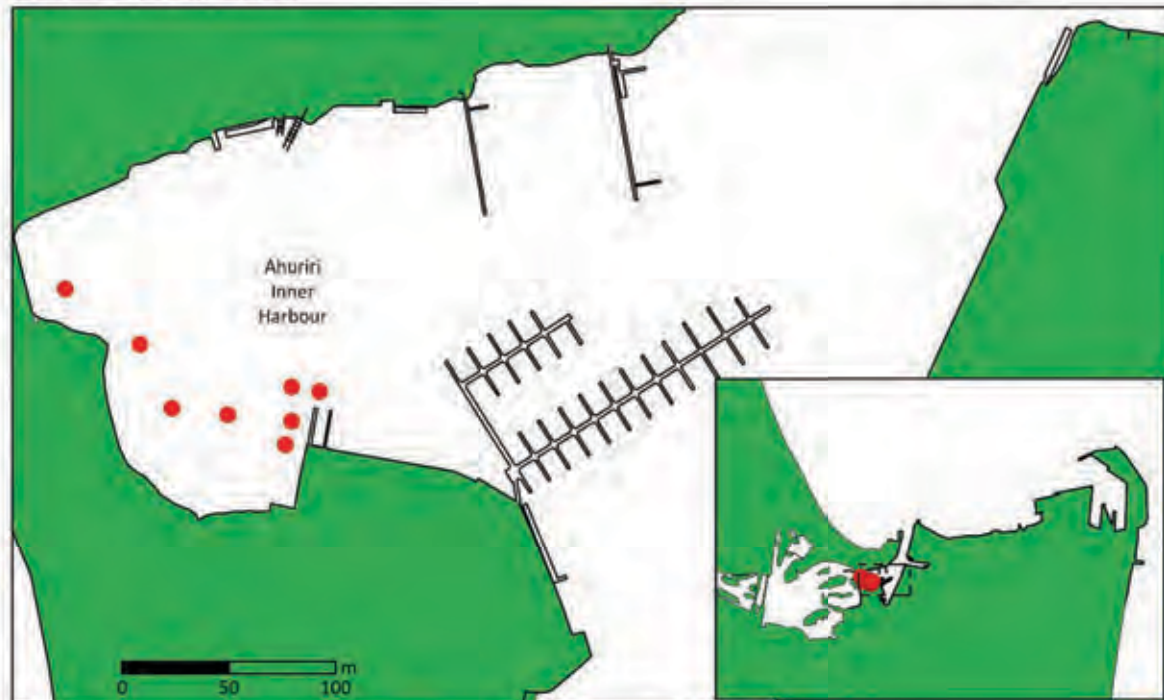
Crab condo (CONDO) locations



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

Crab condo (CONDO) locations



Napier Port and Ahuriri Inner Harbour

Winter 2023

Crab trap (CRBTP) locations



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

Crab trap (CRBTP) locations



Napier Port and Ahuriri Inner Harbour

Winter 2023

Diver search (VISD) locations



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

Diver search (VISD) locations



Napier Port and Ahuriri Inner Harbour

Winter 2023

Shore search (WRACK) locations



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

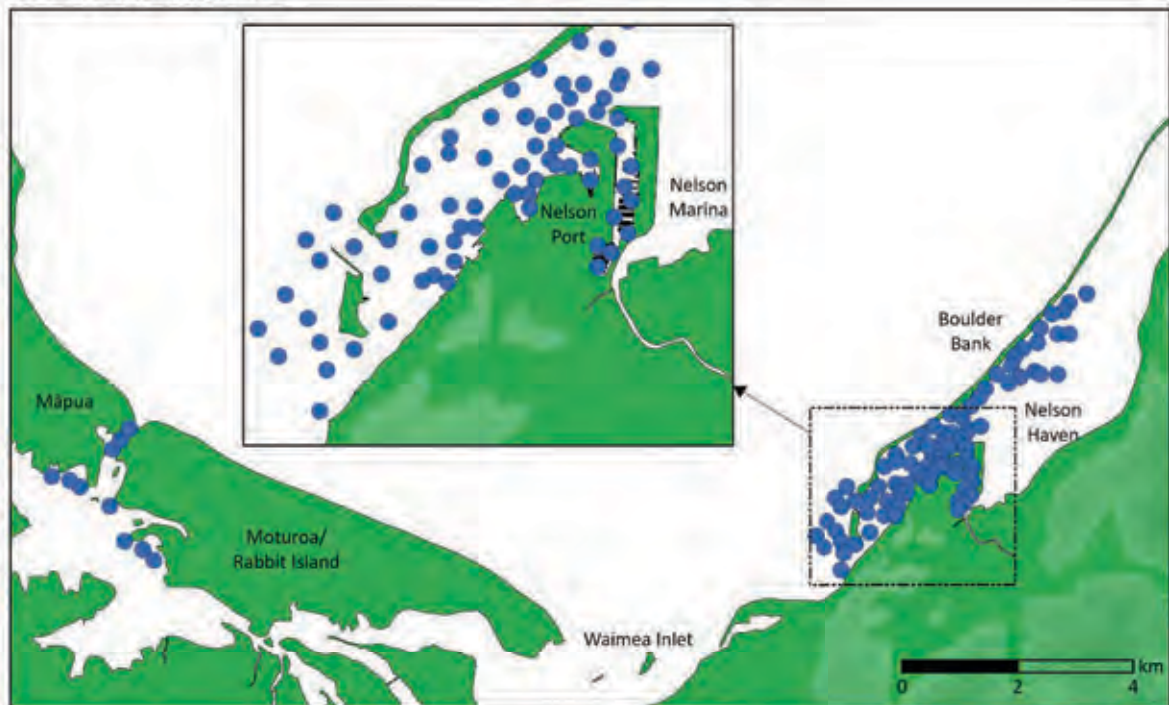
Shore search (WRACK) locations



Nelson Harbour and Waimea Inlet

Winter 2023

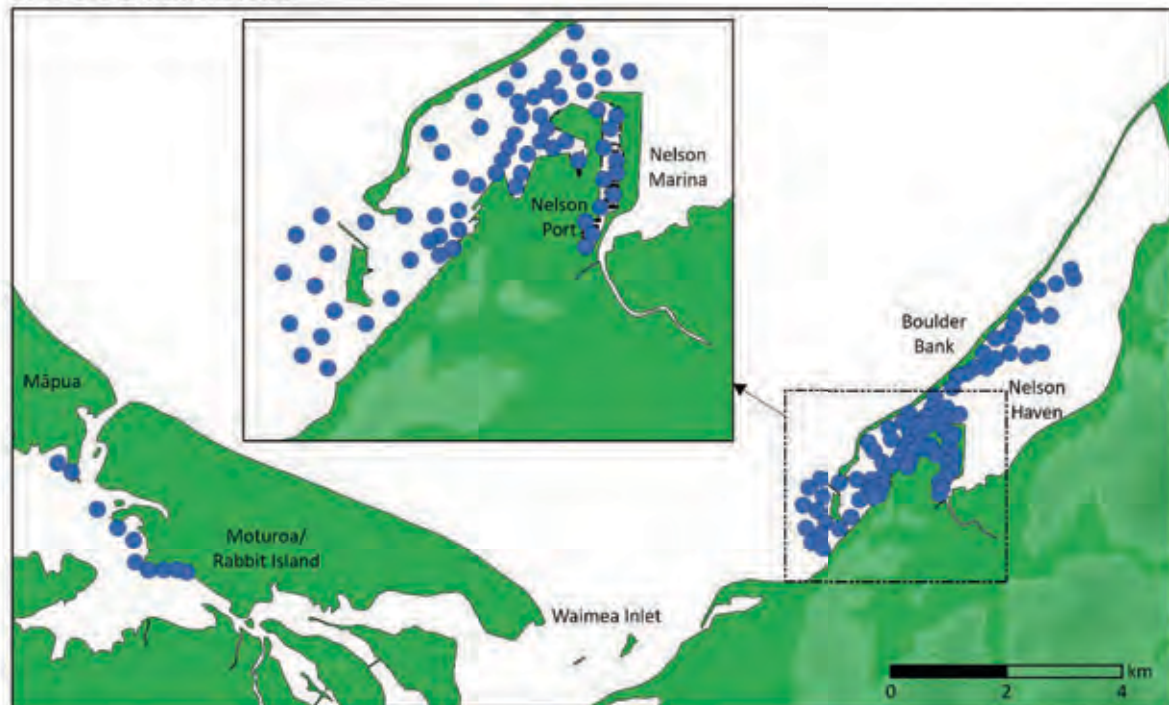
Benthic sled (BSLD) locations



Nelson Harbour and Waimea Inlet

Summer 2023-24

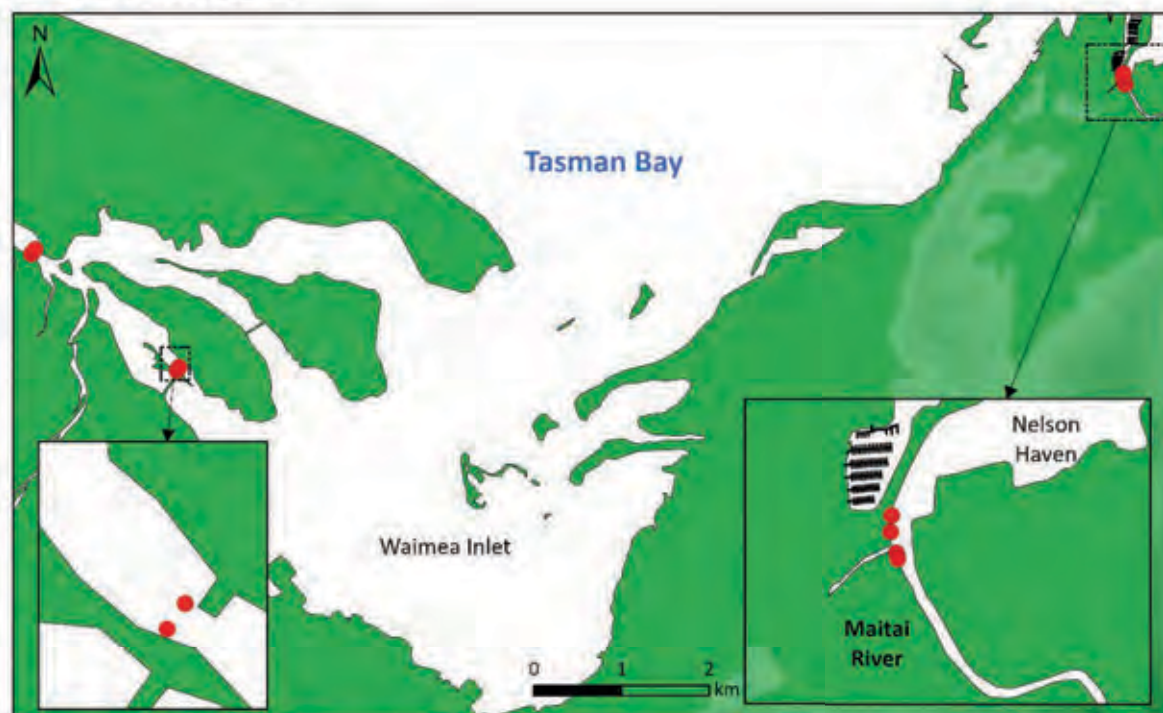
Benthic sled (BSLD) locations



Nelson Harbour and Waimea Inlet

Winter 2023

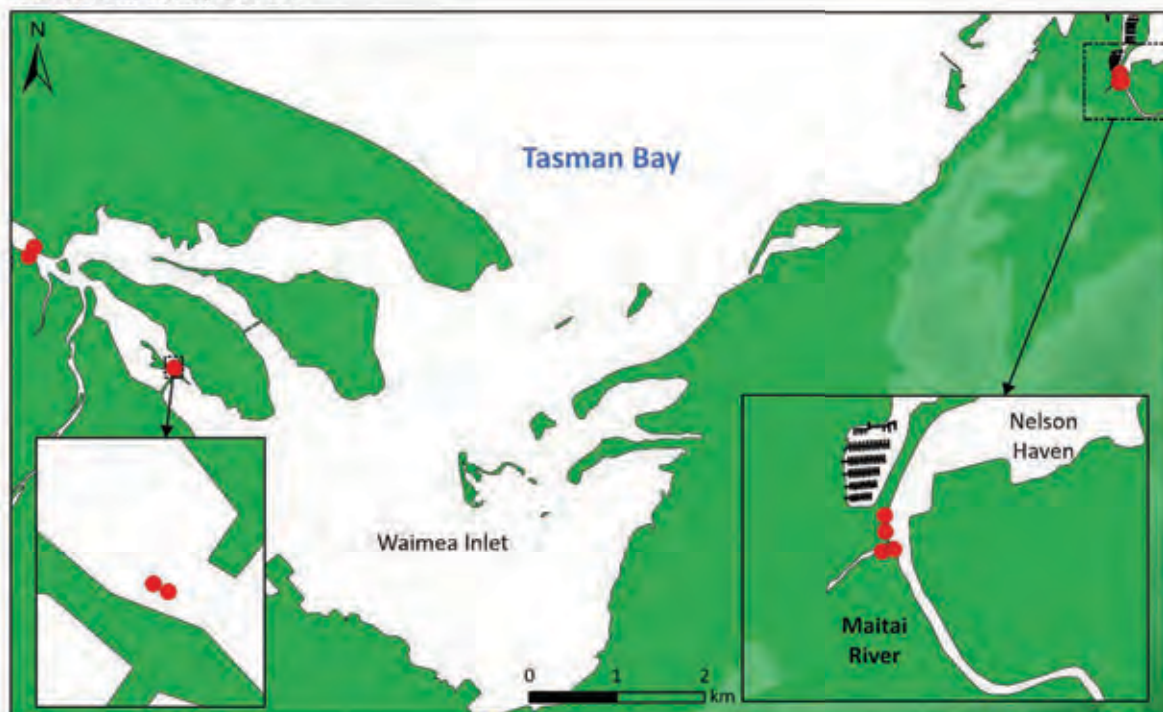
Crab condo (CONDO) locations



Nelson Harbour and Waimea Inlet

Summer 2023-24

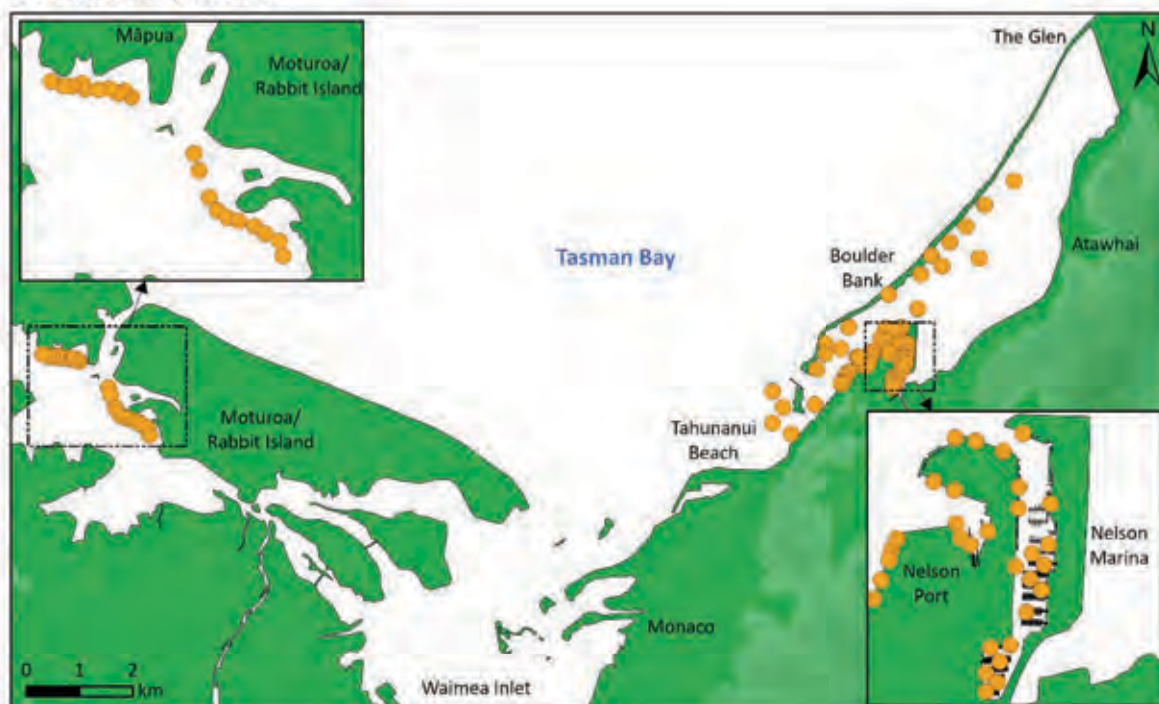
Crab condo (CONDO) locations



Nelson Harbour and Waimea Inlet

Winter 2023

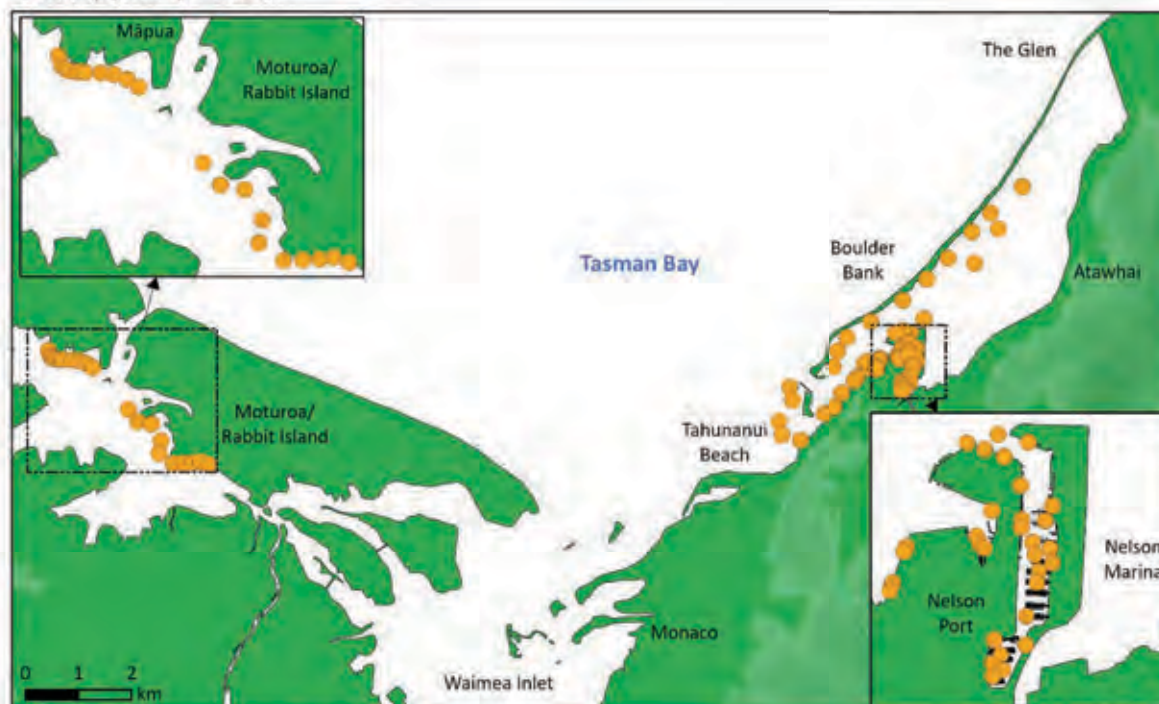
Crab trap (CRBTP) locations



Nelson Harbour and Waimea Inlet

Summer 2023-24

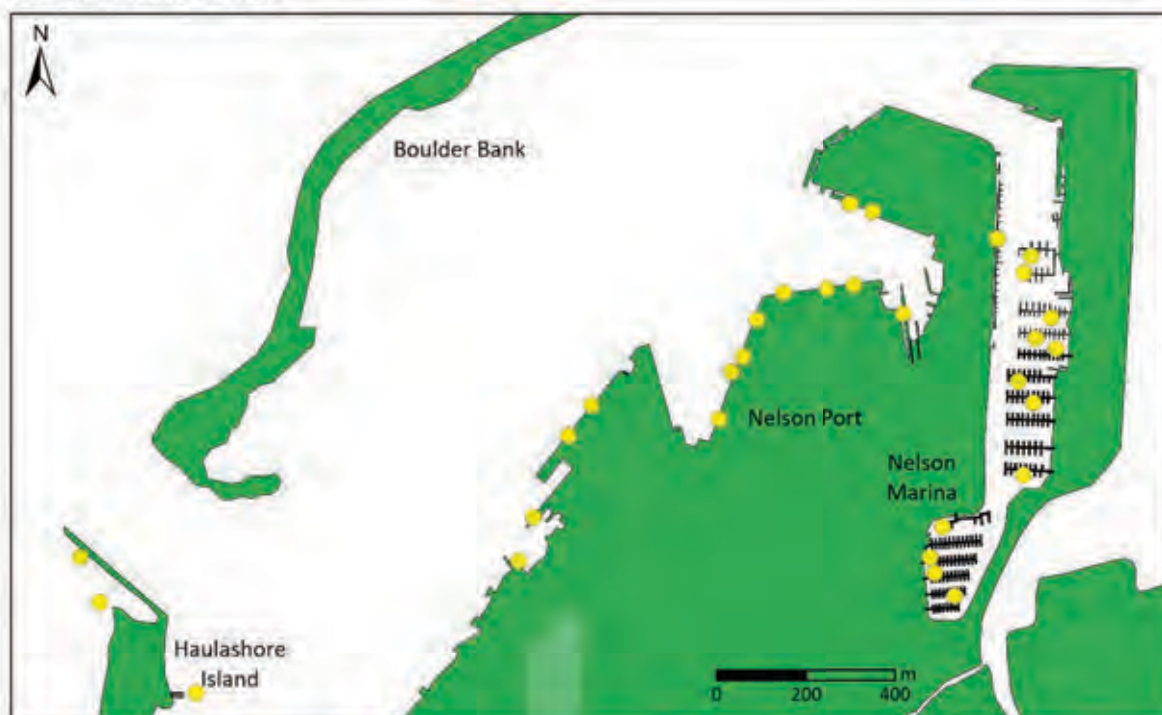
Crab trap (CRBTP) locations



Nelson Harbour and Waimea Inlet

Winter 2023

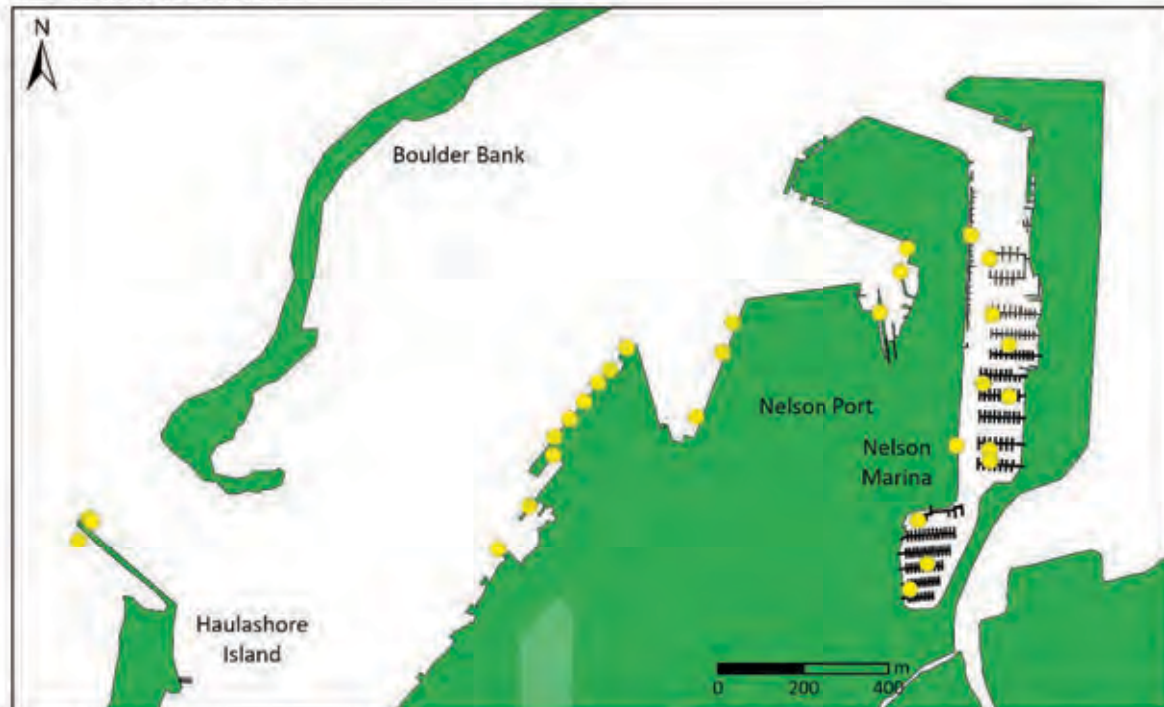
Diver search (VISD) locations



Nelson Harbour and Waimea Inlet

Summer 2023-24

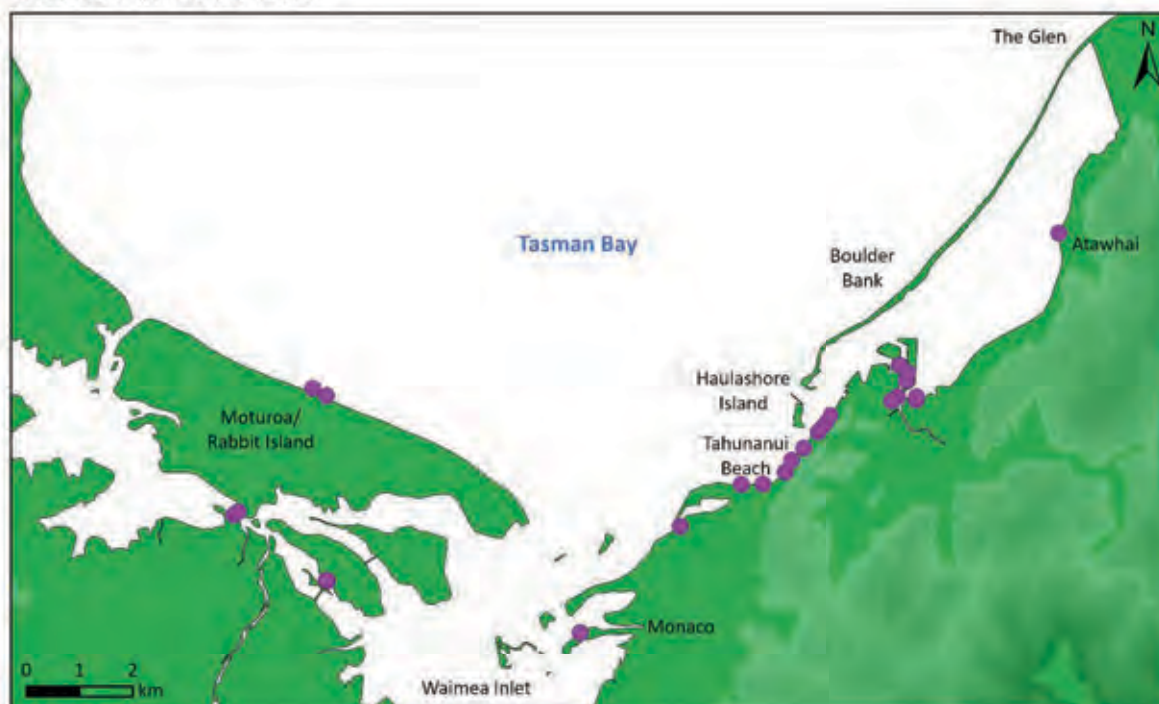
Diver search (VISD) locations



Nelson Harbour and Waimea Inlet

Winter 2023

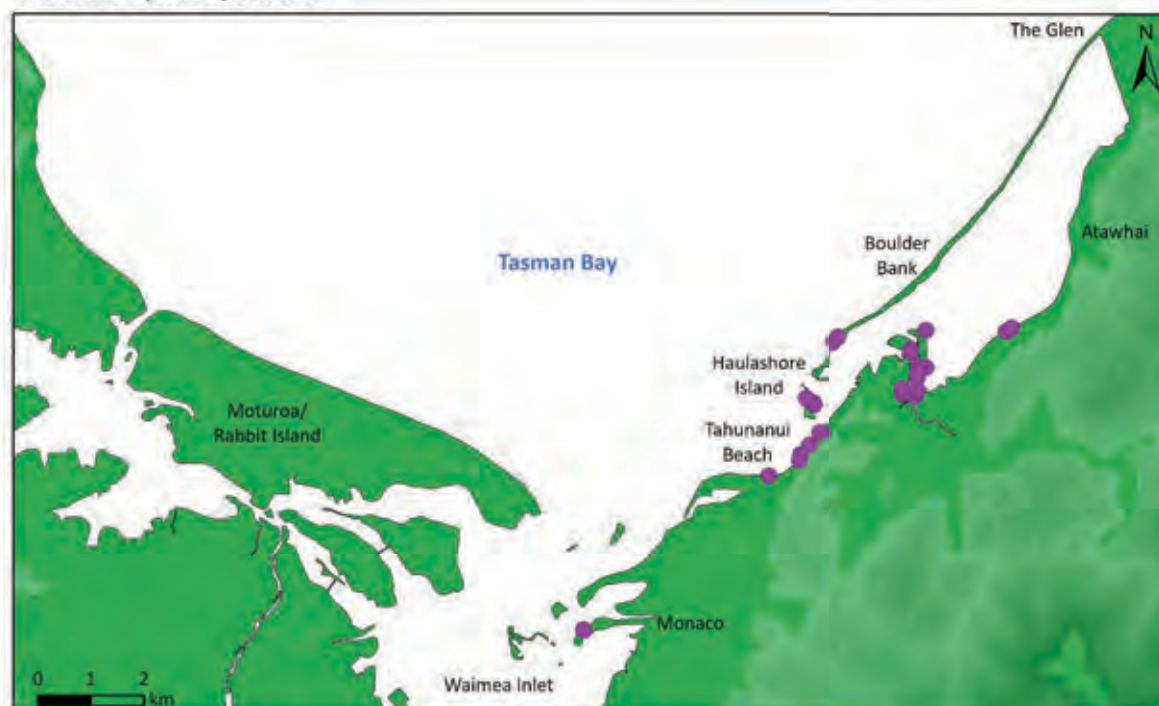
Shore search (WRACK) locations



Nelson Harbour and Waimea Inlet

Summer 2023-24

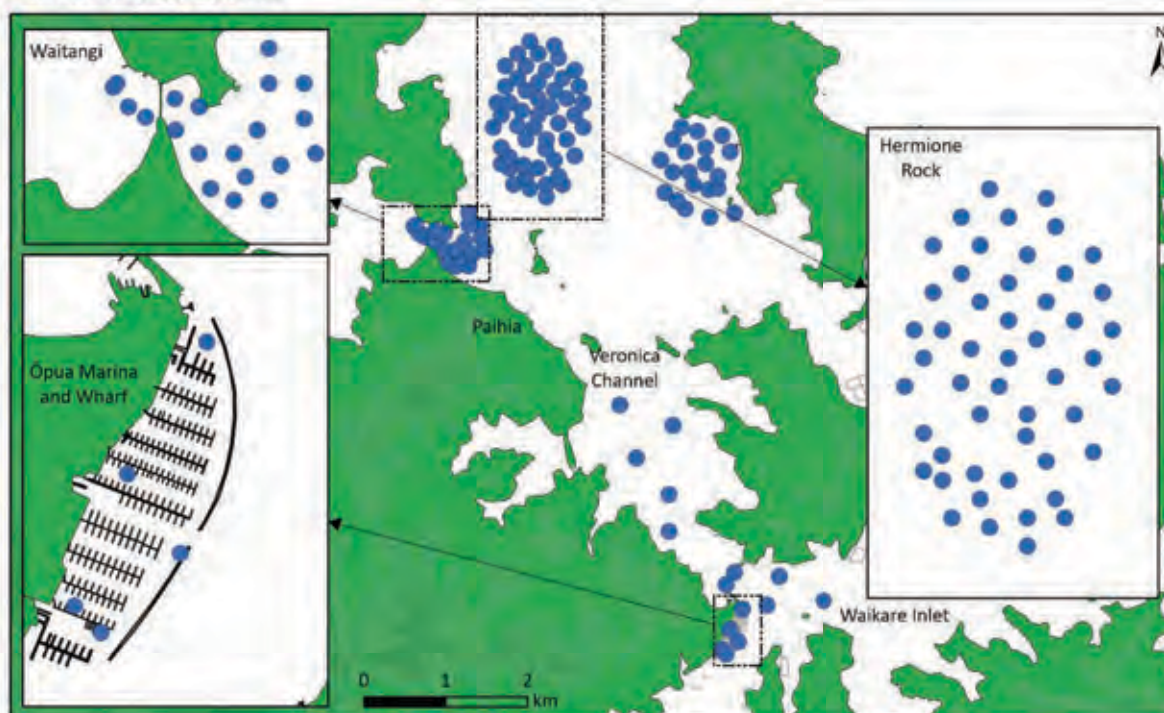
Shore search (WRACK) locations



Ōpua Marina and Waikare Inlet

Winter 2023

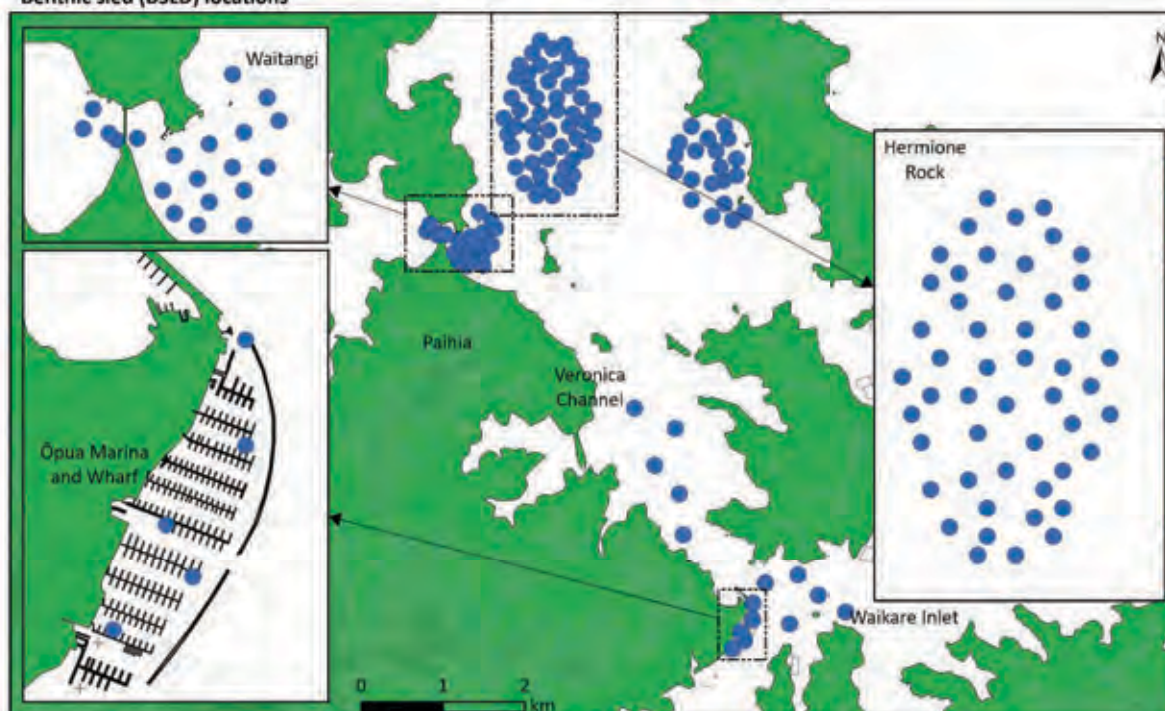
Benthic sled (BSLD) locations



Ōpua Marina and Waikare Inlet

Summer 2023-24

Benthic sled (BSLD) locations



Ōpua Marina and Waikare Inlet

Winter 2023

Crab condo (CONDO) locations



Ōpua Marina and Waikare Inlet

Summer 2023-24

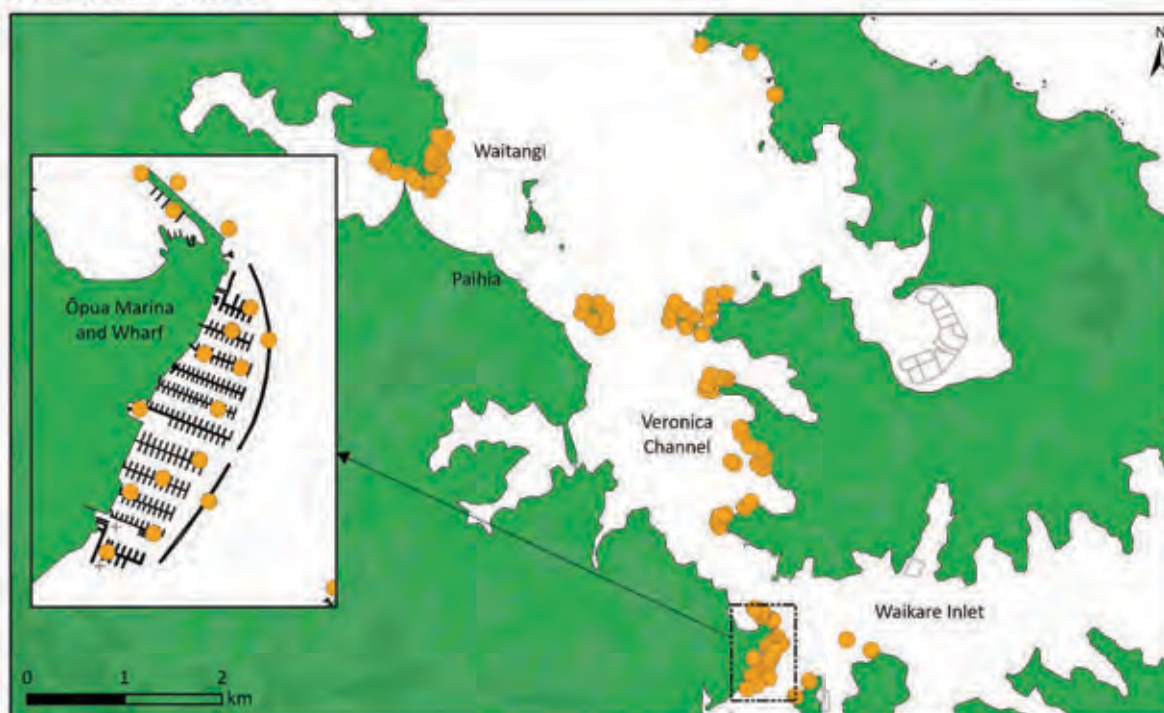
Crab condo (CONDO) locations



Ōpua Marina and Waikare Inlet

Winter 2023

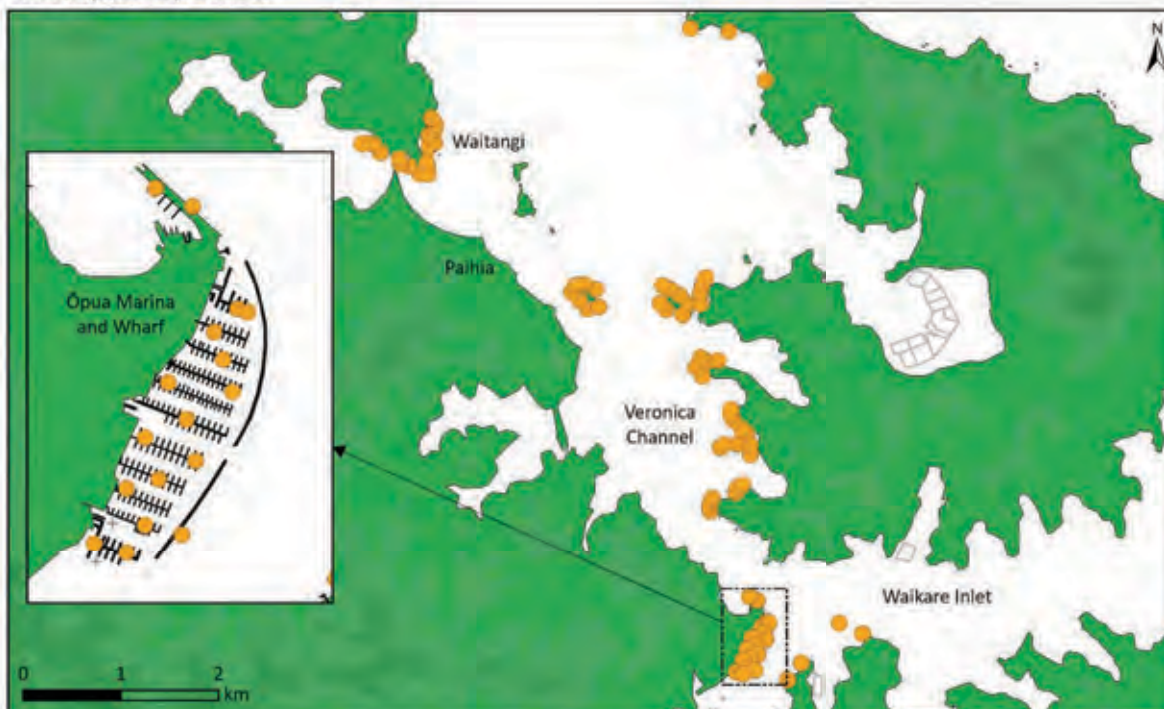
Crab trap (CRBTP) locations



Ōpua Marina and Waikare Inlet

Summer 2023-24

Crab trap (CRBTP) locations



Ōpua Marina and Waikare Inlet

Winter 2023

Diver search (VISD) locations



Ōpua Marina and Waikare Inlet

Summer 2023-24

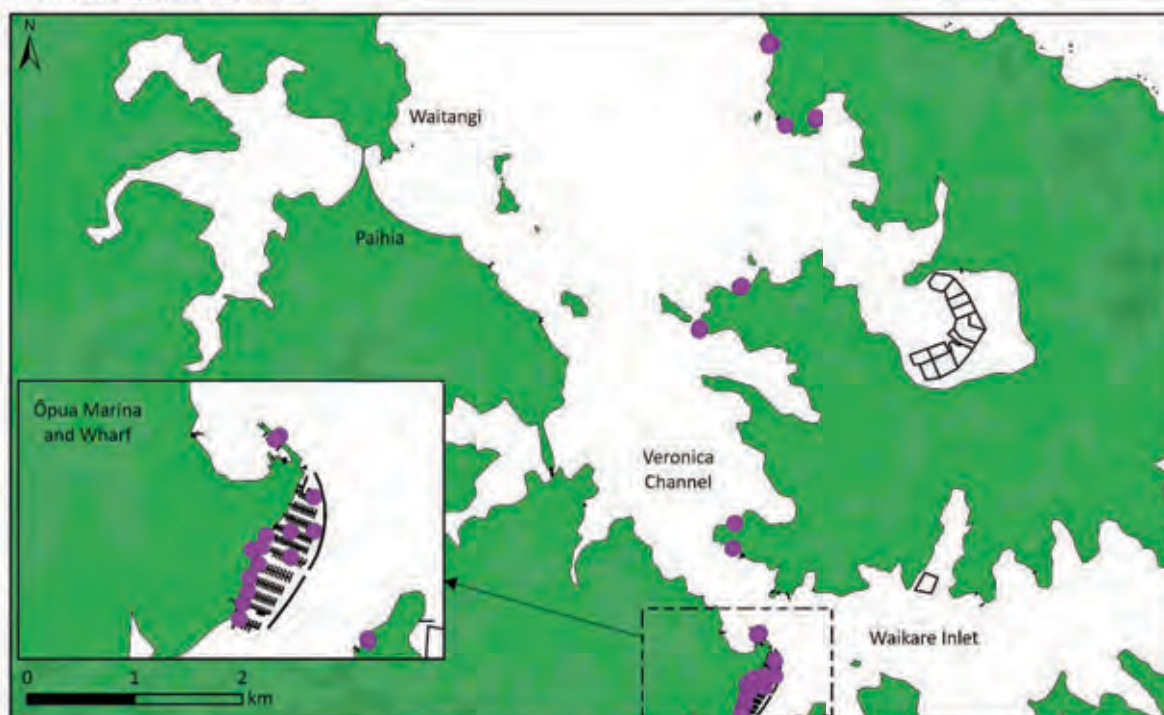
Diver search (VISD) locations



Ōpua Marina and Waikare Inlet

Winter 2023

Shore search (WRACK) locations



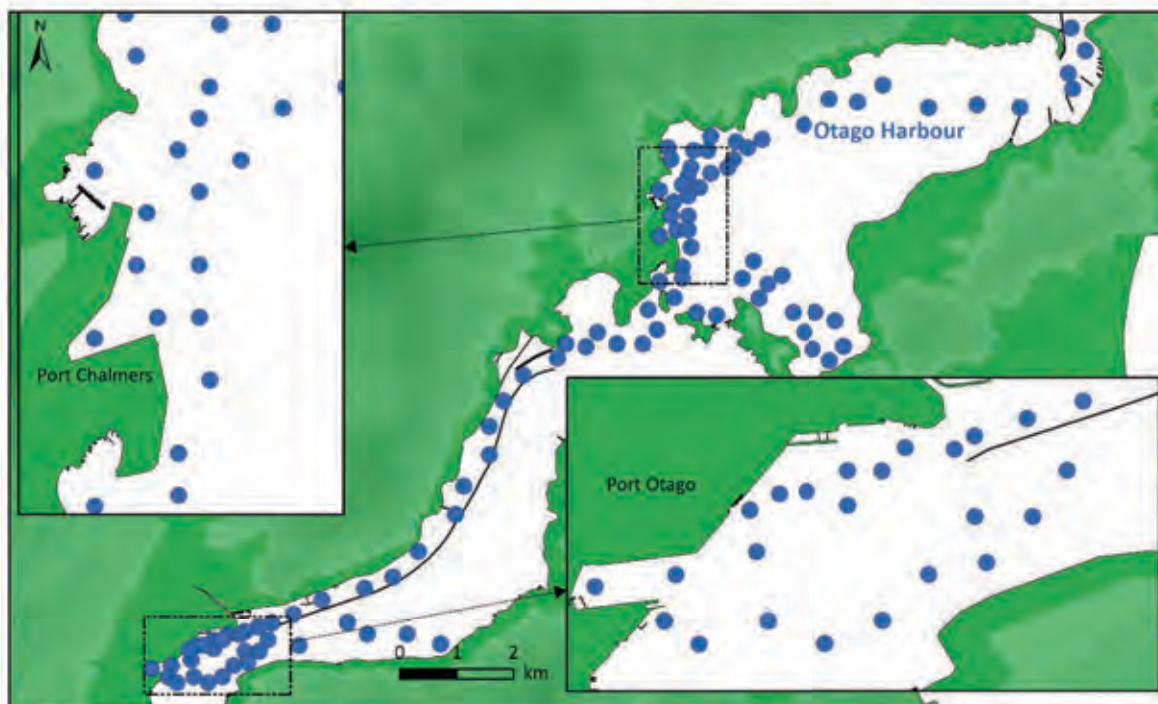
Ōpua Marina and Waikare Inlet

Summer 2023-24

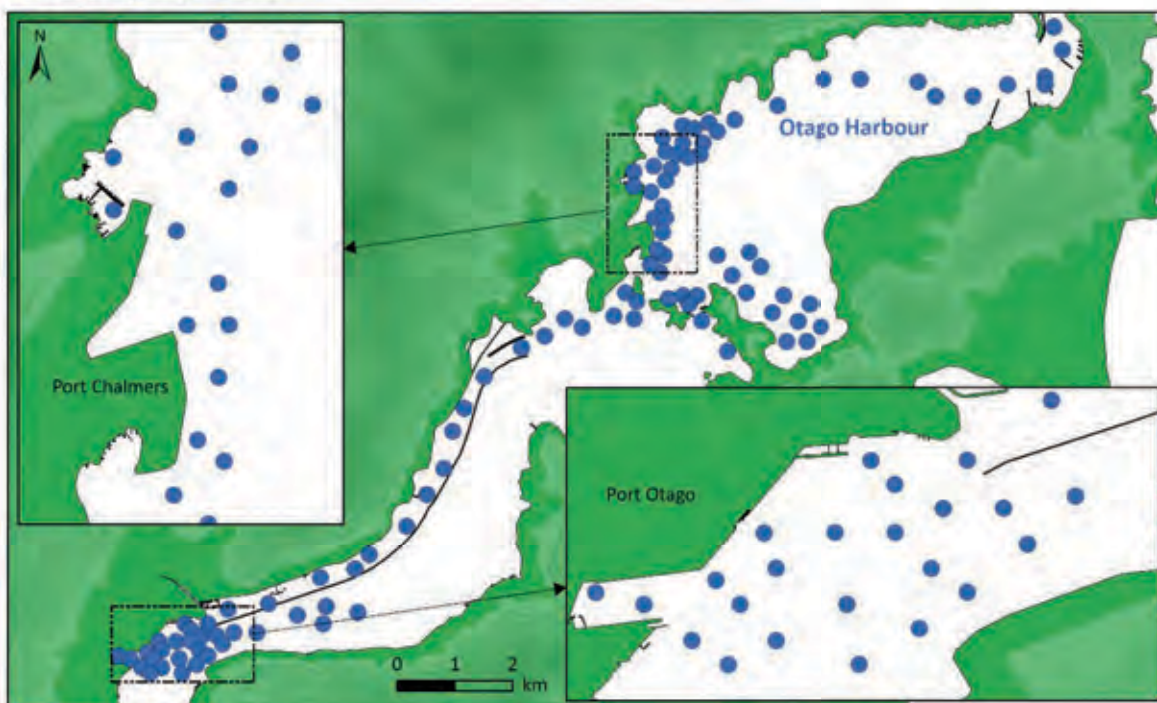
Shore search (WRACK) locations



Otago Harbour
 Winter 2023
 Benthic sled (BSLD) locations



Otago Harbour
 Summer 2023-24
 Benthic sled (BSLD) locations



Otago Harbour
 Winter 2023
 Crab condo (CONDO) locations



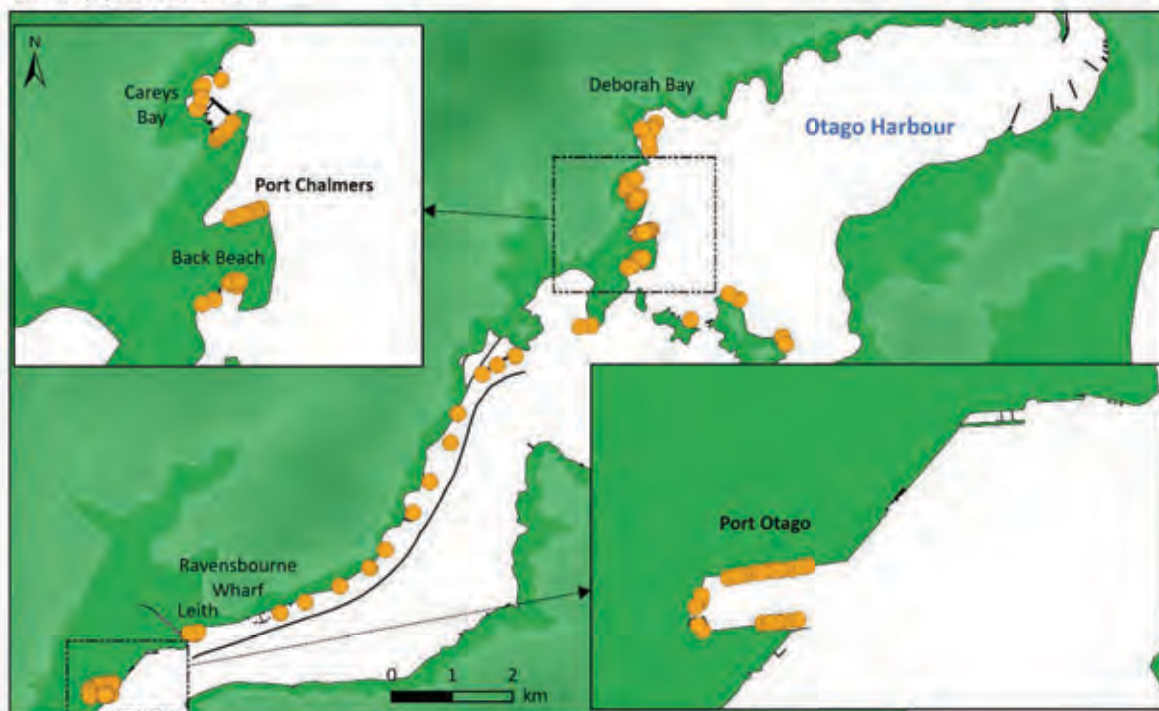
Otago Harbour
 Summer 2023-24
 Crab condo (CONDO) locations



Otago Harbour

Winter 2023

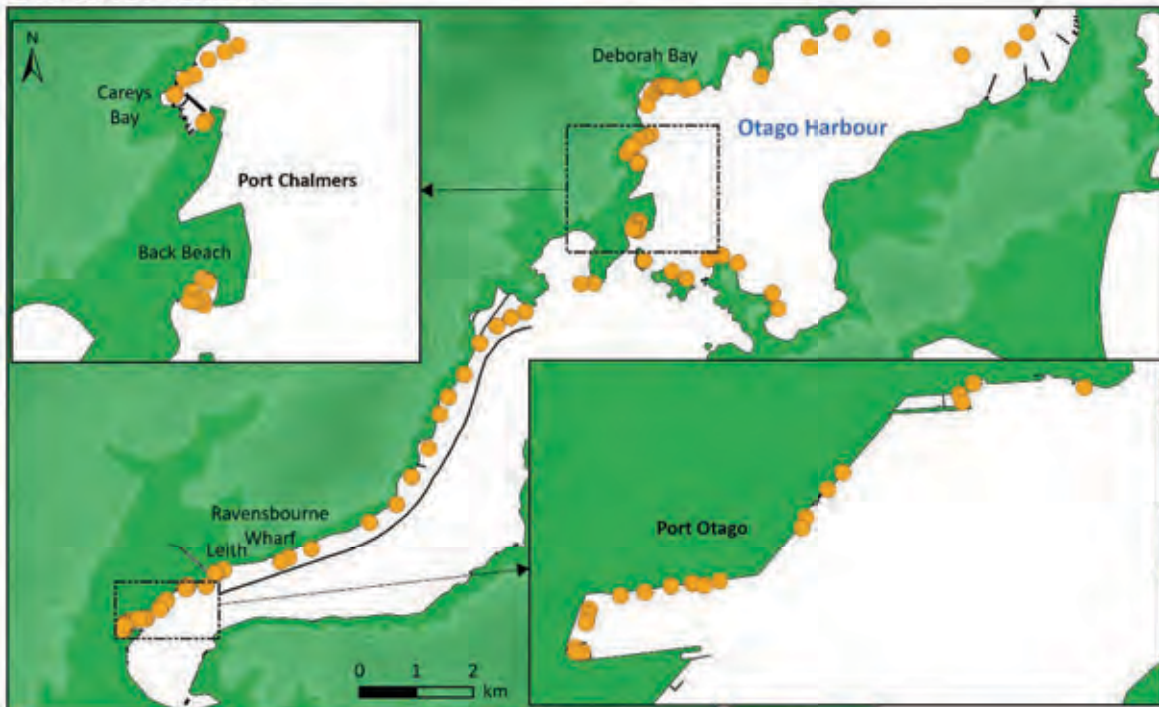
Crab trap (CRBTP) locations



Otago Harbour

Summer 2023-24

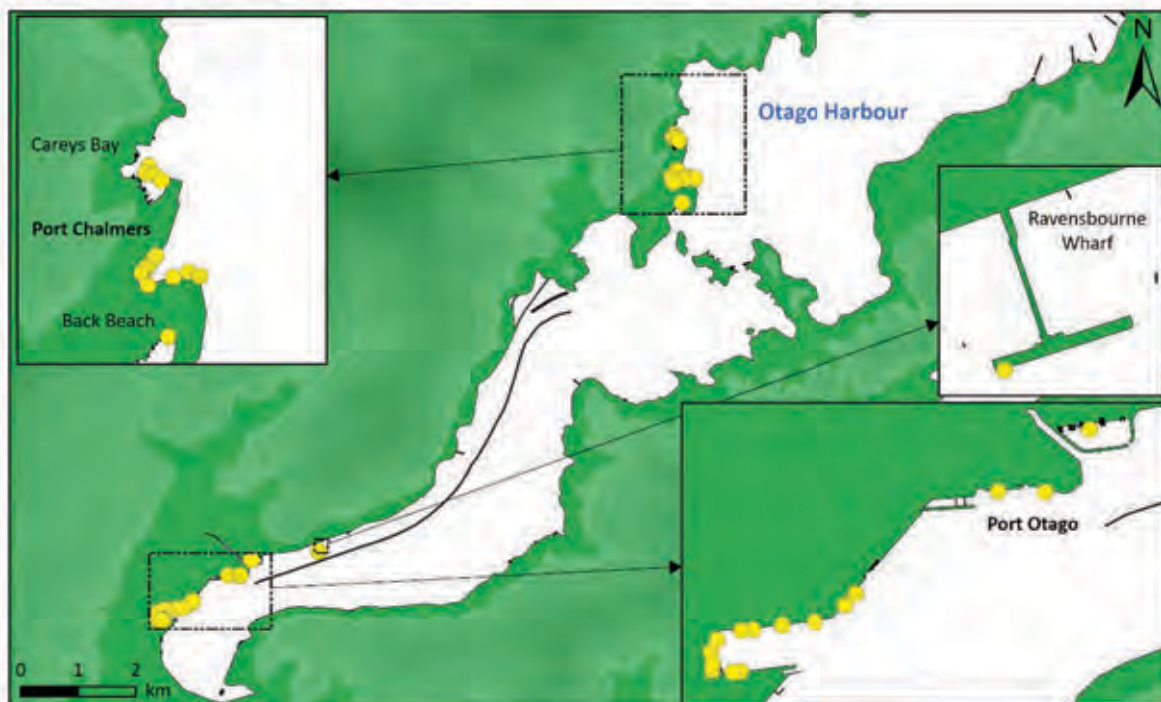
Crab trap (CRBTP) locations



Otago Harbour

Winter 2023

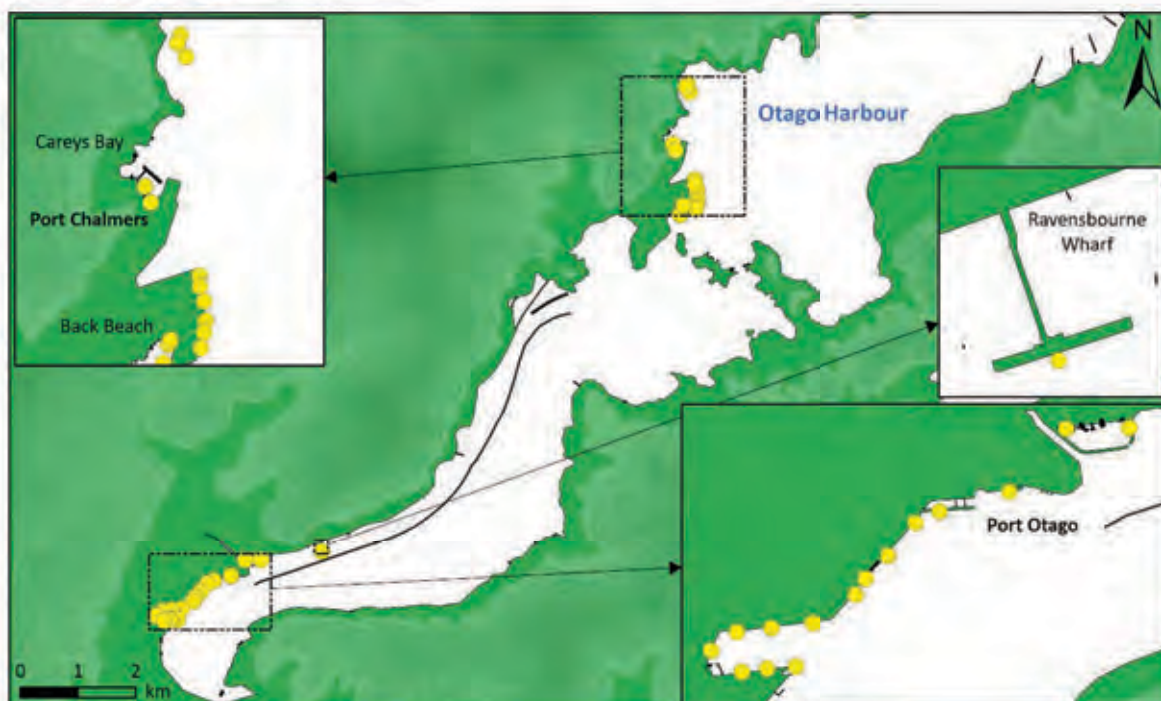
Diver search (VISD) locations



Otago Harbour

Summer 2023-24

Diver search (VISD) locations



Otago Harbour

Winter 2023

Shore search (WRACK) locations



Otago Harbour

Summer 2023-24

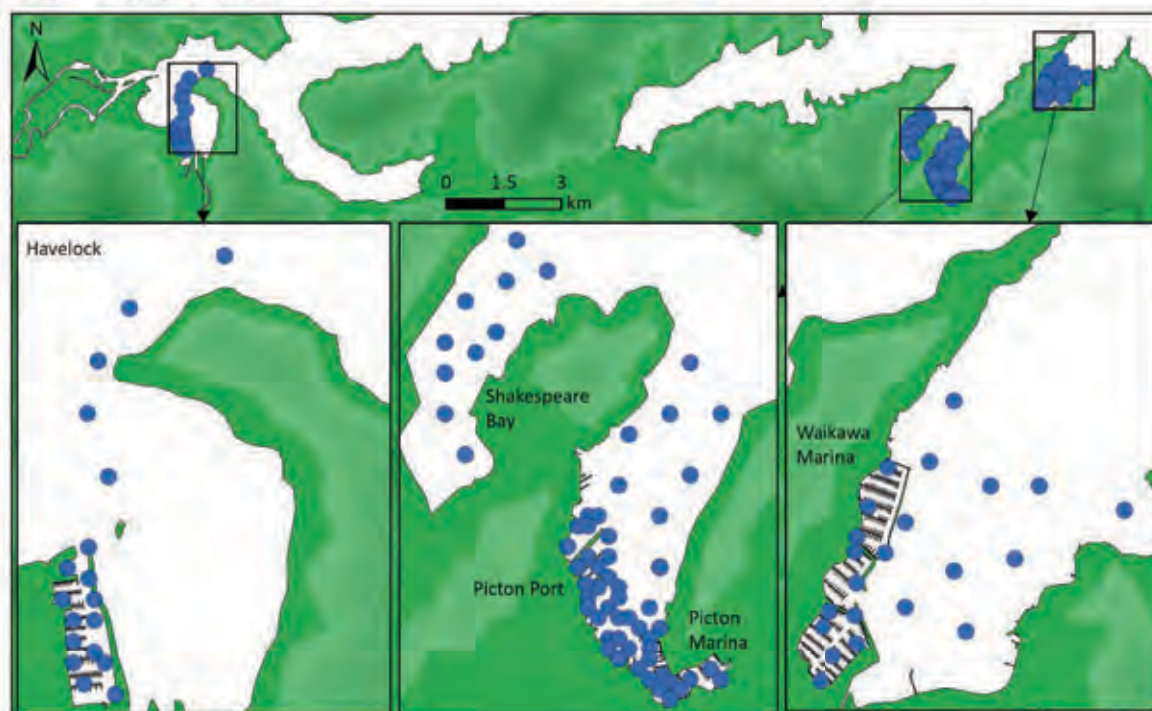
Shore search (WRACK) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Winter 2023

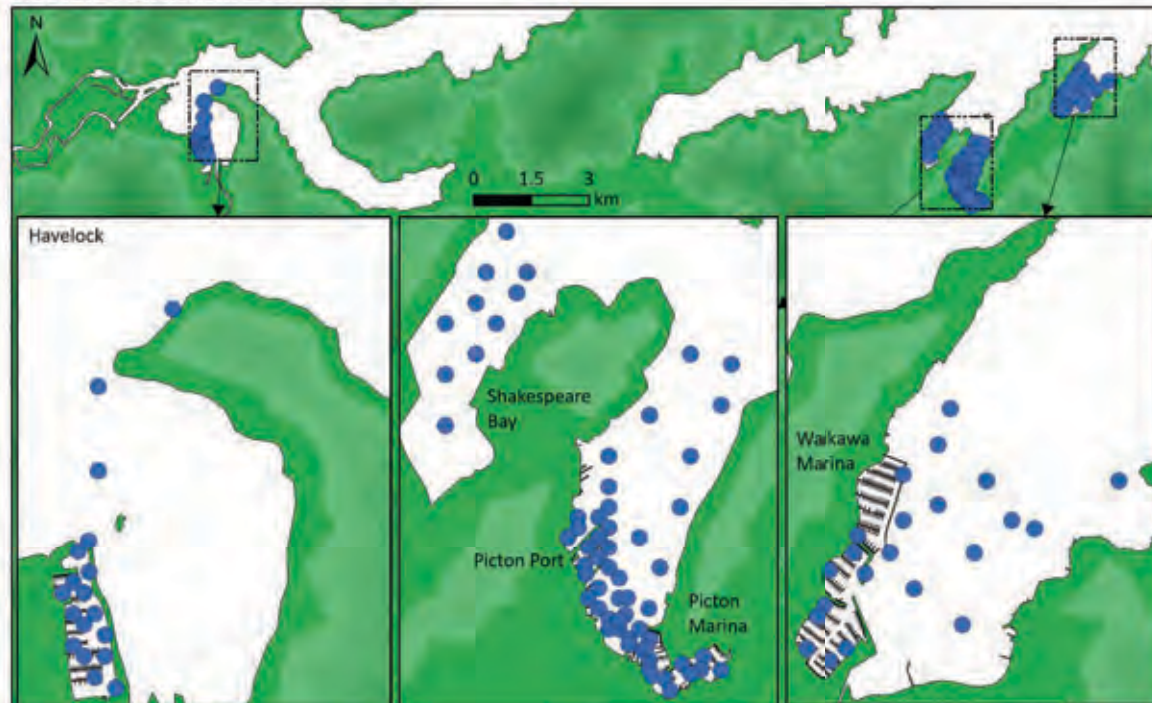
Benthic sled (BSLD) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Summer 2023-24

Benthic sled (BSLD) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Winter 2023

Crab condo (CONDO) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Summer 2023-24

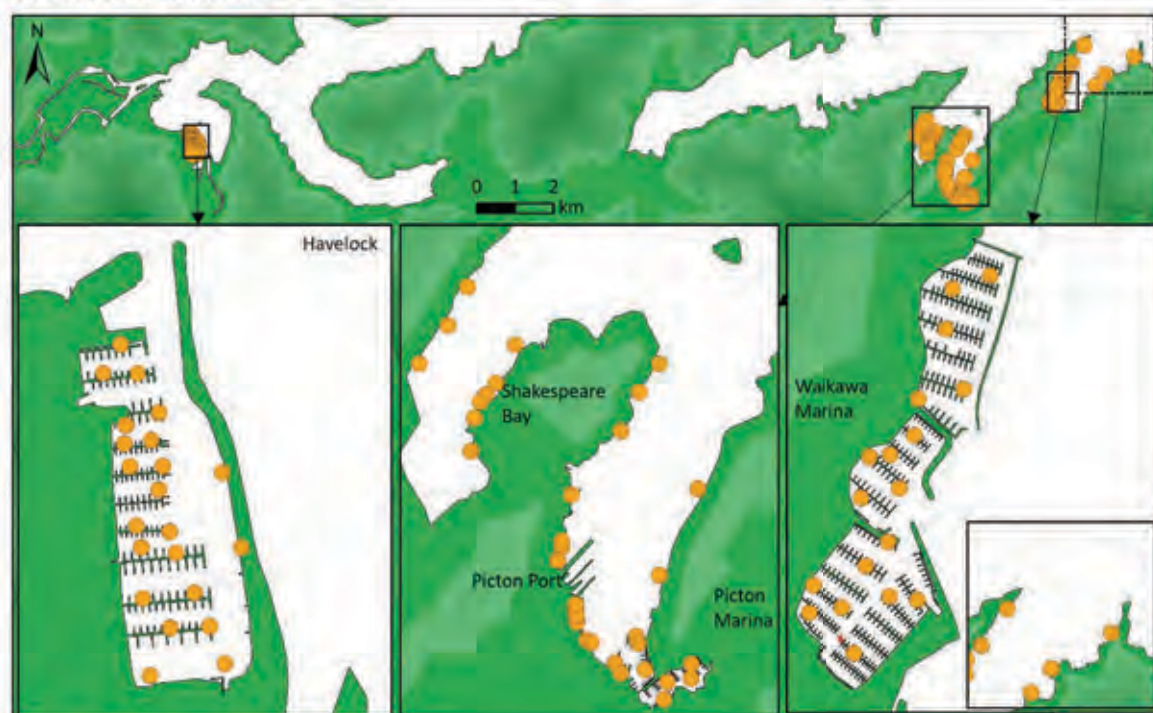
Crab condo (CONDO) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Winter 2023

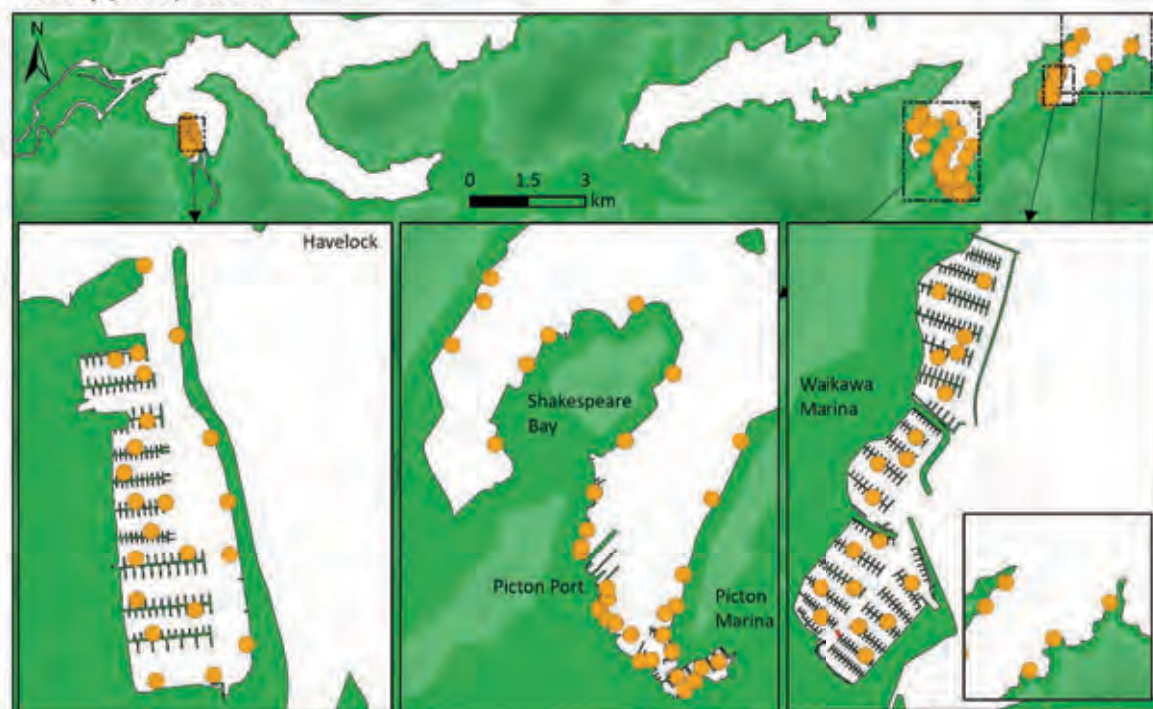
Crab trap (CRBTP) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Summer 2023-24

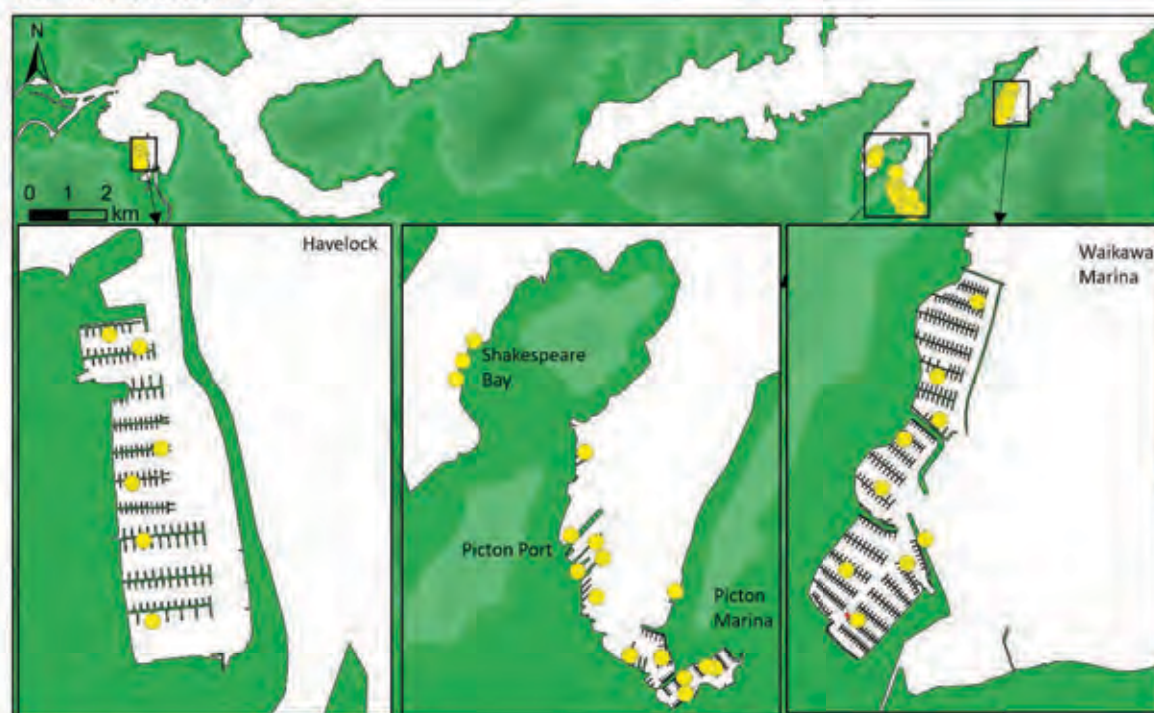
Crab trap (CRBTP) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Winter 2023

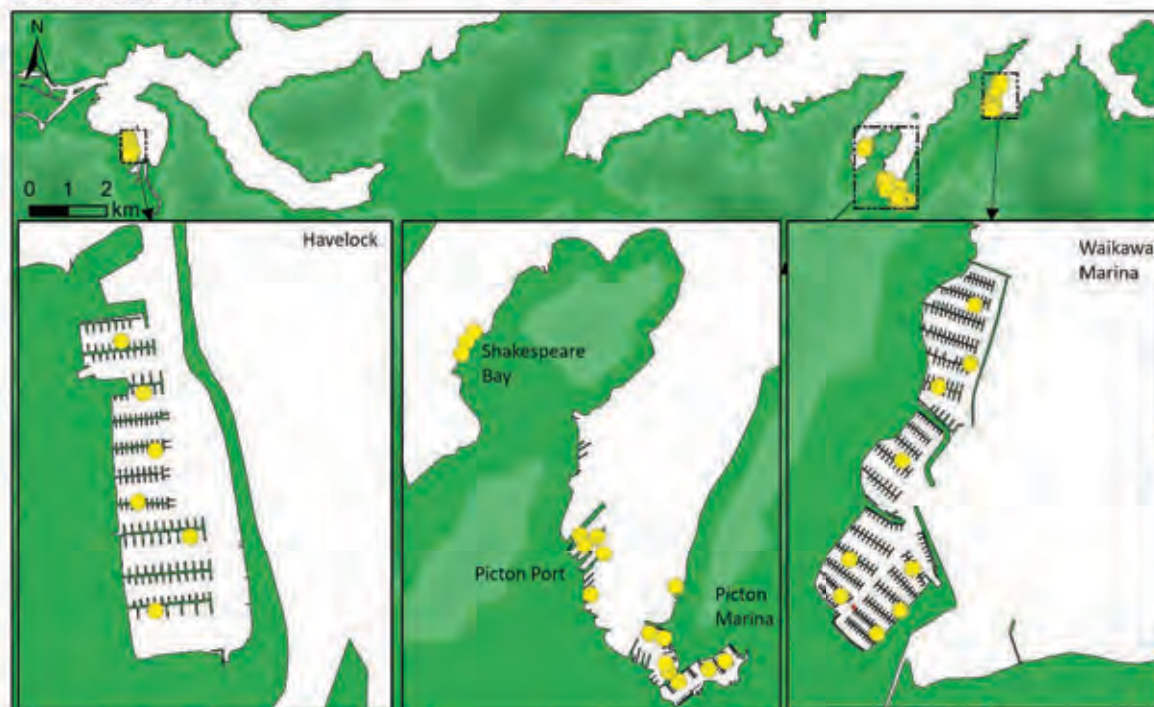
Diver search (VISD) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Summer 2023-24

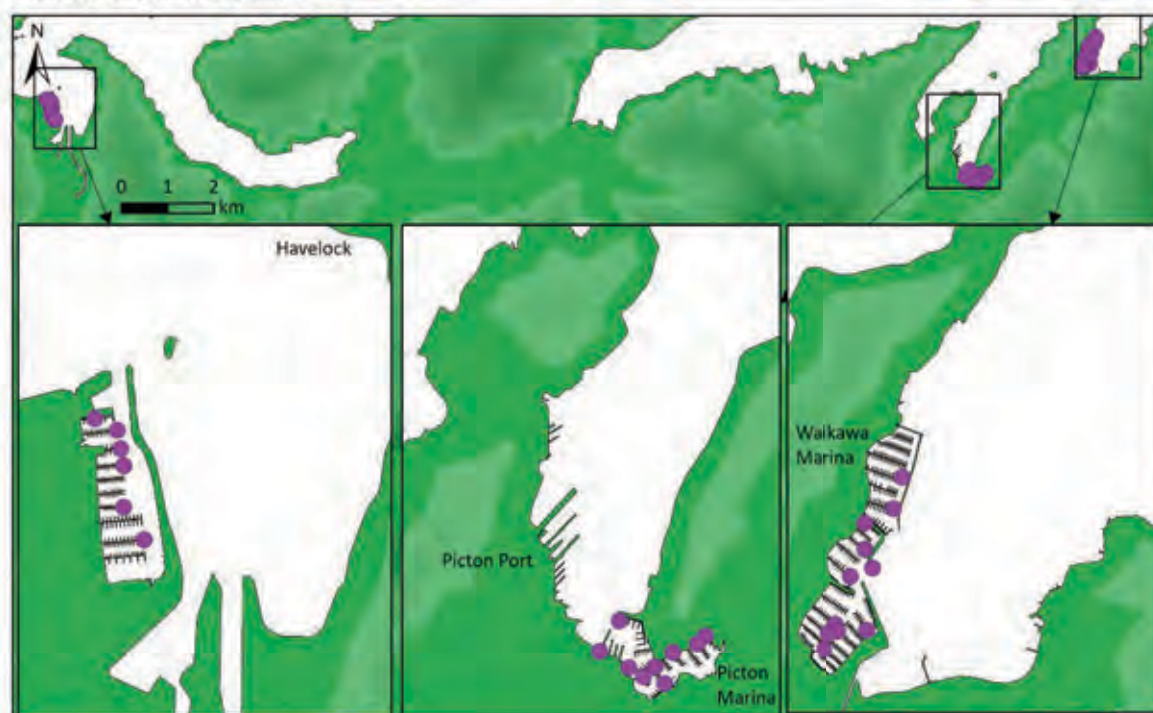
Diver search (VISD) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Winter 2023

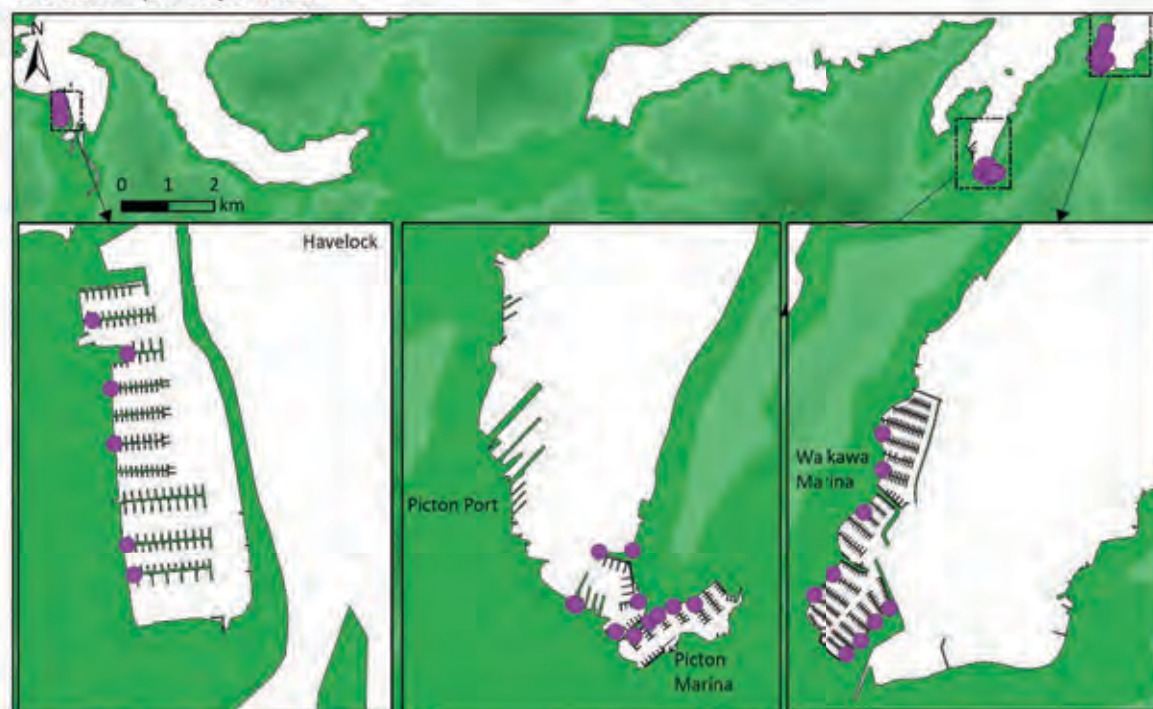
Shore search (WRACK) locations



Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina

Summer 2023-24

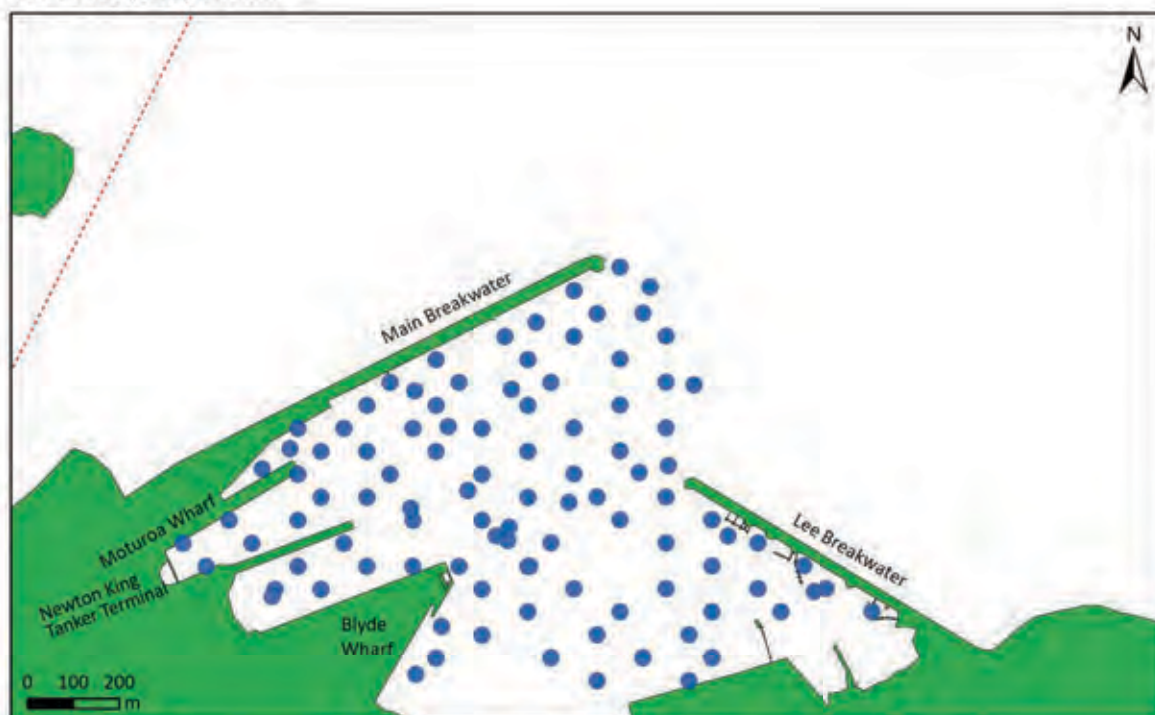
Shore search (WRACK) locations



Port Taranaki

Winter 2023

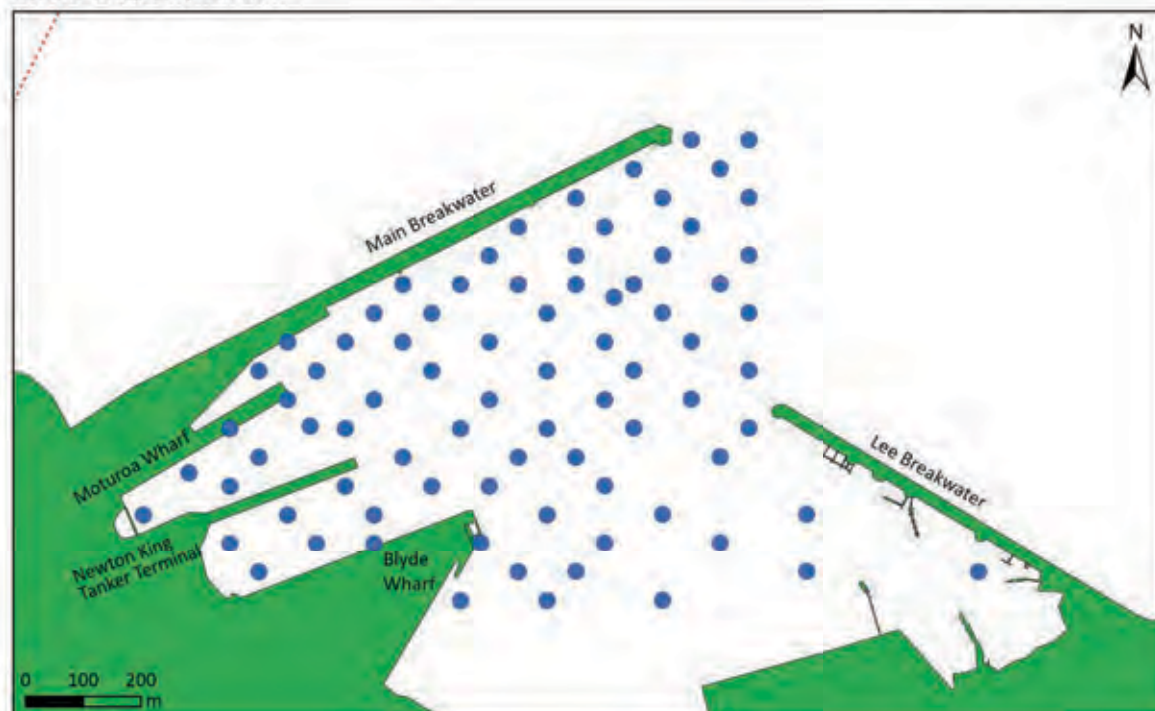
Benthic sled (BSLD) locations



Port Taranaki

Summer 2023-24

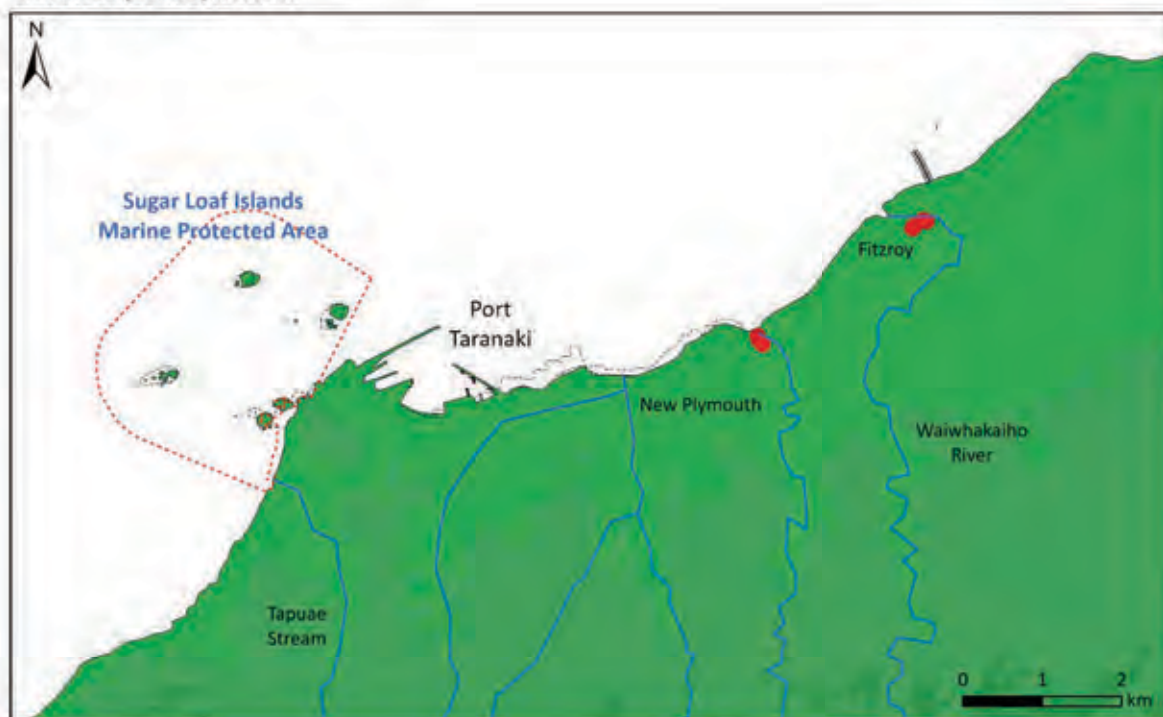
Benthic sled (BSLD) locations



Port Taranaki

Winter 2023

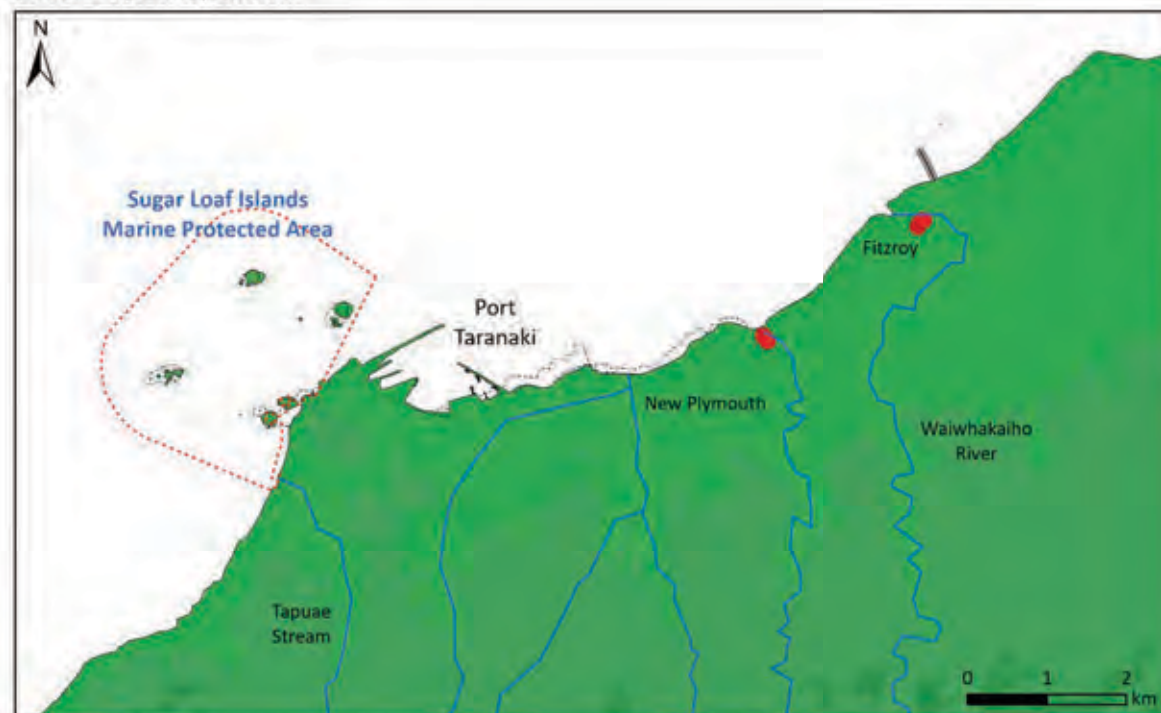
Crab condo (CONDO) locations



Port Taranaki

Summer 2023-24

Crab condo (CONDO) locations



Port Taranaki

Winter 2023

Crab trap (CRBTP) locations



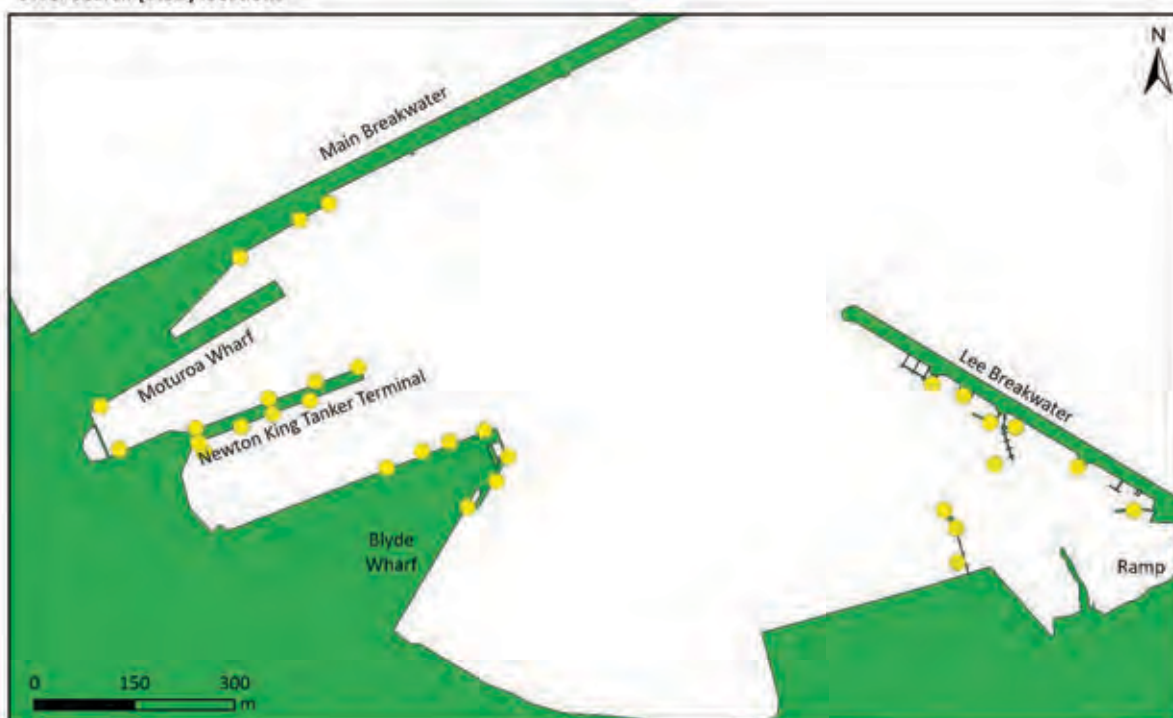
Port Taranaki

Summer 2023-24

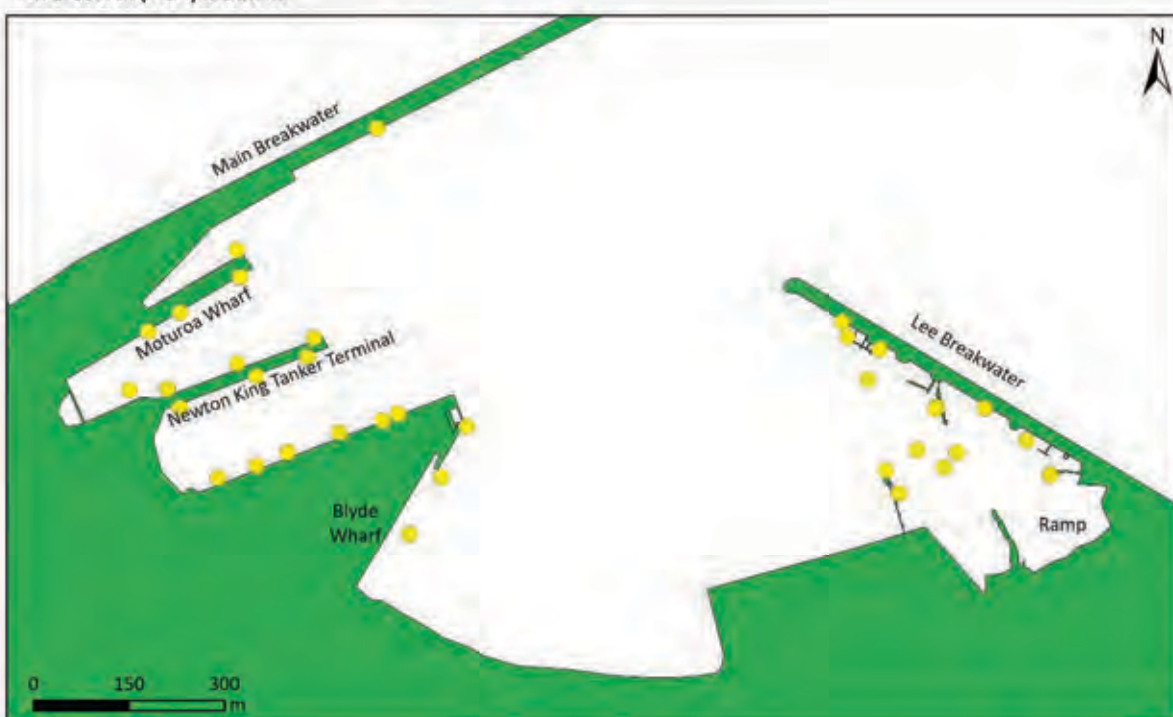
Crab trap (CRBTP) locations



Port Taranaki
 Winter 2023
 Diver search (VISD) locations



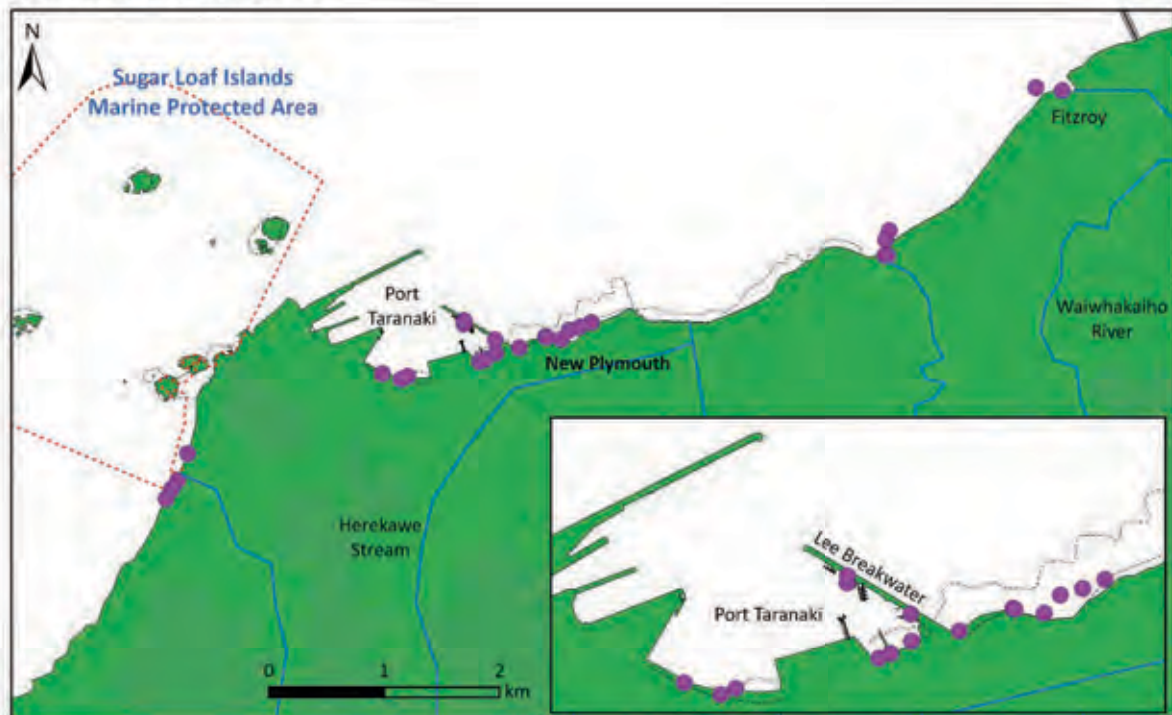
Port Taranaki
 Summer 2023-24
 Diver search (VISD) locations



Port Taranaki

Winter 2023

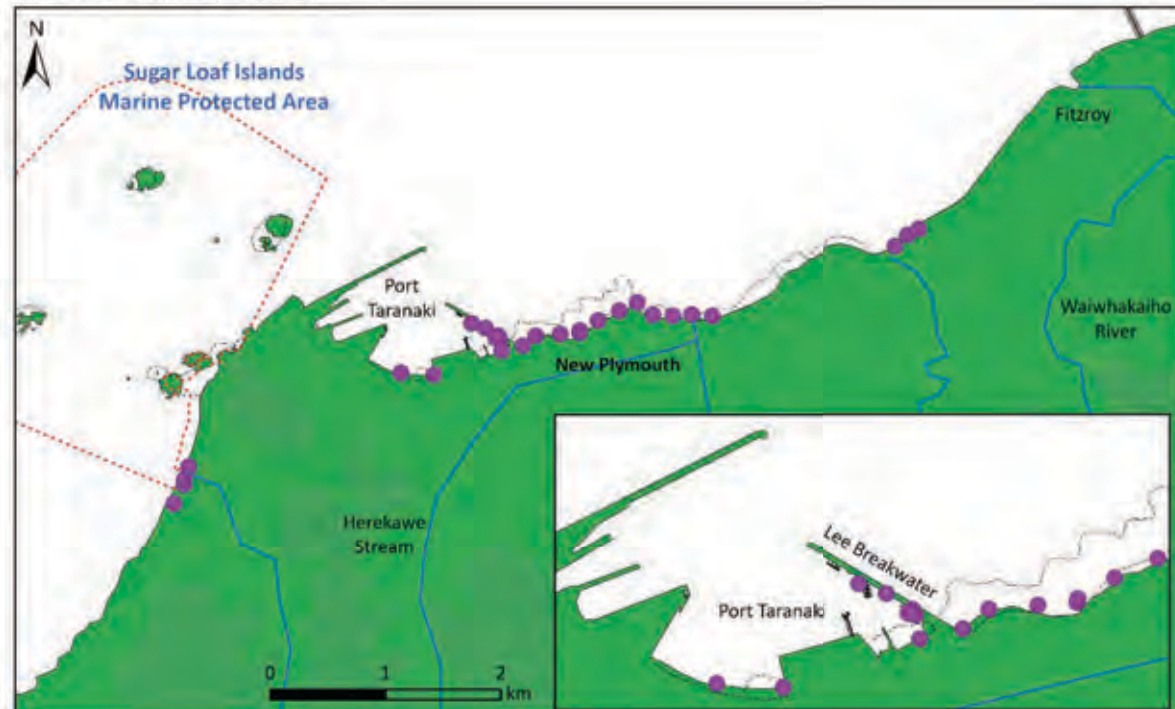
Shore search (WRACK) locations



Port Taranaki

Summer 2023-24

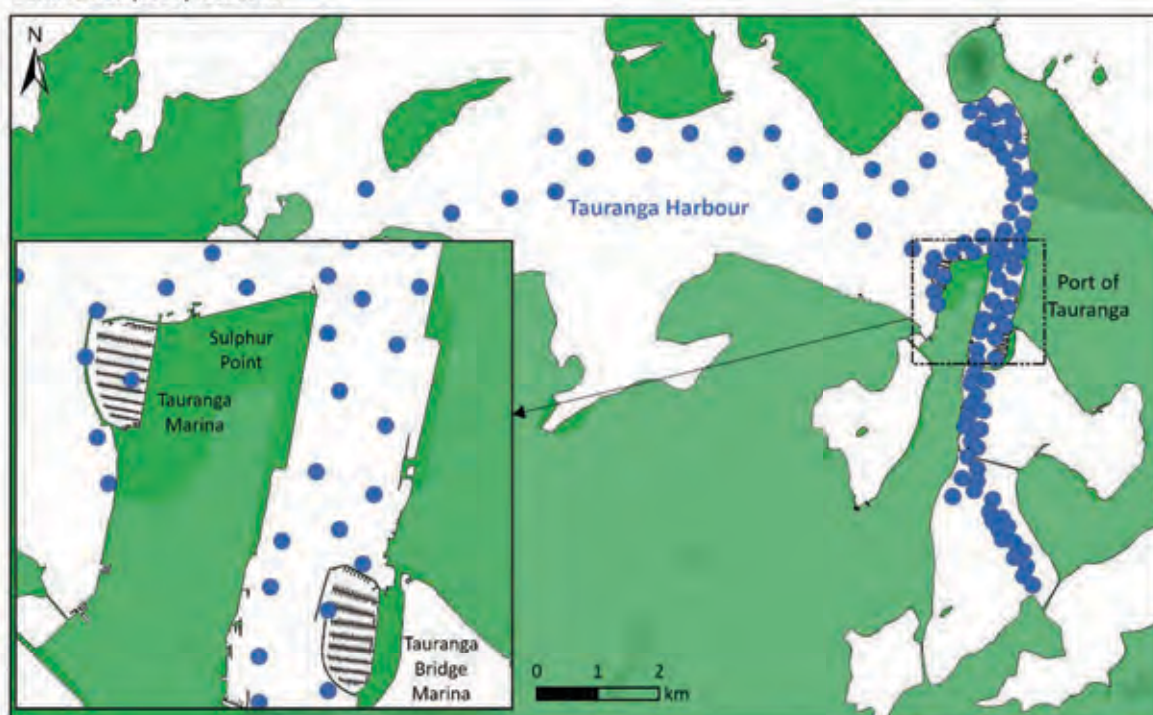
Shore search (WRACK) locations



Tauranga Harbour

Winter 2023

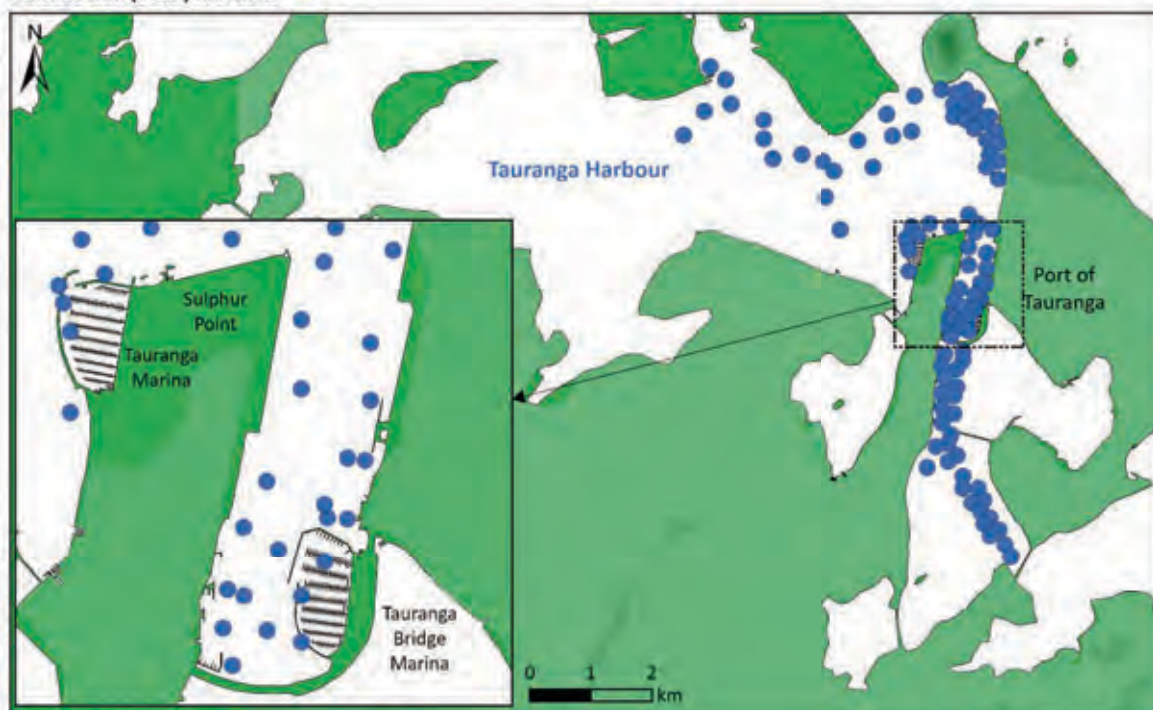
Benthic sled (BSLD) locations



Tauranga Harbour

Summer 2023-24

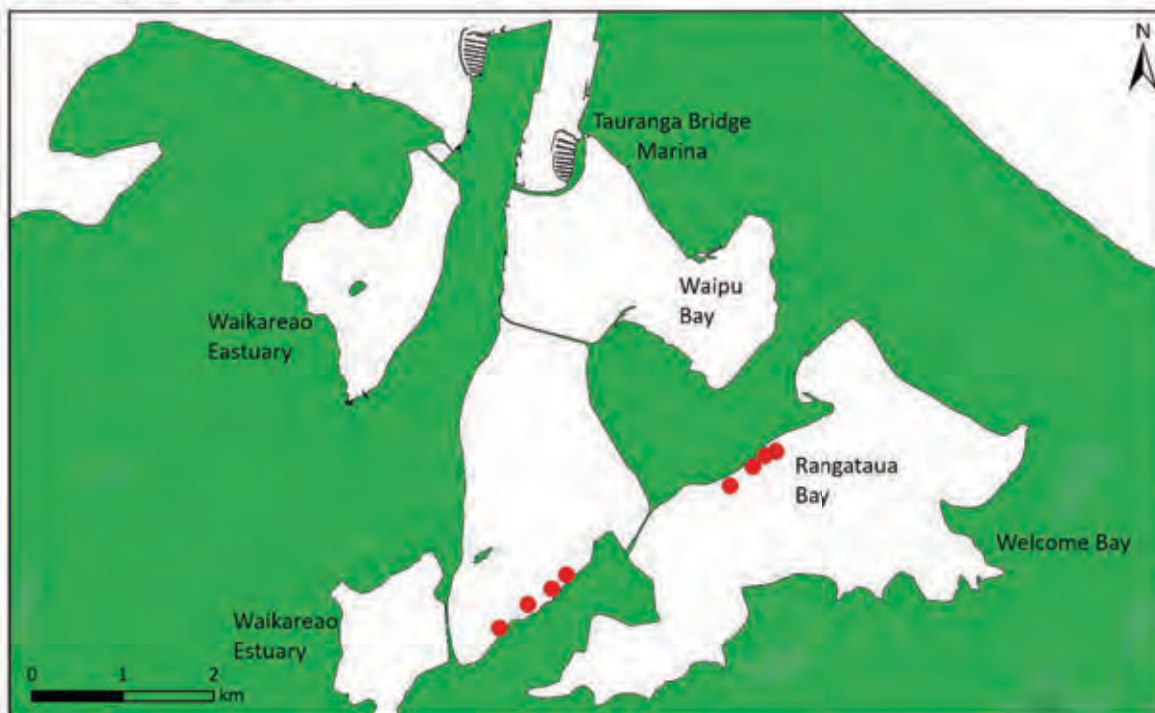
Benthic sled (BSLD) locations



Tauranga Harbour

Winter 2023

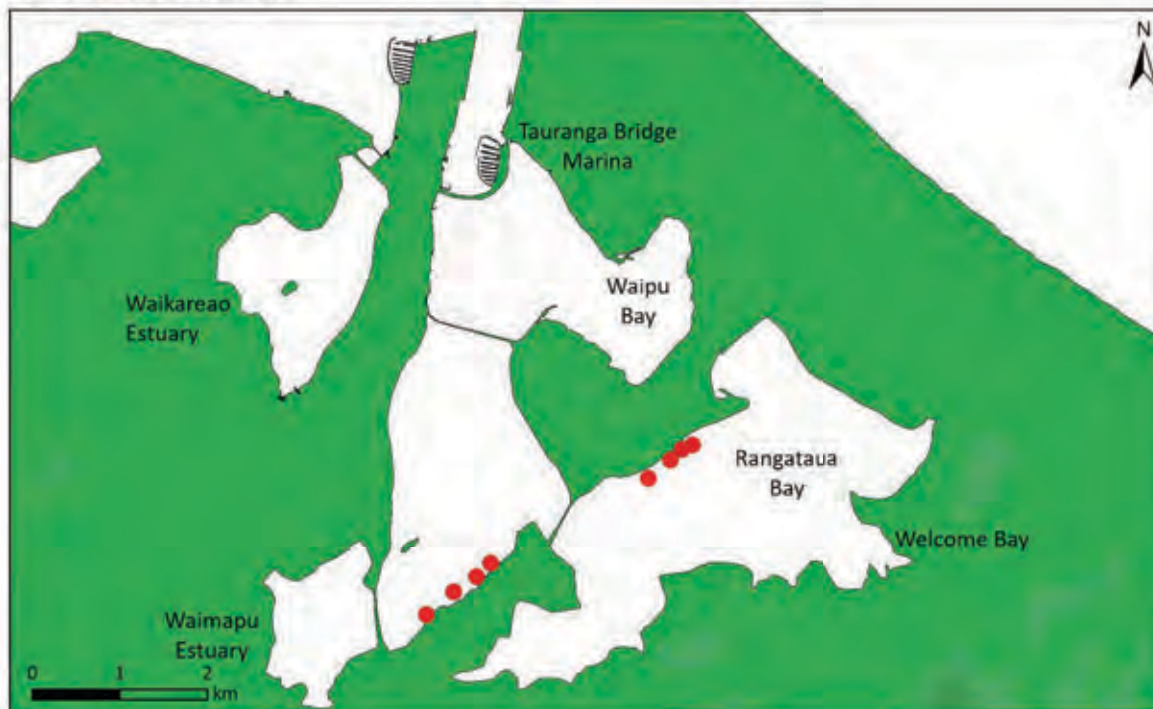
Crab condo (CONDO) locations



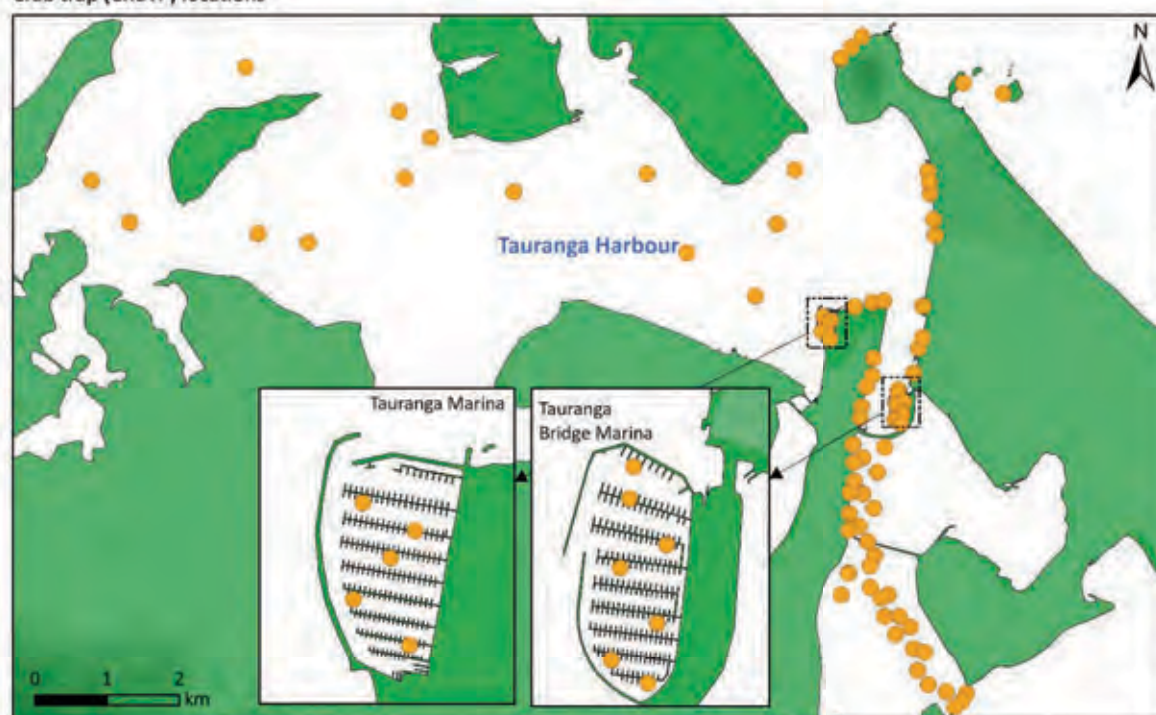
Tauranga Harbour

Summer 2023-24

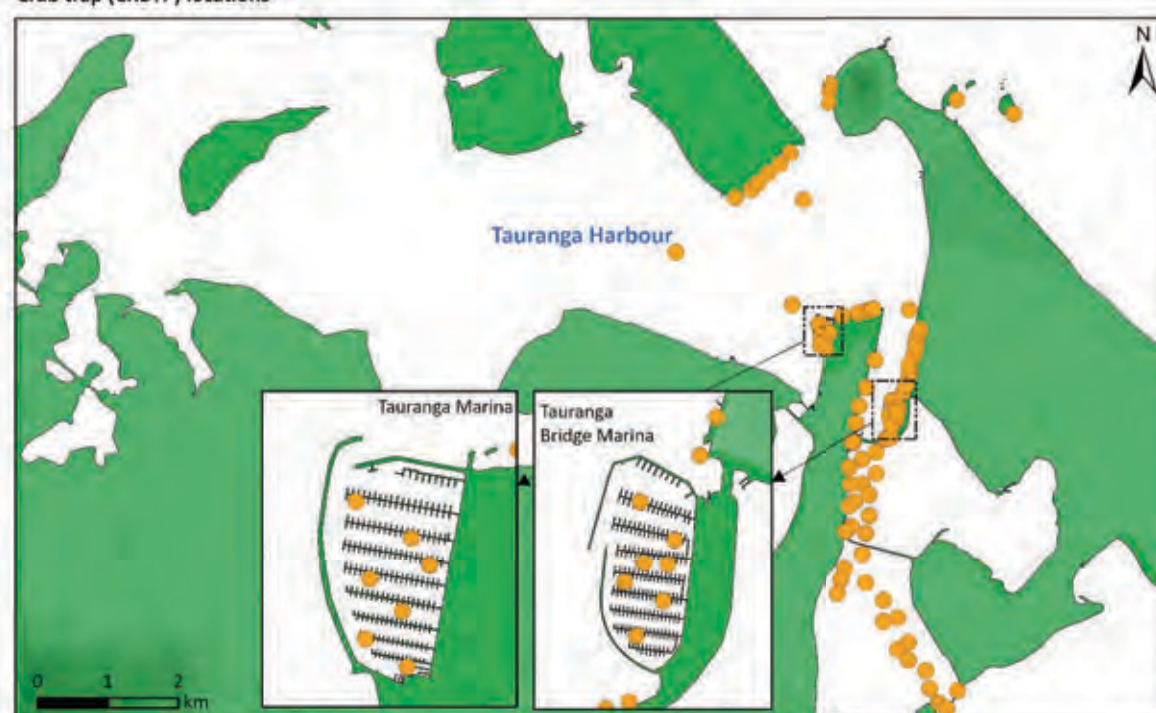
Crab condo (CONDO) locations



Tauranga Harbour
 Winter 2023
 Crab trap (CRBTP) locations



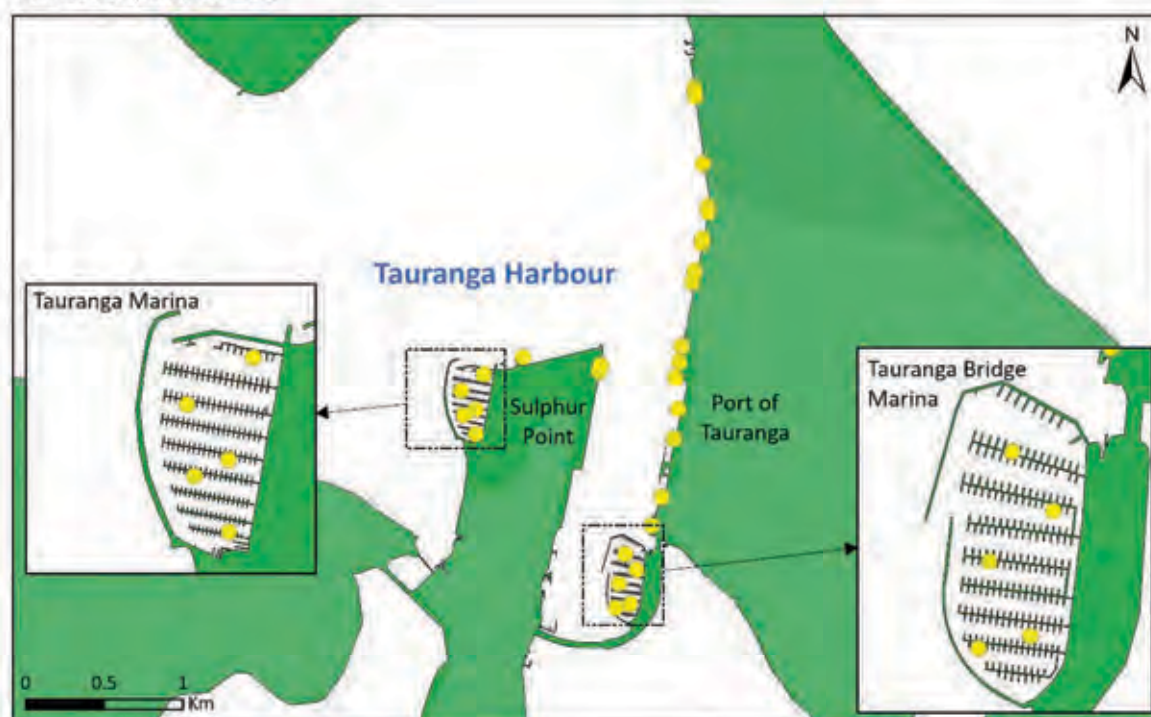
Tauranga Harbour
 Summer 2023-24
 Crab trap (CRBTP) locations



Tauranga Harbour

Winter 2023

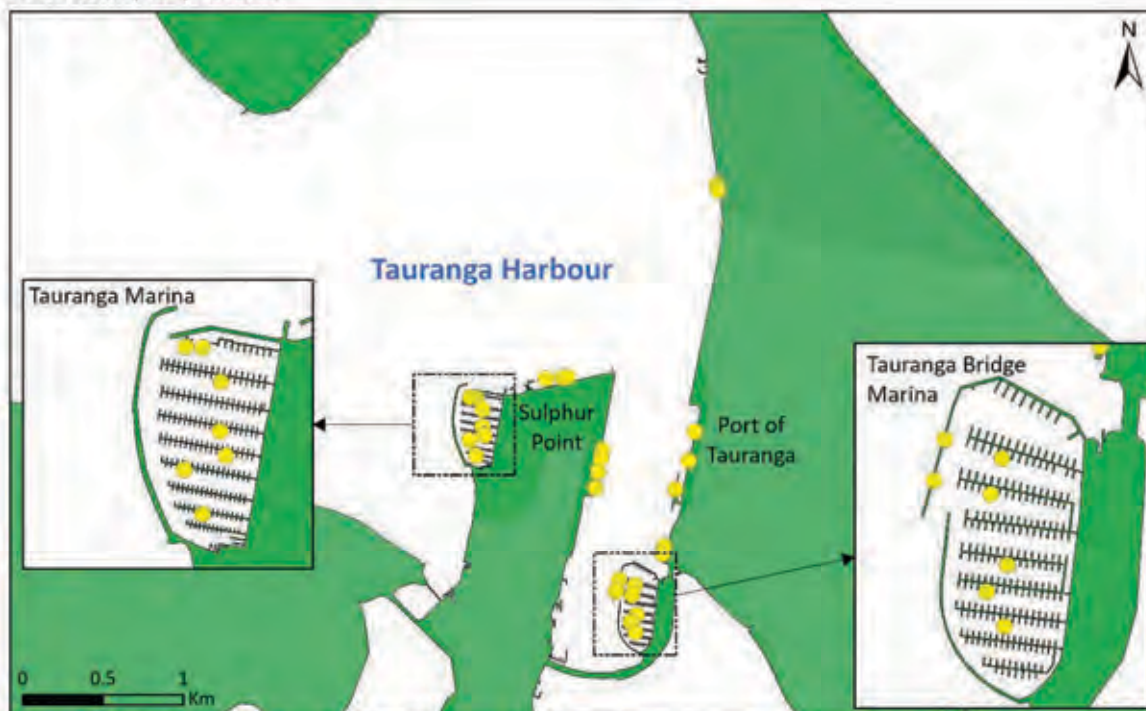
Diver search (VISD) locations



Tauranga Harbour

Summer 2023-24

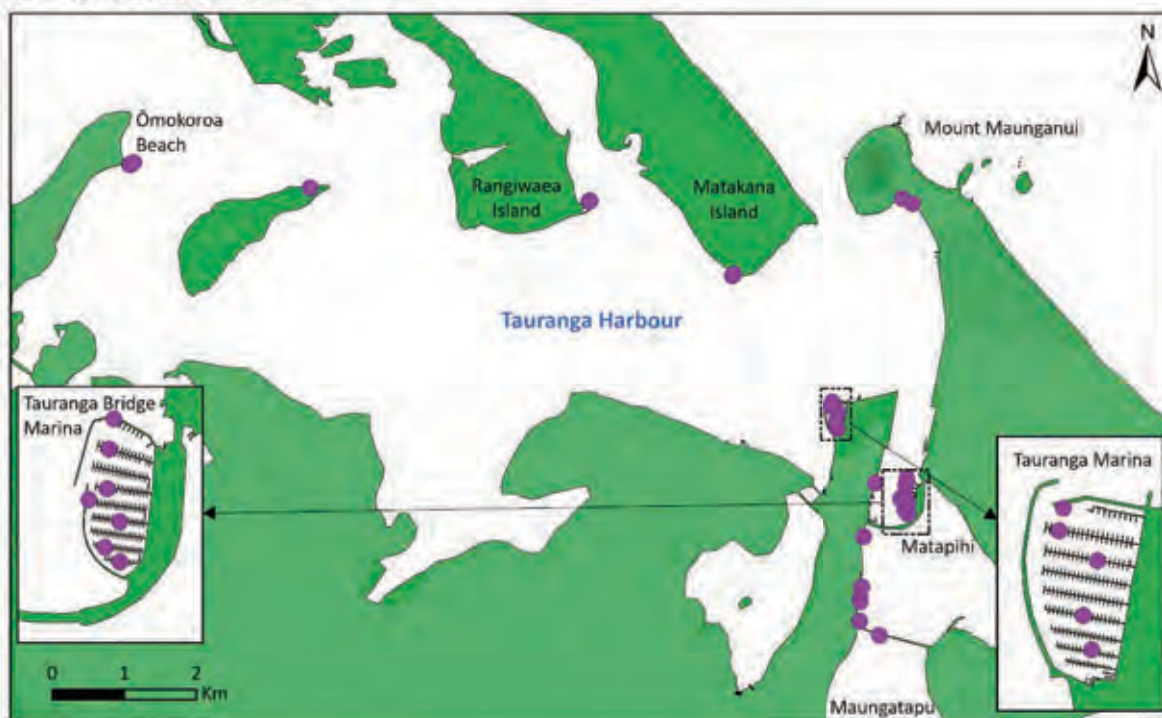
Diver search (VISD) locations



Tauranga Harbour

Winter 2023

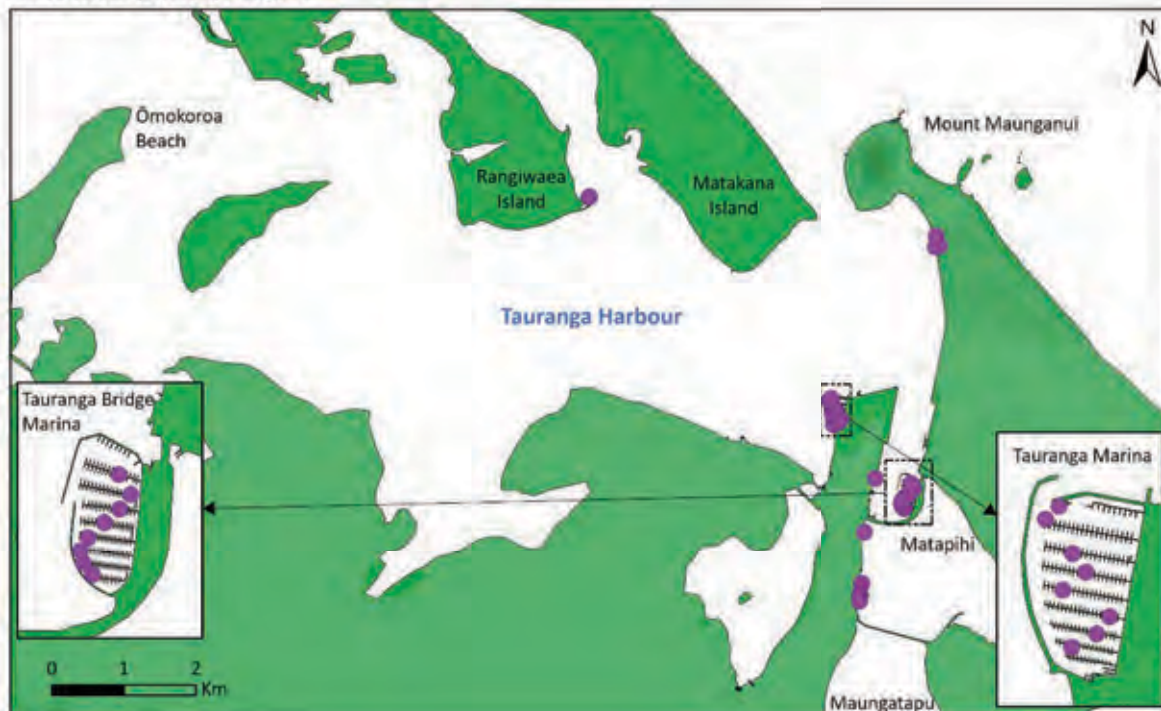
Shore search (WRACK) locations



Tauranga Harbour

Summer 2023-24

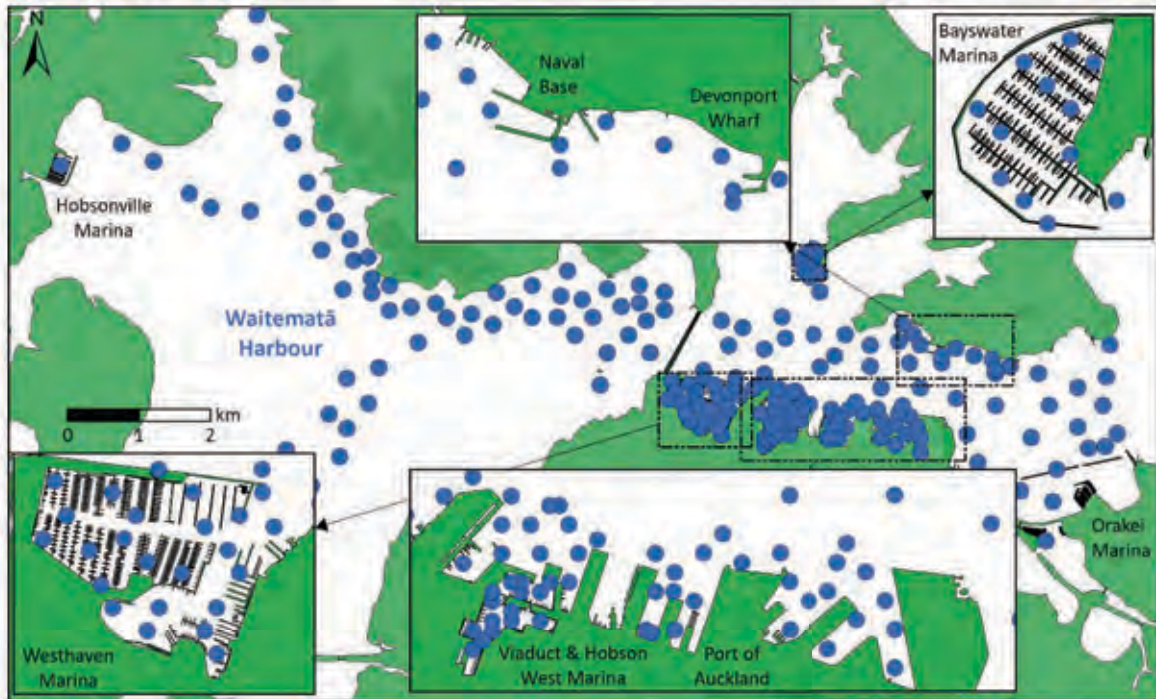
Shore search (WRACK) locations



Waitematā Harbour

Winter 2023

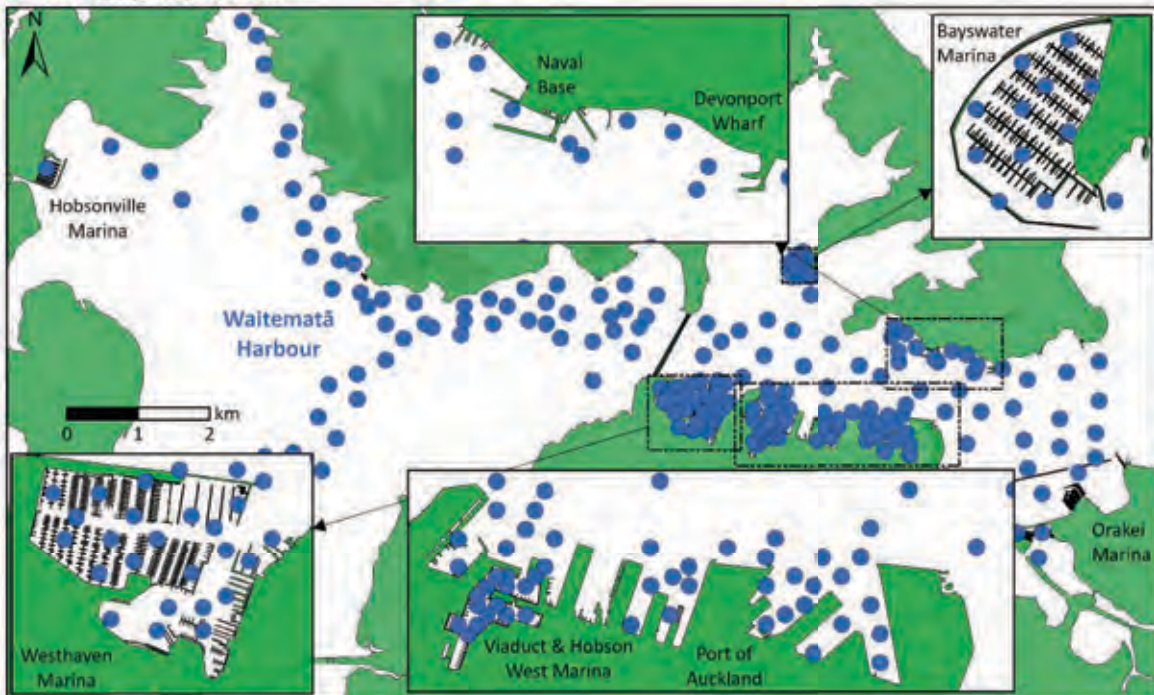
Benthic sled (BSLD) locations



Waitematā Harbour

Summer 2023-24

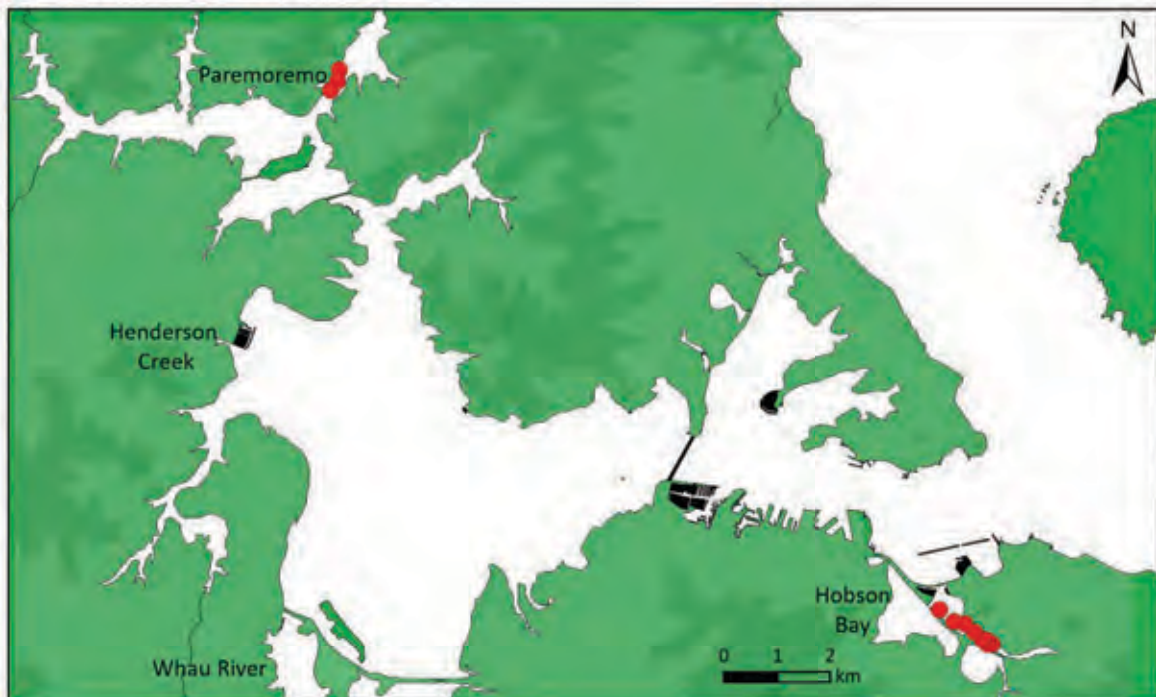
Benthic sled (BSLD) locations



Waitematā Harbour

Winter 2023

Crab condo (CONDO) locations



Waitematā Harbour

Summer 2023-24

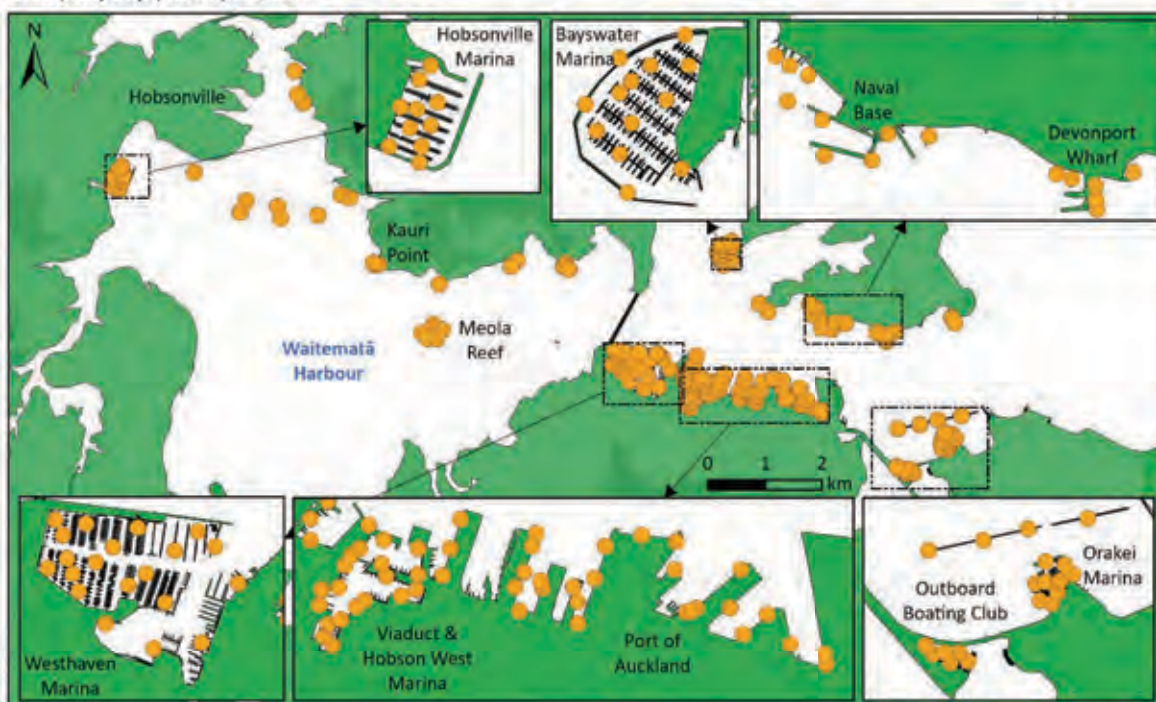
Crab condo (CONDO) locations



Waitematā Harbour

Winter 2023

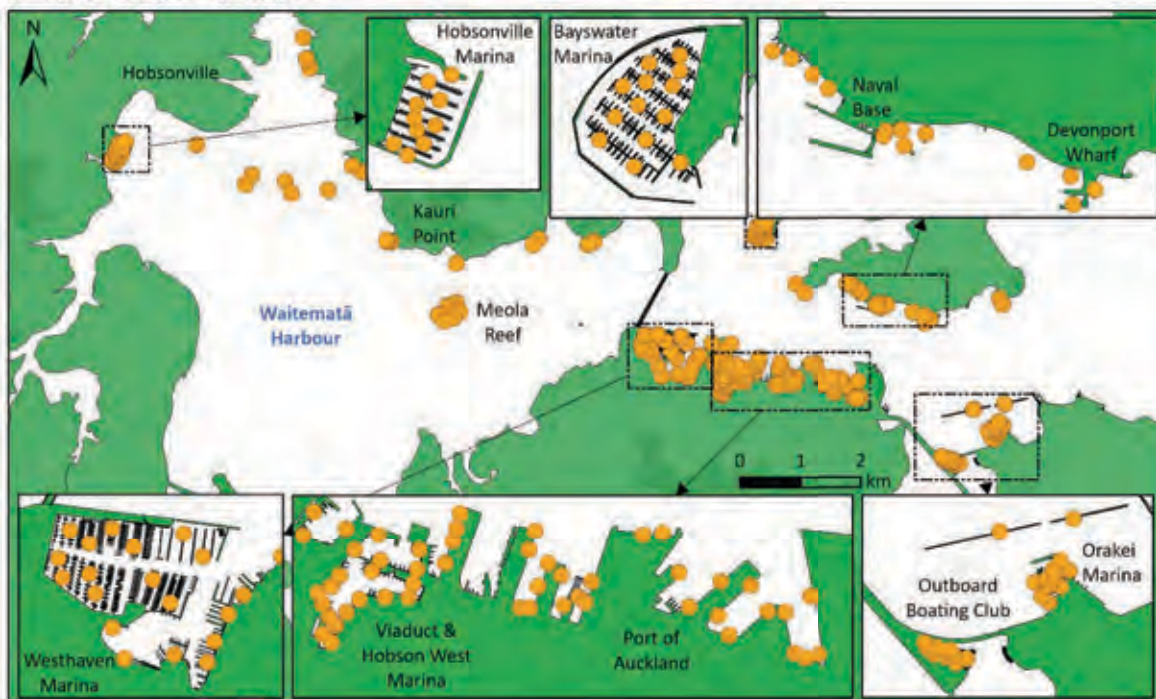
Crab (box) trap (CRBTP) locations



Waitematā Harbour

Summer 2023-24

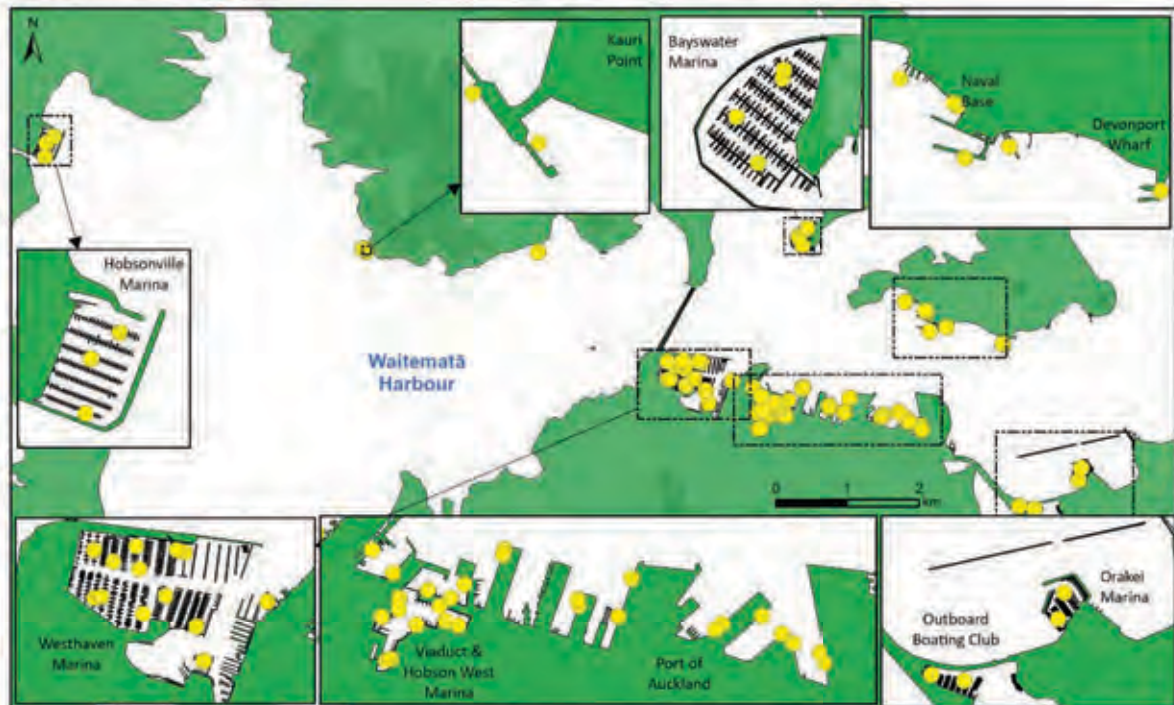
Crab (box) trap (CRBTP) locations



Waitematā Harbour

Winter 2023

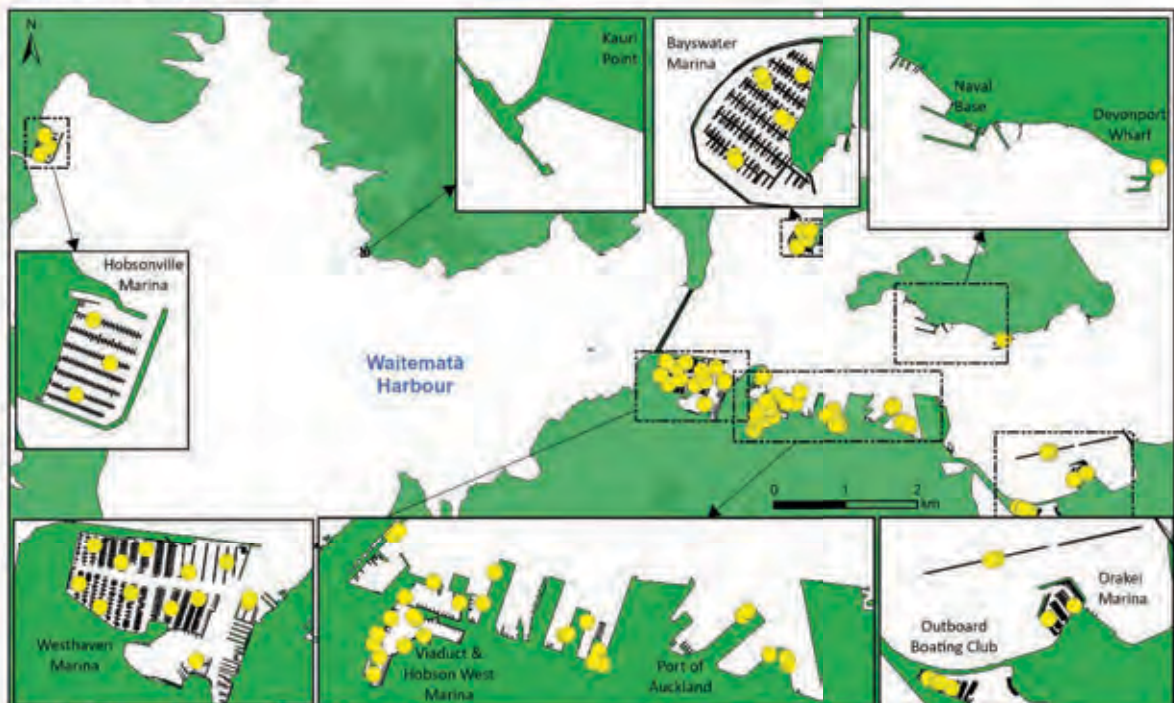
Diver search (VISD) locations



Waitematā Harbour

Summer 2023-24

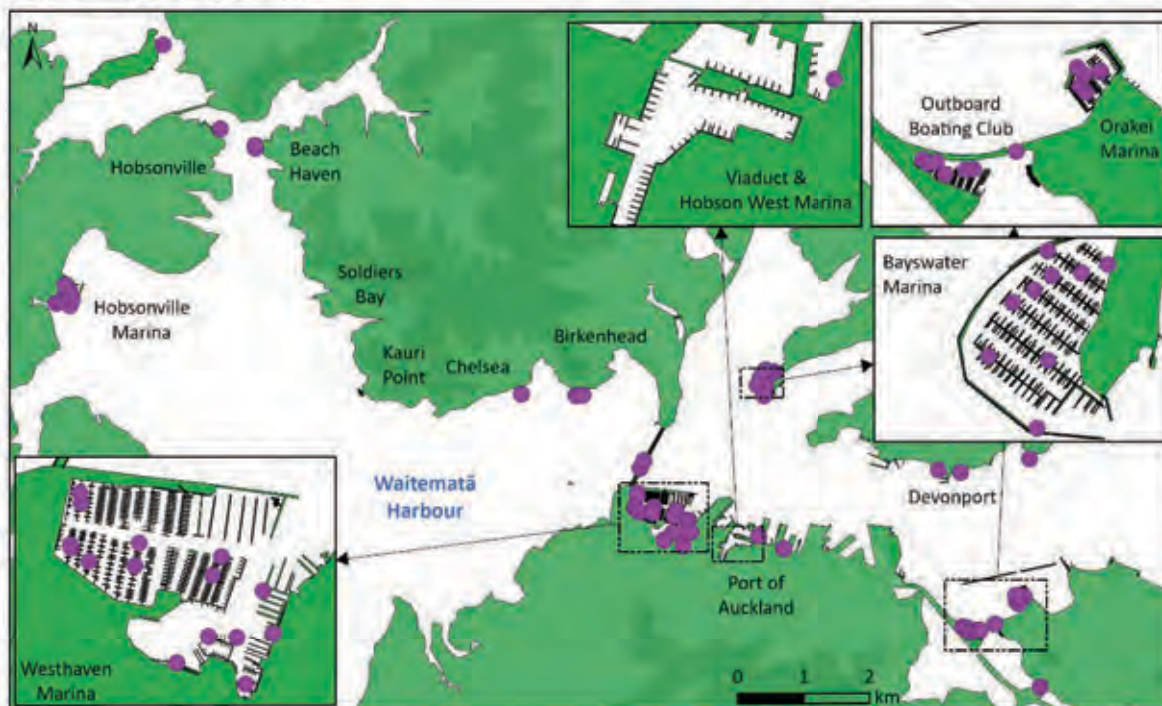
Diver search (VISD) locations



Waitematā Harbour

Winter 2023

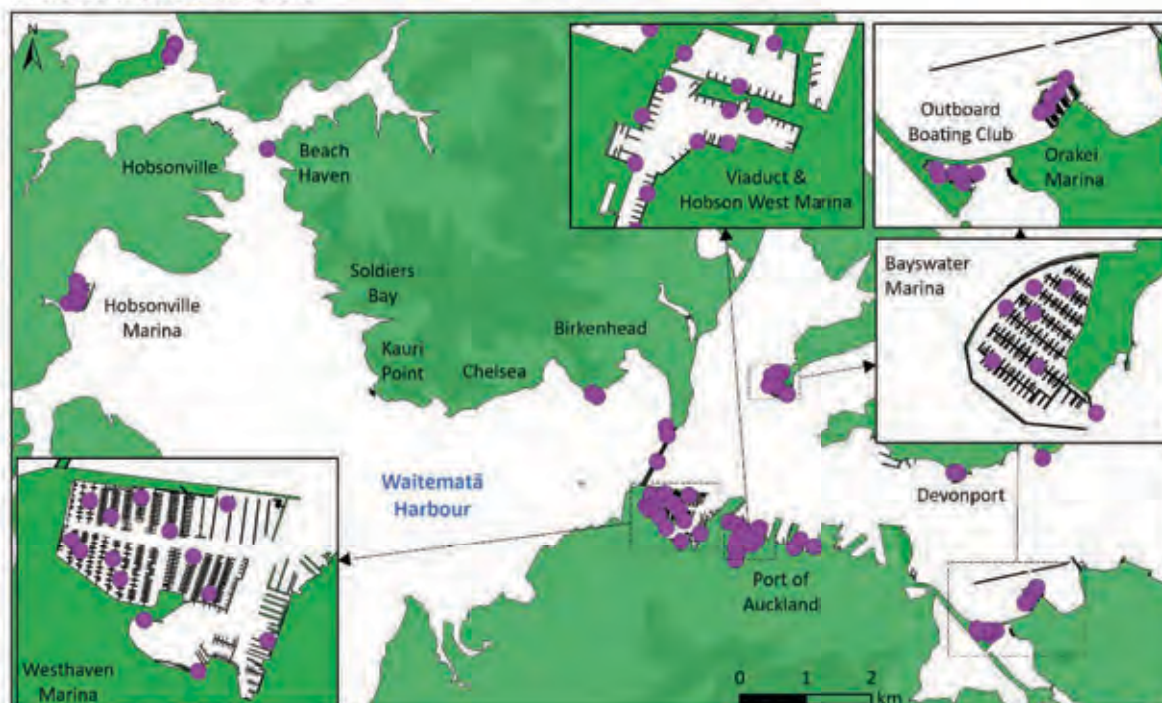
Shore search (WRACK) locations



Waitematā Harbour

Summer 2023-24

Shore search (WRACK) locations



Wellington Harbour
 Winter 2023
 Benthic sled (BSLD) locations



Wellington Harbour
 Summer 2023-24
 Benthic sled (BSLD) locations



Wellington Harbour

Winter 2023

Crab condo (CONDO) locations



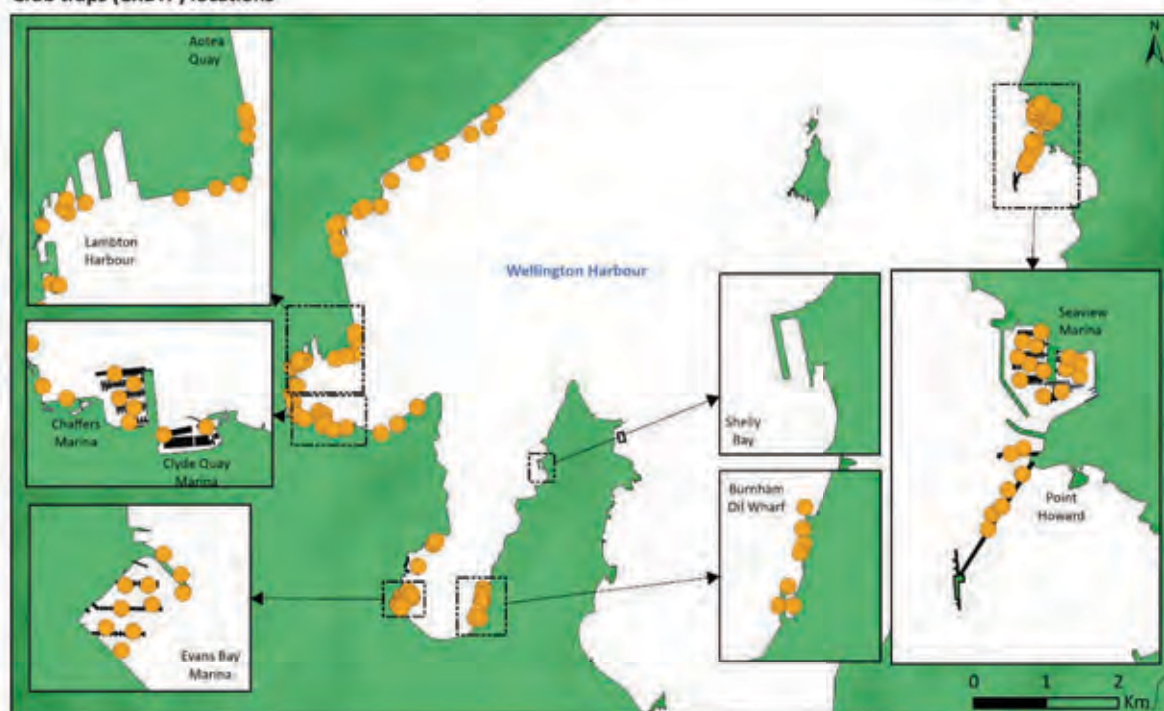
Wellington Harbour

Summer 2023-24

Crab condo (CONDO) locations



Wellington Harbour
 Winter 2023
 Crab traps (CRBTP) locations



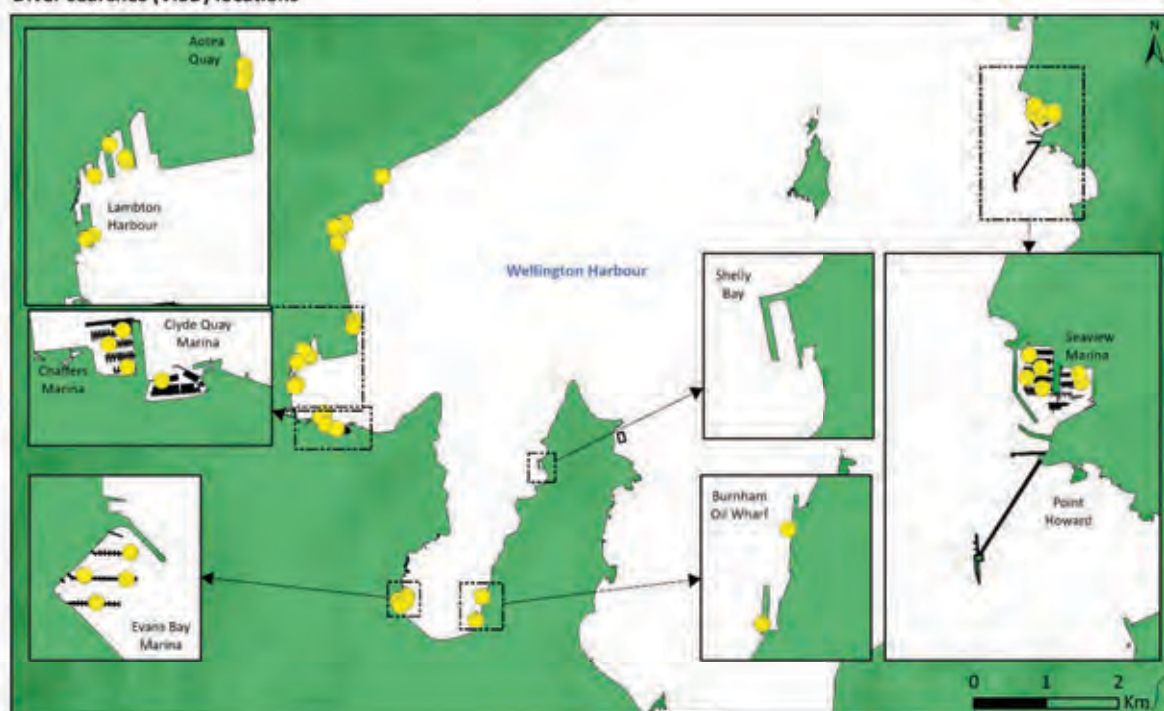
Wellington Harbour
 Summer 2023-24
 Crab traps (CRBTP) locations



Wellington Harbour

Winter 2023

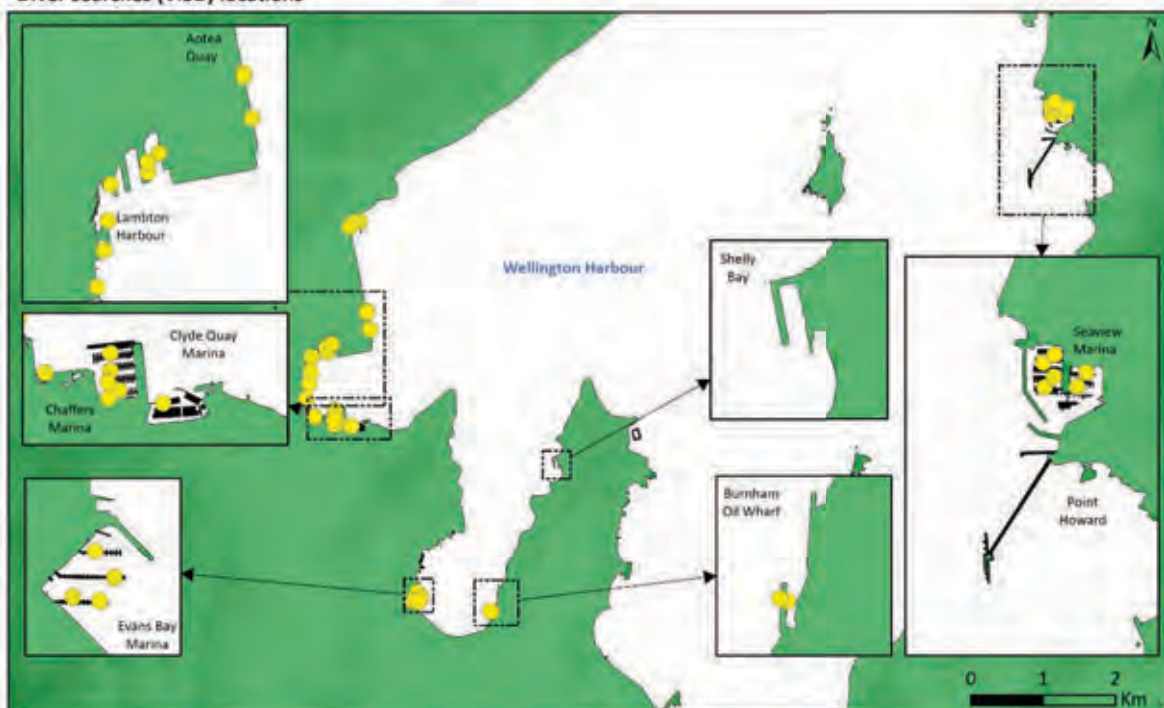
Diver searches (VISD) locations



Wellington Harbour

Summer 2023-24

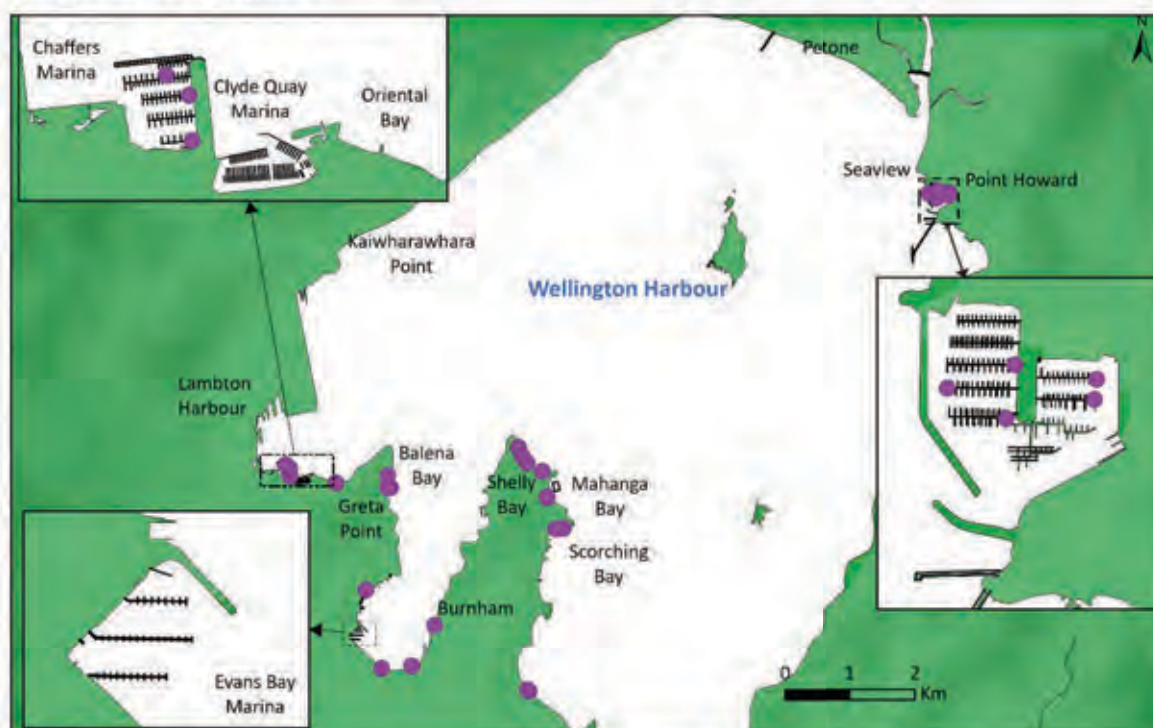
Diver searches (VISD) locations



Wellington Harbour

Winter 2023

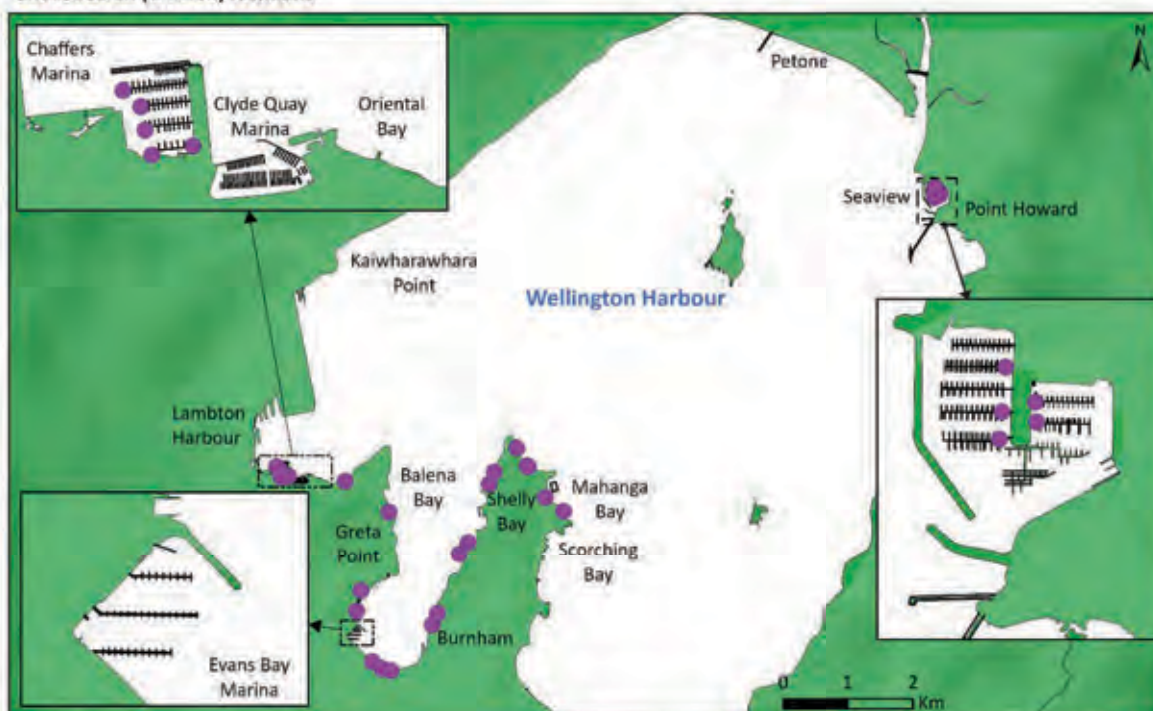
Shore search (WRACK) locations



Wellington Harbour

Summer 2023-24

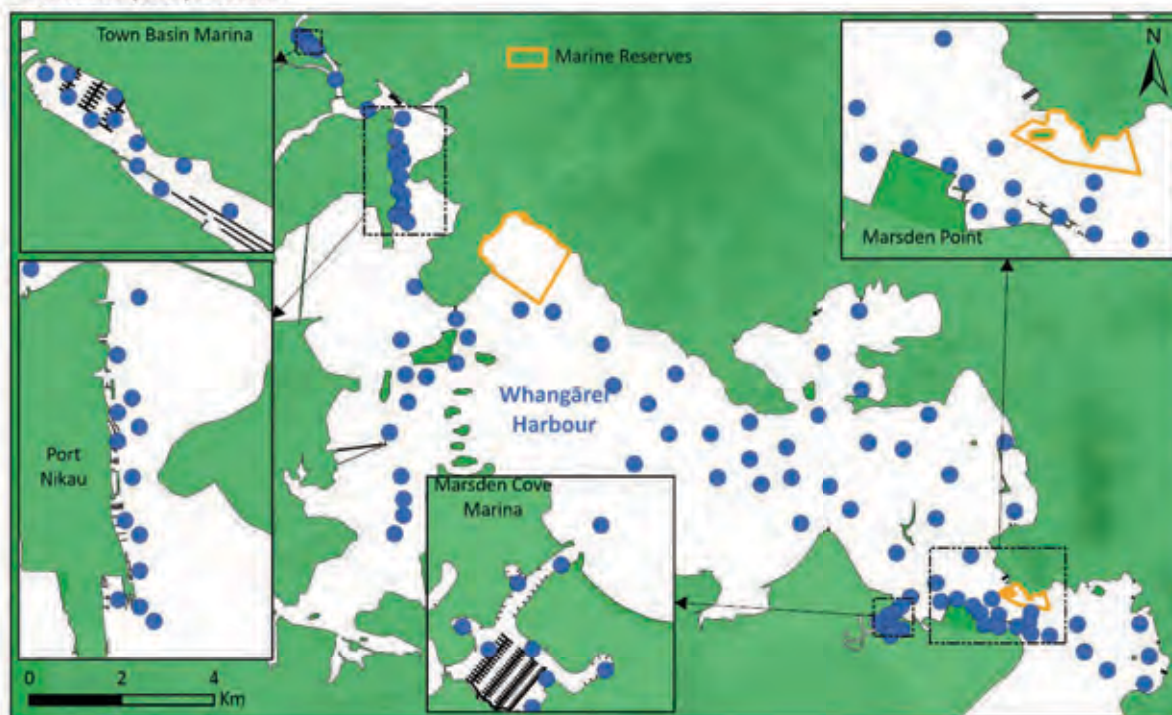
Shore search (WRACK) locations



Whangārei Harbour

Winter 2023

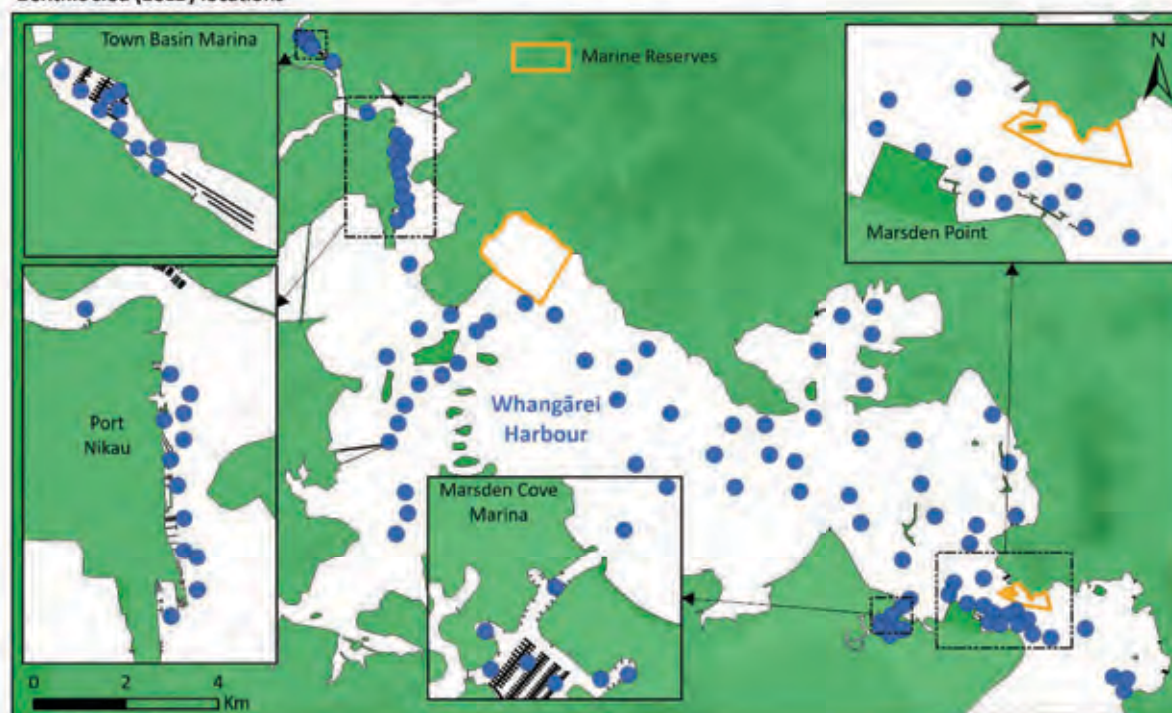
Benthic sled (BSLD) locations



Whangārei Harbour

Summer 2023-24

Benthic sled (BSLD) locations



Whangārei Harbour

Winter 2023

Crab condo (CONDO) locations



Whangārei Harbour

Summer 2023-24

Crab condo (CONDO) locations



Whangārei Harbour

Winter 2023

Crab trap (CRBTP) locations



Whangārei Harbour

Summer 2023-24

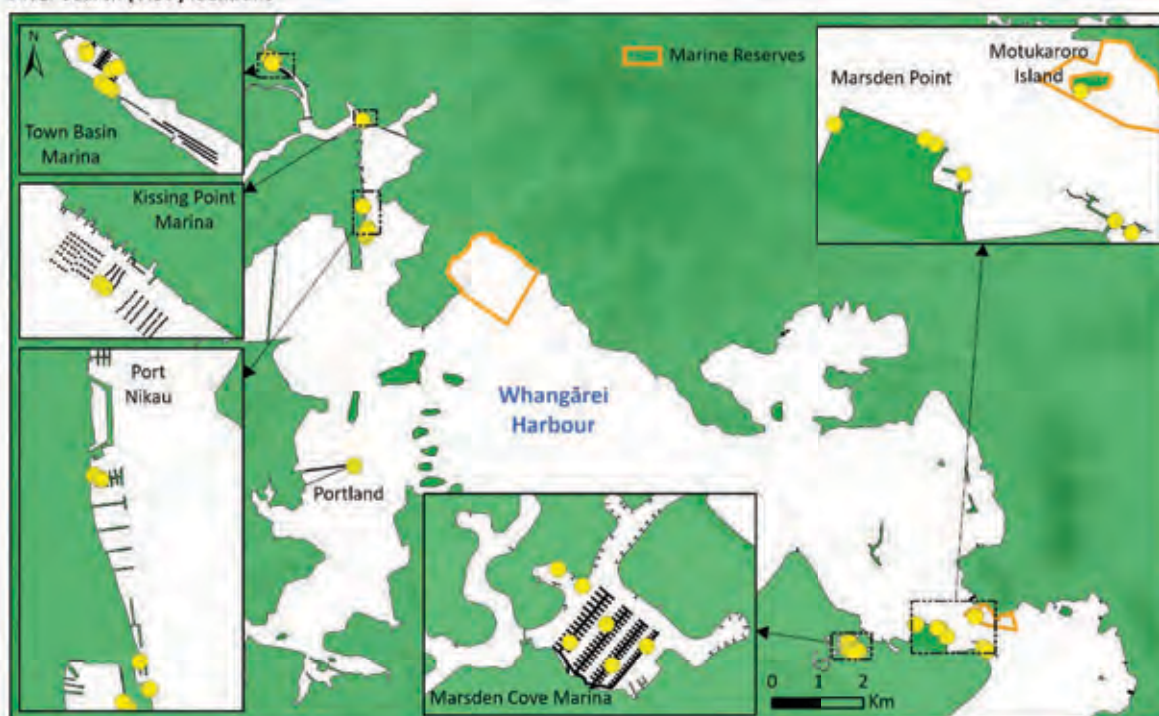
Crab trap (CRBTP) locations



Whangārei Harbour

Winter 2023

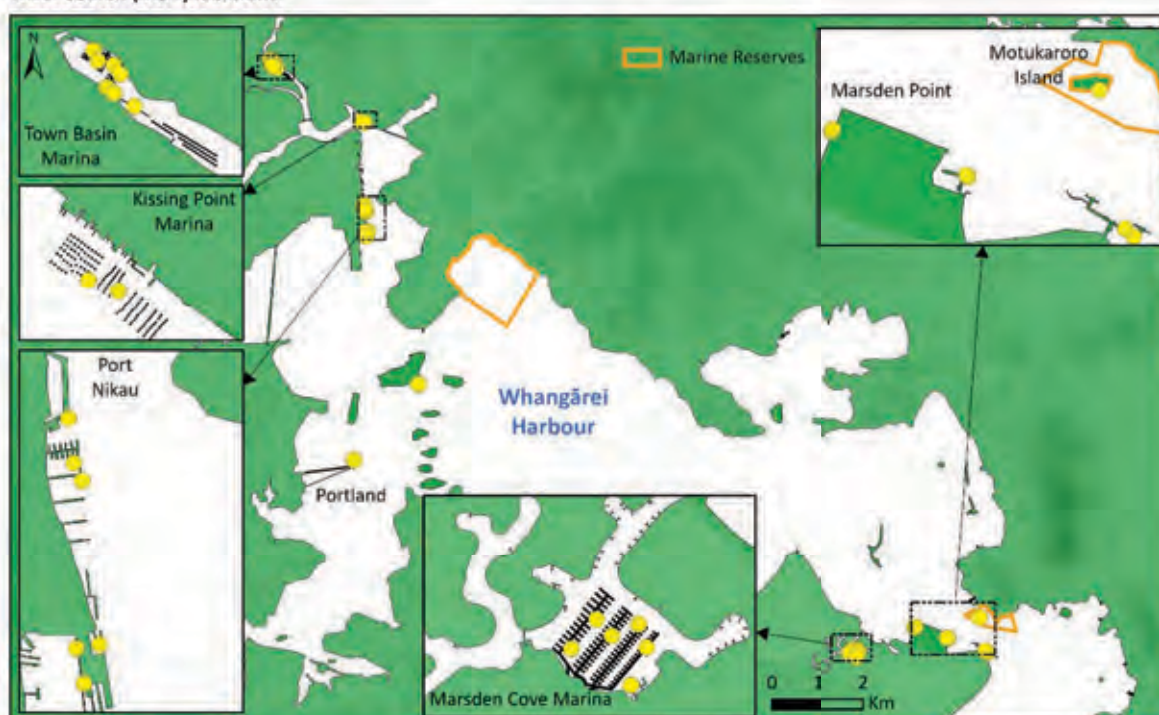
Diver search (VISD) locations



Whangārei Harbour

Summer 2023-24

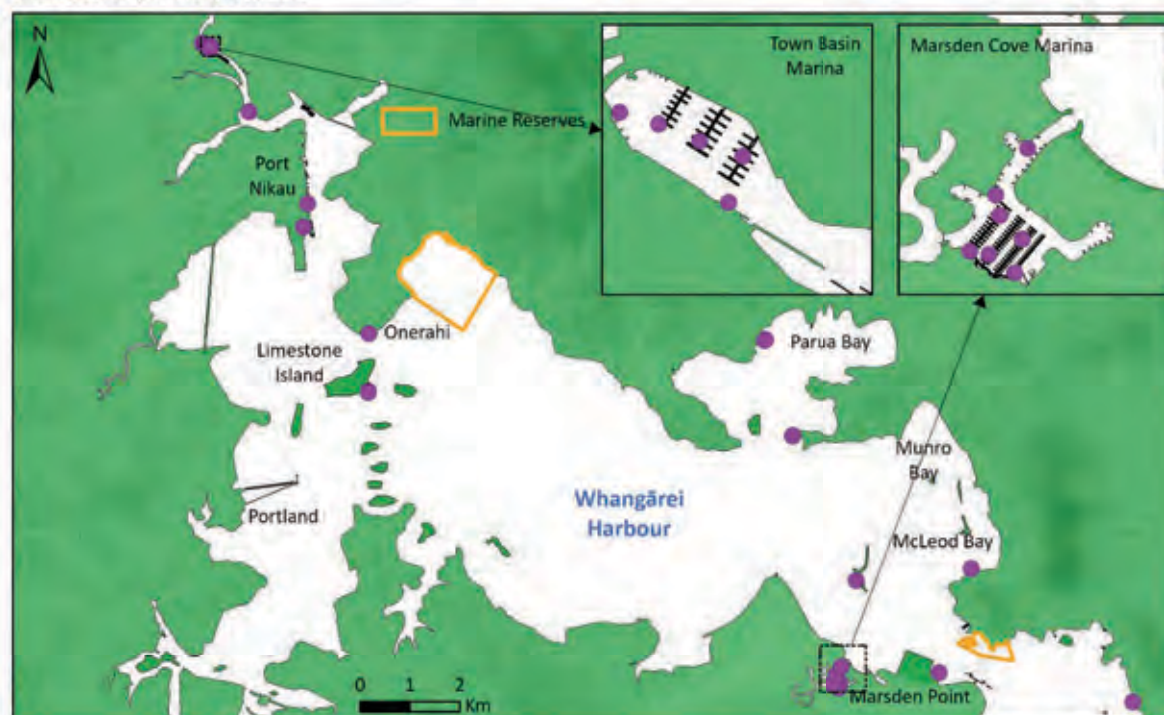
Diver search (VISD) locations



Whangārei Harbour

Winter 2023

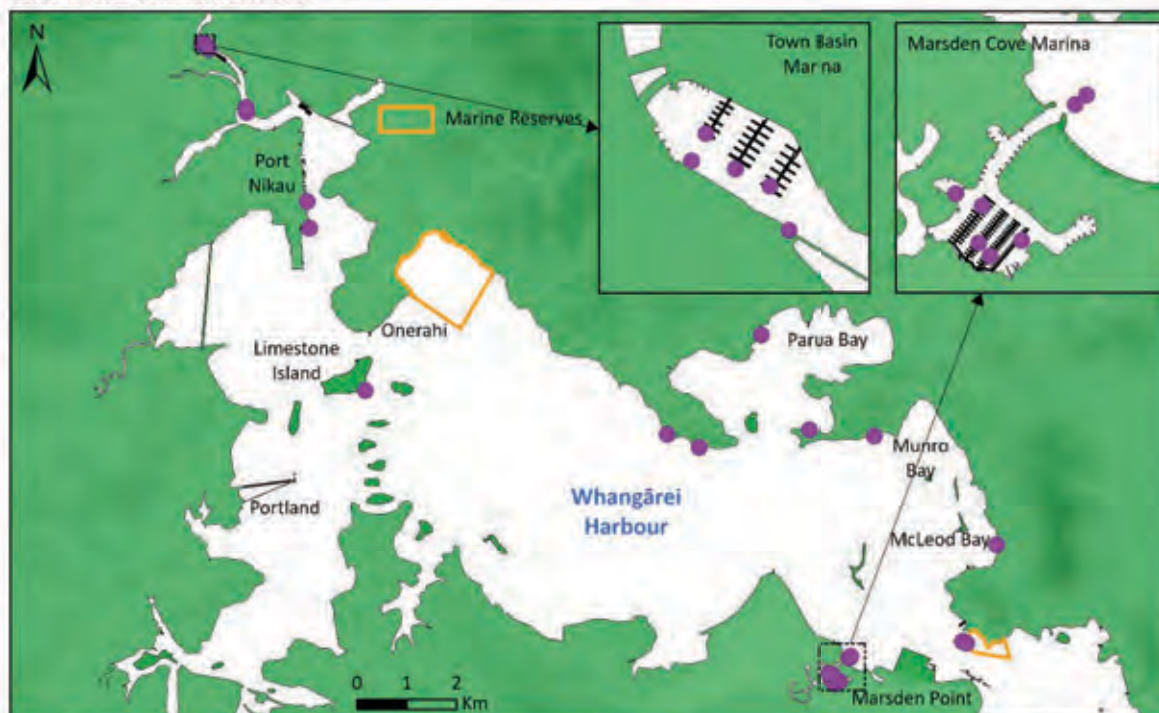
Shore search (WRACK) locations



Whangārei Harbour

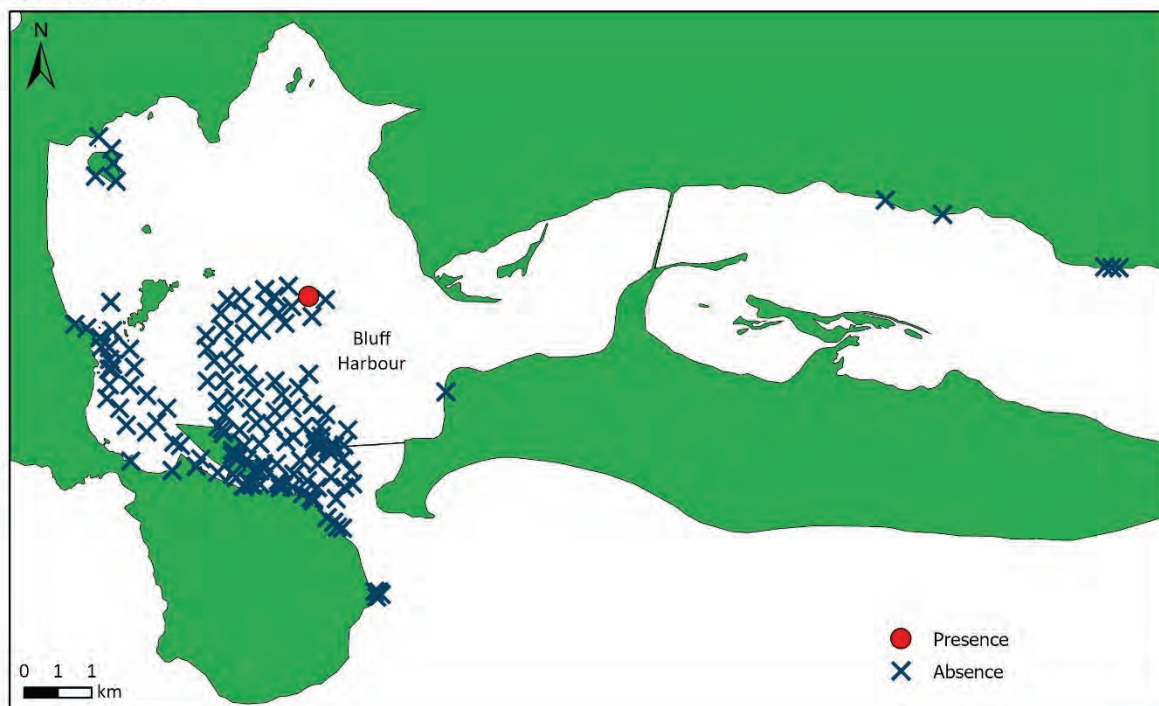
Summer 2023-24

Shore search (WRACK) locations

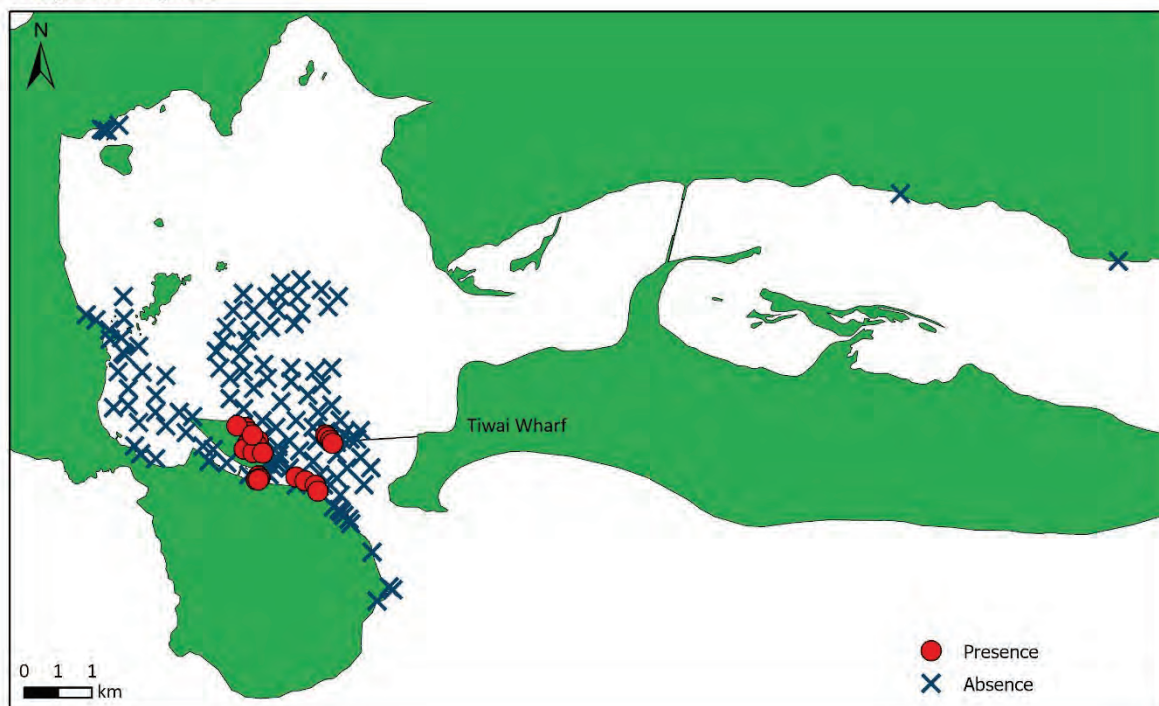


13 Appendix 4. Distribution maps for target and selected non-target marine non-indigenous species detected during Winter 2023 and Summer 2023–24 National Marine High Risk Site Surveillance (NMHRSS) programme surveys

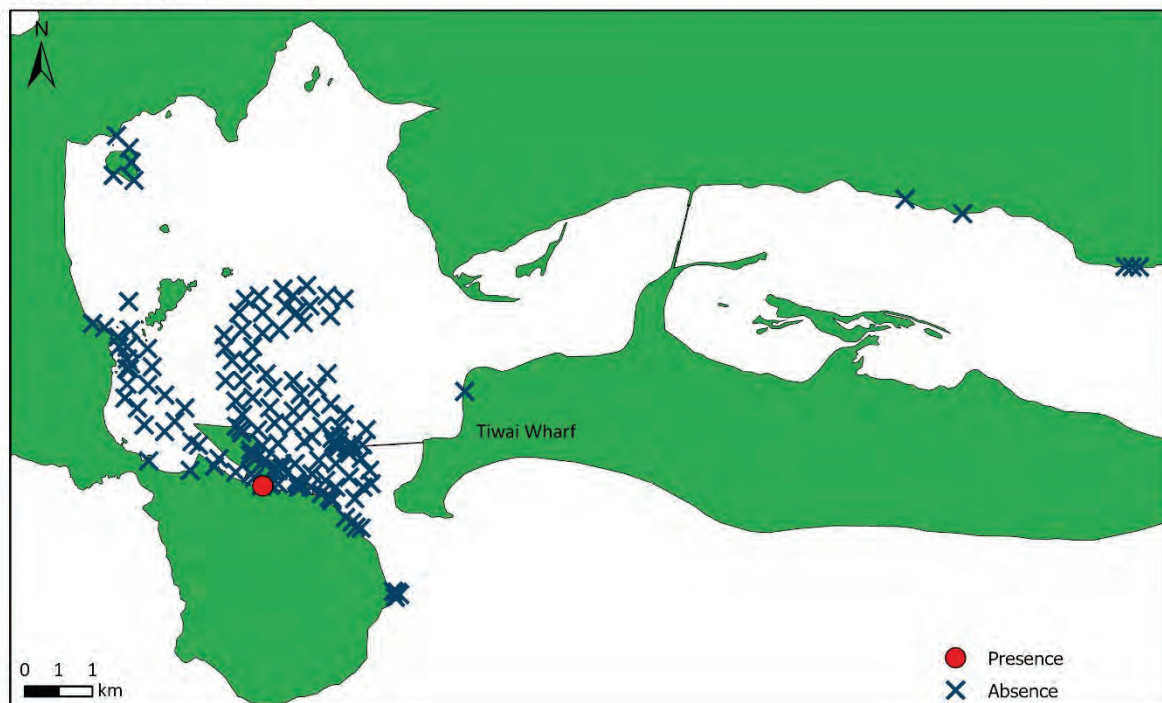
Bluff Harbour
Summer 2023-24
Ascididiella aspersa



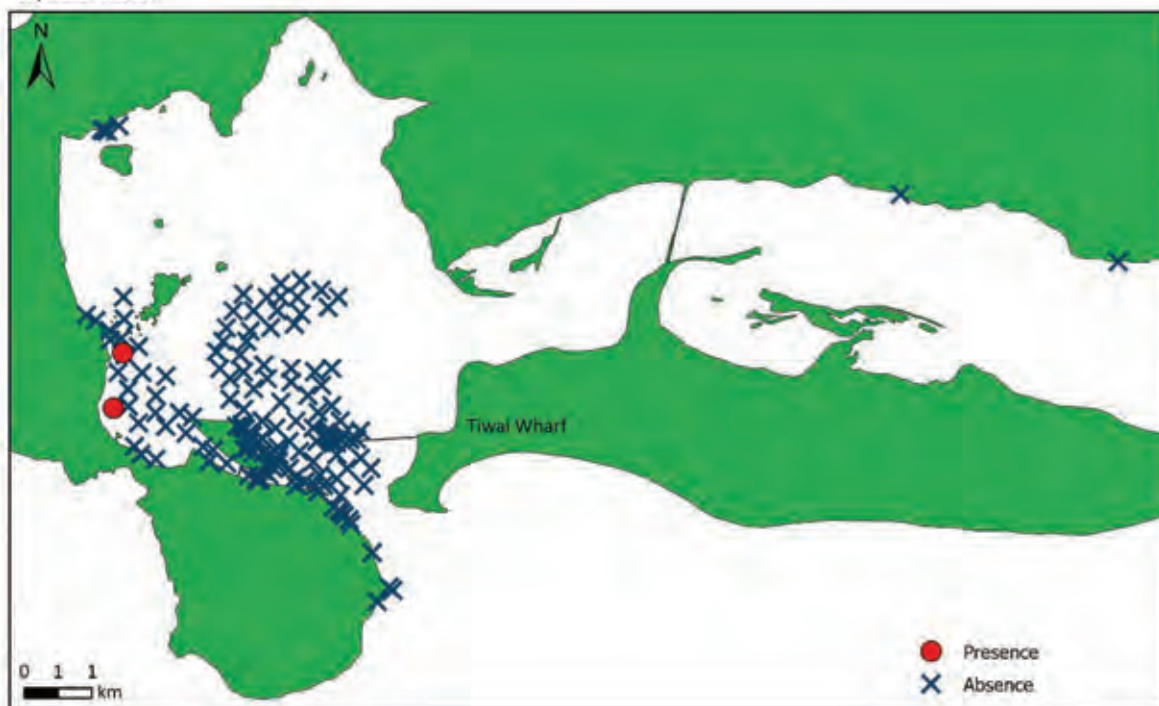
Bluff Harbour
 Winter 2023
Botrylloides diegensis



Bluff Harbour
 Summer 2023-24
Botrylloides diegensis



Bluff Harbour
 Winter 2023
Caprella mutica



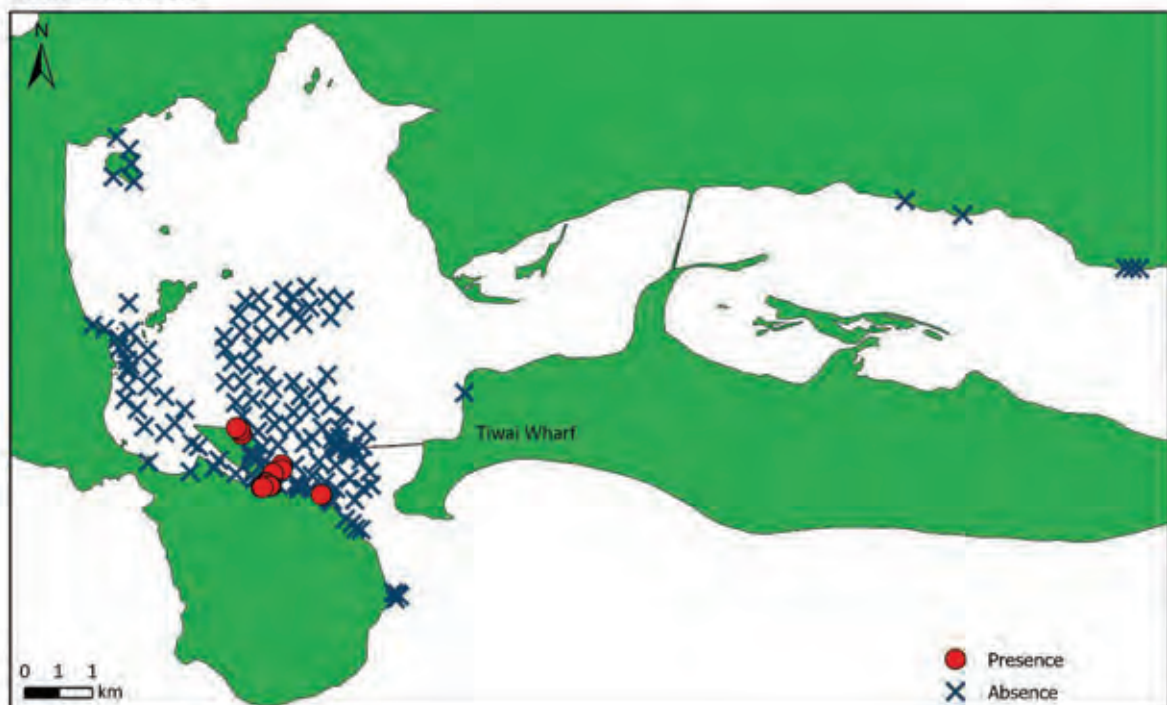
Bluff Harbour
 Summer 2023-24
Caprella mutica



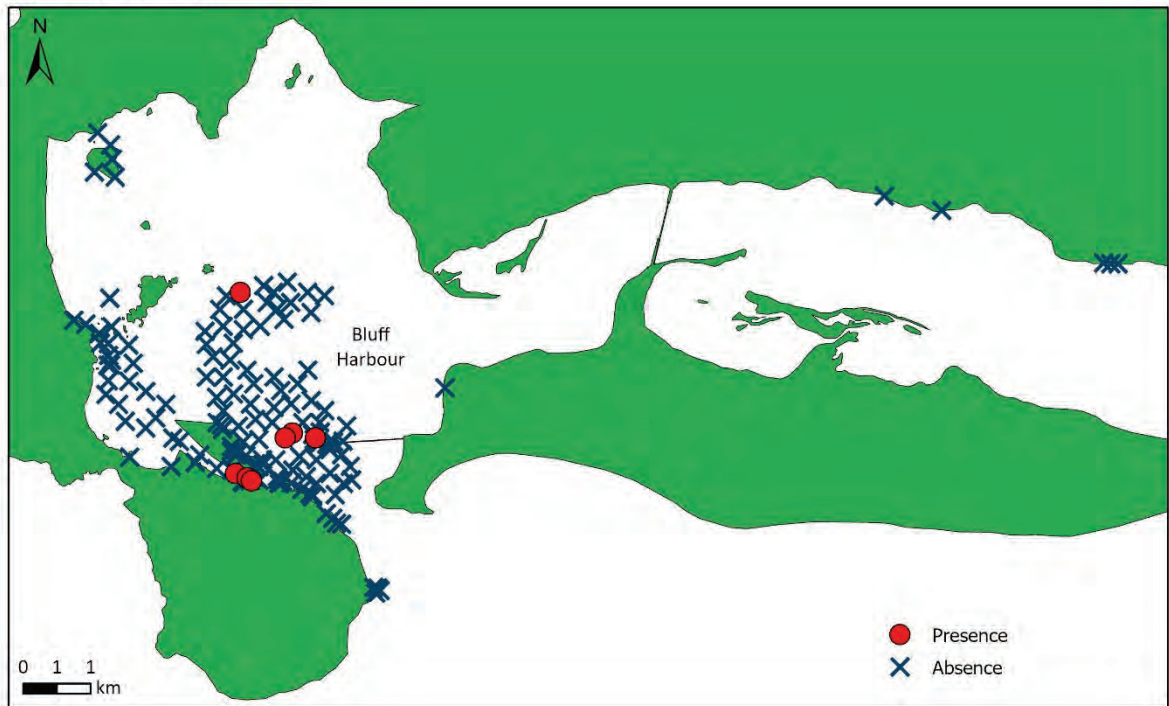
Bluff Harbour
 Winter 2023
Didemnum patulum



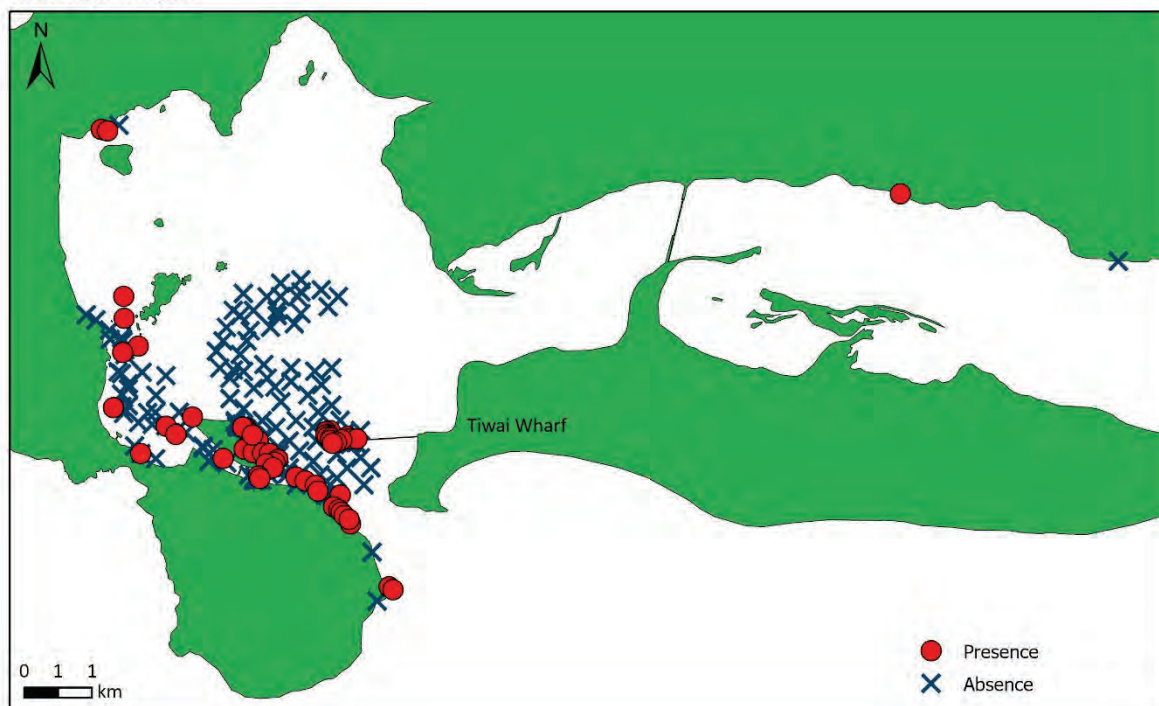
Bluff Harbour
 Summer 2023-24
Didemnum patulum



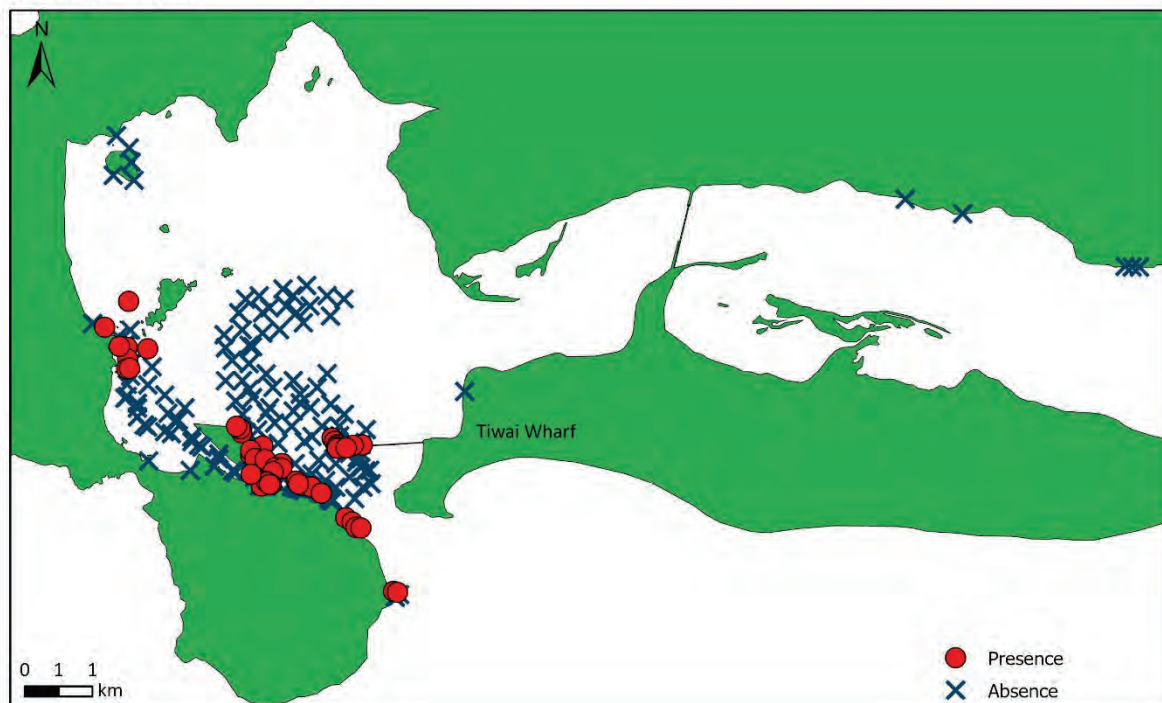
Bluff Harbour
Summer 2023-24
Diplosoma listerianum



Bluff Harbour
 Winter 2023
Undaria pinnatifida



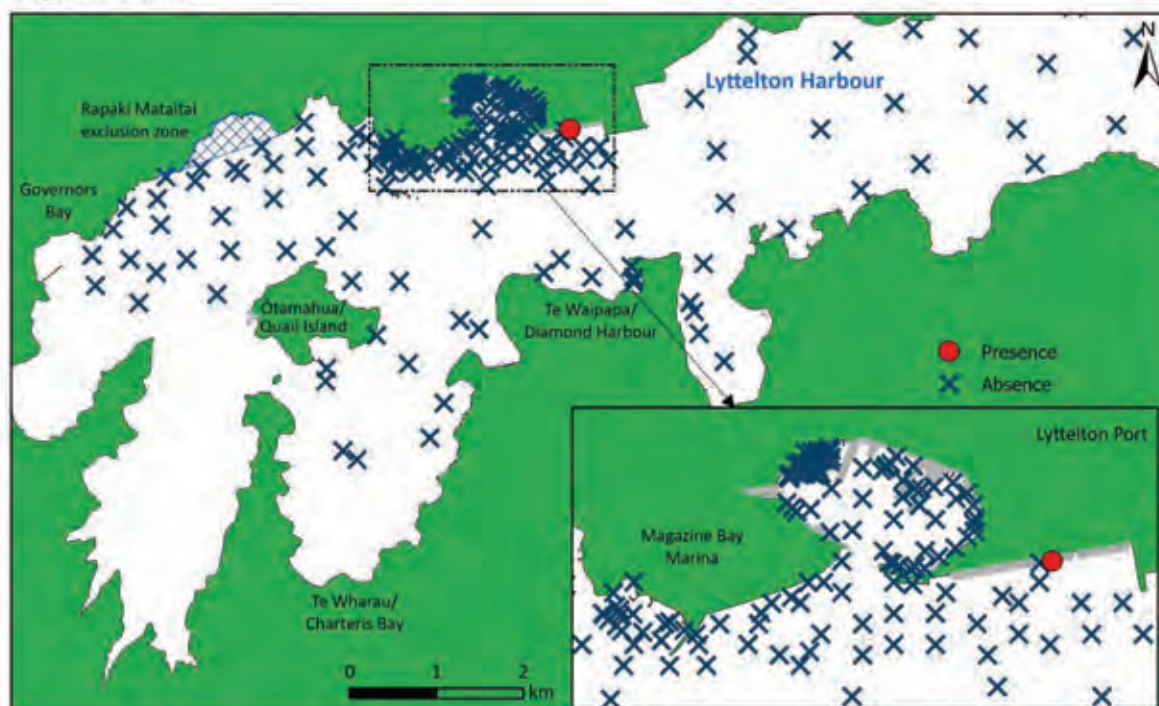
Bluff Harbour
 Summer 2023-24
Undaria pinnatifida



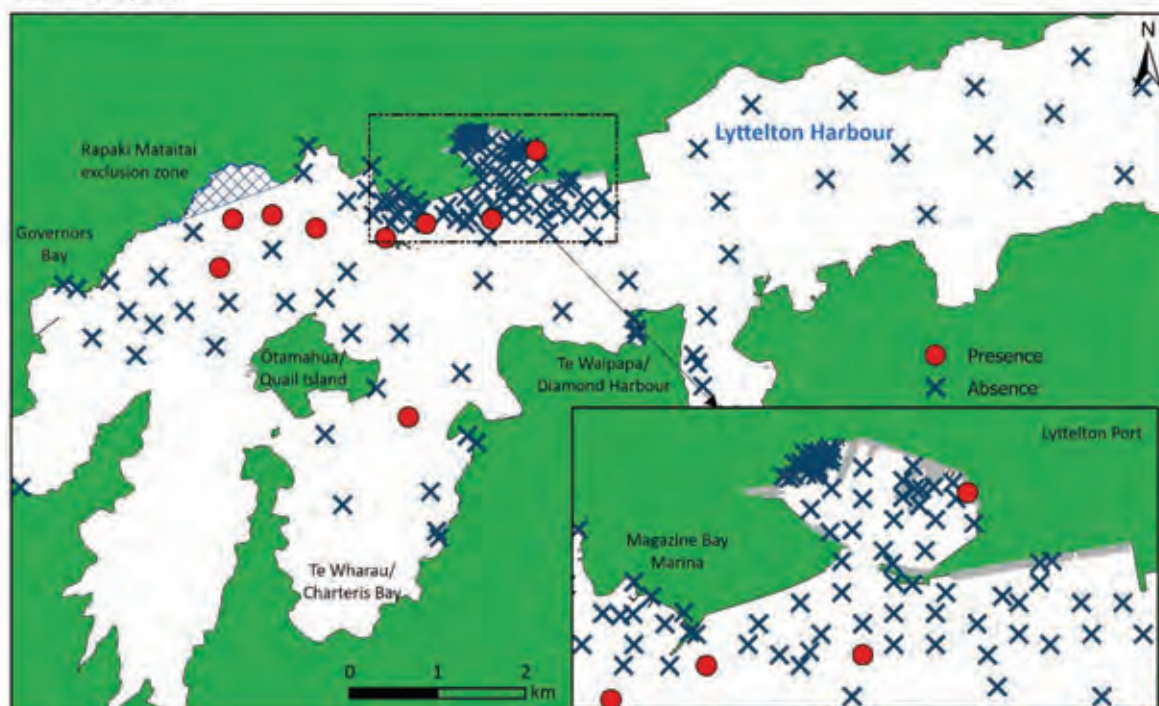
Lyttelton Harbour/ Whakaraupō

Winter 2023

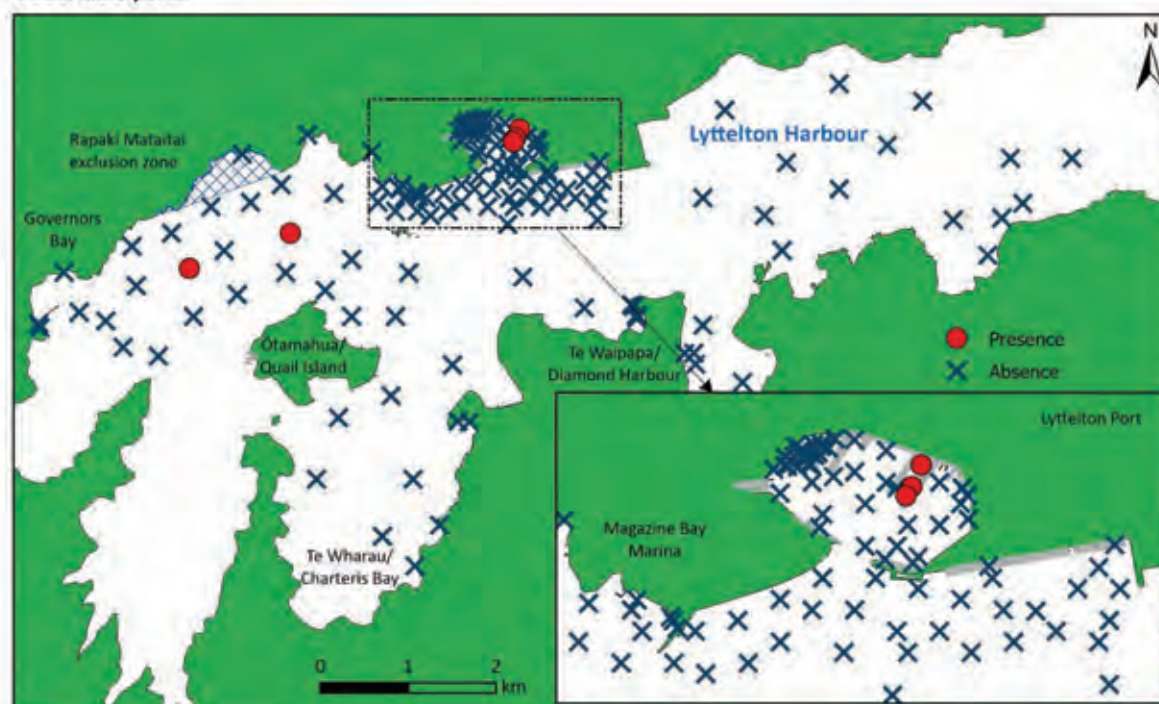
Alcyonidium verrilli



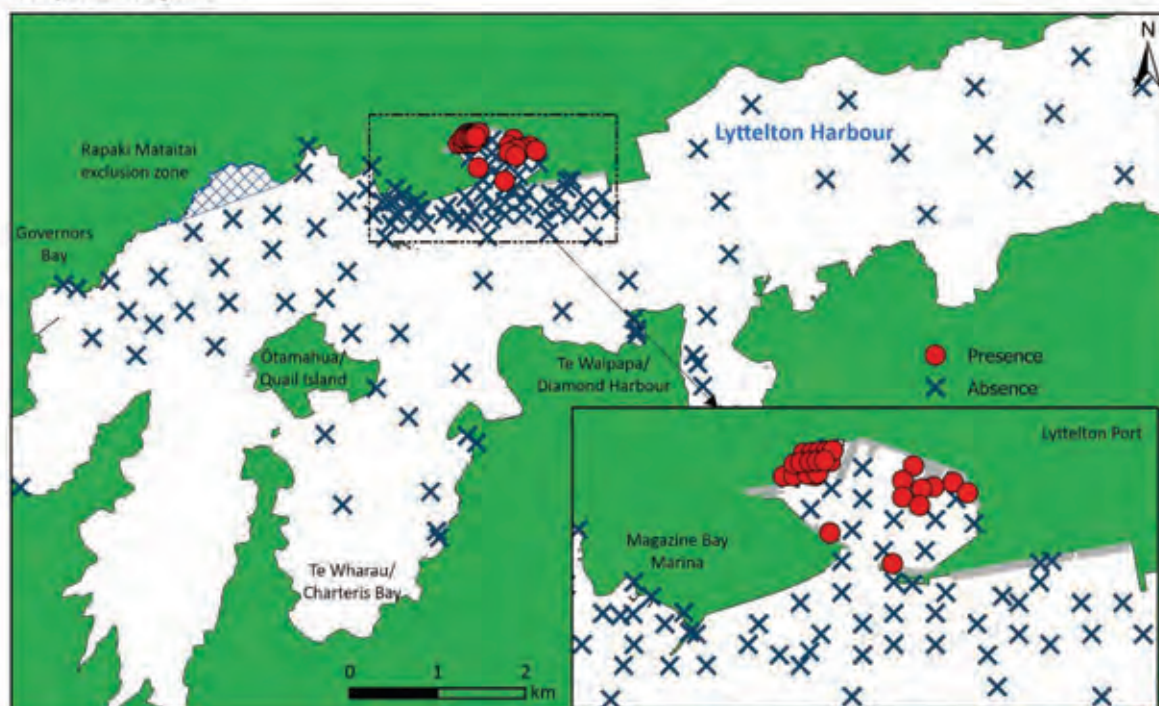
Lyttelton Harbour/ Whakaraupō
 Winter 2023
Ascidella aspersa



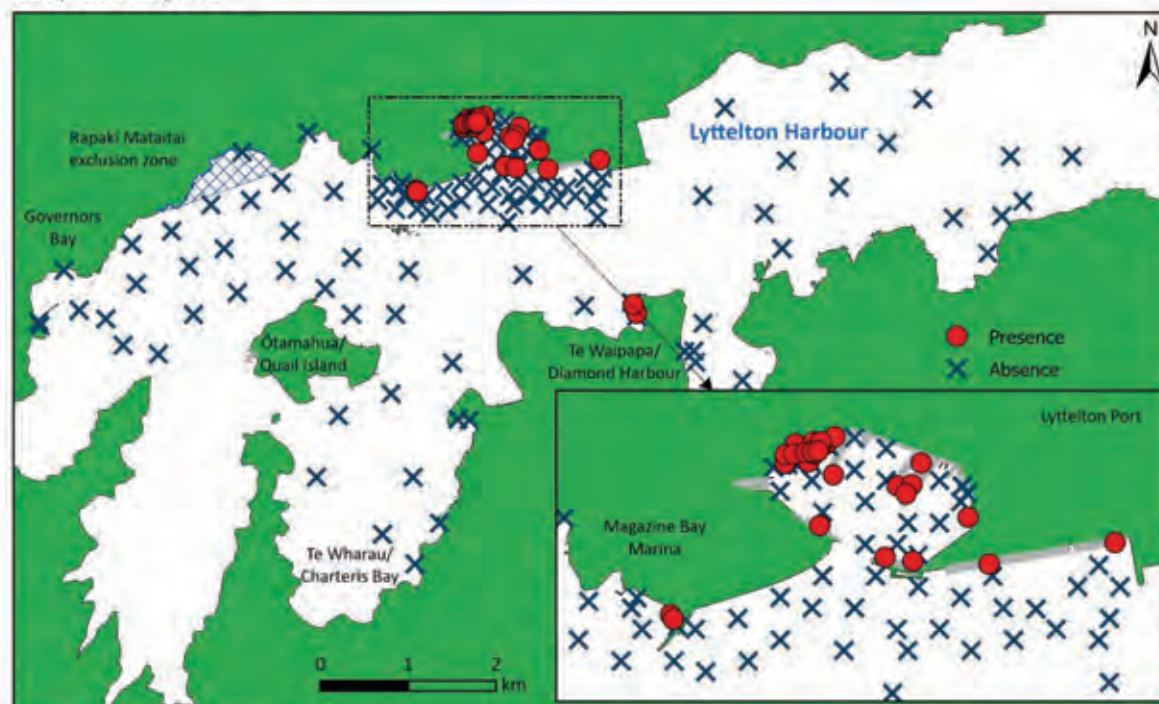
Lyttelton Harbour/ Whakaraupō
 Summer 2023-24
Ascidella aspersa



Lyttelton Harbour/ Whakaraupō
 Winter 2023
Botrylloides diegensis



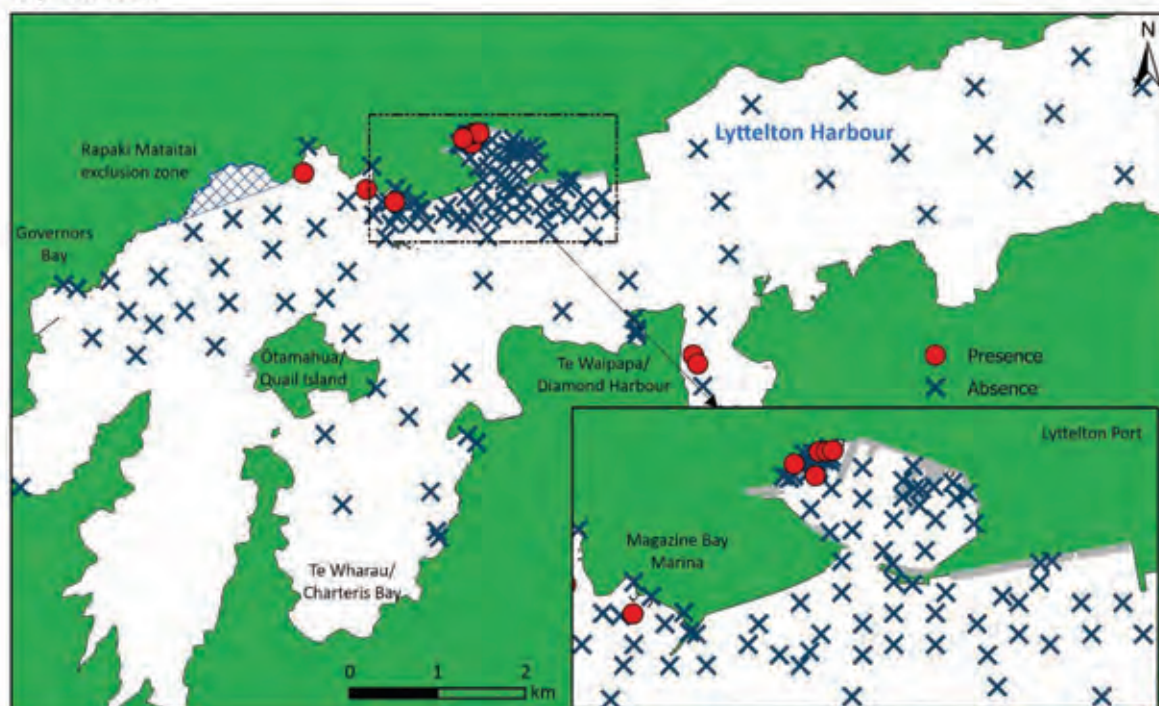
Lyttelton Harbour/ Whakaraupō
 Summer 2023-24
Botrylloides diegensis



Lyttelton Harbour/ Whakaraupō

Winter 2023

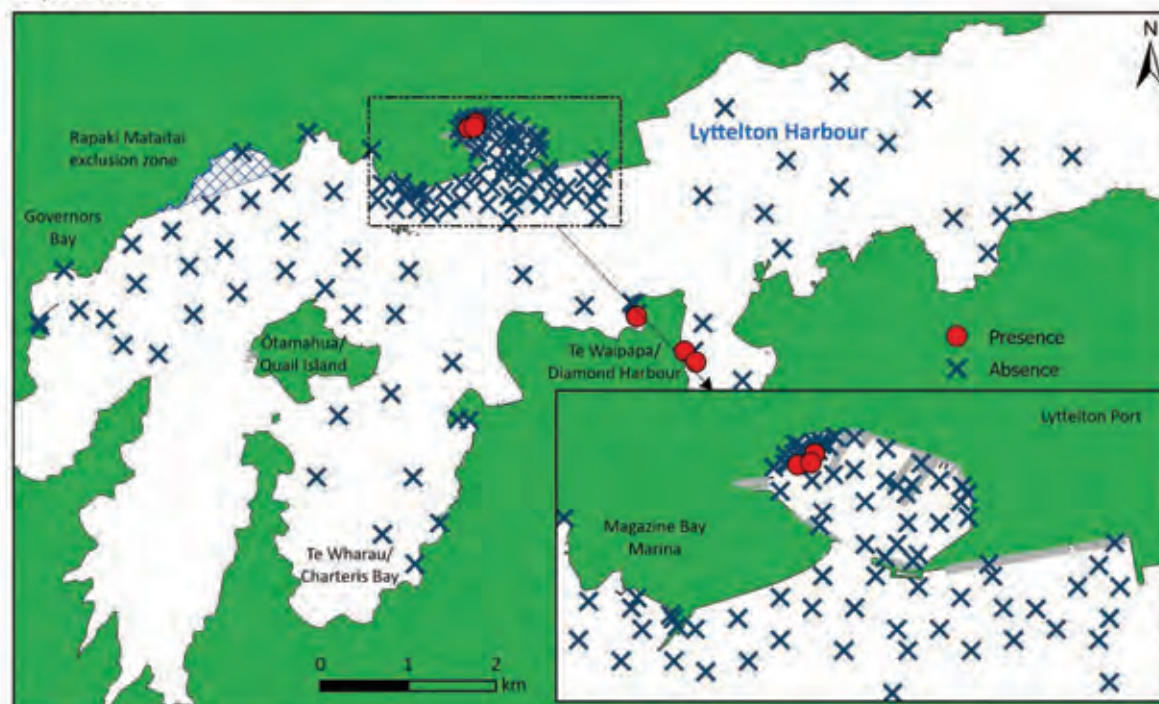
Caprella mutica



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

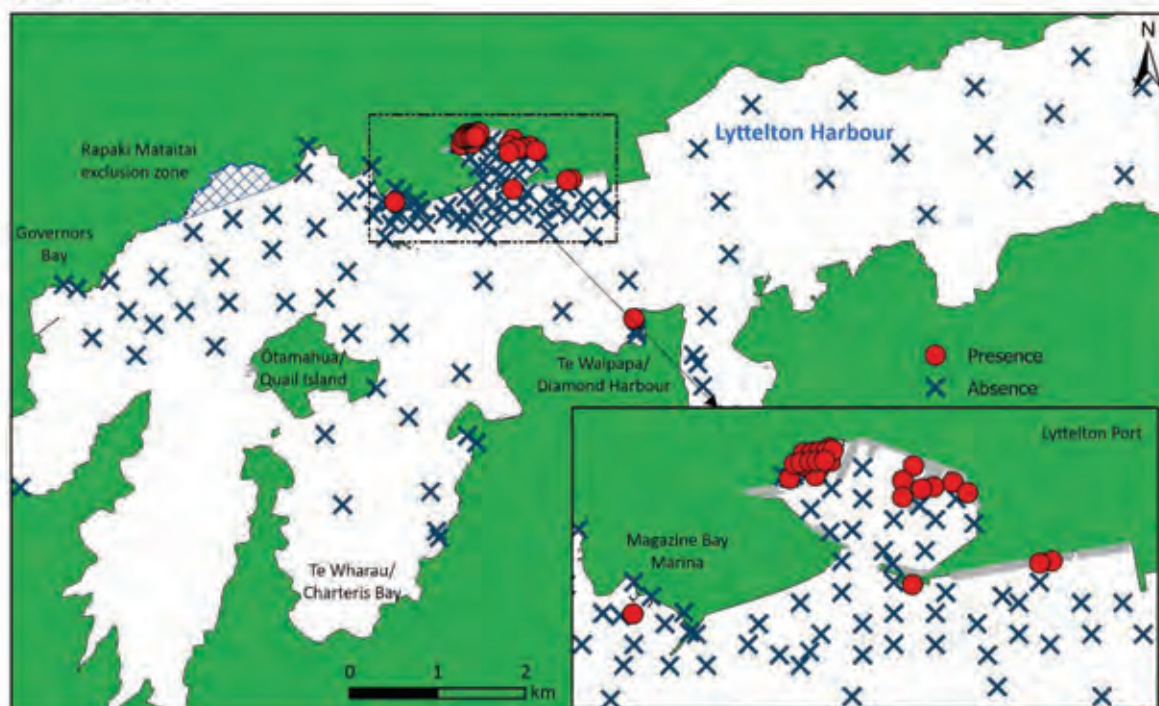
Caprella mutica



Lyttelton Harbour/ Whakaraupō

Winter 2023

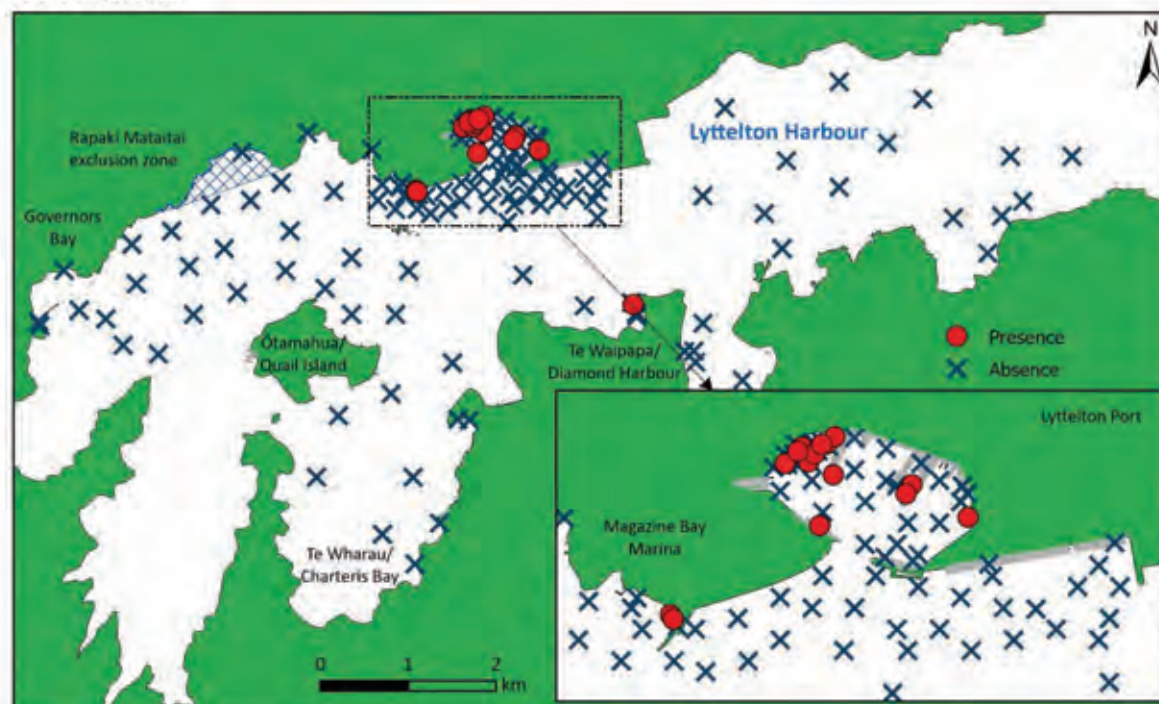
Ciona intestinalis



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

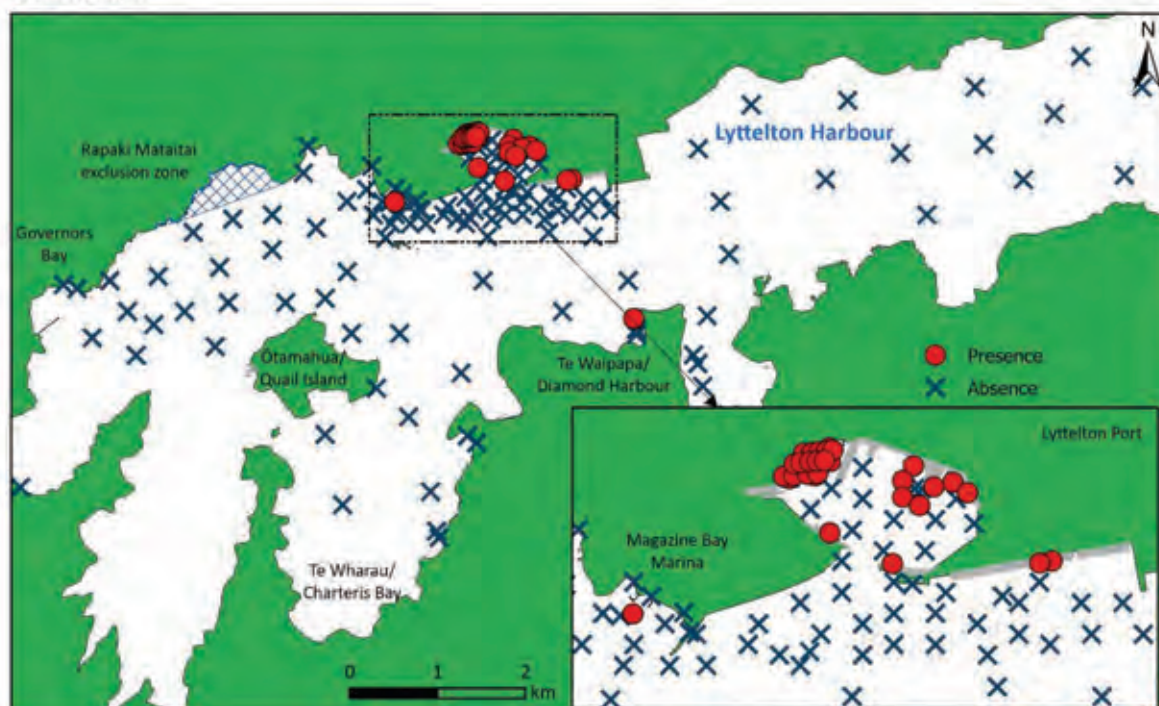
Ciona intestinalis



Lyttelton Harbour/ Whakaraupō

Winter 2023

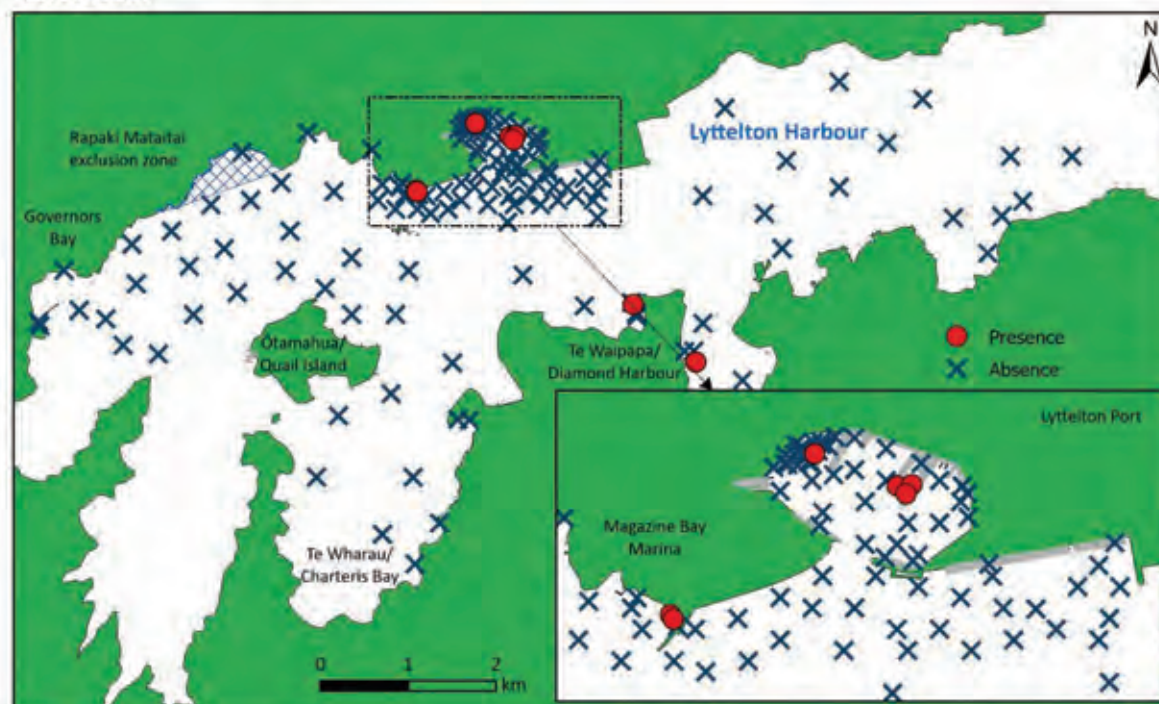
Ciona robusta



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

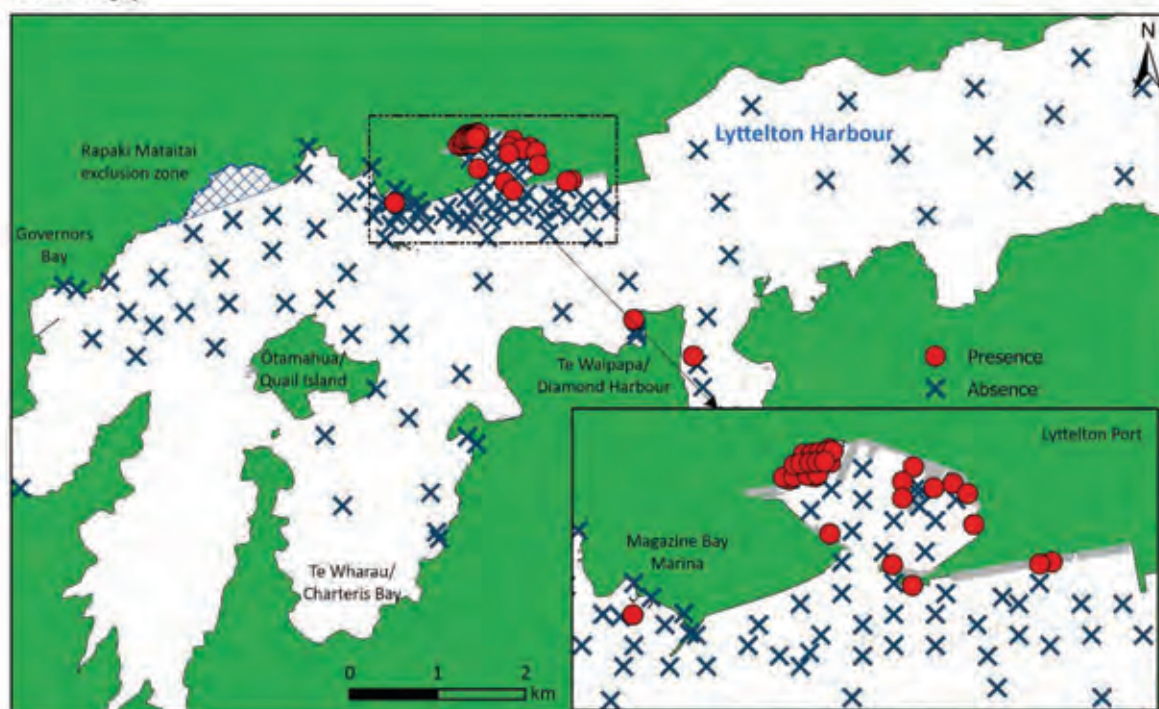
Ciona robusta



Lyttelton Harbour/ Whakaraupō

Winter 2023

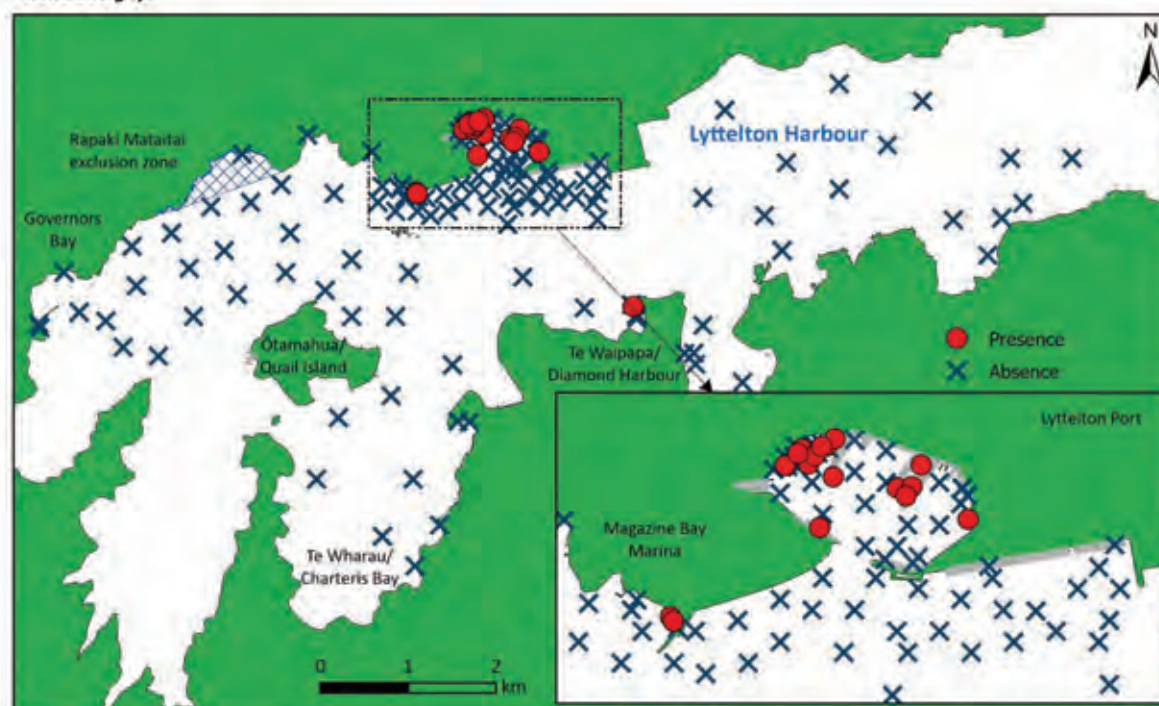
Ciona savignyi



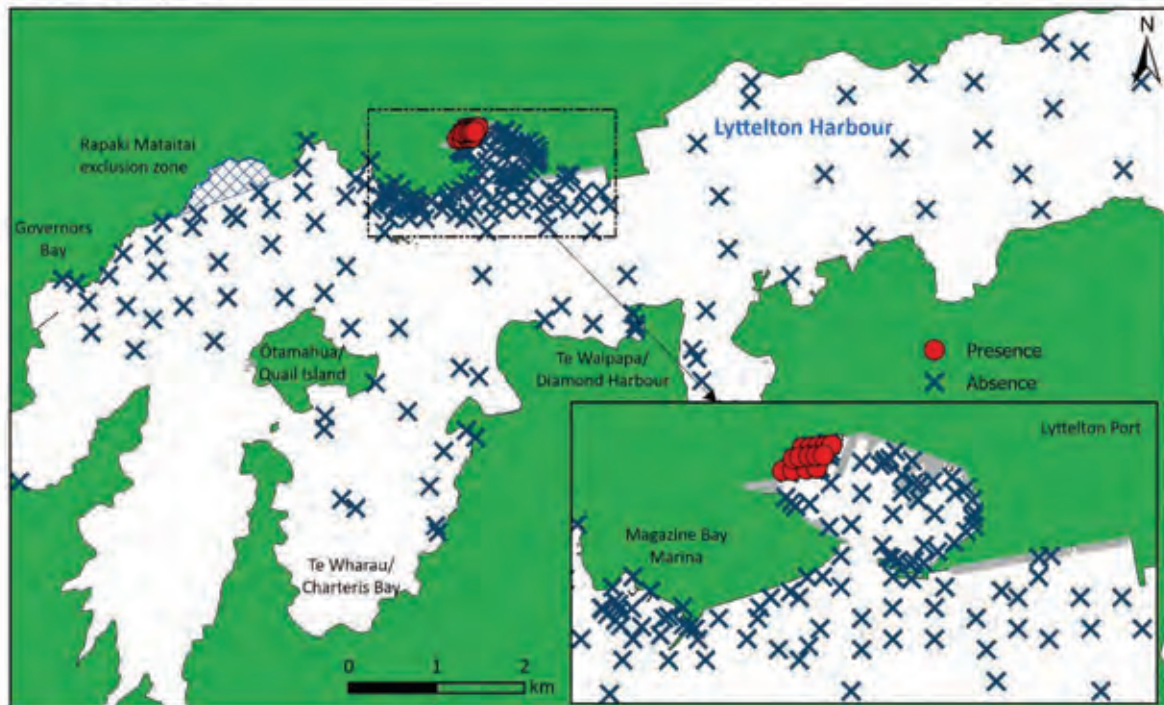
Lyttelton Harbour/ Whakaraupō

Summer 2023-24

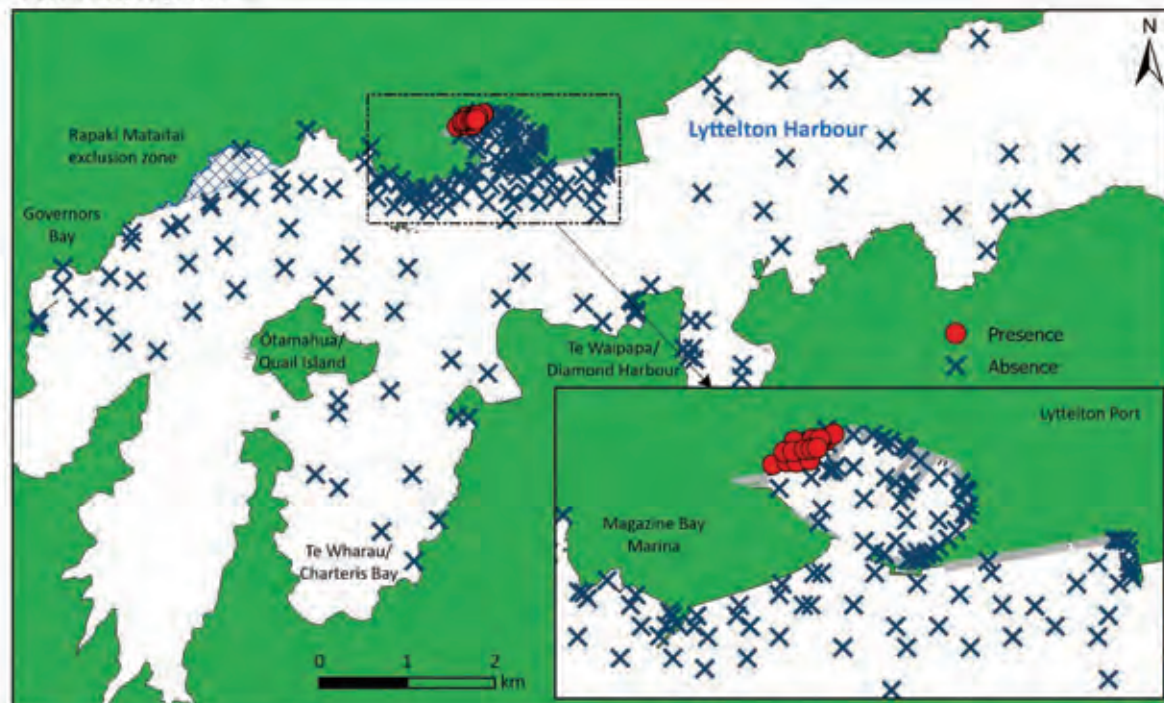
Ciona savignyi



Lyttelton Harbour/ Whakaraupō
 Winter 2023
Clavelina lepadiformis



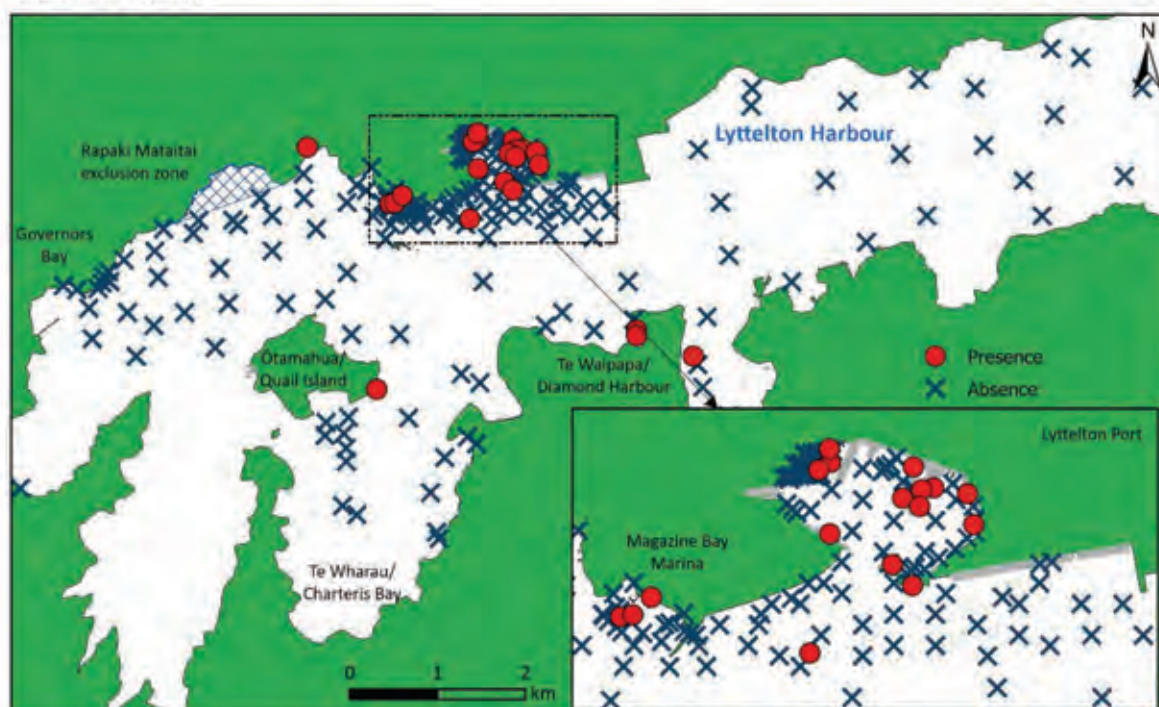
Lyttelton Harbour/ Whakaraupō
 Summer 2023-24
Clavelina lepadiformis



Lyttelton Harbour/ Whakaraupō

Winter 2023

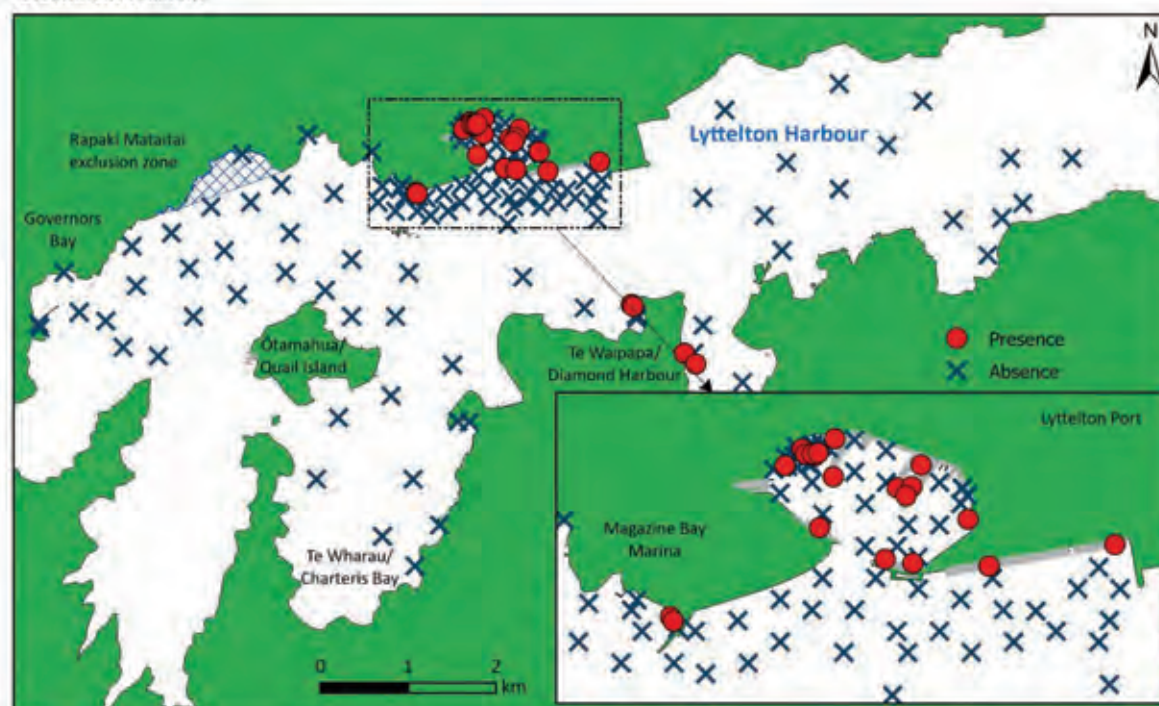
Didemnum vexillum



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

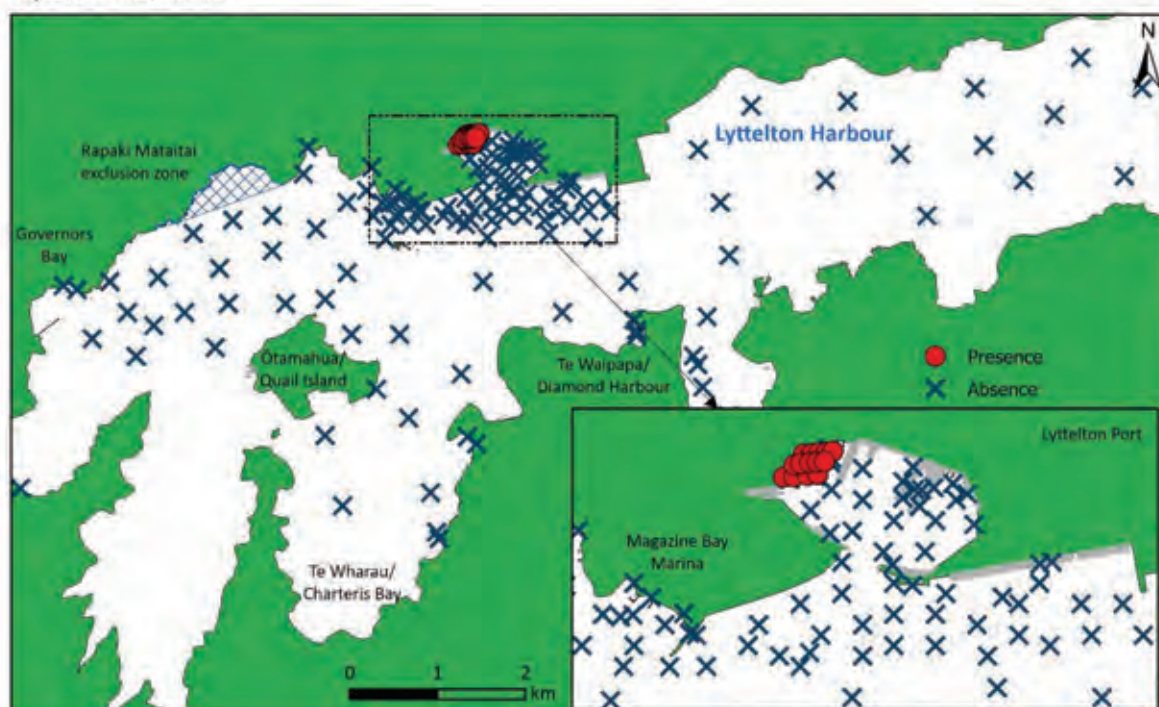
Didemnum vexillum



Lyttelton Harbour/ Whakaraupō

Winter 2023

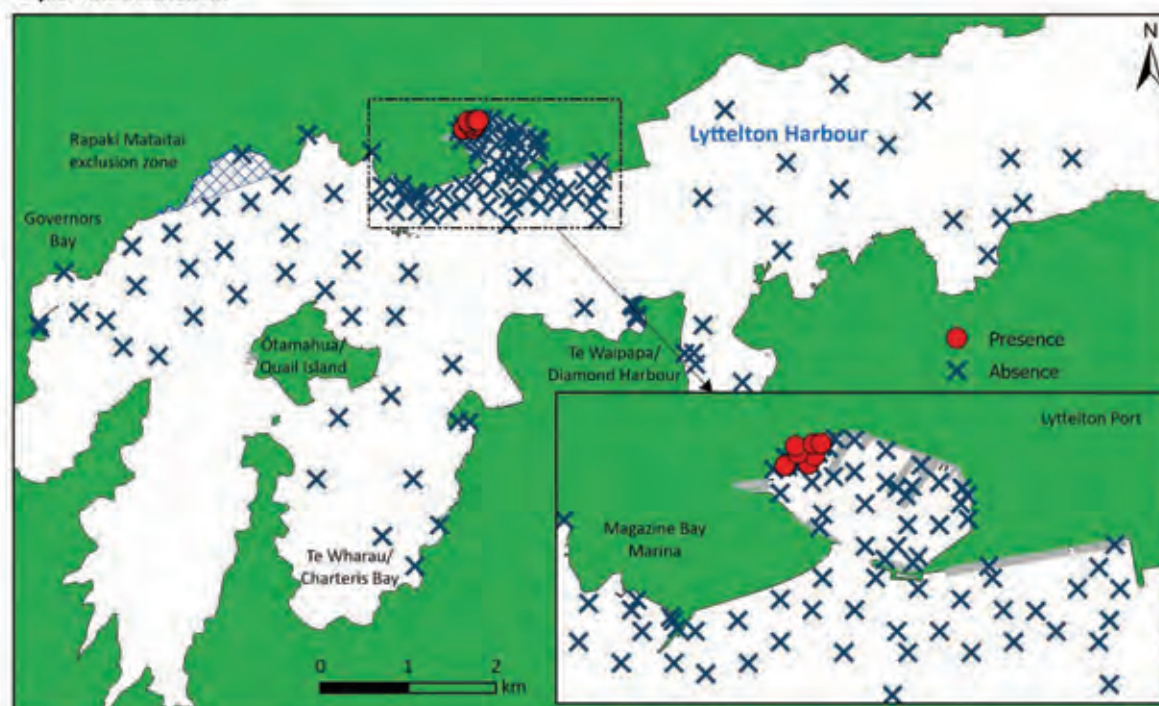
Diplosoma listerianum



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

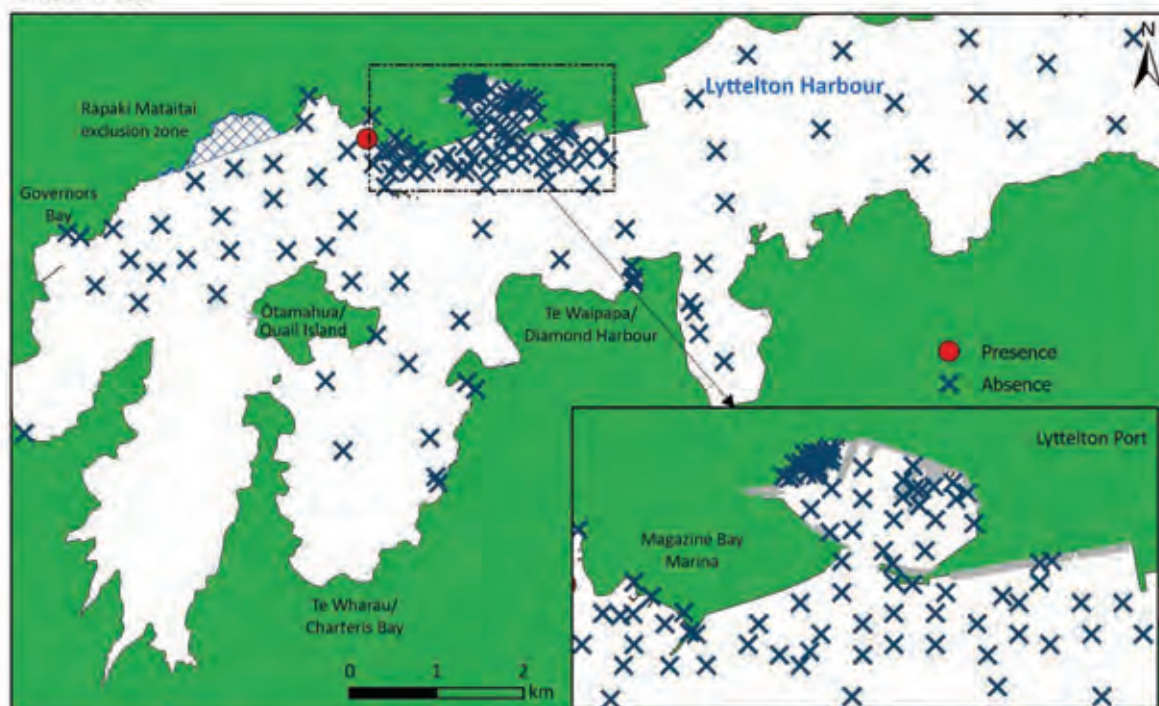
Diplosoma listerianum



Lyttelton Harbour/ Whakaraupō

Winter 2023

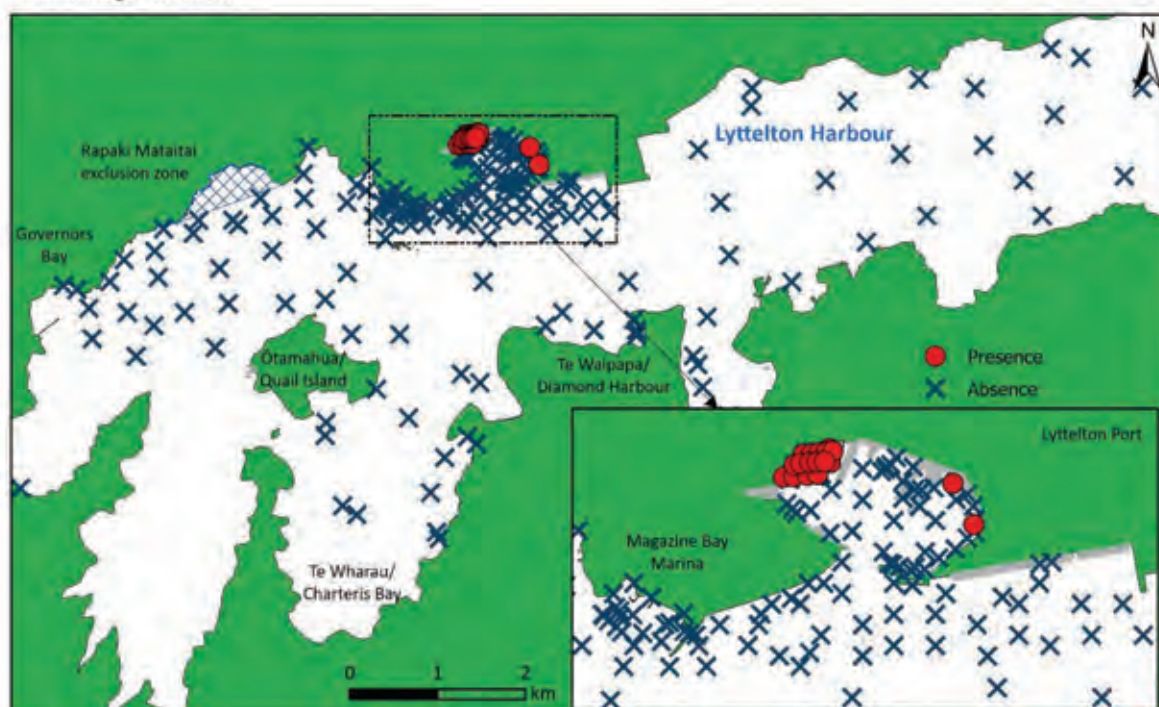
Ectopleura spp.



Lyttelton Harbour/ Whakaraupō

Winter 2023

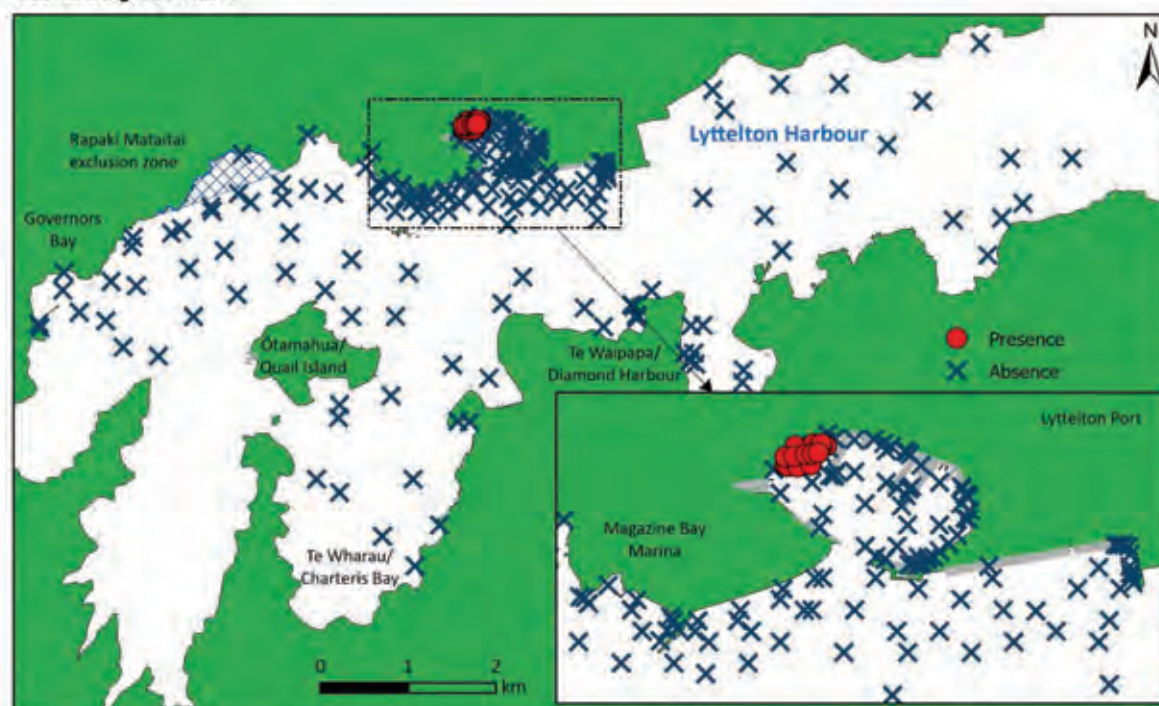
Fushitsunagia catenata



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

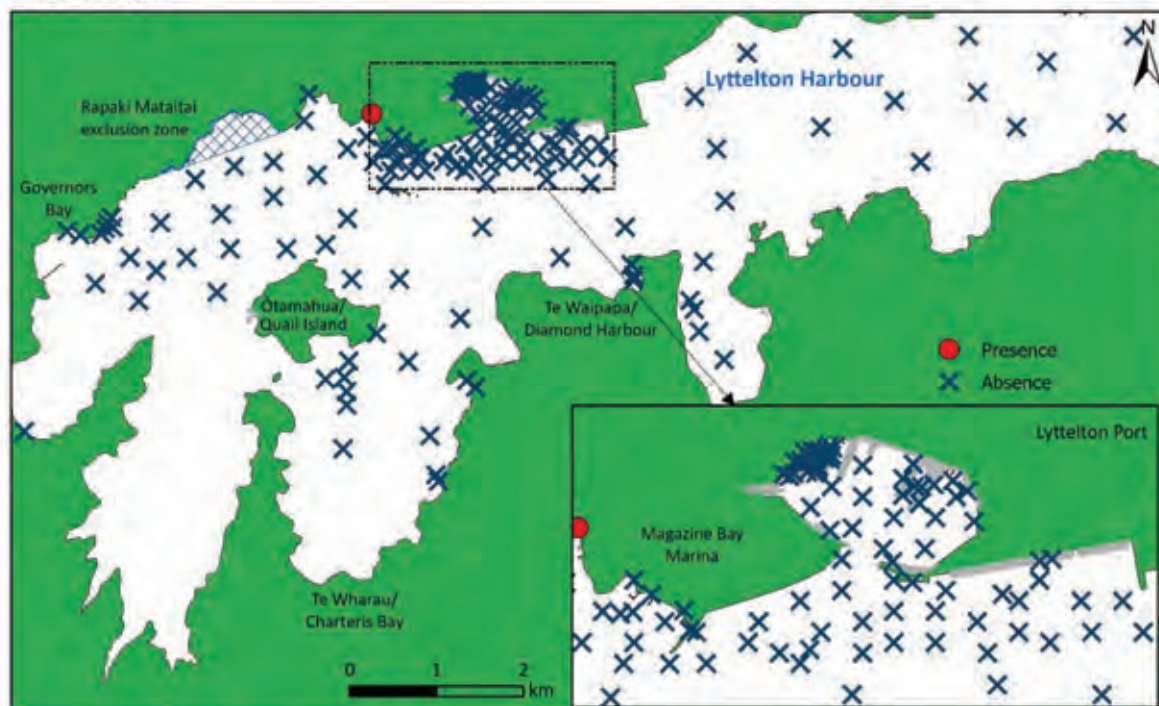
Fushitsunagia catenata



Lyttelton Harbour/ Whakaraupō

Winter 2023

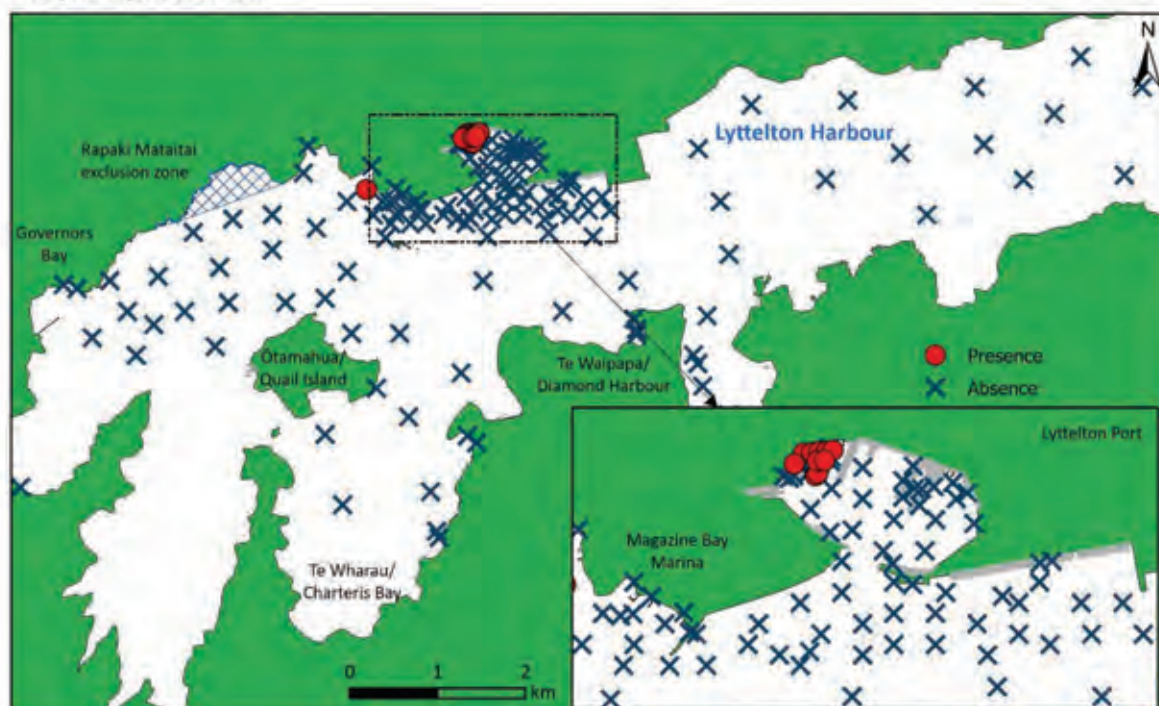
Magallana gigas



Lyttelton Harbour/ Whakaraupō

Winter 2023

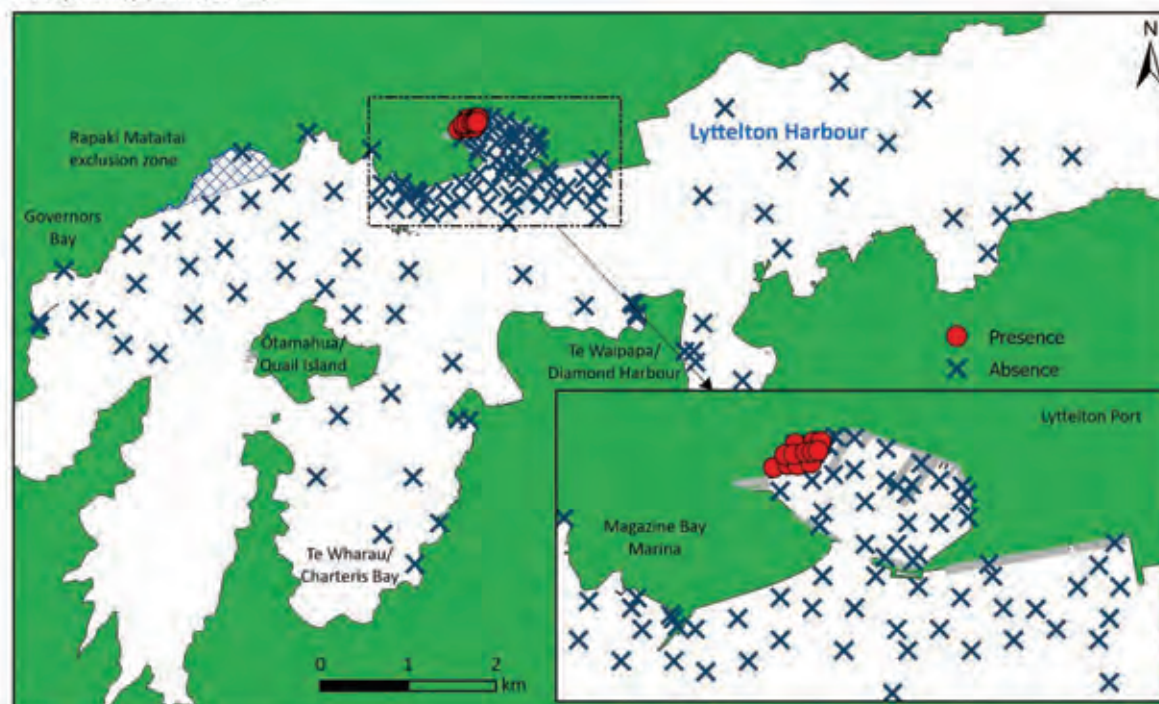
Pachymeniopsis lanceolata



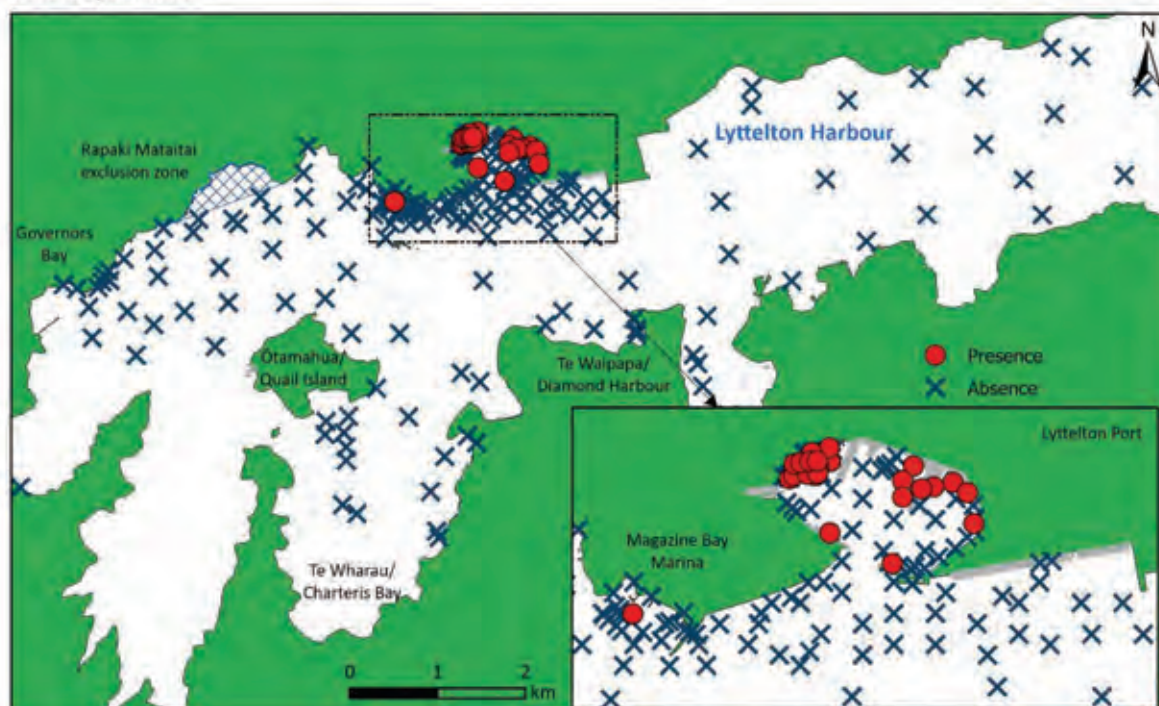
Lyttelton Harbour/ Whakaraupō

Summer 2023-24

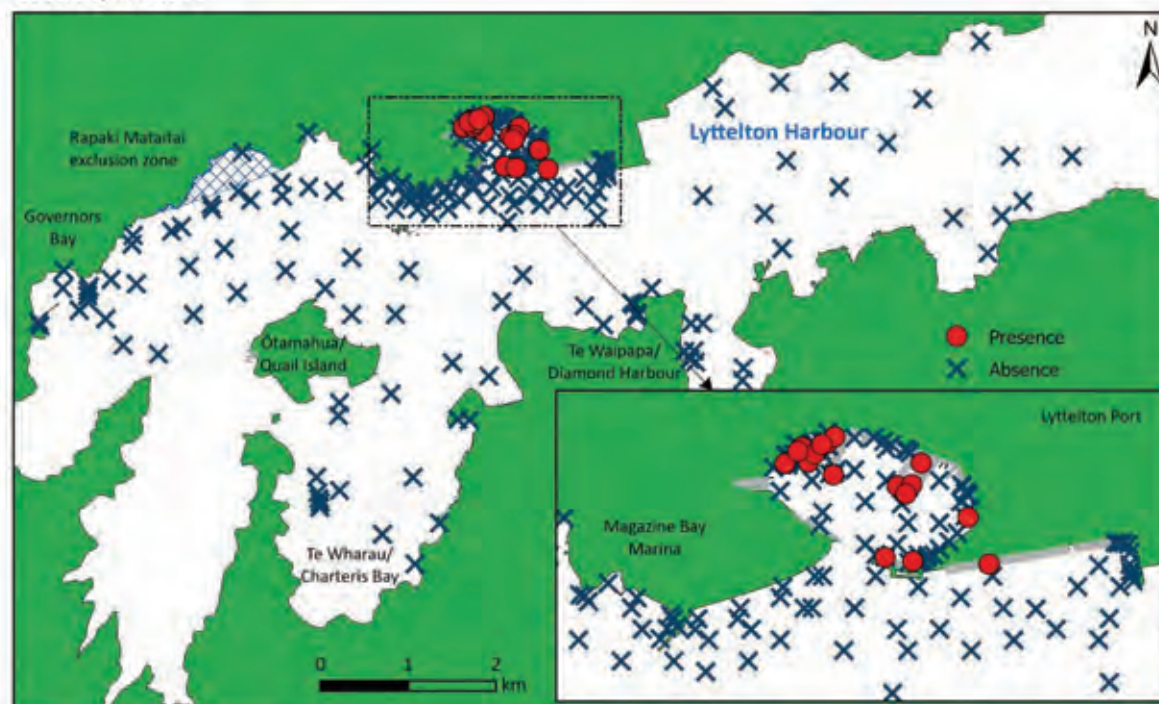
Pachymeniopsis lanceolata



Lyttelton Harbour/ Whakaraupō
 Winter 2023
Sabella spallanzanii



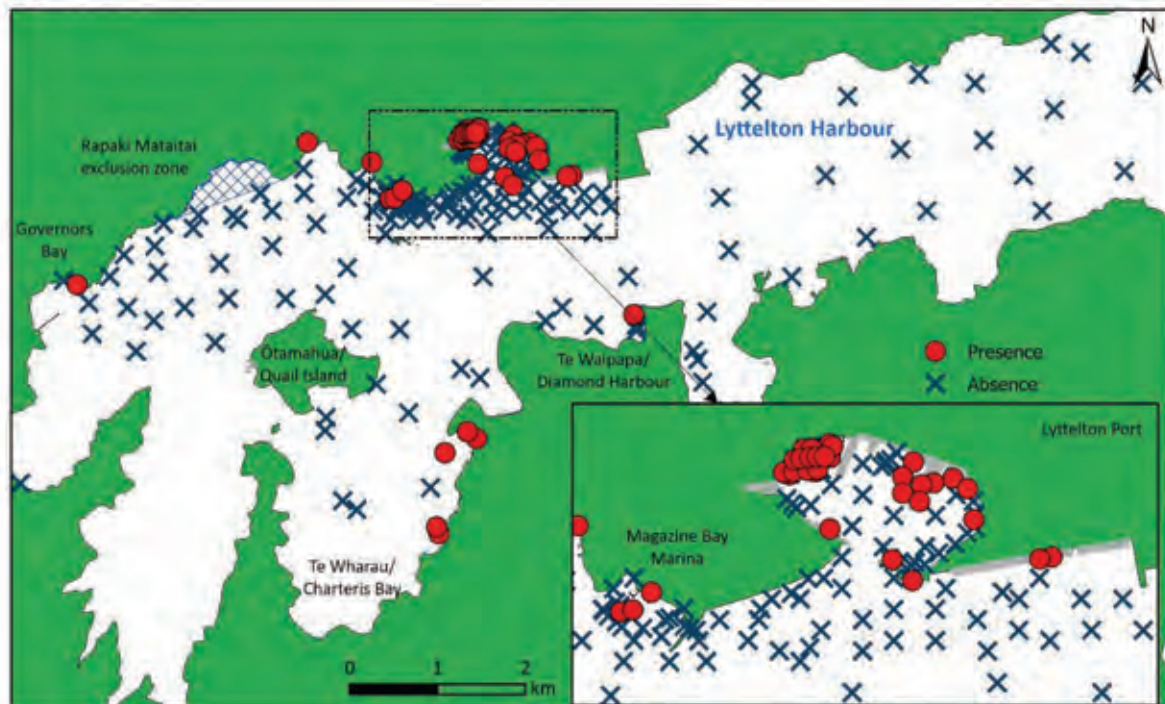
Lyttelton Harbour/ Whakaraupō
 Summer 2023-24
Sabella spallanzanii



Lyttelton Harbour/ Whakaraupō

Winter 2023

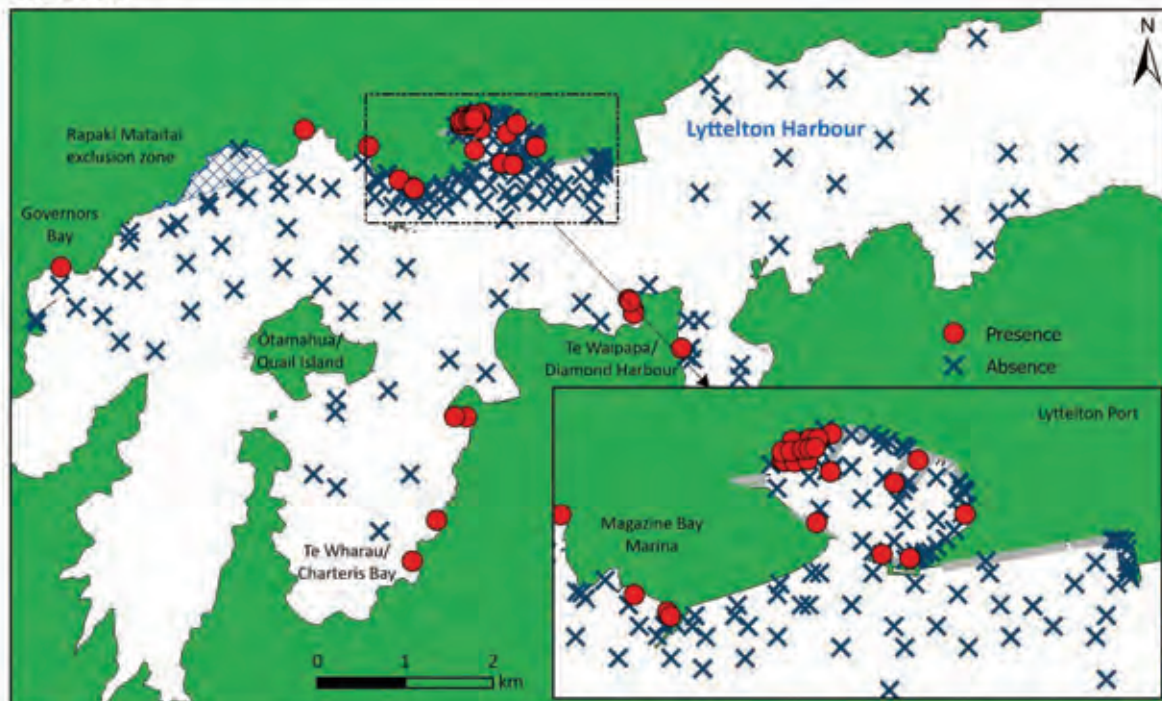
Styela clava



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

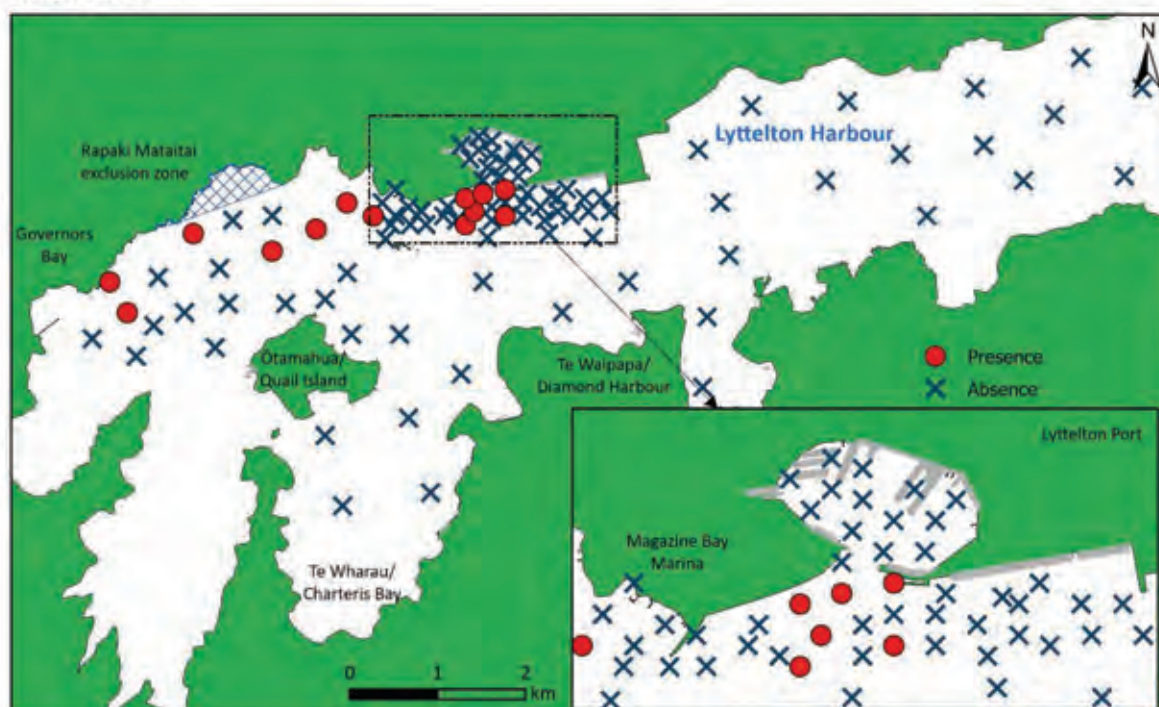
Styela clava



Lyttelton Harbour/ Whakaraupō

Winter 2023

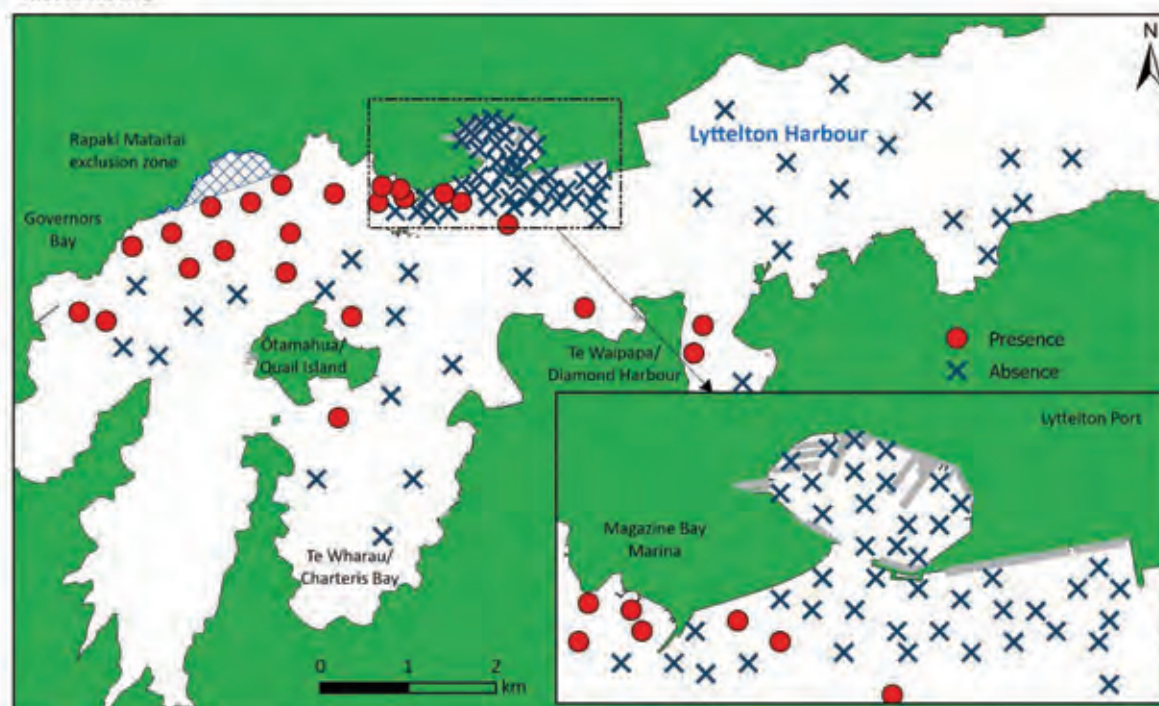
Theora lubrica



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

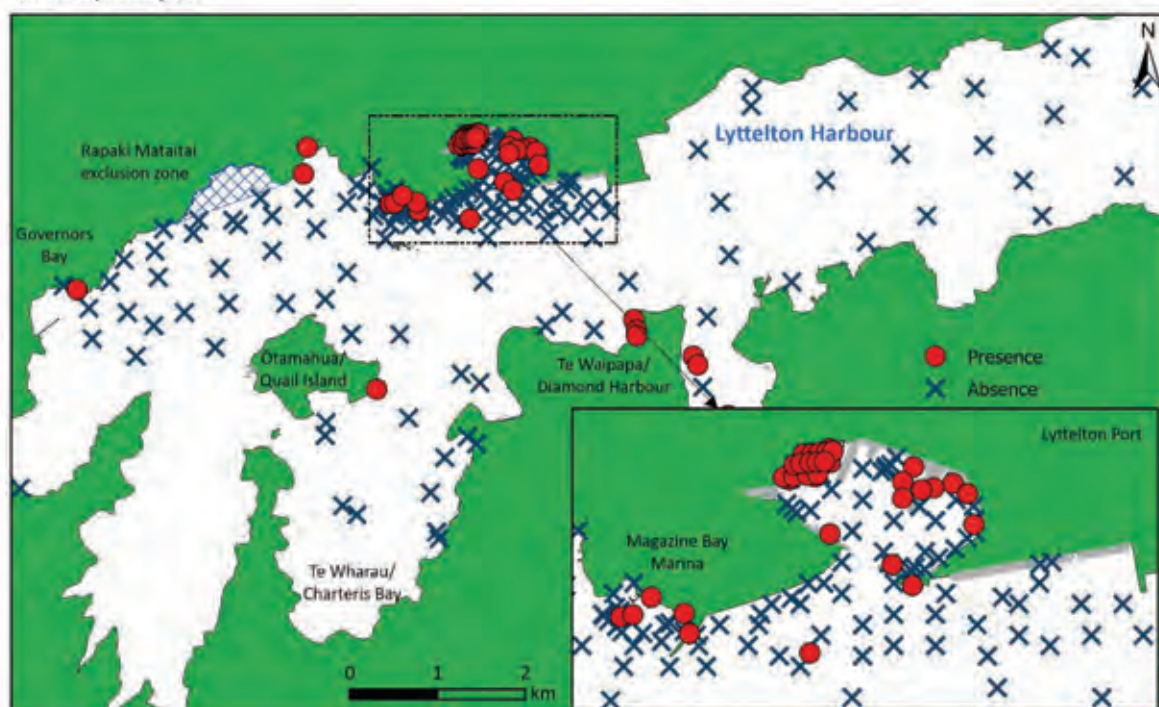
Theora lubrica



Lyttelton Harbour/ Whakaraupō

Winter 2023

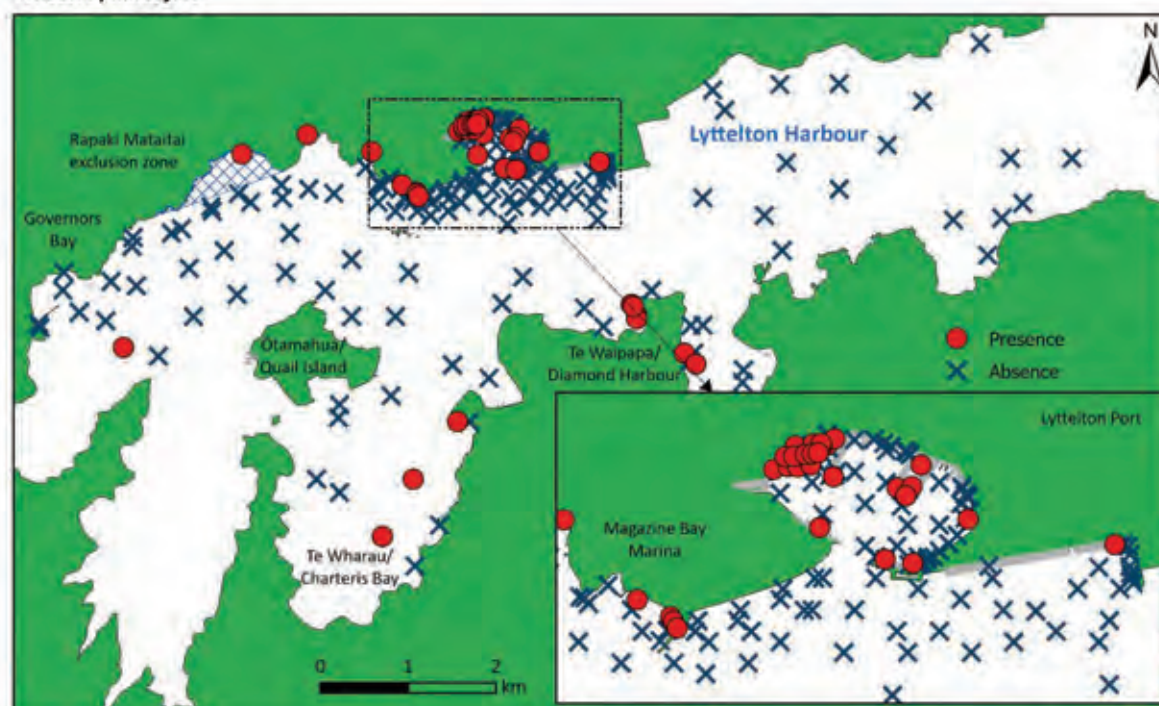
Undaria pinnatifida



Lyttelton Harbour/ Whakaraupō

Summer 2023-24

Undaria pinnatifida



Napier Port and Ahuriri Inner Harbour

Winter 2023

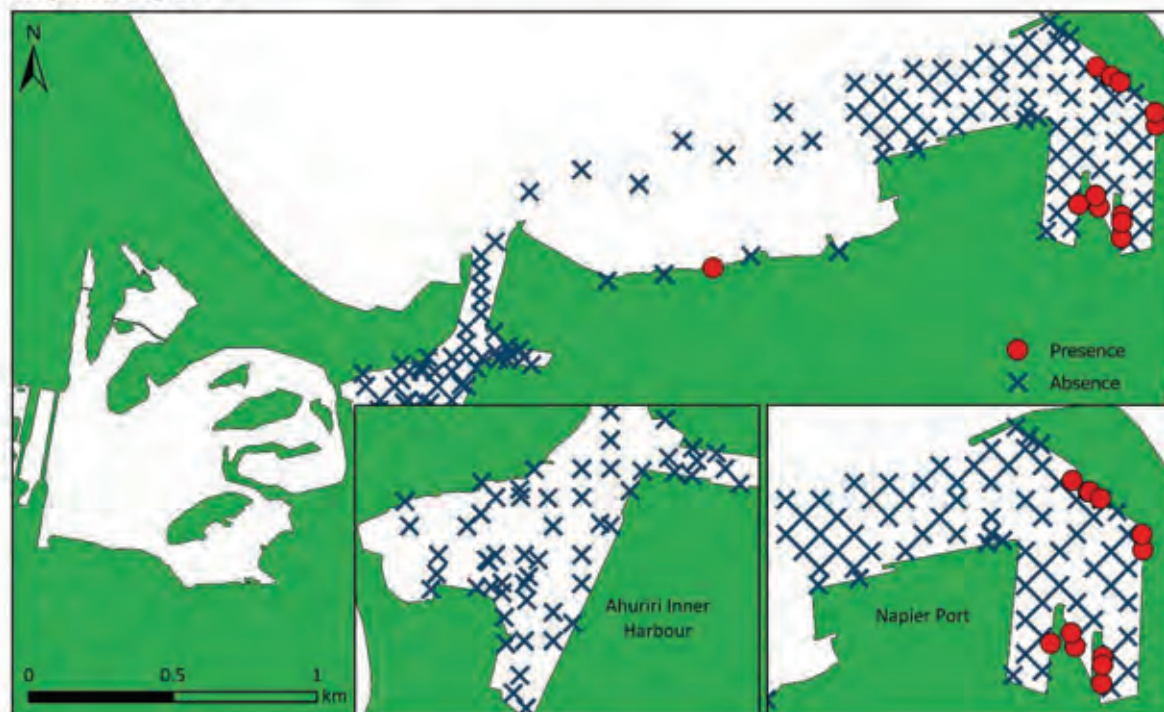
Botrylloides diegensis



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

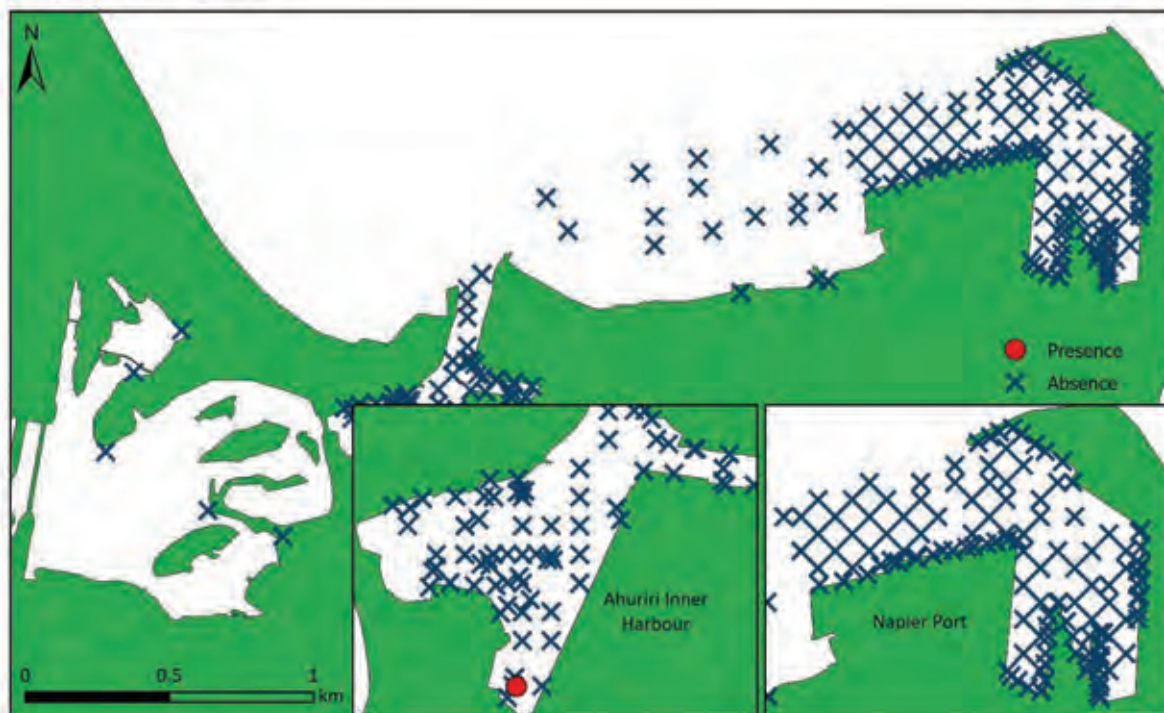
Botrylloides diegensis



Napier Port and Ahuriri Inner Harbour

Winter 2023

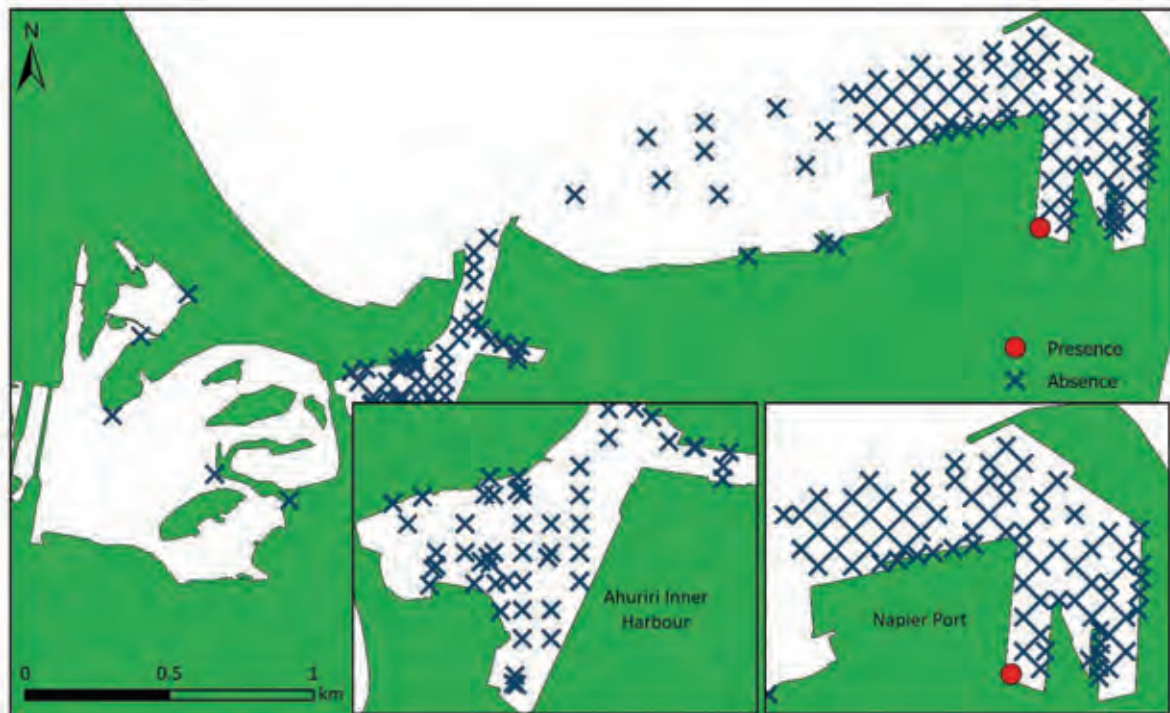
Celleporaria umbonatoidea



Napier Port and Ahuriri Inner Harbour

Winter 2023

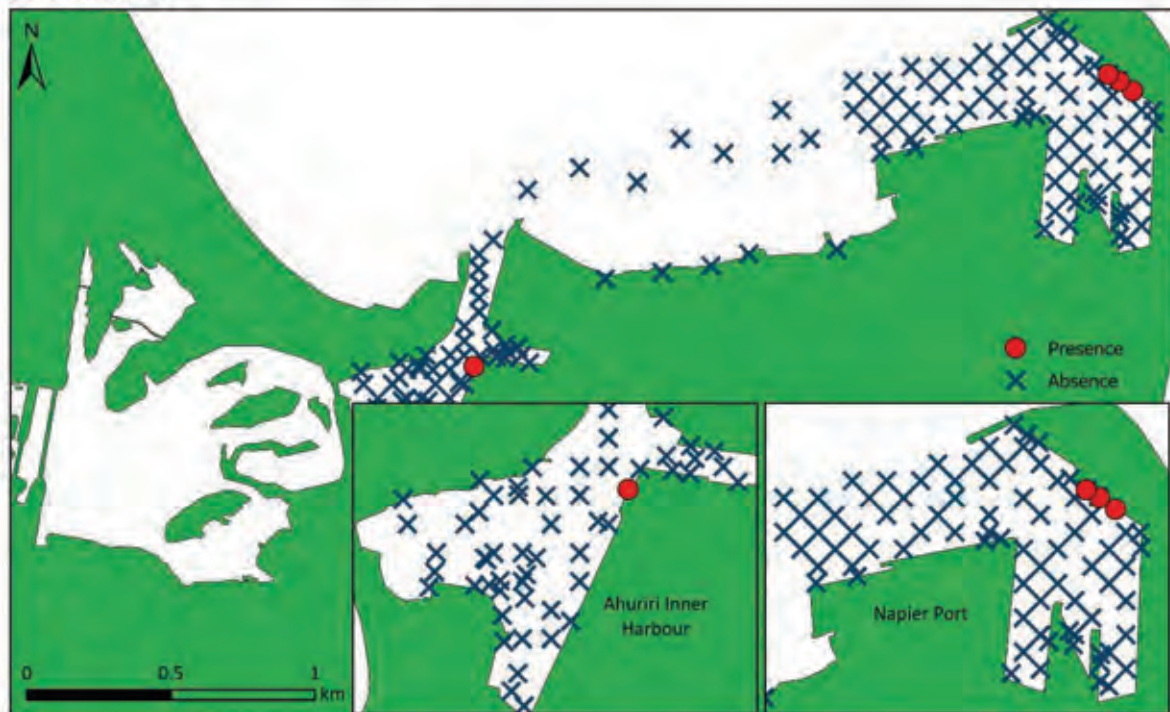
Ciona intestinalis



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

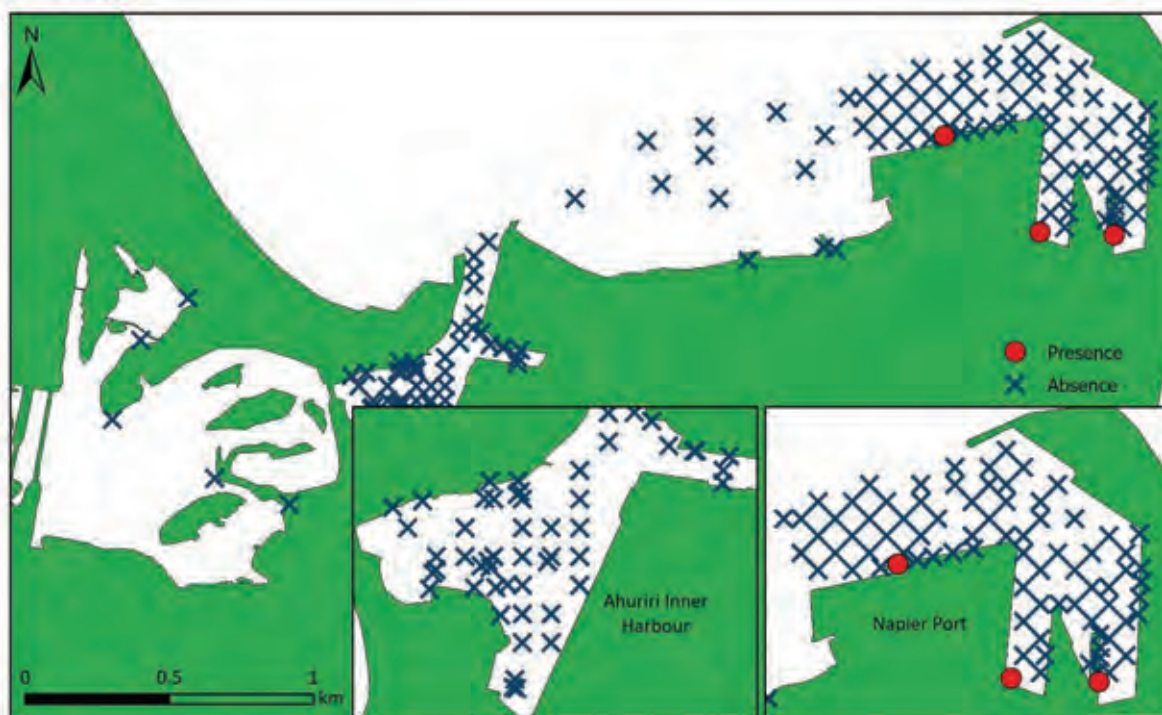
Ciona intestinalis



Napier Port and Ahuriri Inner Harbour

Winter 2023

Ciona savignyi



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

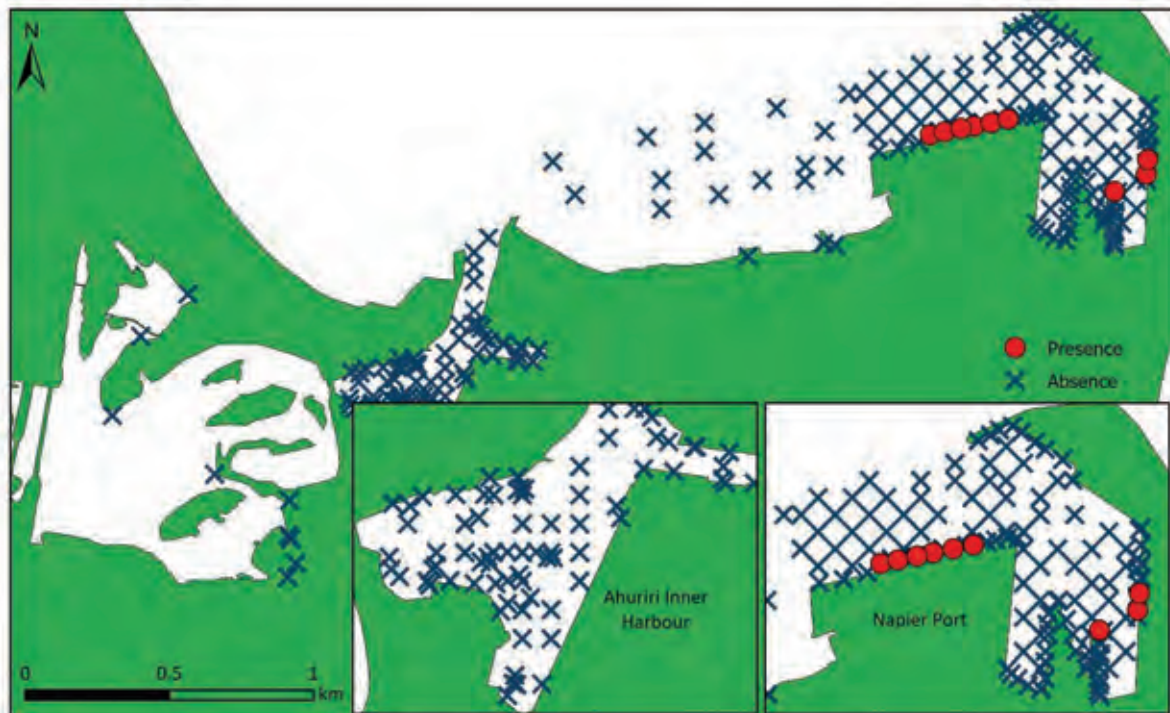
Ciona savignyi



Napier Port and Ahuriri Inner Harbour

Winter 2023

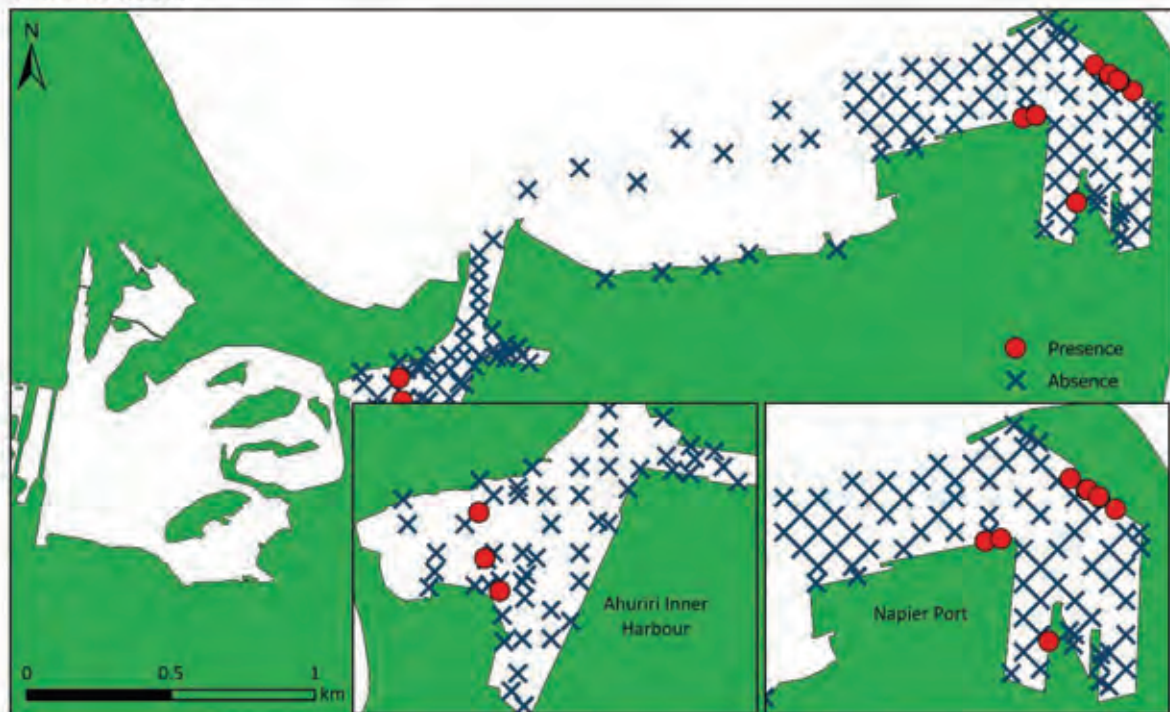
Didemnum vexillum



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

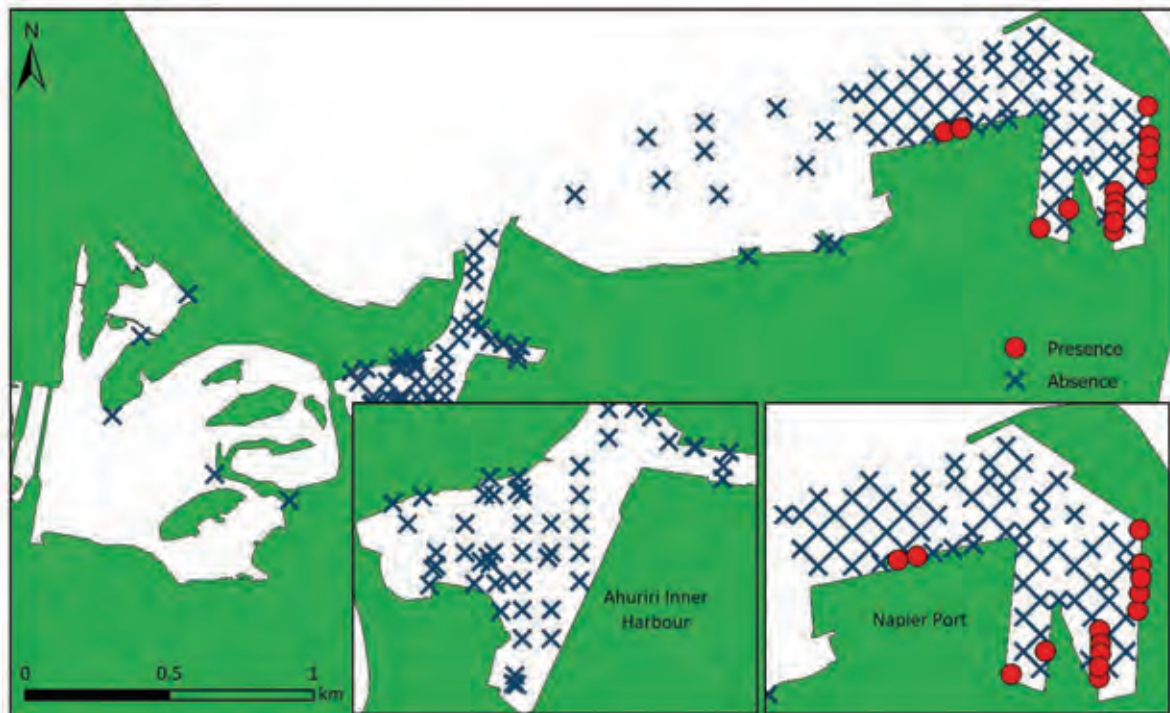
Didemnum vexillum



Napier Port and Ahuriri Inner Harbour

Winter 2023

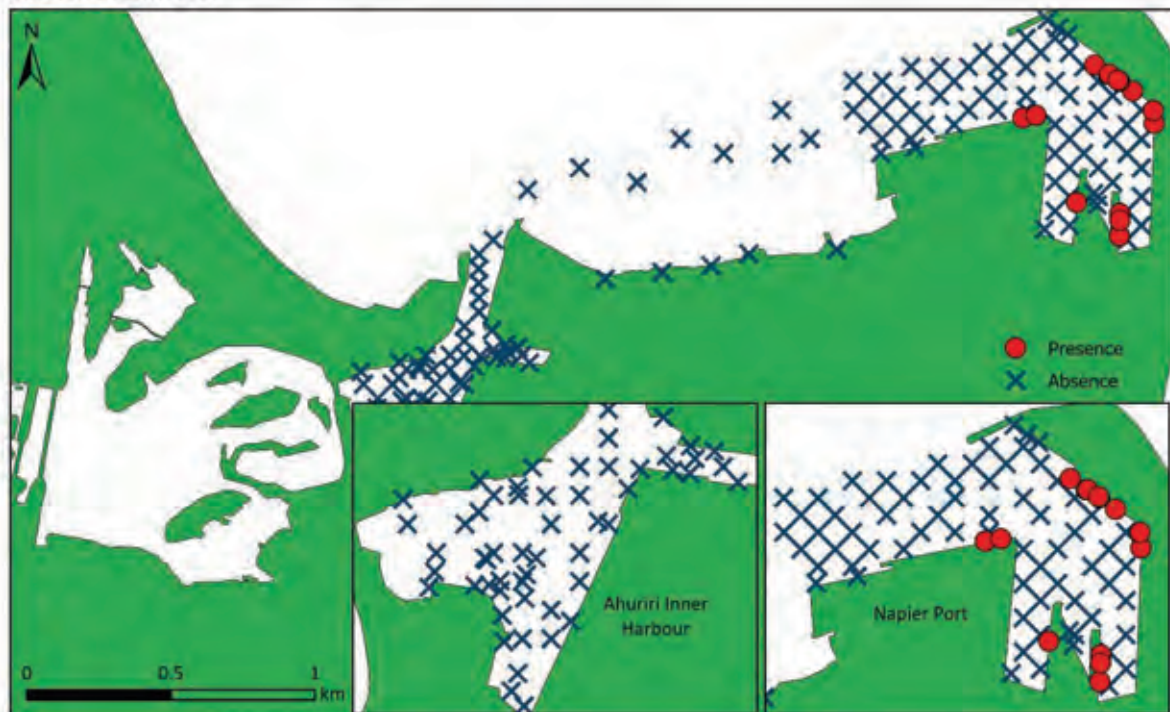
Diplosoma listerianum



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

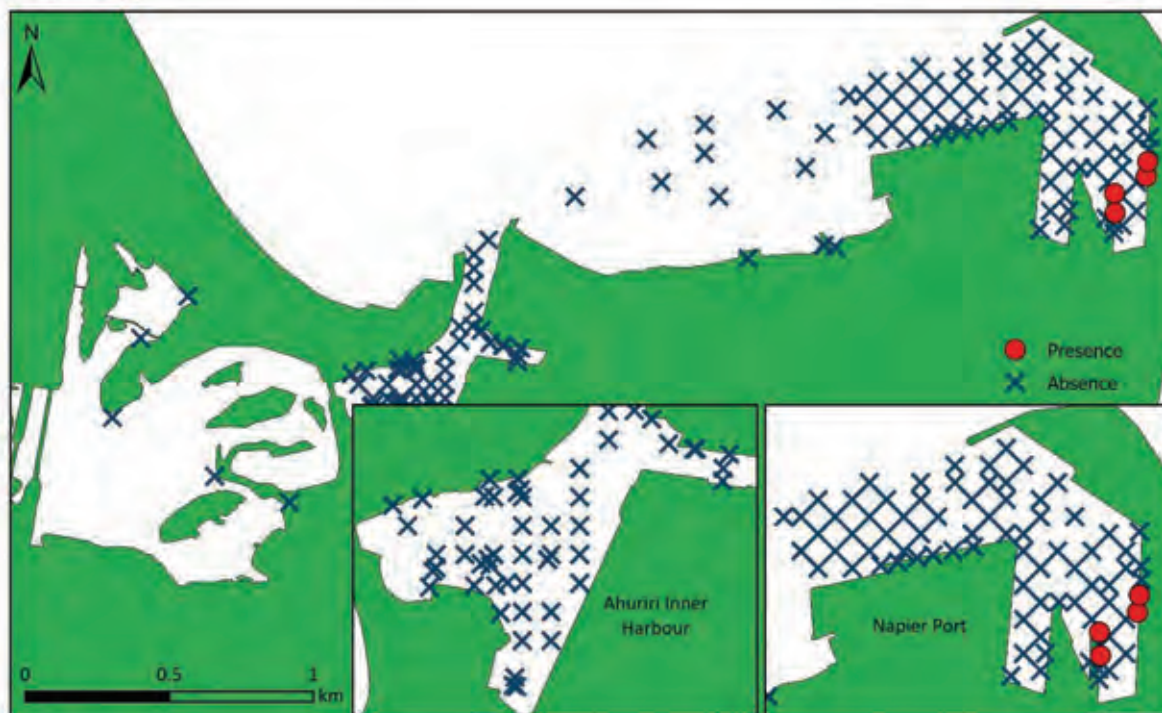
Diplosoma listerianum



Napier Port and Ahuriri Inner Harbour

Winter 2023

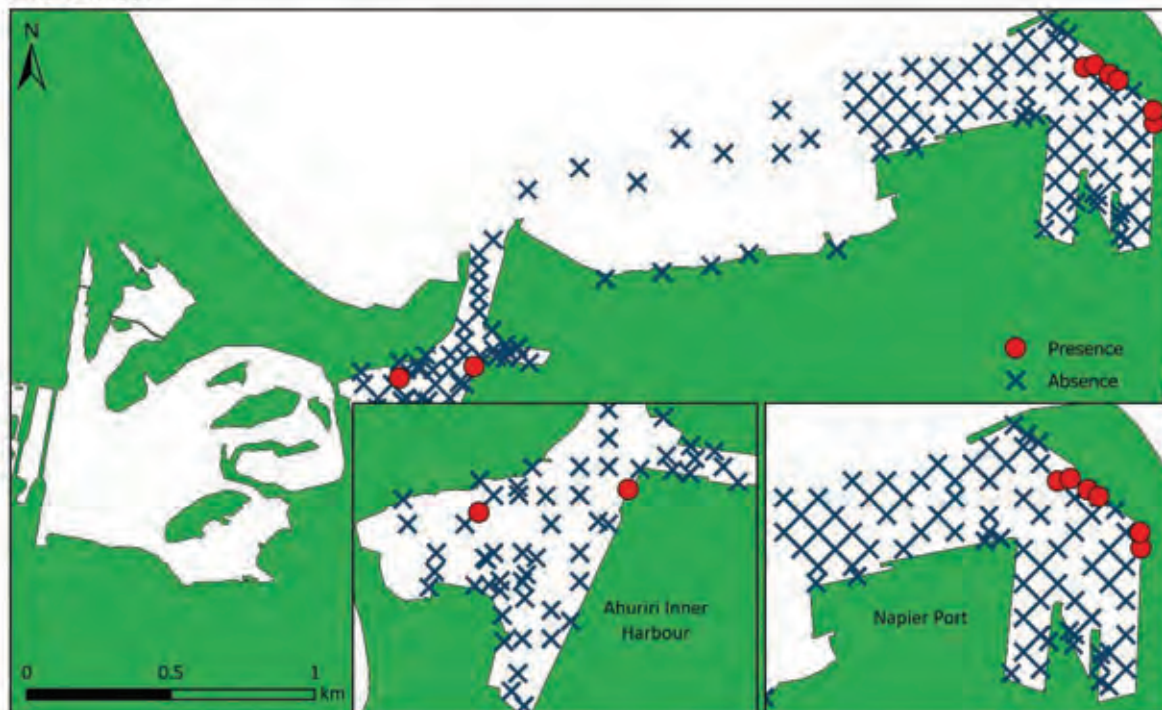
Ectopleura spp.



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

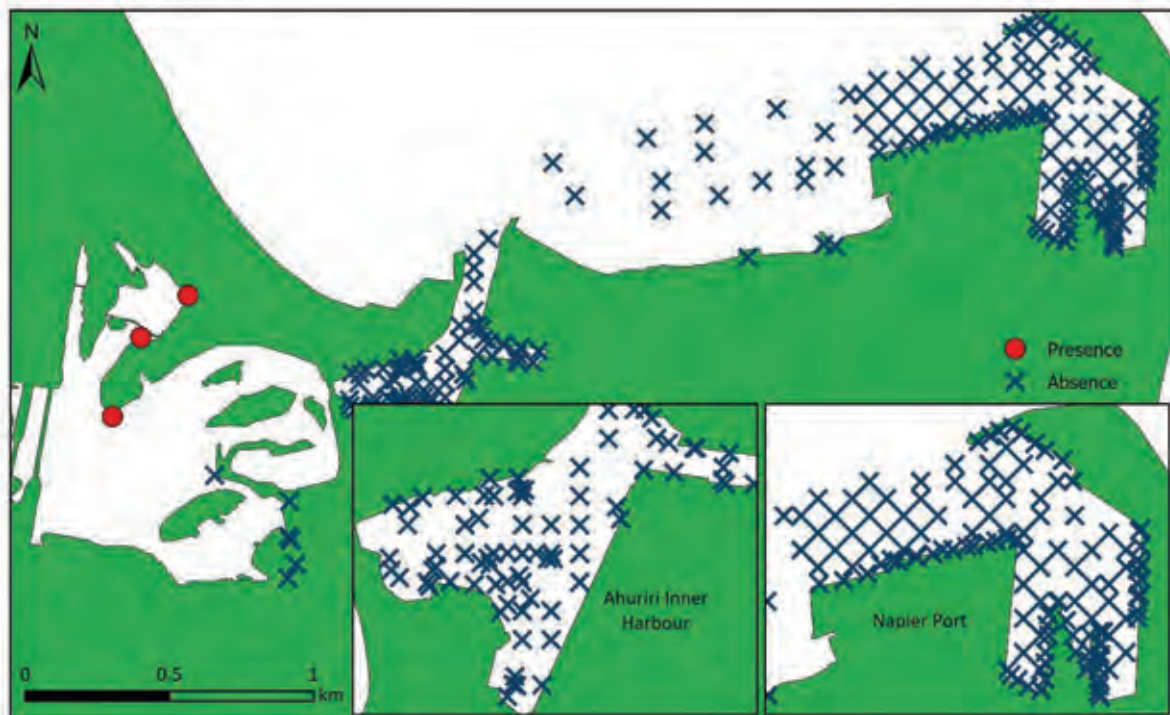
Ectopleura spp.



Napier Port and Ahuriri Inner Harbour

Winter 2023

Ficopomatus enigmaticus



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

Ficopomatus enigmaticus



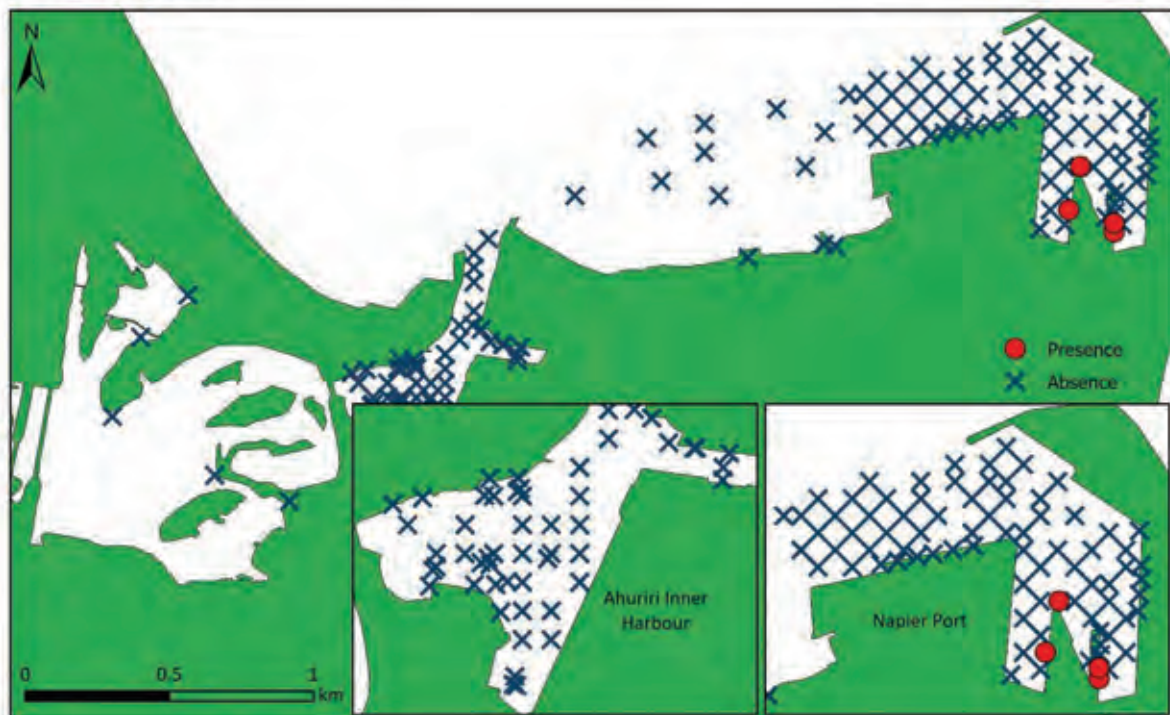
Napier Port and Ahuriri Inner Harbour

Winter 2023

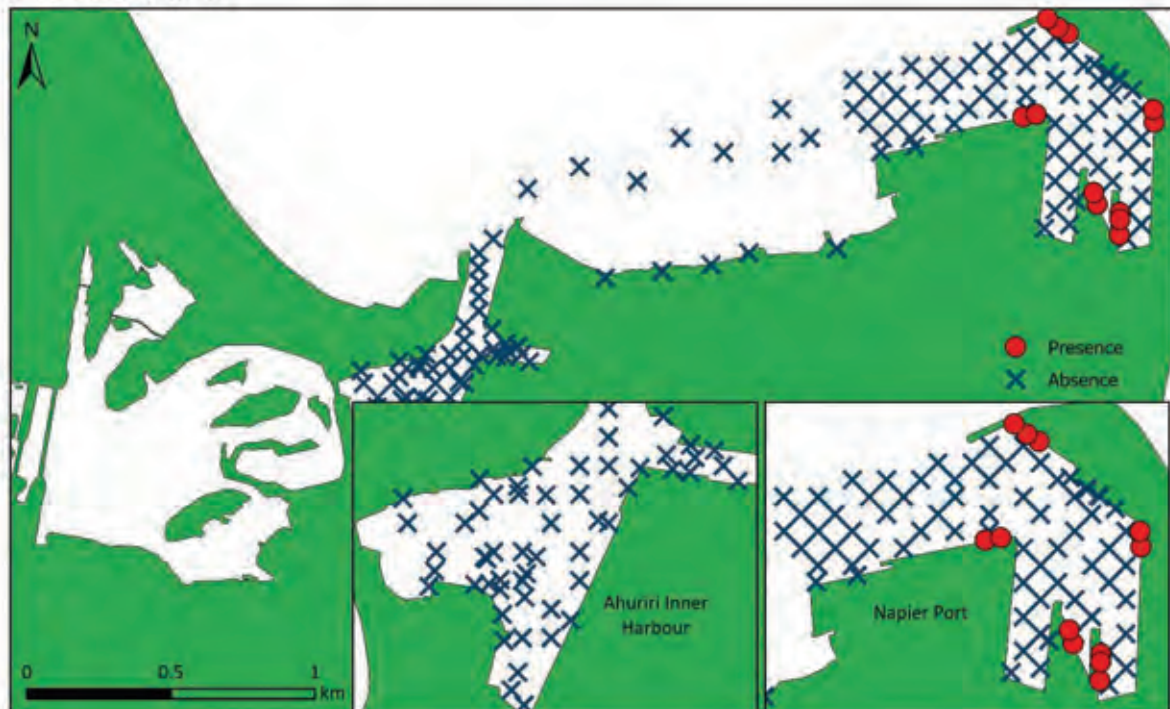
Grateloupia turuturu



Napier Port and Ahuriri Inner Harbour
 Winter 2023
Lissoclinum perforatum



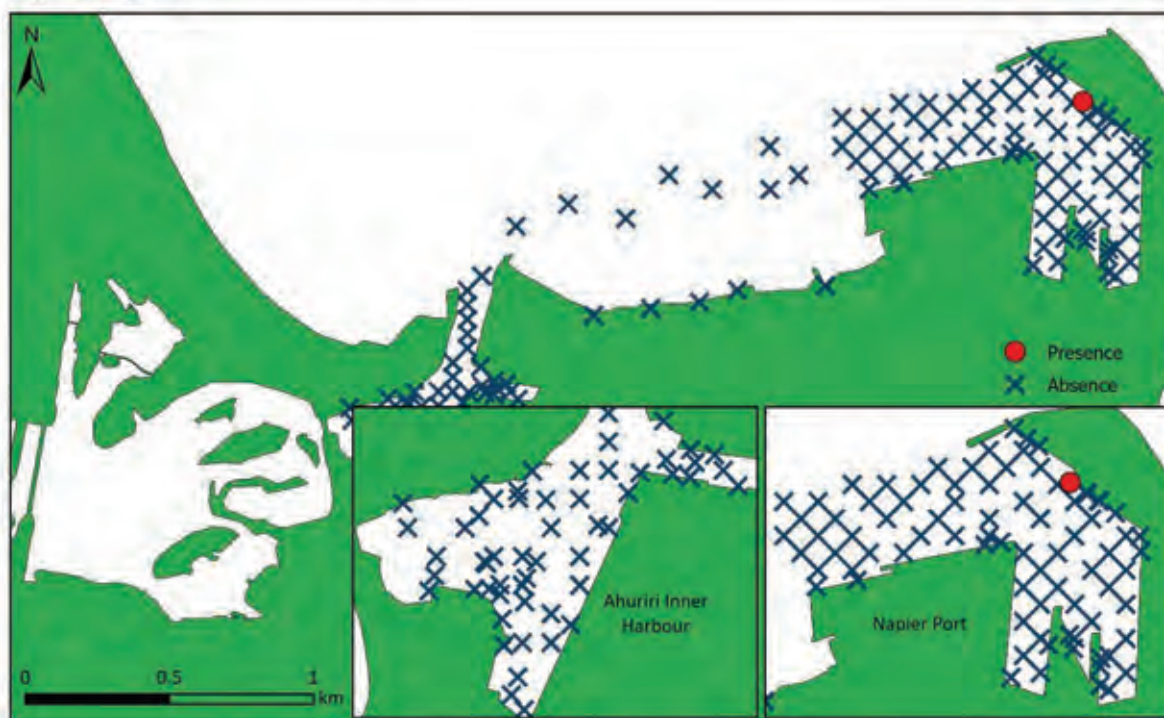
Napier Port and Ahuriri Inner Harbour
 Summer 2023-24
Lissoclinum perforatum



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

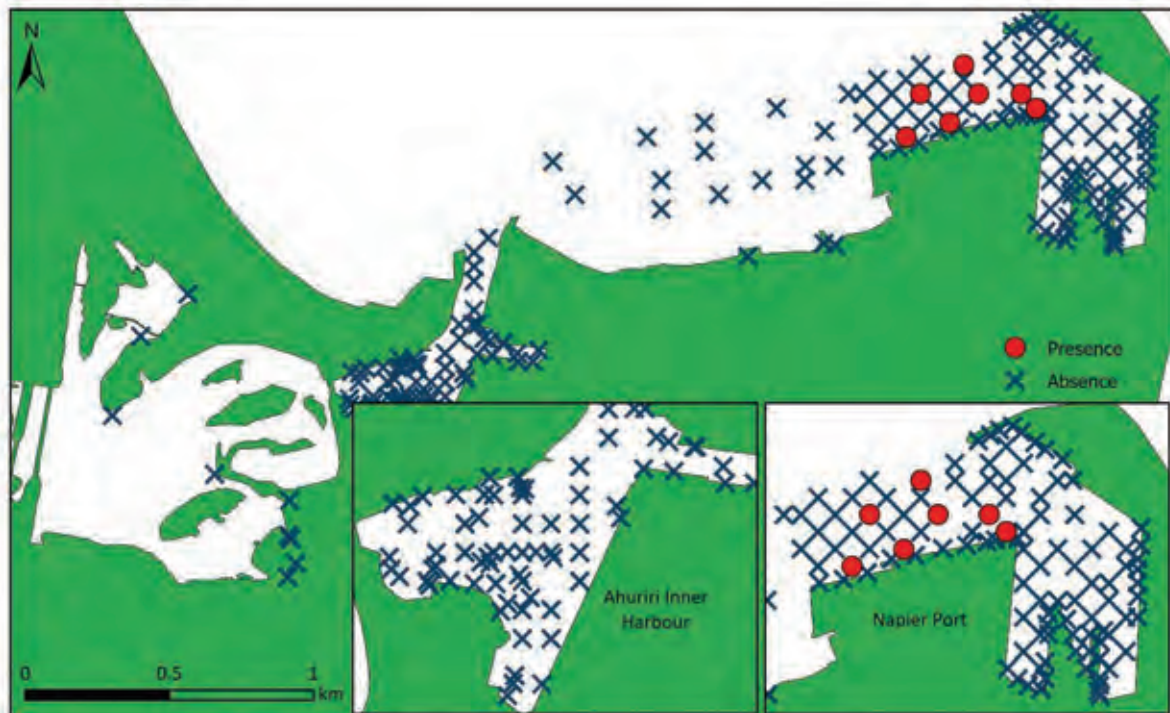
Polycera hedgpethi



Napier Port and Ahuriri Inner Harbour

Winter 2023

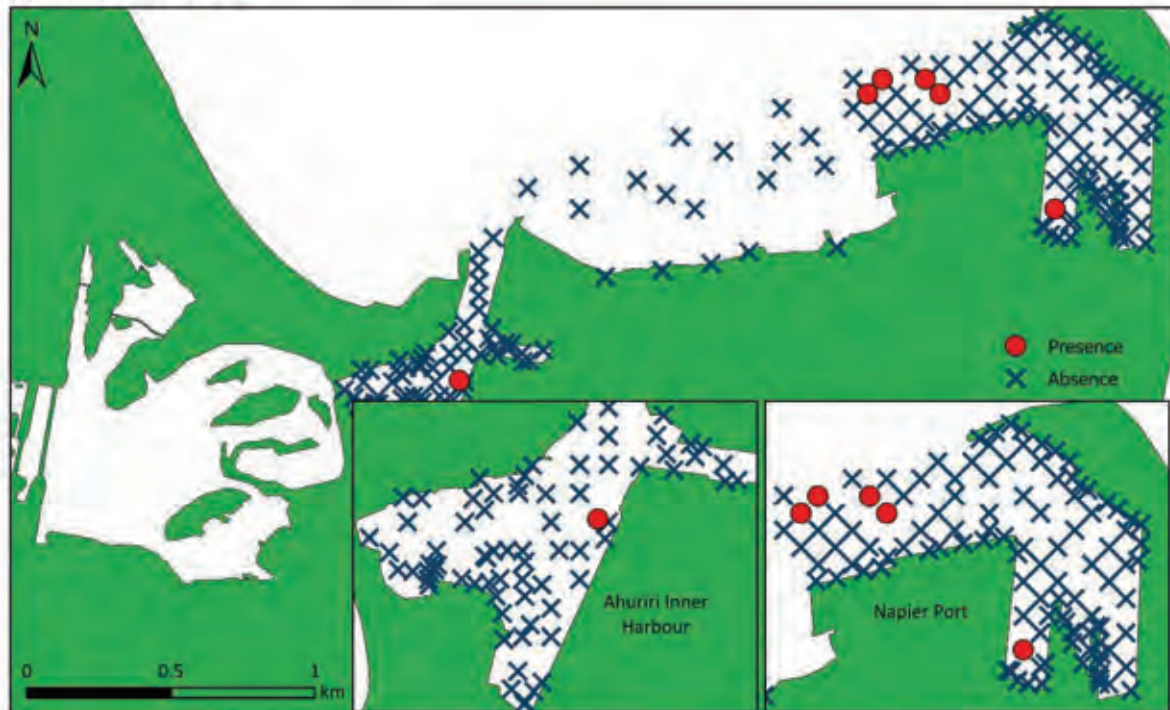
Pyromaia tuberculata



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

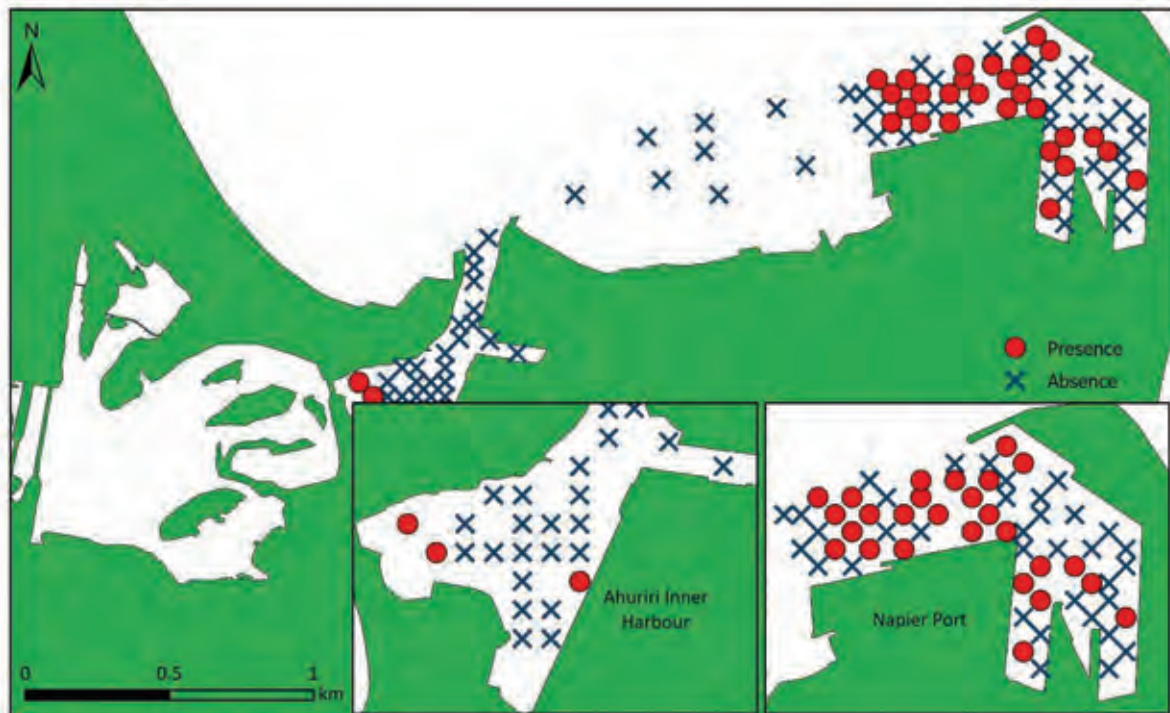
Pyromaia tuberculata



Napier Port and Ahuriri Inner Harbour

Winter 2023

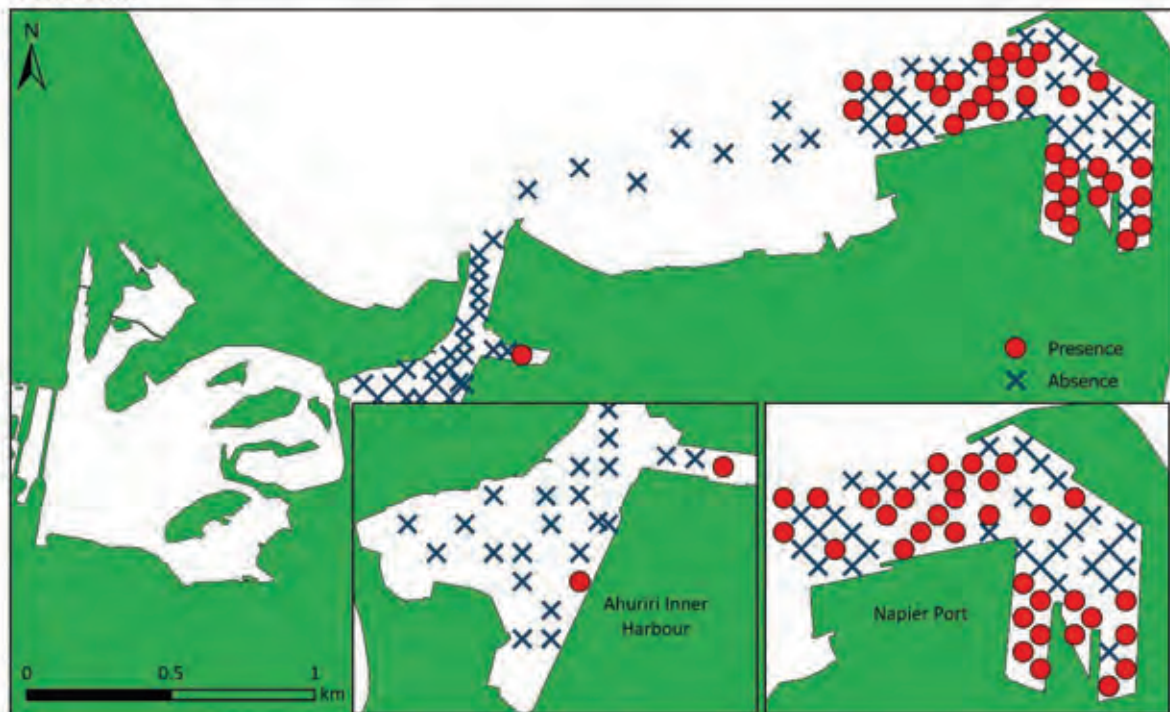
Theora lubrica



Napier Port and Ahuriri Inner Harbour

Summer 2023-24

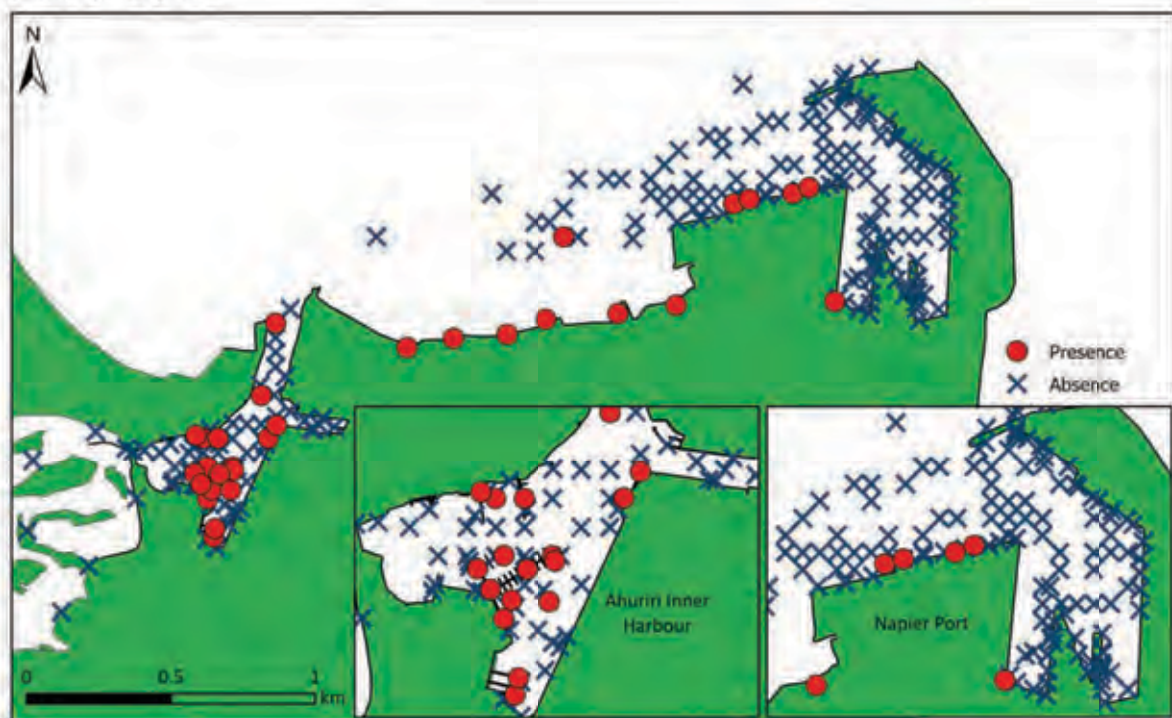
Theora lubrica



Napier Port and Ahuriri Inner Harbour

Winter 2022

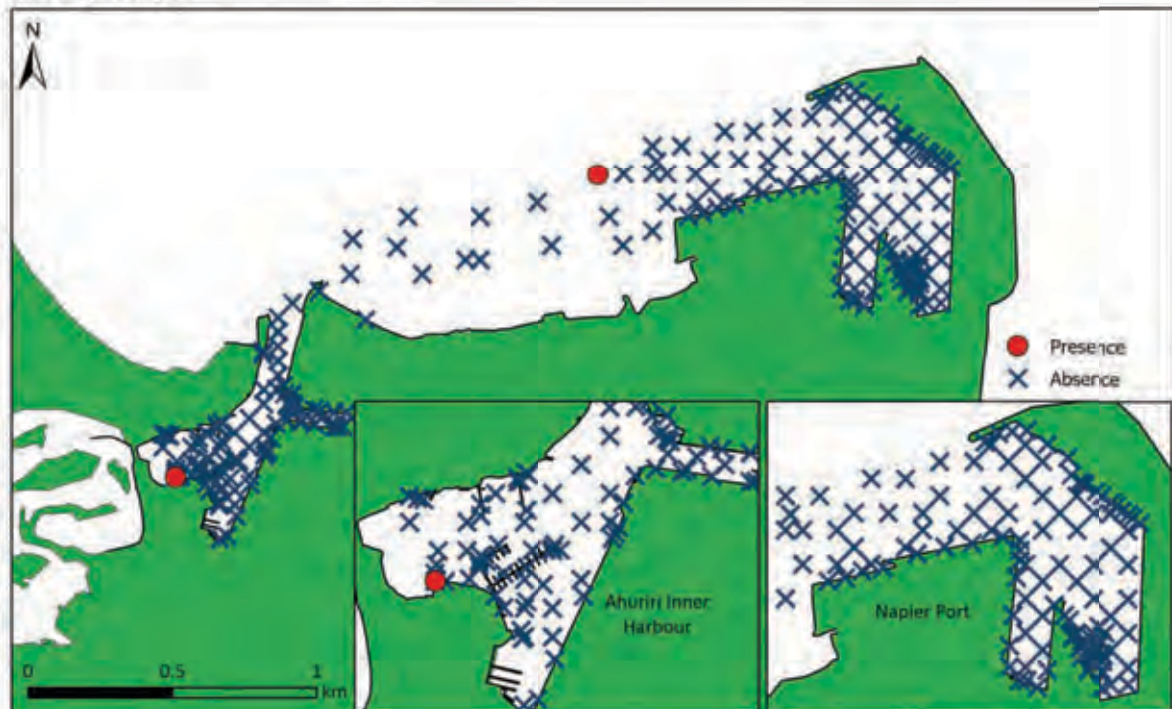
Undaria pinnatifida



Napier Port and Ahuriri Inner Harbour

Summer 2022-23

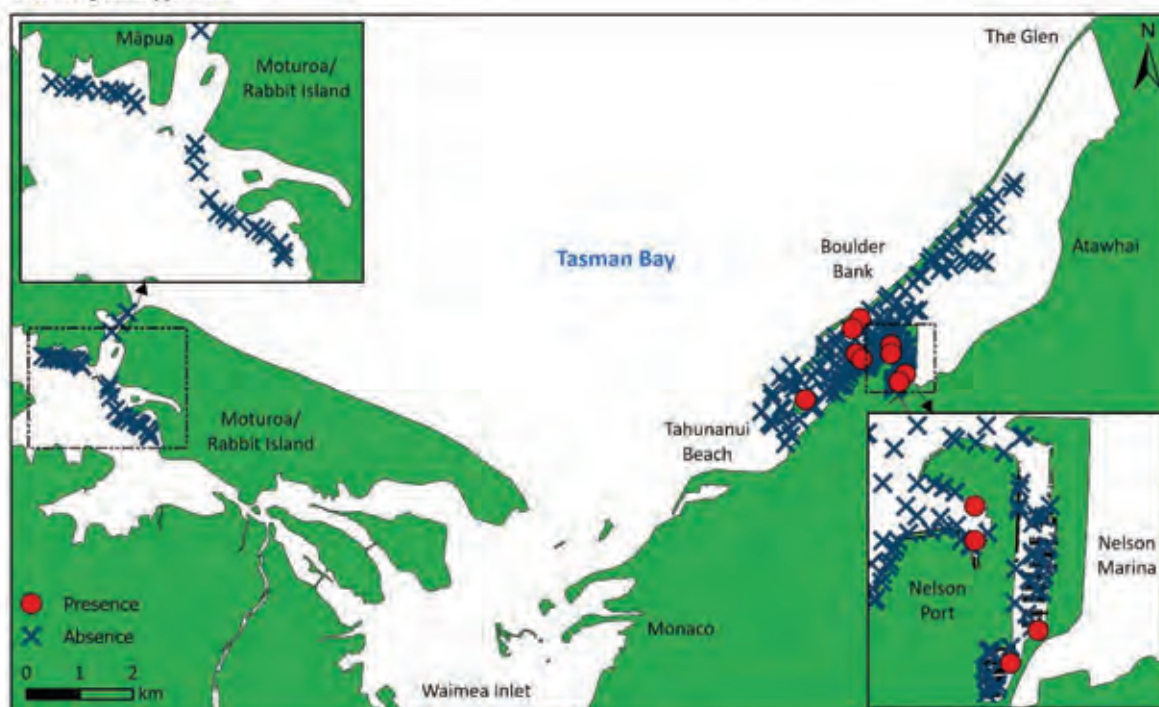
Undaria pinnatifida



Nelson Harbour and Waimea Inlet

Winter 2023

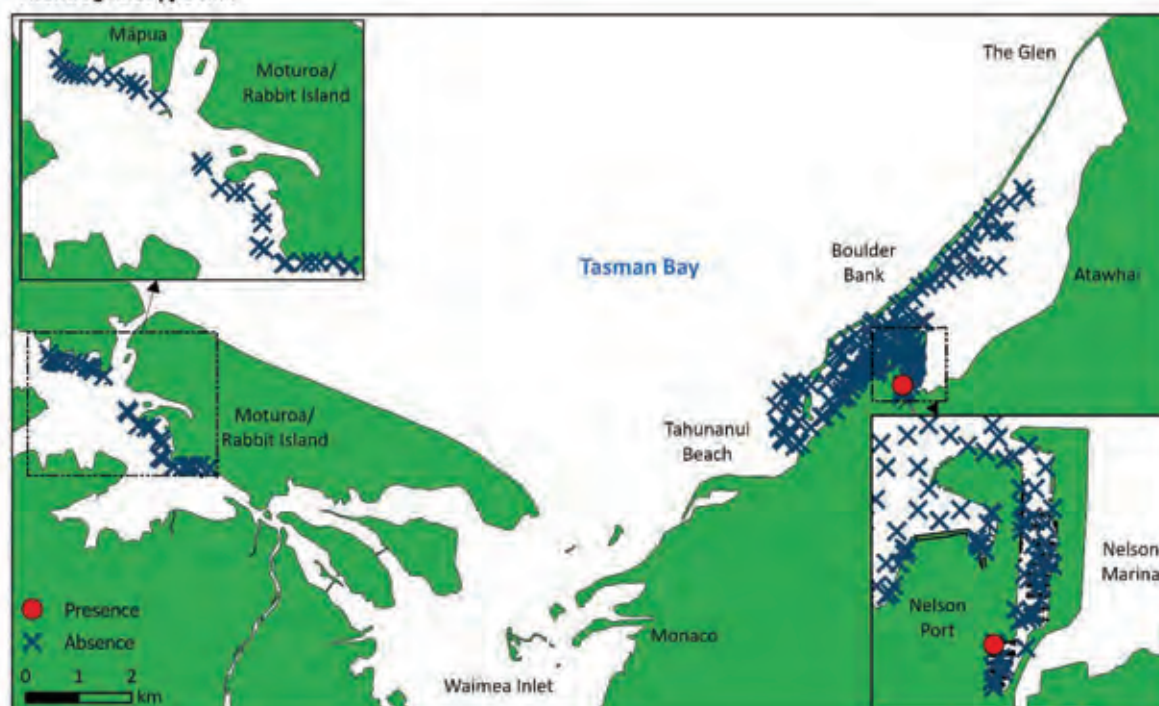
Acentrogobius pflaumii



Nelson Harbour and Waimea Inlet

Summer 2023-24

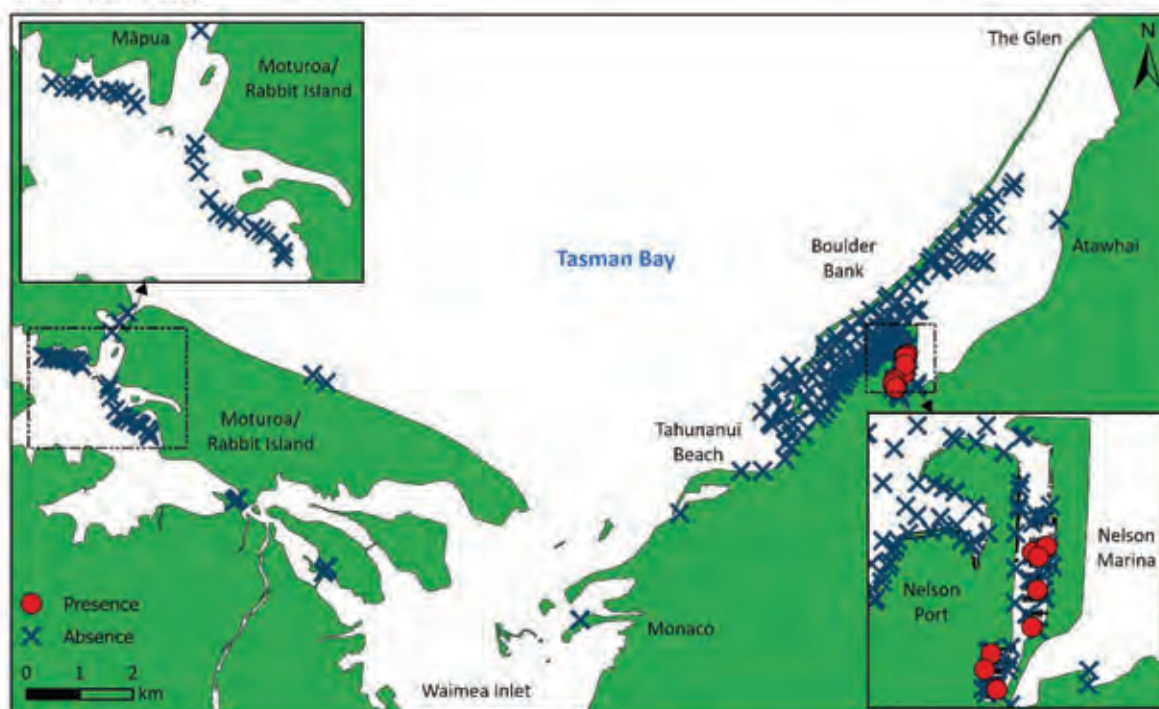
Acentrogobius pflaumii



Nelson Harbour and Waimea Inlet

Winter 2023

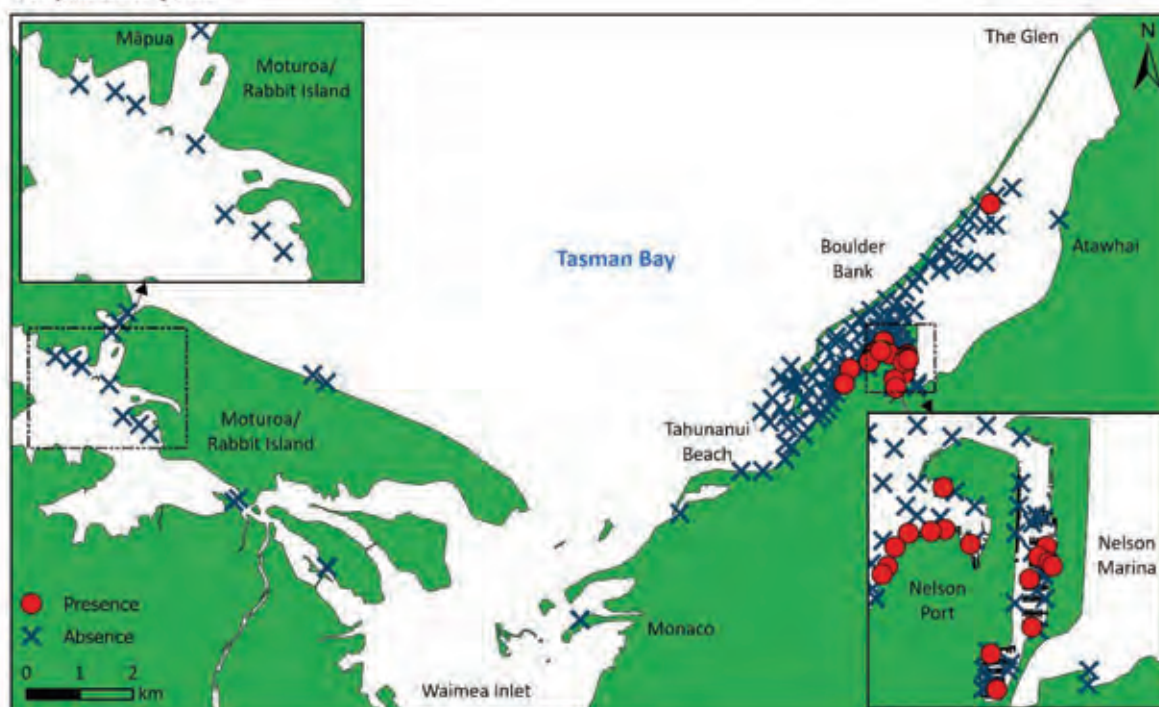
Amathia verticillata



Nelson Harbour and Waimea Inlet

Winter 2023

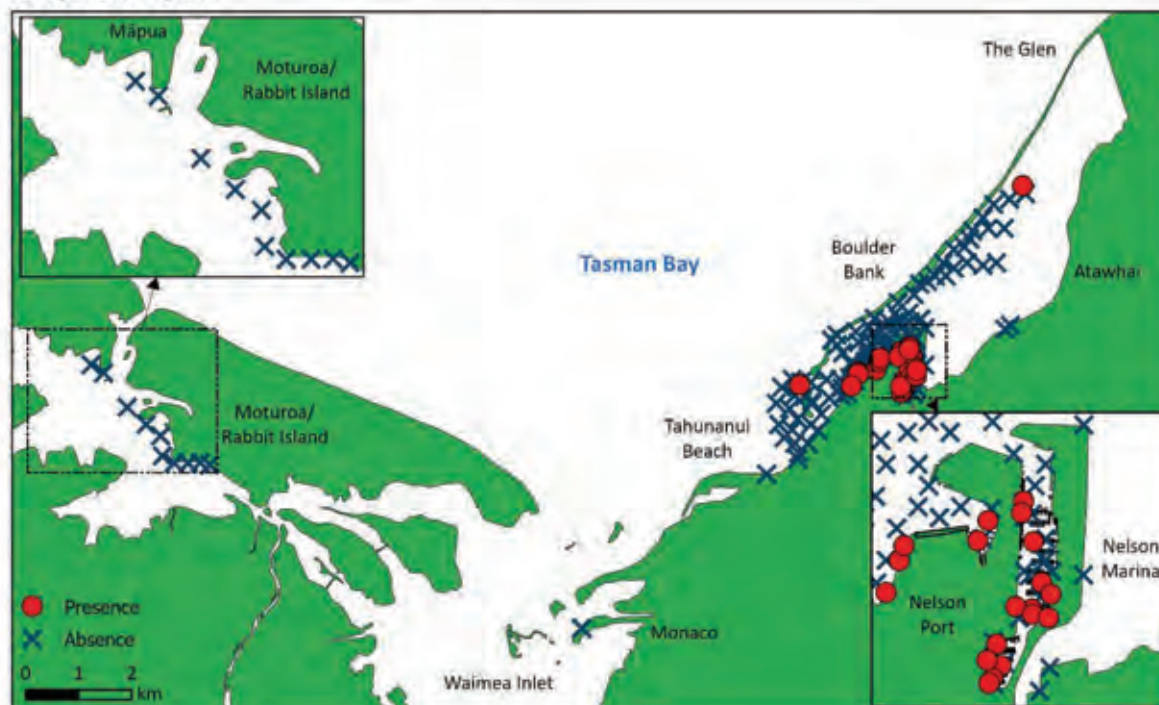
Botrylloides diegensis



Nelson Harbour and Waimea Inlet

Summer 2023-24

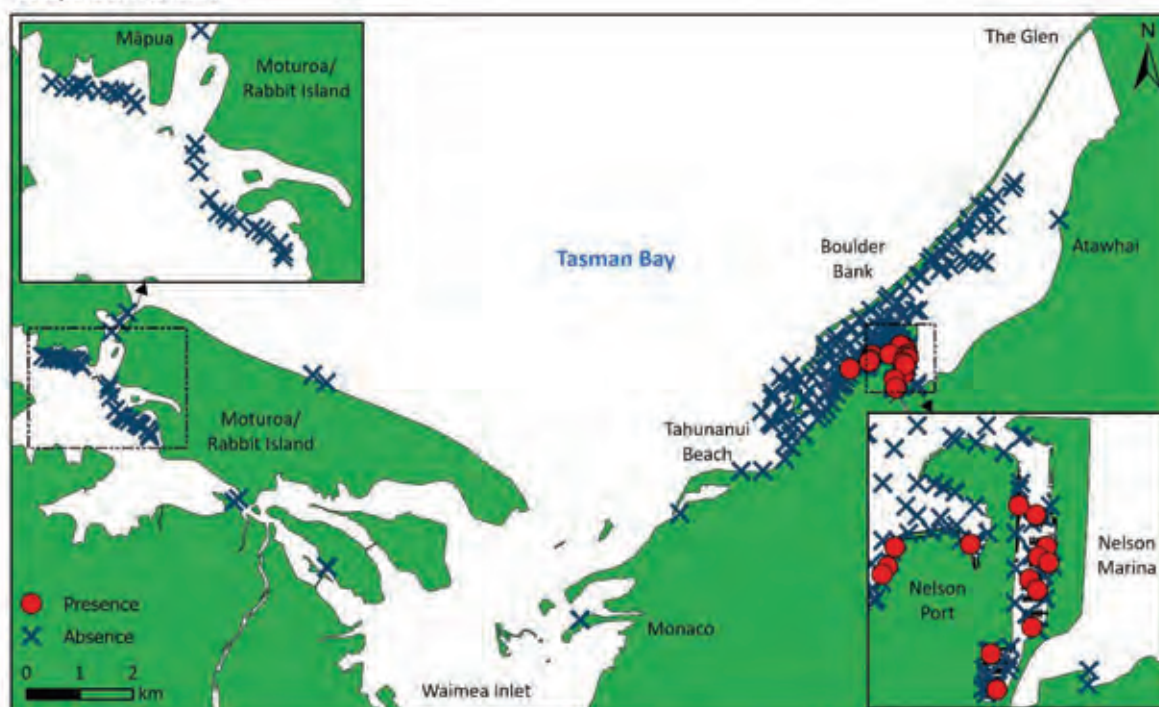
Botrylloides diegensis



Nelson Harbour and Waimea Inlet

Winter 2023

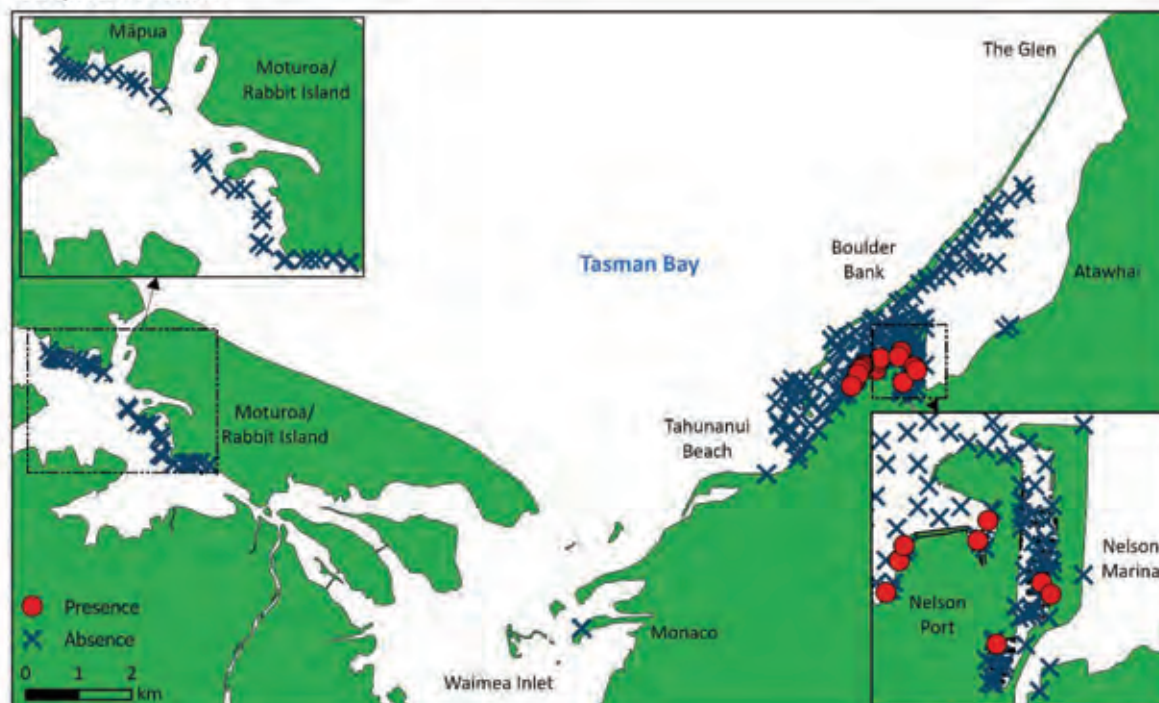
Celleporaria nodulosa



Nelson Harbour and Waimea Inlet

Summer 2023-24

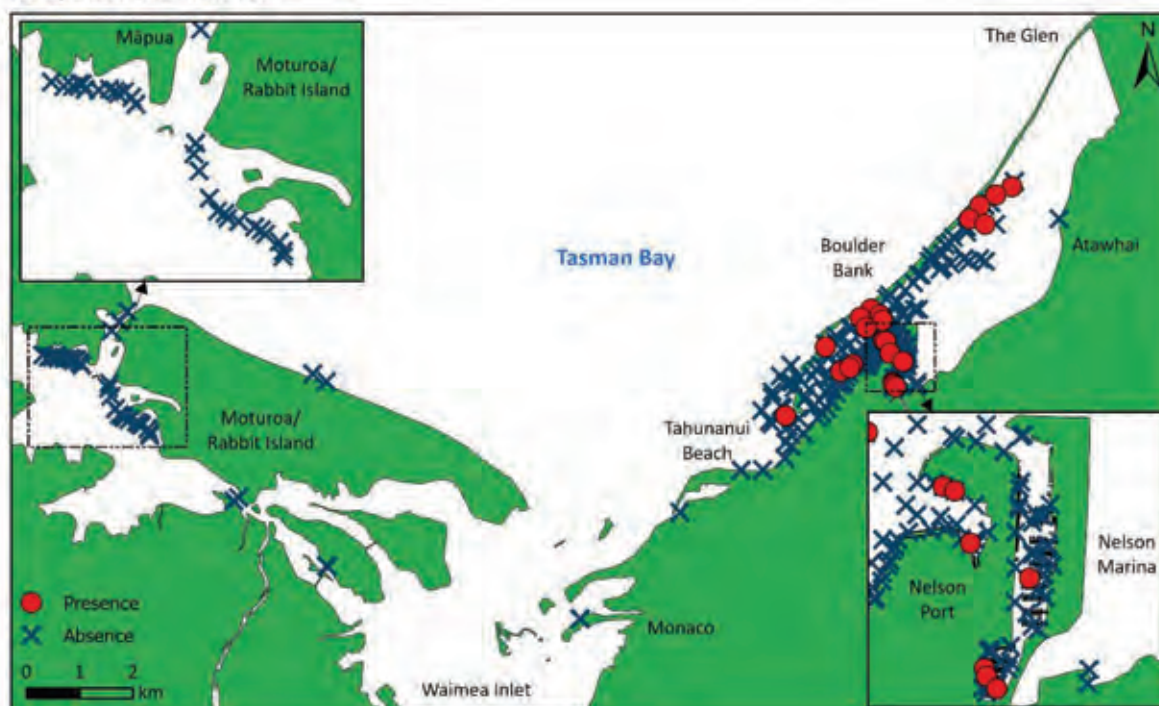
Celleporaria nodulosa



Nelson Harbour and Waimea Inlet

Winter 2023

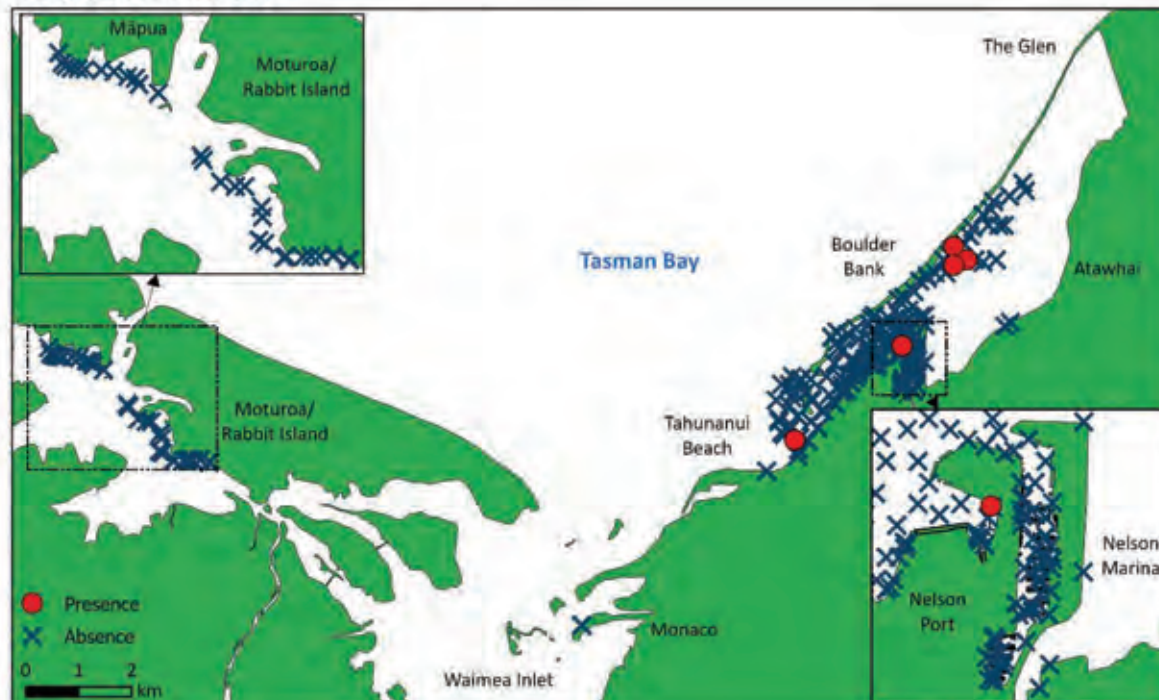
Celleporaria umbonatoidea



Nelson Harbour and Waimea Inlet

Summer 2023-24

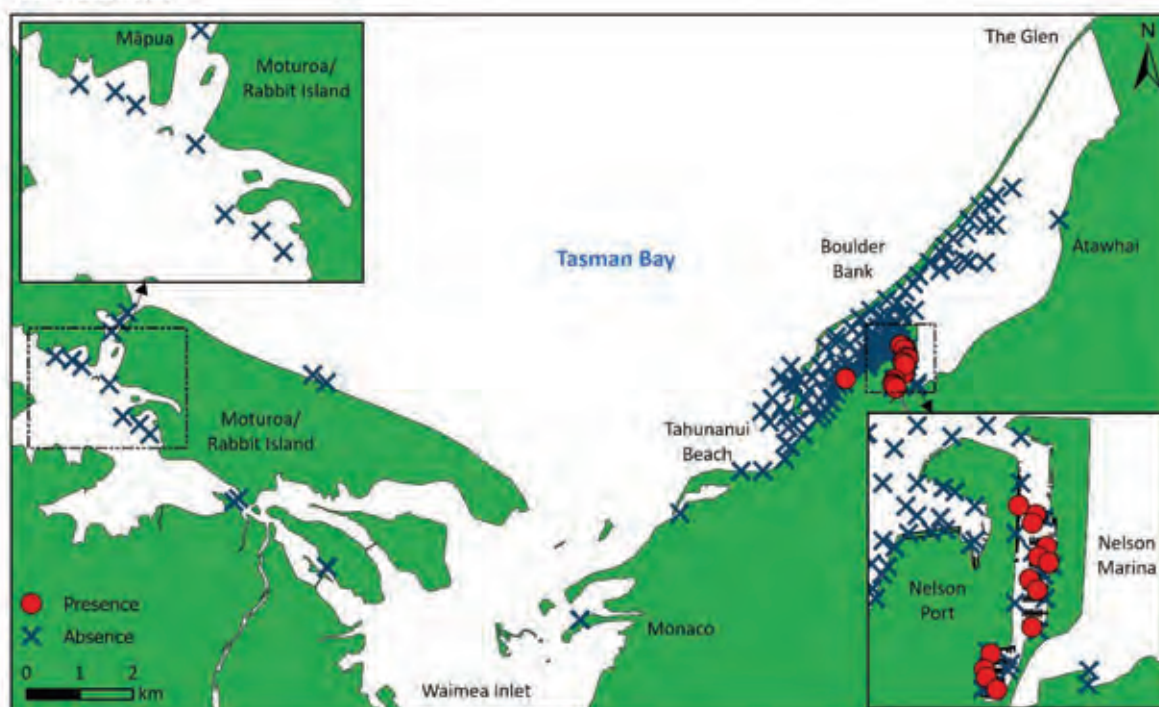
Celleporaria umbonatoidea



Nelson Harbour and Waimea Inlet

Winter 2023

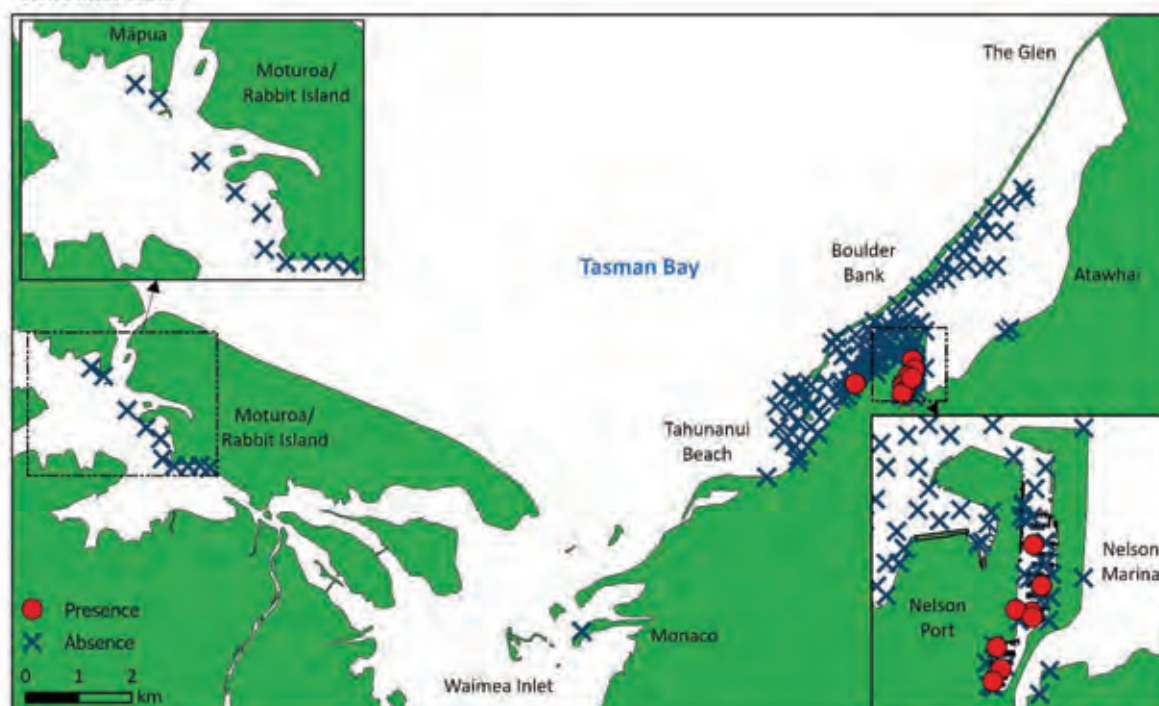
Ciona intestinalis



Nelson Harbour and Waimea Inlet

Summer 2023-24

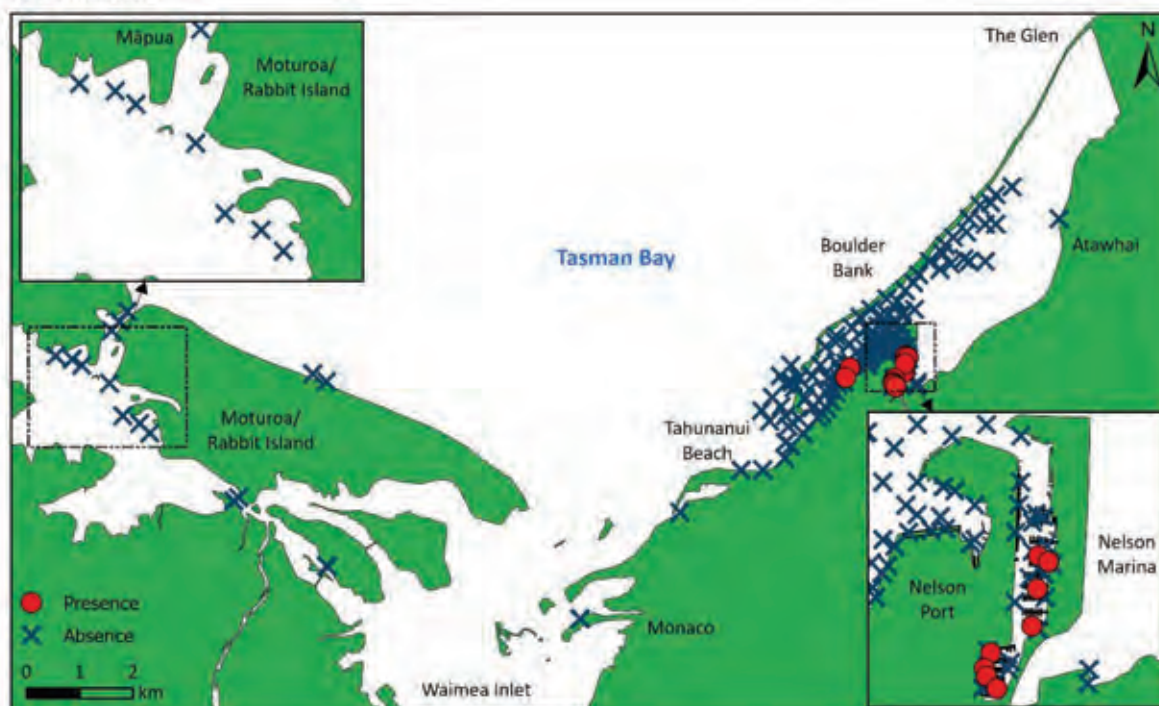
Ciona intestinalis



Nelson Harbour and Waimea Inlet

Winter 2023

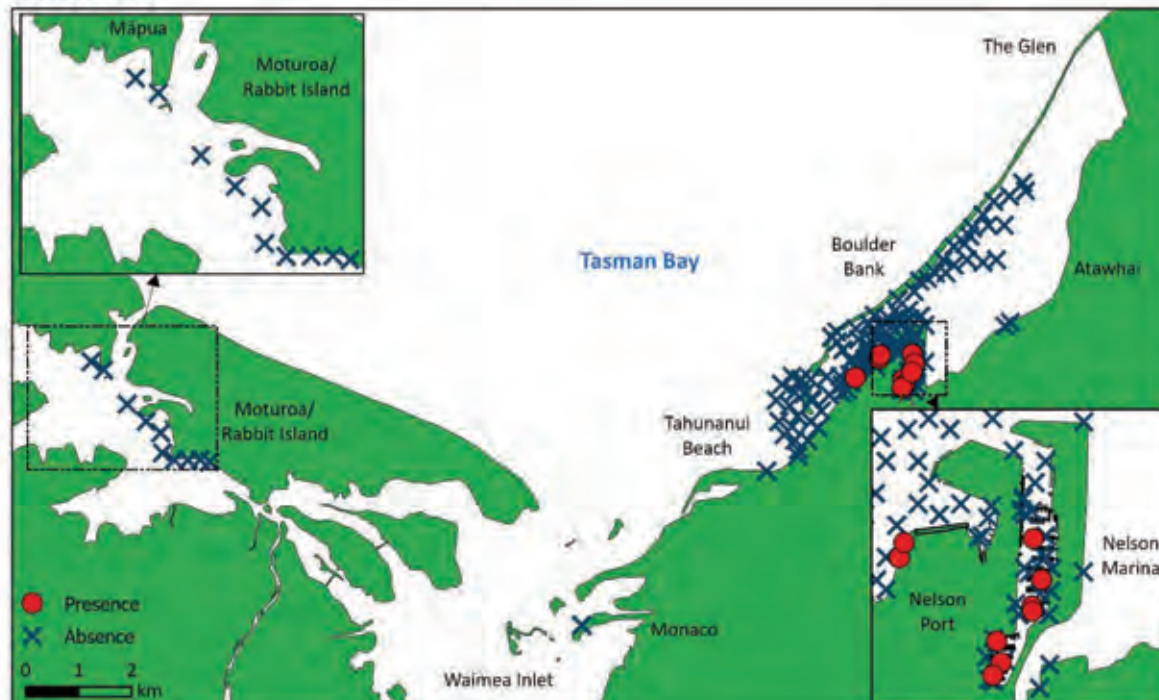
Ciona robusta



Nelson Harbour and Waimea Inlet

Summer 2023-24

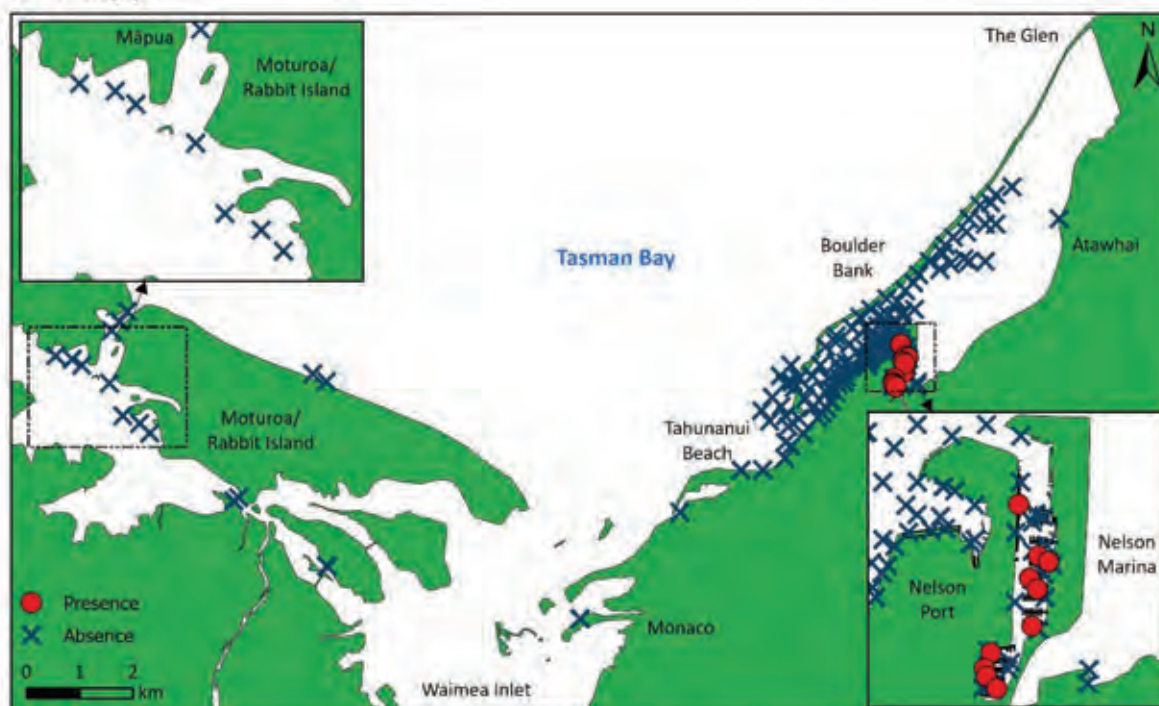
Ciona robusta



Nelson Harbour and Waimea Inlet

Winter 2023

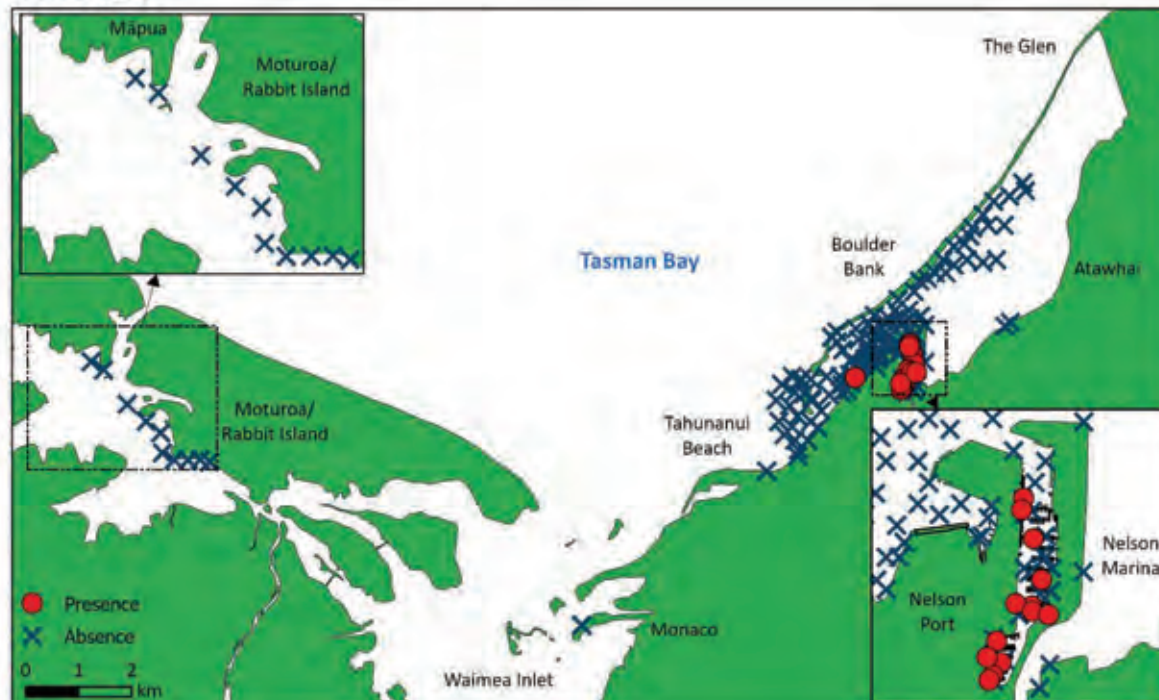
Ciona savignyi



Nelson Harbour and Waimea Inlet

Summer 2023-24

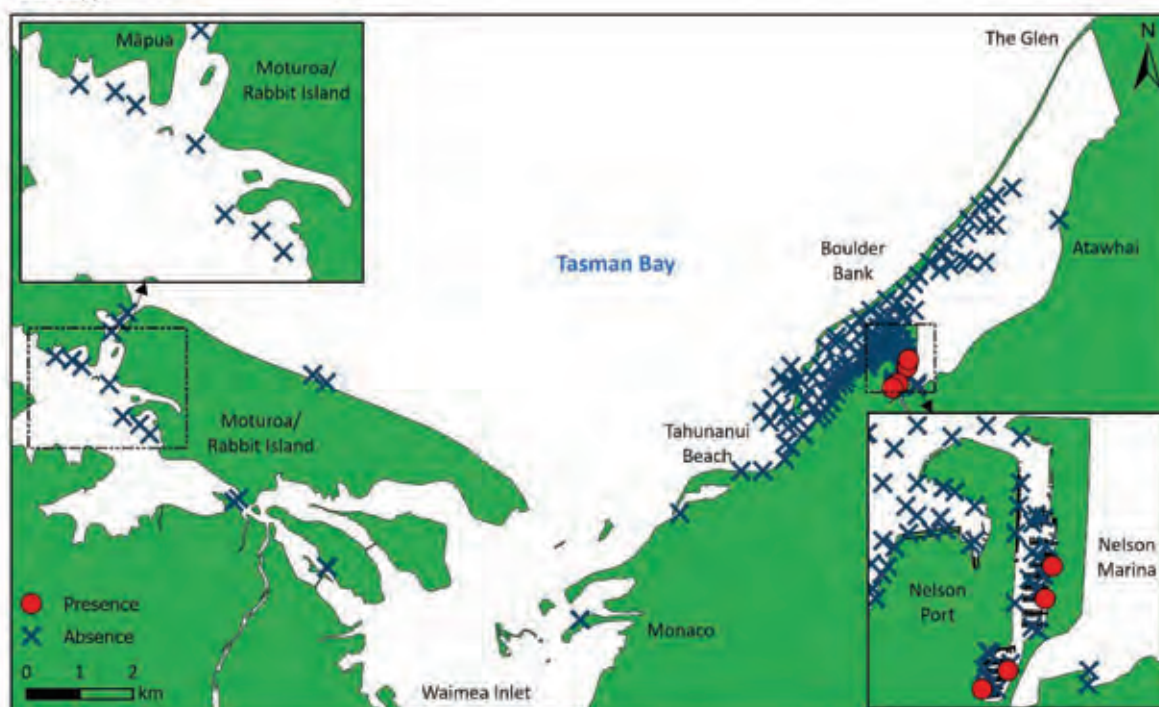
Ciona savignyi



Nelson Harbour and Waimea Inlet

Winter 2023

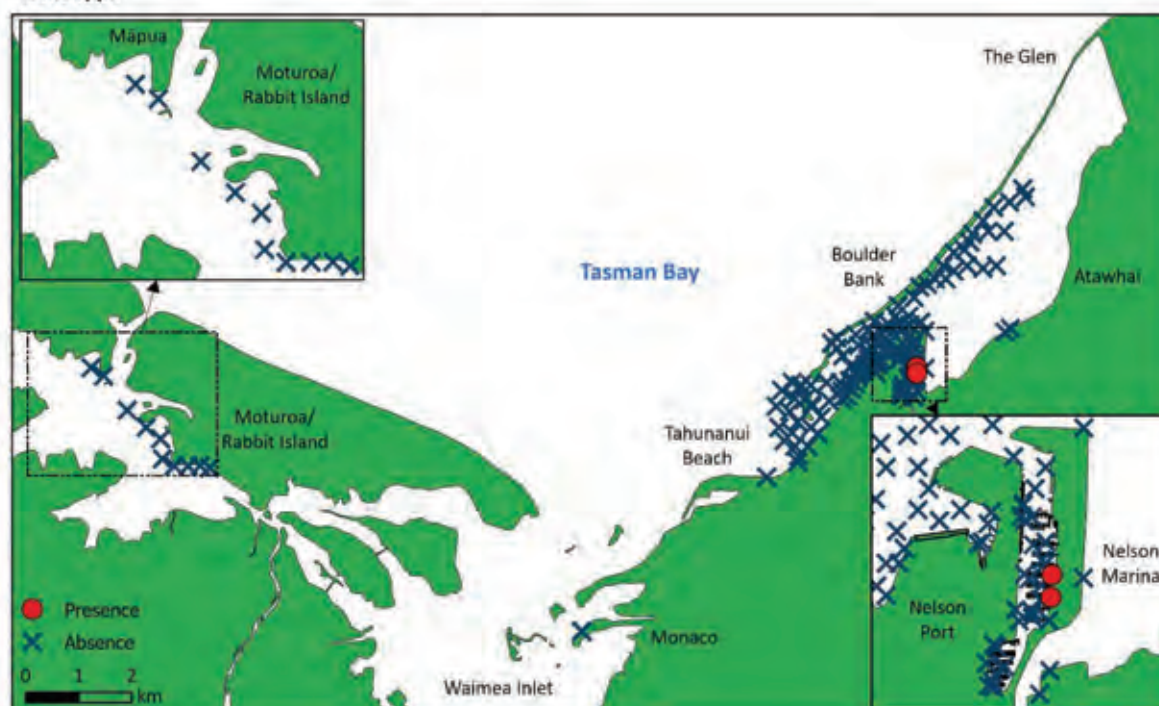
Ciona spp.



Nelson Harbour and Waimea Inlet

Summer 2023-24

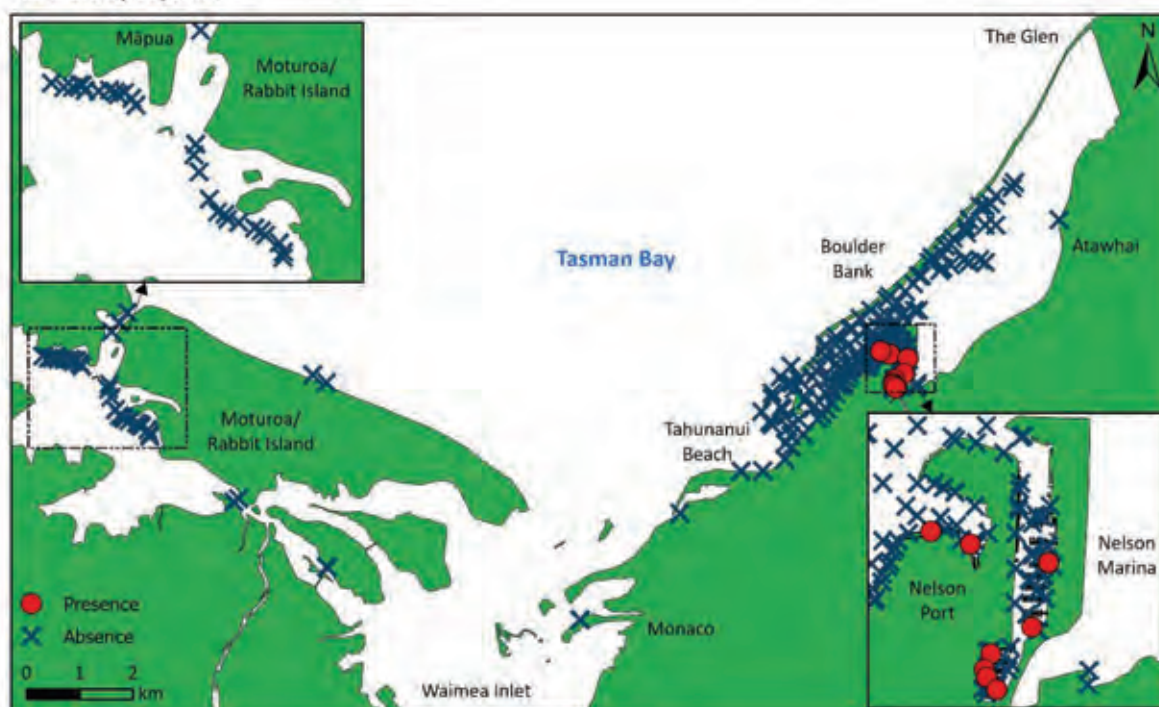
Ciona spp.



Nelson Harbour and Waimea Inlet

Winter 2023

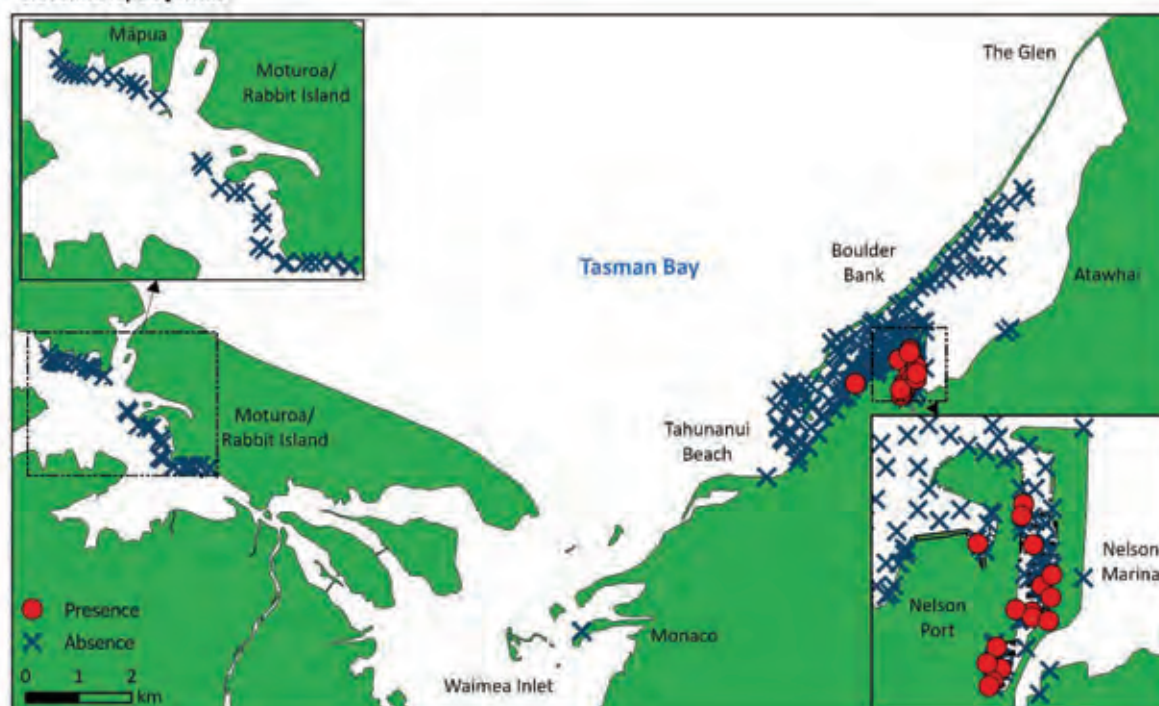
Clavelina lepadiformis



Nelson Harbour and Waimea Inlet

Summer 2023-24

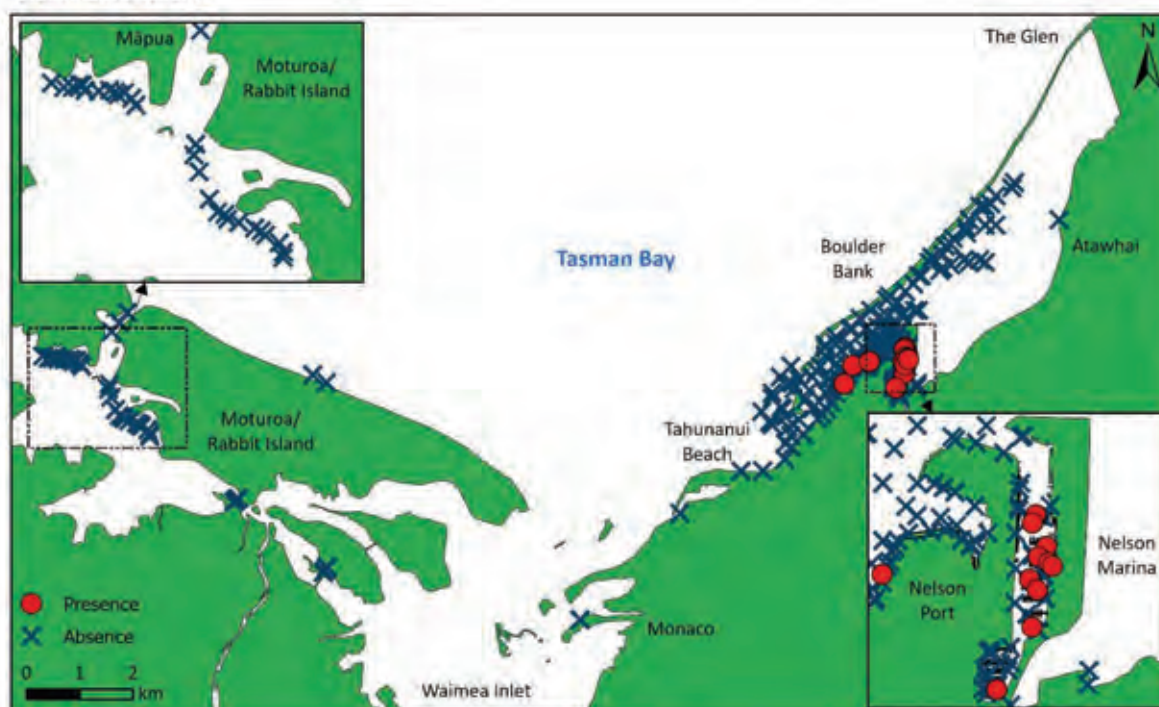
Clavelina lepadiformis



Nelson Harbour and Waimea Inlet

Winter 2023

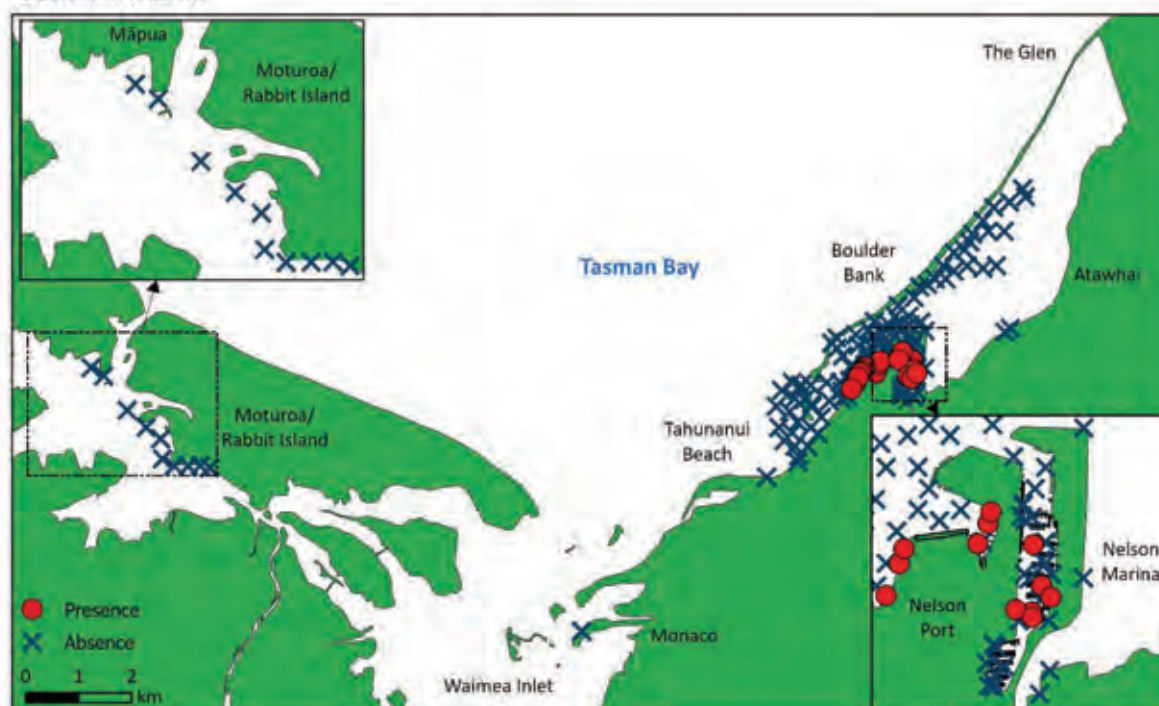
Didemnum vexillum



Nelson Harbour and Waimea Inlet

Summer 2023-24

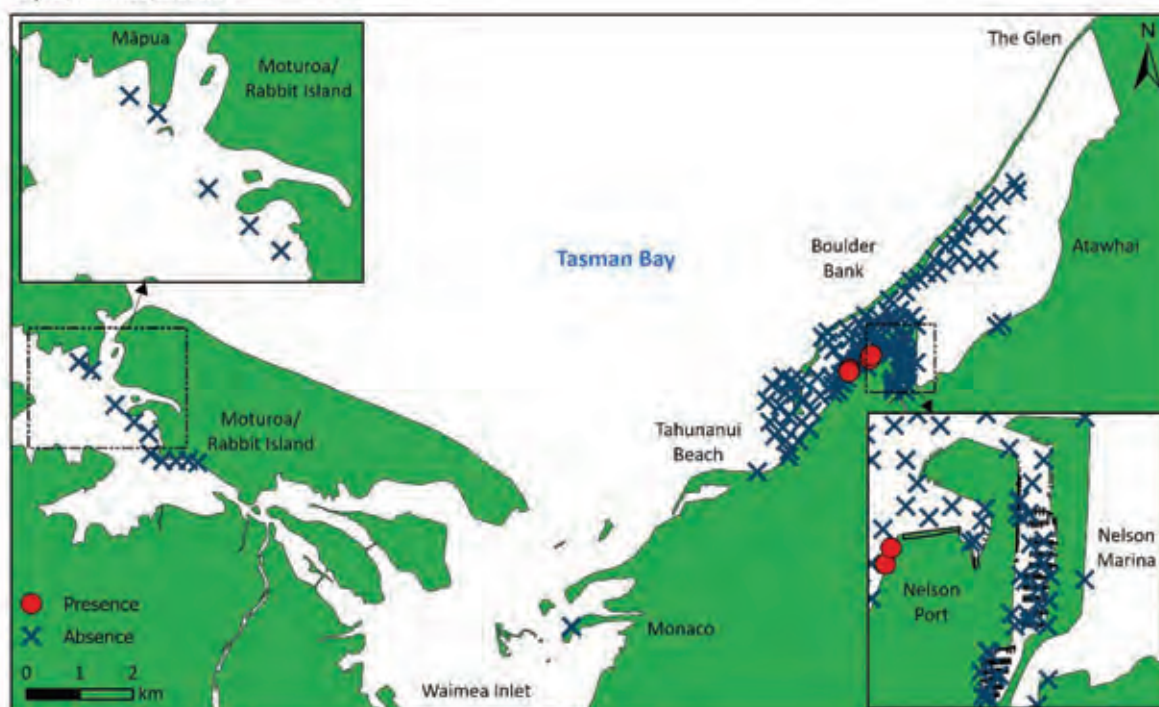
Didemnum vexillum



Nelson Harbour and Waimea Inlet

Summer 2023-24

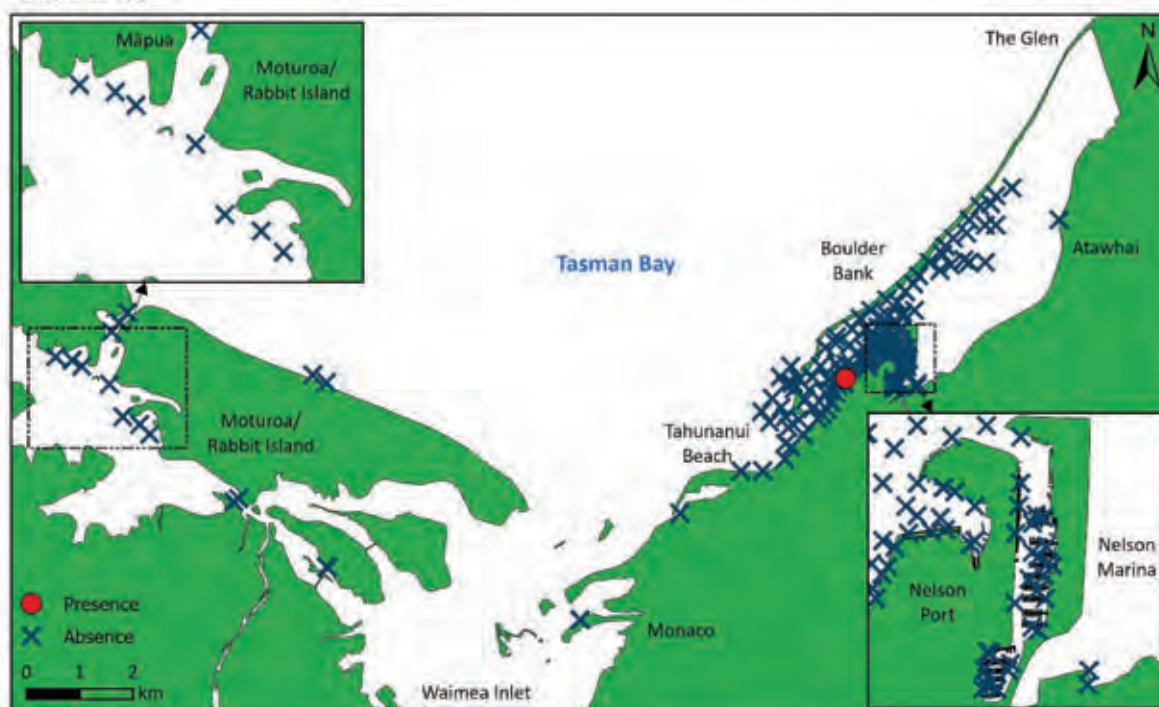
Diplosoma listerianum



Nelson Harbour and Waimea Inlet

Winter 2023

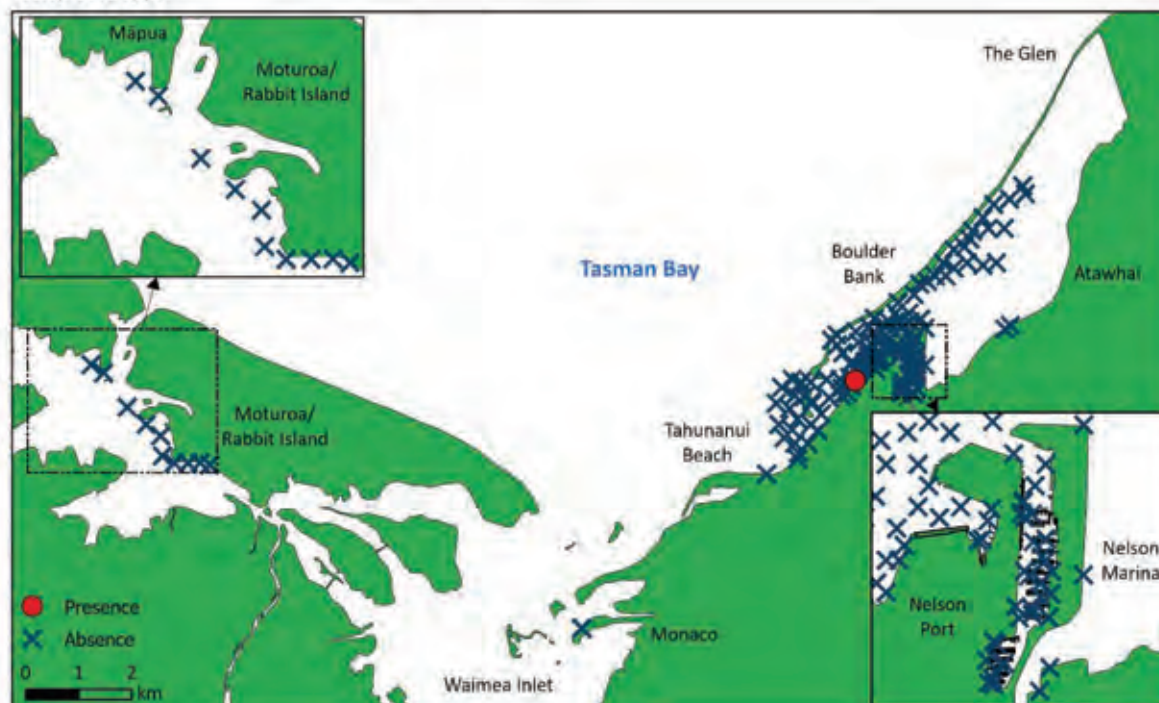
Ectopleura spp.



Nelson Harbour and Waimea Inlet

Summer 2023-24

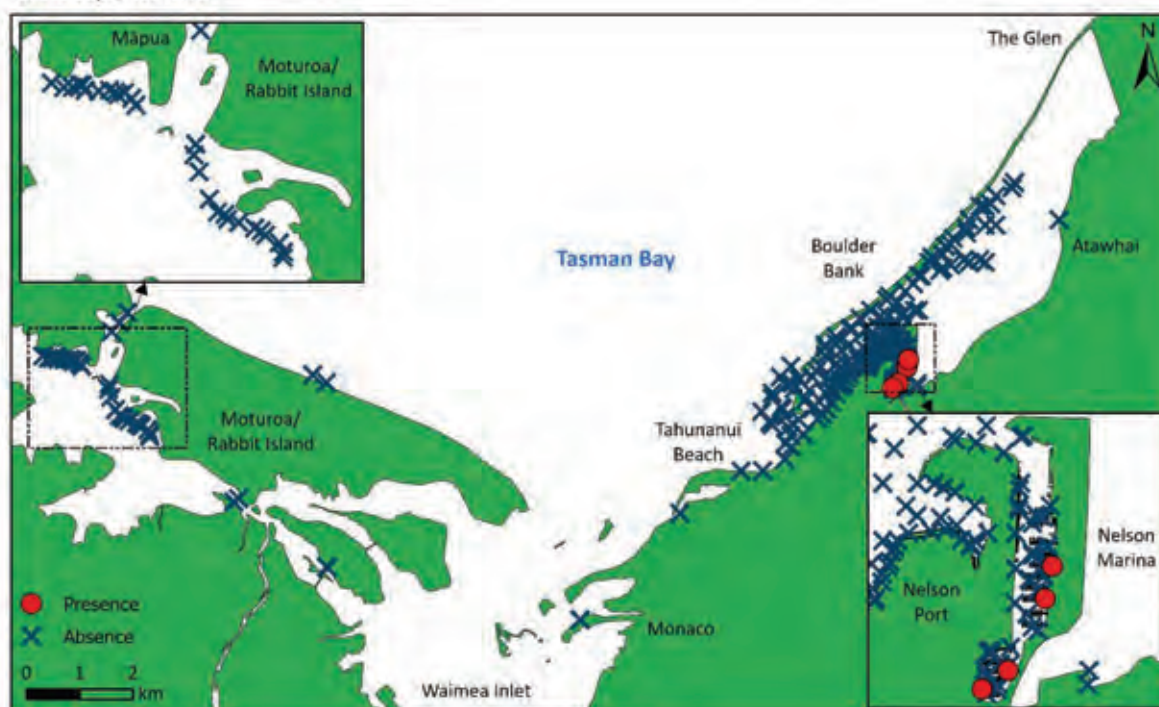
Ectopleura spp.



Nelson Harbour and Waimea Inlet

Winter 2023

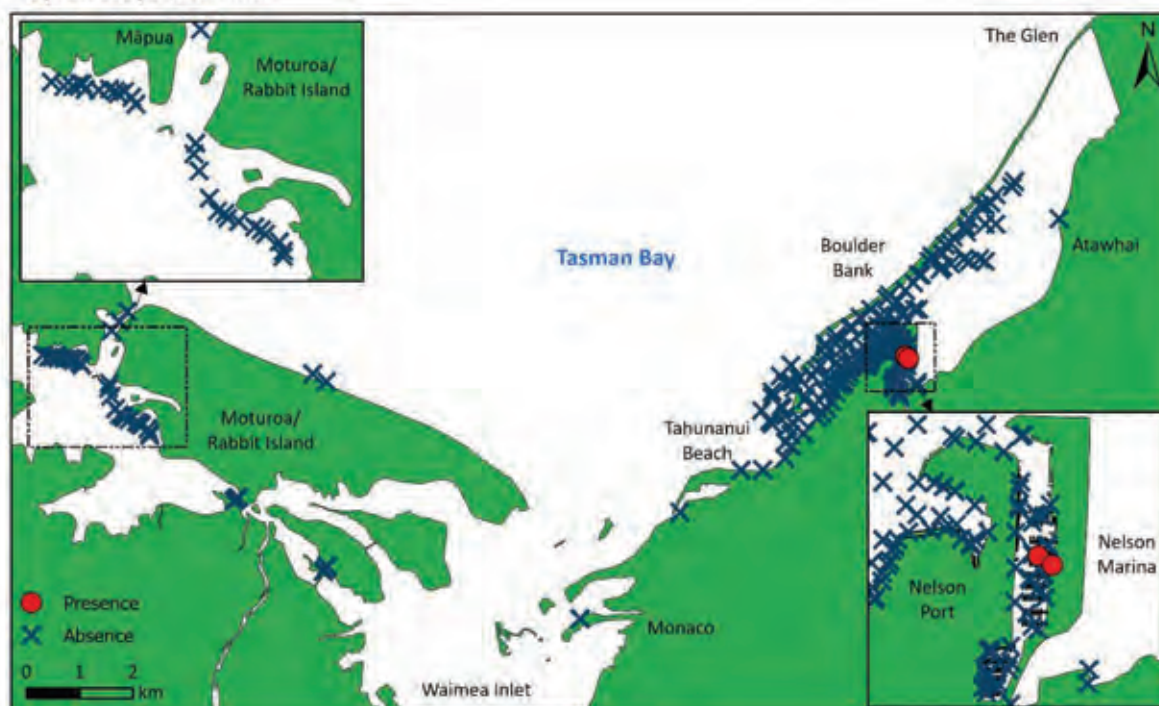
Grateloupia turuturu



Nelson Harbour and Waimea Inlet

Winter 2023

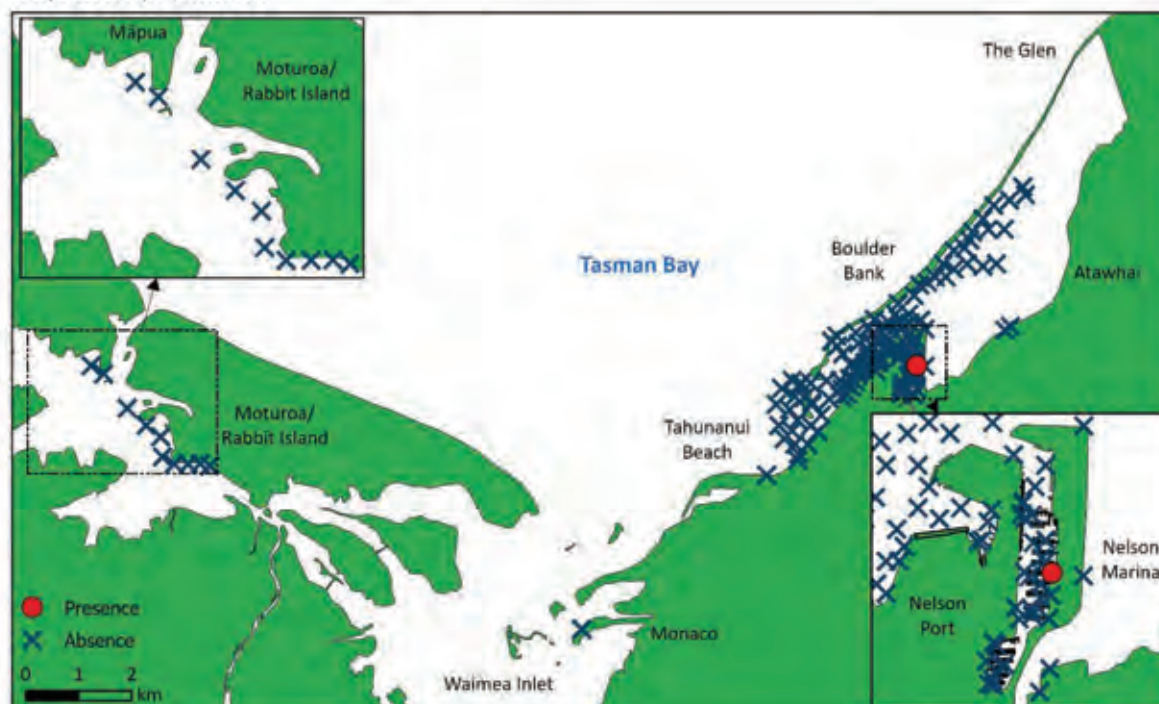
Polyandrocarpa zorritensis



Nelson Harbour and Waimea Inlet

Summer 2023-24

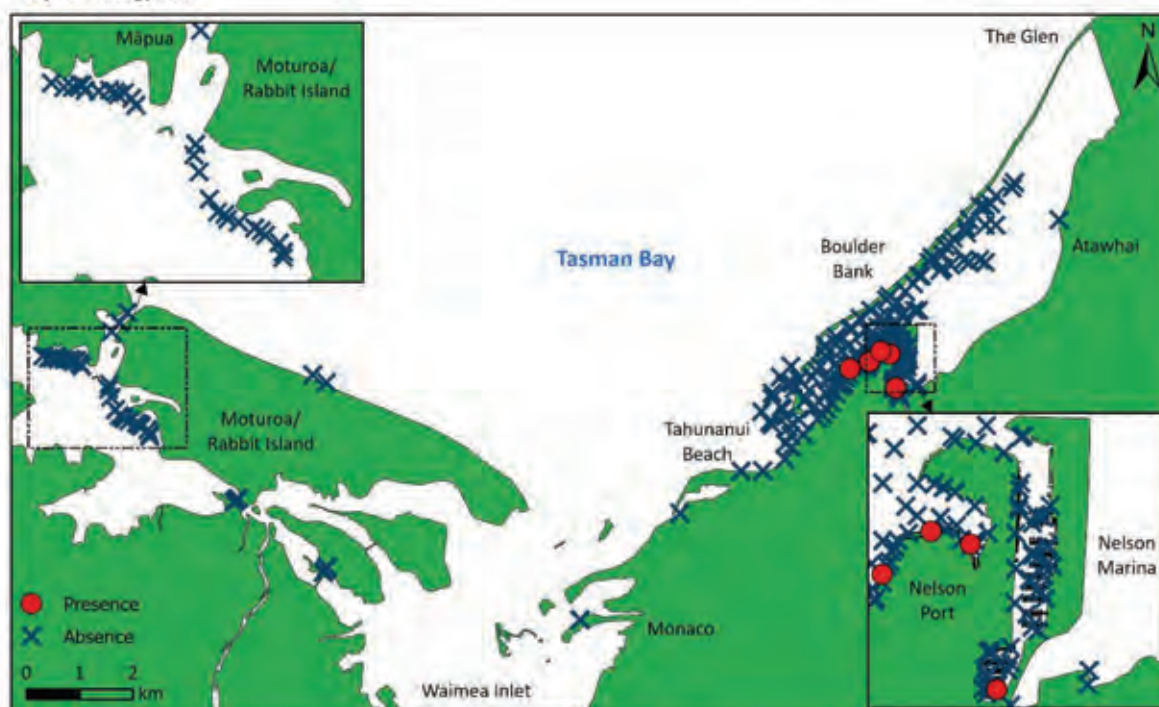
Polyandrocarpa zorritensis



Nelson Harbour and Waimea Inlet

Winter 2023

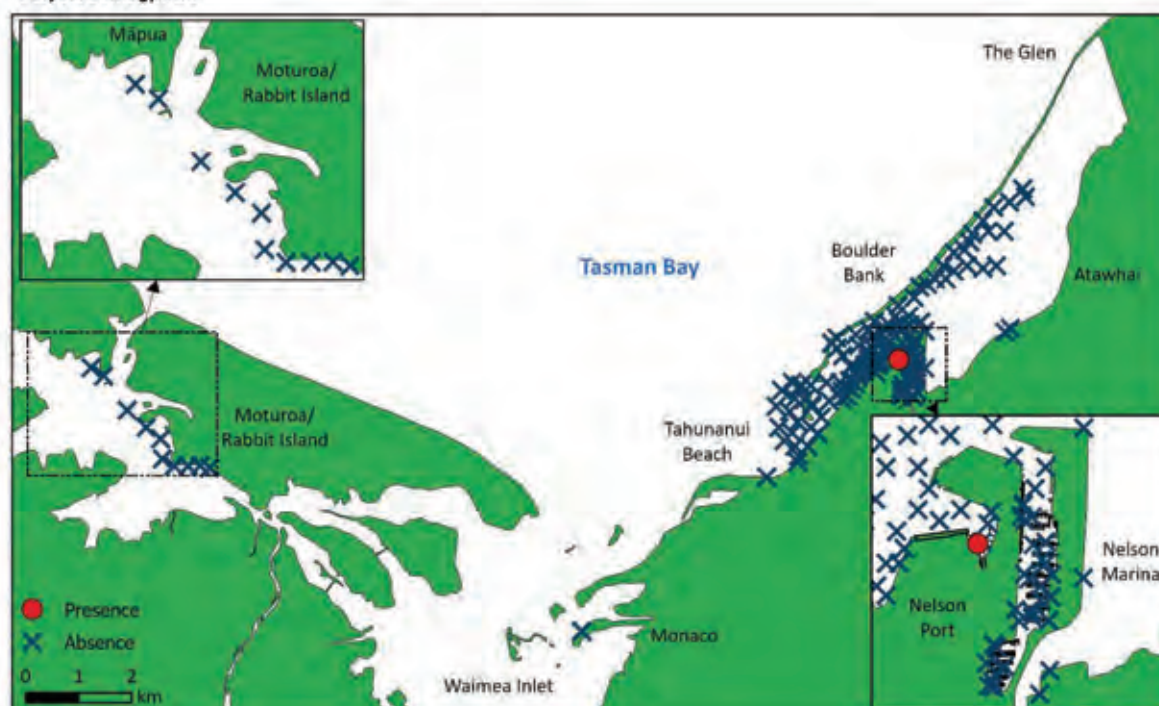
Polycera hedgpethi



Nelson Harbour and Waimea Inlet

Summer 2023-24

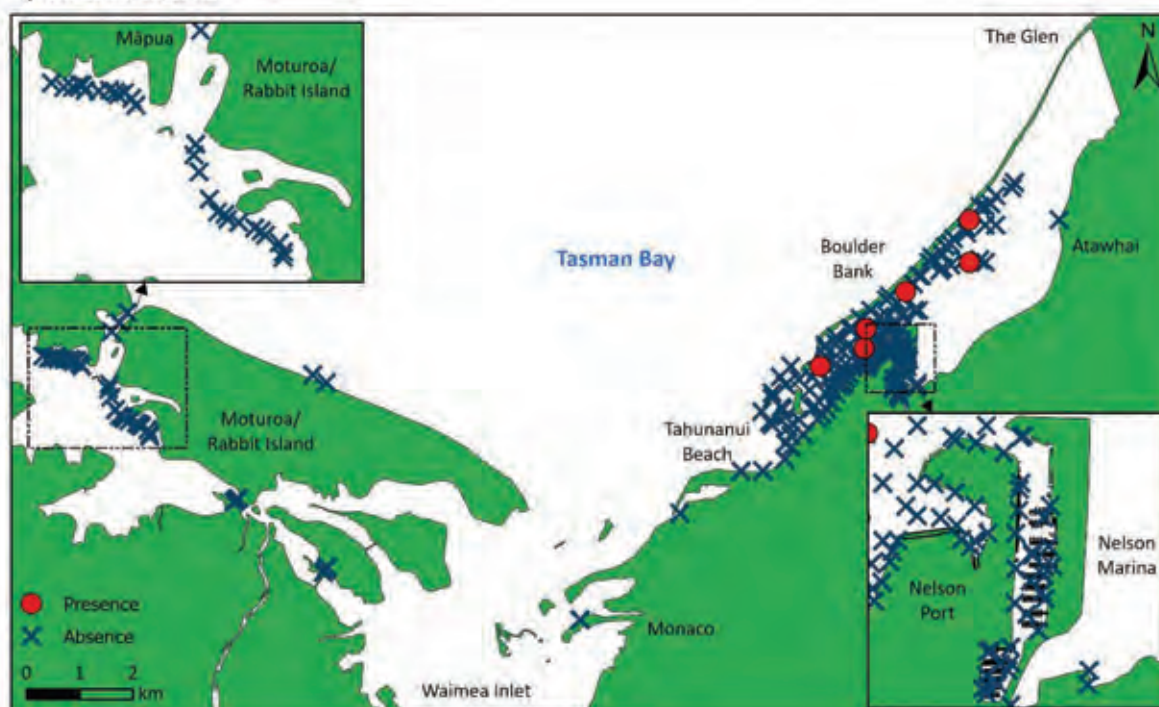
Polycera hedgpethi



Nelson Harbour and Waimea Inlet

Winter 2023

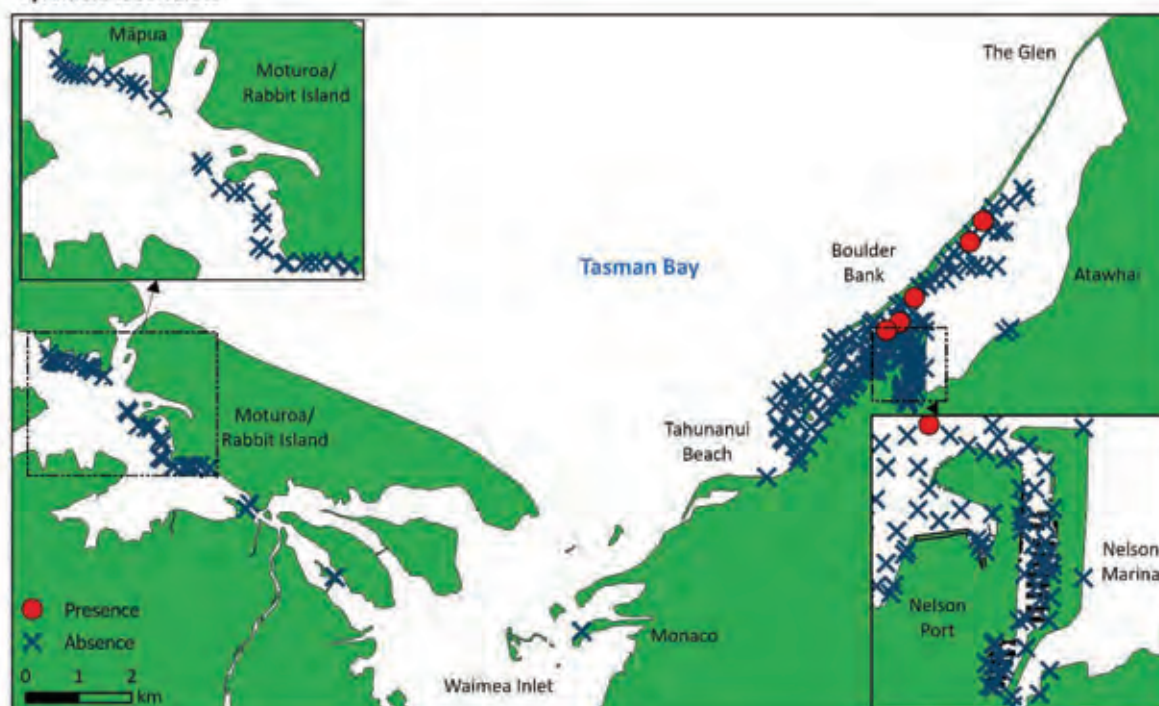
Pyromaia tuberculata



Nelson Harbour and Waimea Inlet

Summer 2023-24

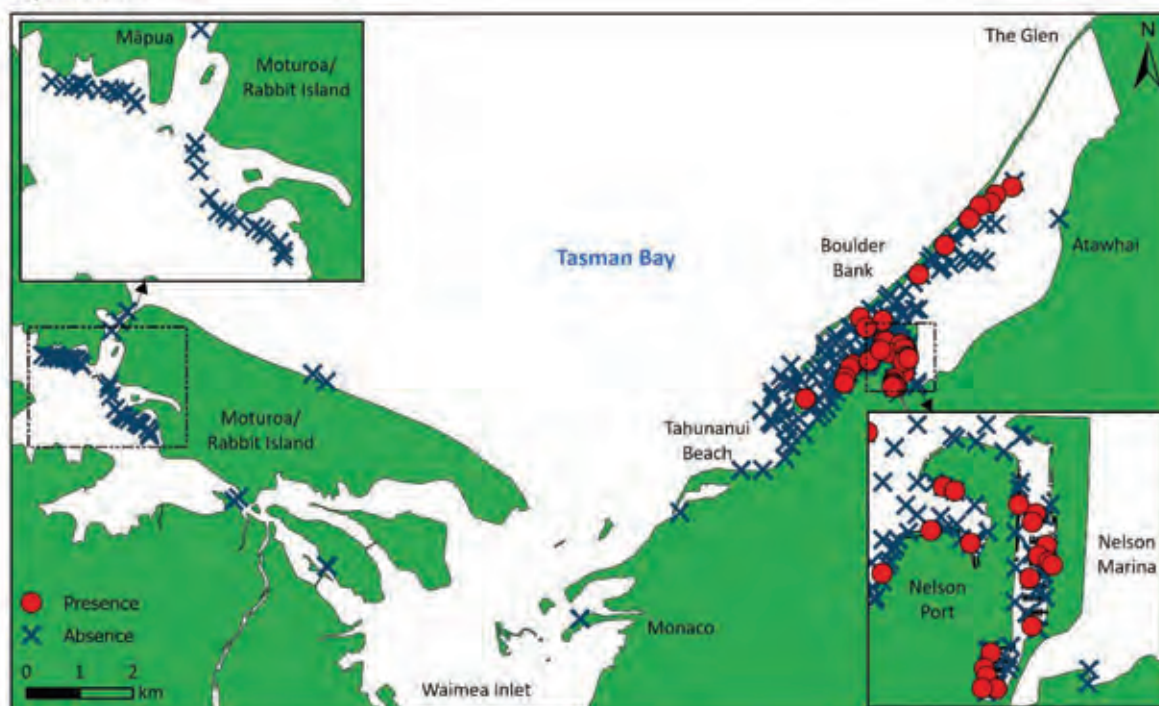
Pyromaia tuberculata



Nelson Harbour and Waimea Inlet

Winter 2023

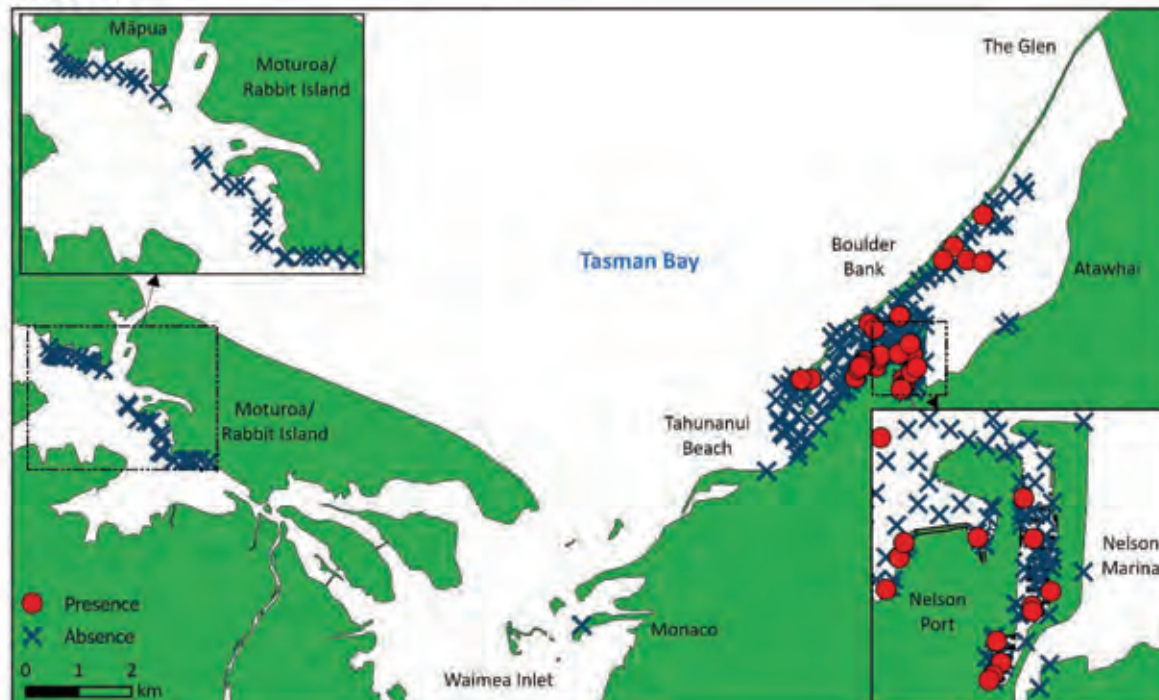
Styela clava



Nelson Harbour and Waimea Inlet

Summer 2023-24

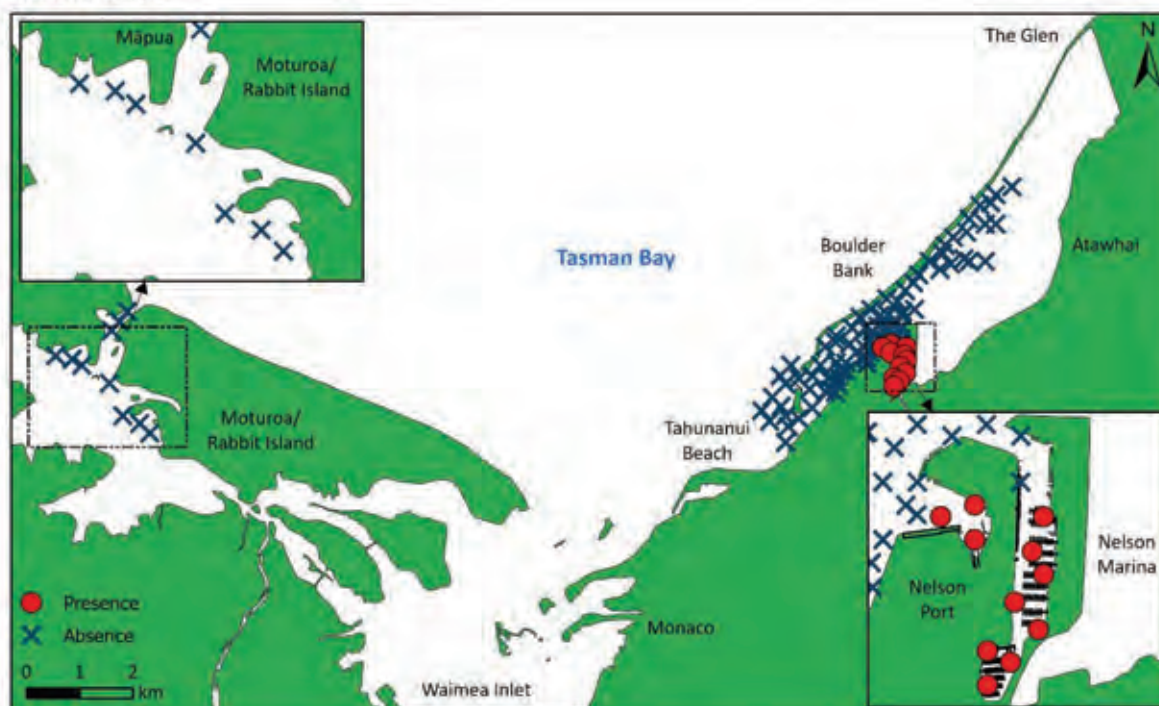
Styela clava



Nelson Harbour and Waimea Inlet

Winter 2023

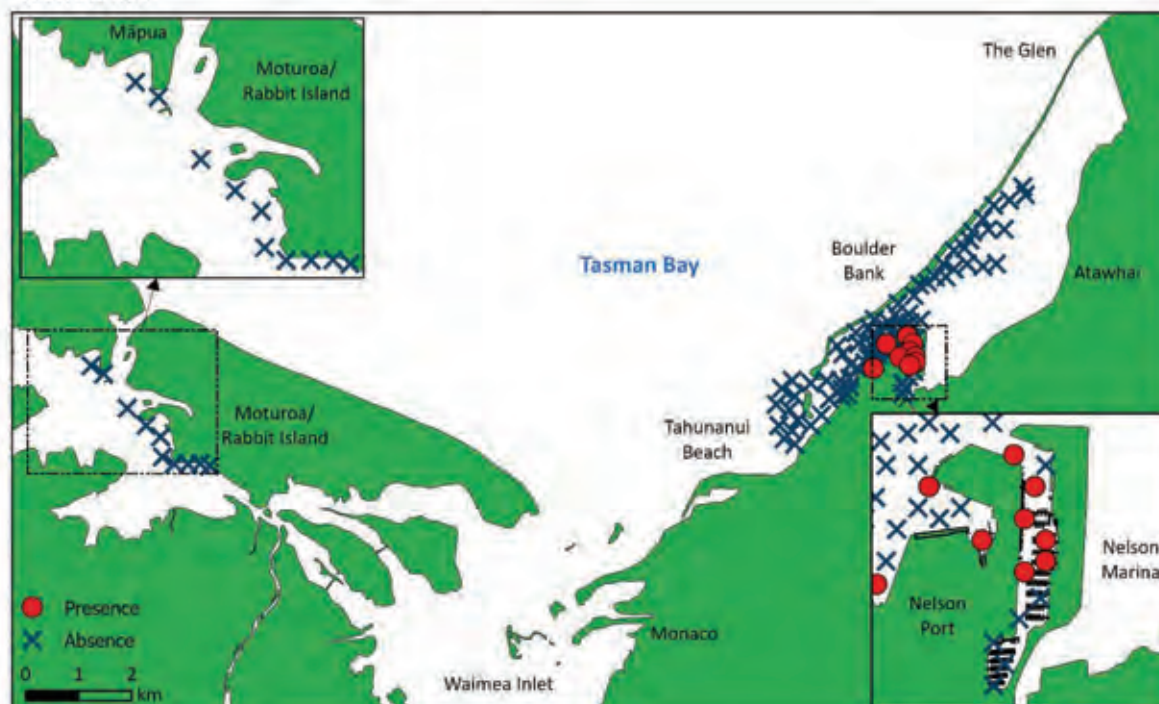
Theora lubrica



Nelson Harbour and Waimea Inlet

Summer 2023-24

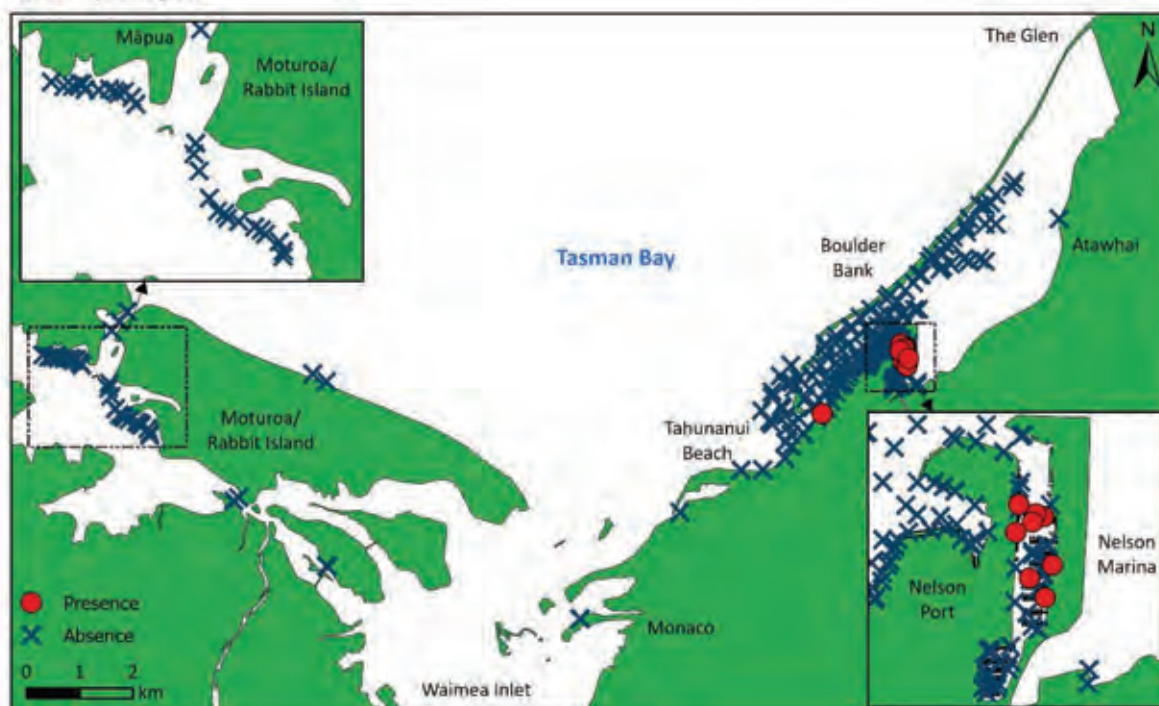
Theora lubrica



Nelson Harbour and Waimea Inlet

Winter 2023

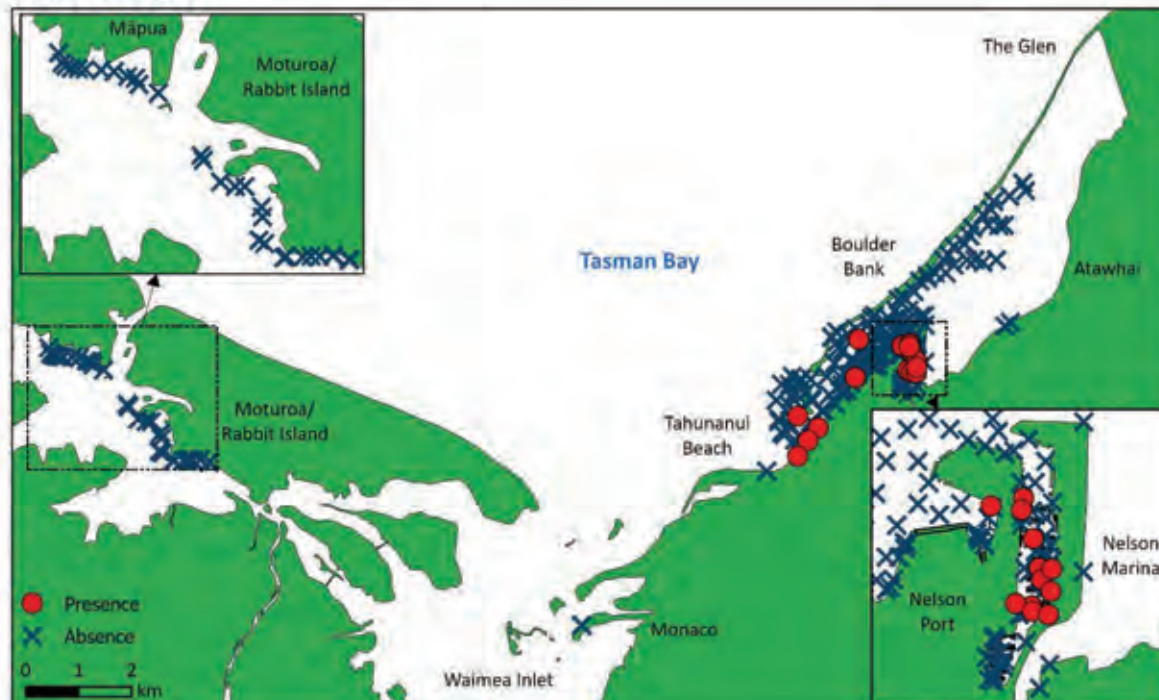
Undaria pinnatifida



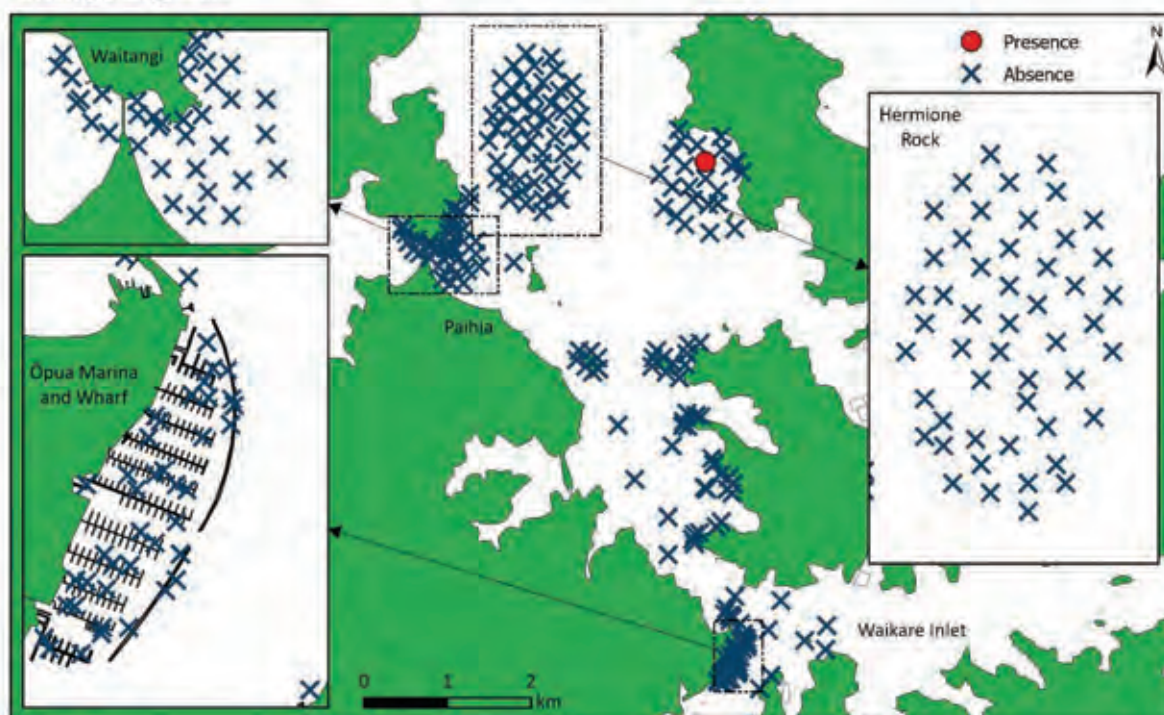
Nelson Harbour and Waimea Inlet

Summer 2023-24

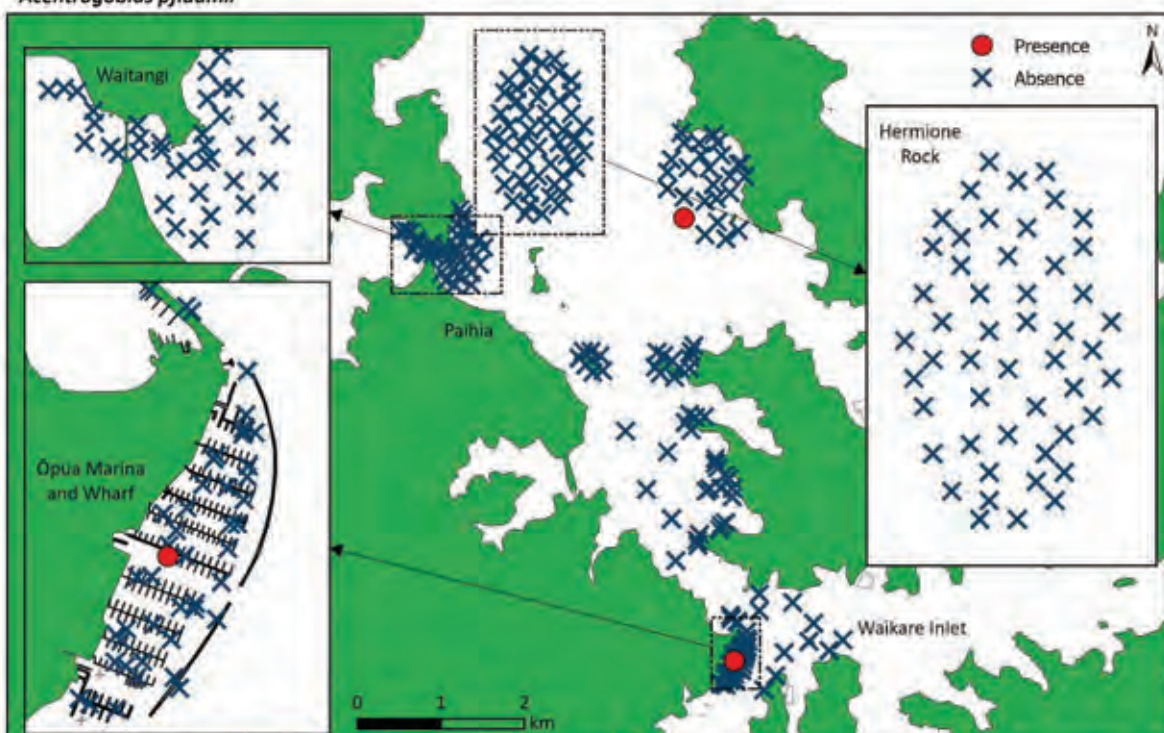
Undaria pinnatifida



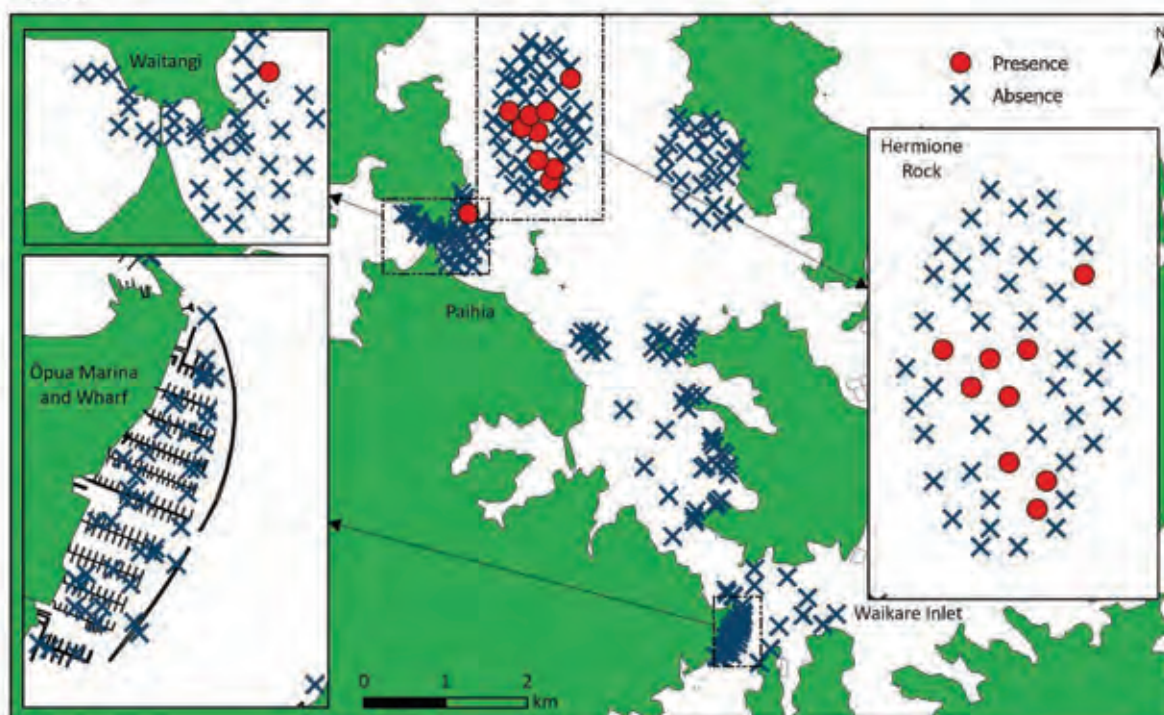
Ōpua Marina and Waikare Inlet
 Winter 2023
Acentrogobius pflaumii



Ōpua Marina and Waikare Inlet
 Summer 2023-24
Acentrogobius pflaumii



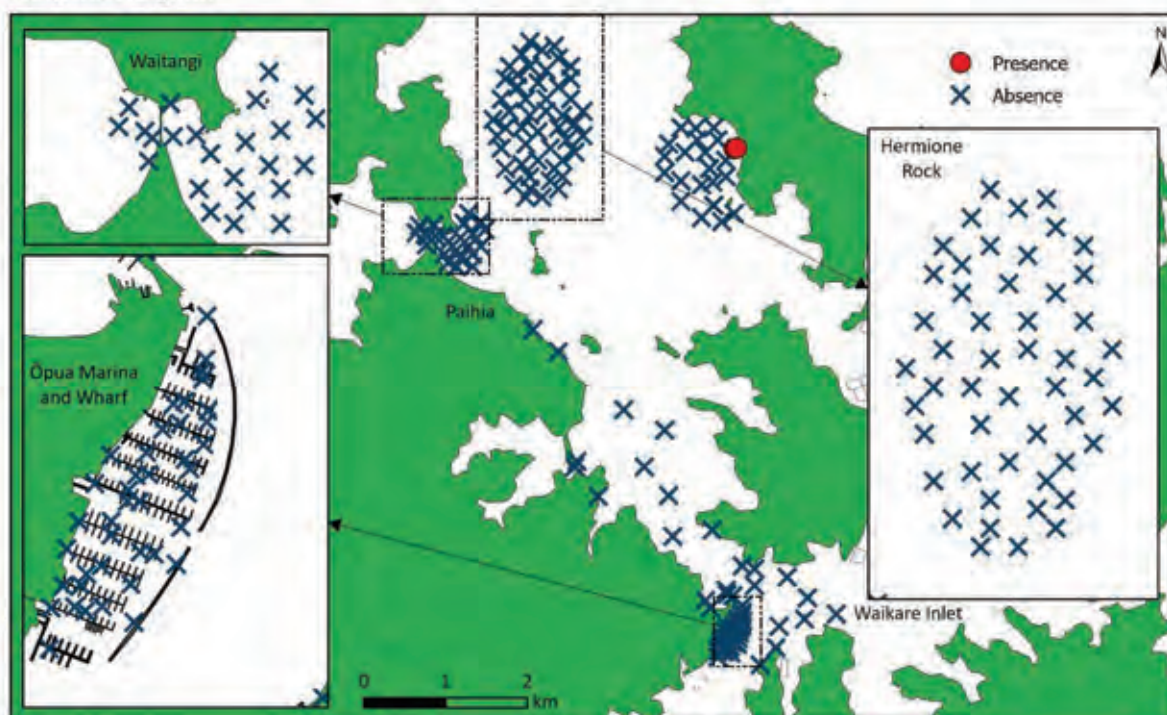
Ōpua Marina and Waikare Inlet
 Summer 2023-24
Agnezia



Ōpua Marina and Waikare Inlet

Summer 2023-24

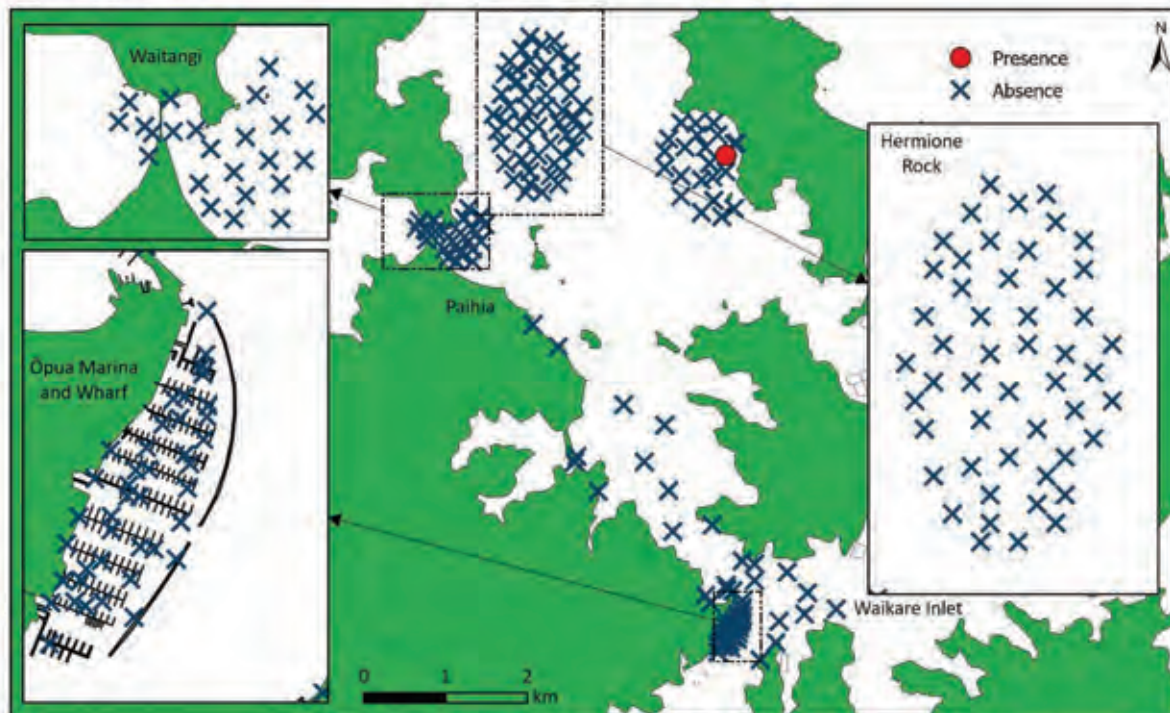
Botrylloides diegensis



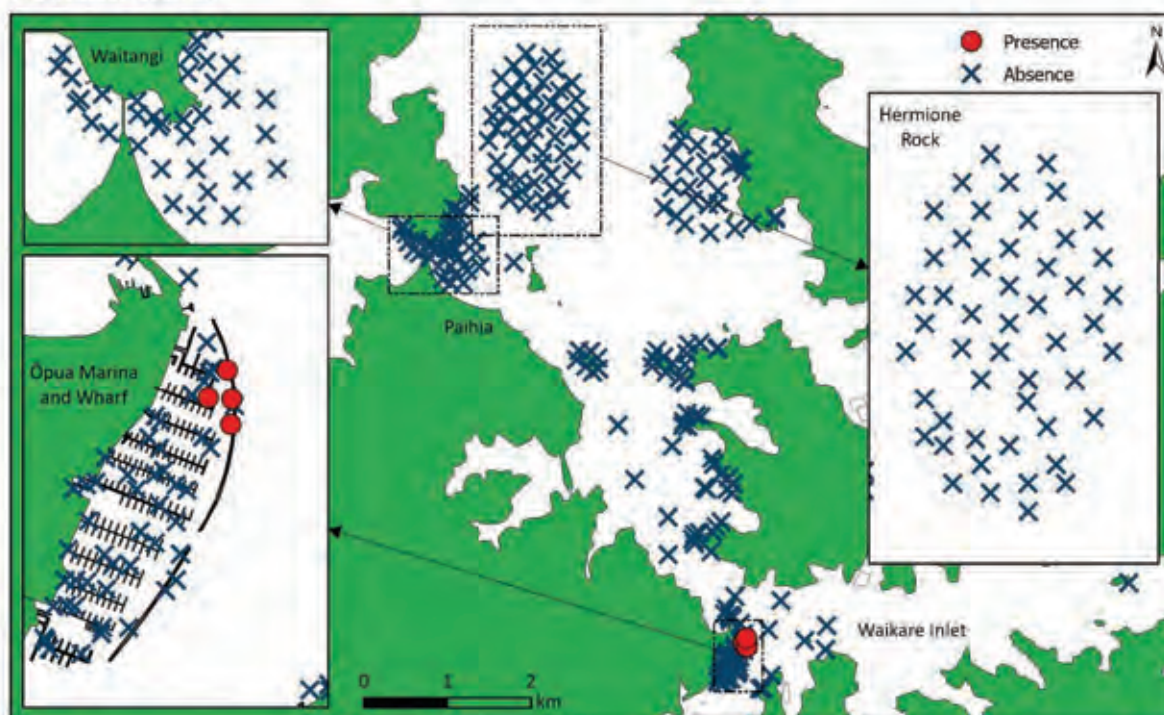
Ōpua Marina and Waikare Inlet

Summer 2023-24

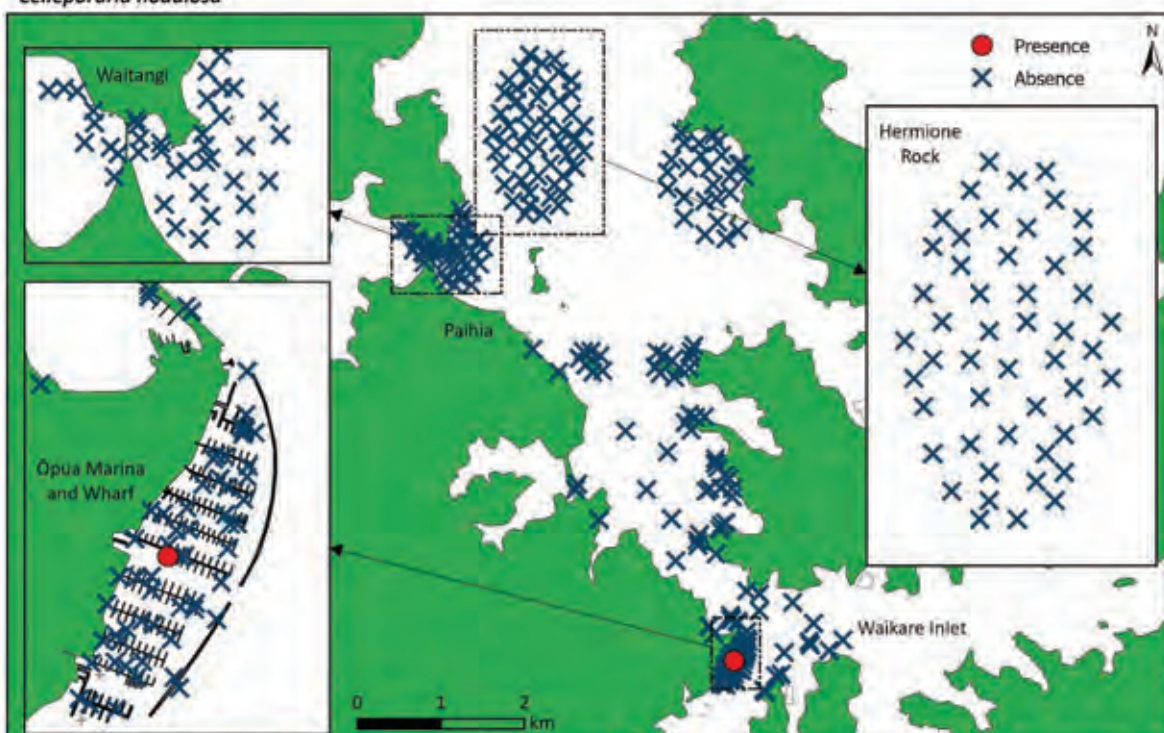
Caprella scauroides



Ōpua Marina and Waikare Inlet
 Winter 2023
Celleporaria nodulosa



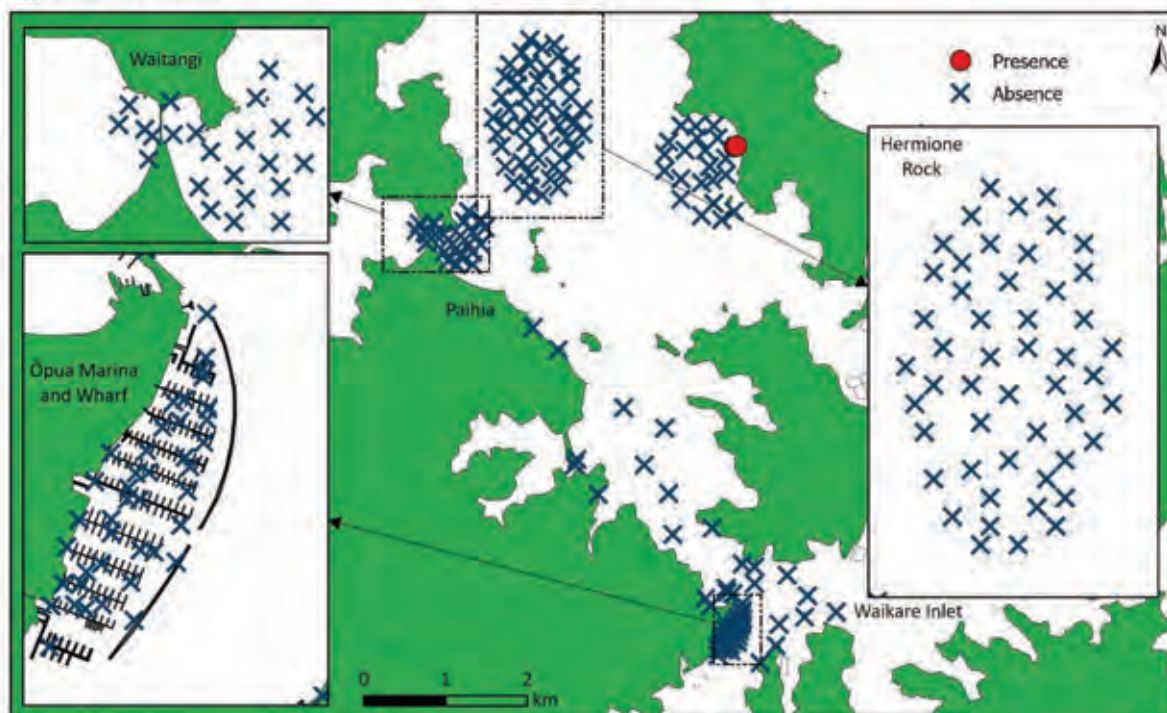
Ōpua Marina and Waikare Inlet
 Summer 2023-24
Celleporaria nodulosa



Ōpua Marina and Waikare Inlet

Summer 2023-24

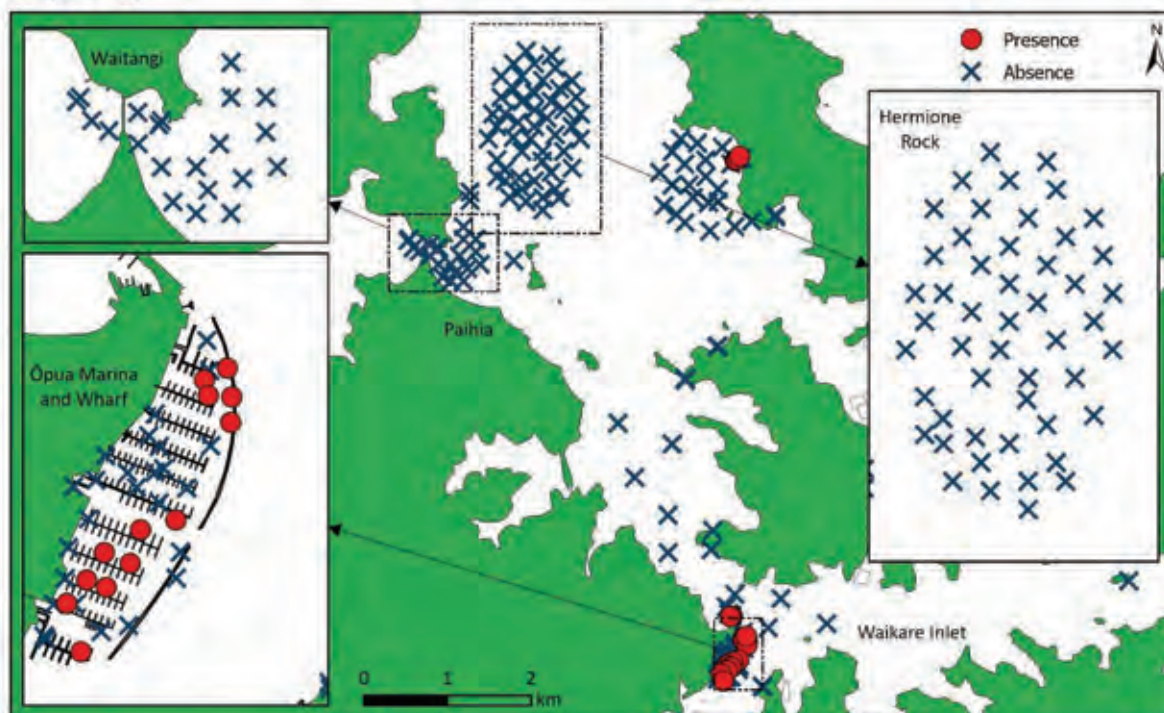
Diplosoma listerianum



Ōpua Marina and Waikare Inlet

Winter 2023

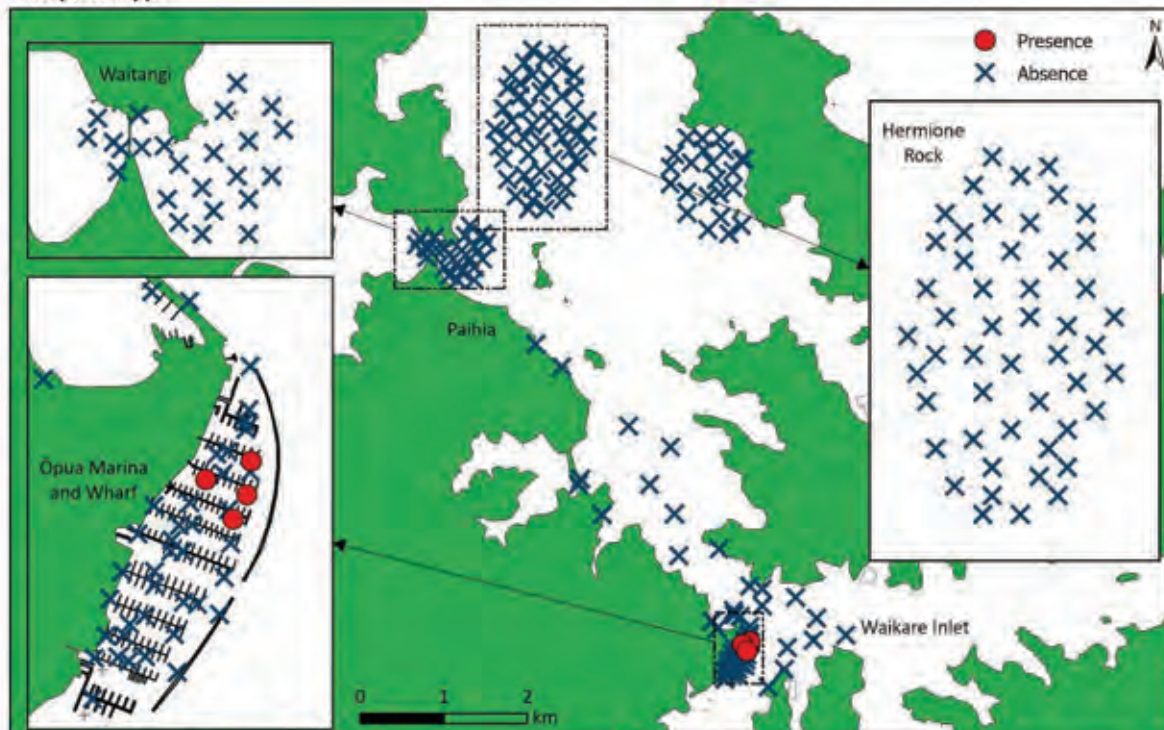
Ectopleura spp.



Ōpua Marina and Waikare Inlet

Summer 2023-24

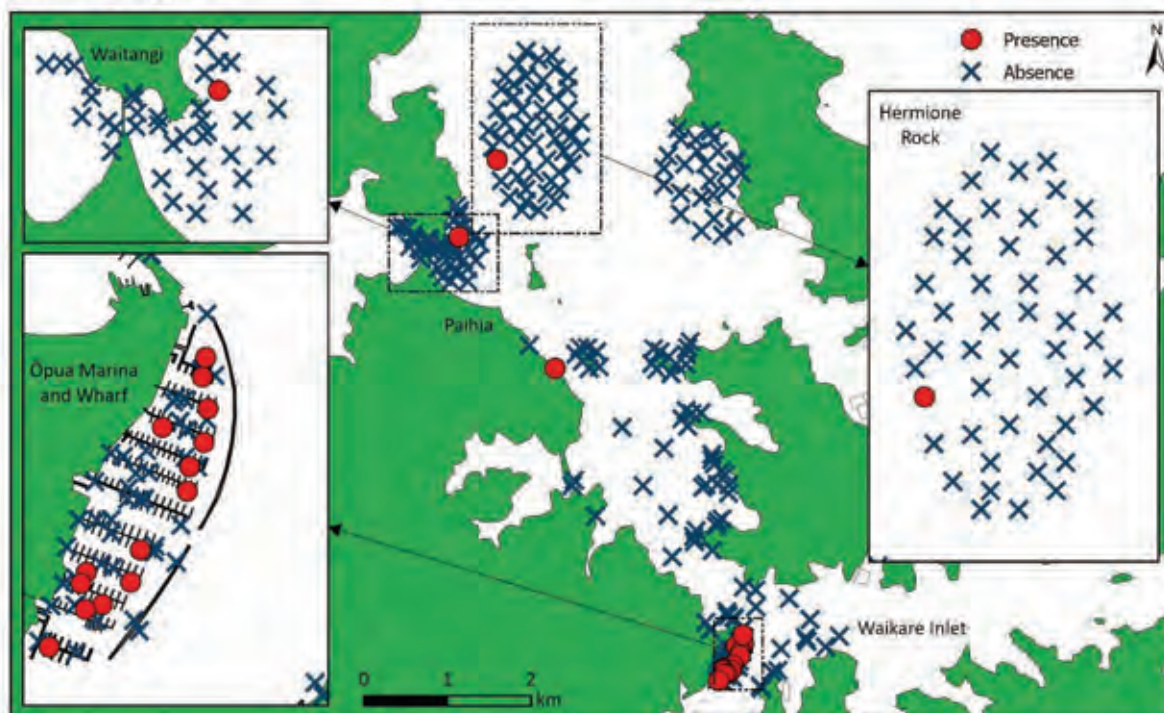
Ectopleura spp.



Ōpua Marina and Waikare Inlet

Winter 2023

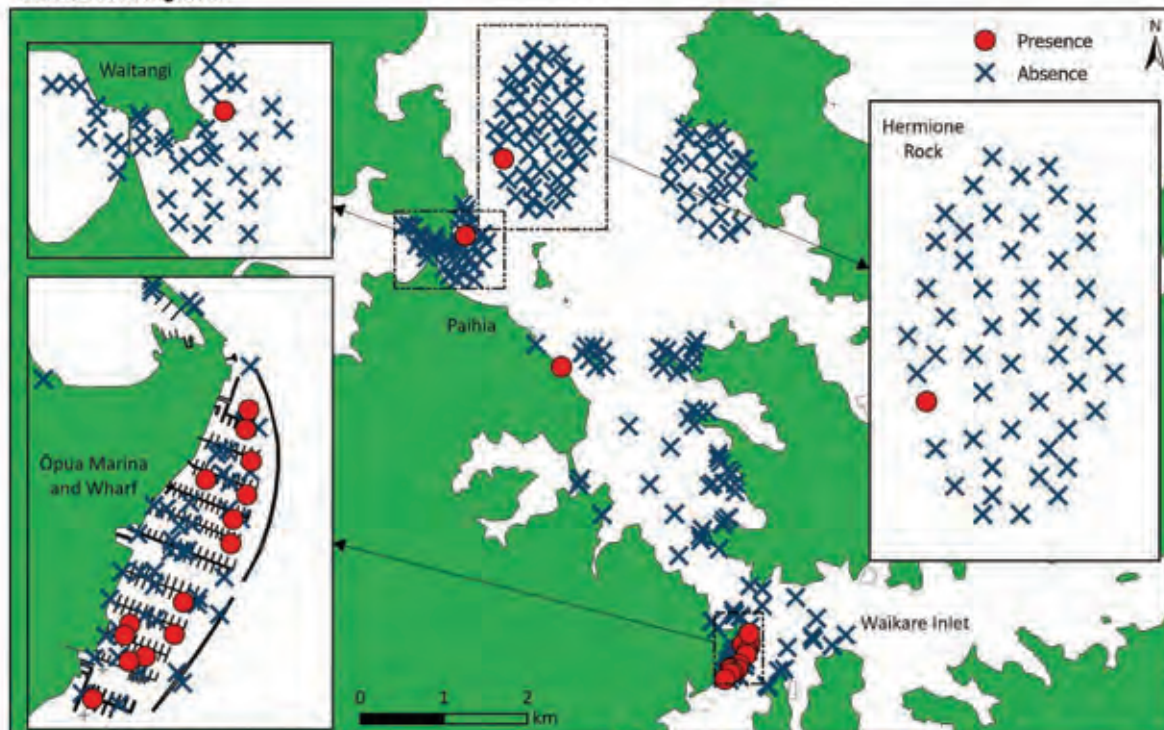
Eudistoma elongatum



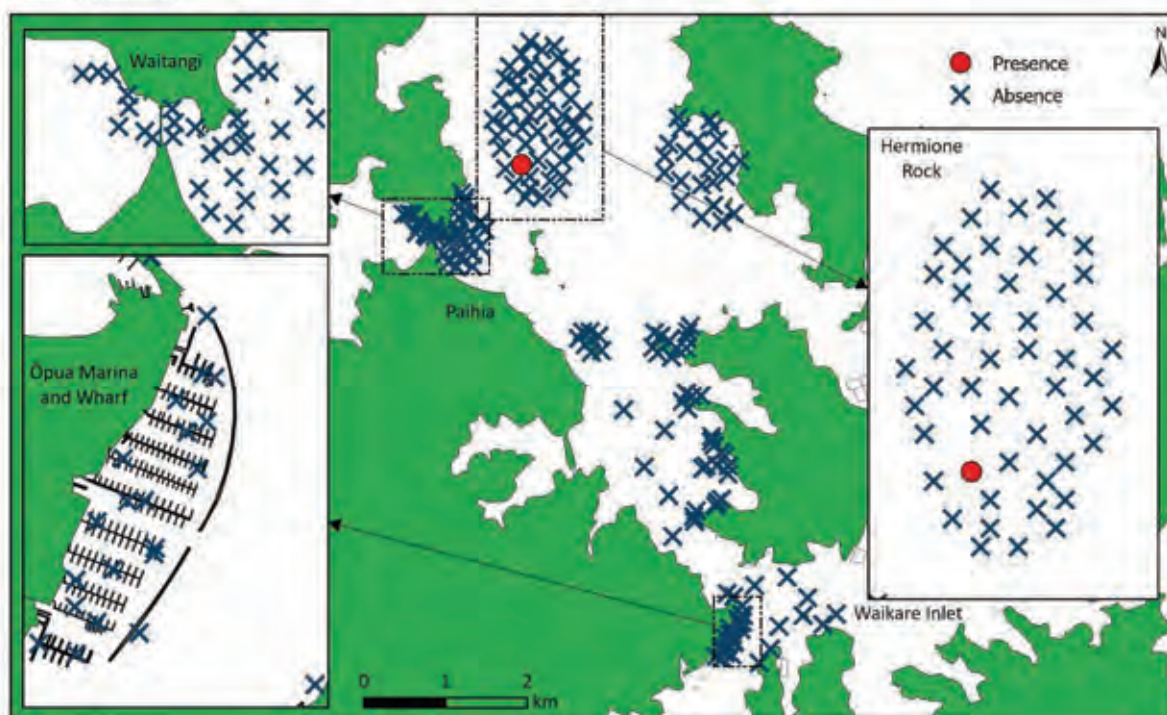
Ōpua Marina and Waikare Inlet

Summer 2023-24

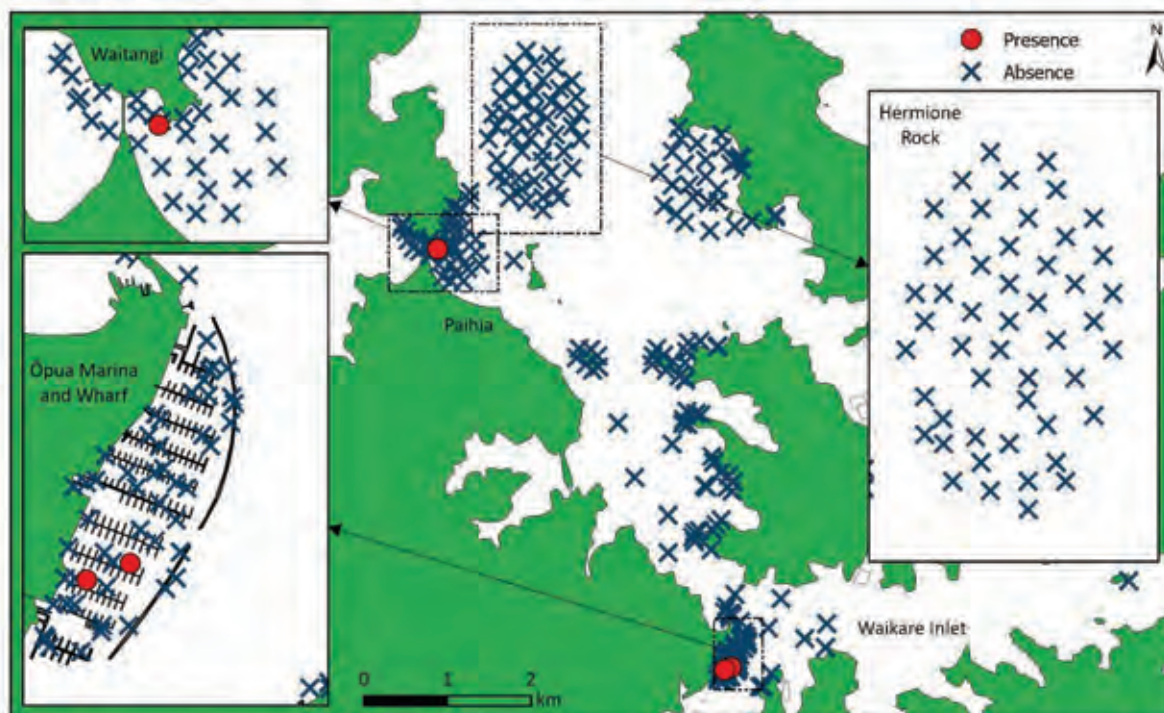
Eudistoma elongatum



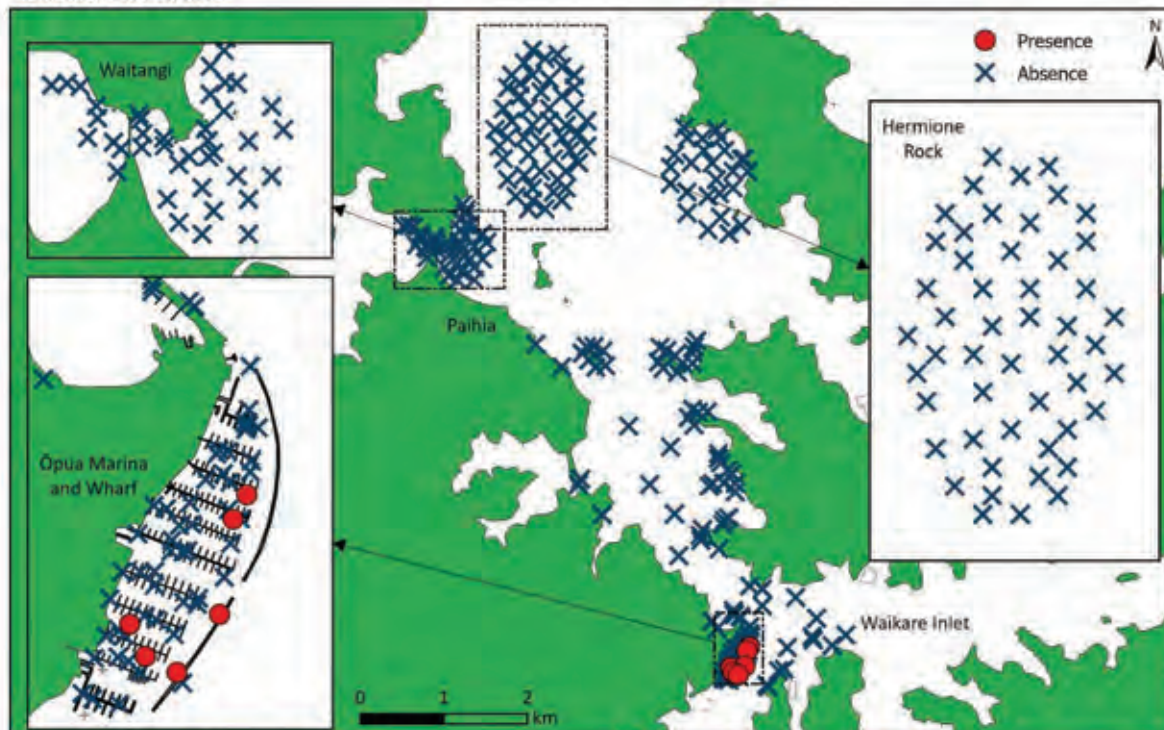
Ōpua Marina and Waikare Inlet
 Summer 2023-24
Limaria orientalis



Ōpua Marina and Waikare Inlet
 Winter 2023
Omobranchus anolius



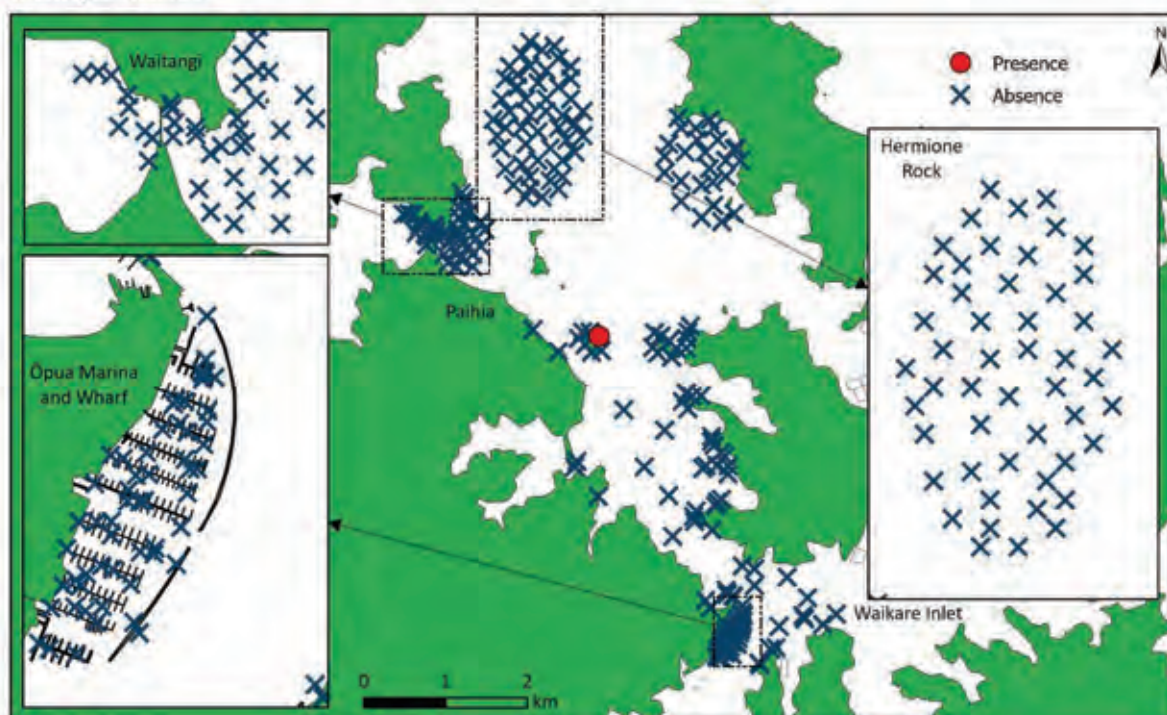
Ōpua Marina and Waikare Inlet
 Summer 2023-24
Omobranchus anolius



Ōpua Marina and Waikare Inlet

Summer 2023-24

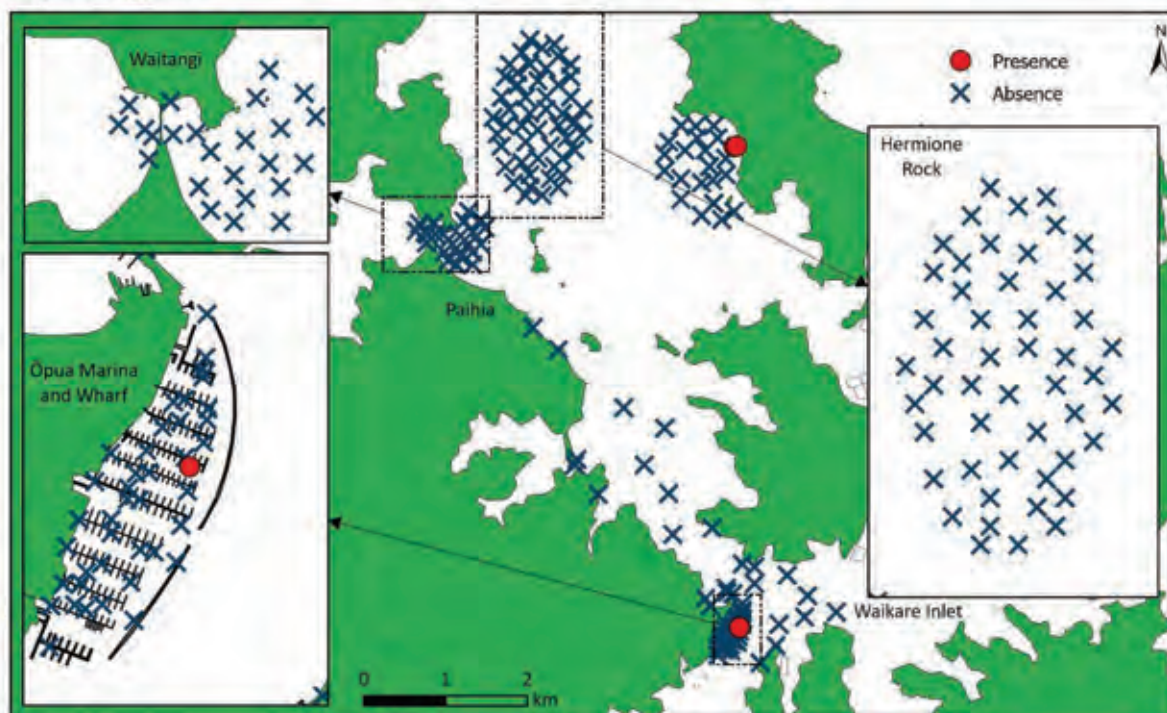
Oratosquilla oratoria



Ōpua Marina and Waikare Inlet

Summer 2023-24

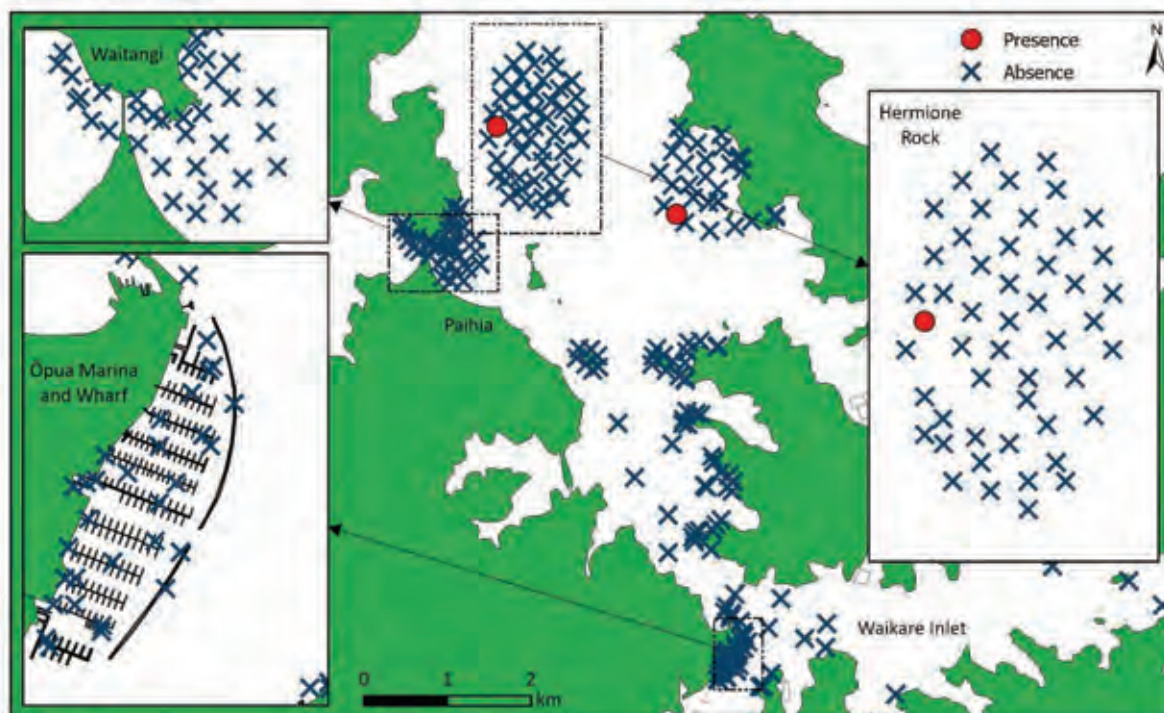
Polycera hedgpethi



Ōpua Marina and Waikare Inlet

Winter 2023

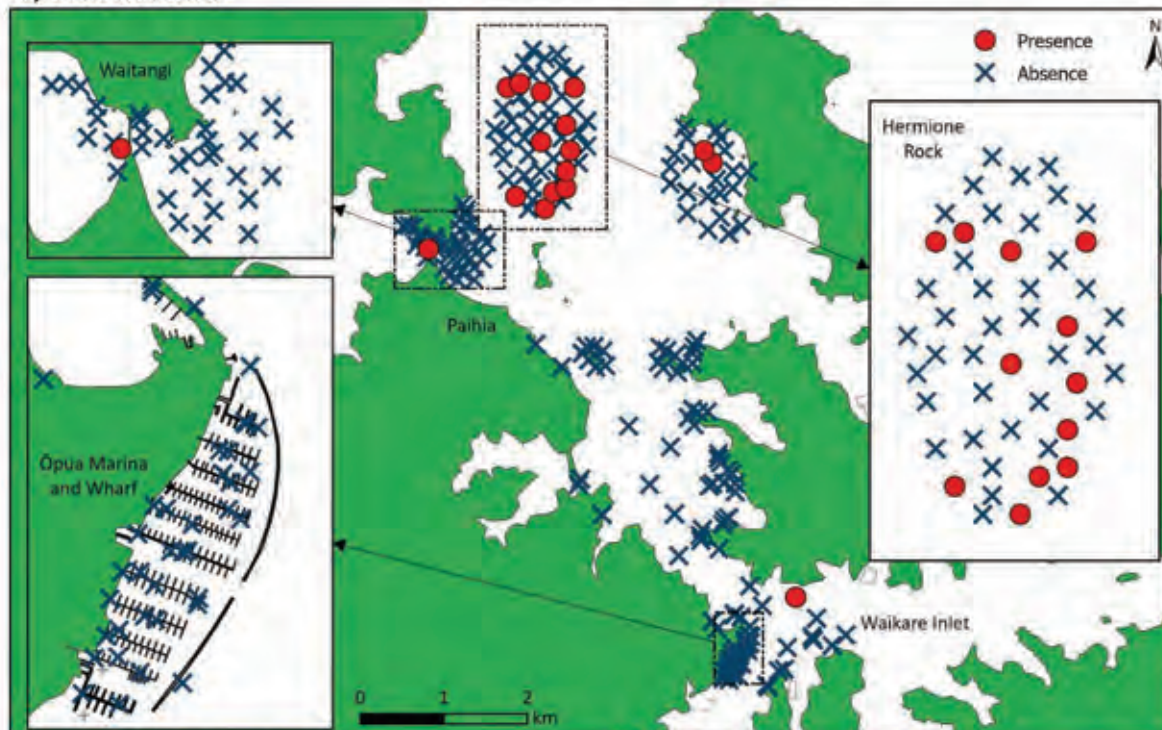
Pyromaia tuberculata



Ōpua Marina and Waikare Inlet

Summer 2023-24

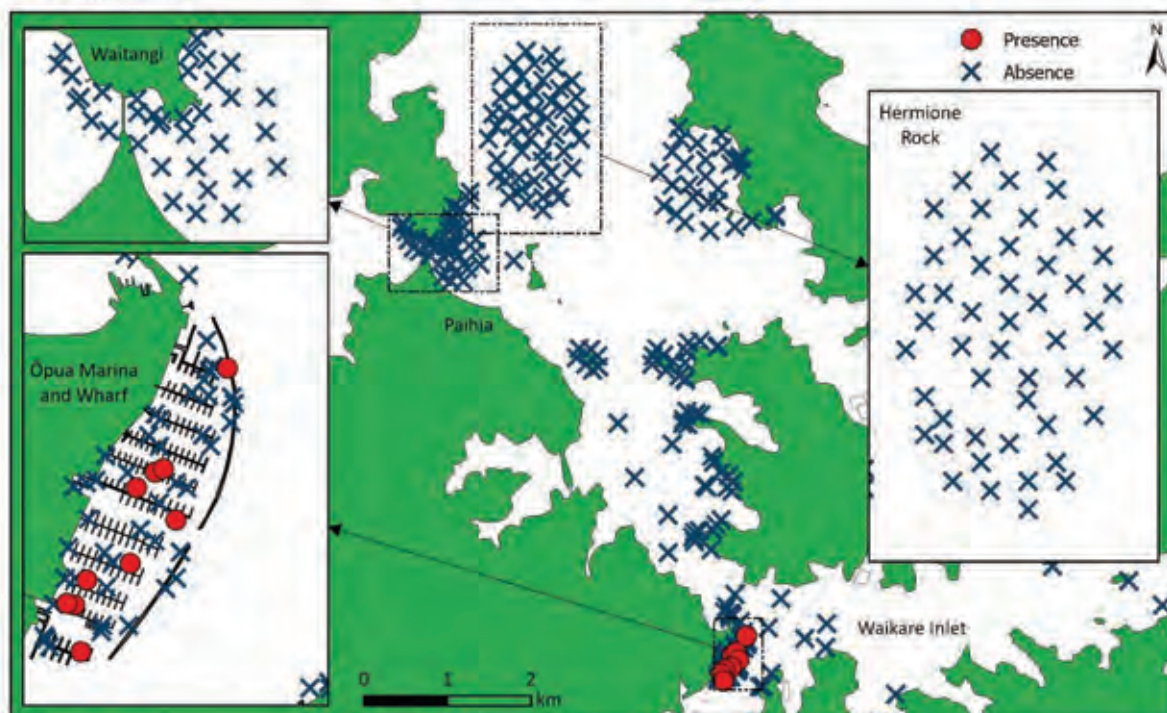
Pyromaia tuberculata



Ōpua Marina and Waikare Inlet

Winter 2023

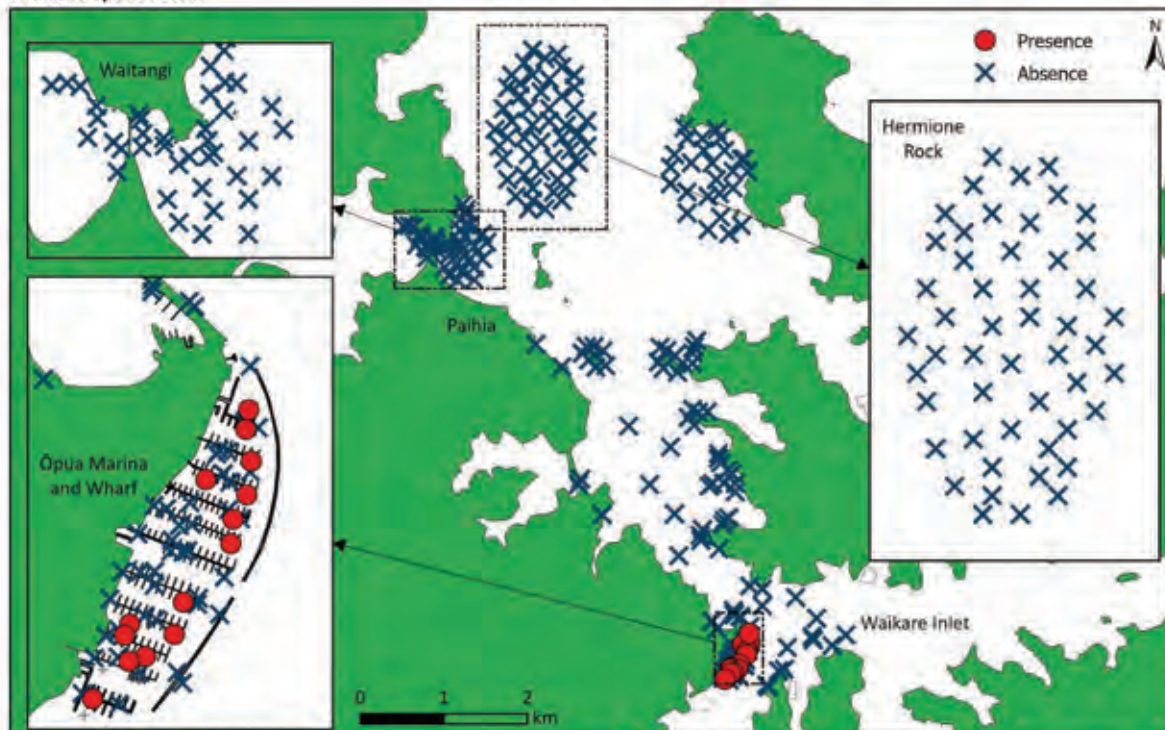
Sabella spallanzanii



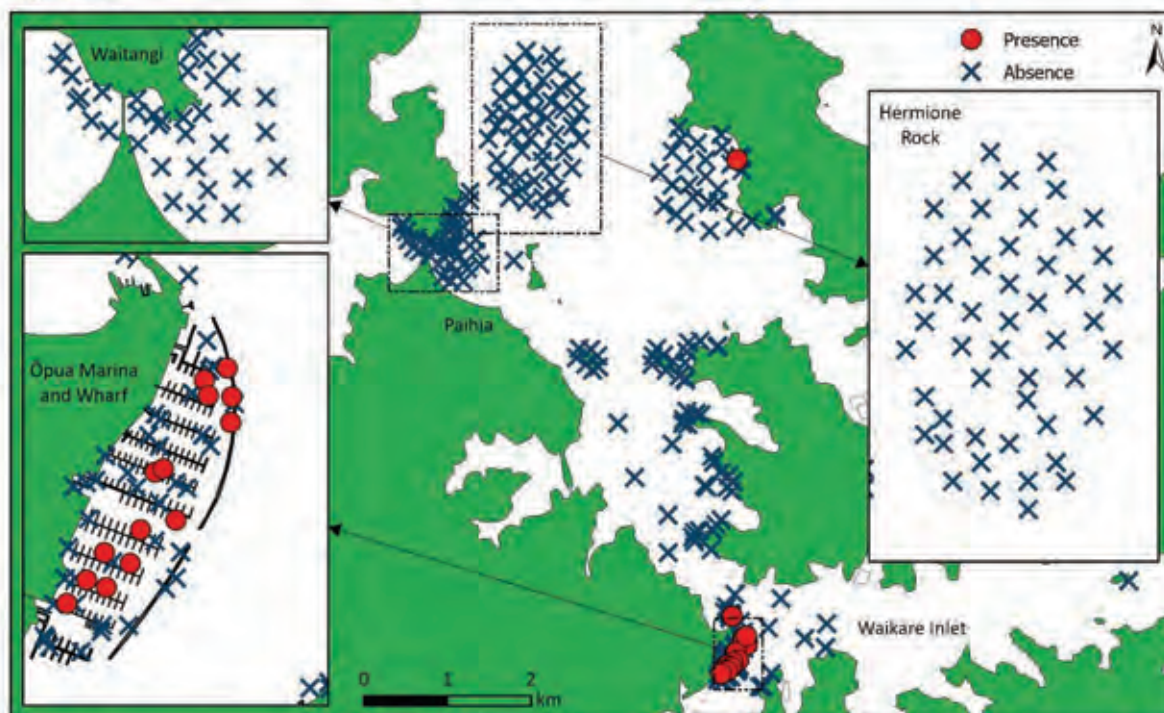
Ōpua Marina and Waikare Inlet

Summer 2023-24

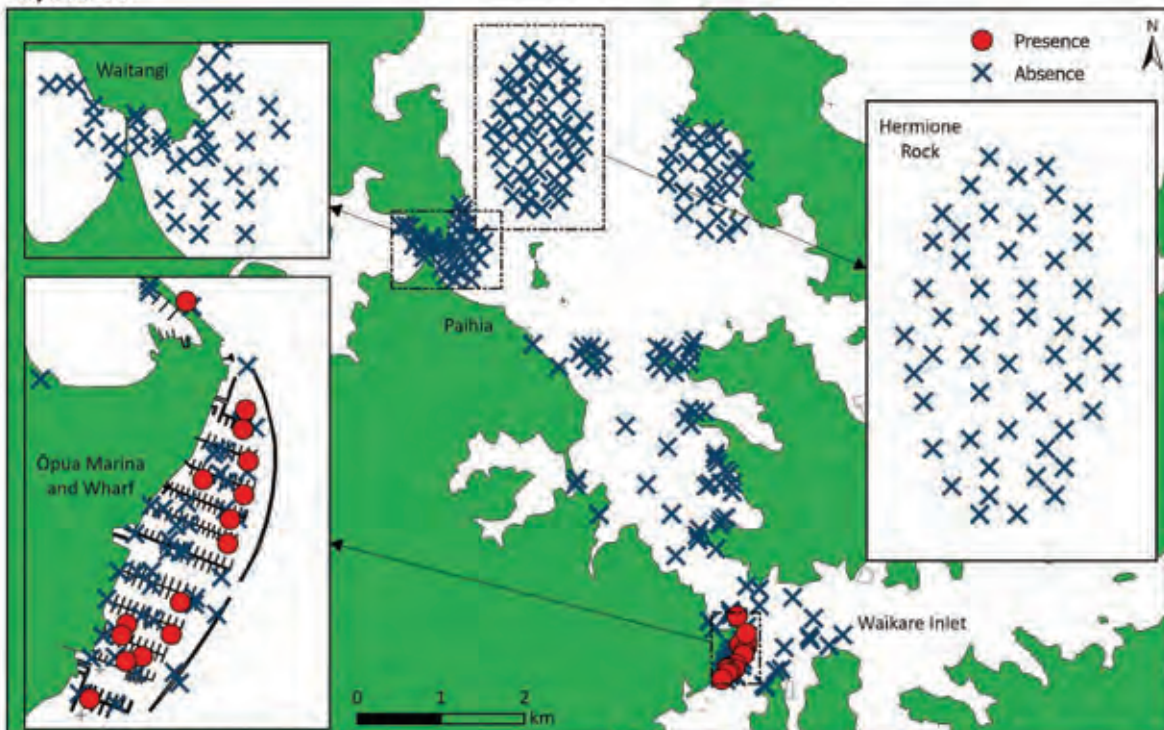
Sabella spallanzanii



Ōpua Marina and Waikare Inlet
 Winter 2023
Styela clava



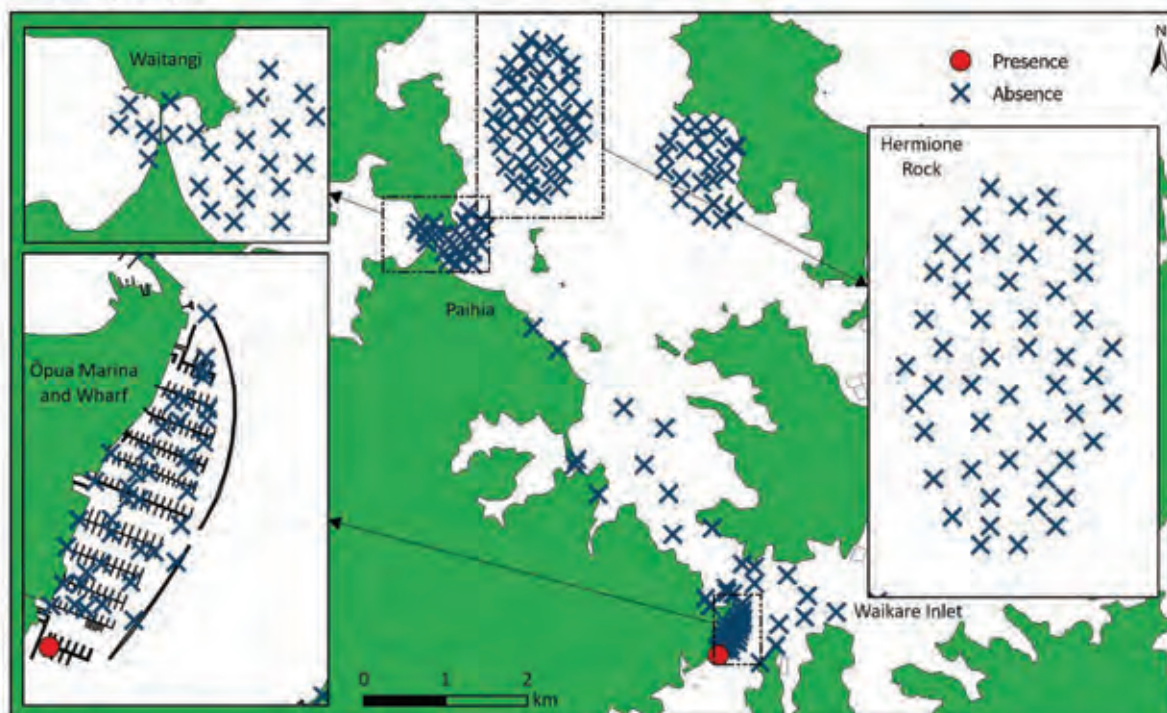
Ōpua Marina and Waikare Inlet
 Summer 2023-24
Styela clava



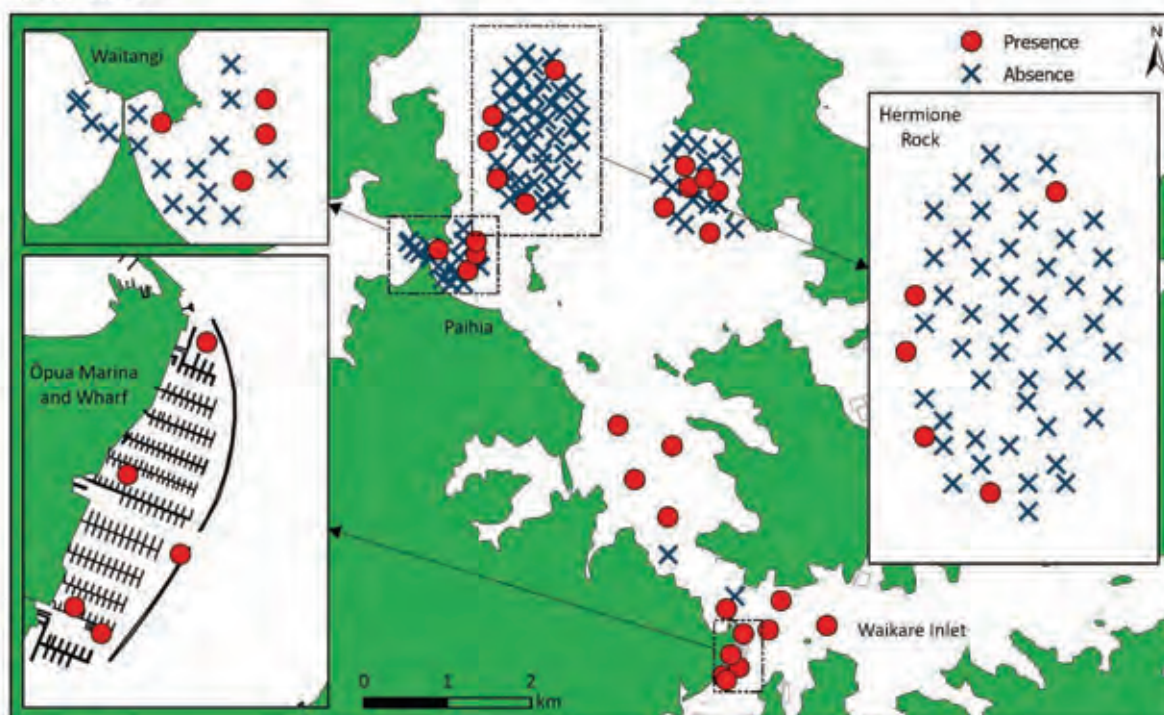
Ōpua Marina and Waikare Inlet

Summer 2023-24

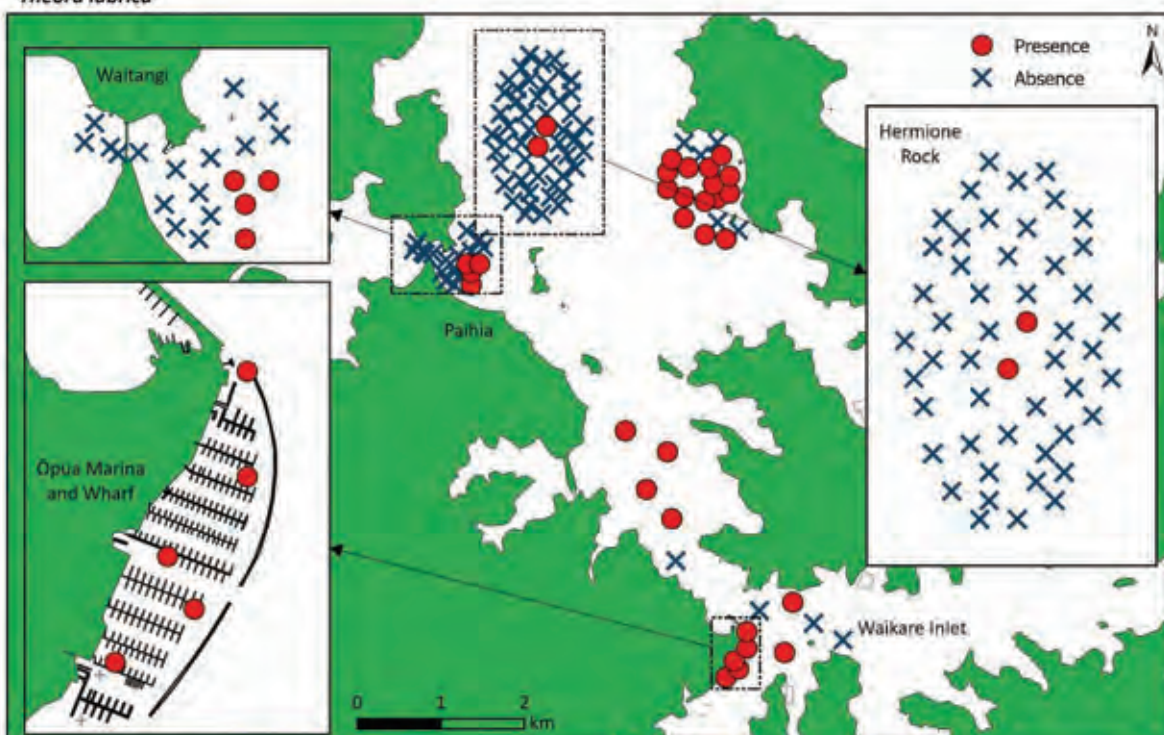
Thecacera pennigera



Ōpua Marina and Waikare Inlet
 Winter 2023
Theora lubrica



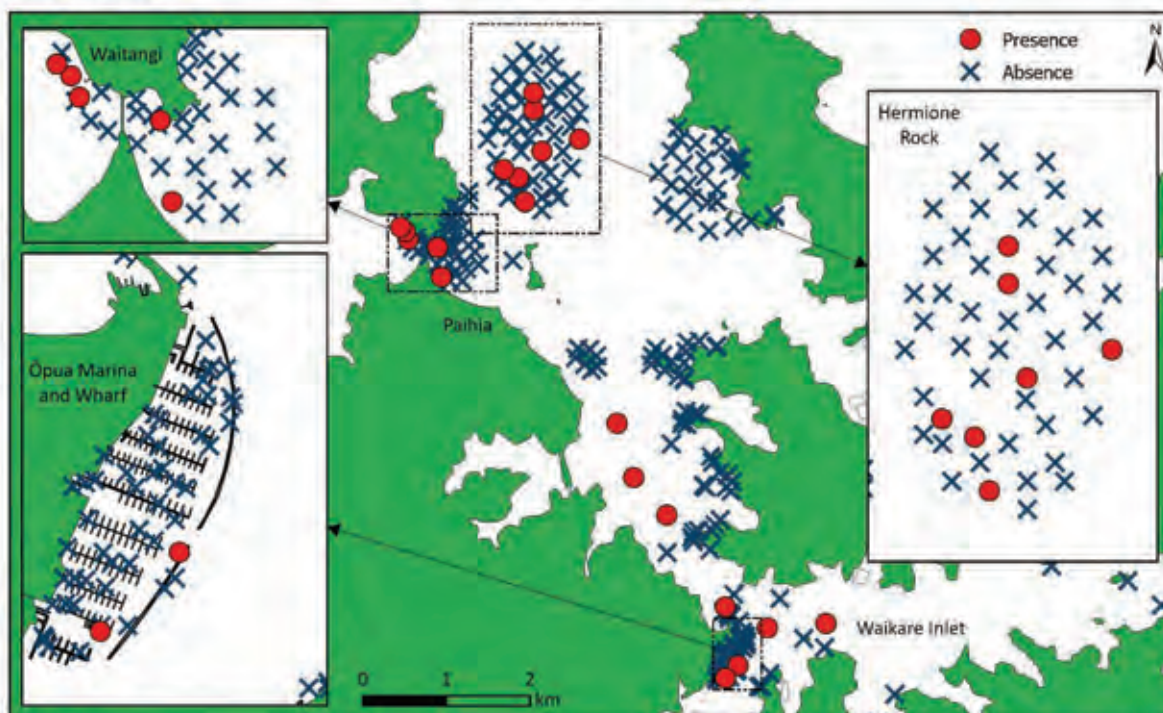
Ōpua Marina and Waikare Inlet
 Summer 2023-24
Theora lubrica



Ōpua Marina and Waikare Inlet

Winter 2023

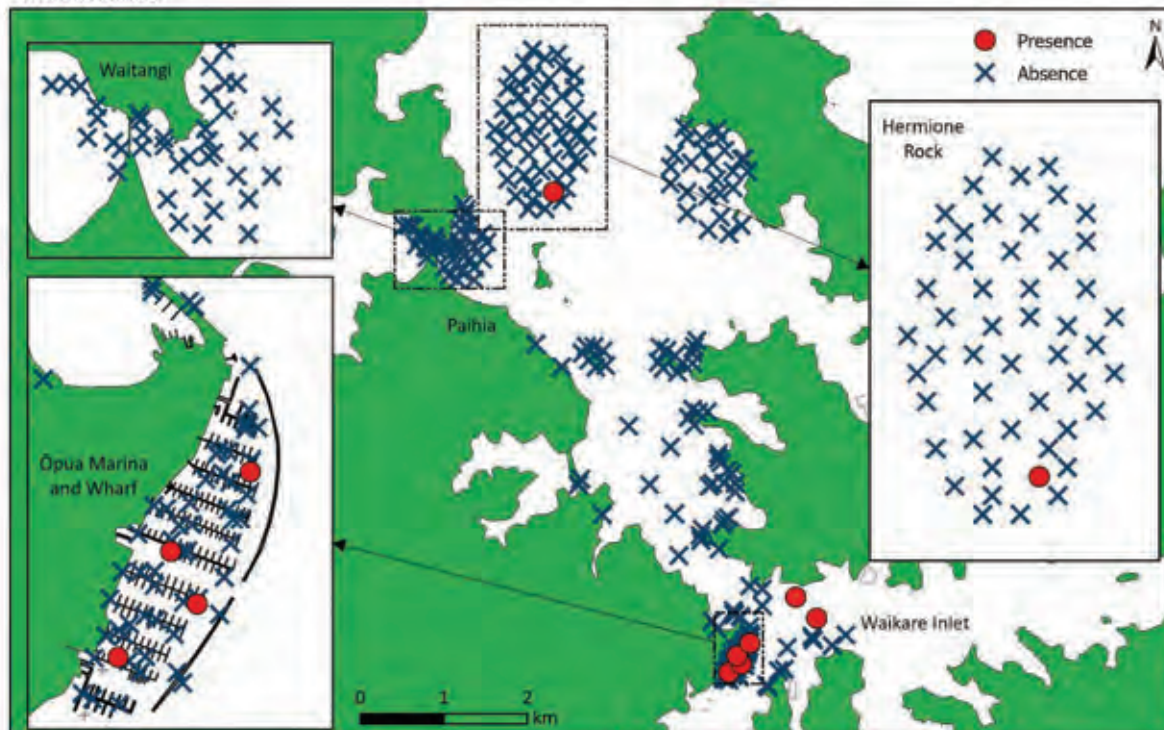
Tritia burchardi



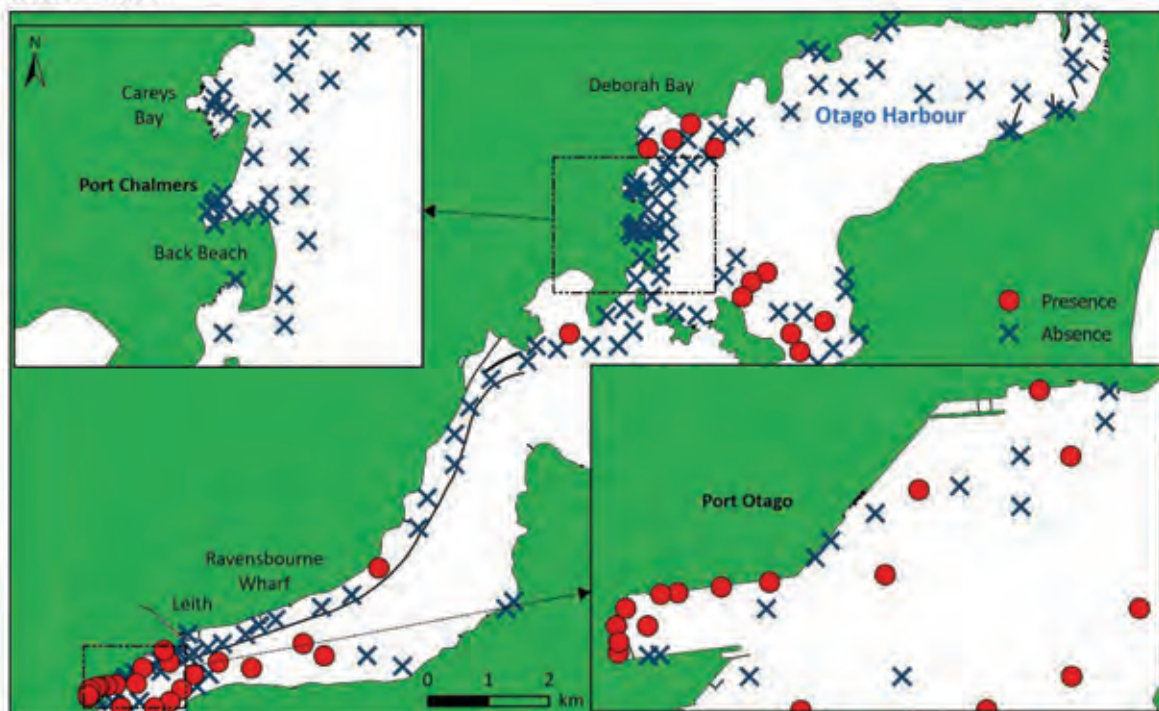
Ōpua Marina and Waikare Inlet

Summer 2023-24

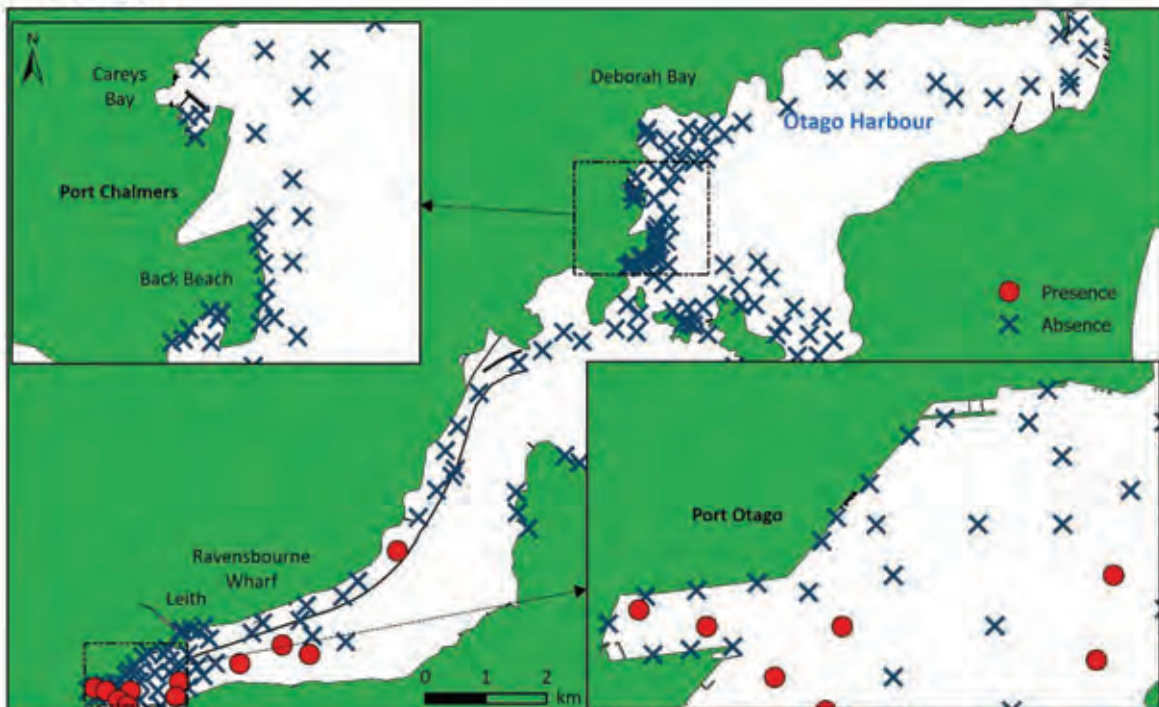
Tritia burchardi



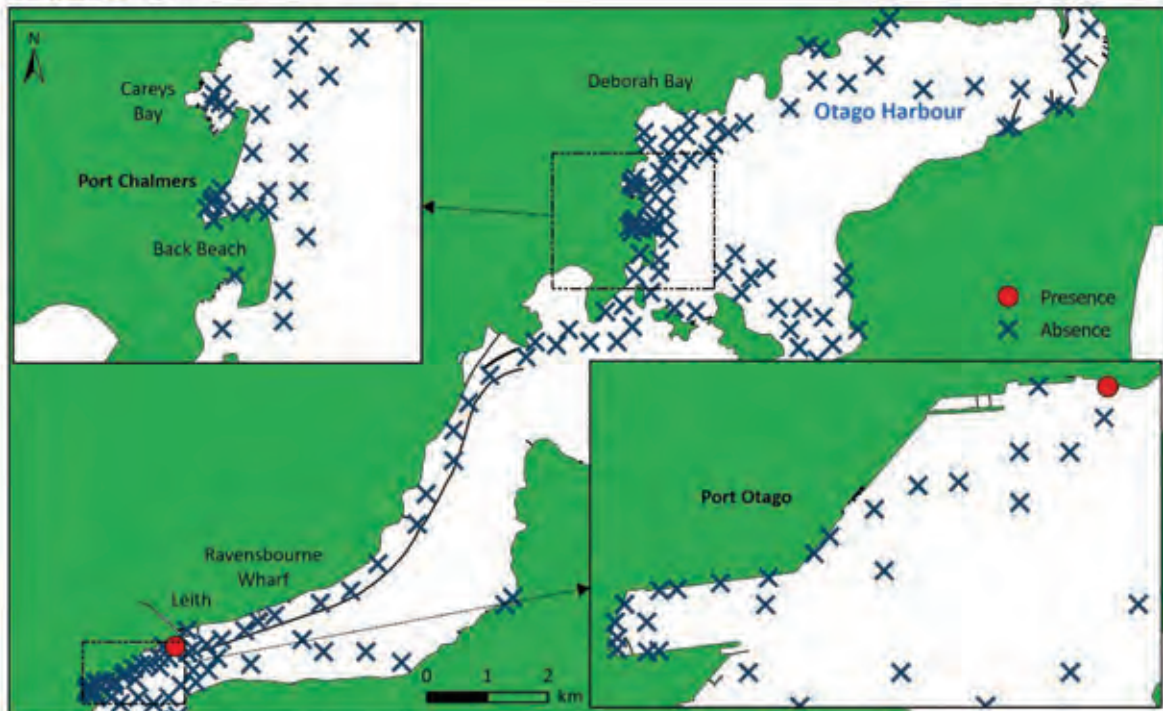
Otago Harbour
 Winter 2023
Ascidella aspersa



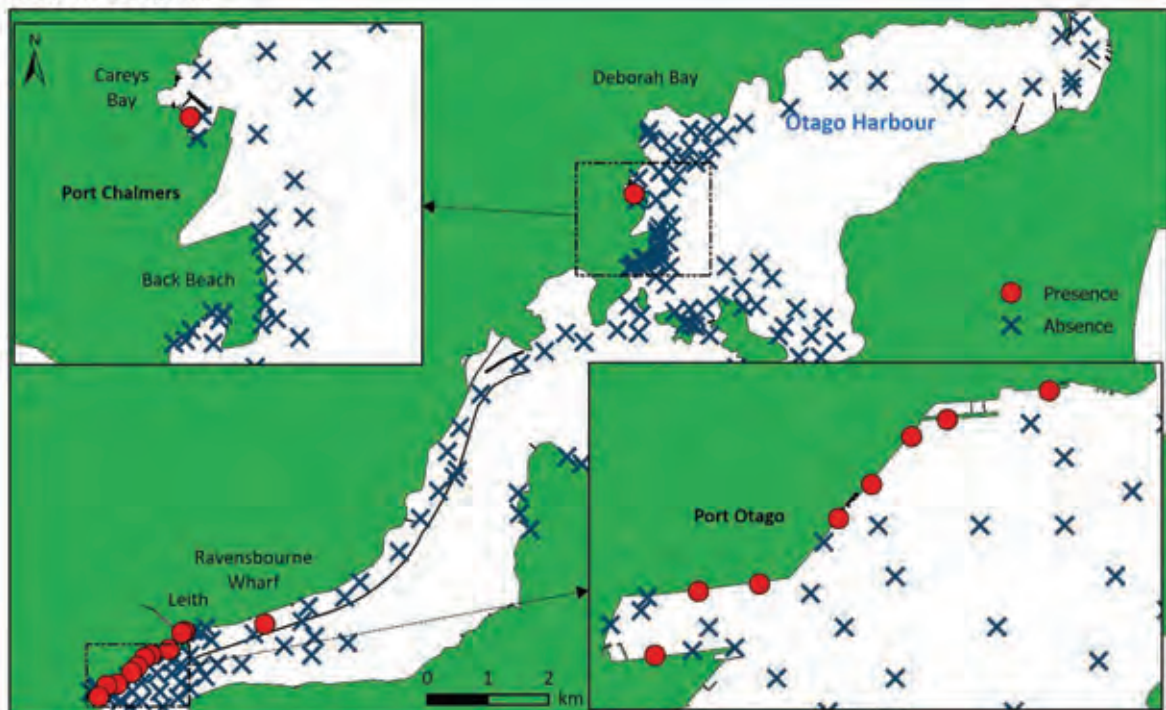
Otago Harbour
 Summer 2023-24
Ascidella aspersa



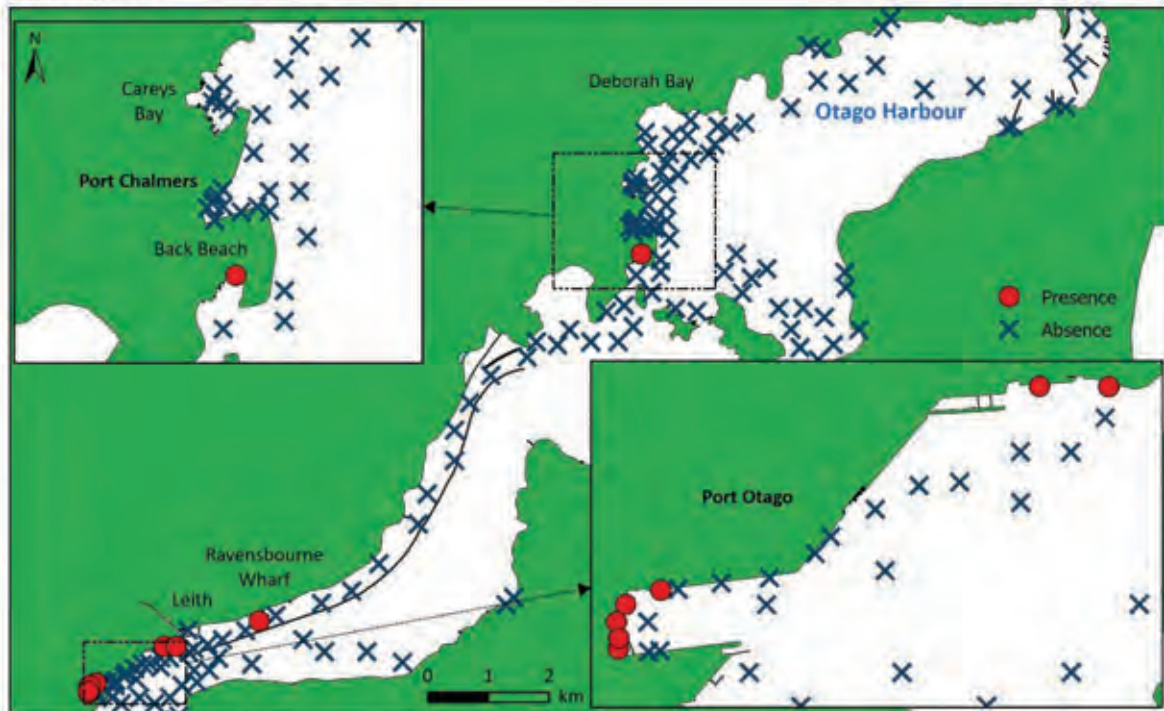
Otago Harbour
 Winter 2023
Botrylloides diegensis



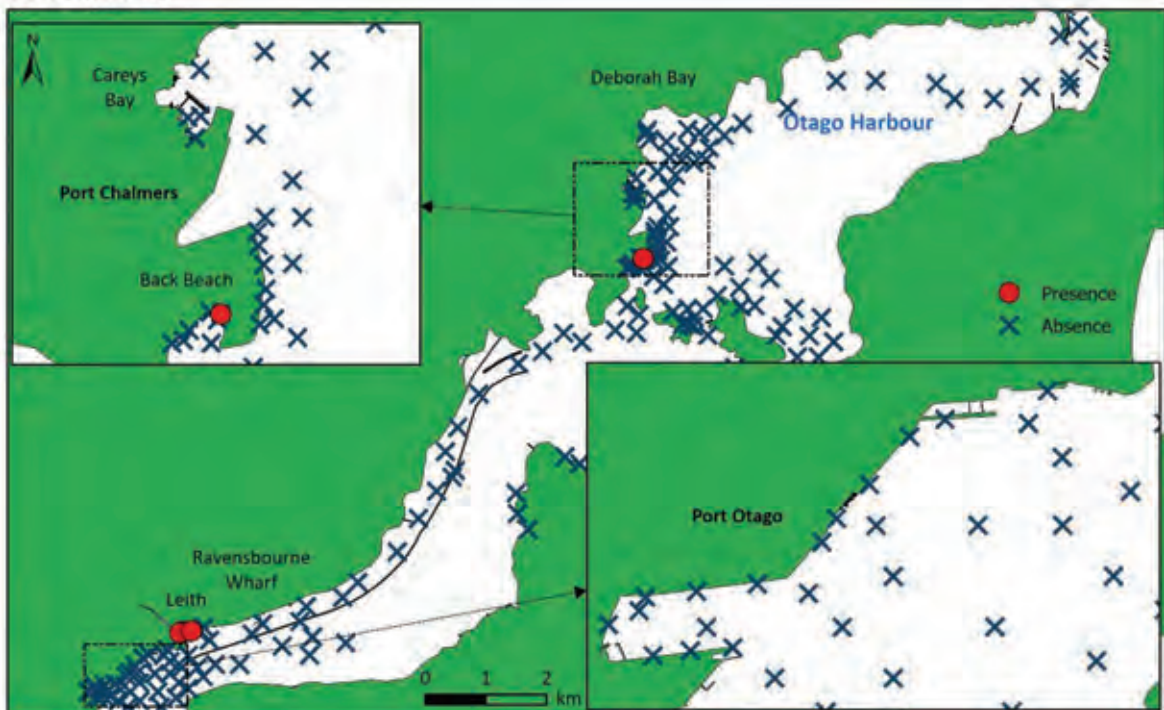
Otago Harbour
 Summer 2023-24
Botrylloides diegensis



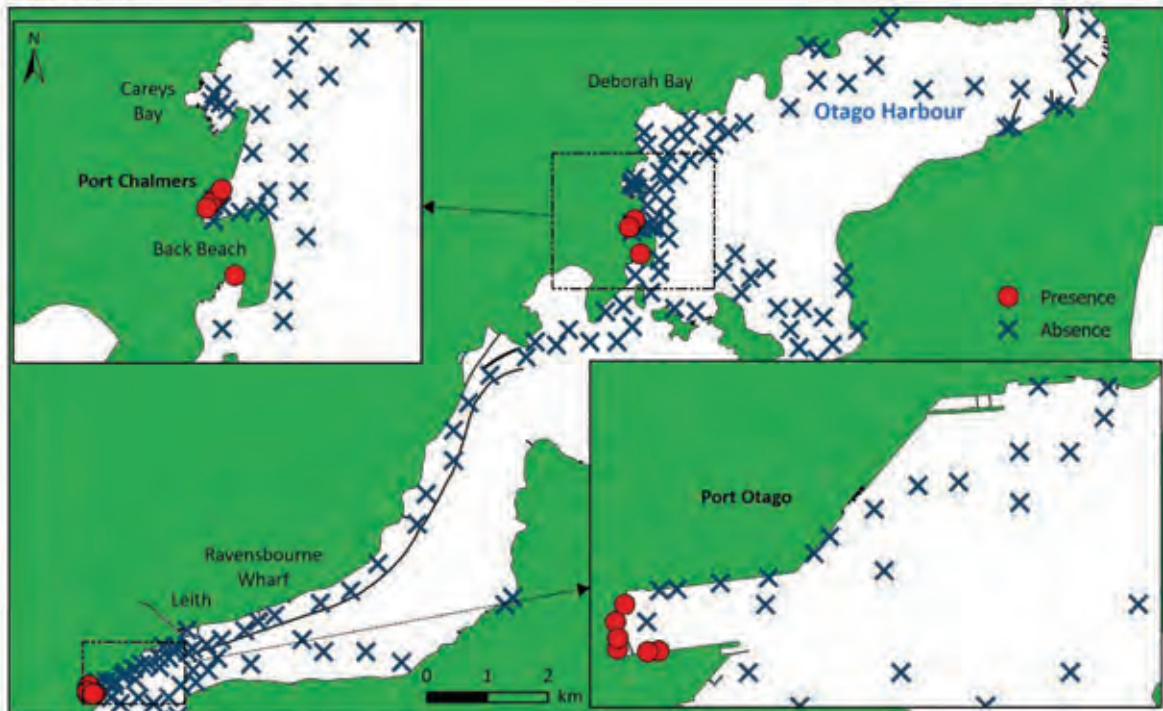
Otago Harbour
 Winter 2023
Ciona intestinalis



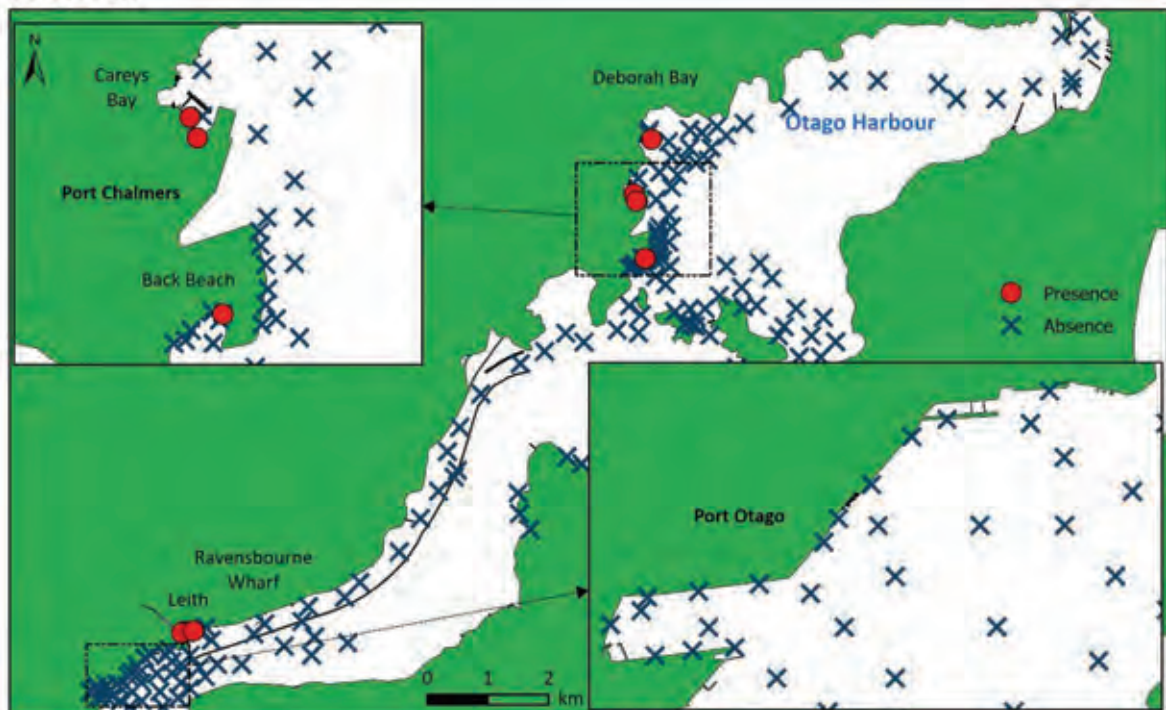
Otago Harbour
 Summer 2023-24
Ciona intestinalis



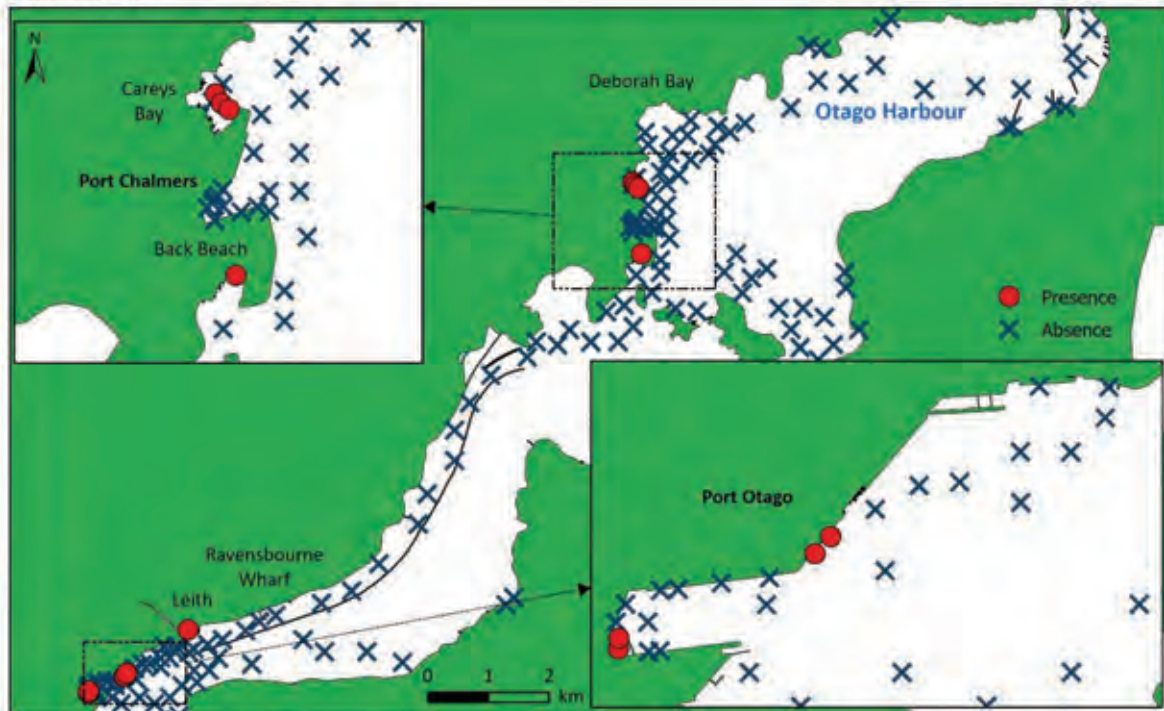
Otago Harbour
 Winter 2023
Ciona robusta



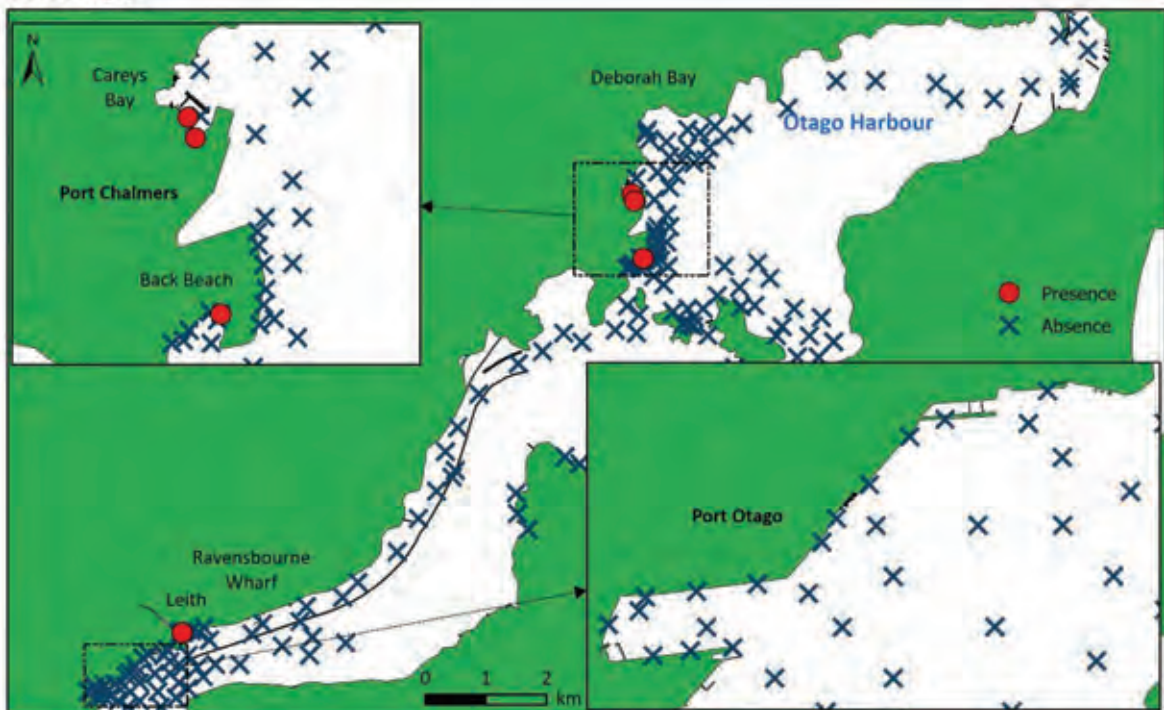
Otago Harbour
 Summer 2023-24
Ciona robusta



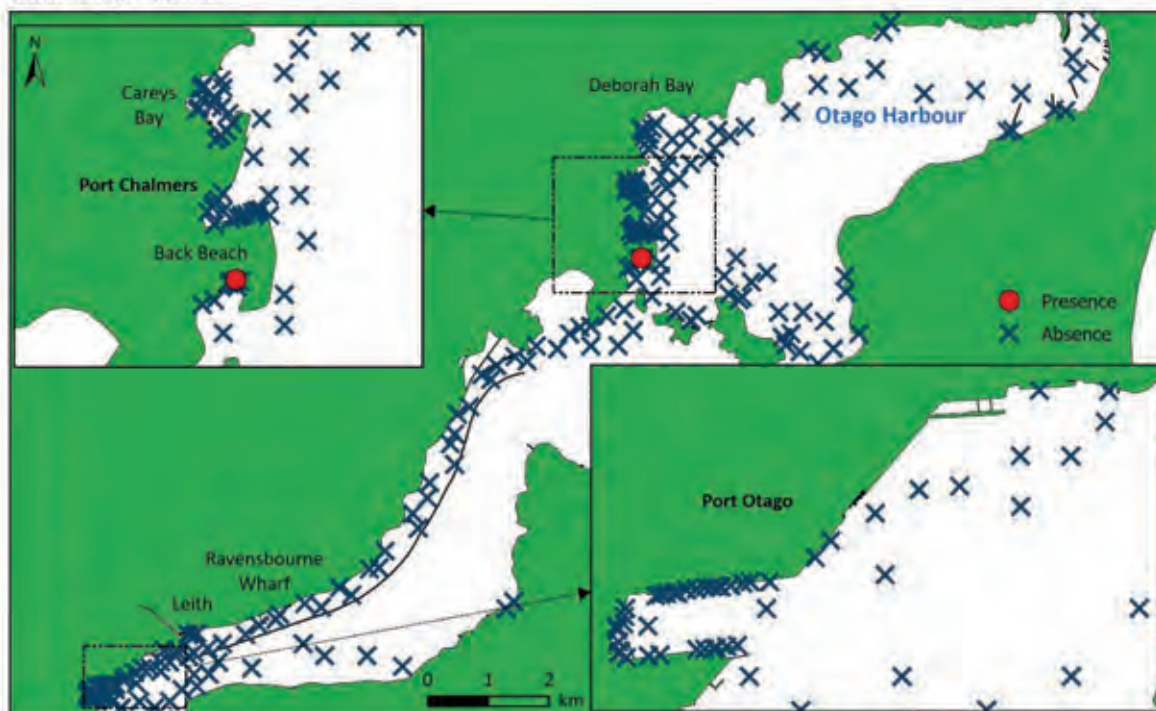
Otago Harbour
 Winter 2023
Ciona savignyi



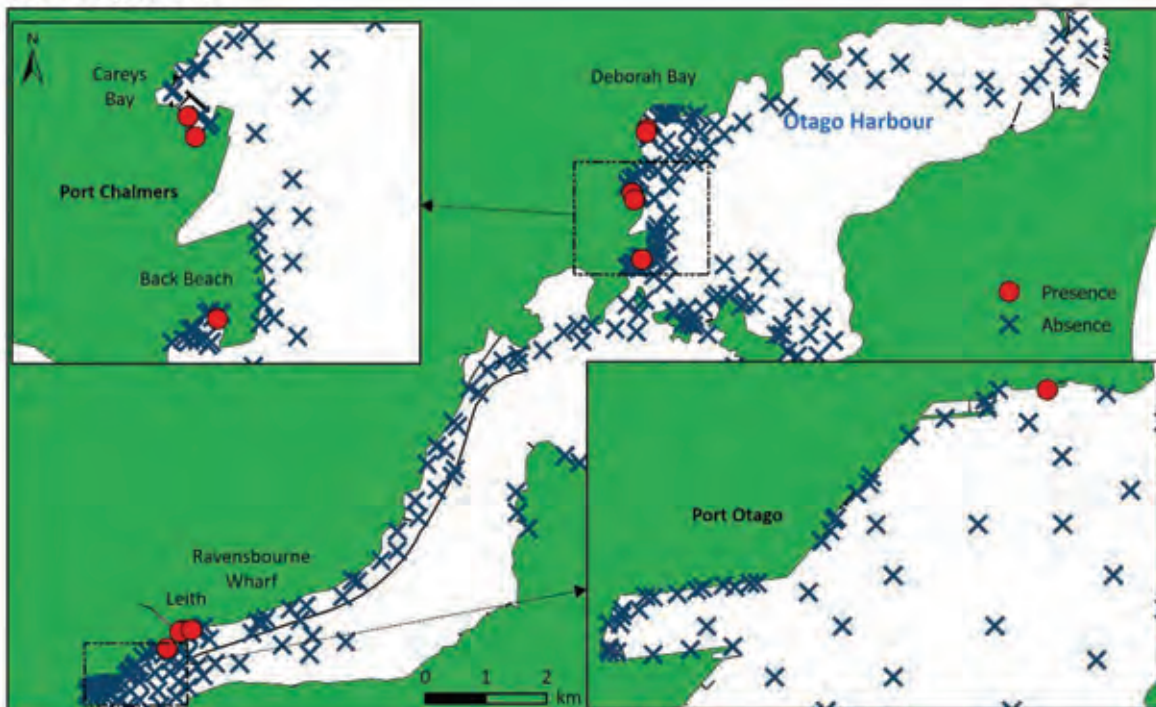
Otago Harbour
 Summer 2023-24
Ciona savignyi



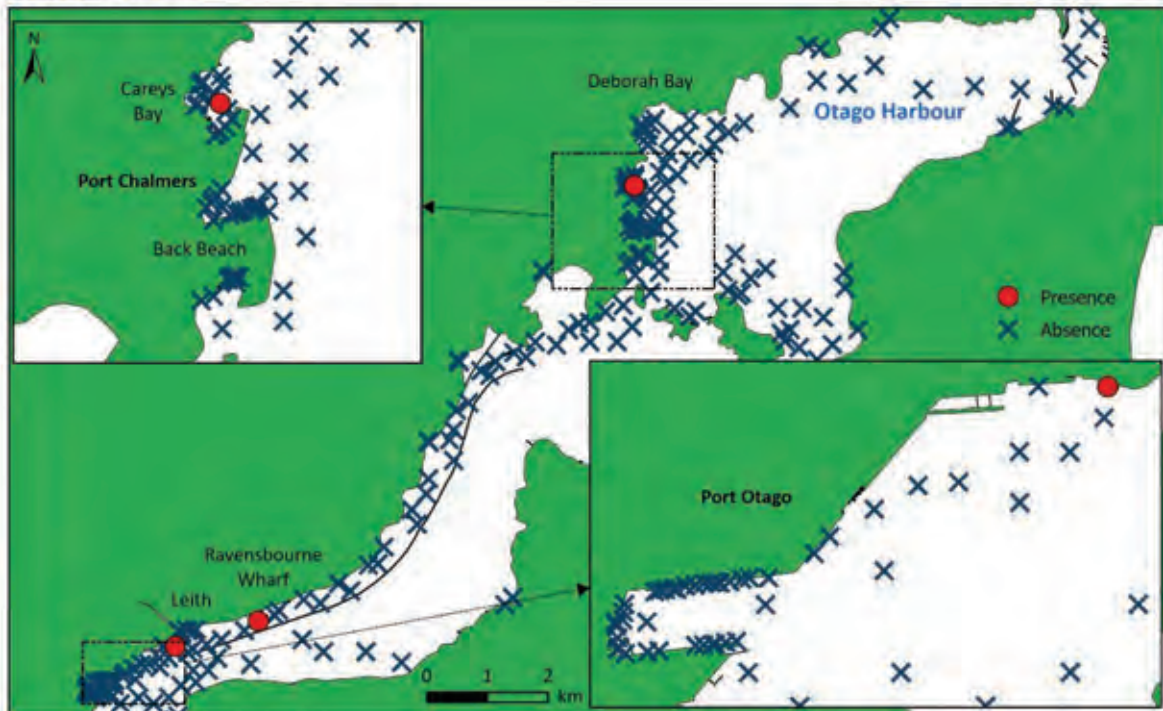
Otago Harbour
 Winter 2023
Clavelina lepadiformis



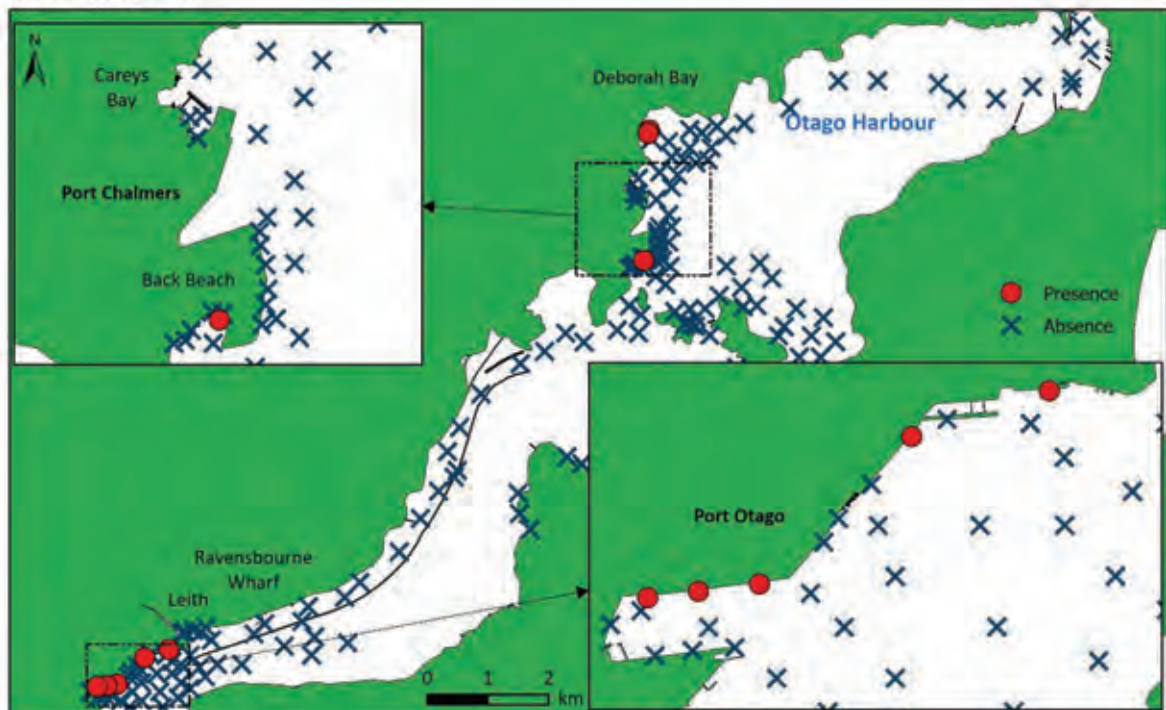
Otago Harbour
 Summer 2023-24
Clavelina lepadiformis



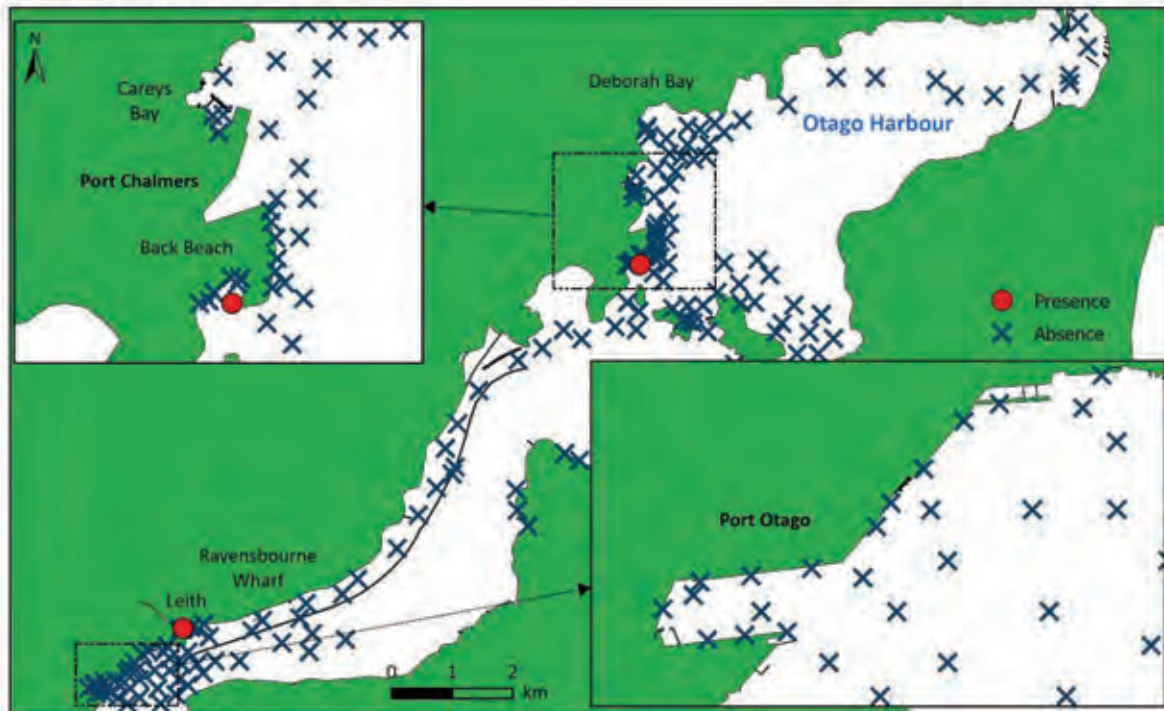
Otago Harbour
 Winter 2023
Didemnum vexillum



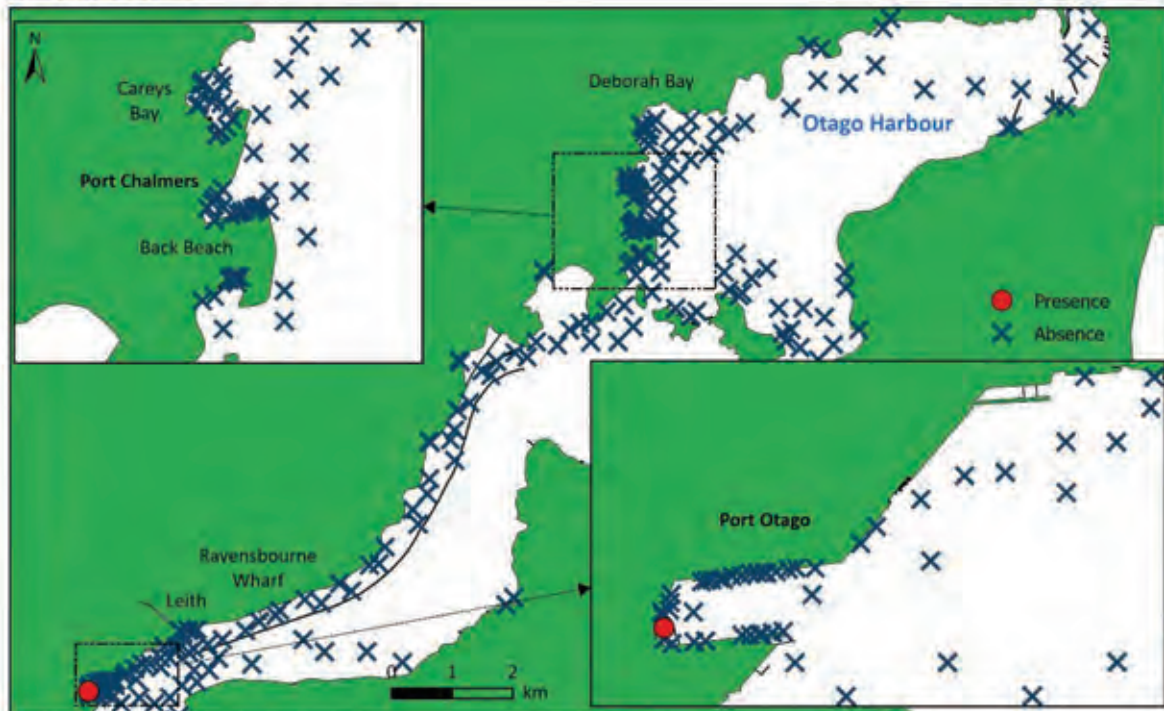
Otago Harbour
 Summer 2023-24
Didemnum vexillum



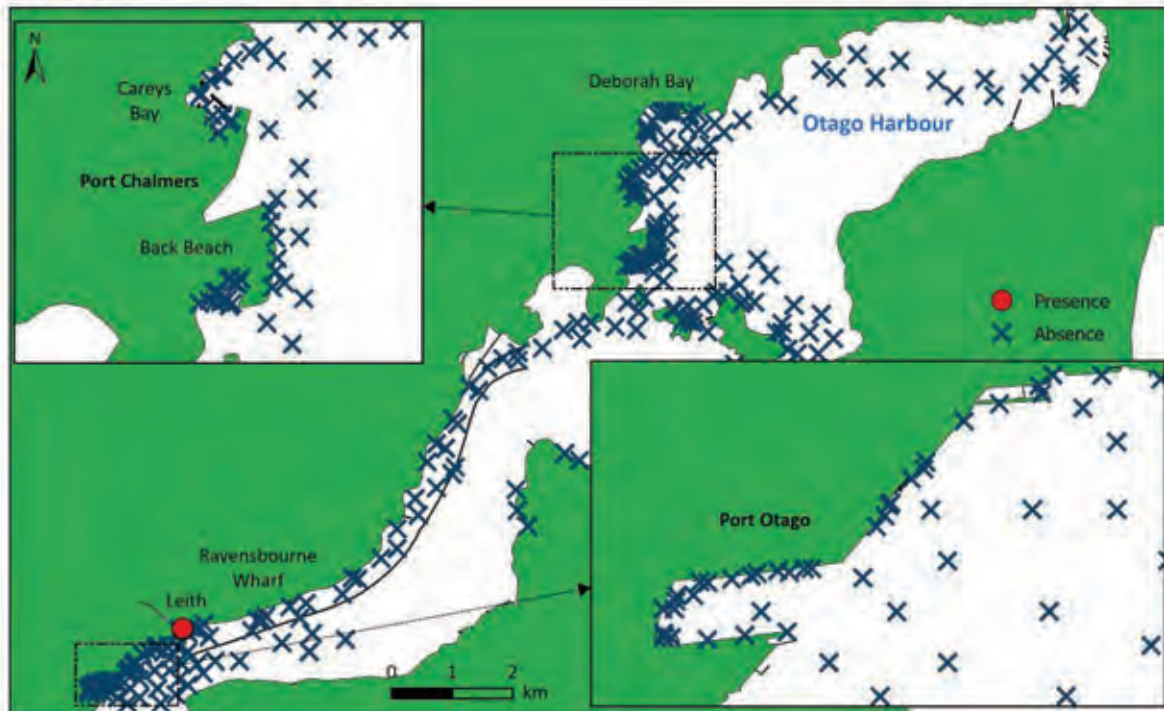
Otago Harbour
 Summer 2023-24
Diplosoma listerianum



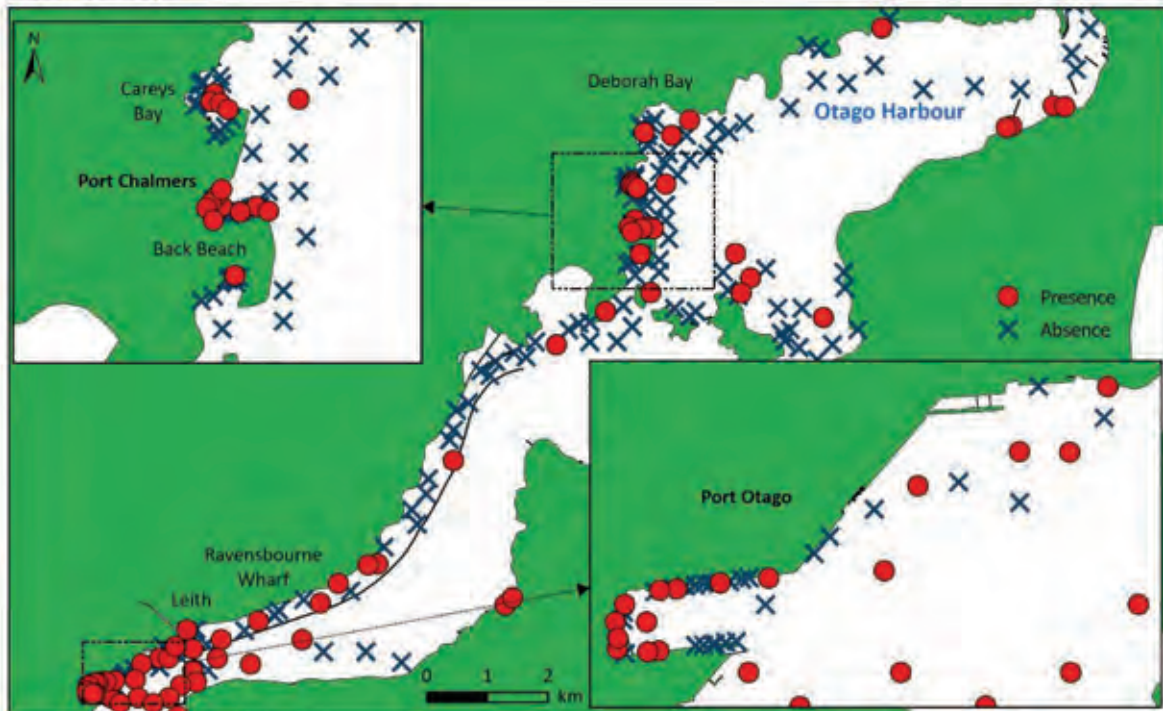
Otago Harbour
 Winter 2023
Schizymenia apoda



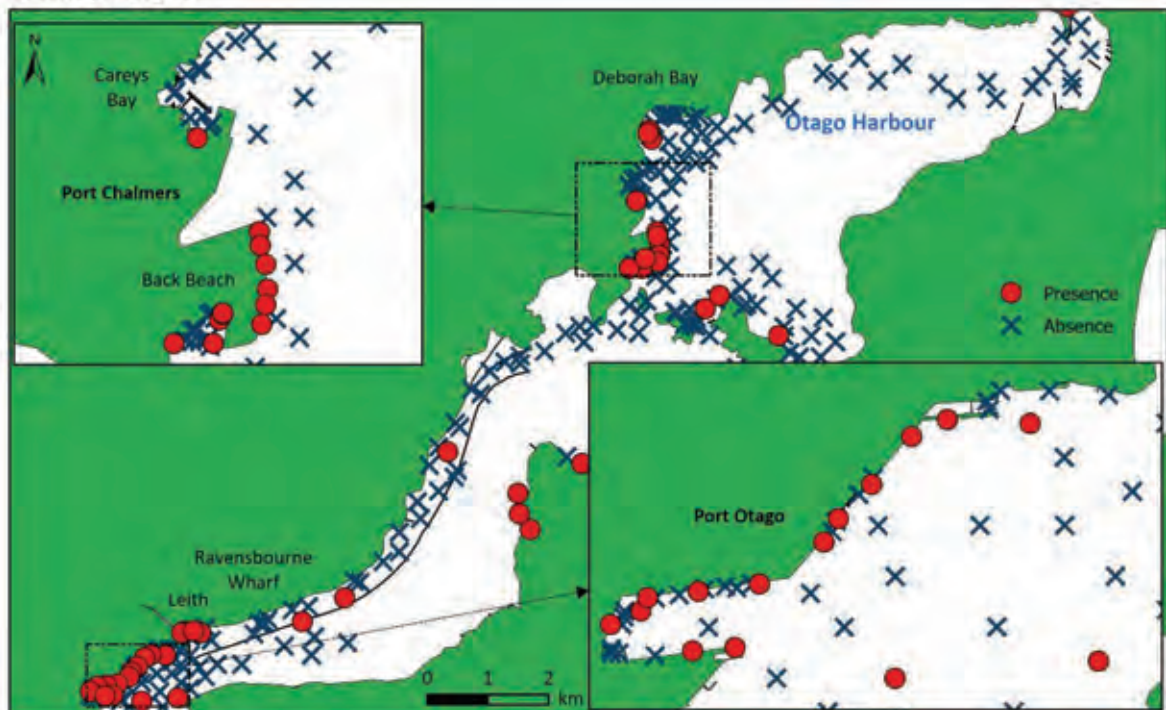
Otago Harbour
 Summer 2023-24
Styela clava



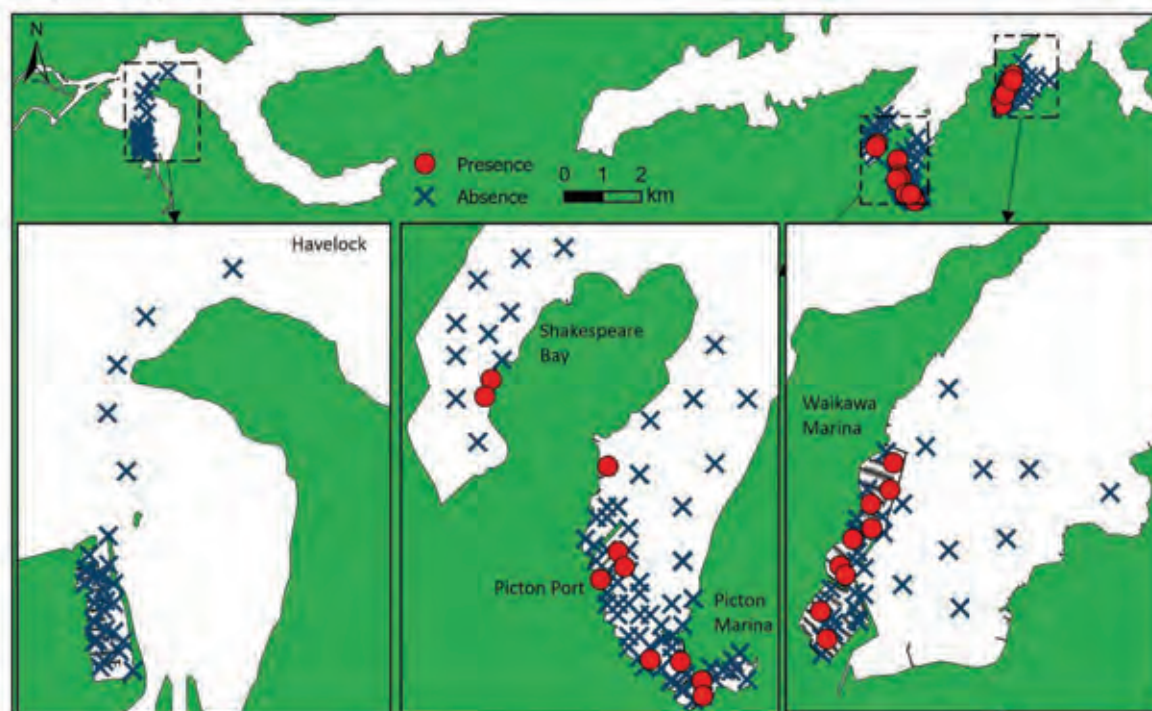
Otago Harbour
 Winter 2023
Undaria pinnatifida



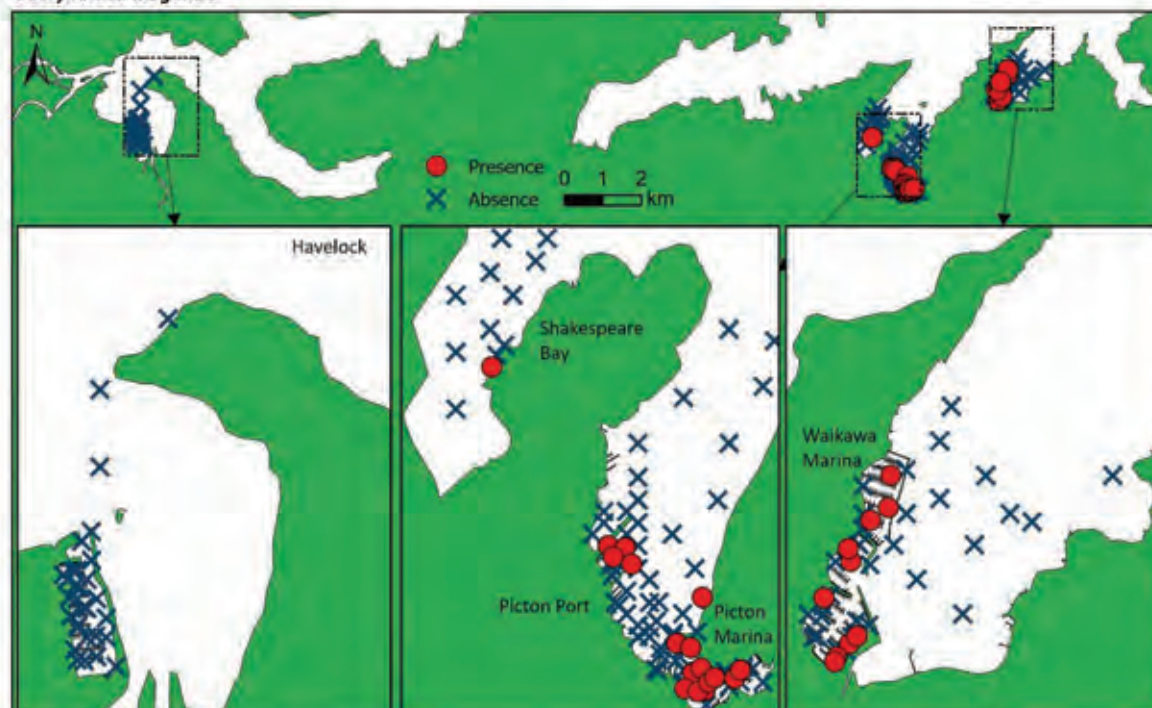
Otago Harbour
 Summer 2023-24
Undaria pinnatifida



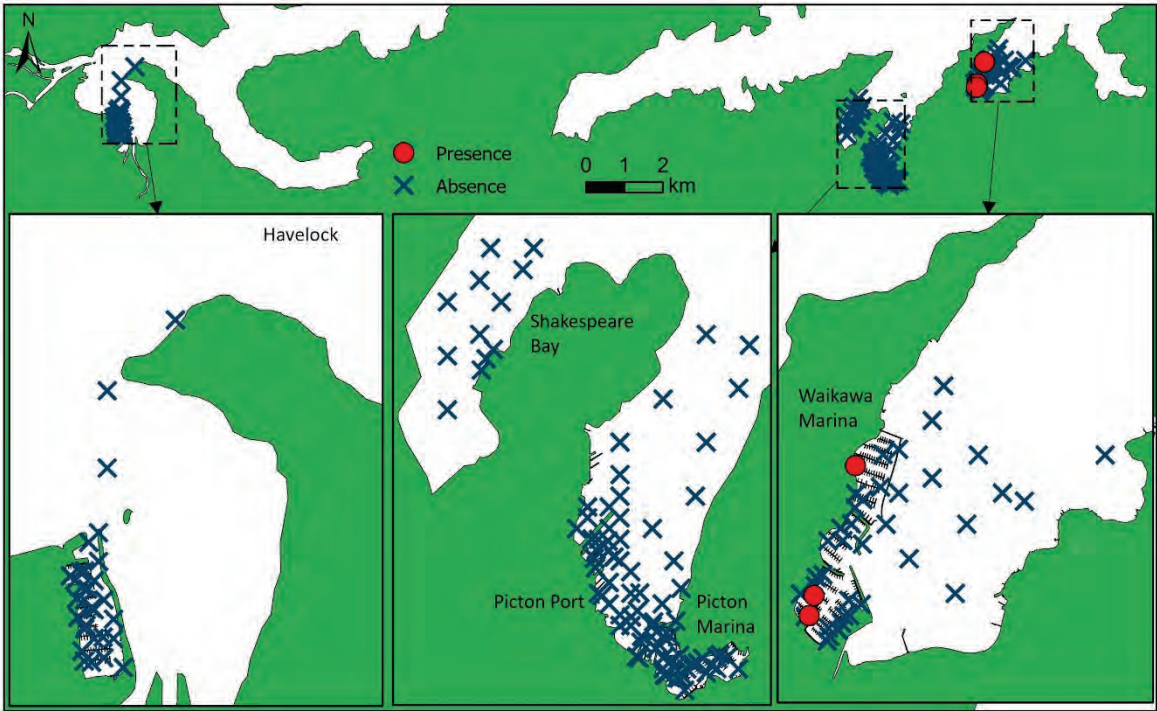
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Botrylloides diegensis



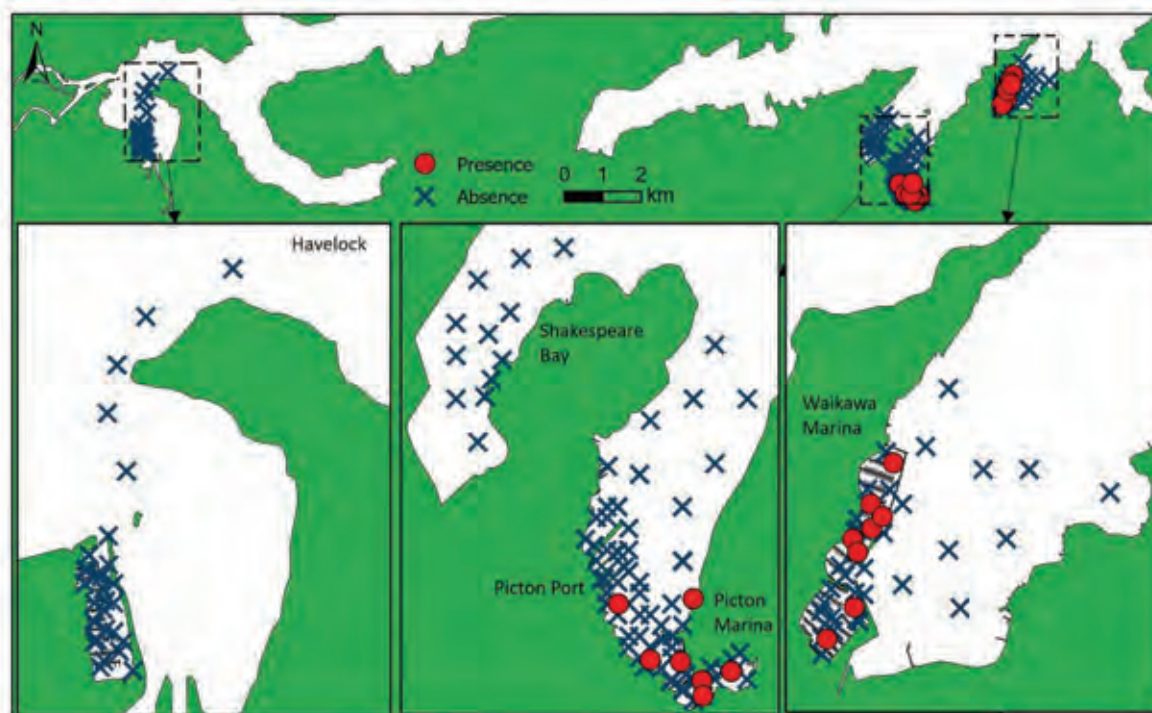
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Botrylloides diegensis



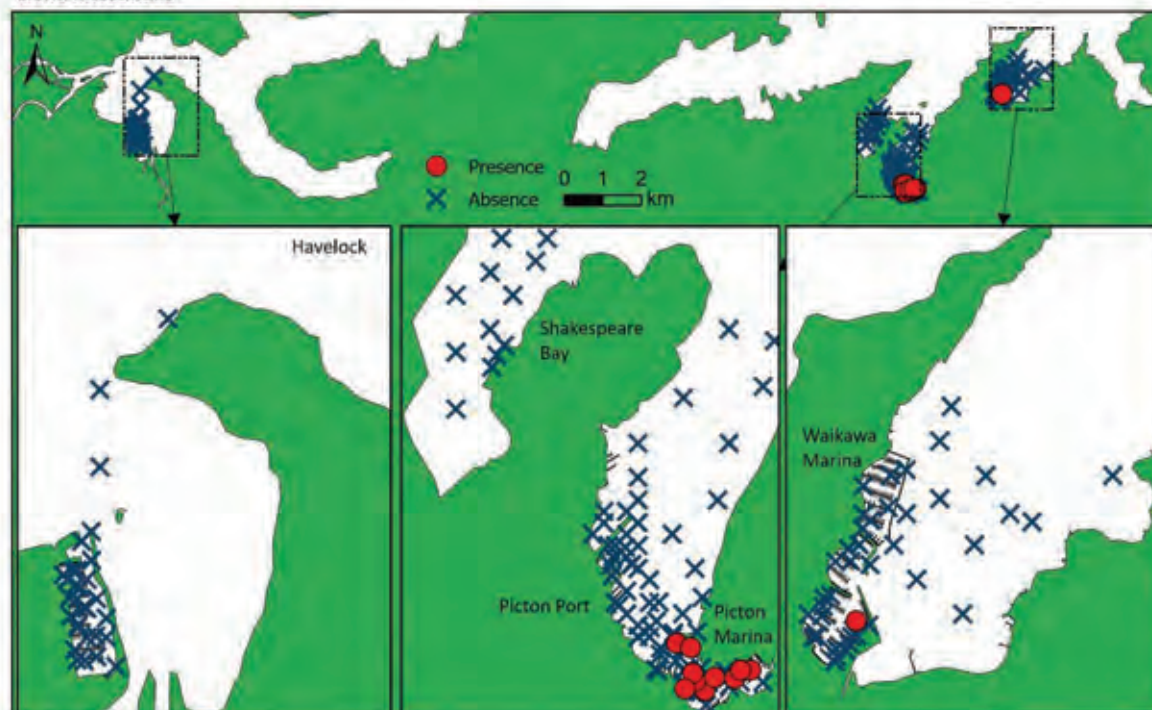
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
Summer 2023-24
Caprella mutica



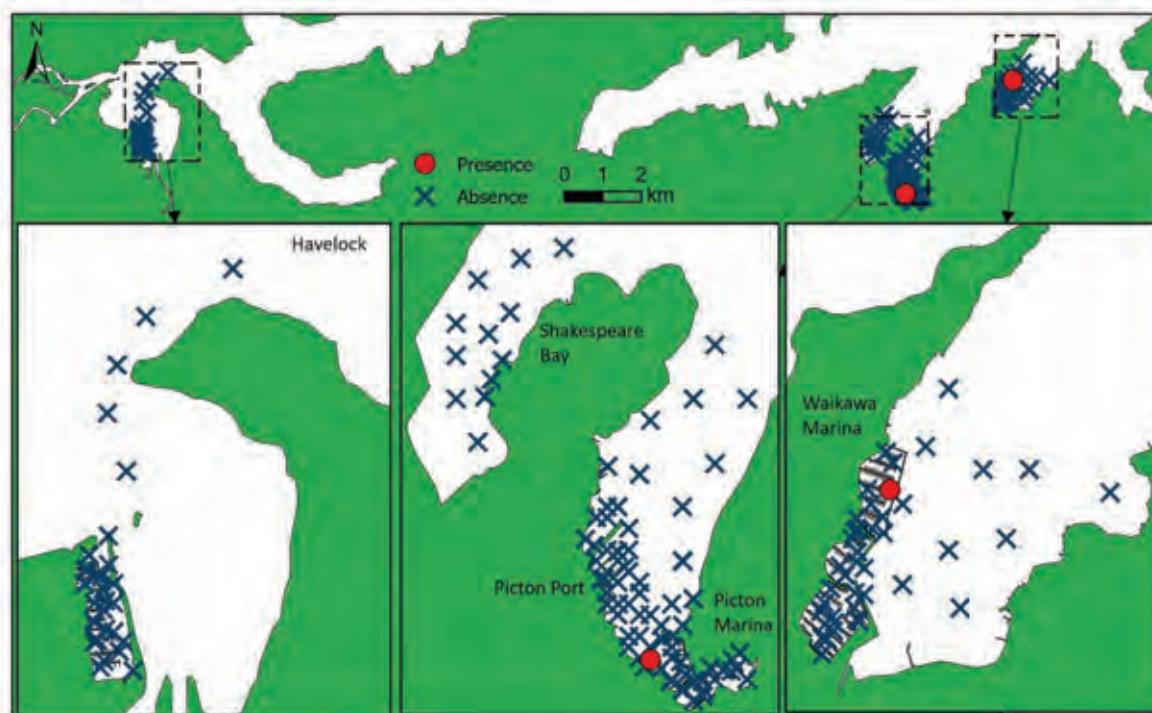
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Ciona intestinalis



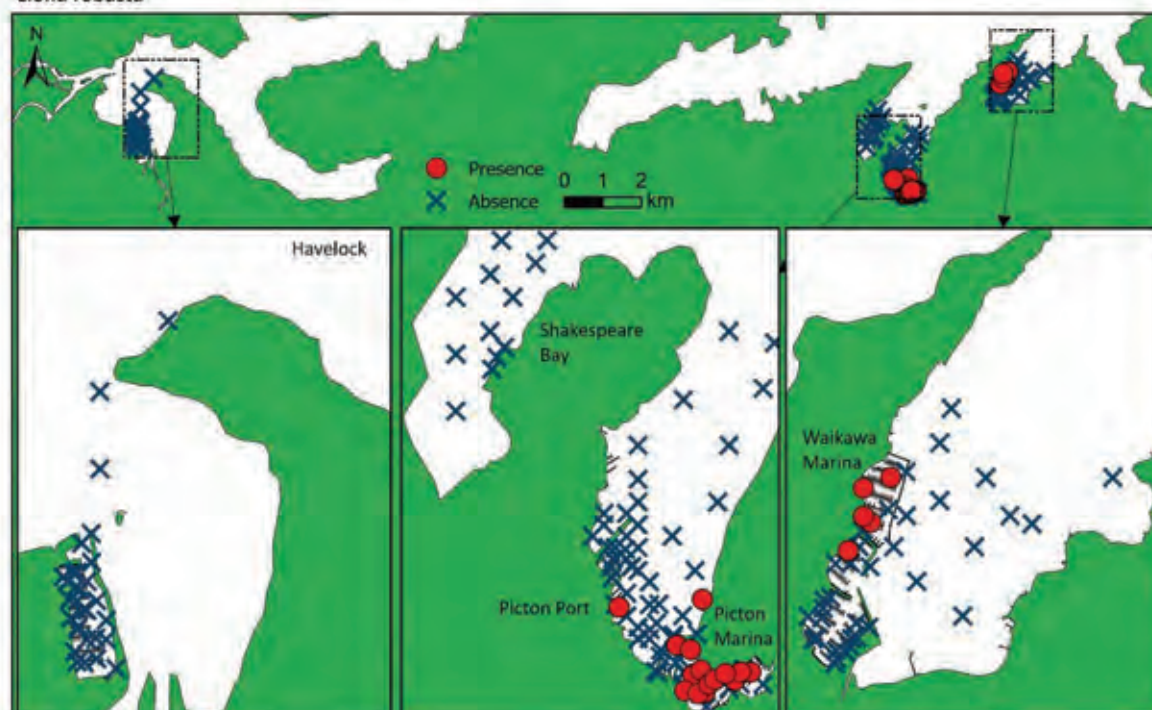
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Ciona intestinalis



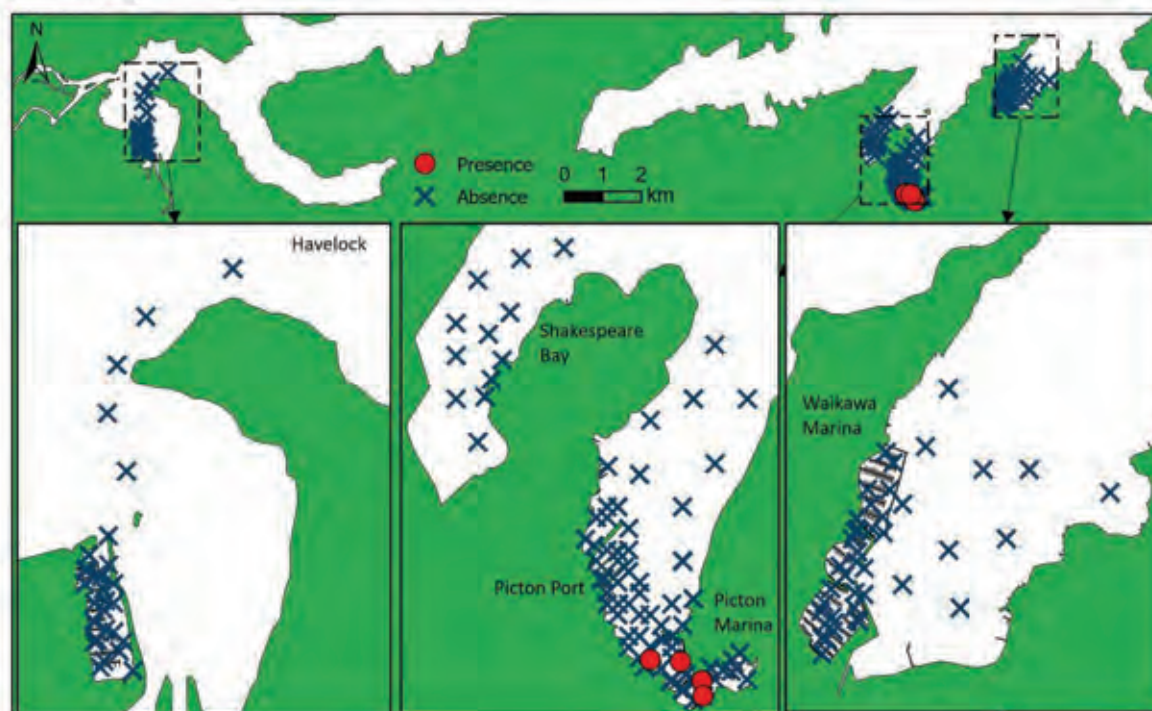
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Ciona robusta



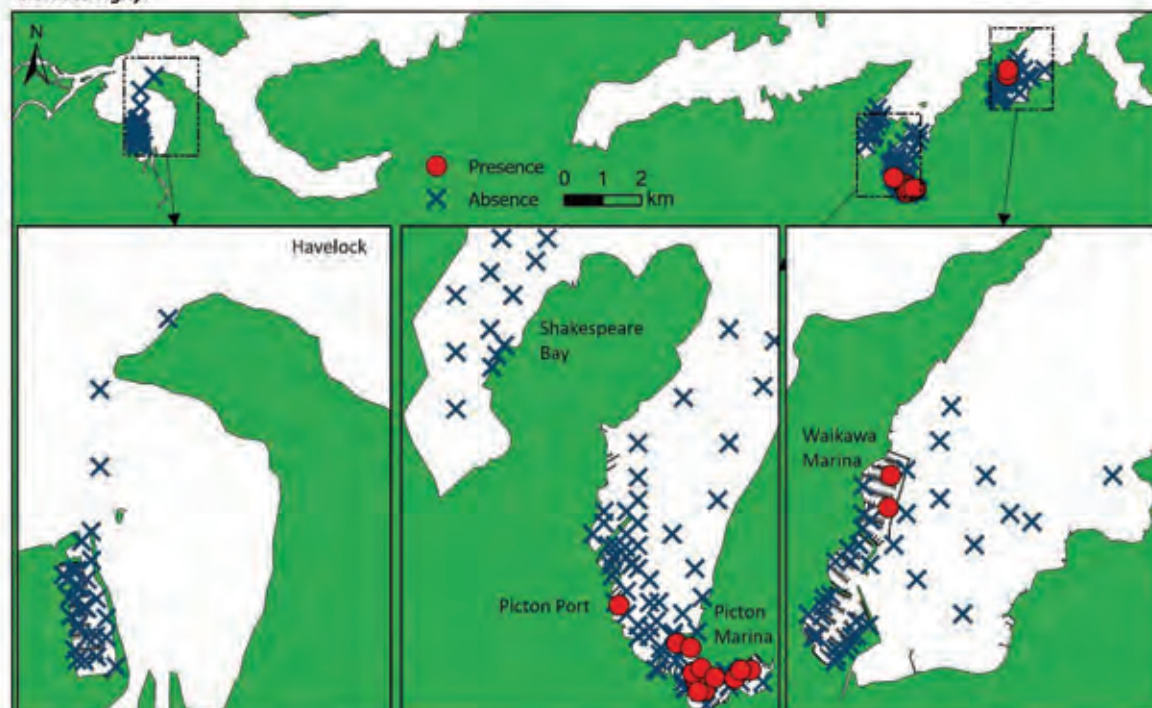
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Ciona robusta



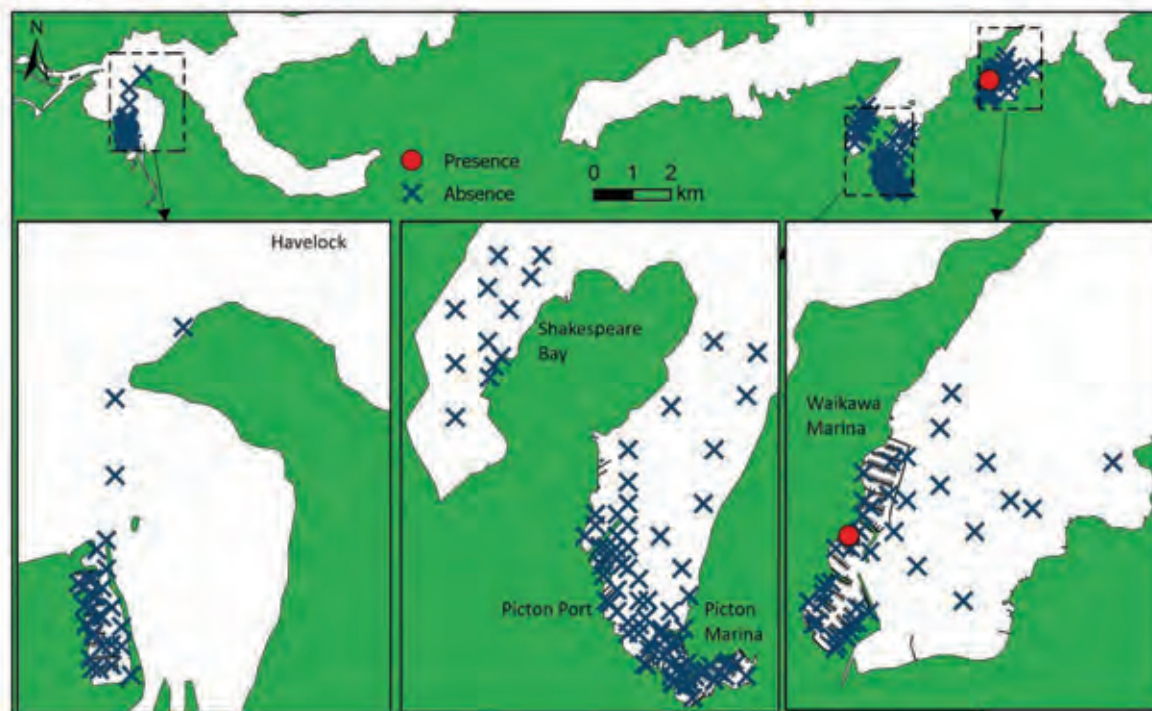
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Ciona savignyi



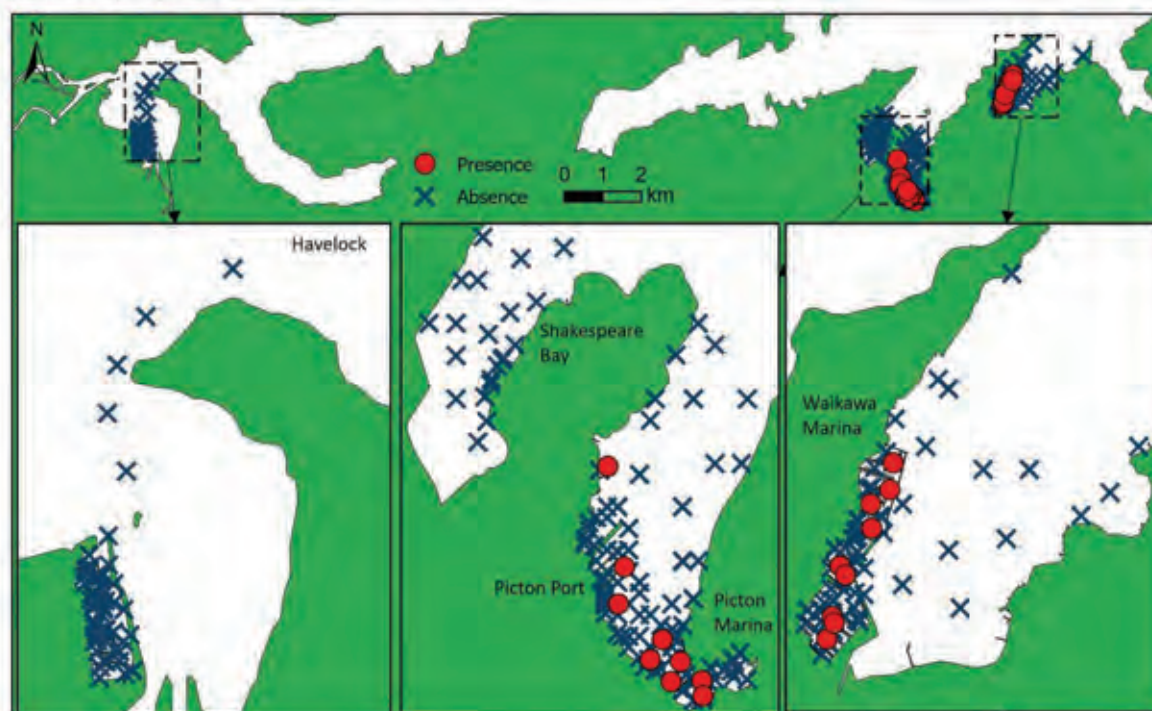
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Ciona savignyi



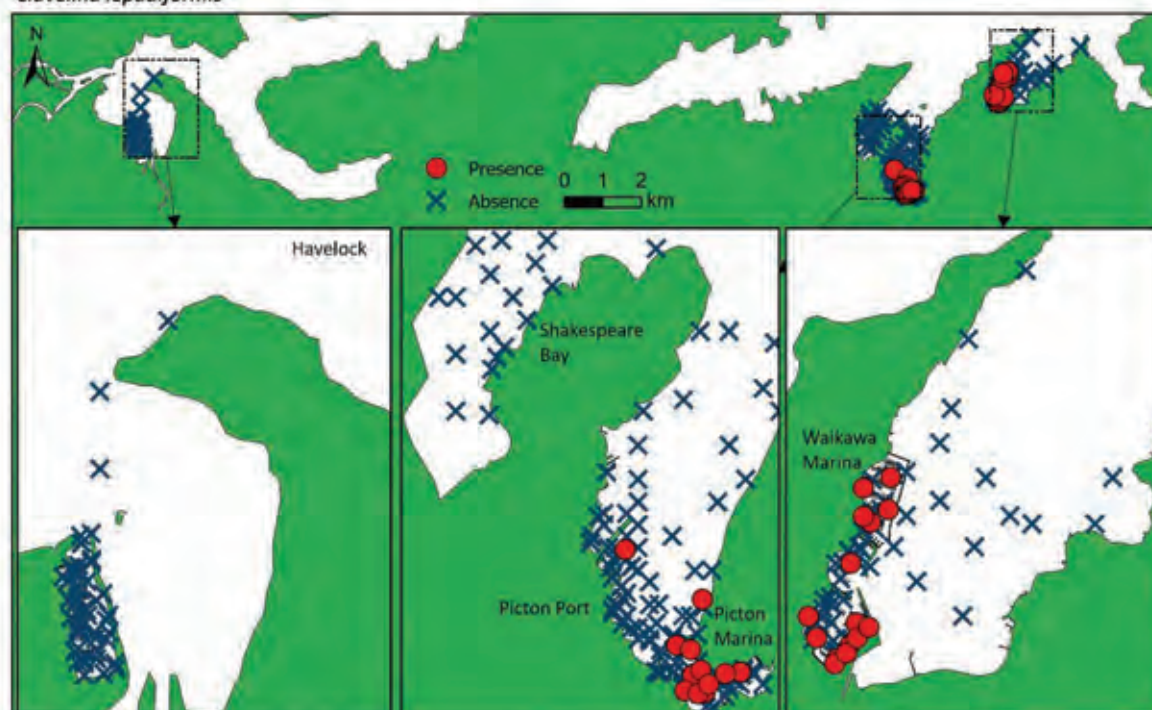
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Ciona spp.



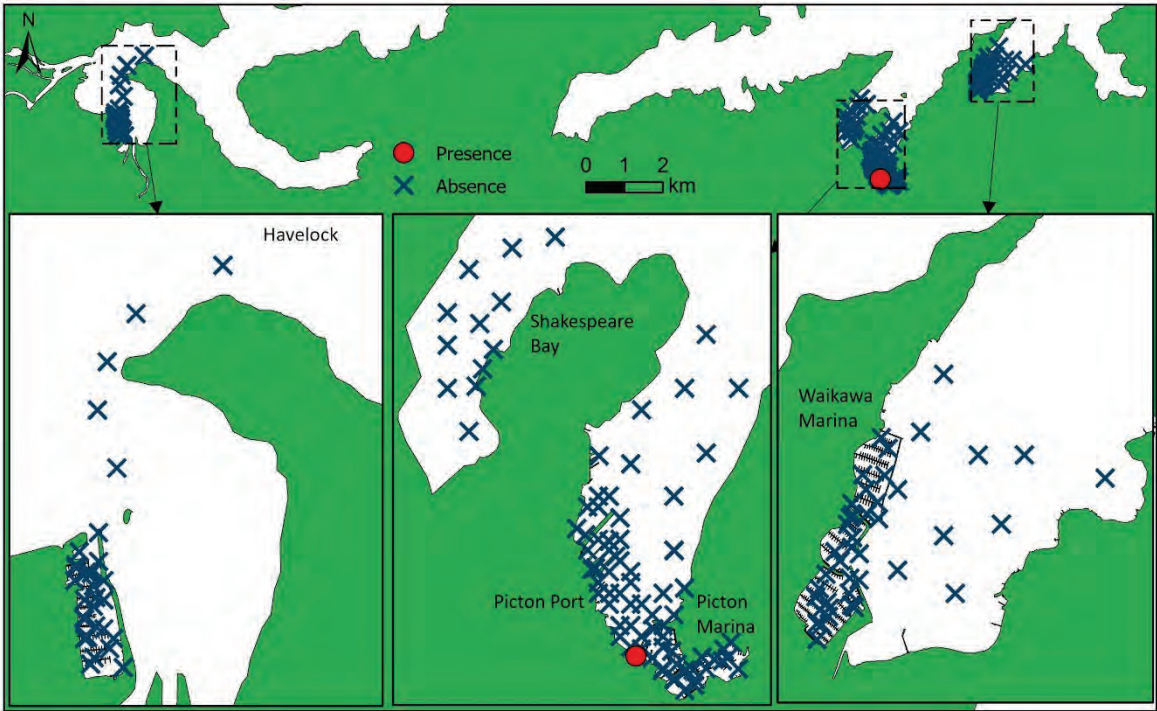
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Clavelina lepadiformis



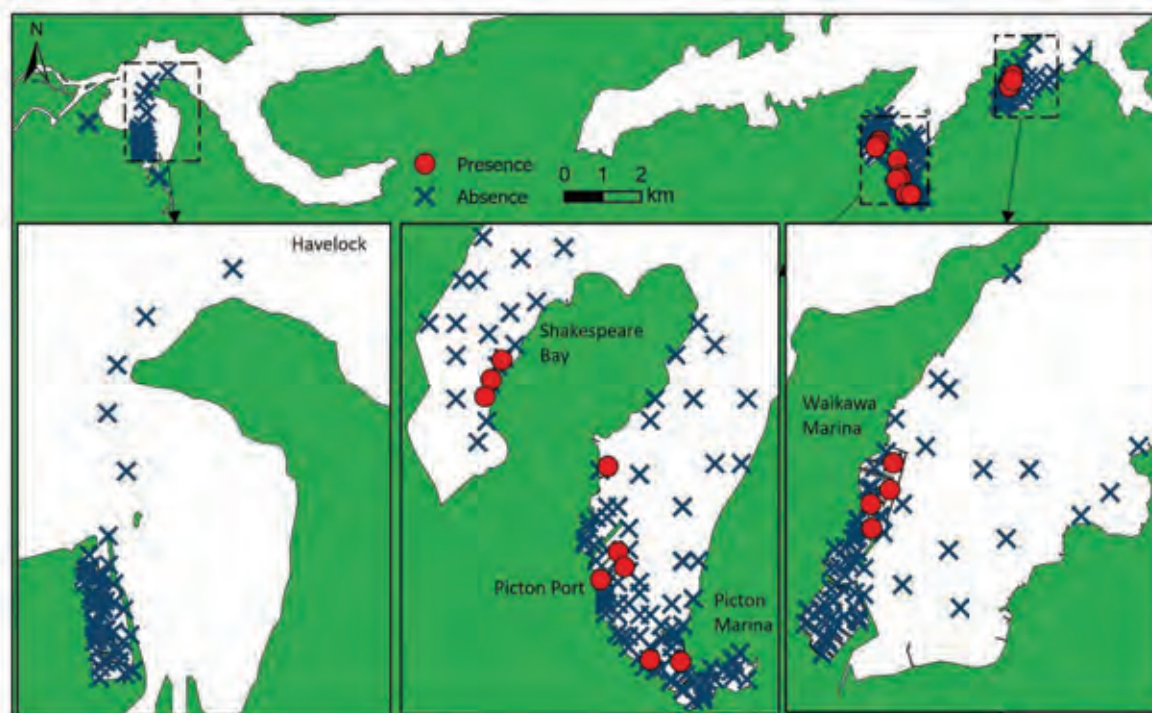
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Clavelina lepadiformis



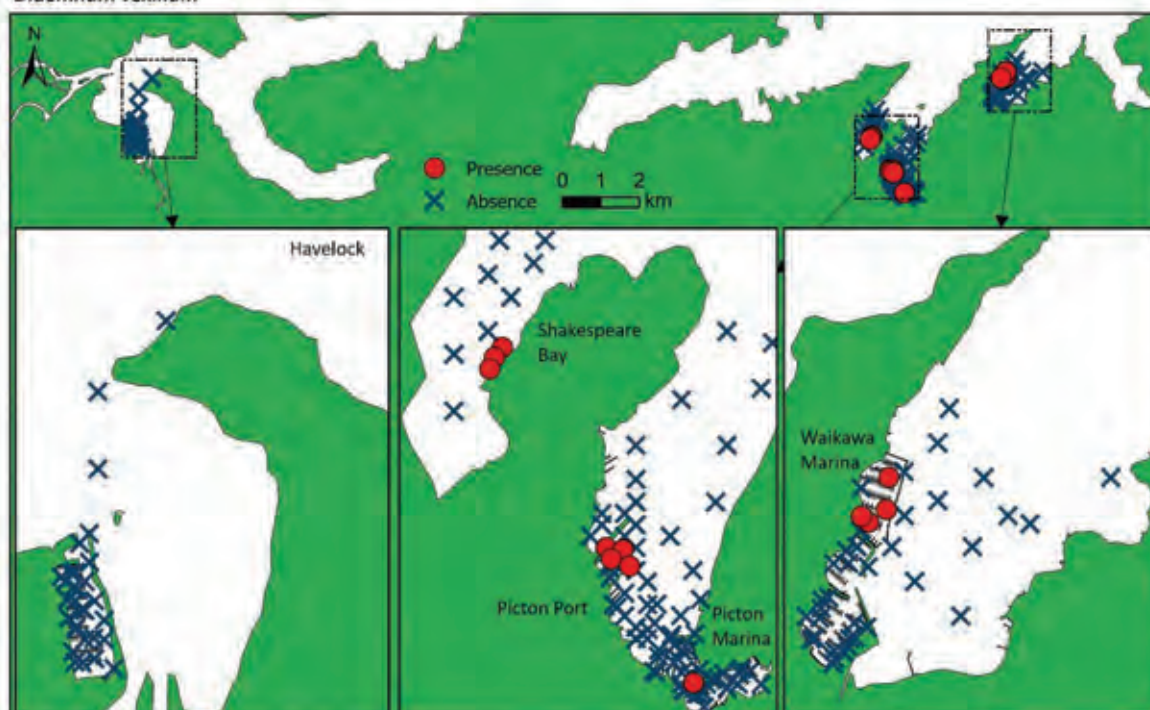
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
Winter 2023
Dactylosiphon bullosus



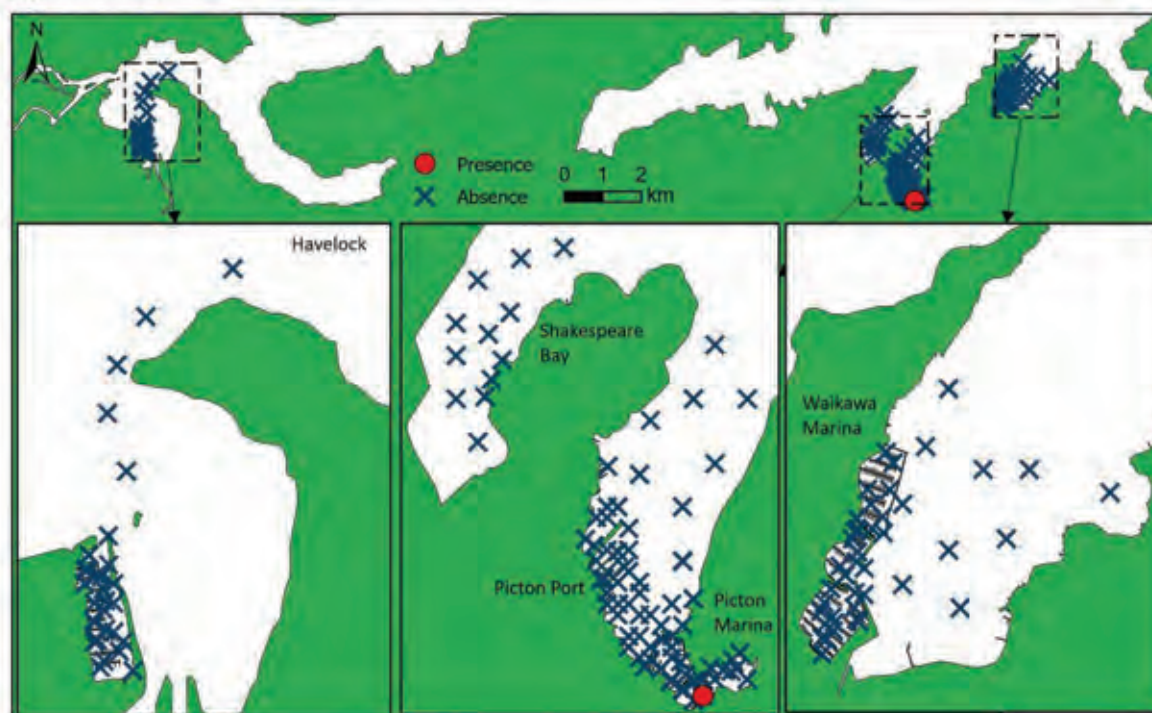
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Didemnum vexillum



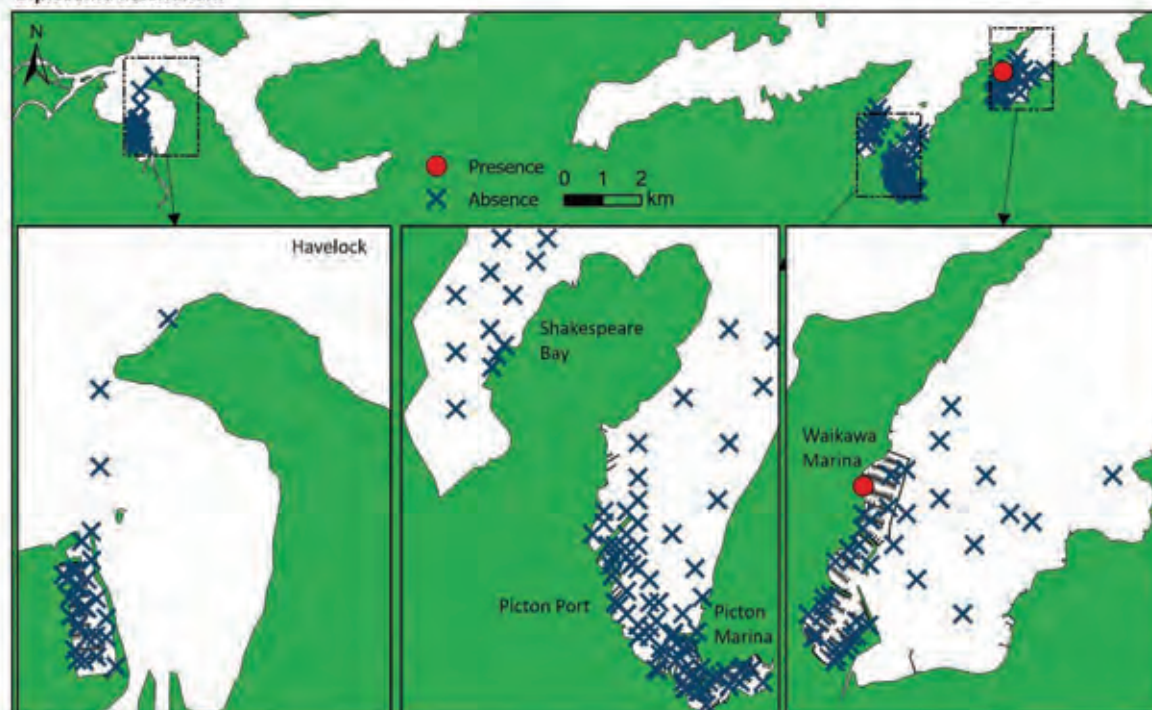
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Didemnum vexillum



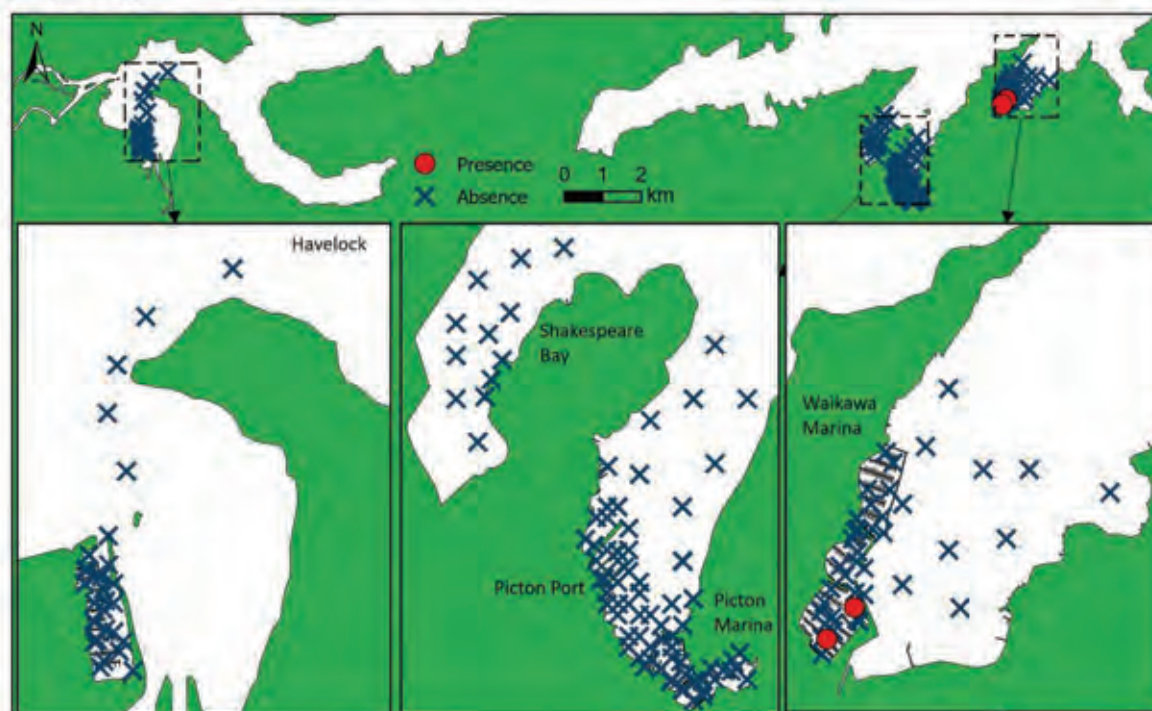
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Diplosoma listerianum



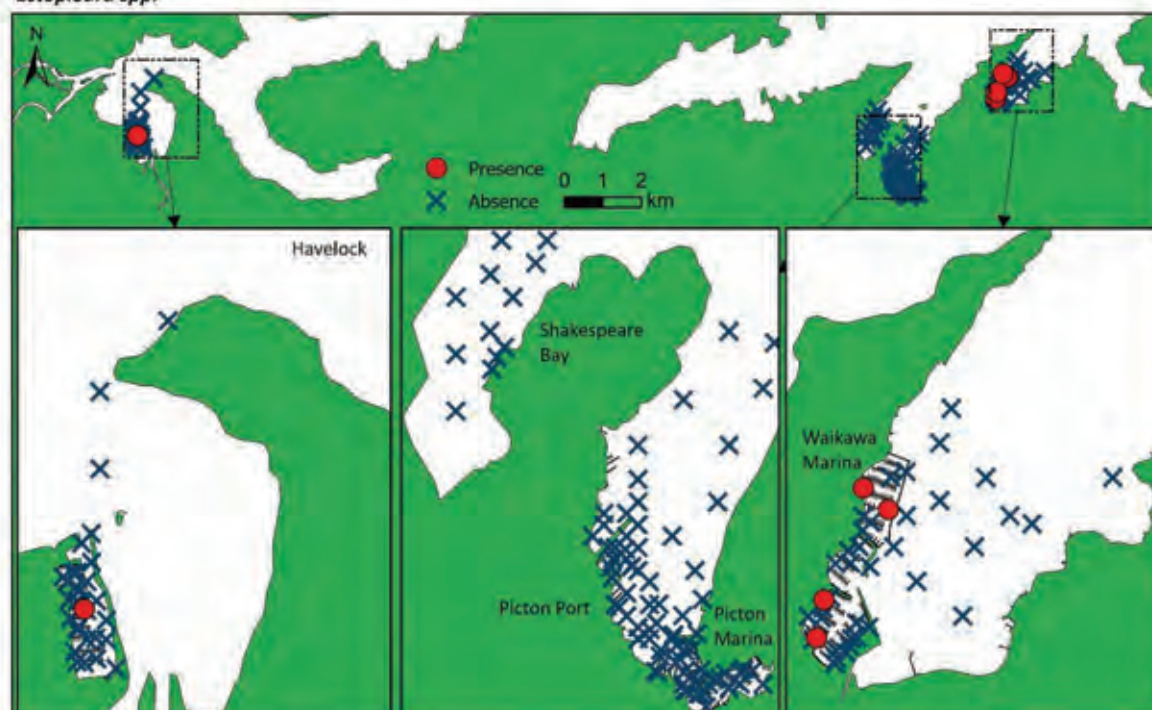
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Diplosoma listerianum



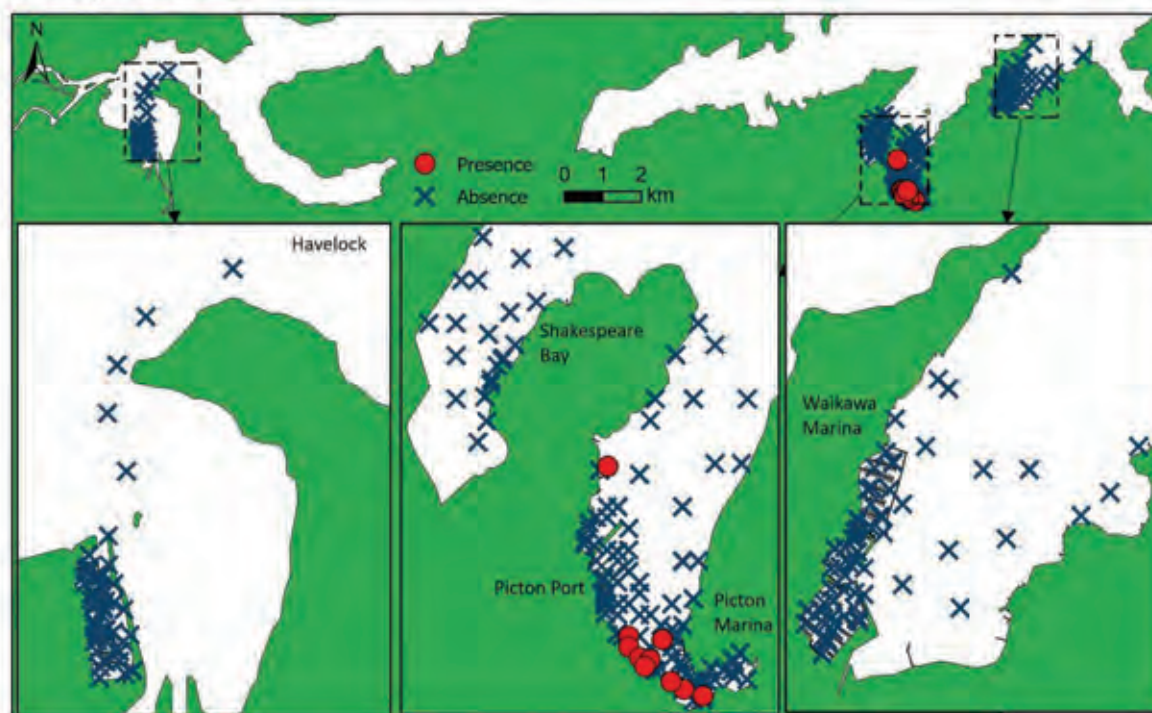
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Ectopleura spp.



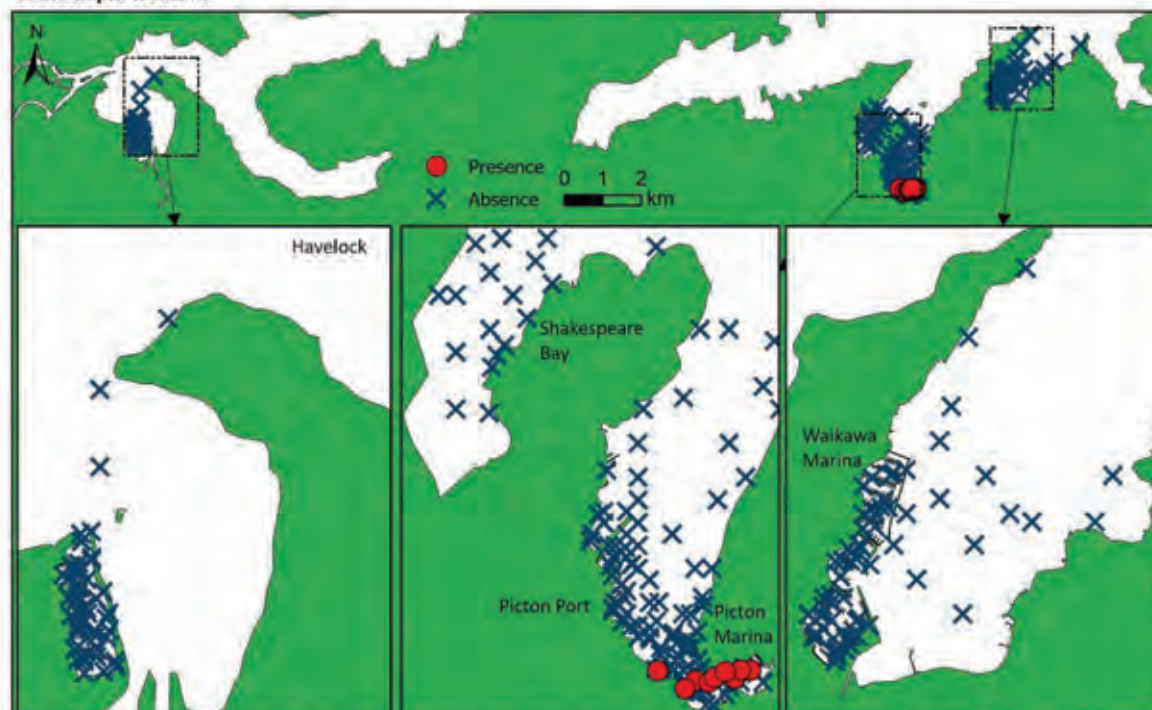
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Ectopleura spp.



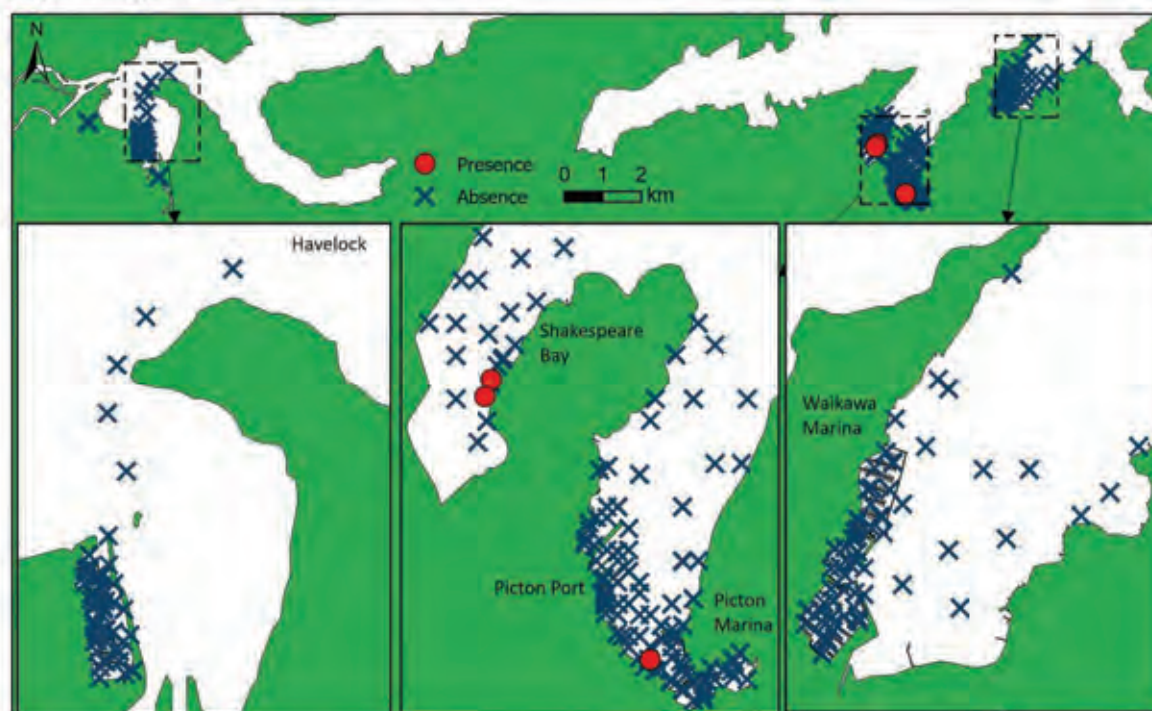
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Grateloupia turuturu



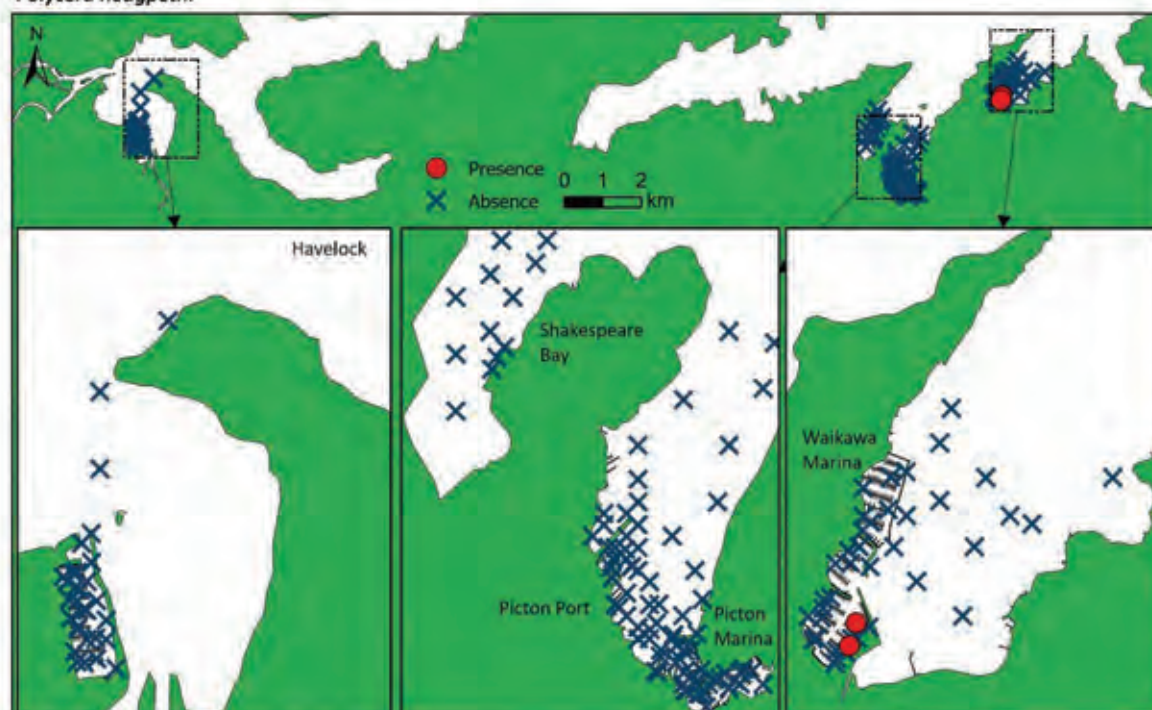
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Grateloupia turuturu



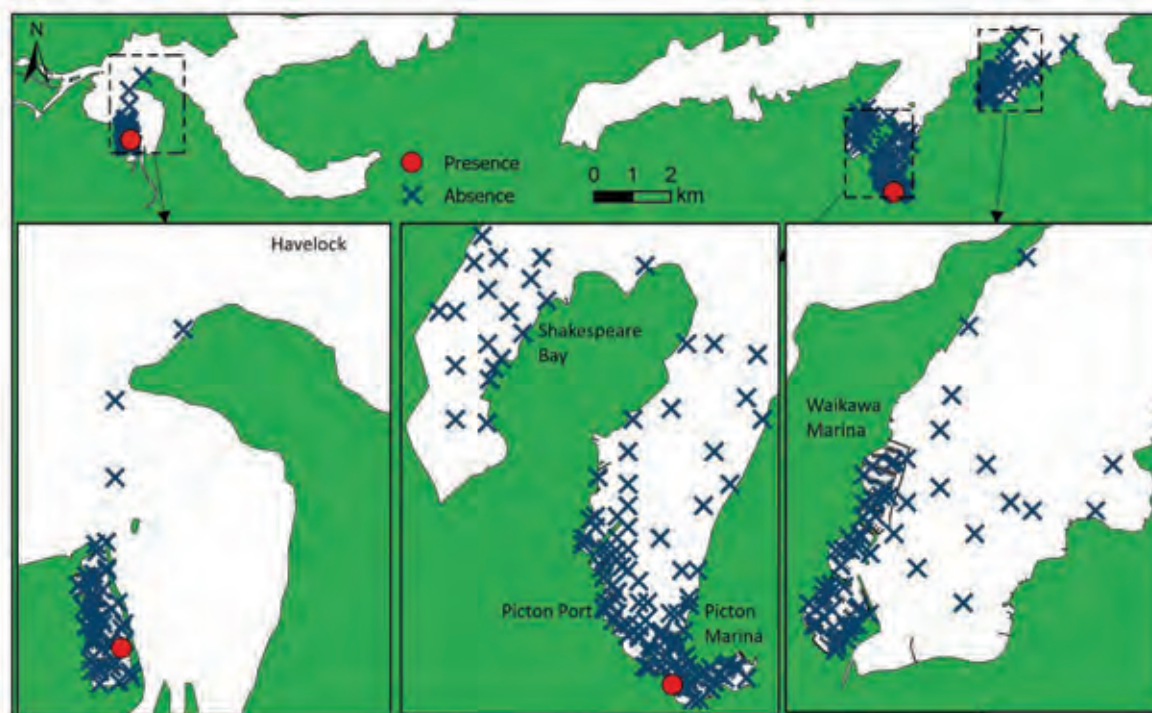
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Polycera hedgpethi



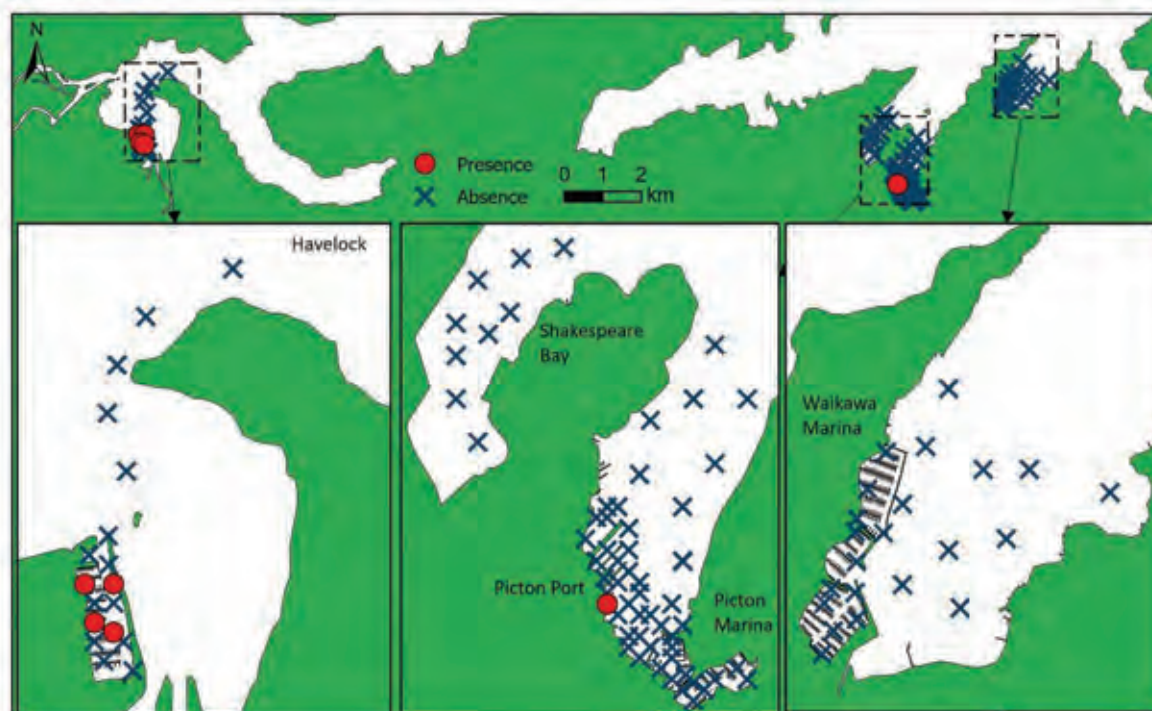
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Polycera hedgpethi



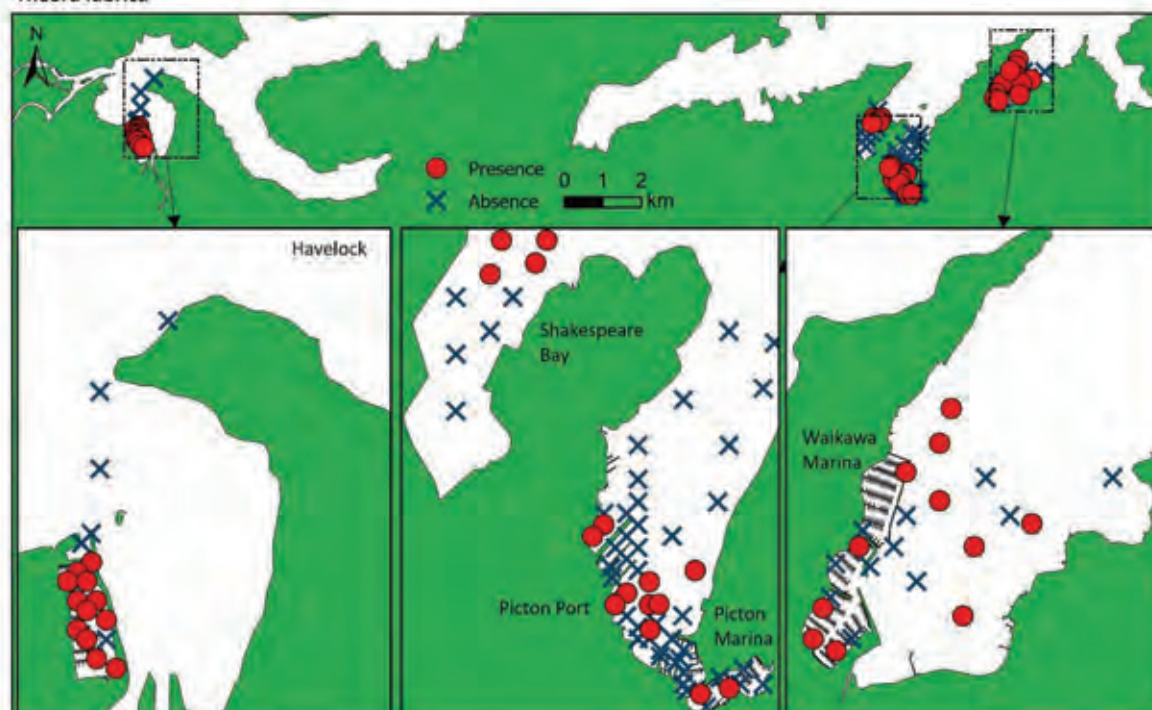
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Styela clava



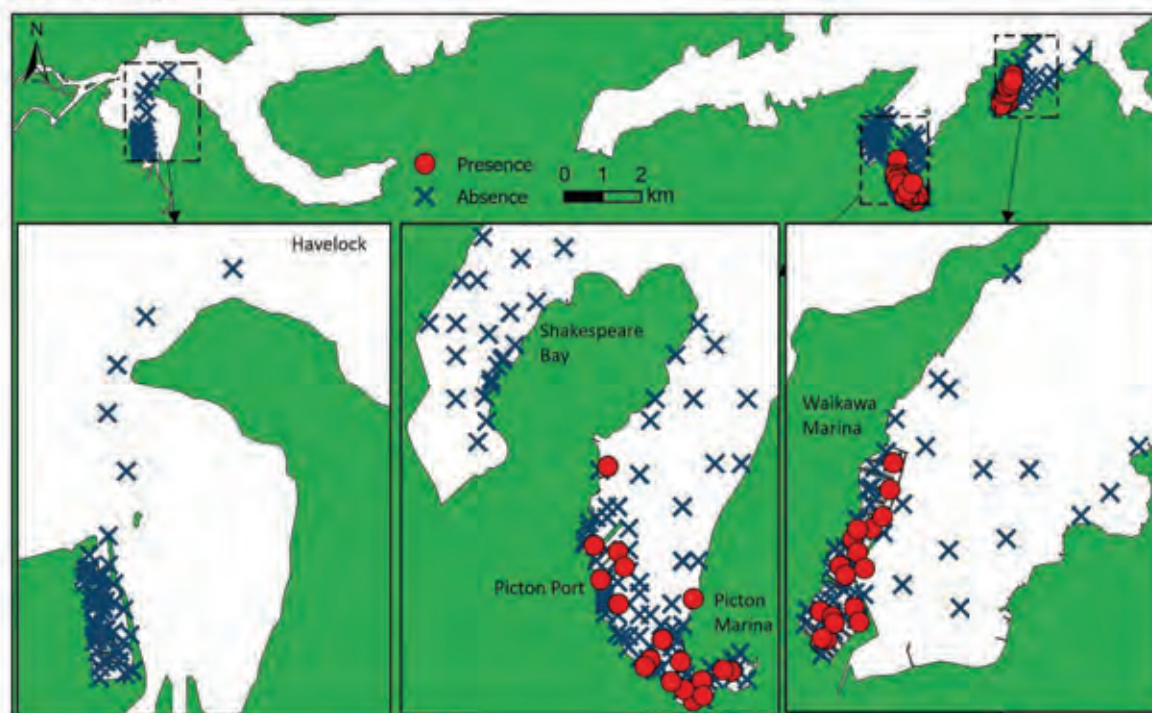
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Theora lubrica



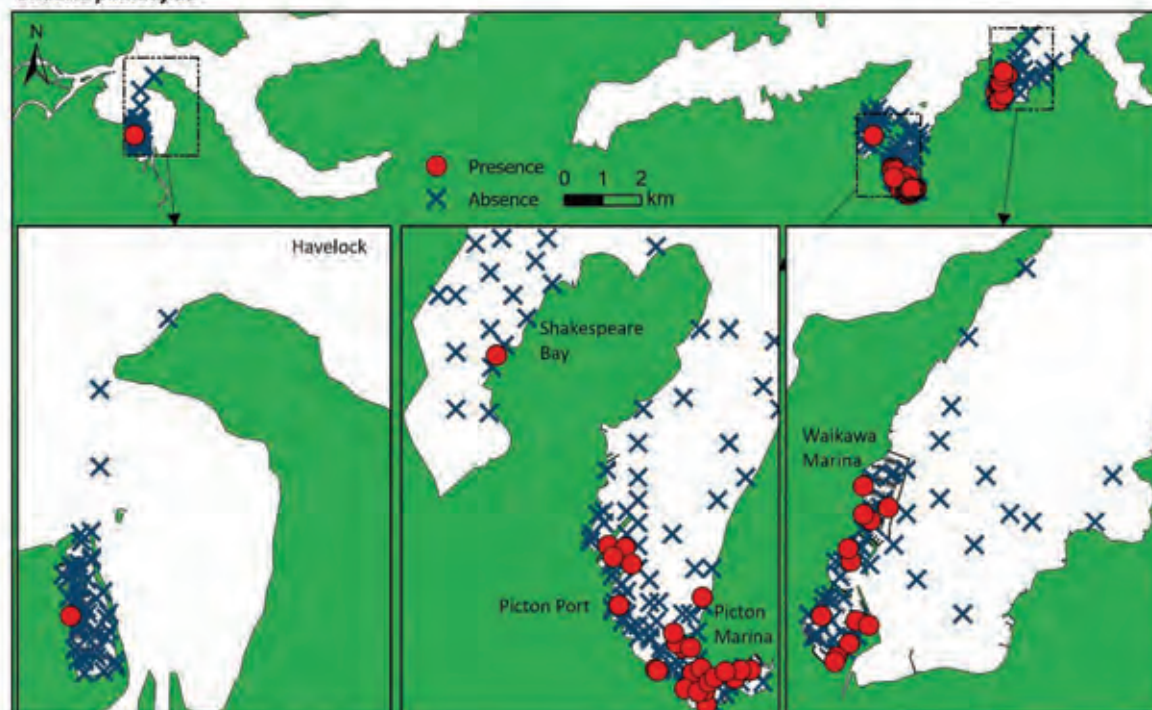
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Theora lubrica



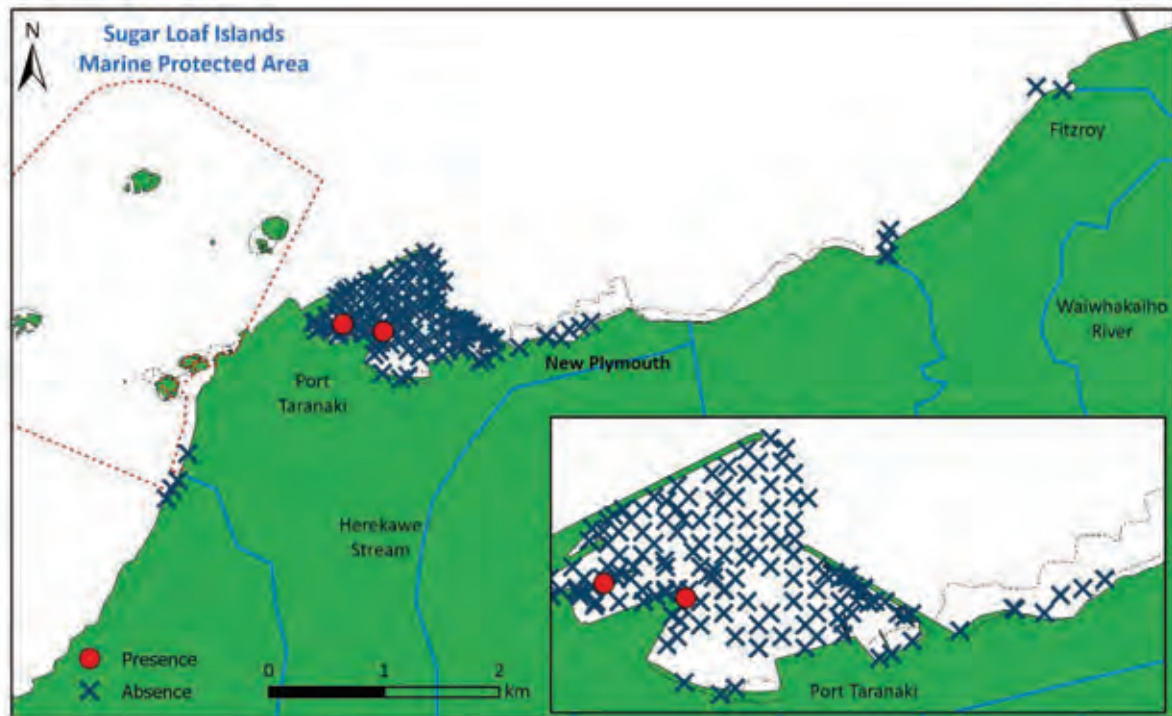
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Winter 2023
Undaria pinnatifida



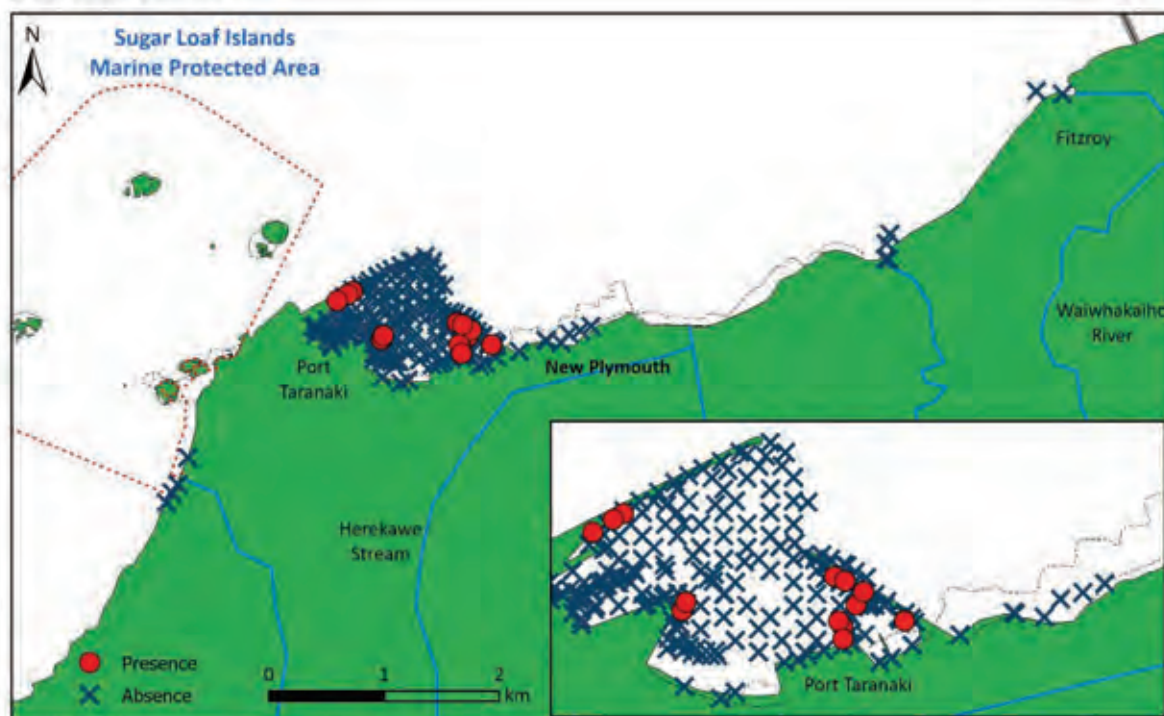
Picton Harbour, Havelock Marina, Port of Picton, Shakespeare Bay and Waikawa Marina
 Summer 2023-24
Undaria pinnatifida



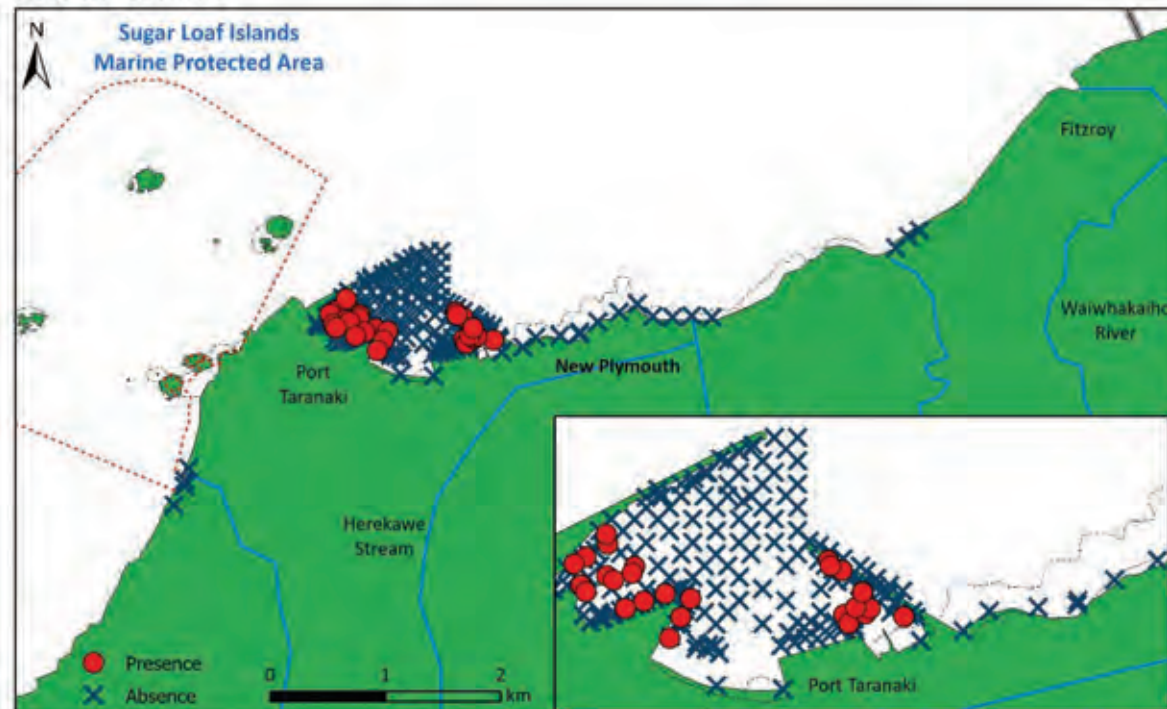
Port Taranaki
 Winter 2023
Botrylloides diegensis



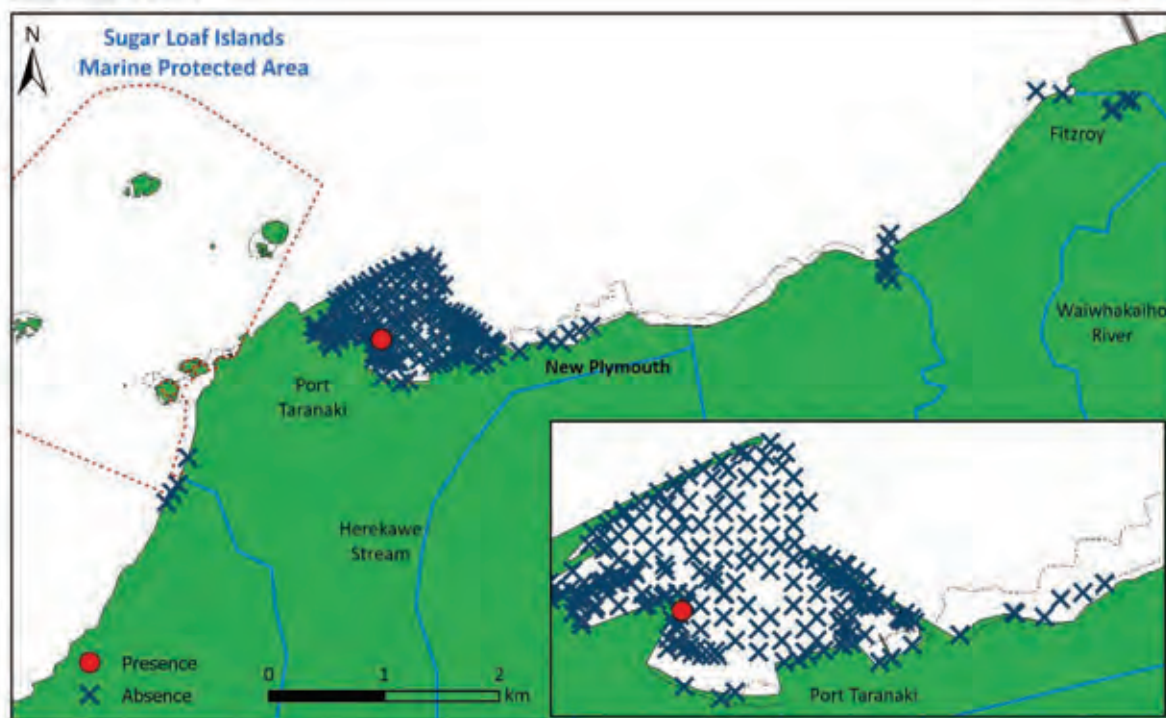
Port Taranaki
 Winter 2023
Celleporaria nodulosa



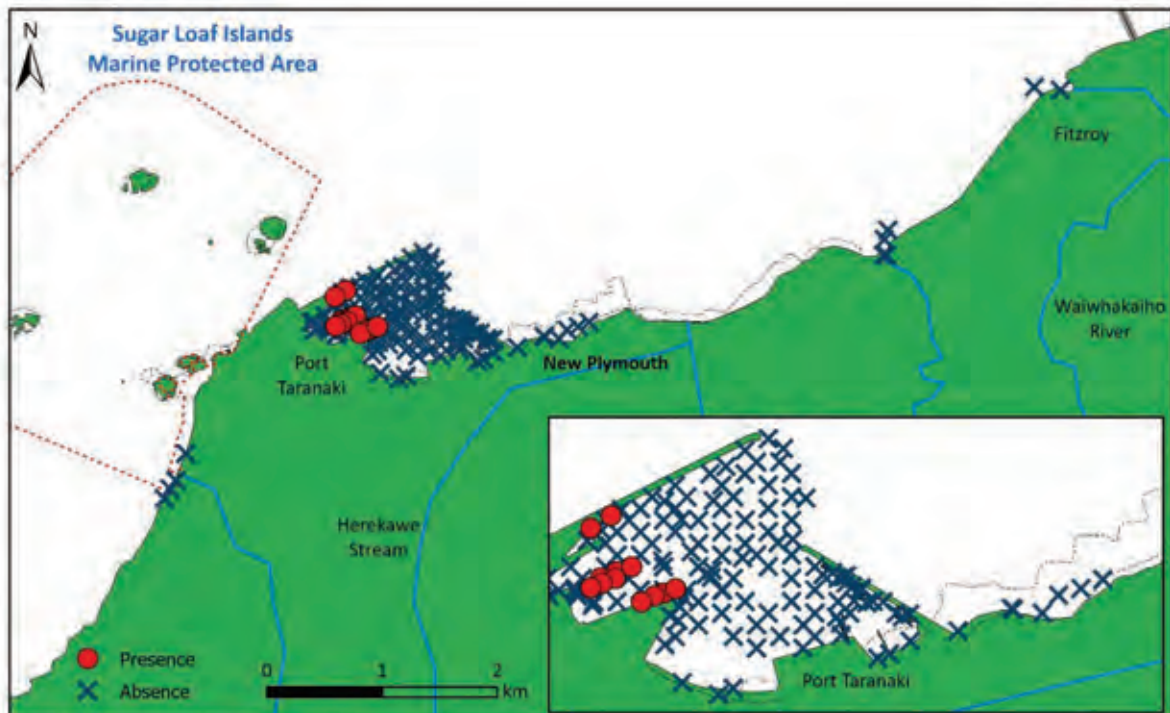
Port Taranaki
 Summer 2023-24
Celleporaria nodulosa



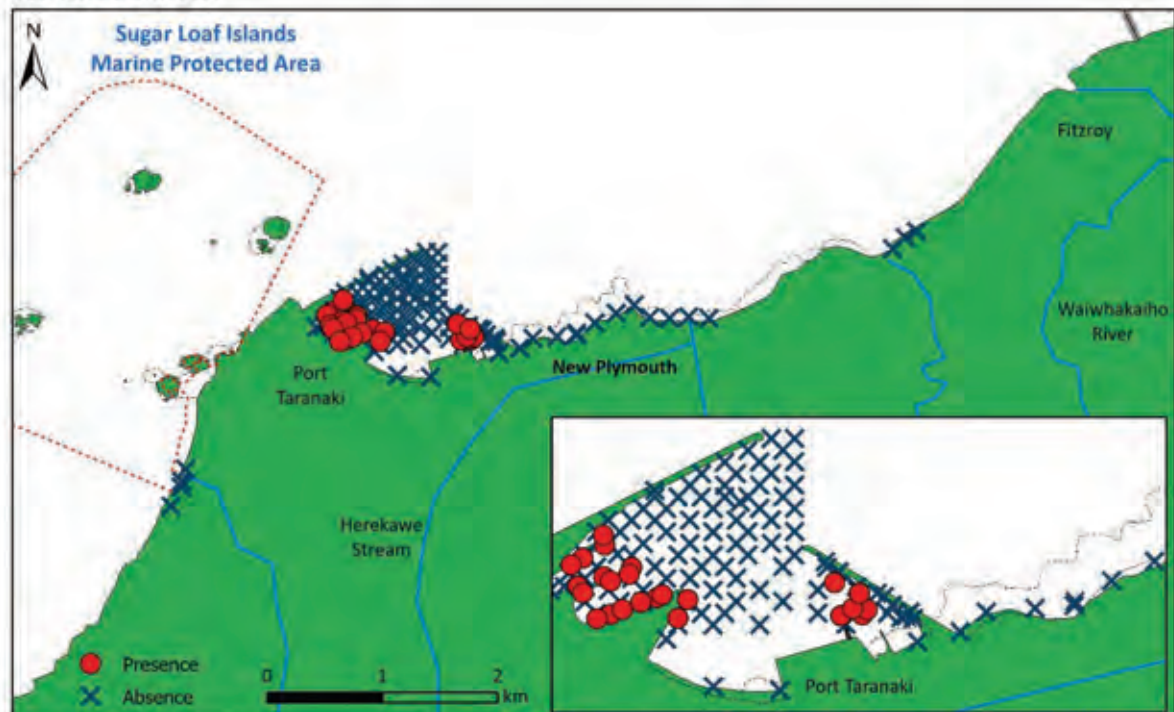
Port Taranaki
Winter 2023
Didemnum vexillum



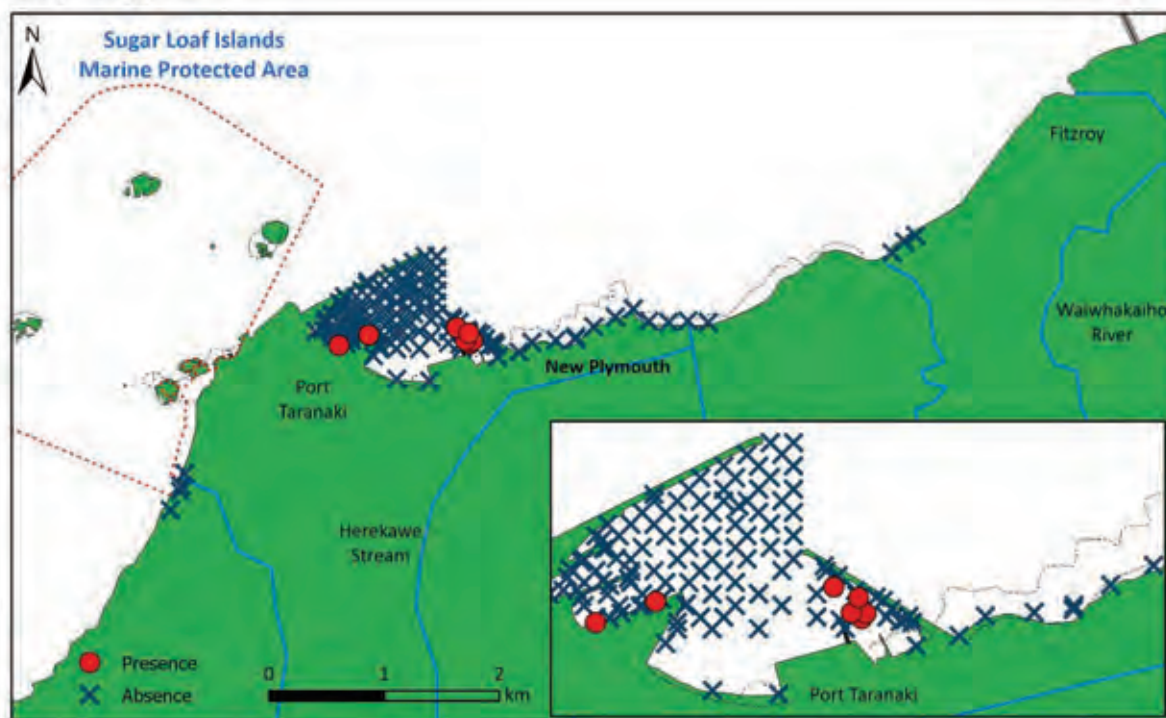
Port Taranaki
 Winter 2023
Diplosoma listerianum



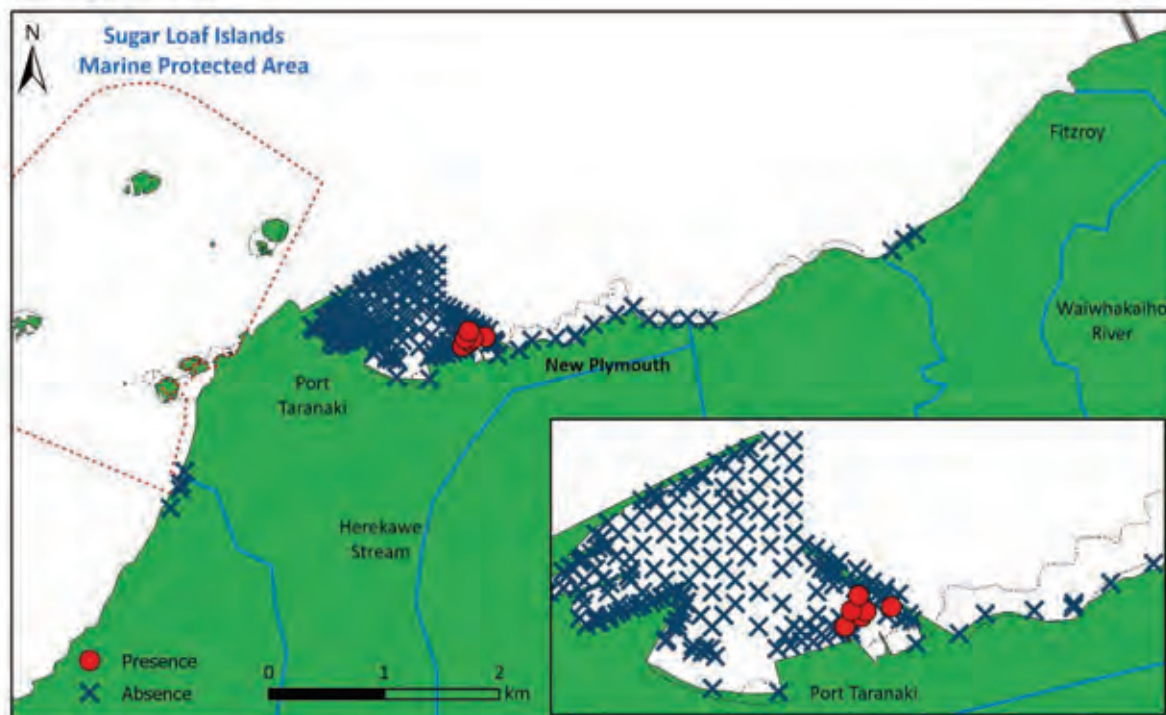
Port Taranaki
 Summer 2023-24
Diplosoma listerianum



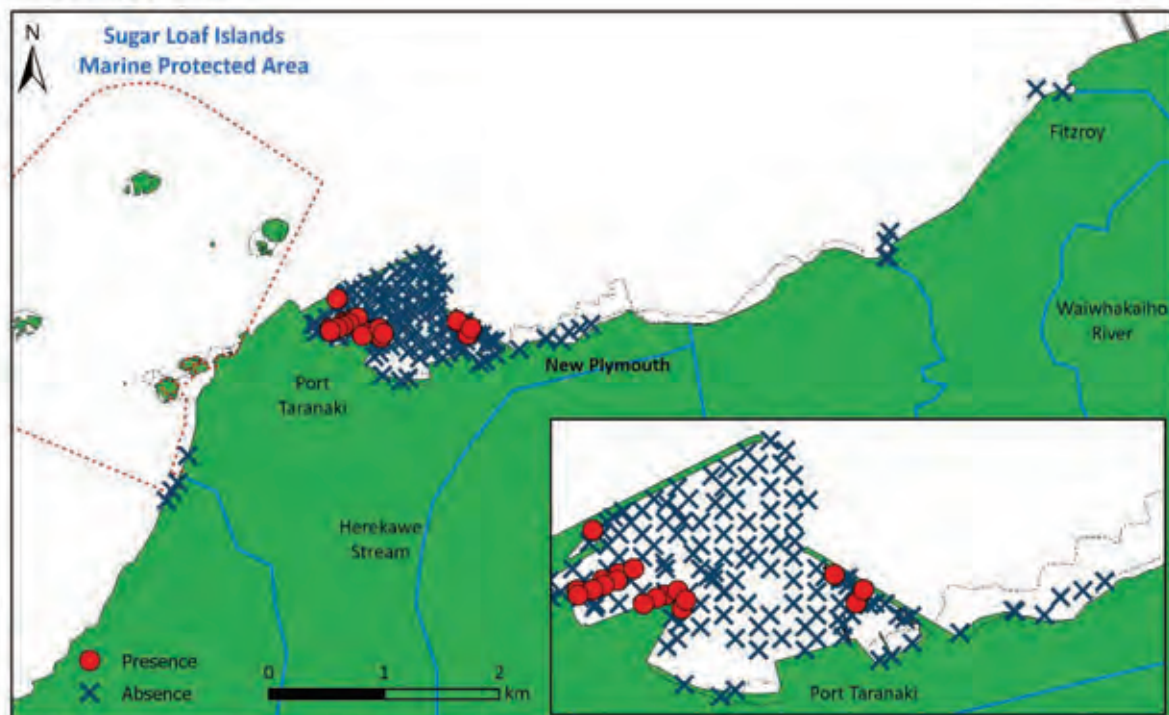
Port Taranaki
Summer 2023-24
Ectopleura spp.



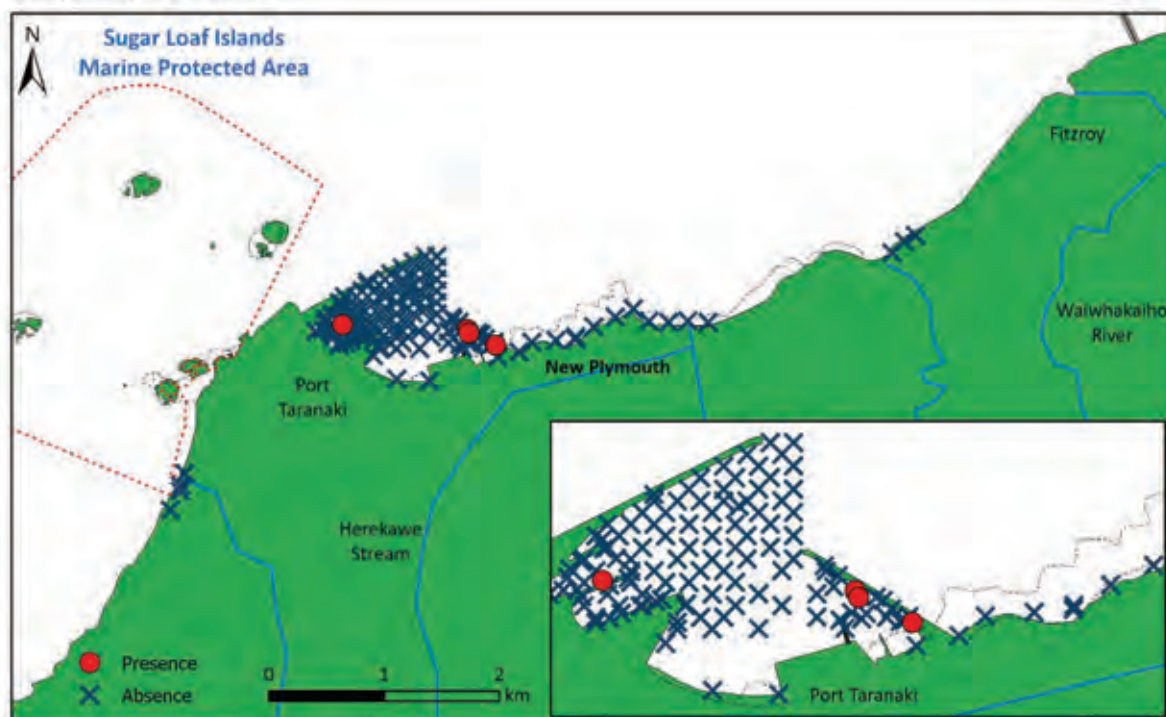
Port Taranaki
 Summer 2023-24
Grateloupia turuturu



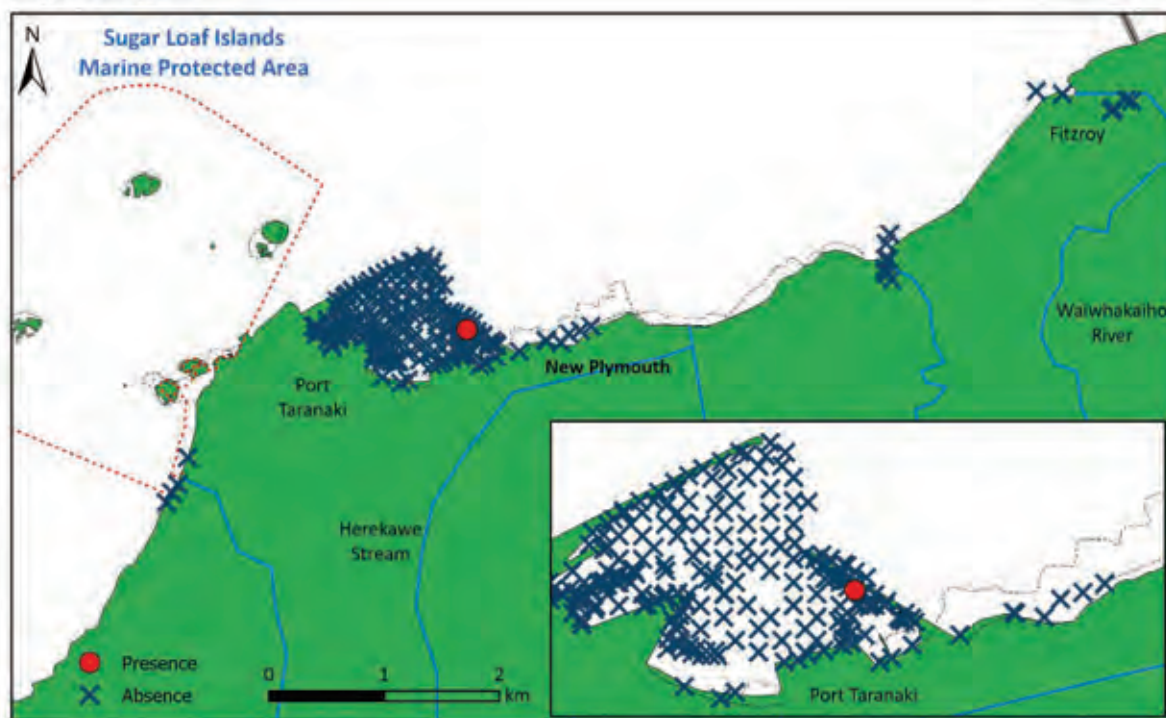
Port Taranaki
 Winter 2023
Lissoclinum perforatum



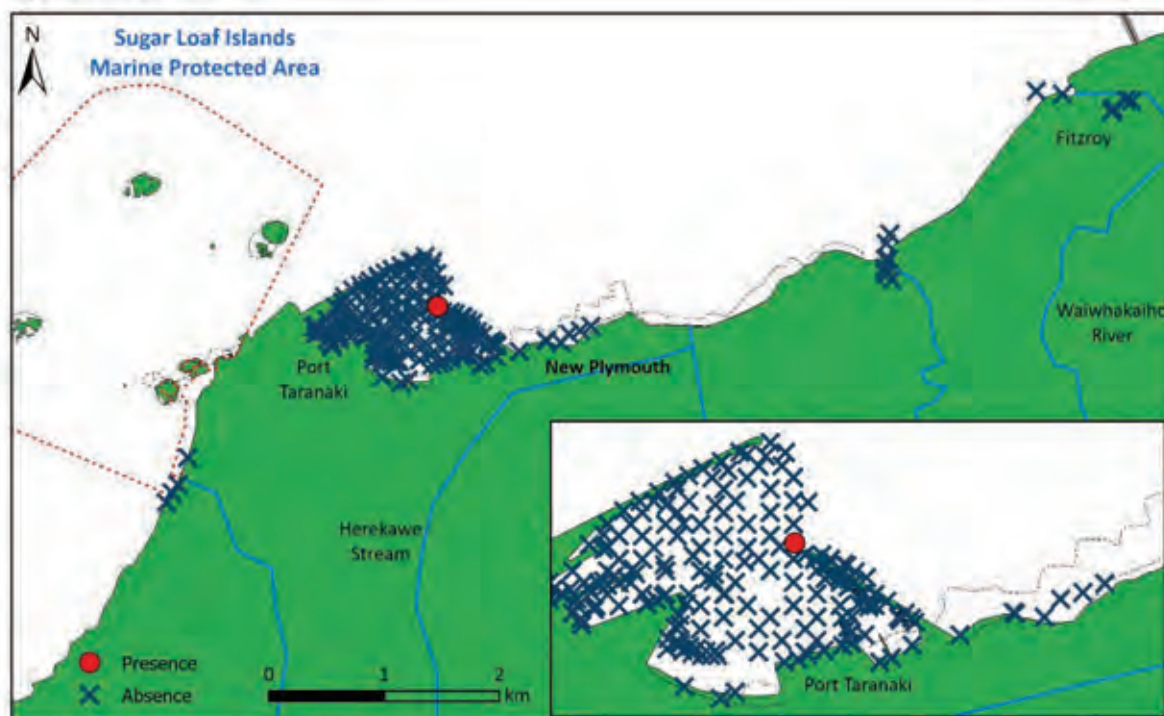
Port Taranaki
 Summer 2023-24
Pachymeniopsis lanceolata



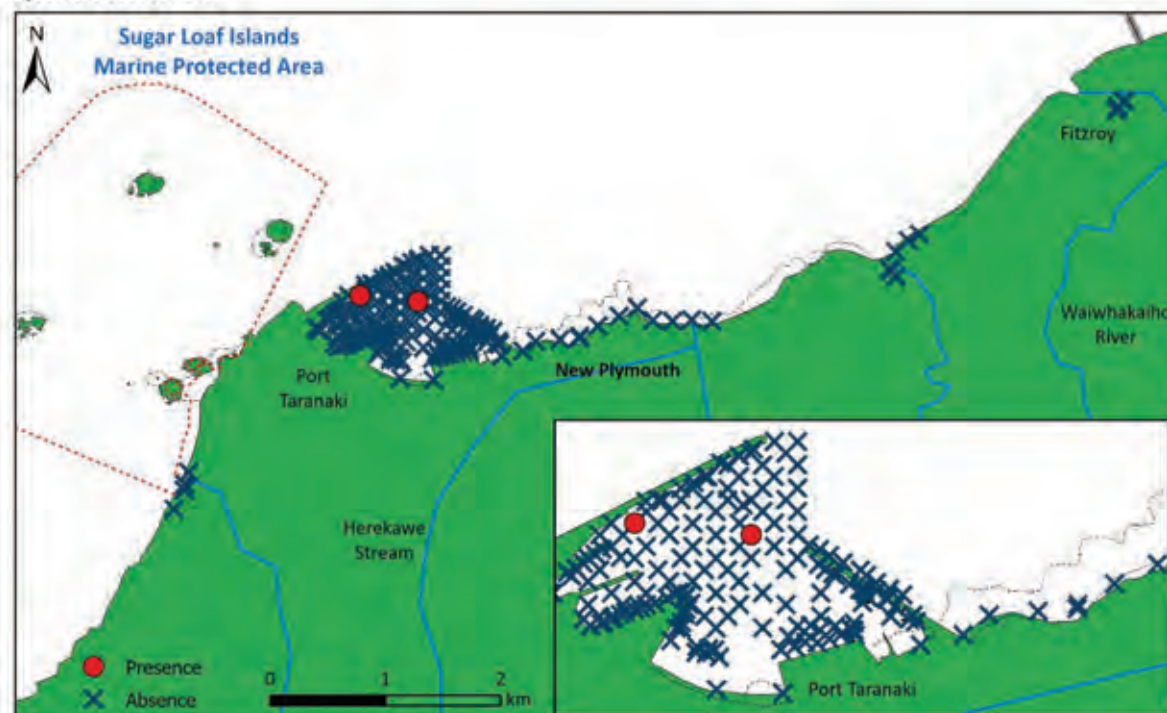
Port Taranaki
Winter 2023
Polycera hedgpethi



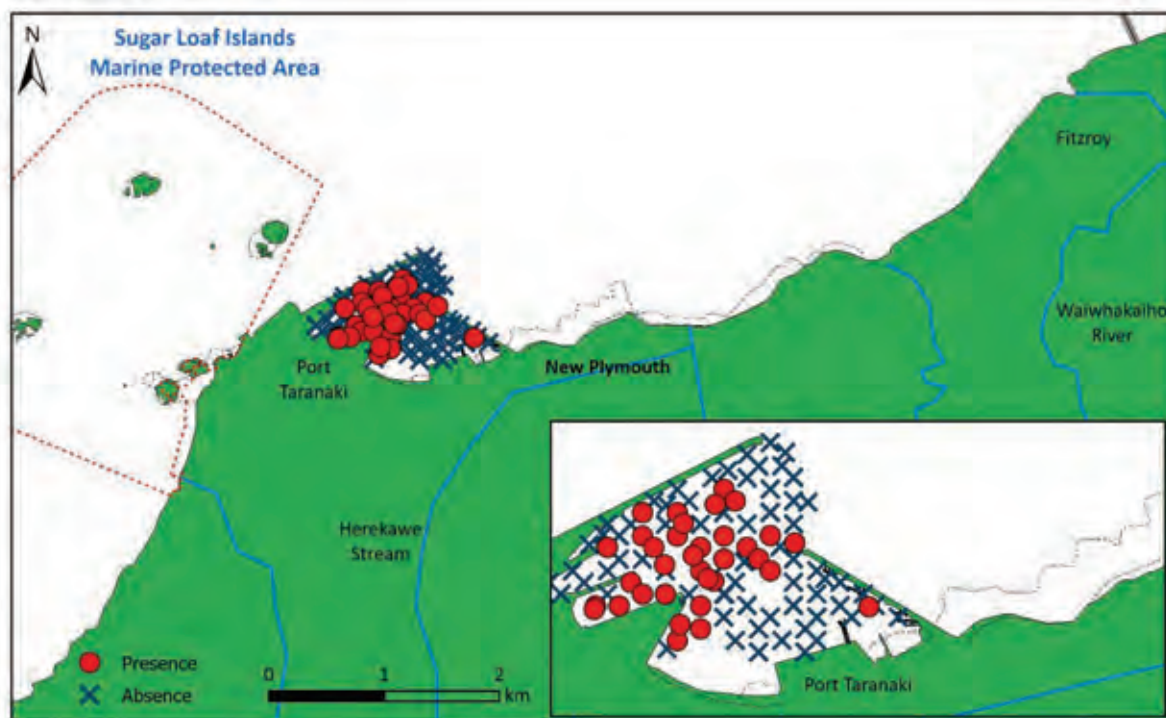
Port Taranaki
 Winter 2023
Pyromaia tuberculata



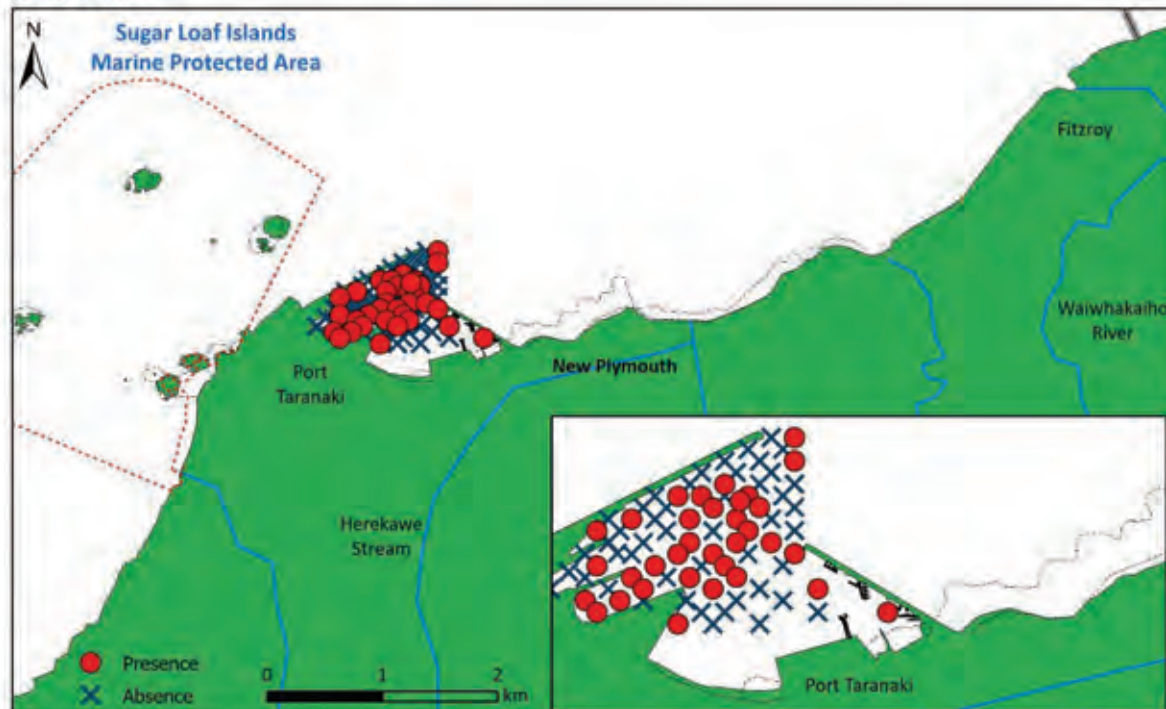
Port Taranaki
 Summer 2023-24
Pyromaia tuberculata



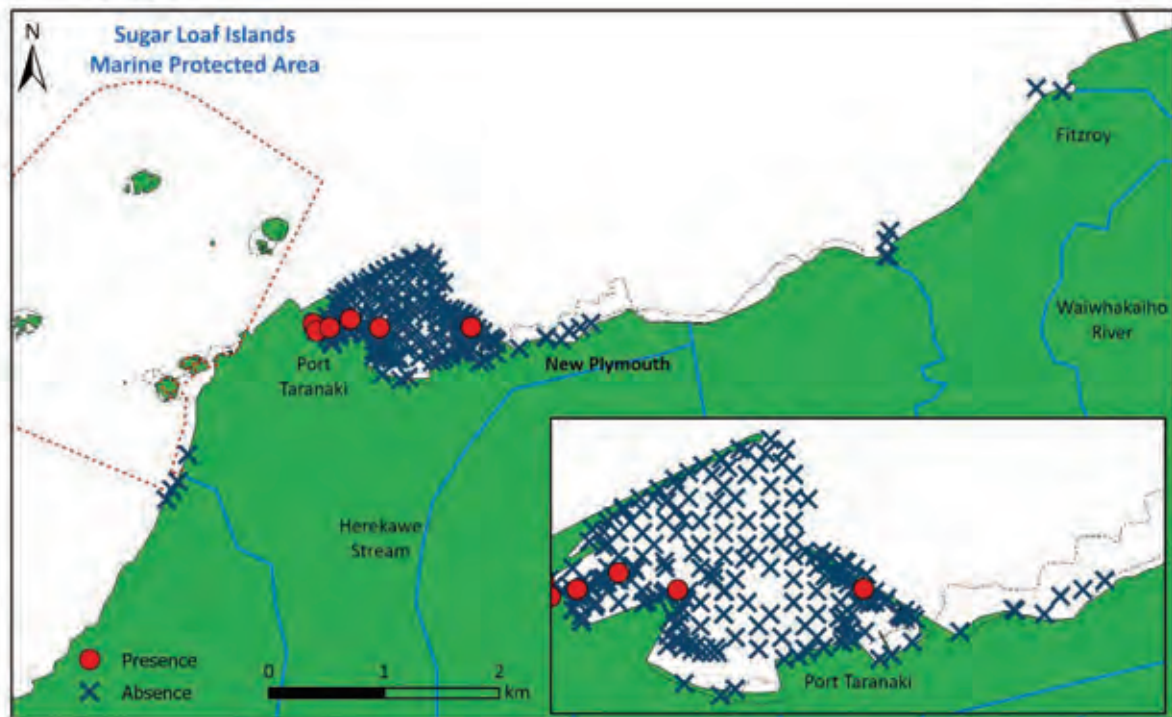
Port Taranaki
 Winter 2023
Theora lubrica



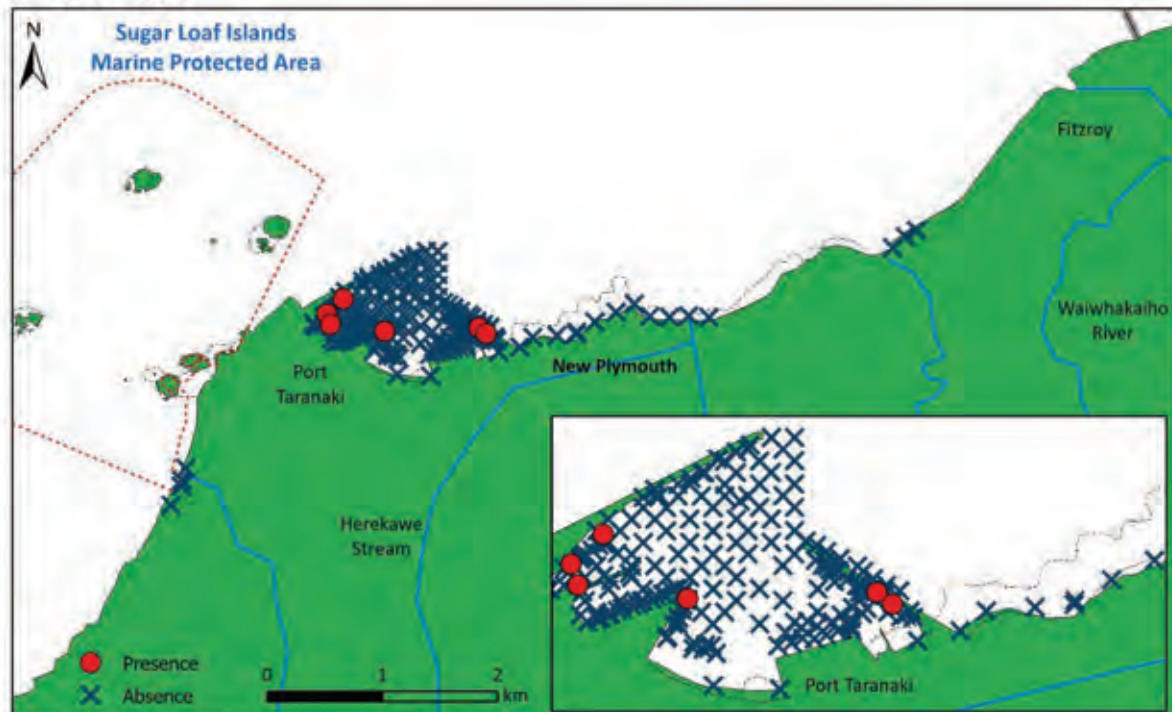
Port Taranaki
 Summer 2023-24
Theora lubrica



Port Taranaki
 Winter 2023
Undaria pinnatifida



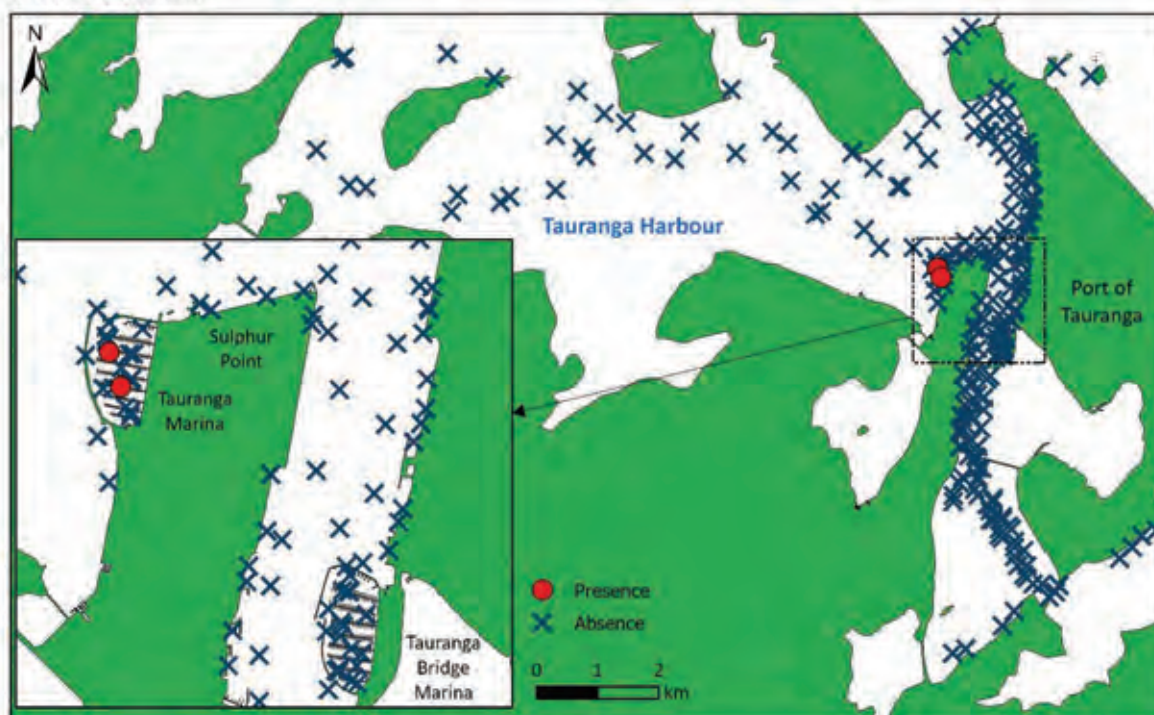
Port Taranaki
 Summer 2023-24
Undaria pinnatifida



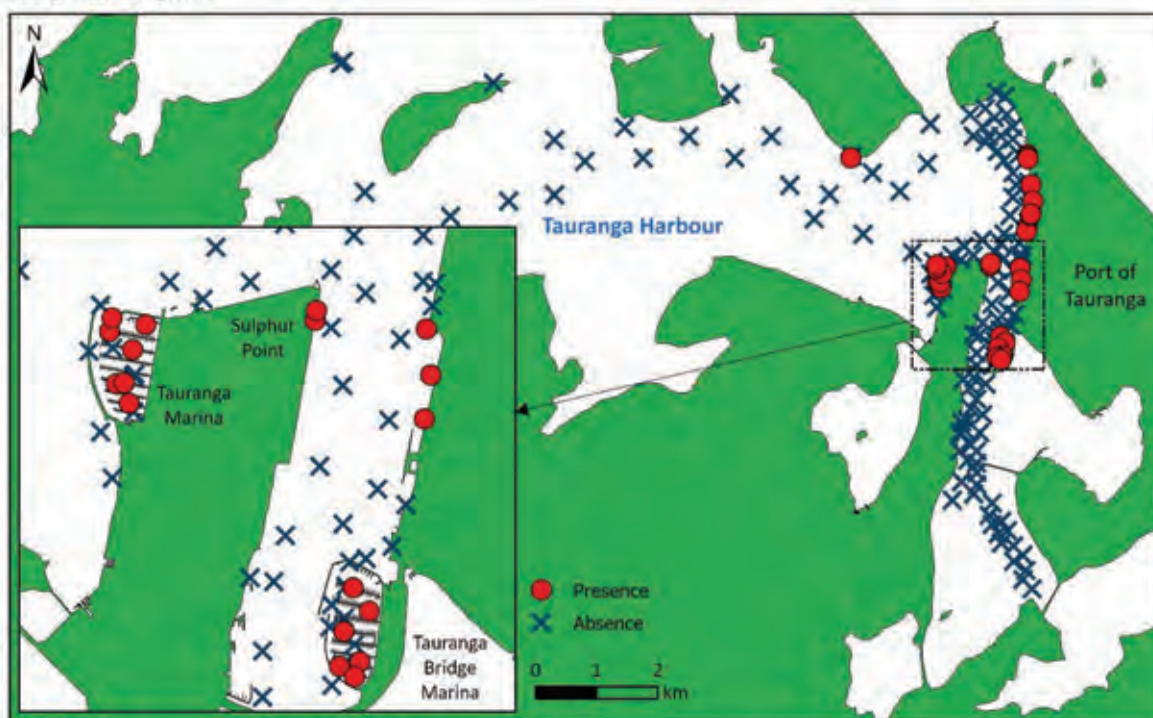
Tauranga Harbour

Winter 2023

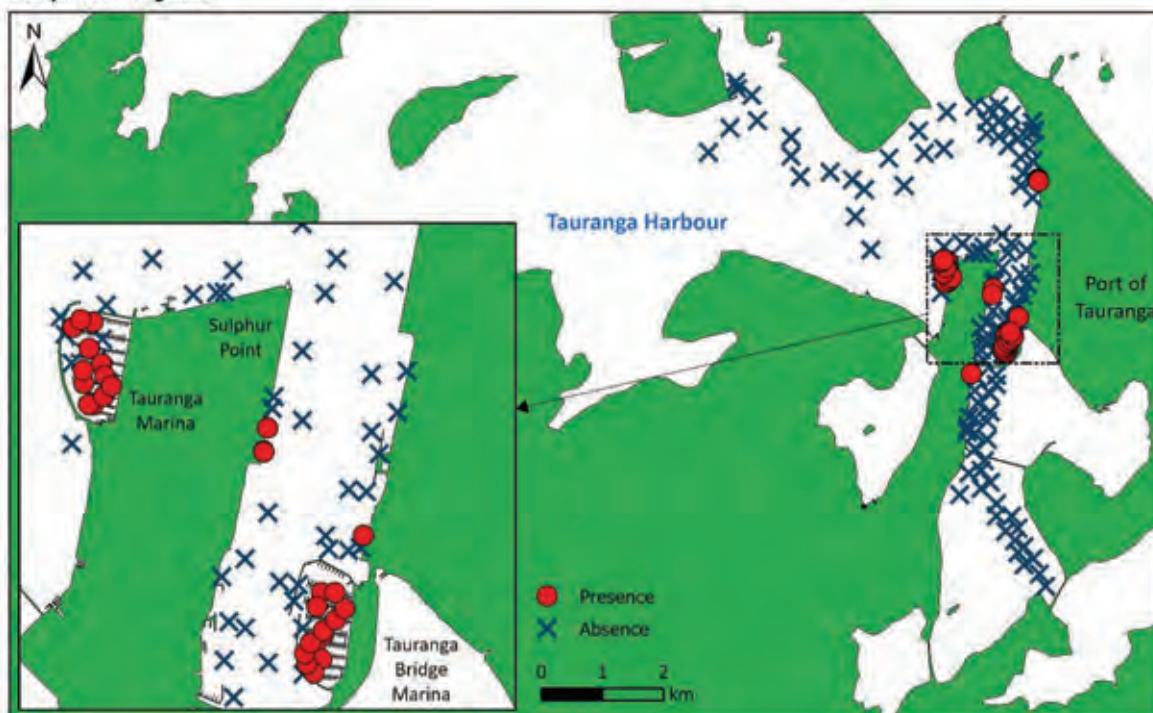
Amathia verticillata



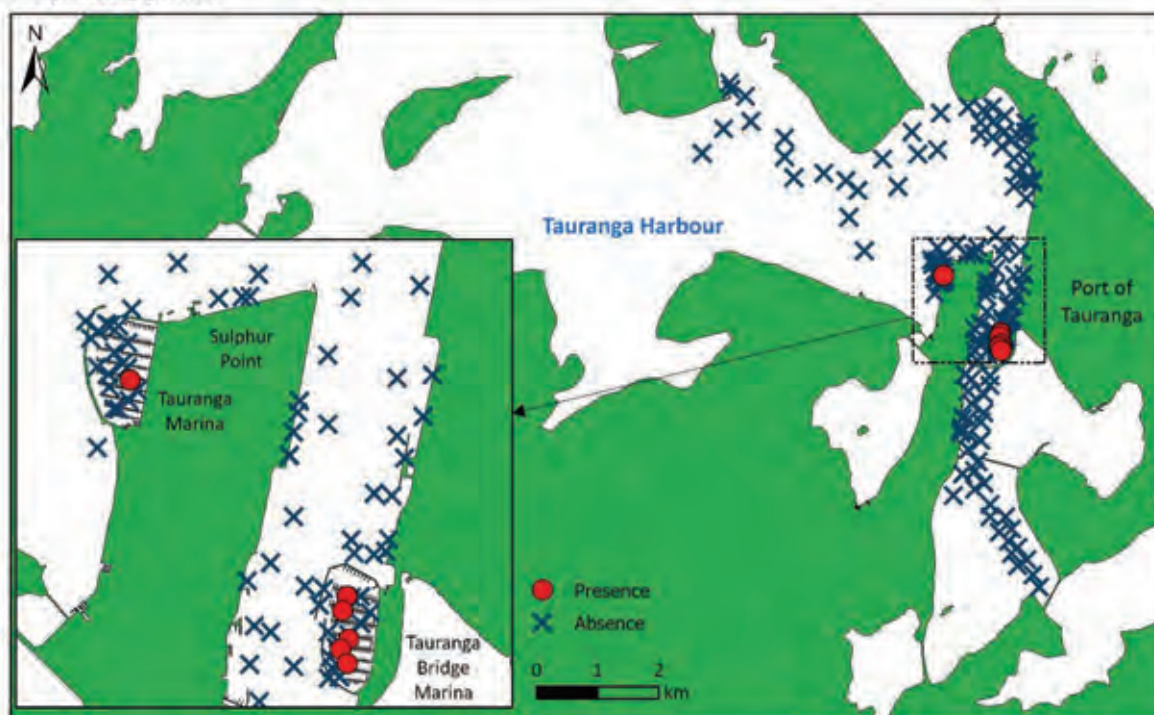
Tauranga Harbour
 Winter 2023
Botrylloides diegensis



Tauranga Harbour
 Summer 2023-24
Botrylloides diegensis



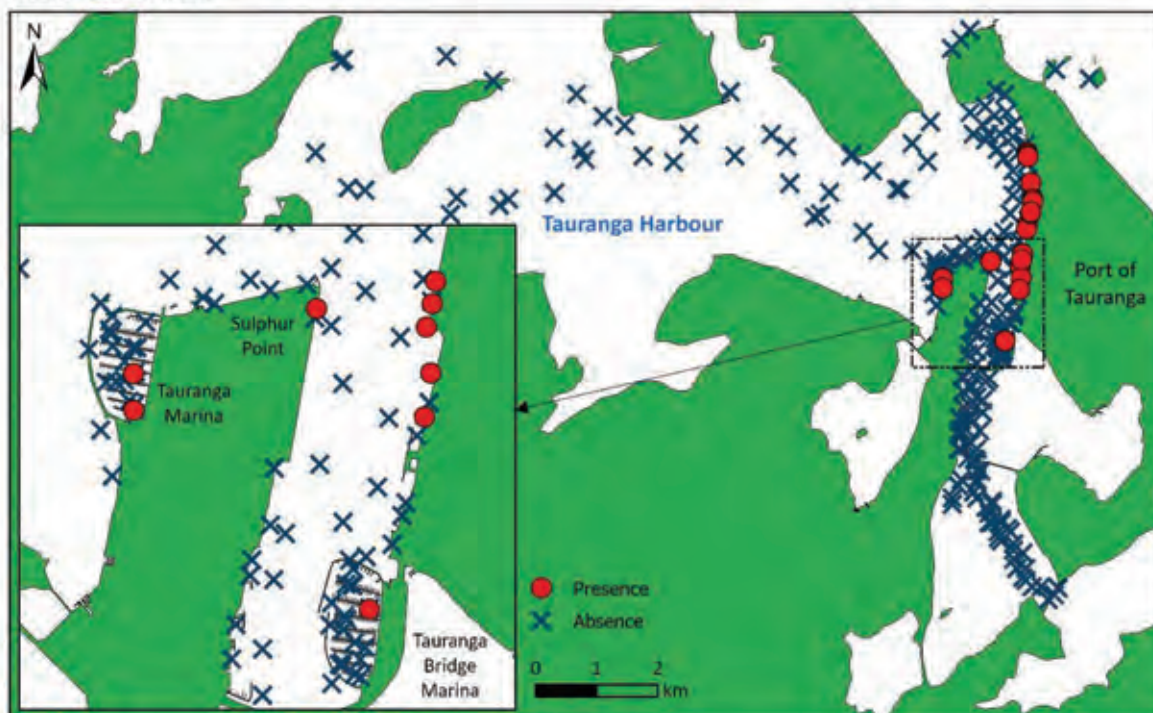
Tauranga Harbour
 Summer 2023-24
Botrylloides giganteus



Tauranga Harbour

Winter 2023

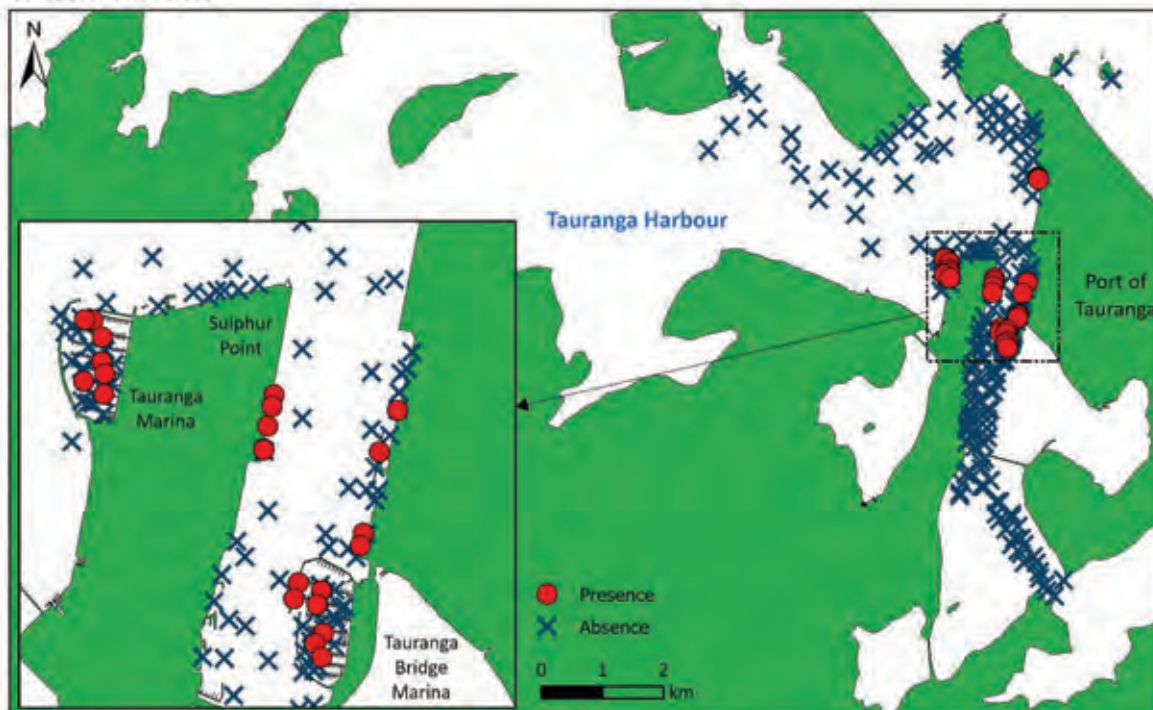
Celleporaria nodulosa



Tauranga Harbour

Summer 2023-24

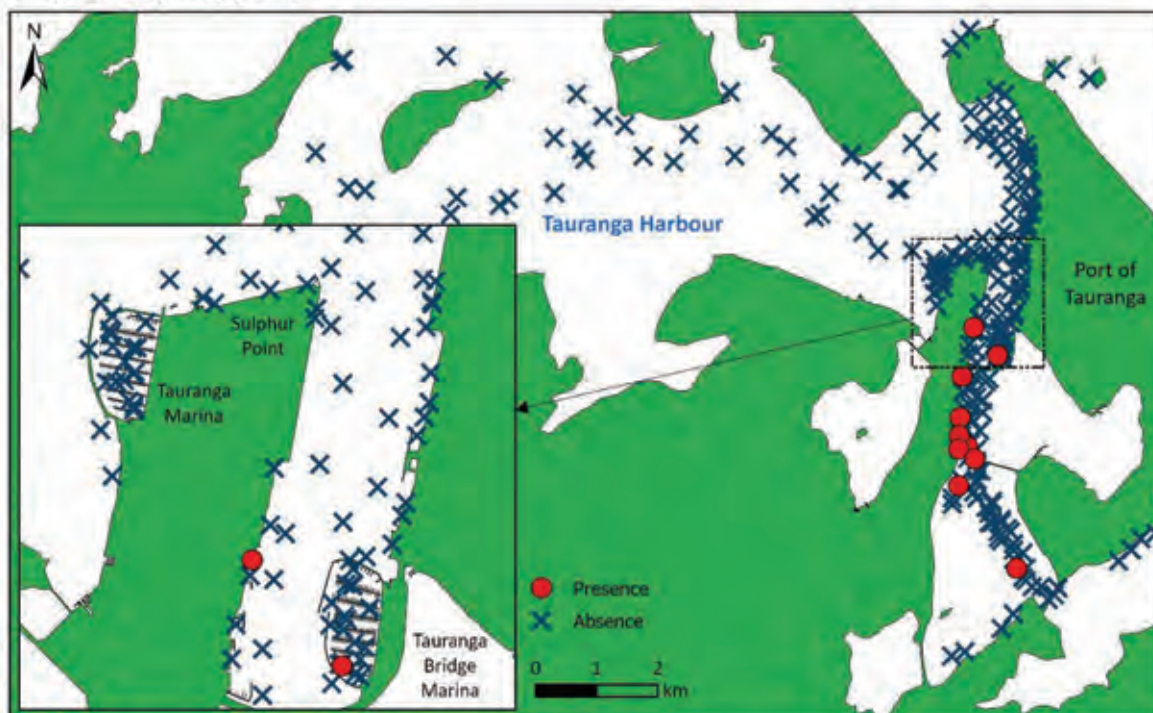
Celleporaria nodulosa



Tauranga Harbour

Winter 2023

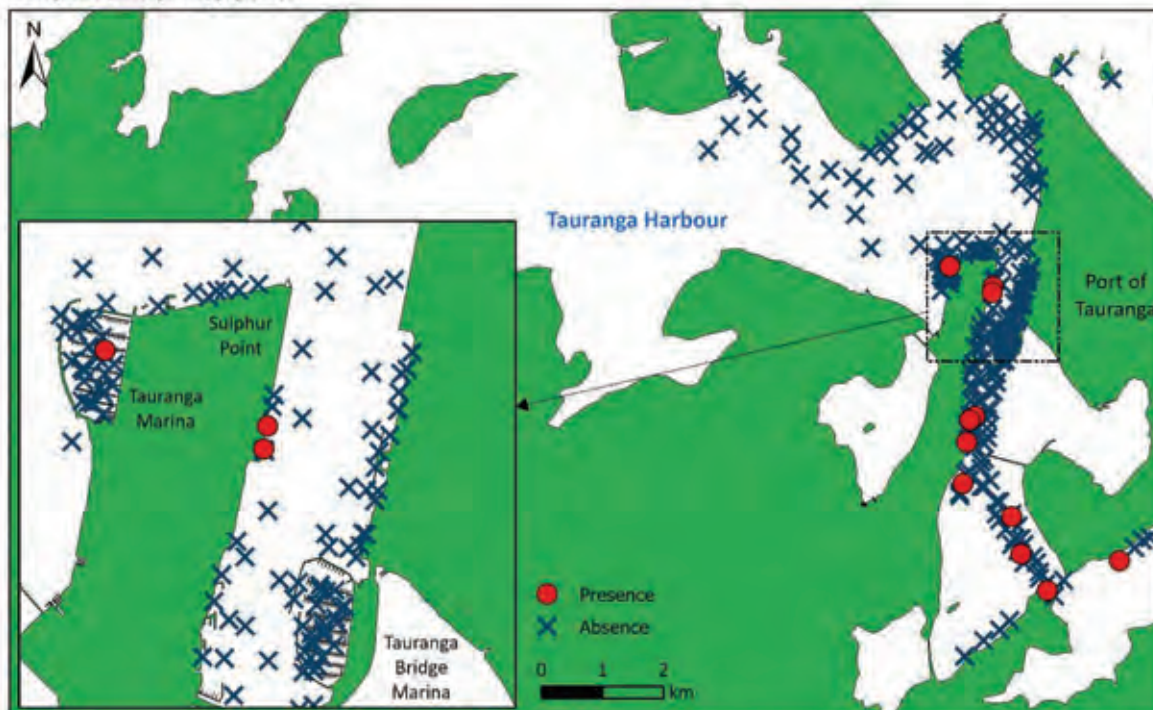
Charybdis (Charybdis) japonica



Tauranga Harbour

Summer 2023-24

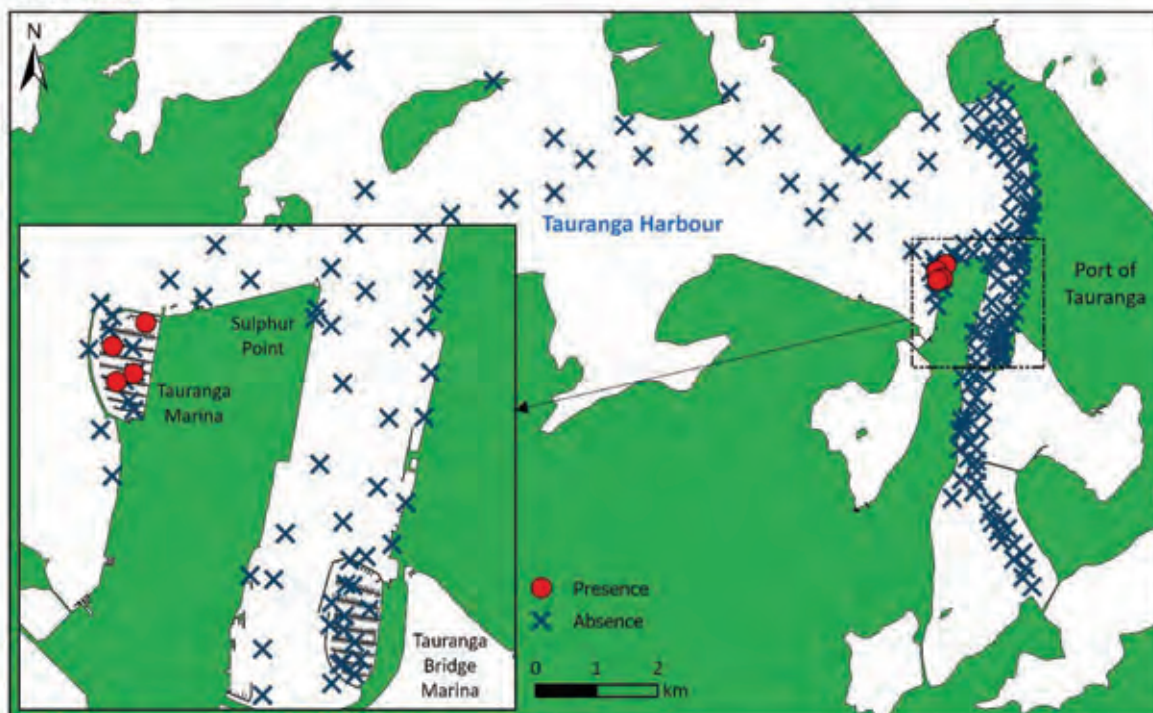
Charybdis (Charybdis) japonica



Tauranga Harbour

Winter 2023

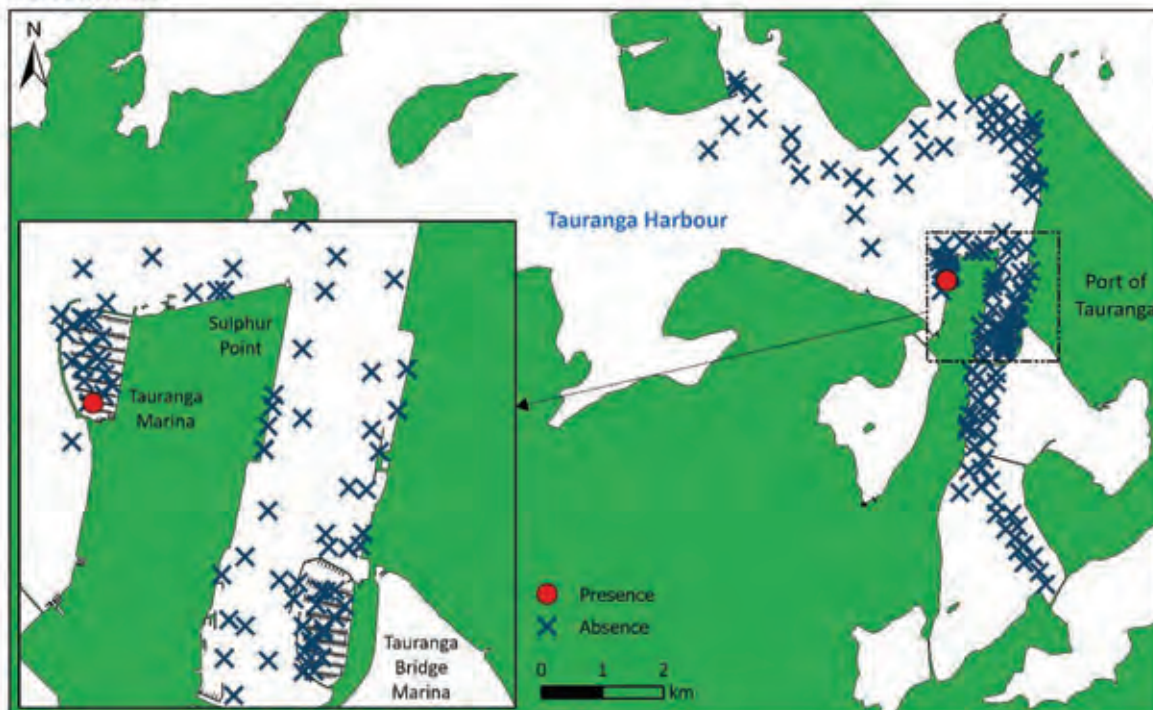
Ciona intestinalis



Tauranga Harbour

Summer 2023-24

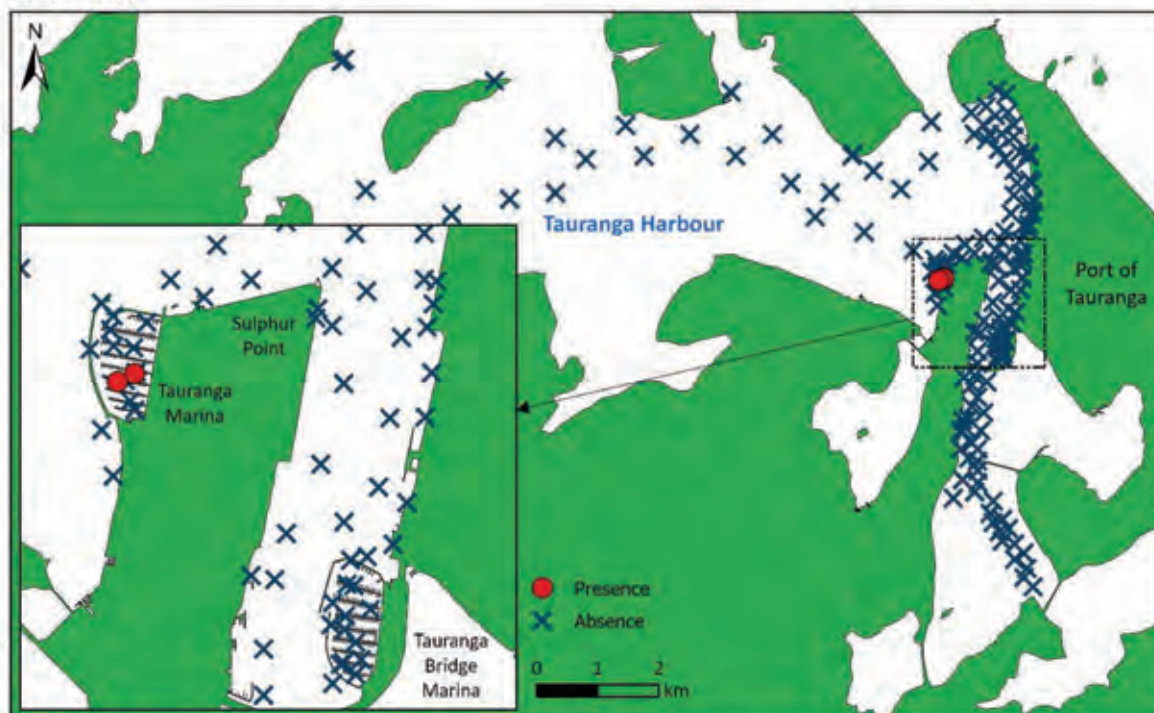
Ciona intestinalis



Tauranga Harbour

Winter 2023

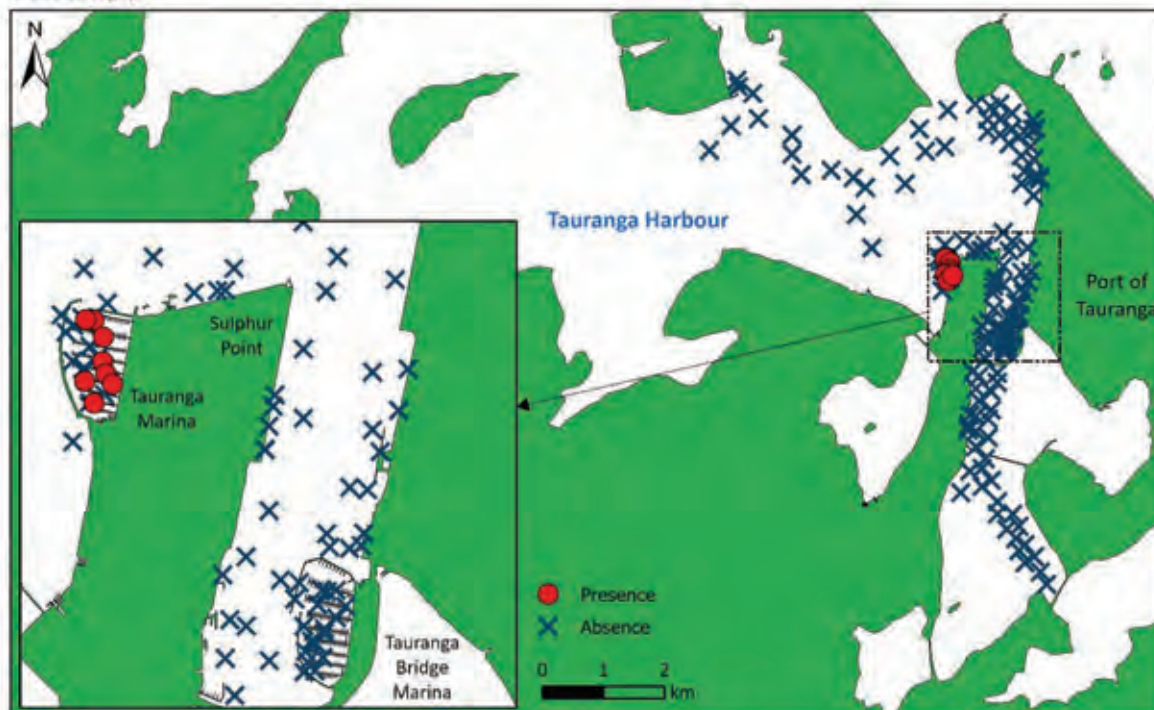
Ciona savignyi



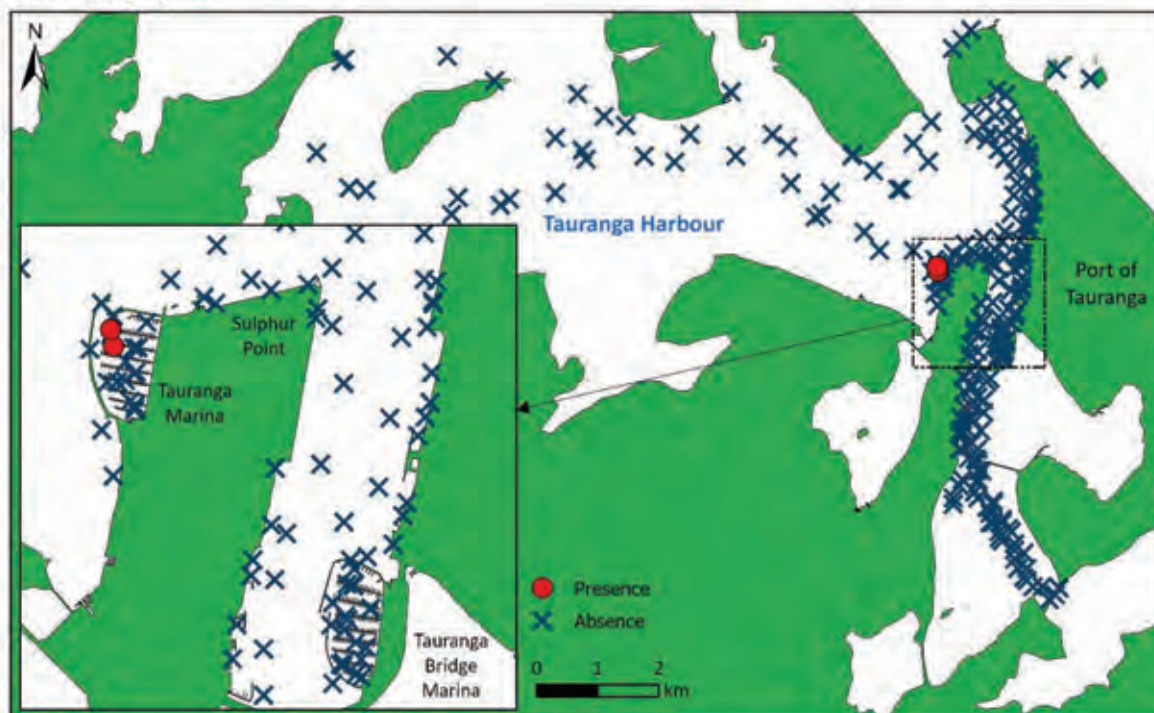
Tauranga Harbour

Summer 2023-24

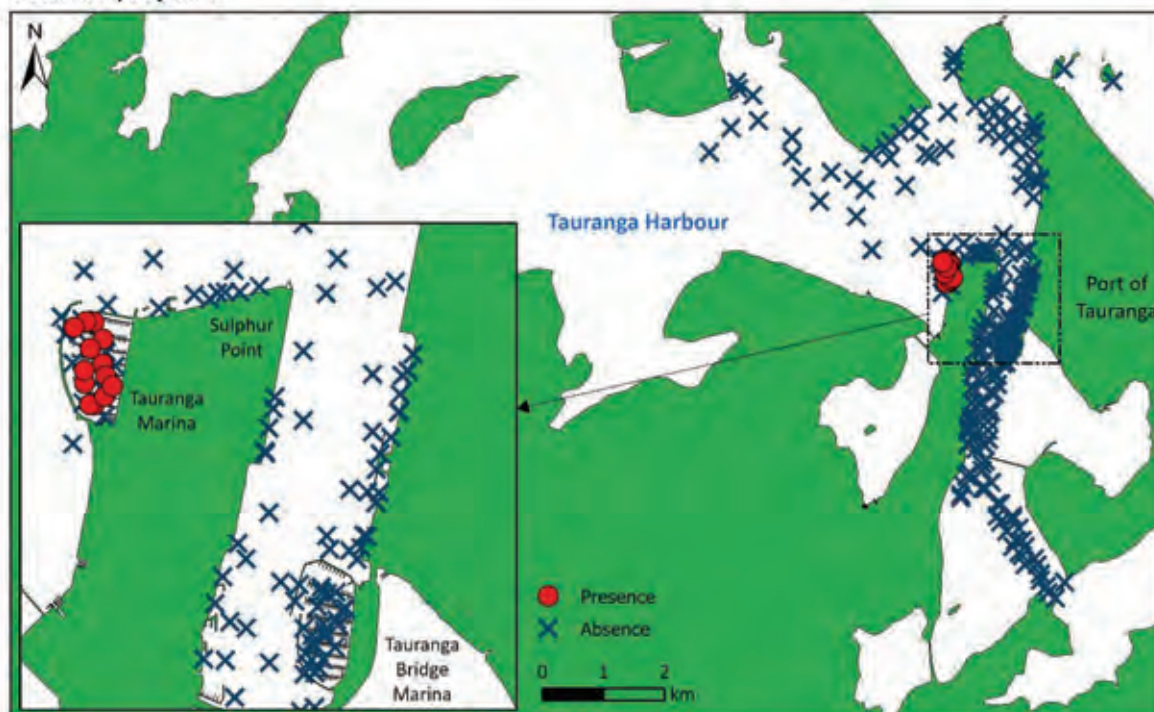
Ciona savignyi



Tauranga Harbour
 Winter 2023
Clavelina lepadiformis



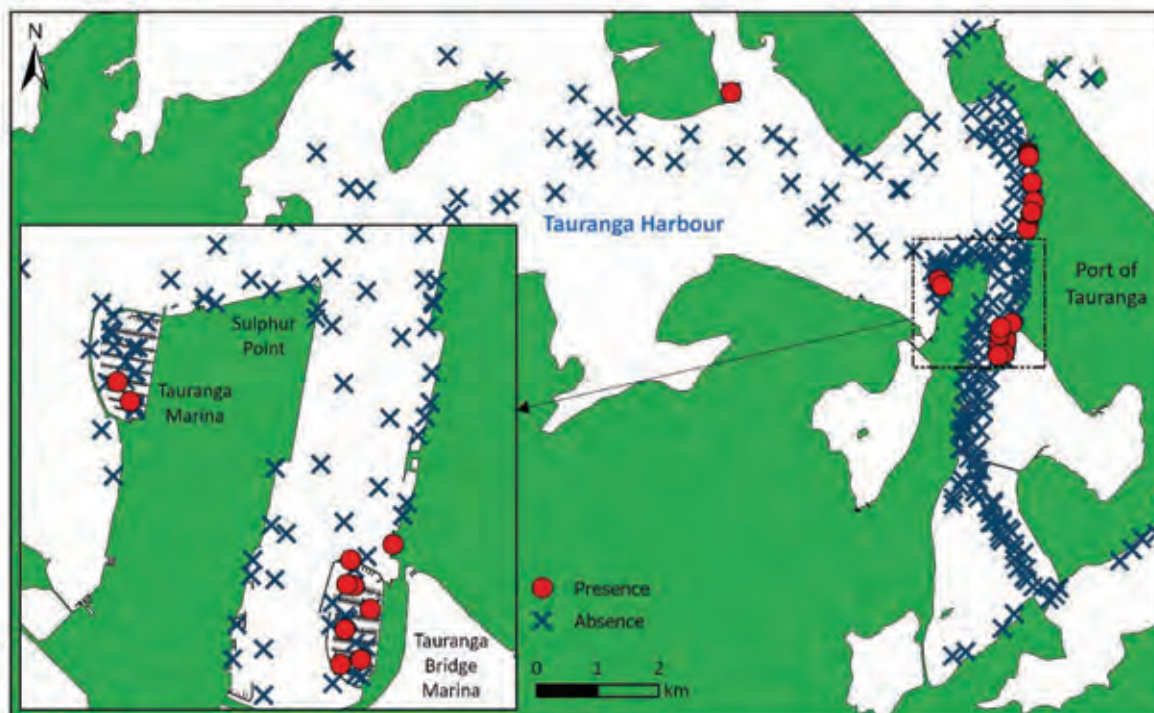
Tauranga Harbour
 Summer 2023-24
Clavelina lepadiformis



Tauranga Harbour

Winter 2023

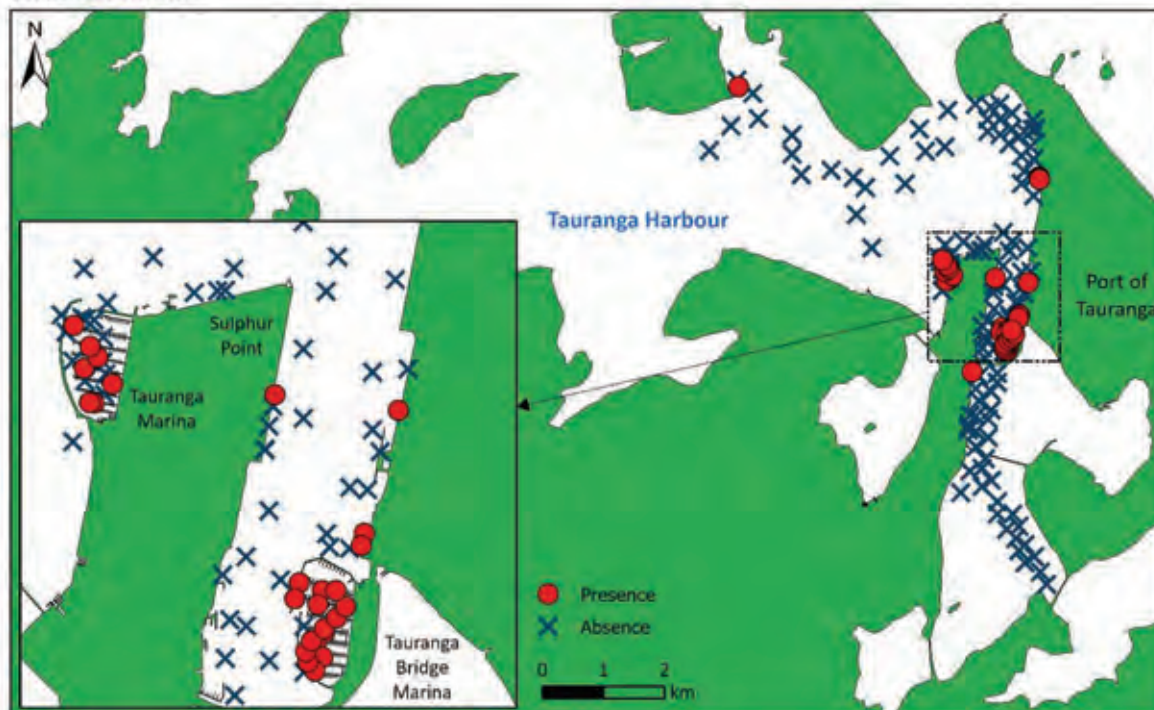
Didemnum vexillum



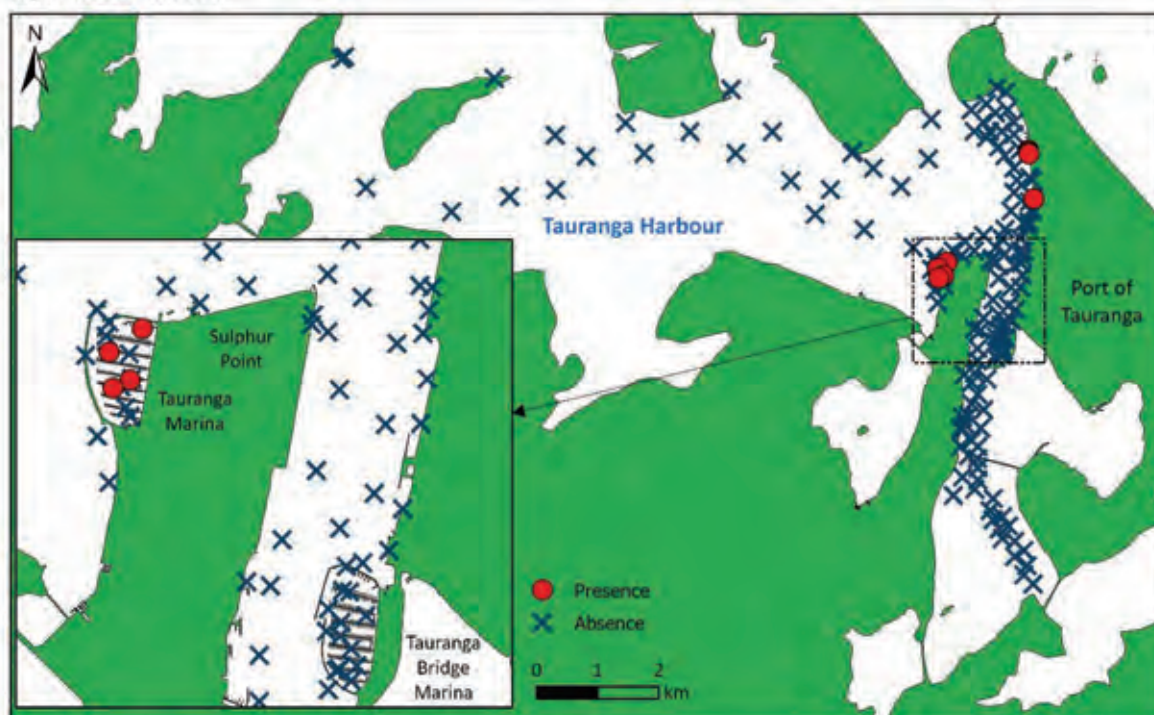
Tauranga Harbour

Summer 2023-24

Didemnum vexillum



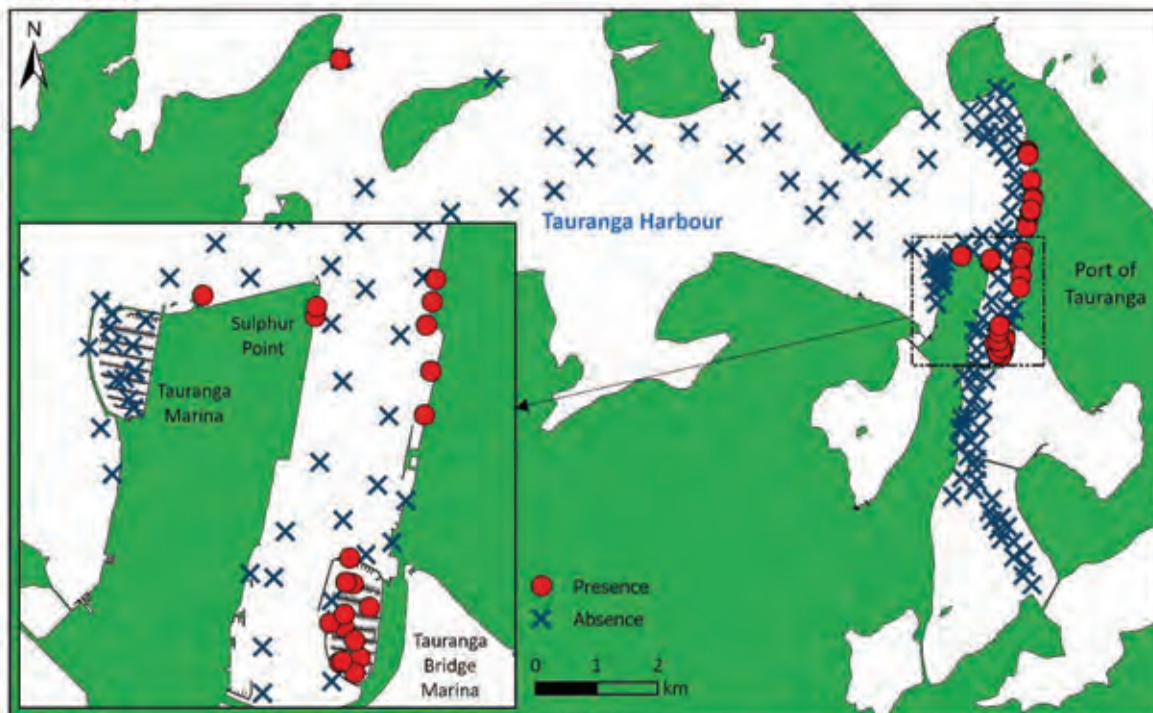
Tauranga Harbour
 Winter 2023
Diplosoma listerianum



Tauranga Harbour

Winter 2023

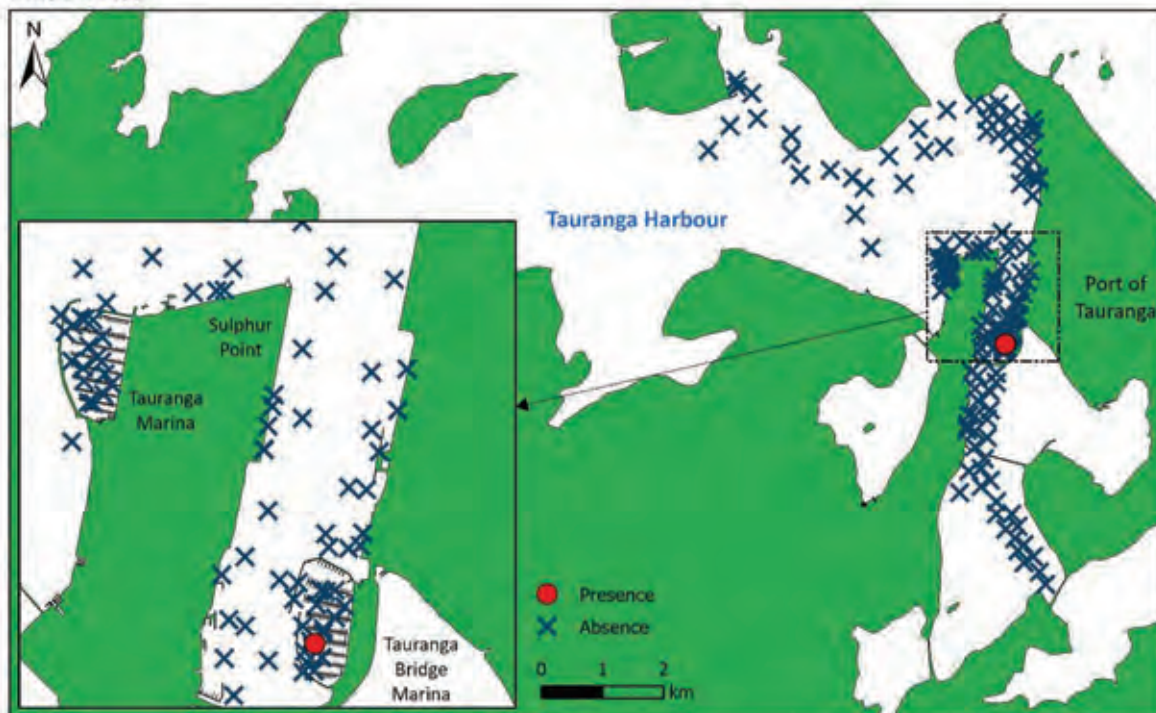
Ectopleura spp.



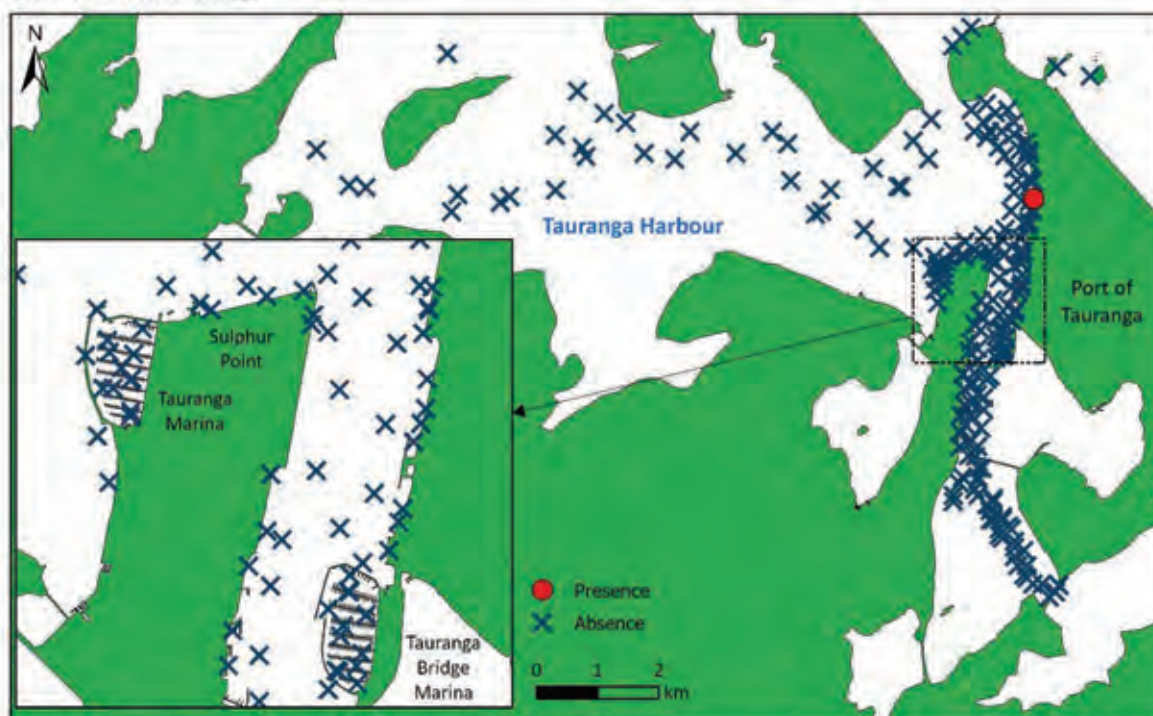
Tauranga Harbour

Summer 2023-24

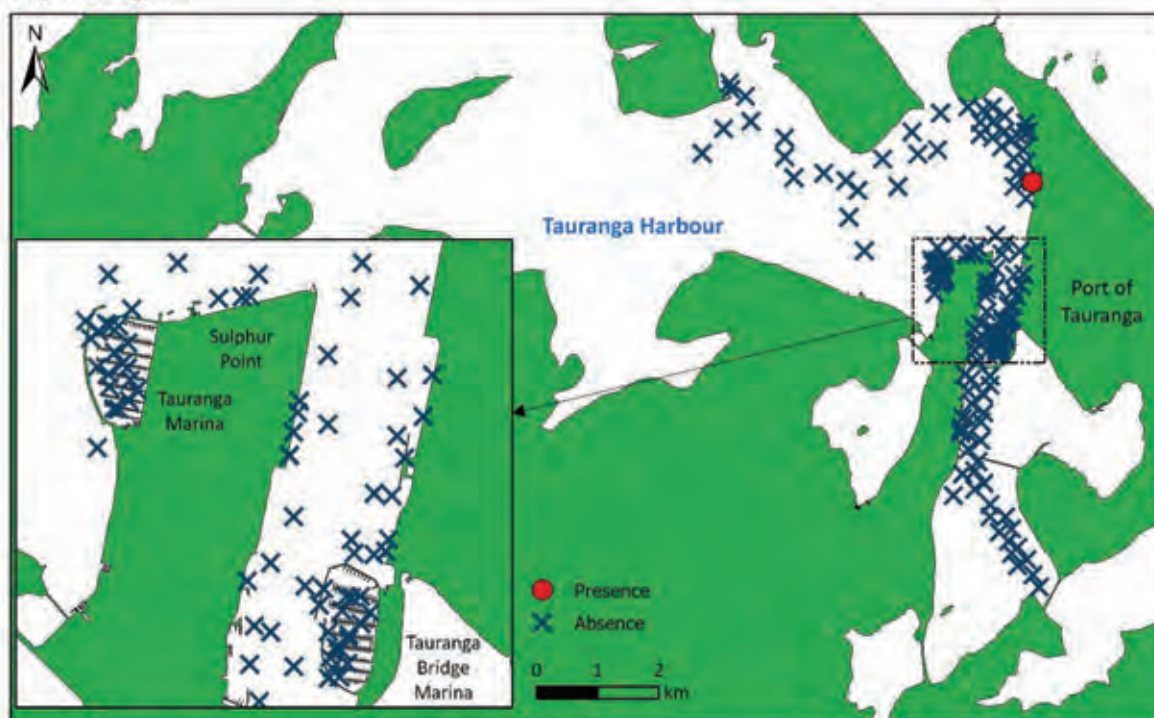
Ectopleura spp.



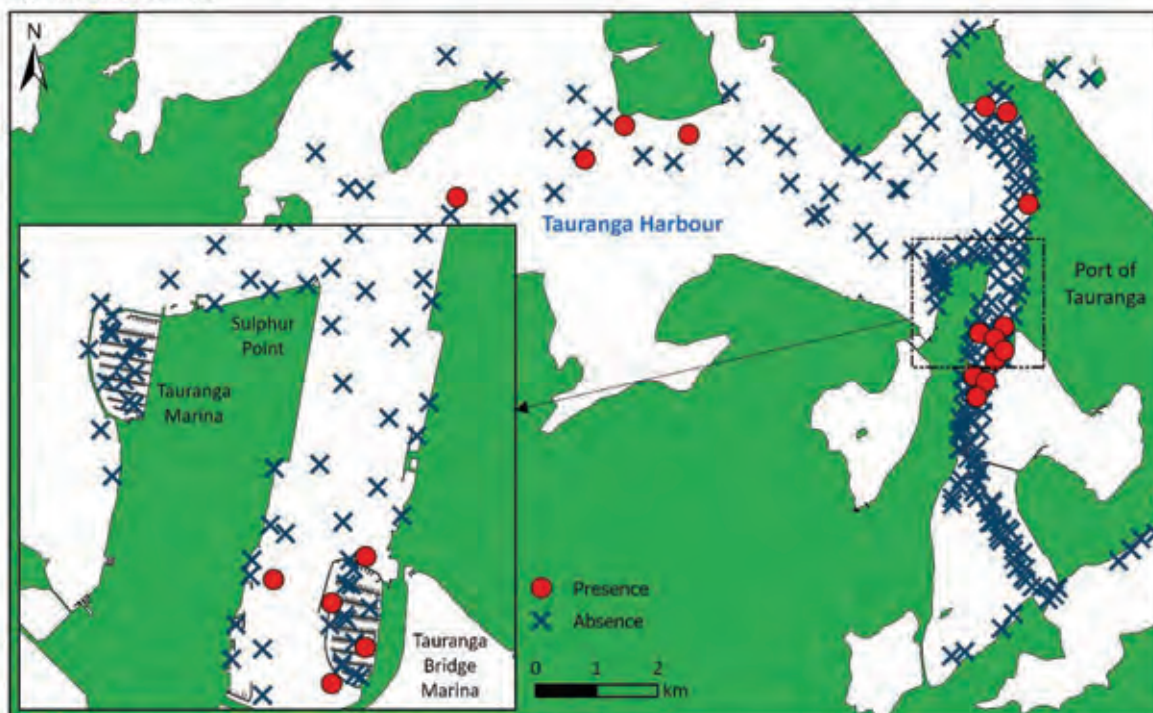
Tauranga Harbour
 Winter 2023
Parablennius tasmanianus



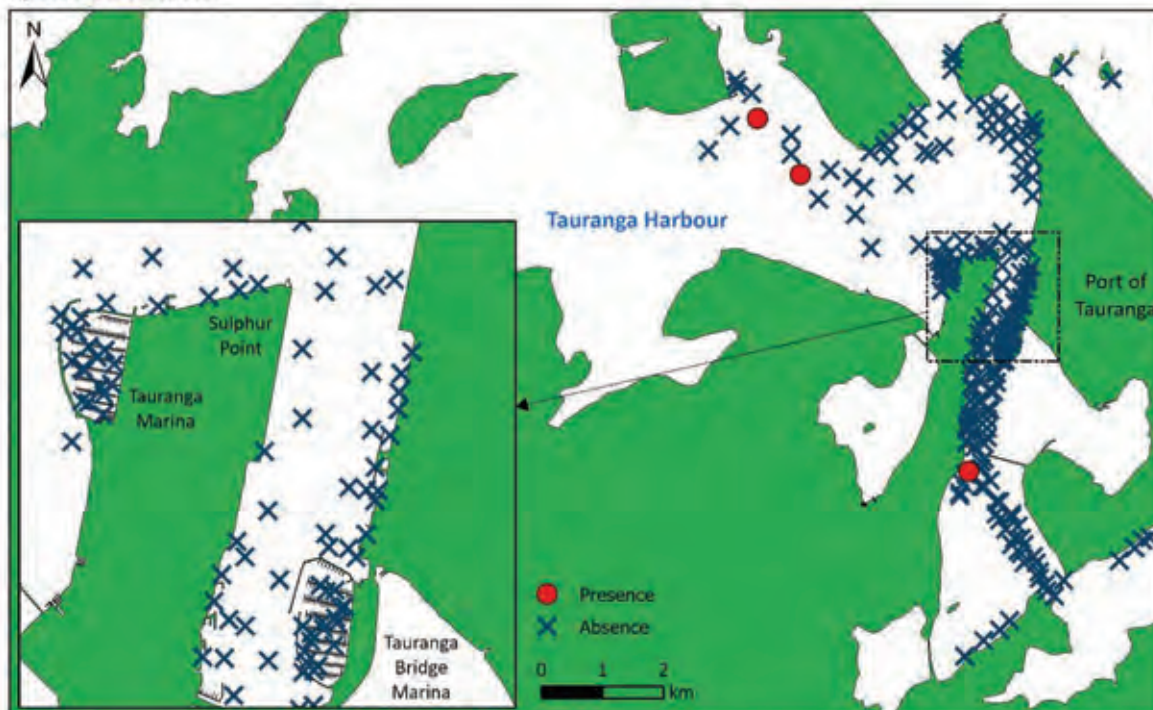
Tauranga Harbour
 Summer 2023-24
Polycera hedgpethi



Tauranga Harbour
 Winter 2023
Pyromaila tuberculata



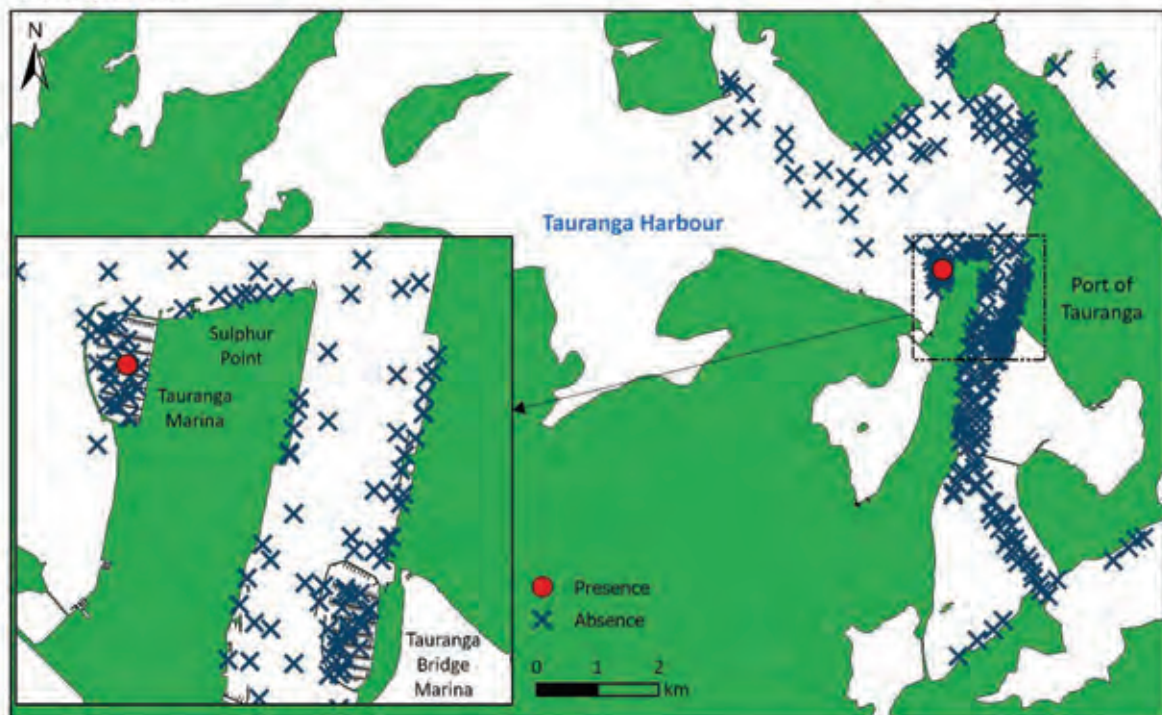
Tauranga Harbour
 Summer 2023-24
Pyromaila tuberculata



Tauranga Harbour

Summer 2023-24

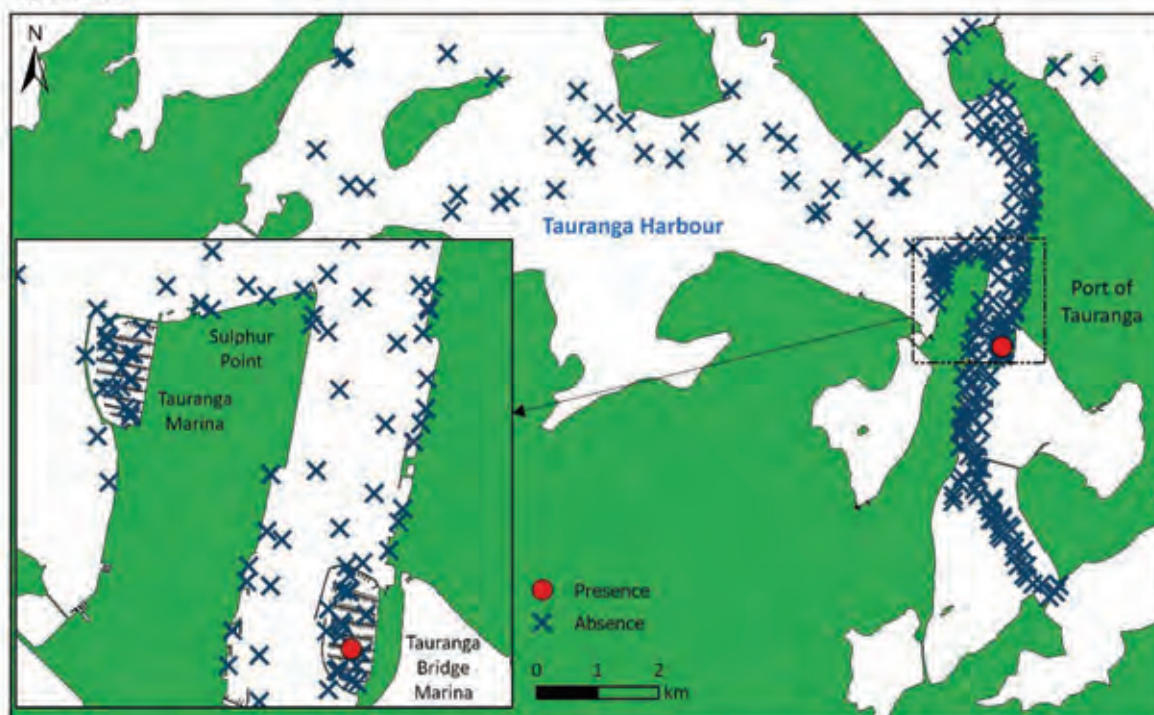
Sabella spallanzanii



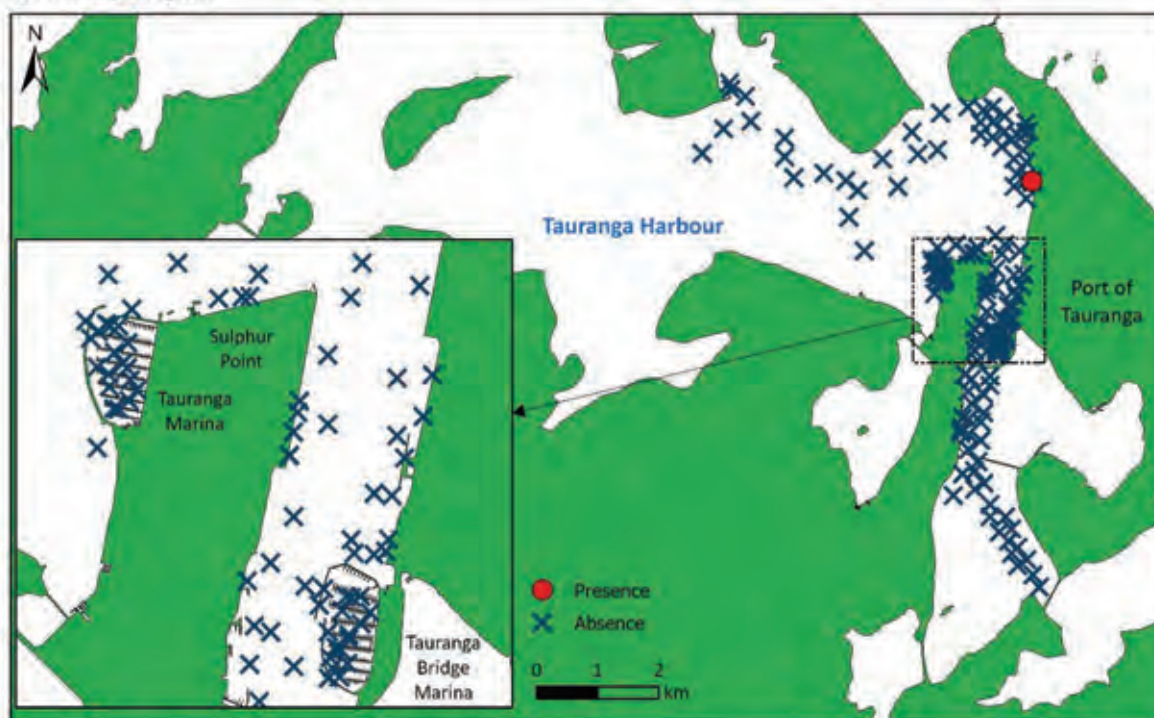
Tauranga Harbour

Winter 2023

Styela clava



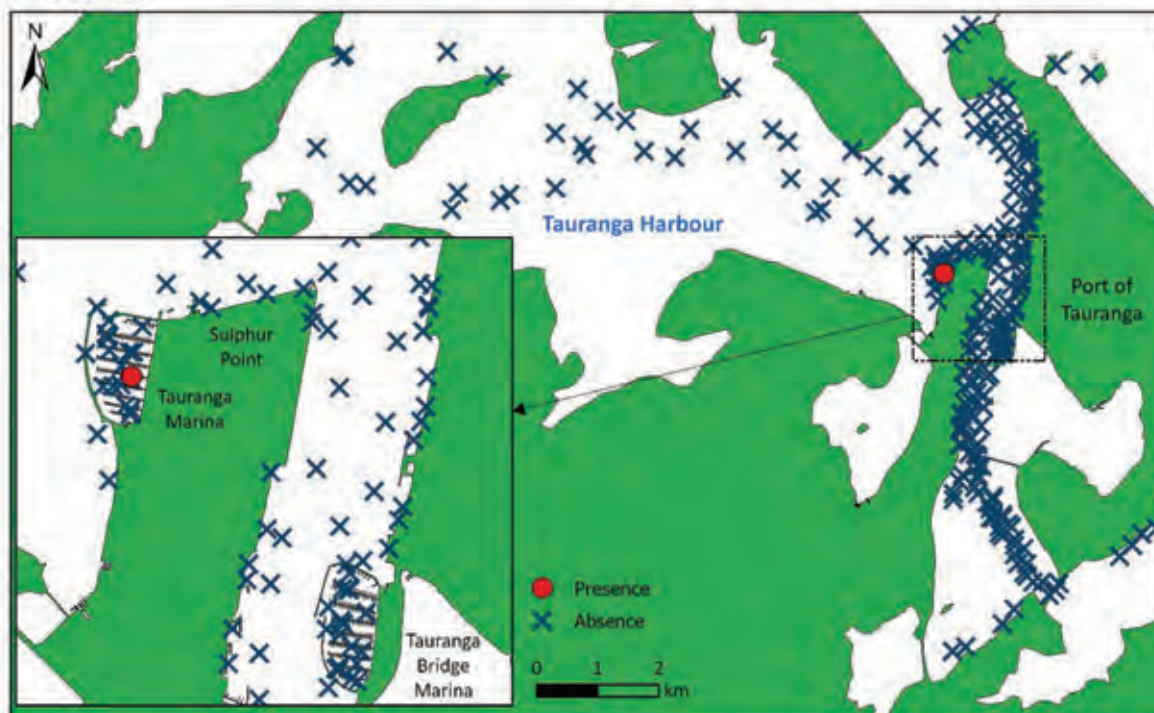
Tauranga Harbour
 Summer 2023-24
Thecaera pennigera



Tauranga Harbour

Winter 2023

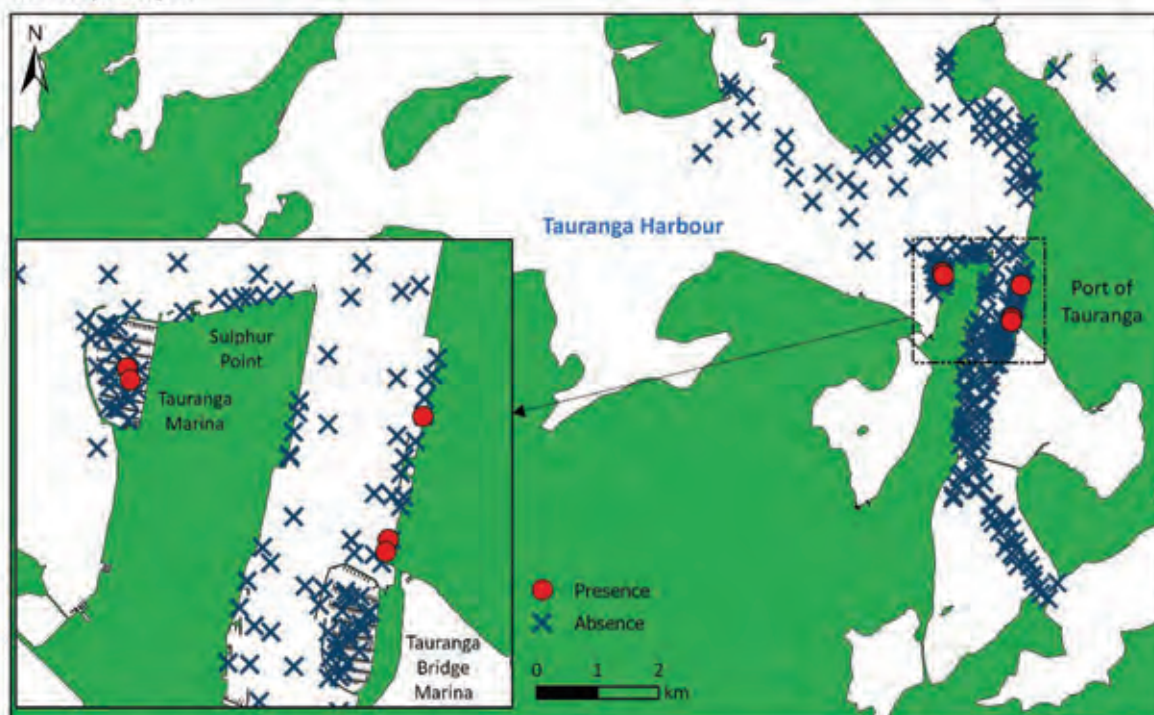
Tritia burchardi



Tauranga Harbour

Summer 2023-24

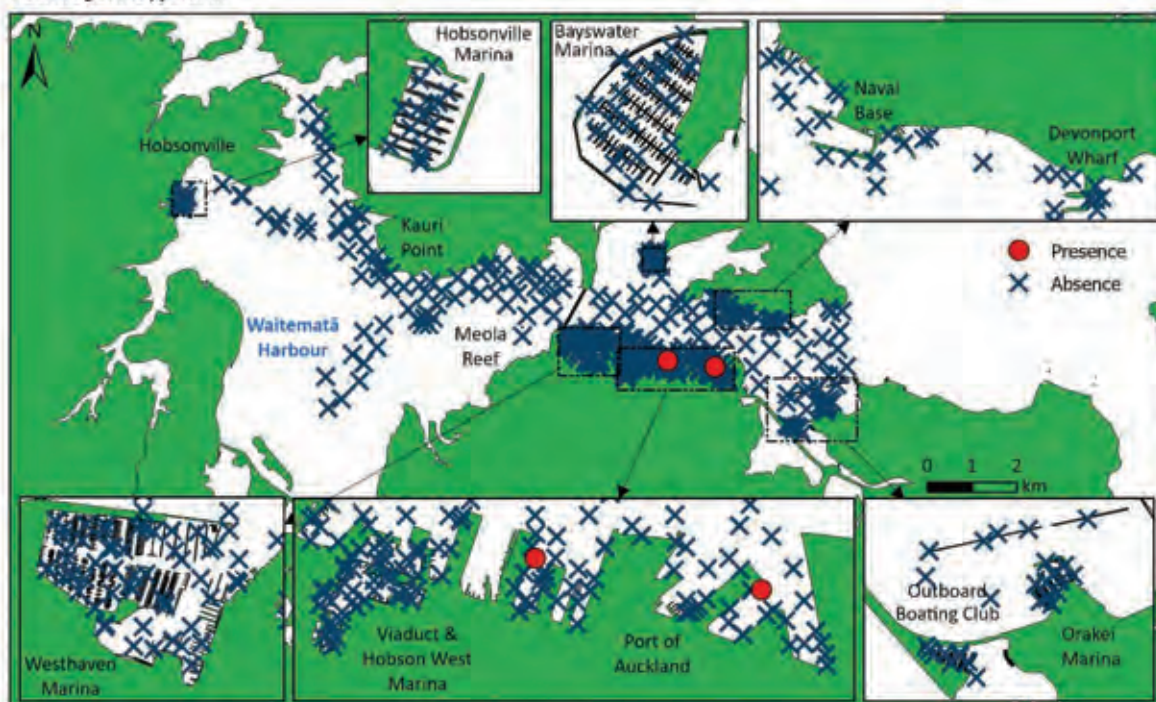
Undaria pinnatifida



Waitematā Harbour

Winter 2023

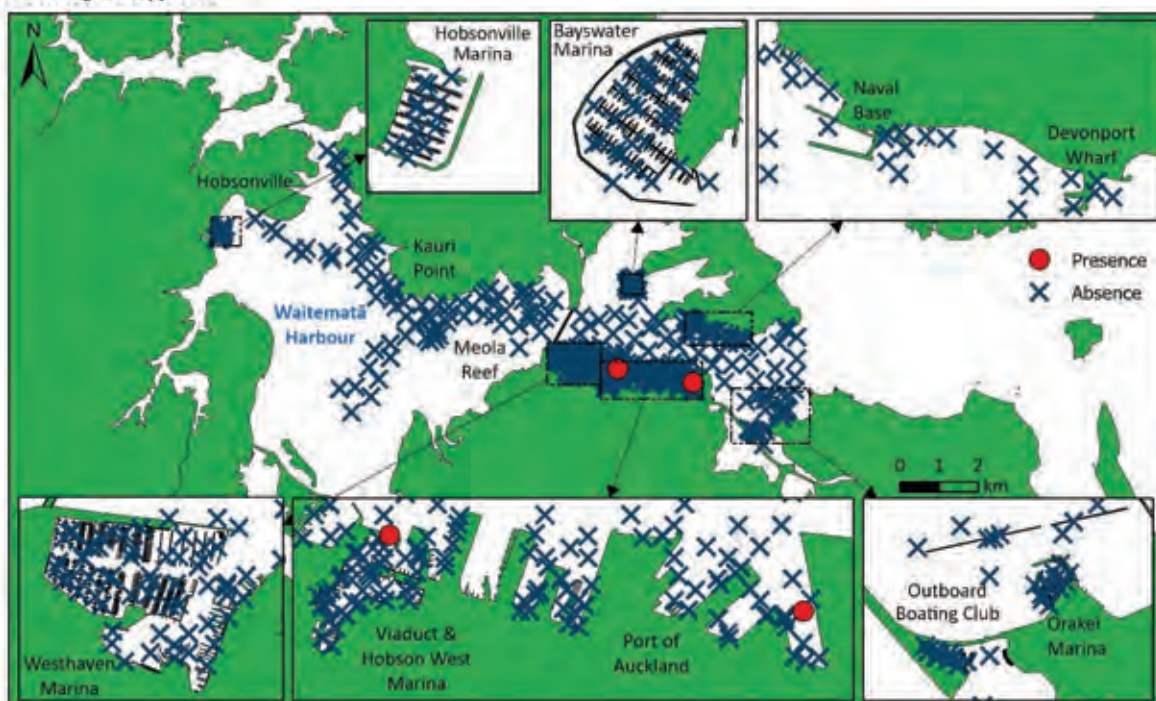
Acentrogobius pflaumii



Waitematā Harbour

Summer 2023-24

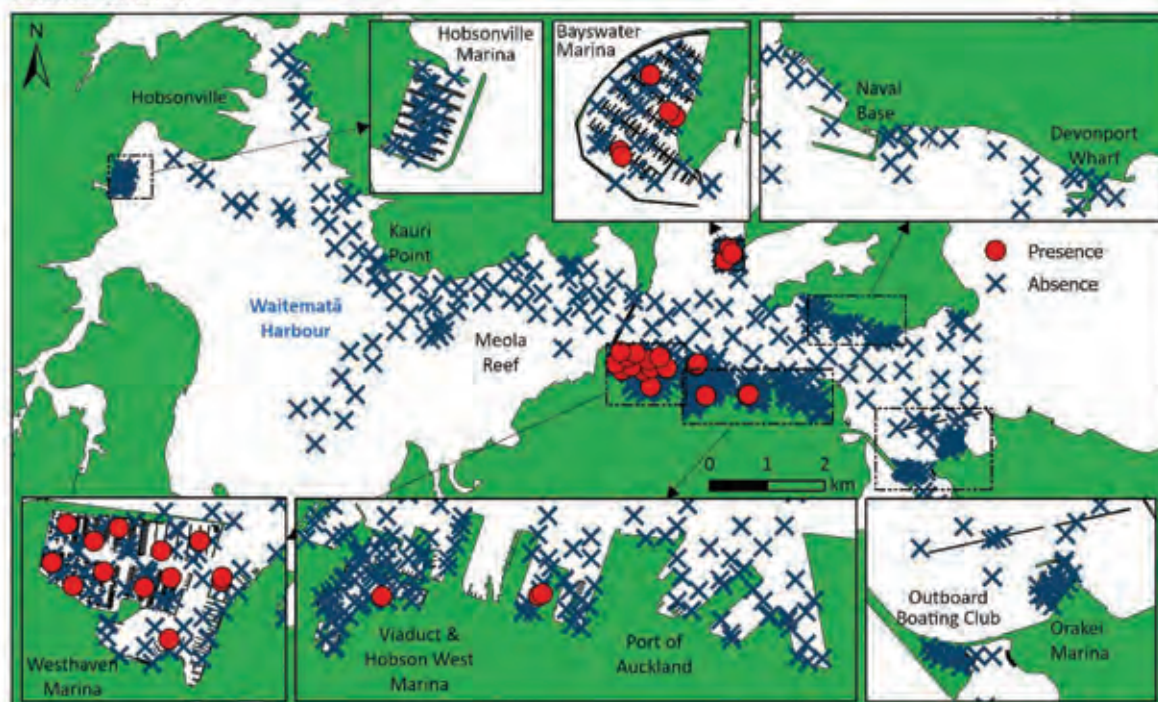
Acentrogobius pflaumii



Waitematā Harbour

Summer 2023-24

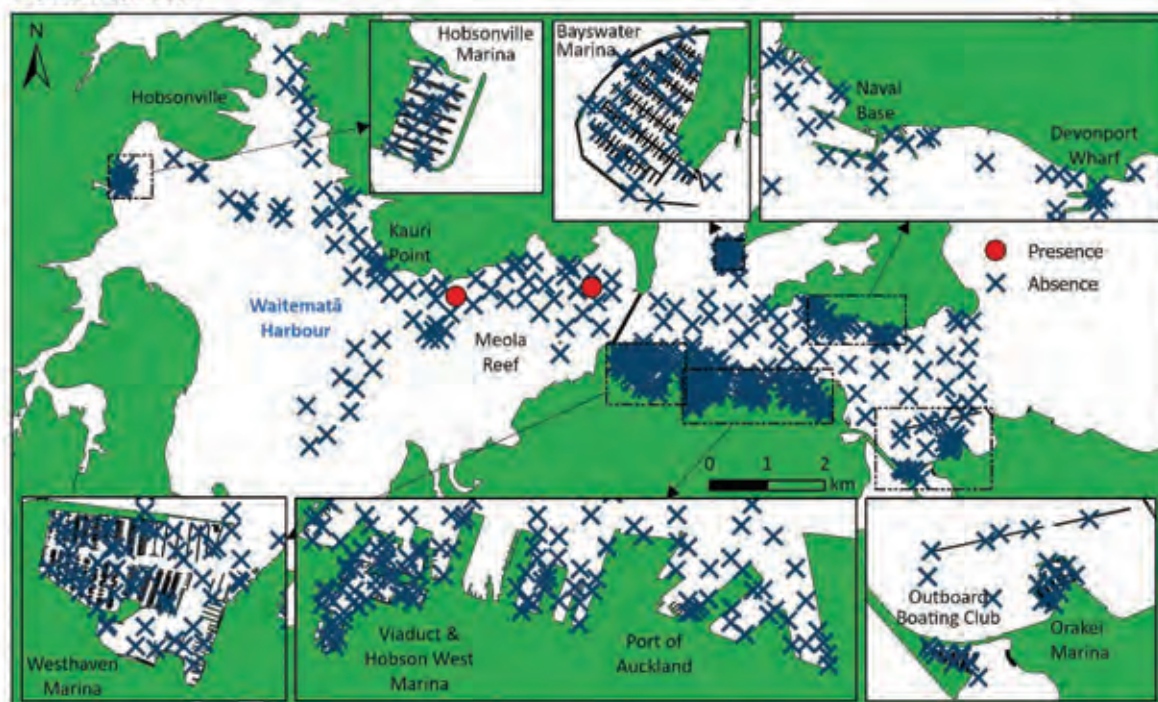
Amathia verticillata



Waitematā Harbour

Winter 2023

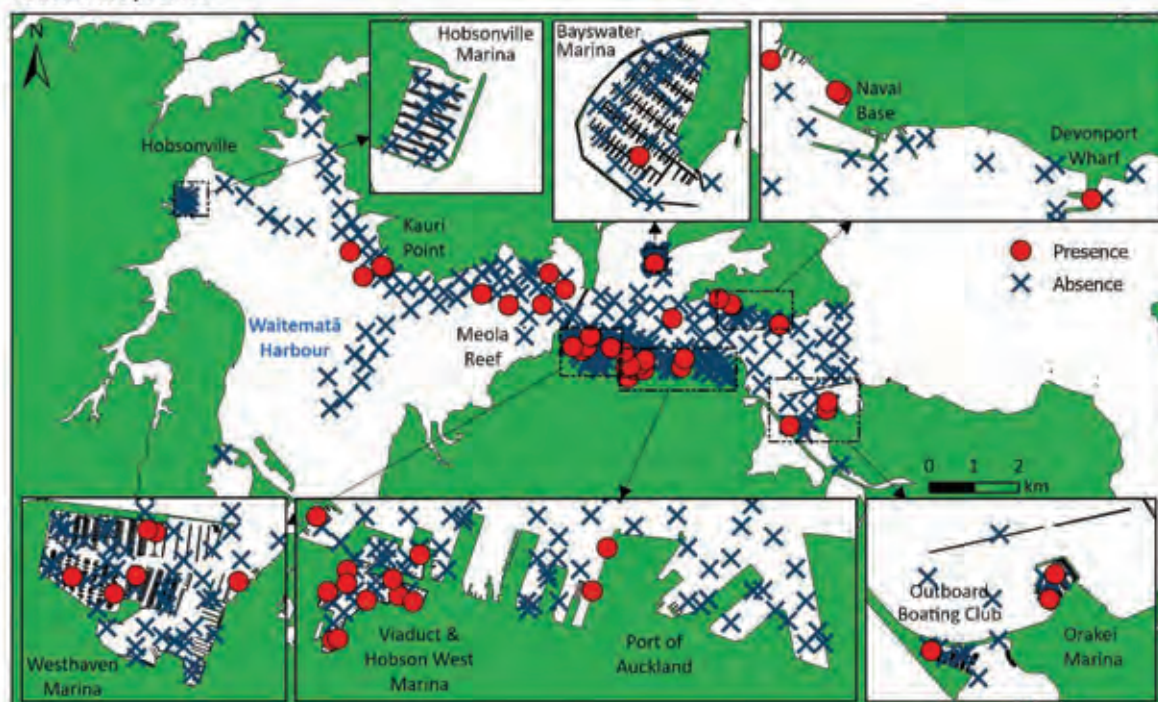
Arcuatula senhousia



Waitematā Harbour

Winter 2023

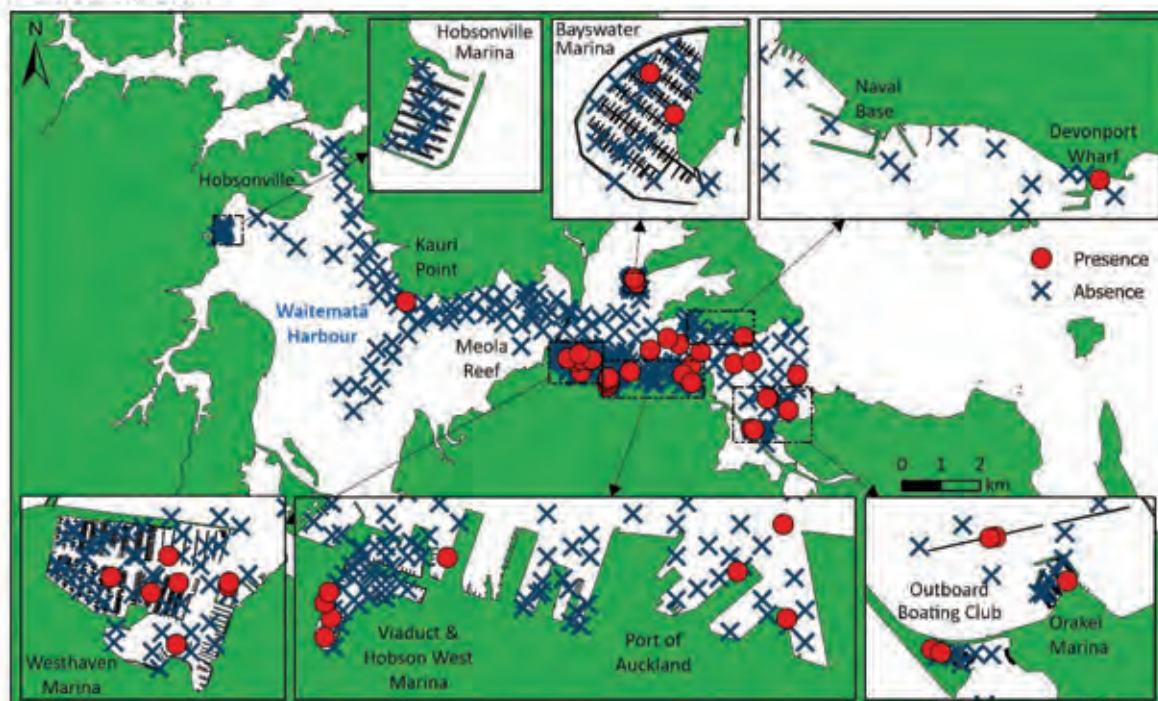
Ascidia latesiphonica



Waitematā Harbour

Summer 2023-24

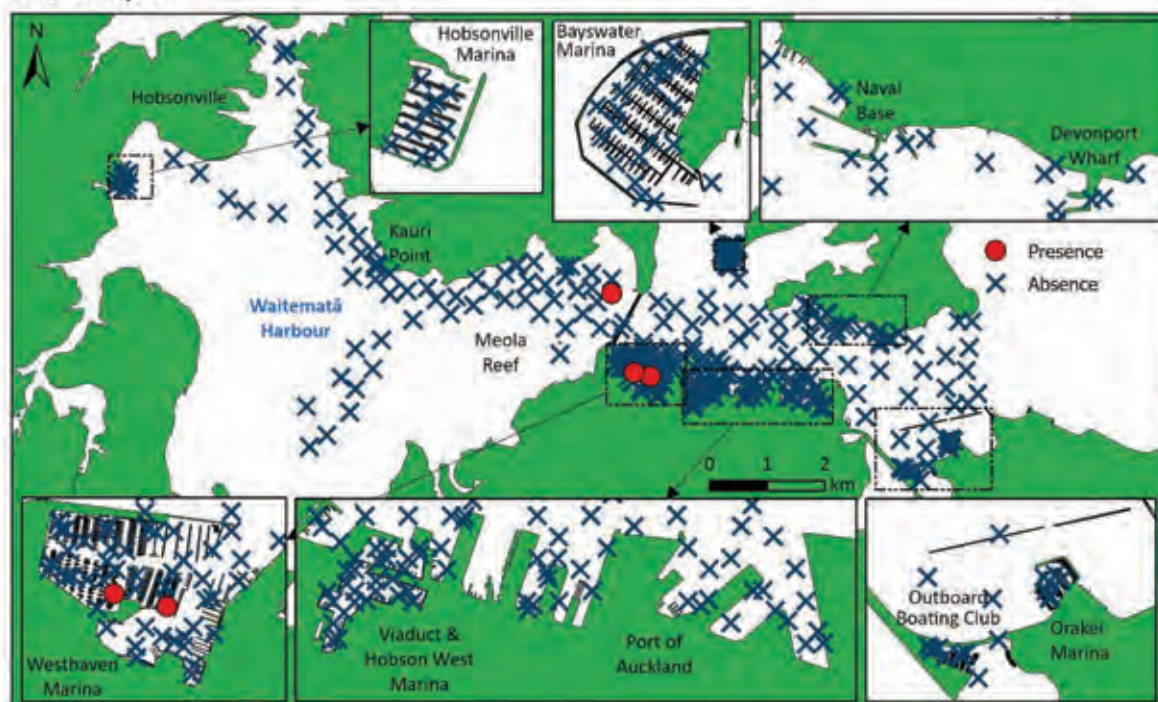
Ascidia latesiphonica



Waitematā Harbour

Winter 2023

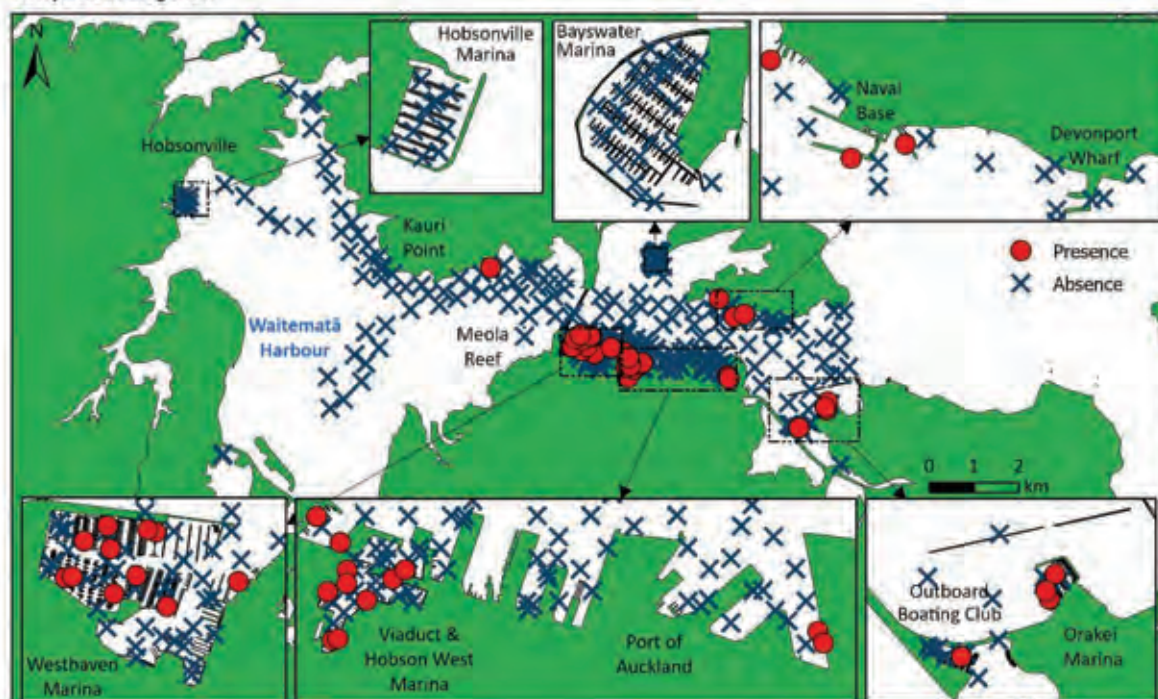
Ascidella aspersa



Waitematā Harbour

Winter 2023

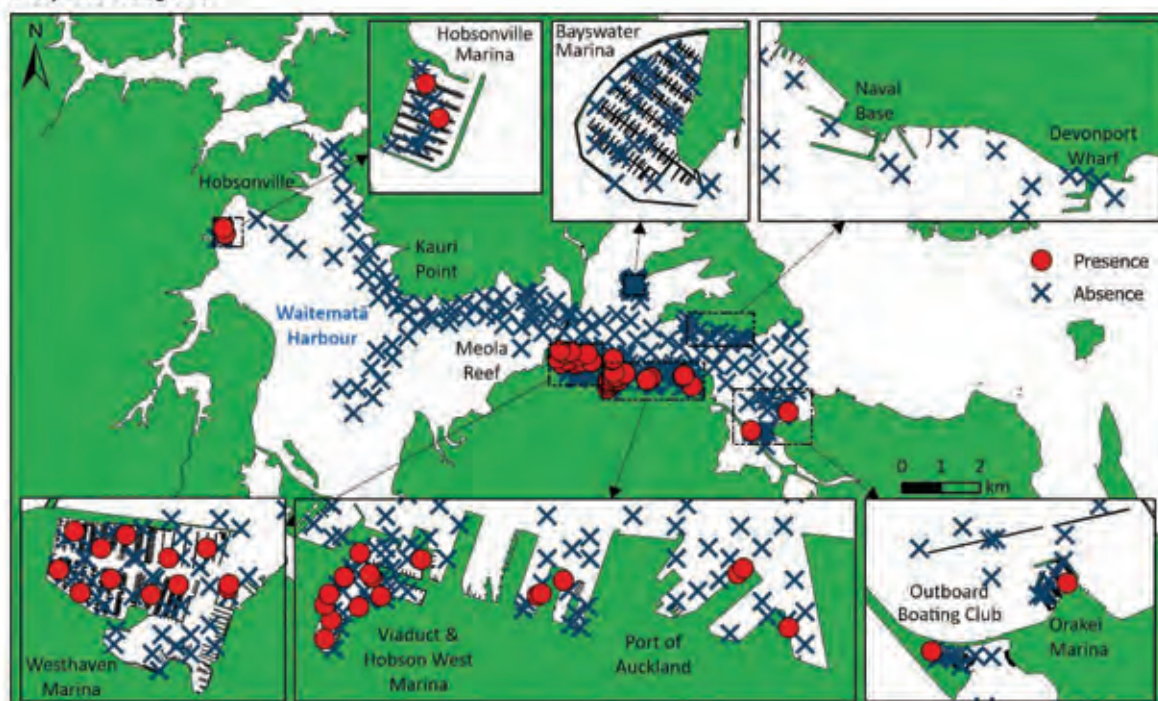
Botrylloides diegensis



Waitematā Harbour

Summer 2023-24

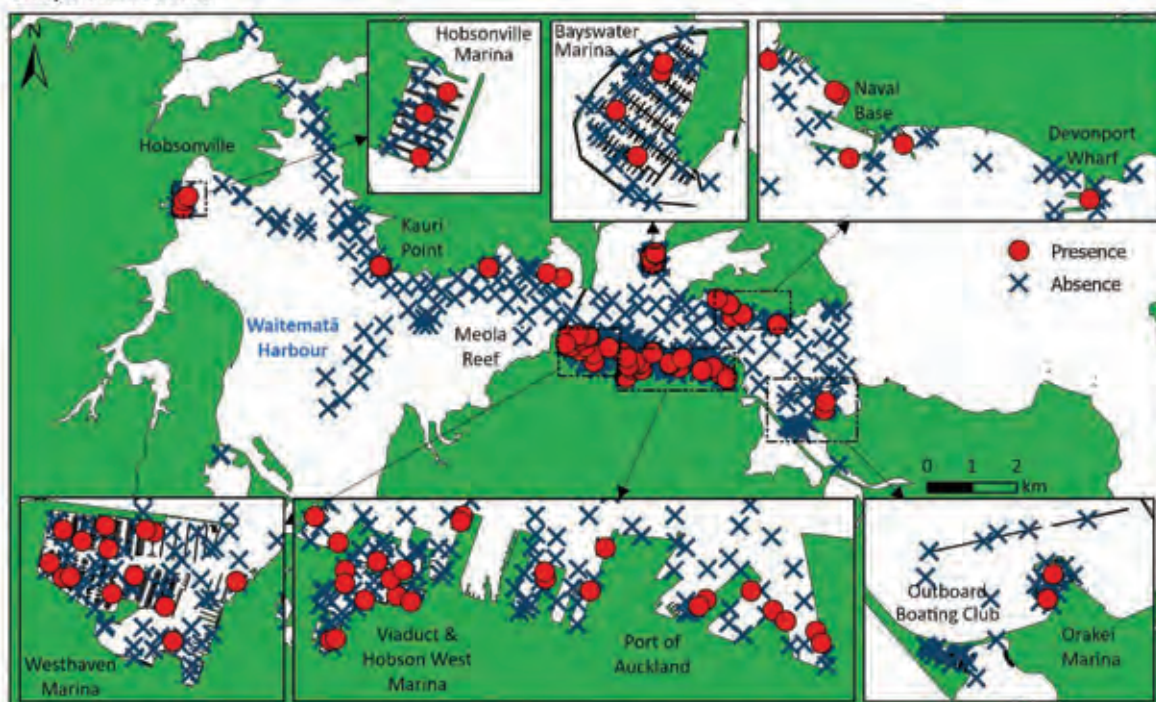
Botrylloides diegensis



Waitematā Harbour

Winter 2023

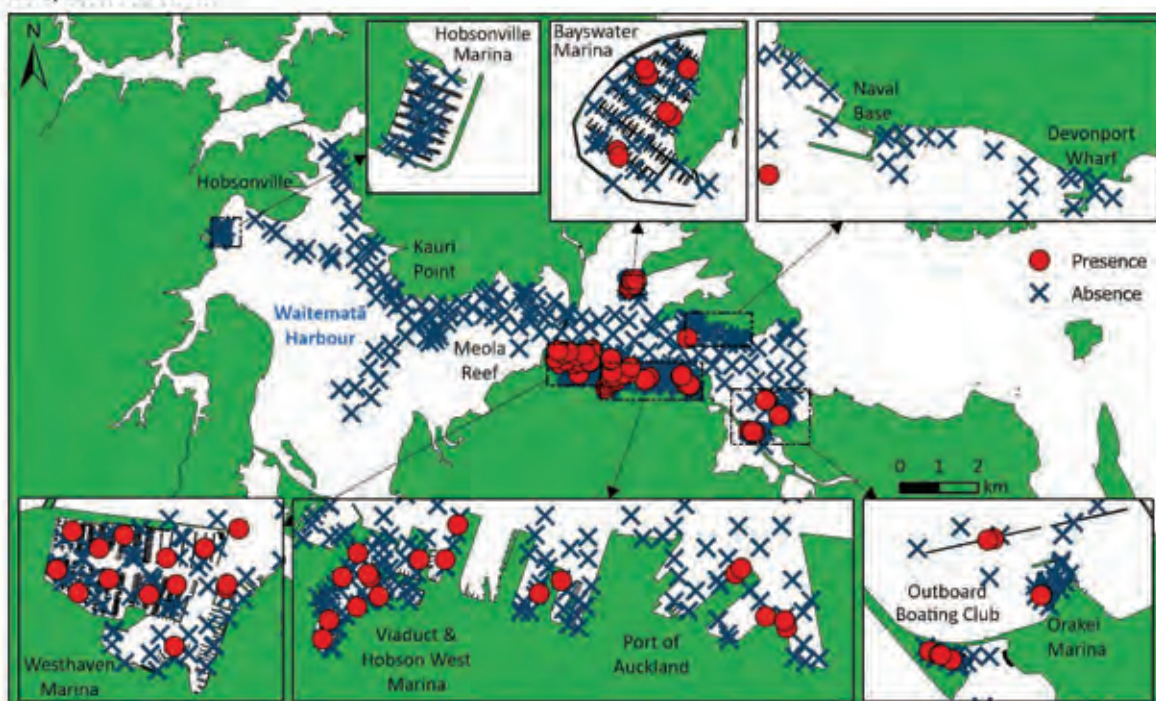
Celleporaria nodulosa



Waitematā Harbour

Summer 2023-24

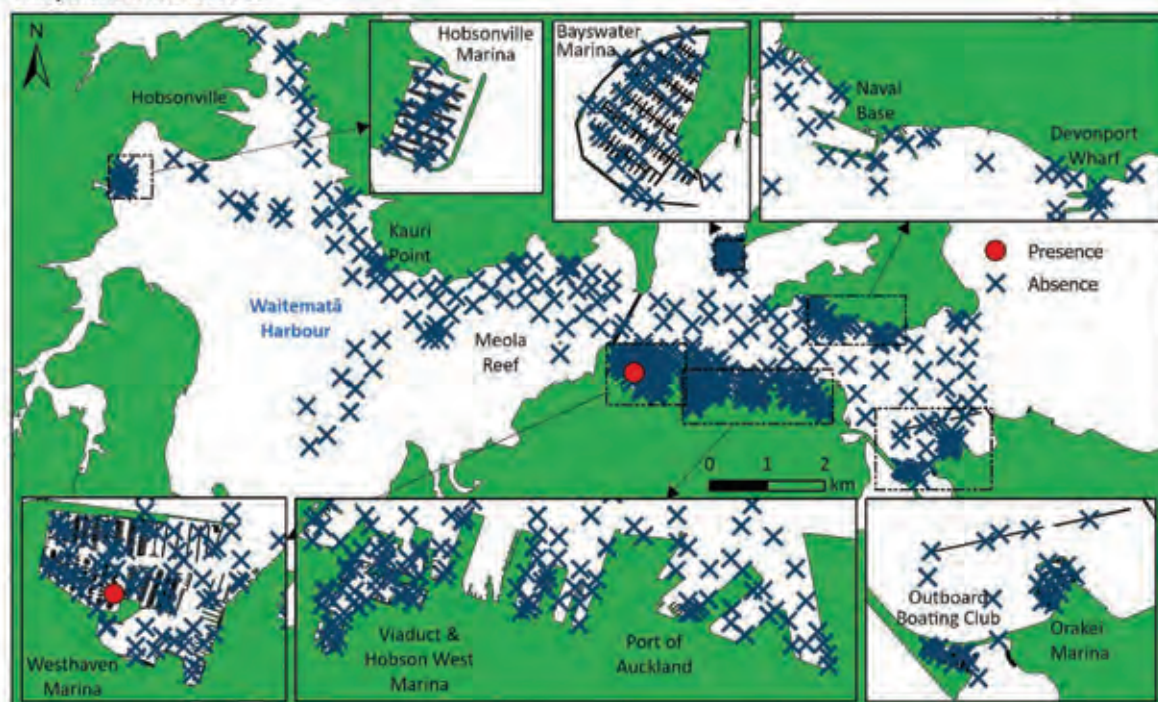
Celleporaria nodulosa



Waitematā Harbour

Winter 2023

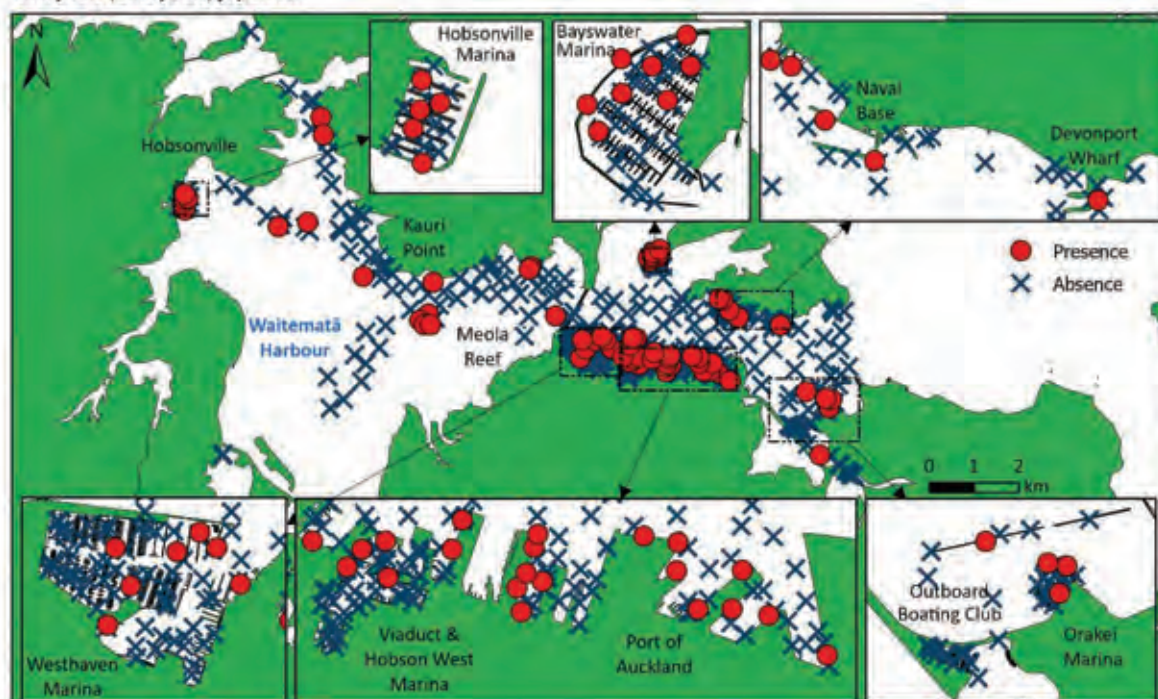
Celleporaria umbonatoidea



Waitematā Harbour

Winter 2023

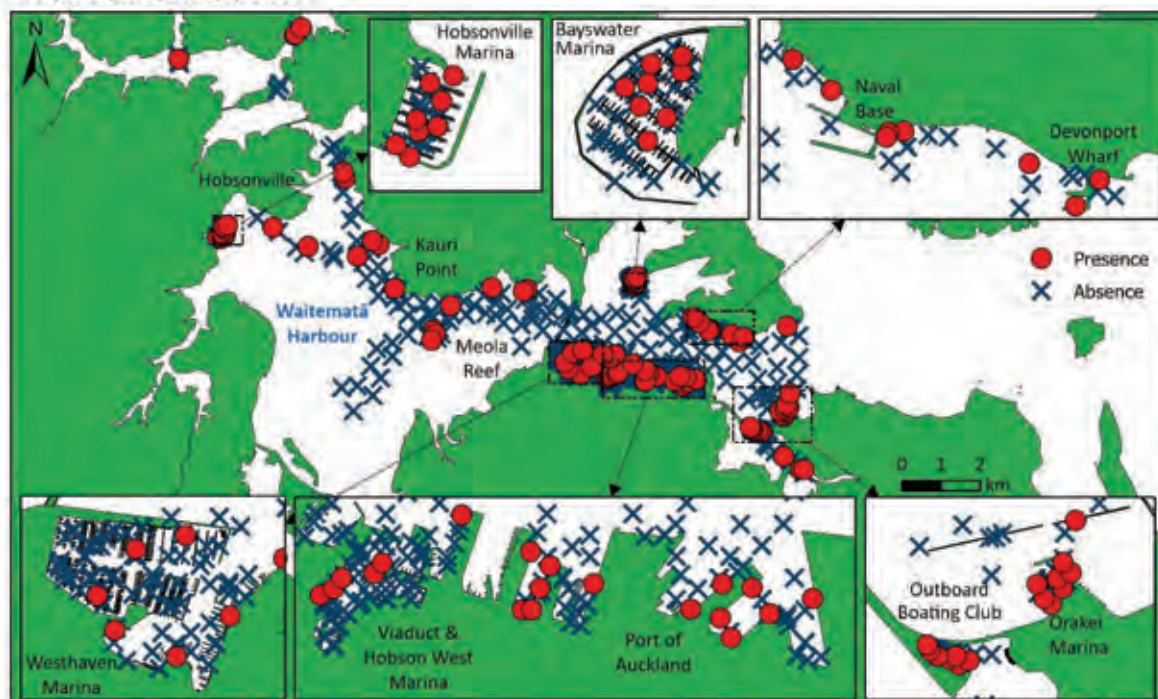
Charybdis (Charybdis) japonica



Waitematā Harbour

Summer 2023-24

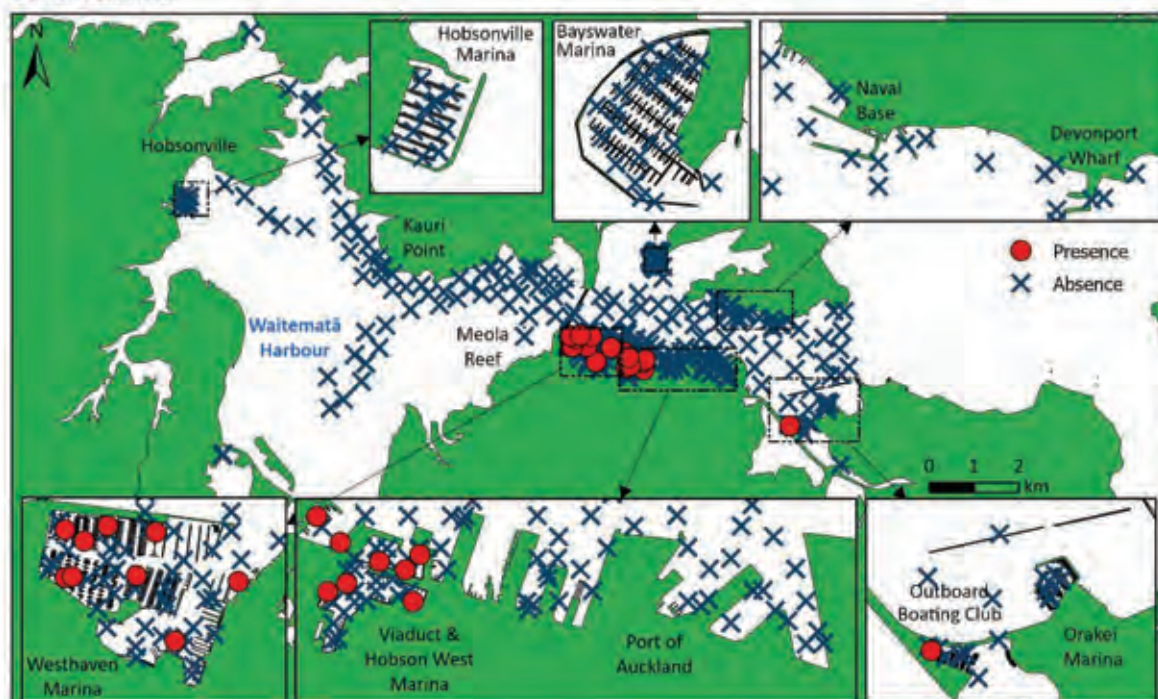
Charybdis (Charybdis) japonica



Waitematā Harbour

Winter 2023

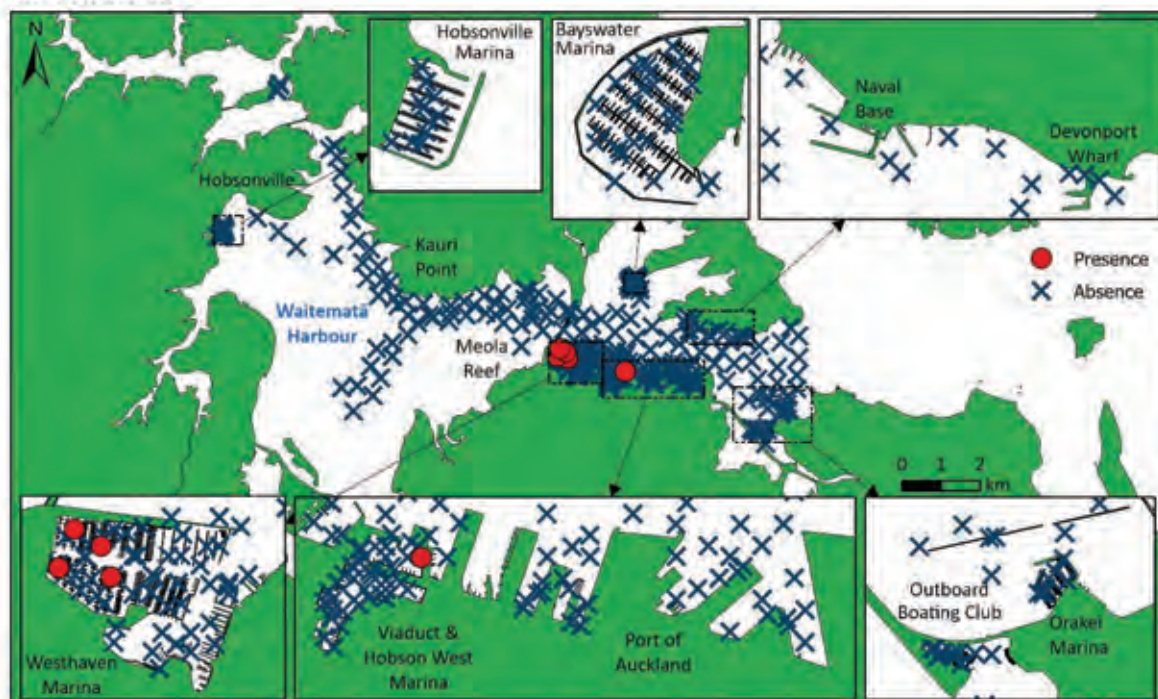
Ciona intestinalis



Waitematā Harbour

Summer 2023-24

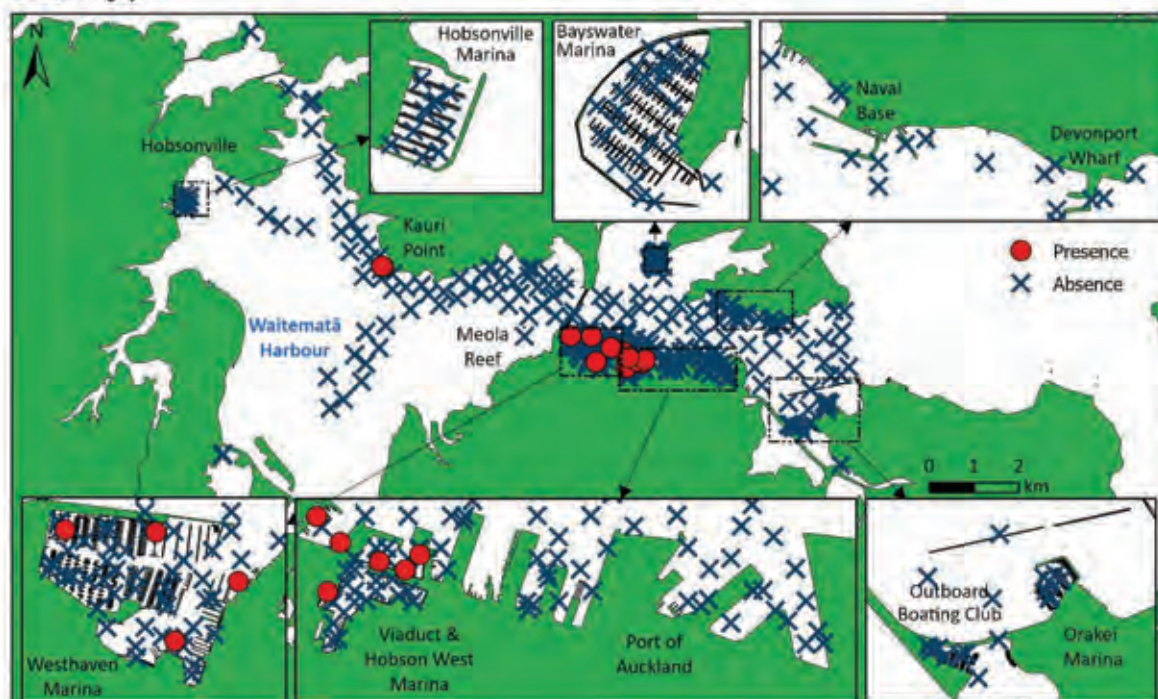
Ciona intestinalis



Waitematā Harbour

Winter 2023

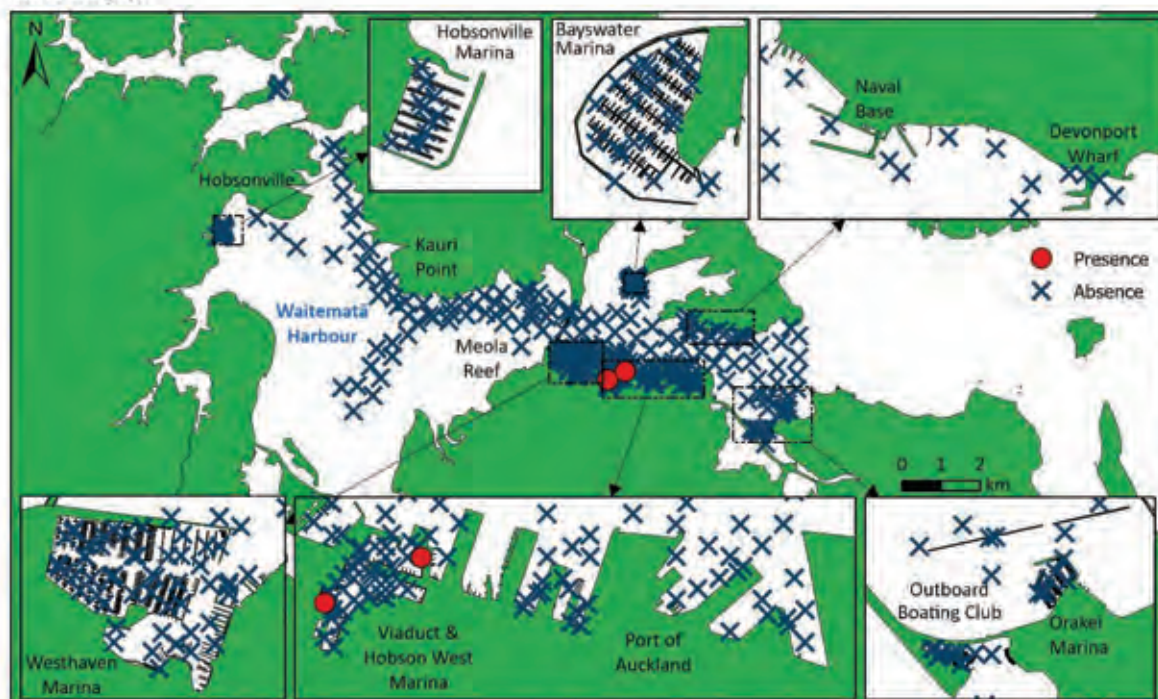
Ciona savignyi



Waitematā Harbour

Summer 2023-24

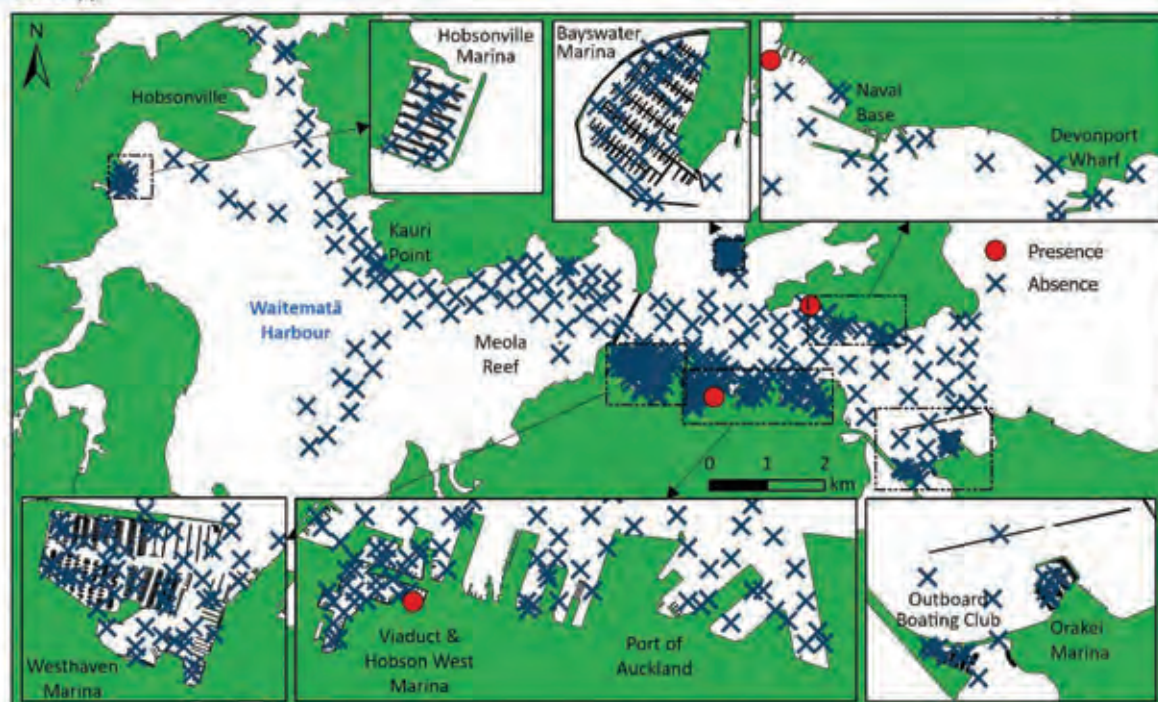
Ciona savignyi



Waitematā Harbour

Winter 2023

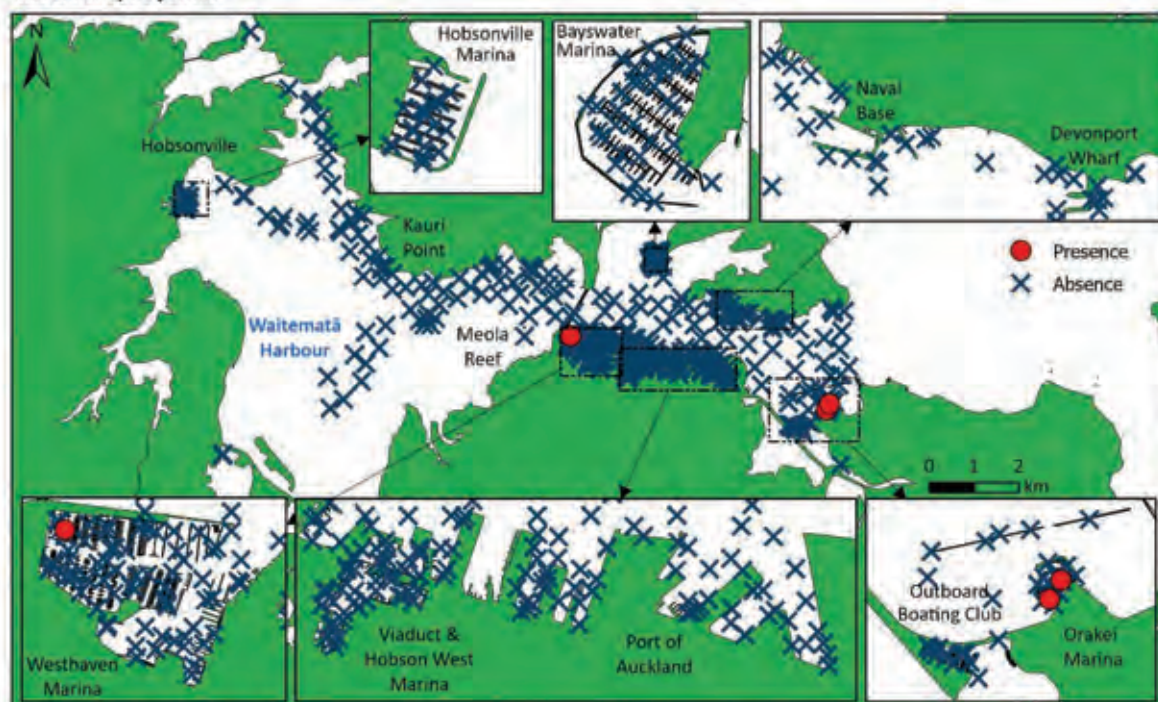
Ciona spp.



Waitematā Harbour

Winter 2023

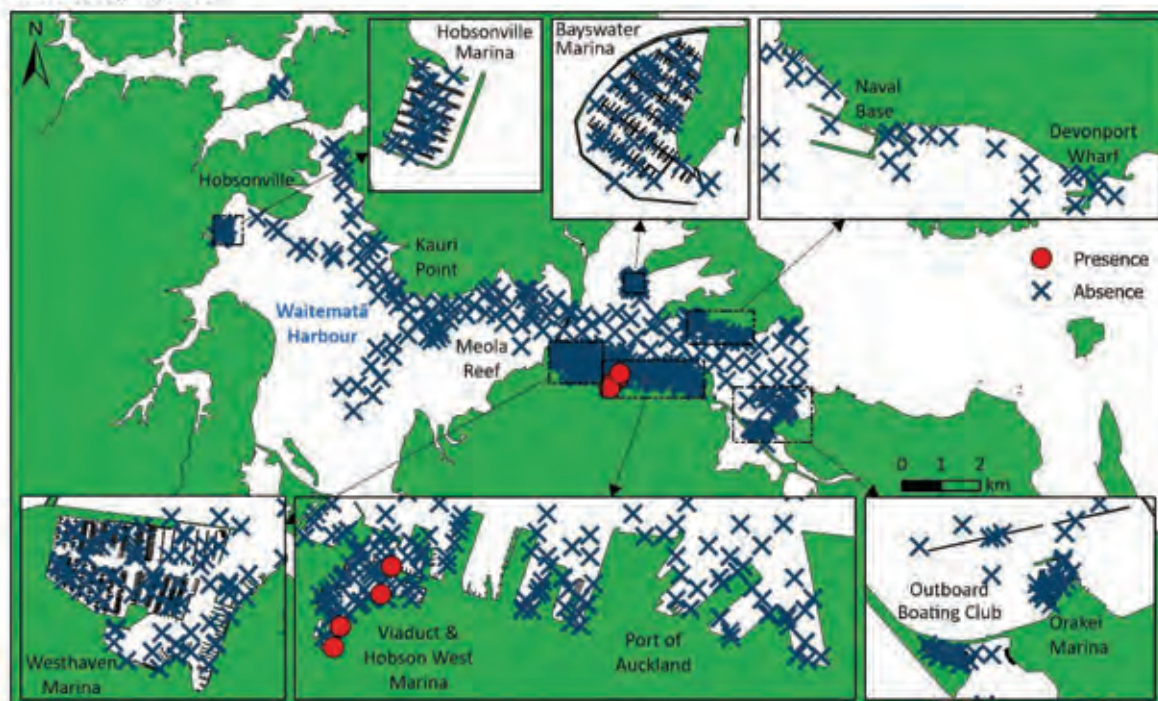
Clavelina lepadiformis



Waitematā Harbour

Summer 2023-24

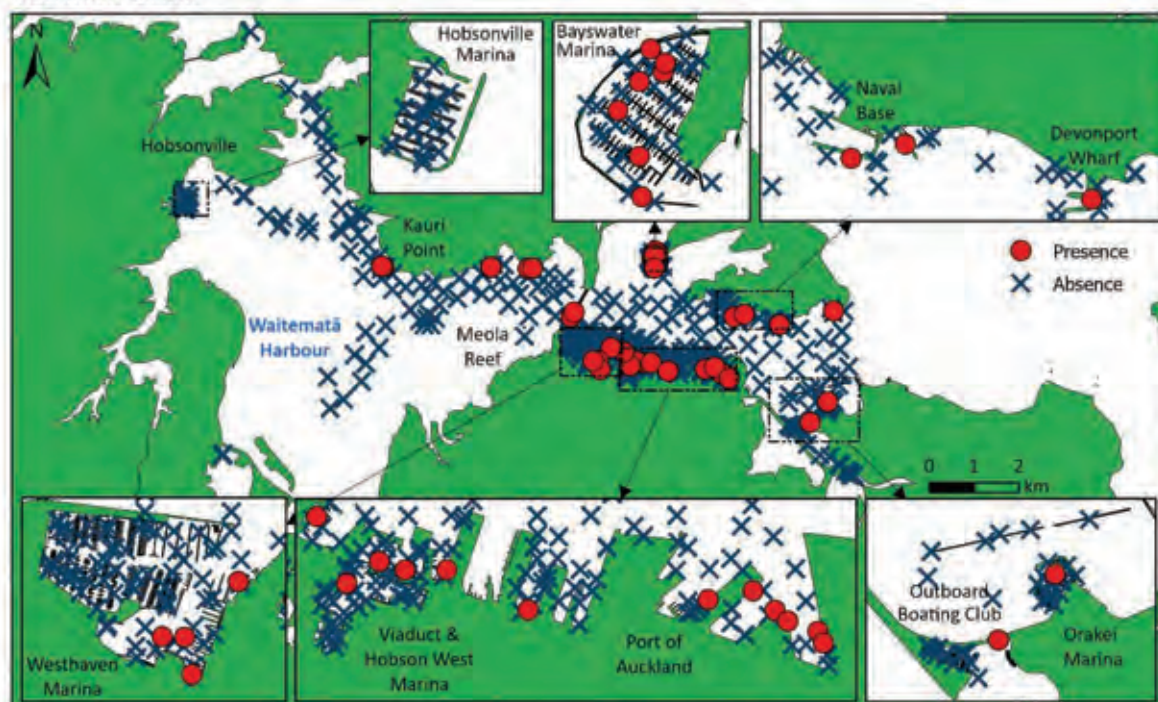
Clavelina lepadiformis



Waitematā Harbour

Winter 2023

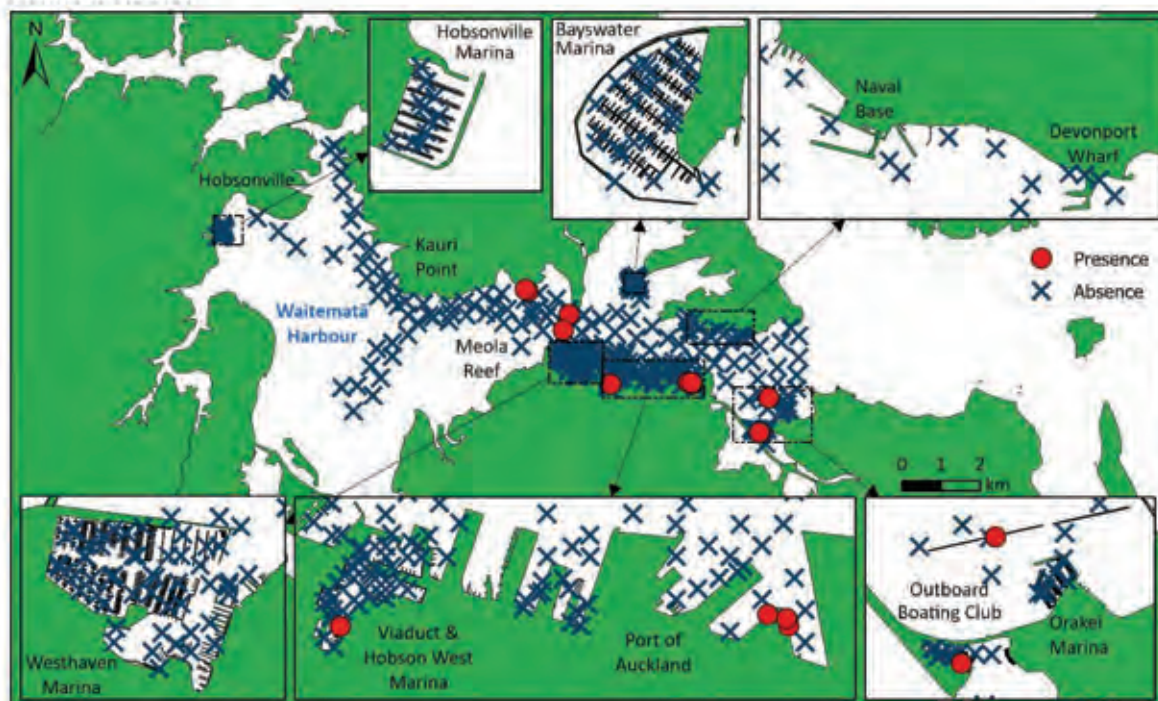
Didemnum vexillum



Waitematā Harbour

Summer 2023-24

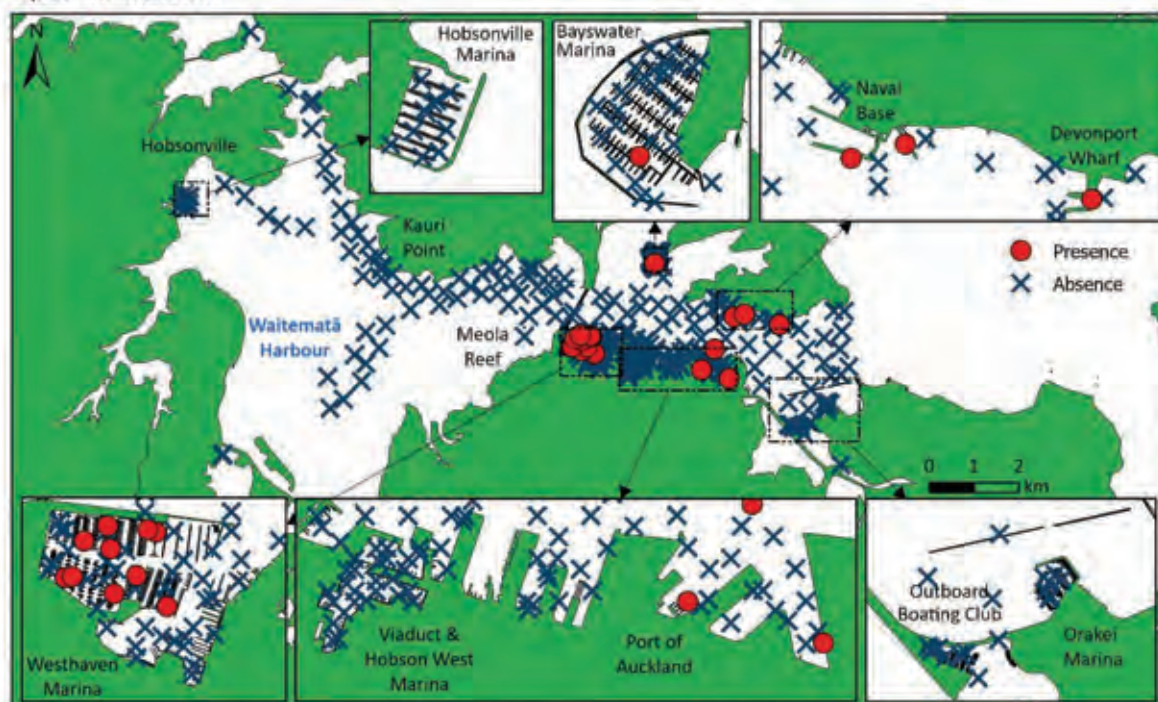
Didemnum vexillum



Waitematā Harbour

Winter 2023

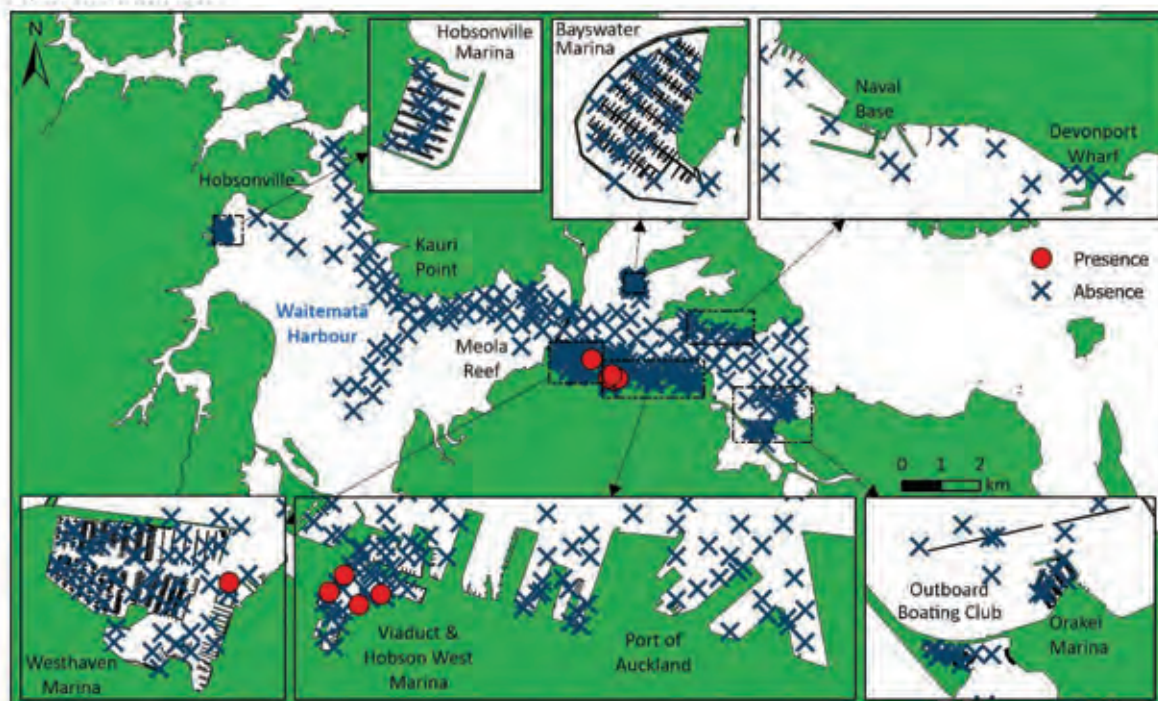
Diplosoma listerianum



Waitematā Harbour

Summer 2023-24

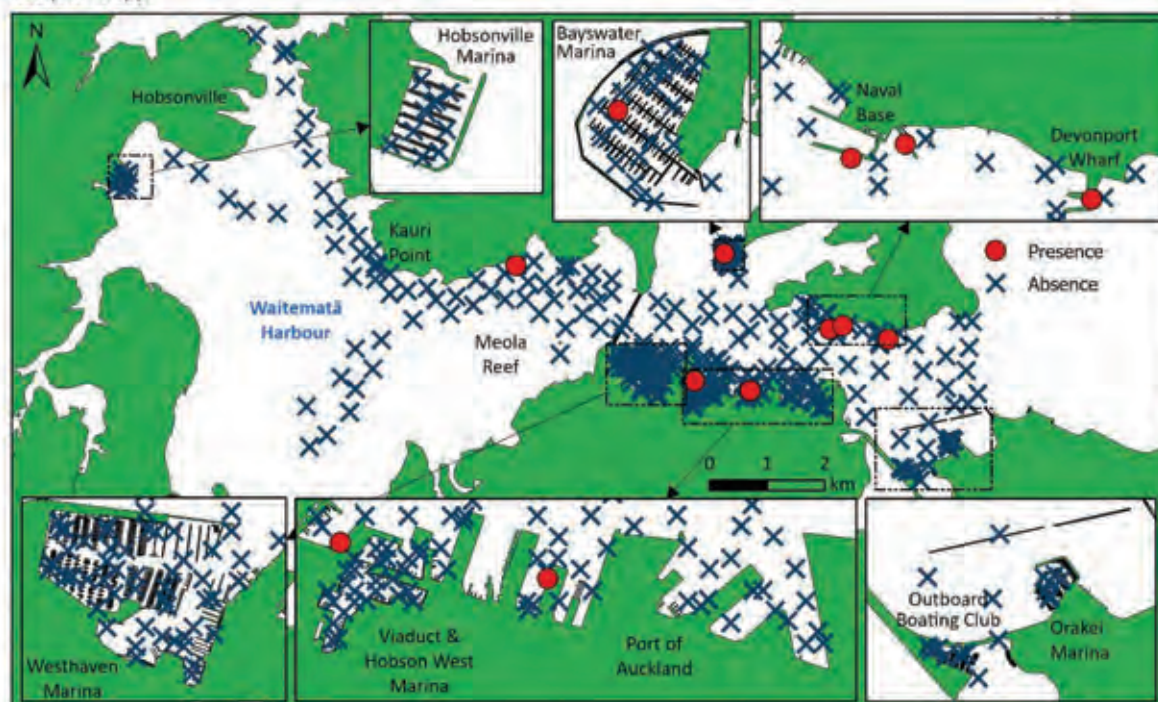
Diplosoma listerianum



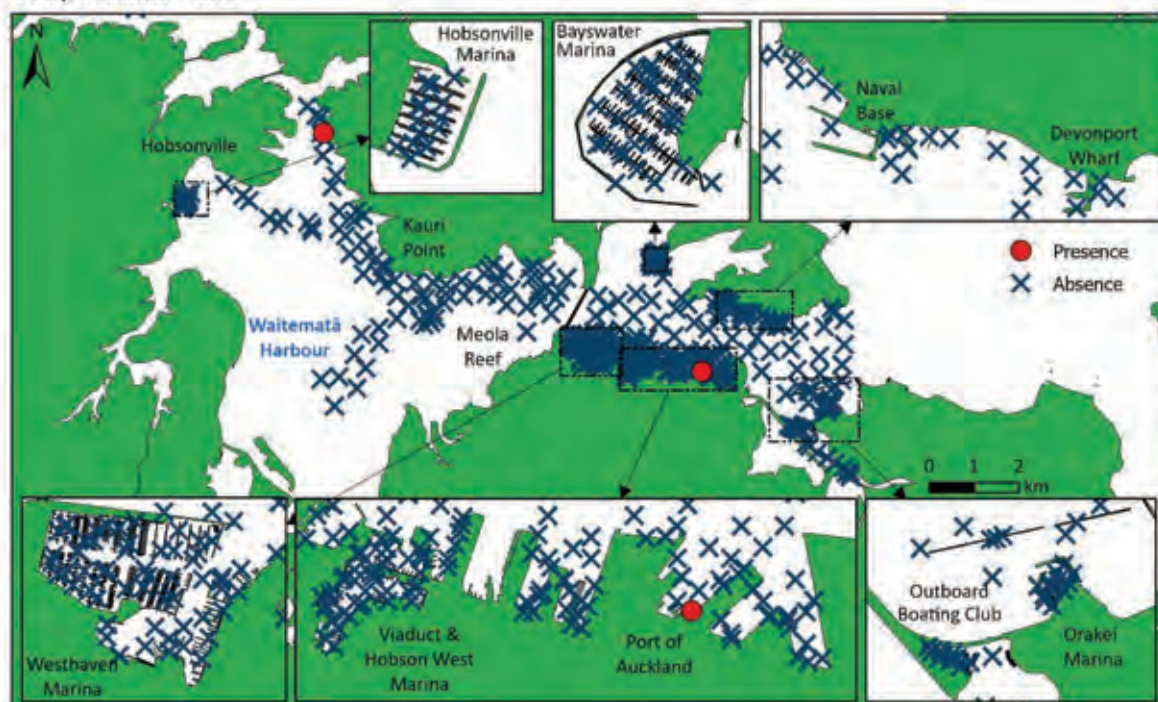
Waitematā Harbour

Winter 2023

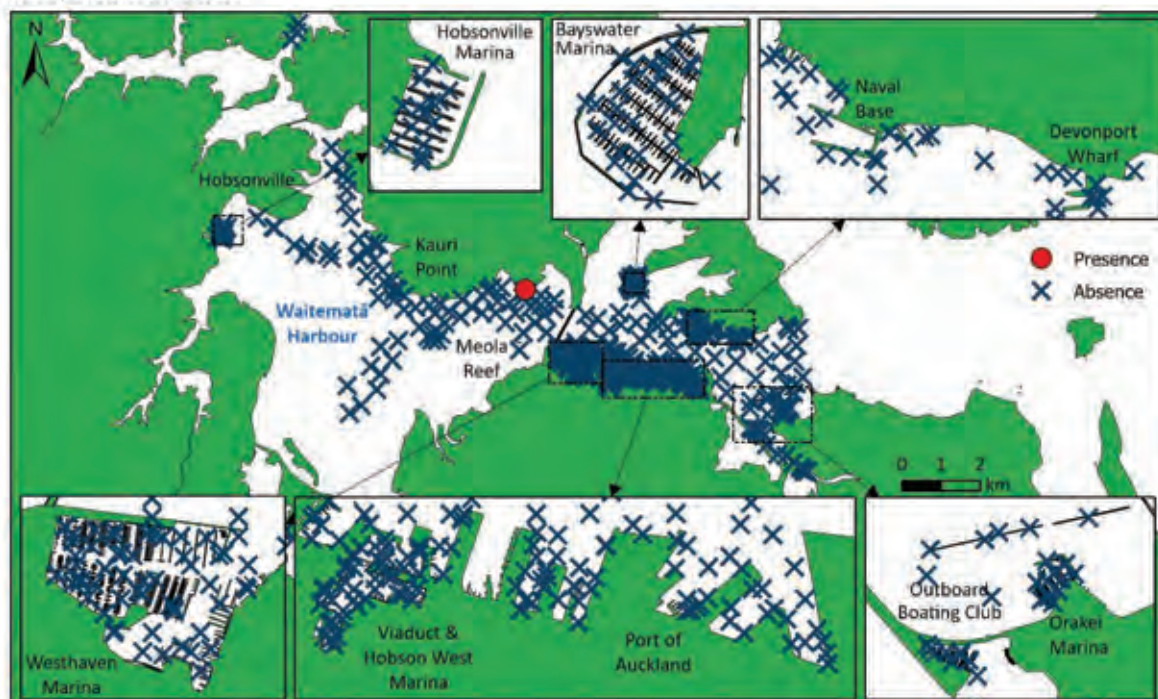
Ectopleura spp.



Waitematā Harbour
 Winter 2023
Metopeneus bennettiae



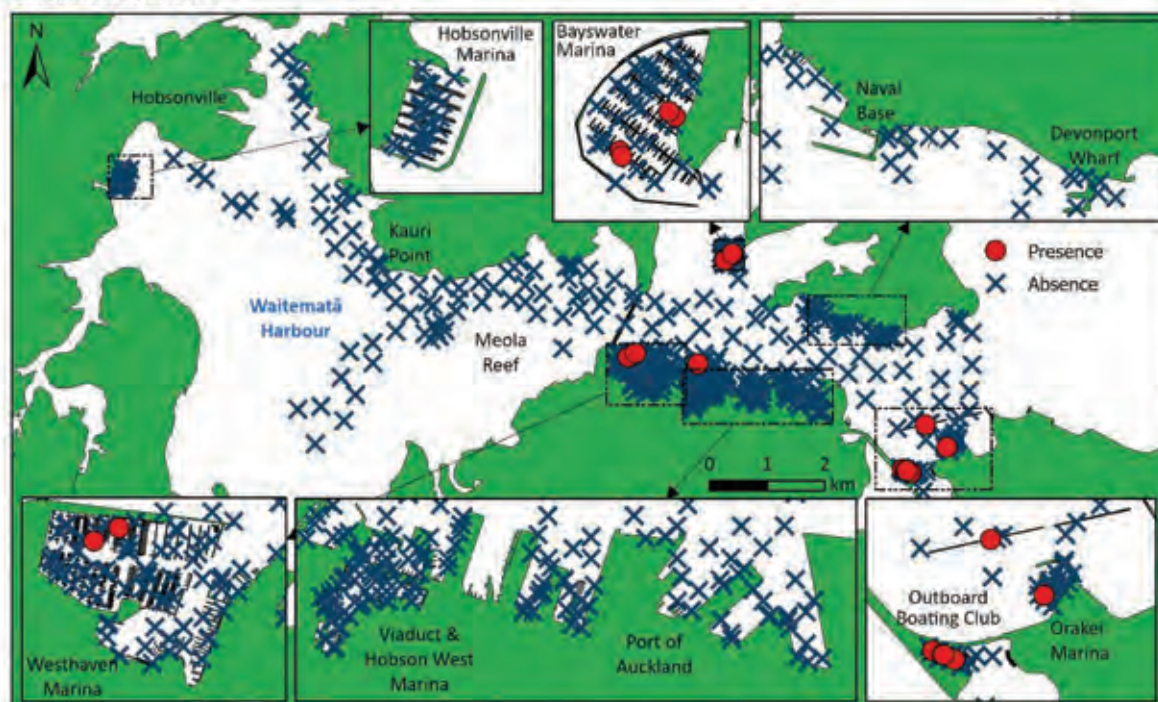
Waitematā Harbour
 Summer 2023-24
Metopeneus bennettiae



Waitematā Harbour

Summer 2023-24

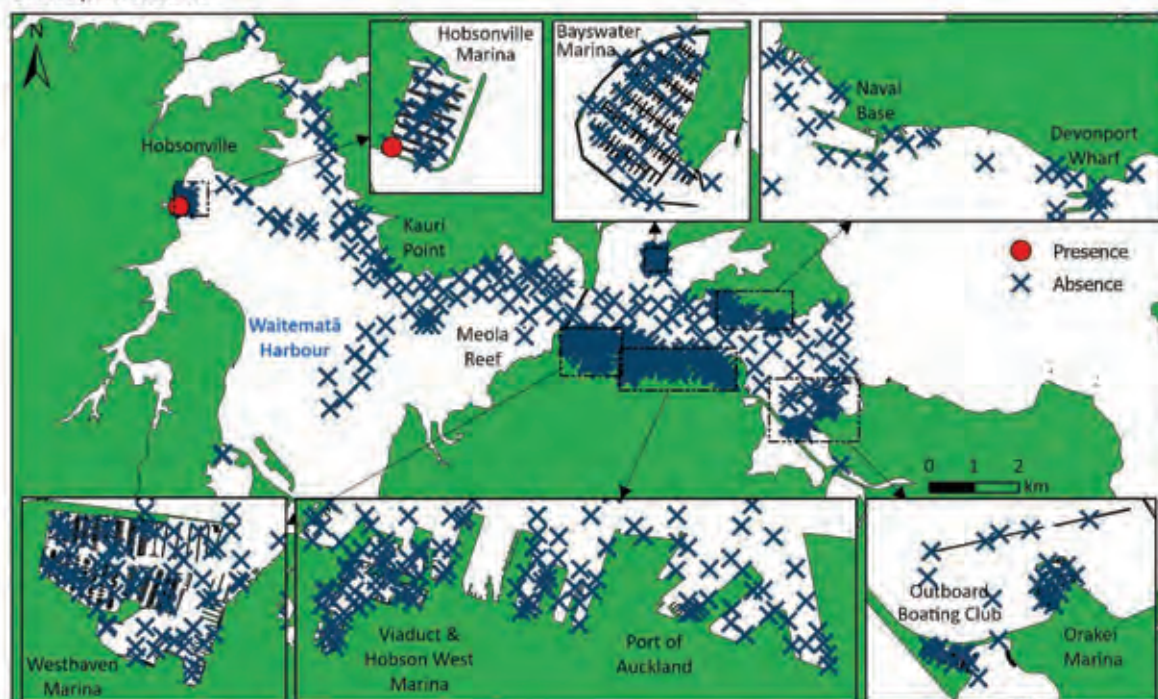
Omobranchus anolius



Waitematā Harbour

Winter 2023

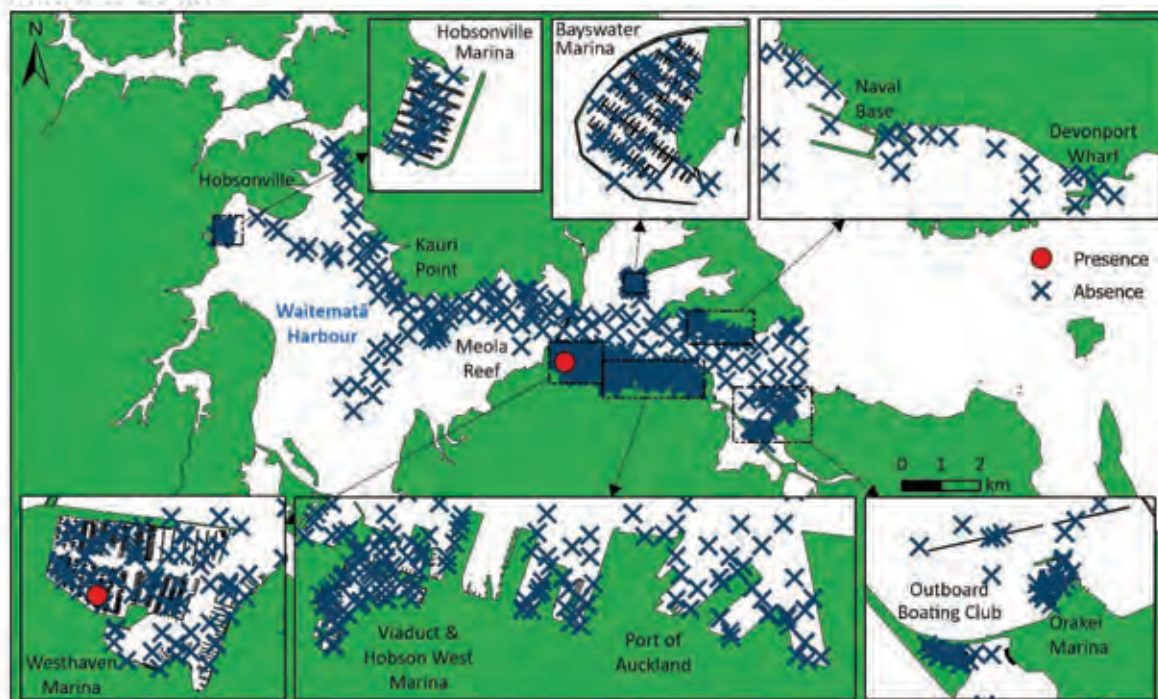
Oratosquilla oratoria



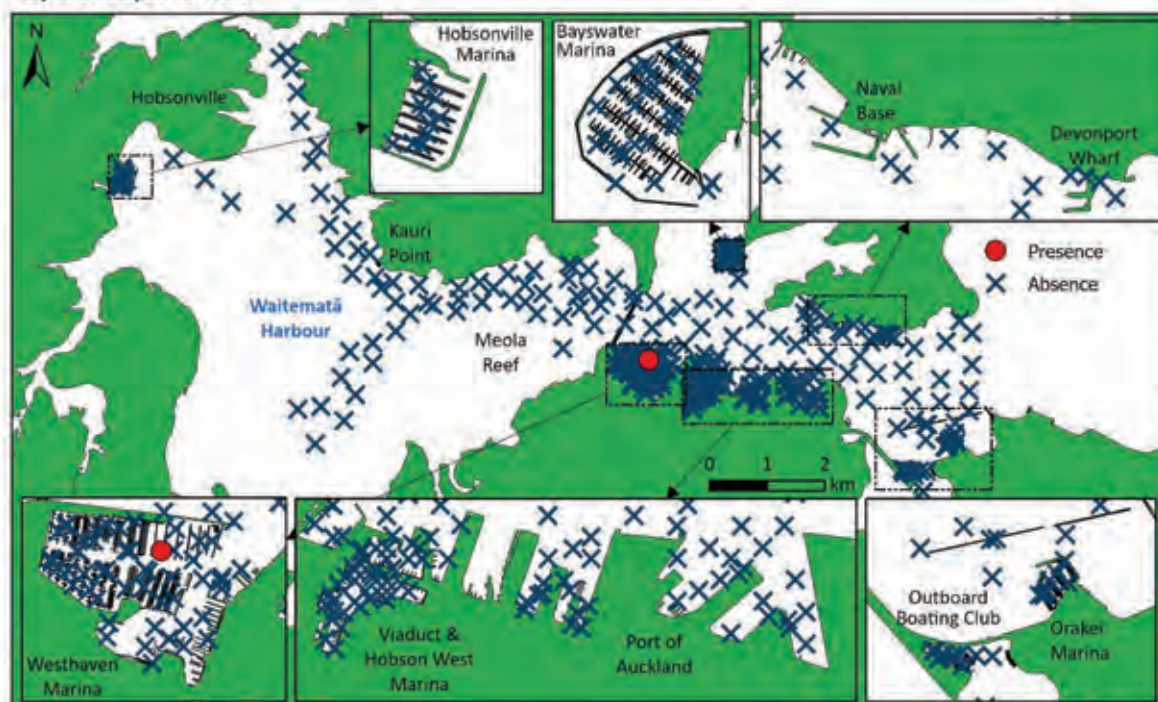
Waitematā Harbour

Summer 2023-24

Oratosquilla oratoria



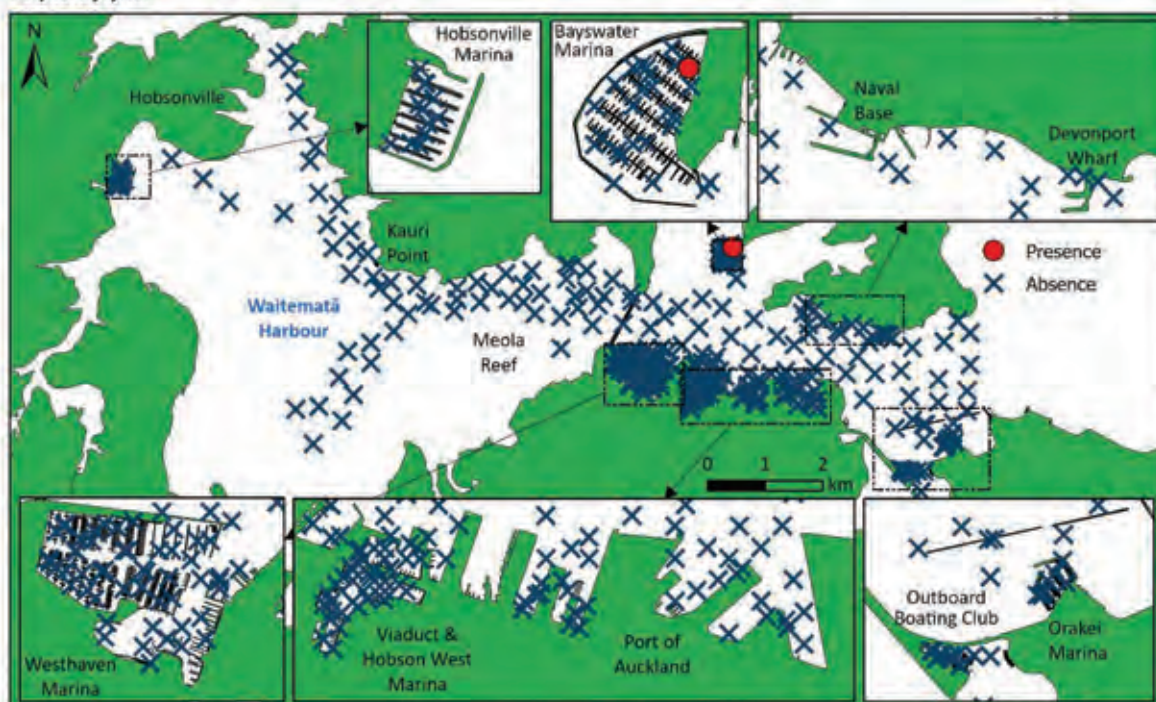
Waitematā Harbour
 Summer 2023-24
Polyandrocarpa zorritensis



Waitematā Harbour

Summer 2023-24

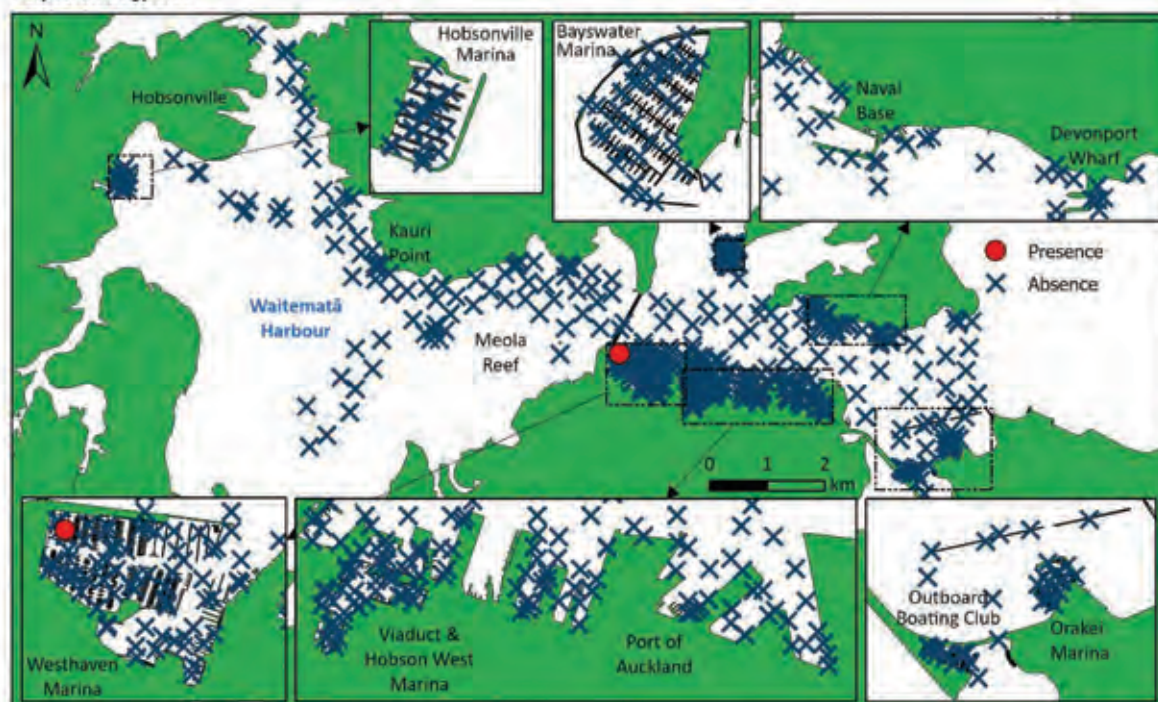
Polycera fujitai



Waitematā Harbour

Winter 2023

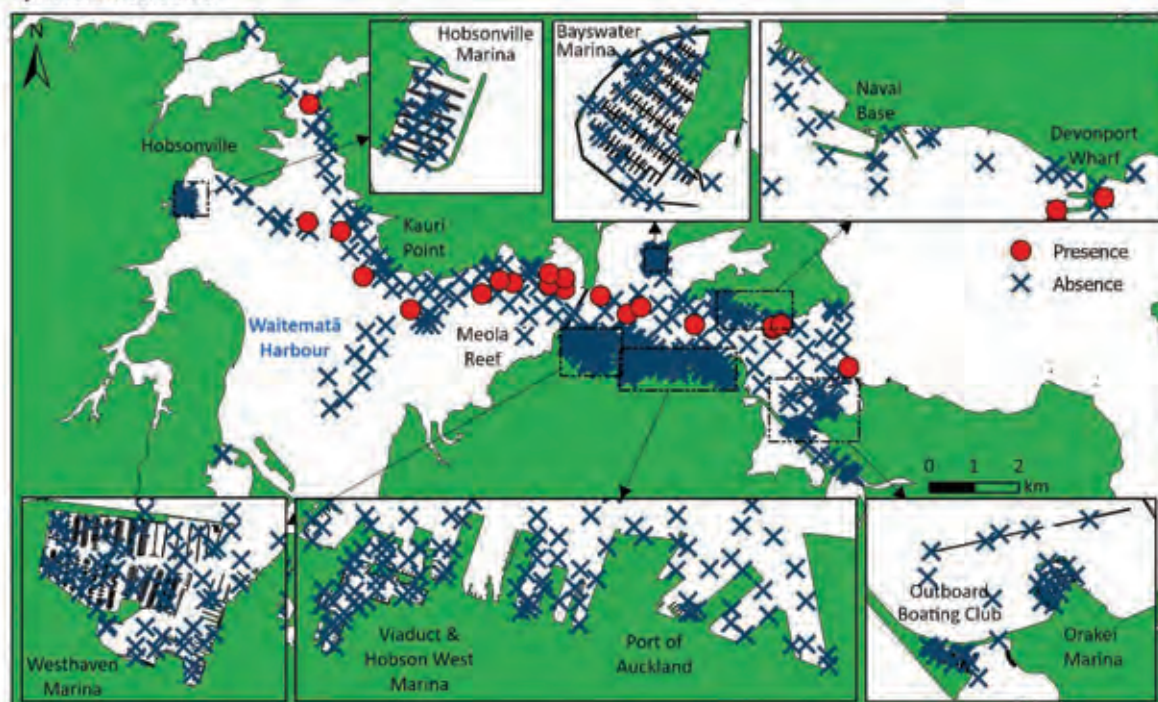
Polycera hedgpethi



Waitematā Harbour

Winter 2023

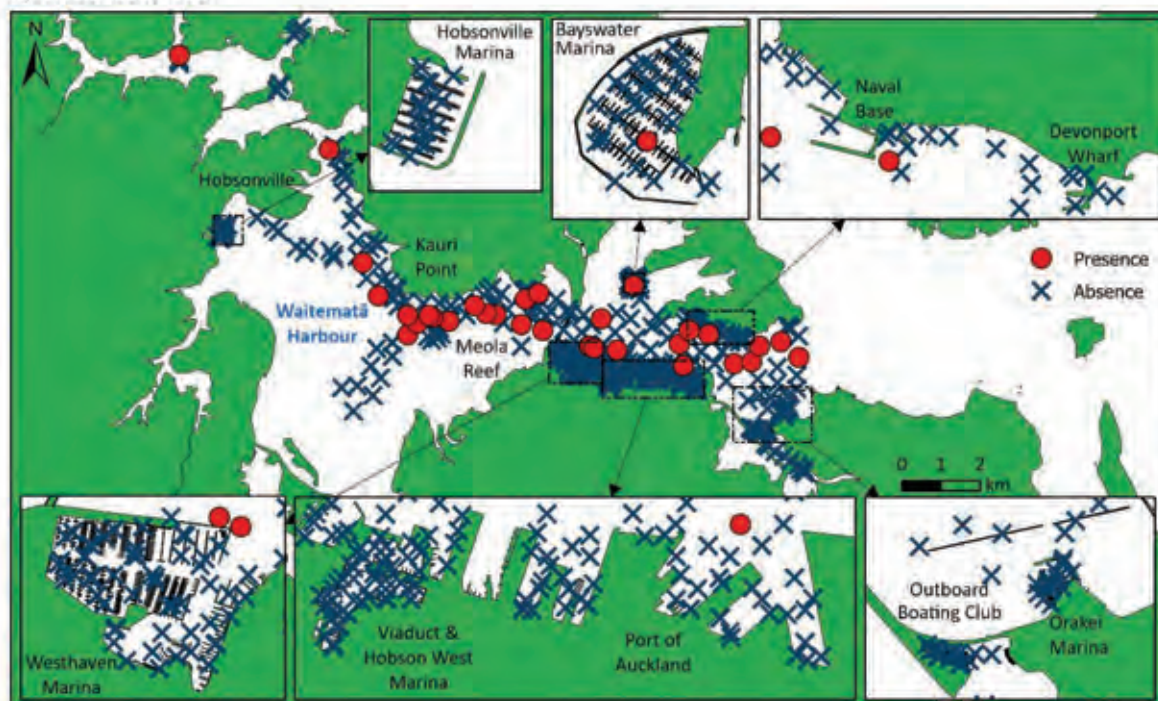
Pyromia tuberculata



Waitematā Harbour

Summer 2023-24

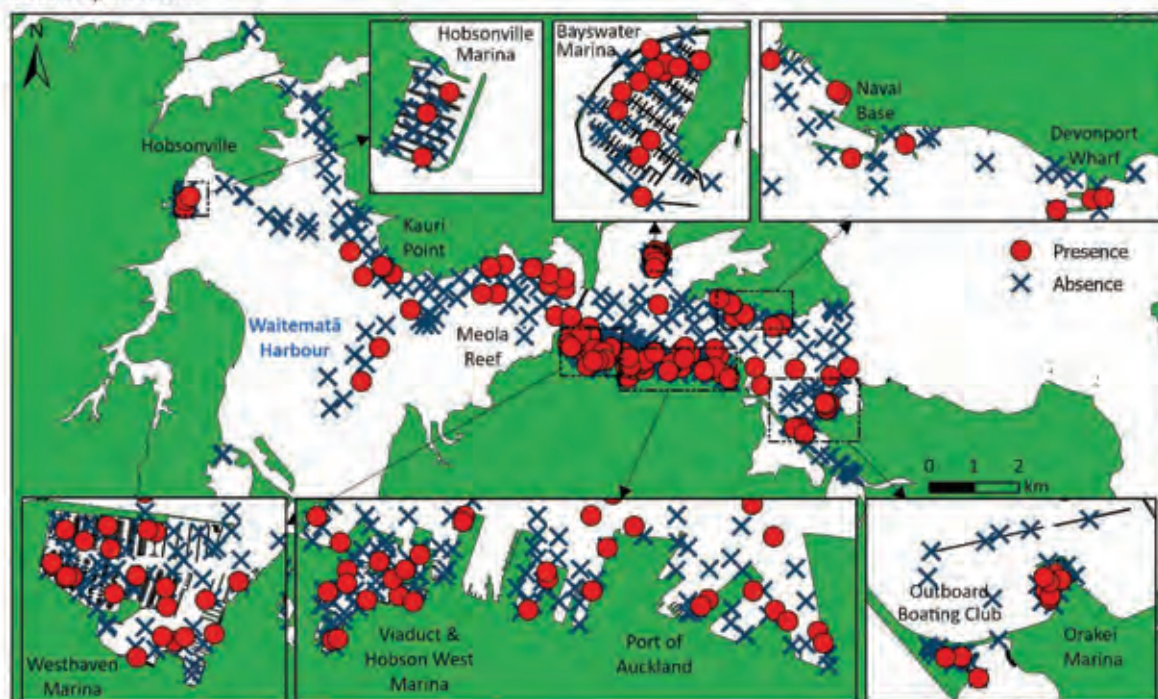
Pyromia tuberculata



Waitematā Harbour

Winter 2023

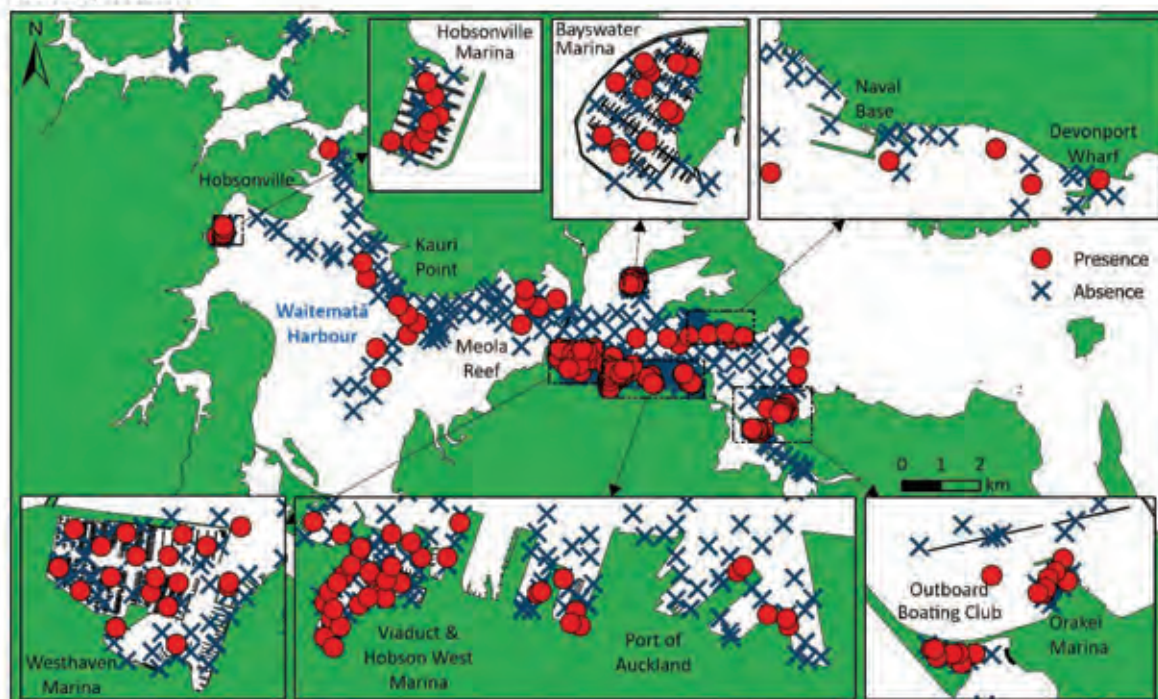
Sabella spallanzanii



Waitematā Harbour

Summer 2023-24

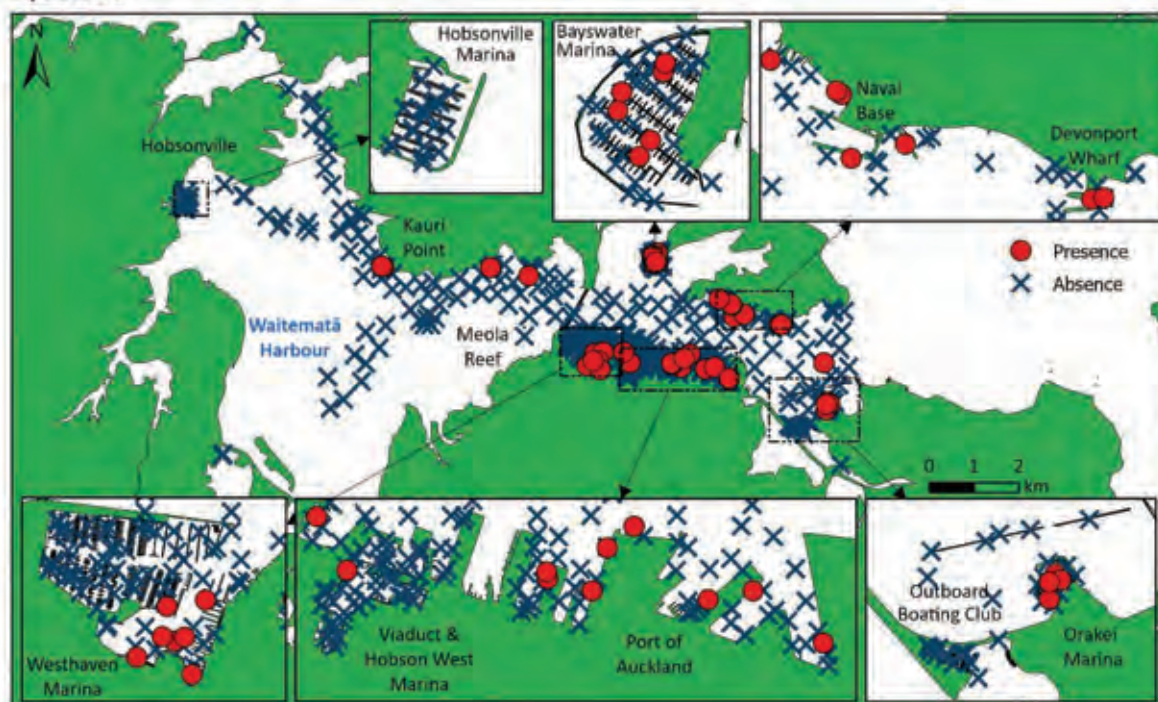
Sabella spallanzanii



Waitematā Harbour

Winter 2023

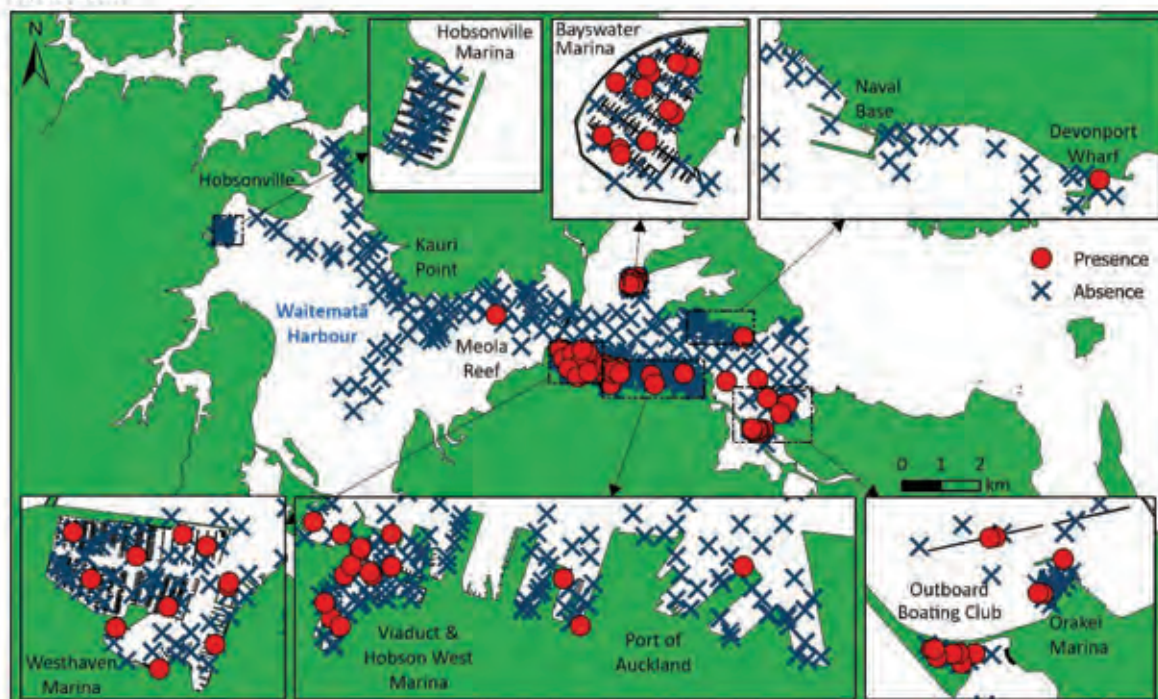
Styela clava



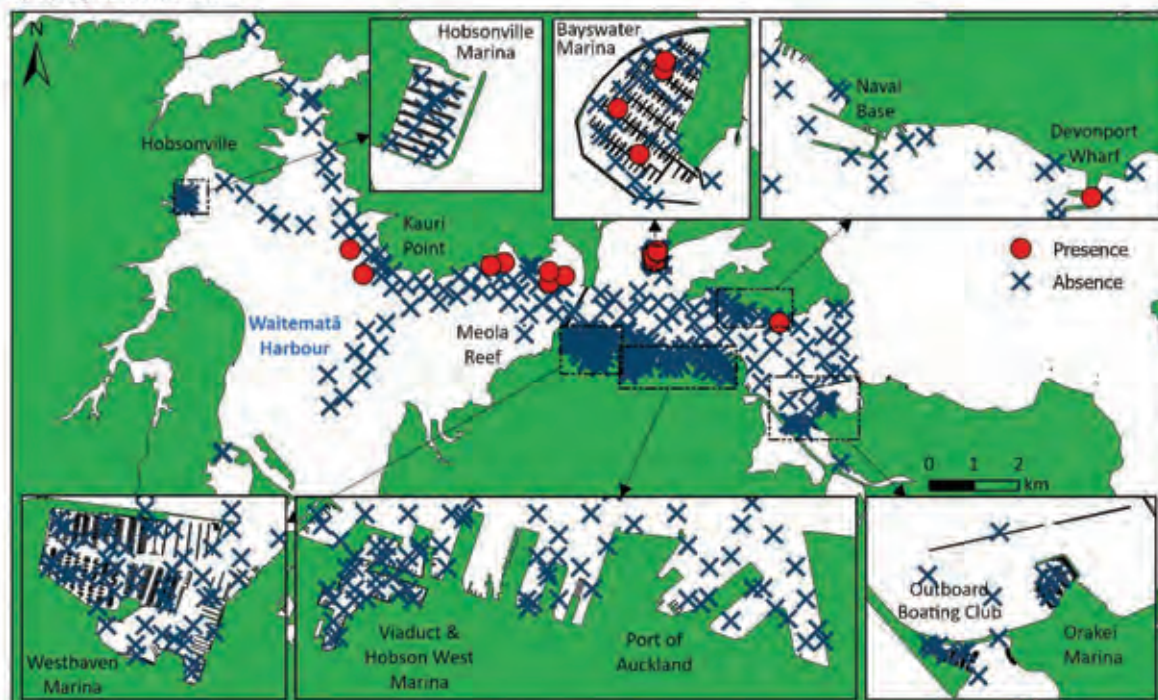
Waitematā Harbour

Summer 2023-24

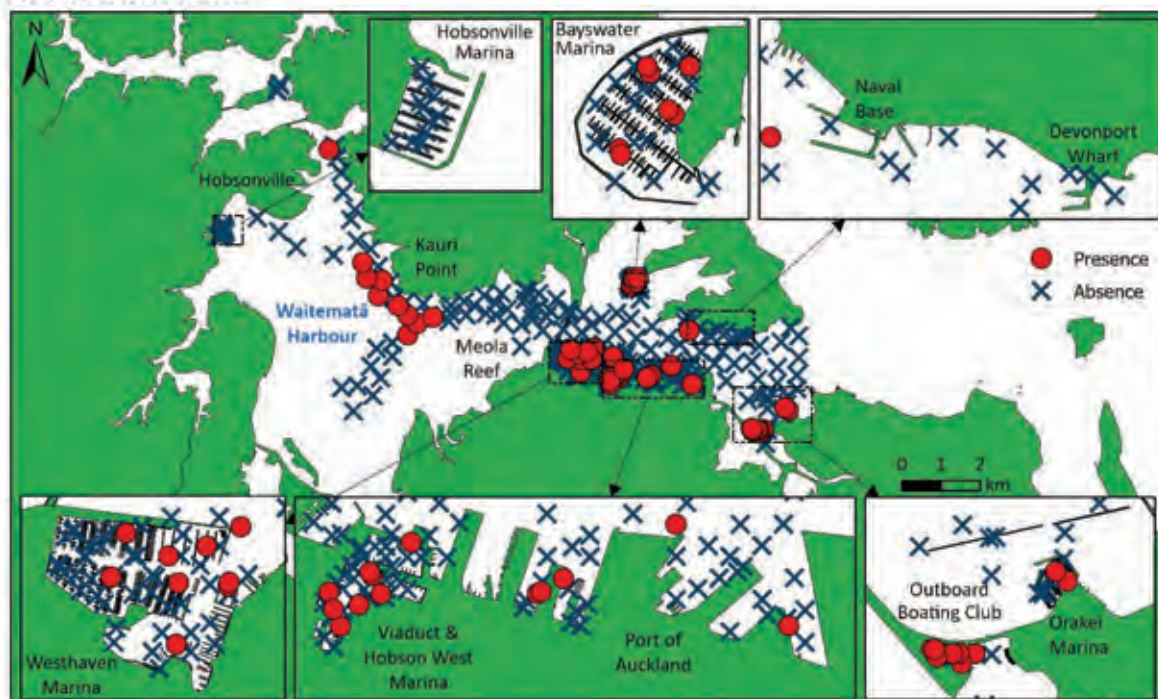
Styela clava



Waitematā Harbour
 Winter 2023
Symplegma brakenhielmi



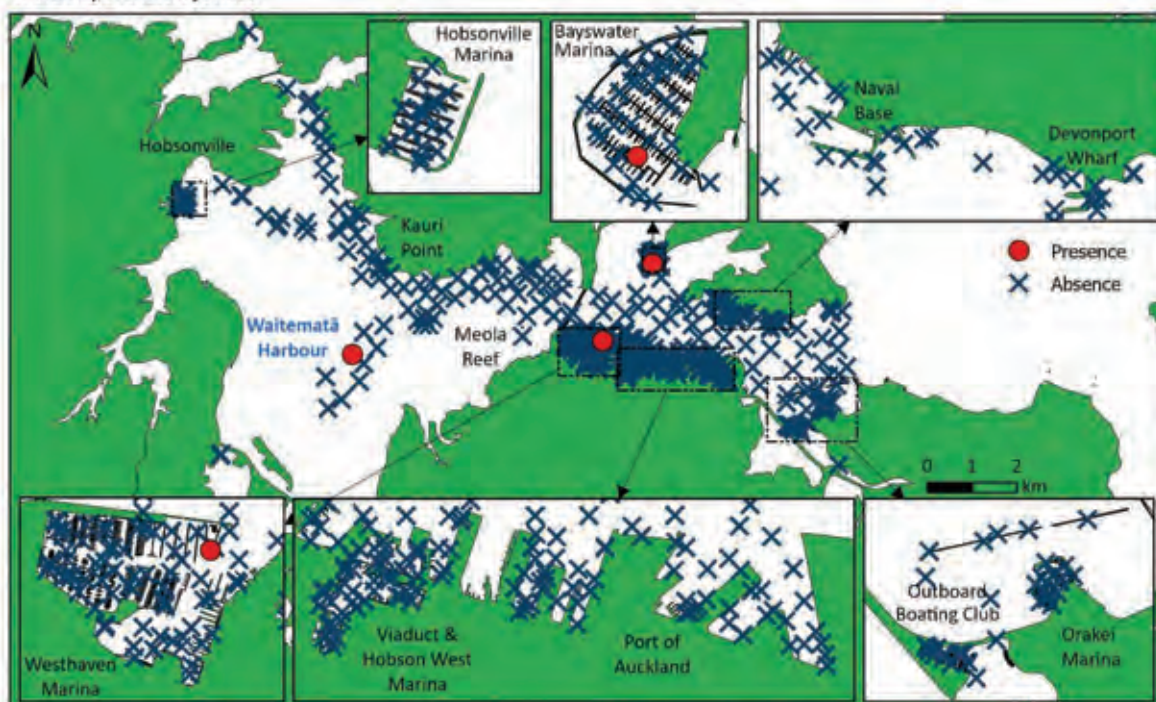
Waitematā Harbour
 Summer 2023-24
Symplegma brakenhielmi



Waitematā Harbour

Winter 2023

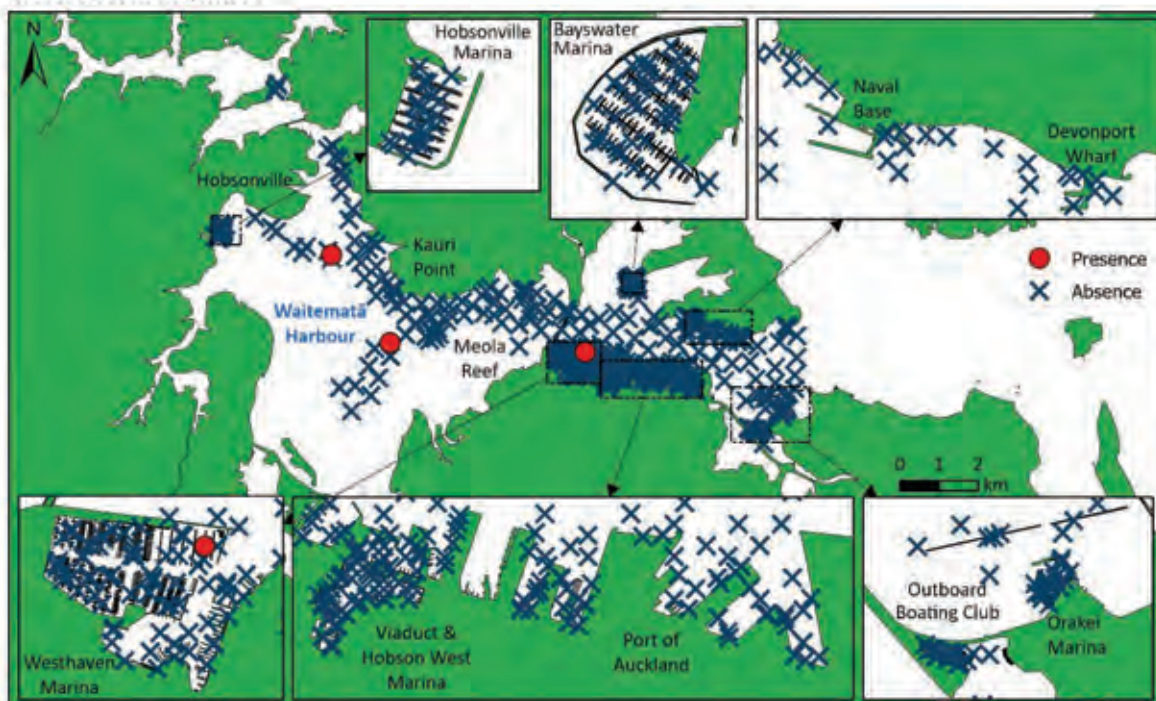
Thalamoporella californica



Waitematā Harbour

Summer 2023-24

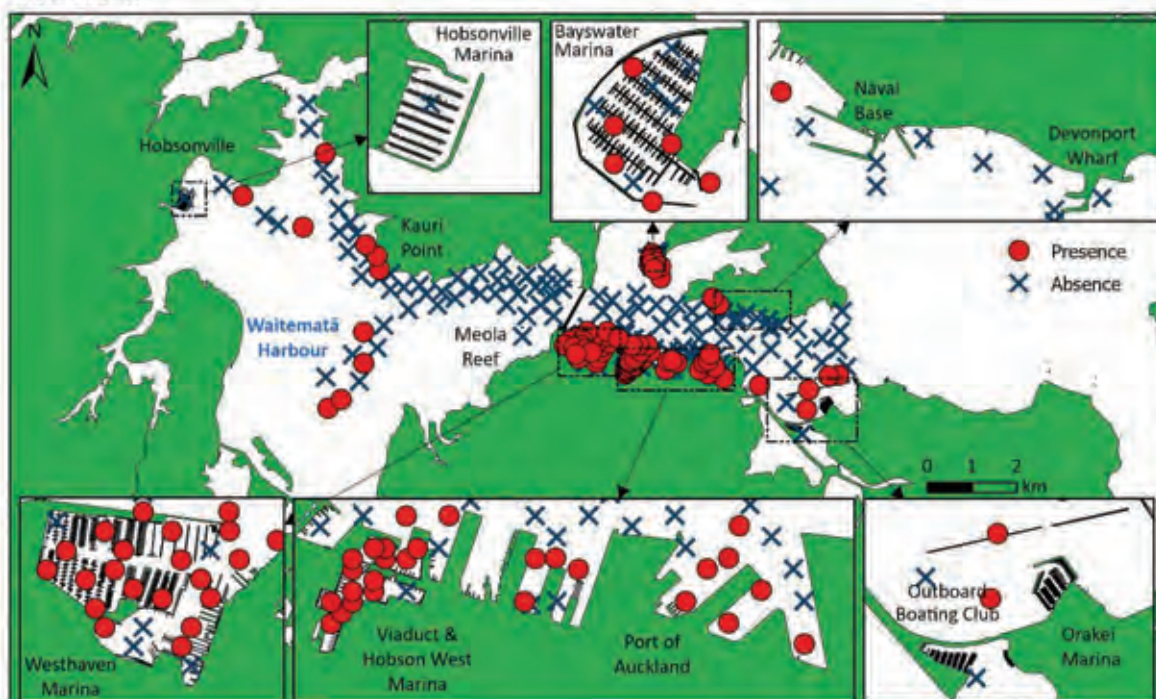
Thalamoporella californica



Waitematā Harbour

Winter 2023

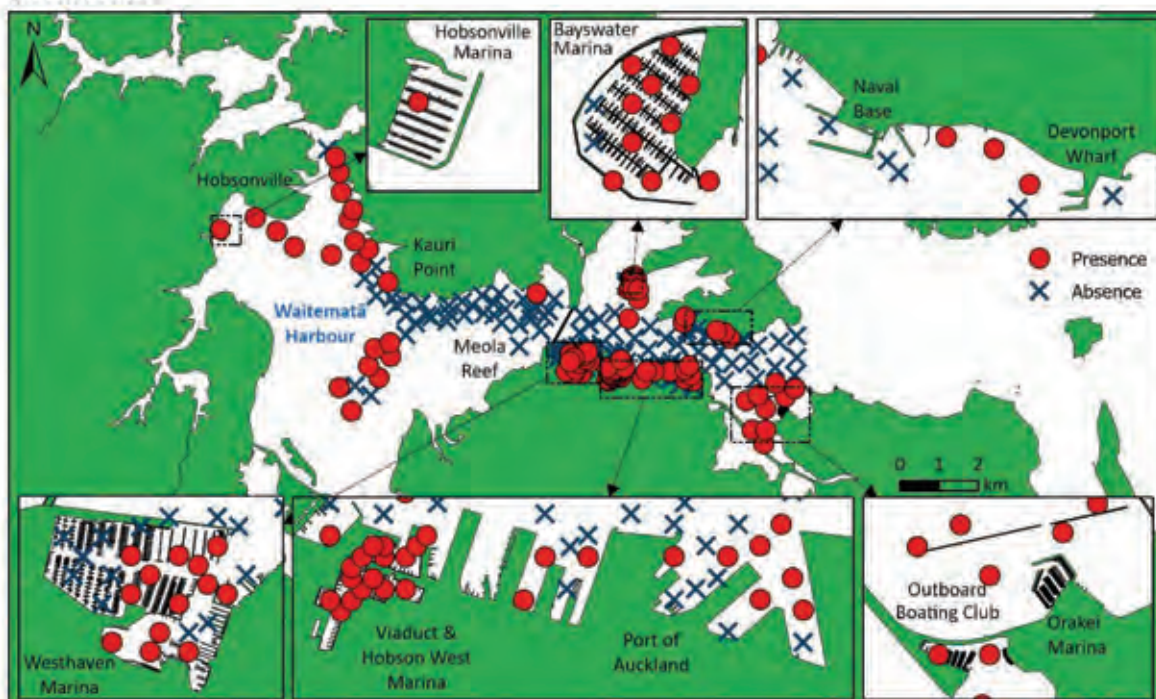
Theora lubrica



Waitematā Harbour

Summer 2023-24

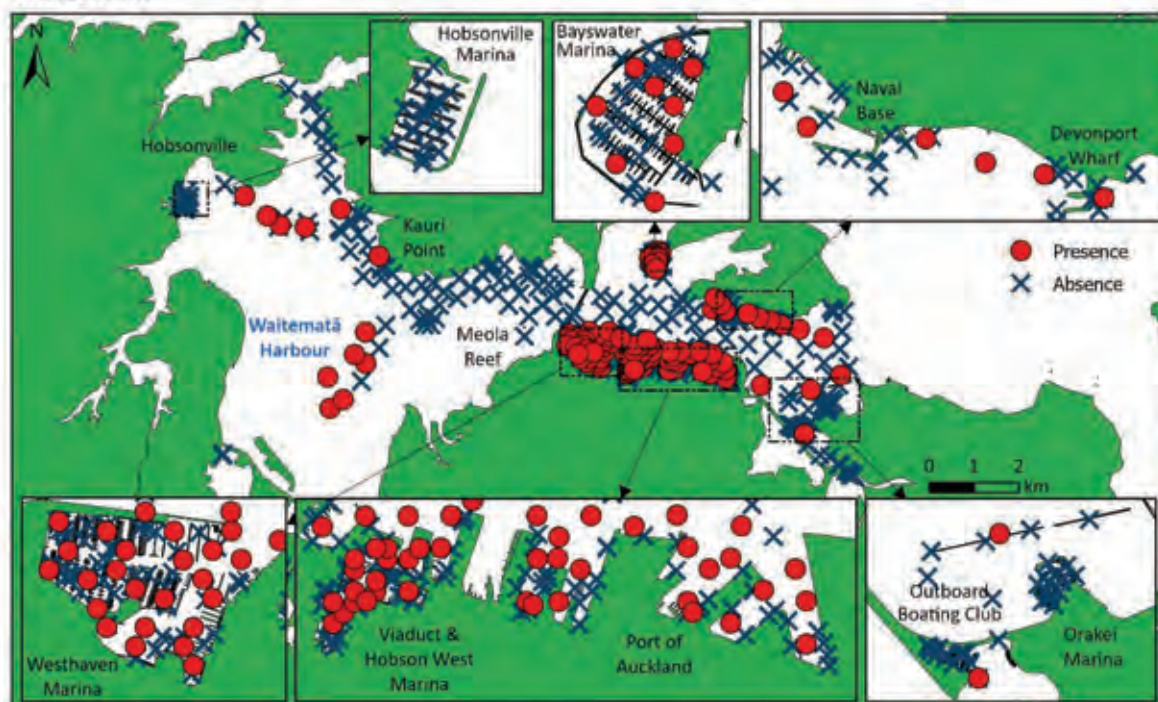
Theora lubrica



Waitematā Harbour

Winter 2023

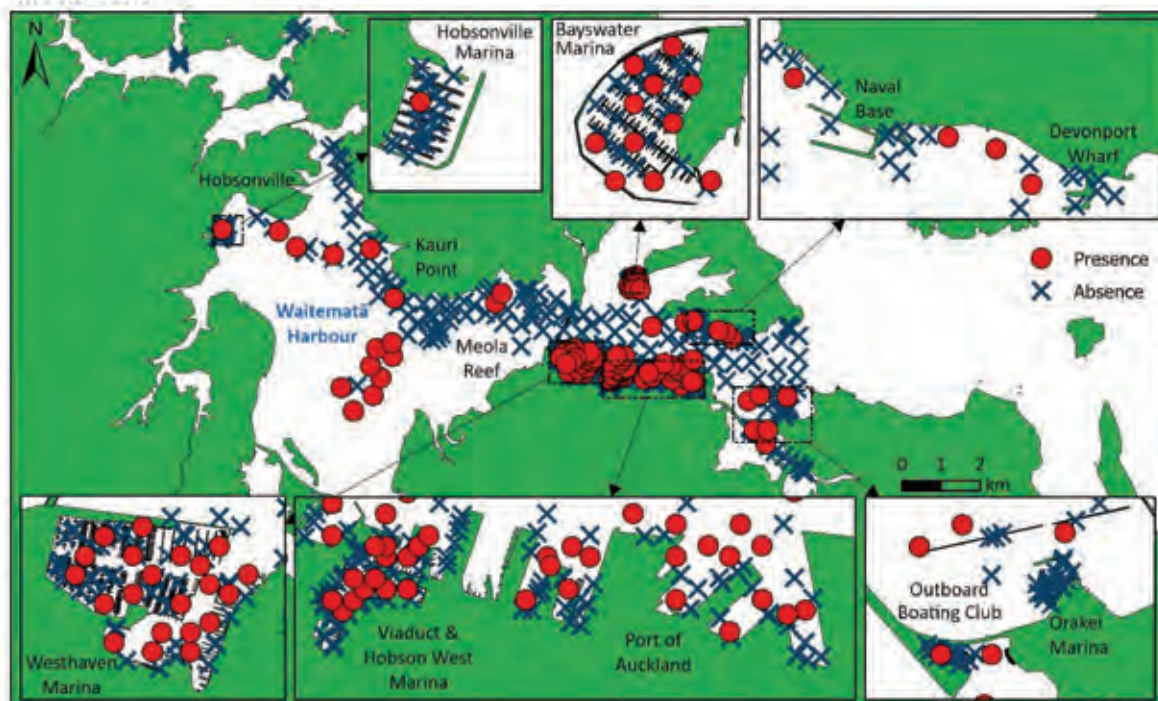
Tritia burchari



Waitematā Harbour

Summer 2023-24

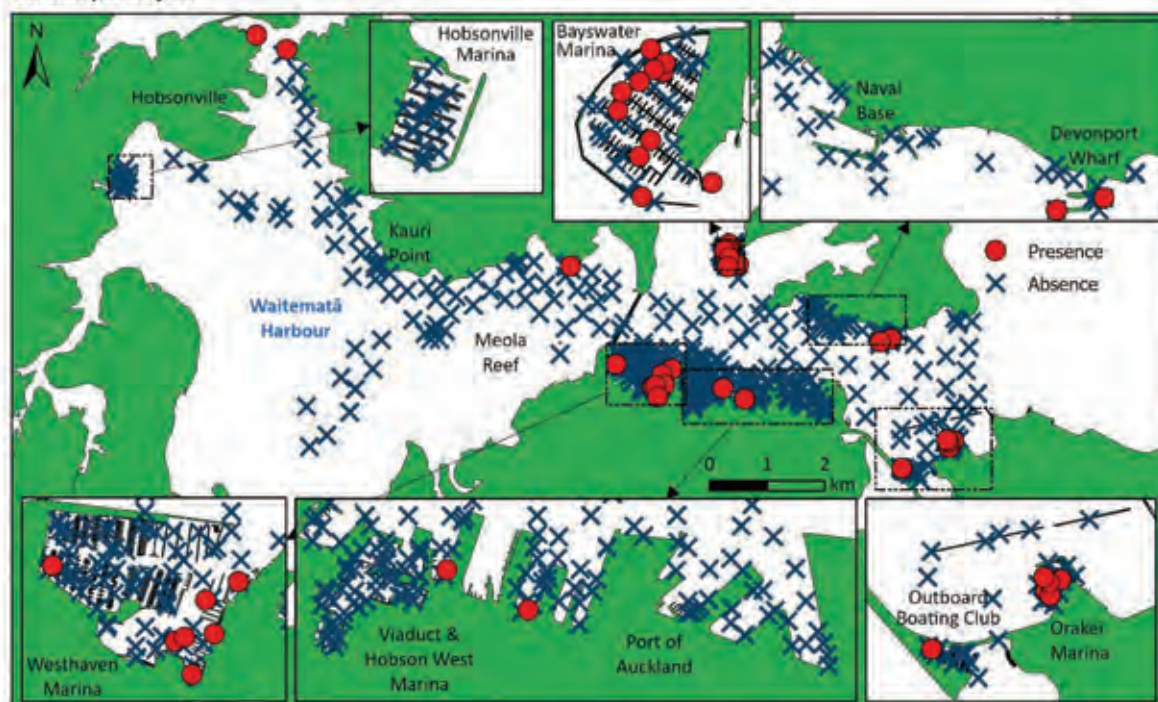
Tritia burchari



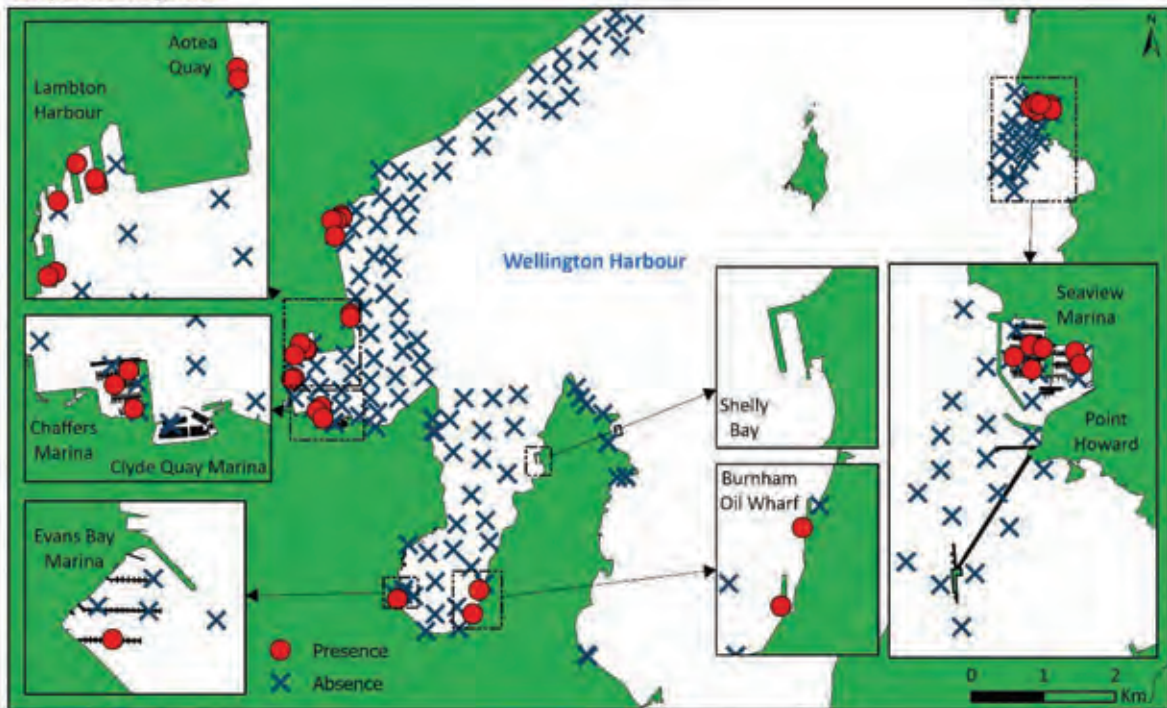
Waitematā Harbour

Winter 2023

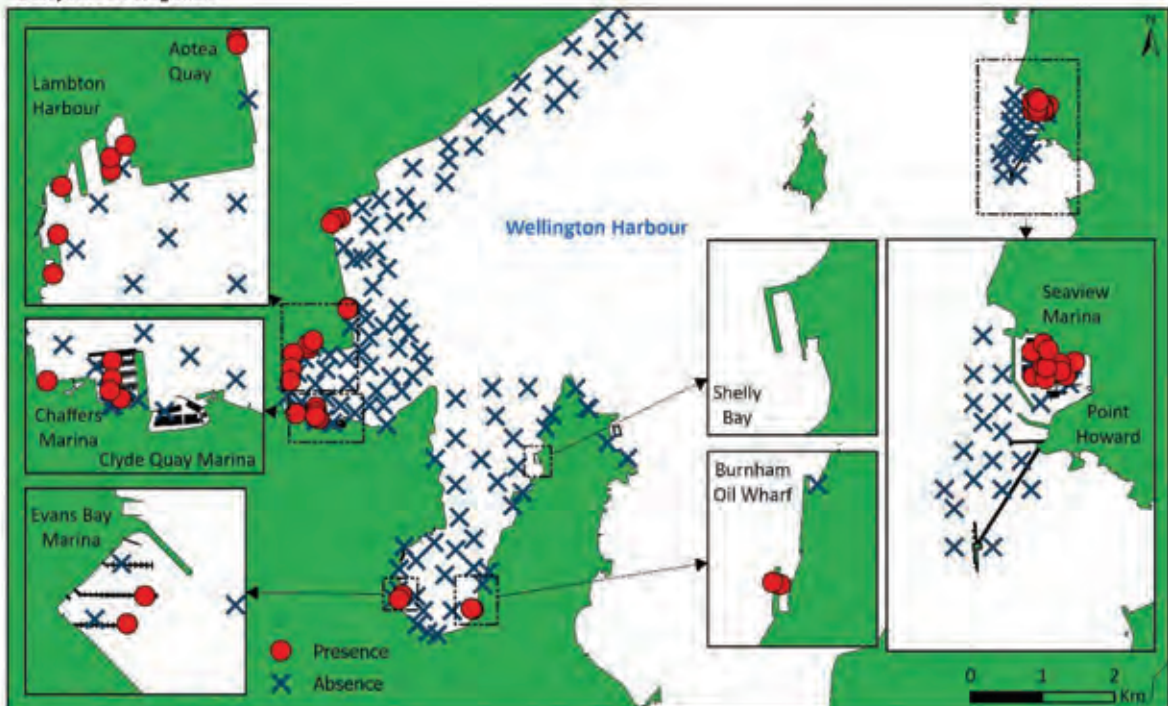
Undaria pinnatifida



Wellington Harbour
 Winter 2023
Botrylloides diegensis



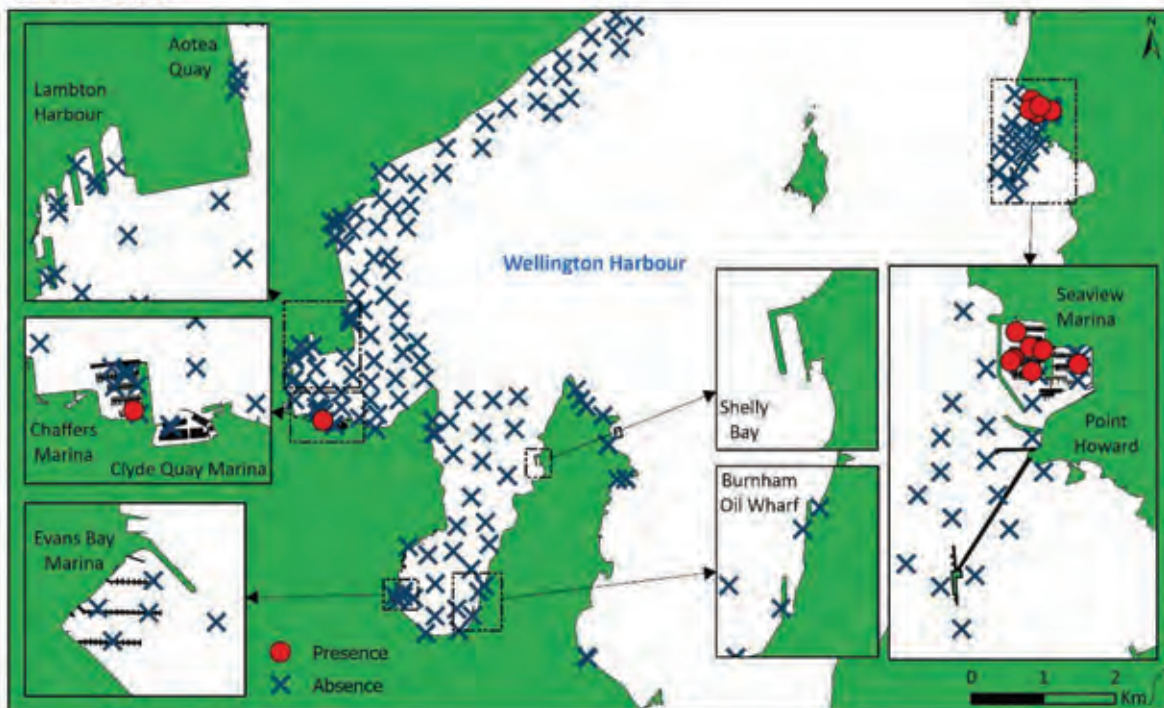
Wellington Harbour
 Summer 2023-24
Botrylloides diegensis



Wellington Harbour

Winter 2023

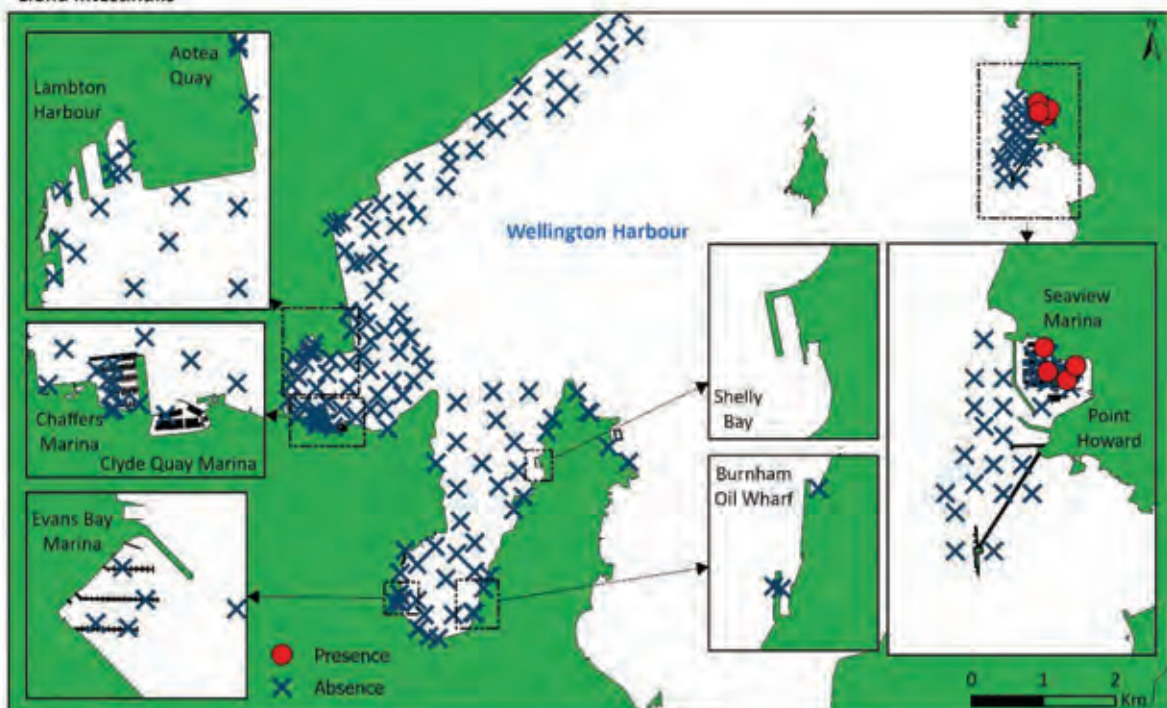
Ciona intestinalis



Wellington Harbour

Summer 2023-24

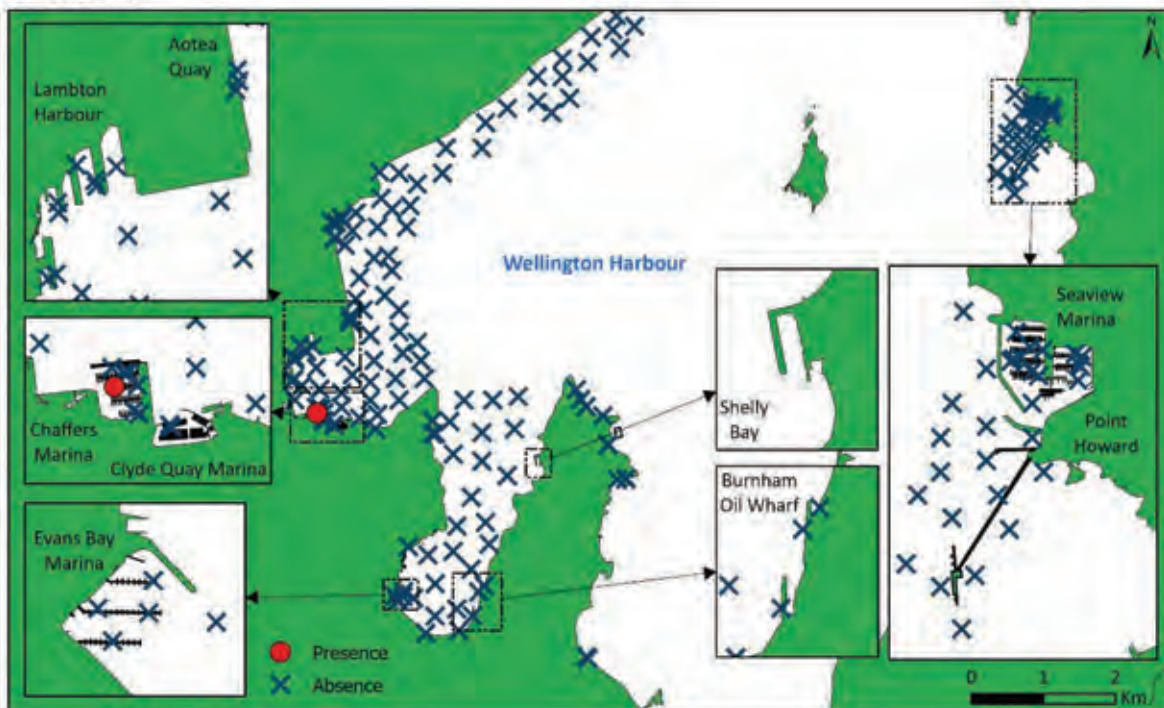
Ciona intestinalis



Wellington Harbour

Winter 2023

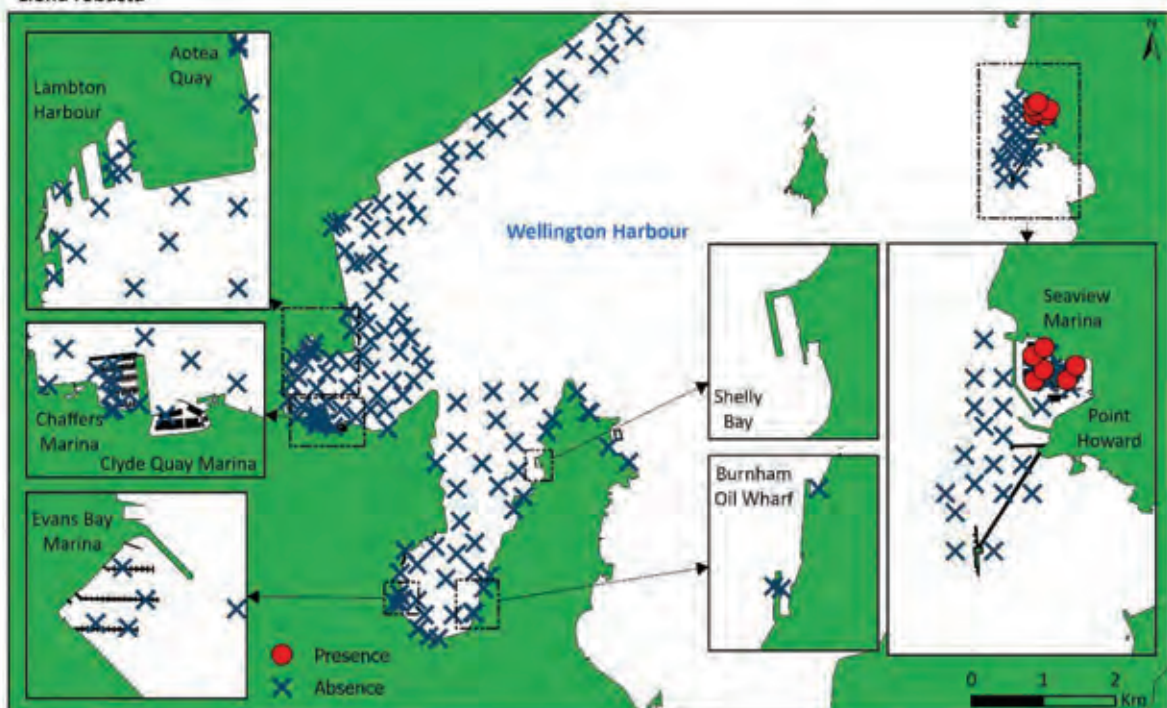
Ciona robusta



Wellington Harbour

Summer 2023-24

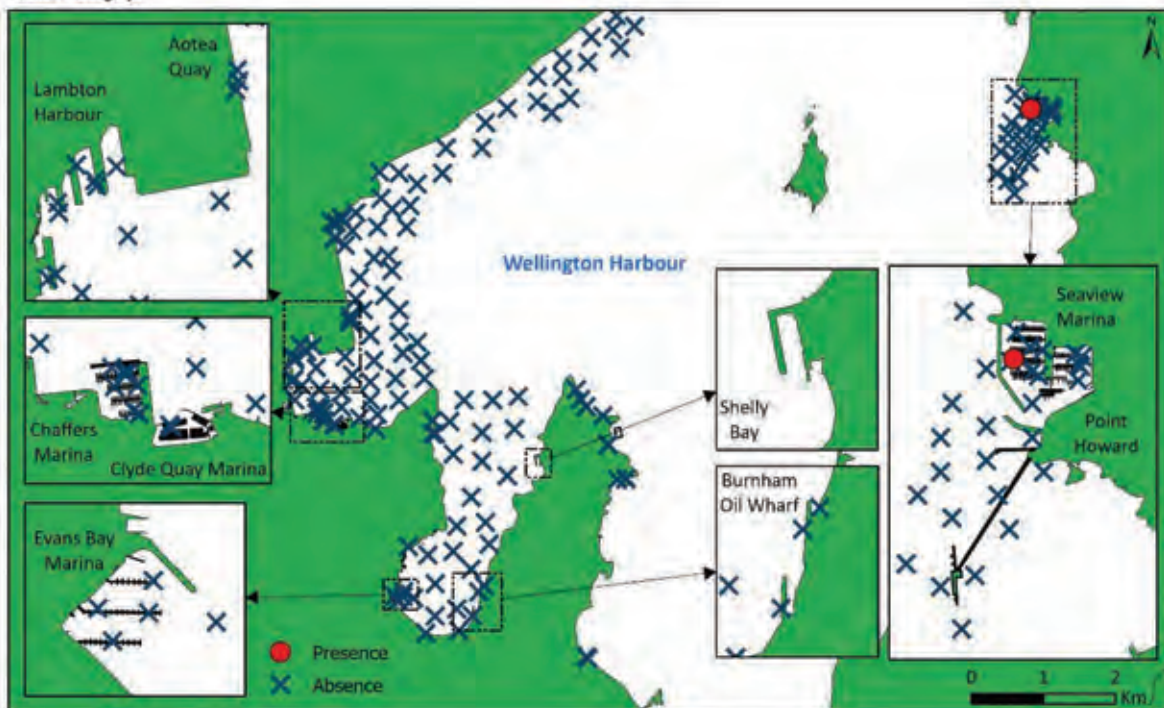
Ciona robusta



Wellington Harbour

Winter 2023

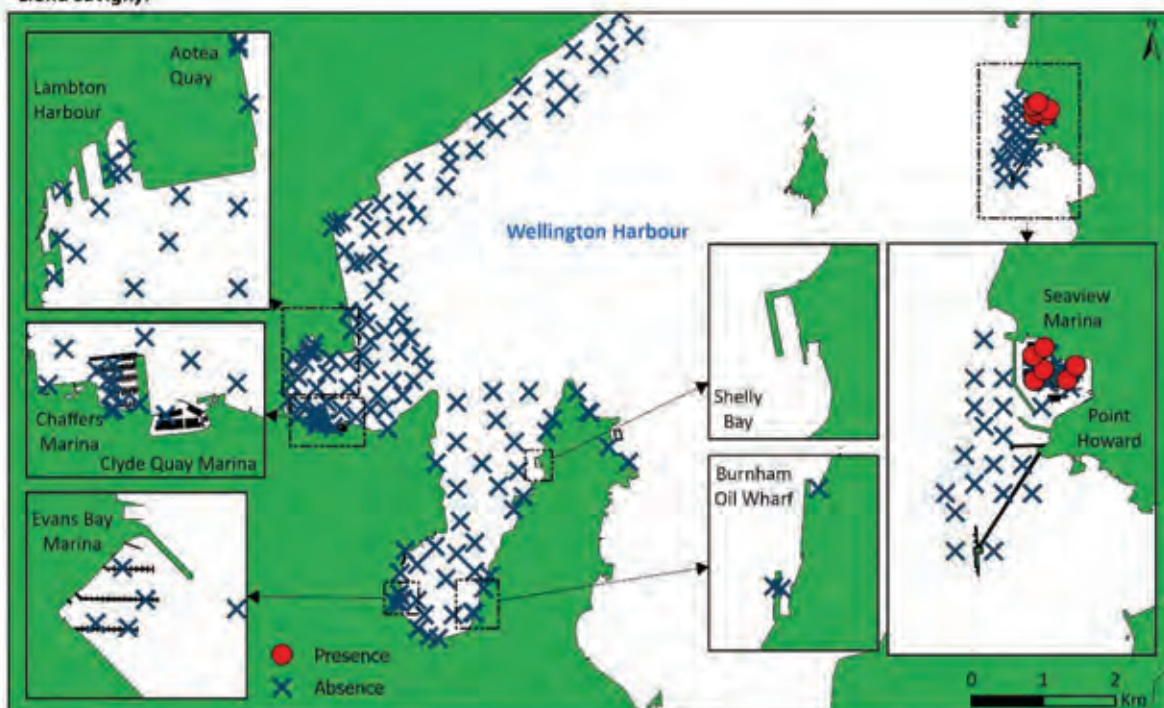
Ciona savignyi



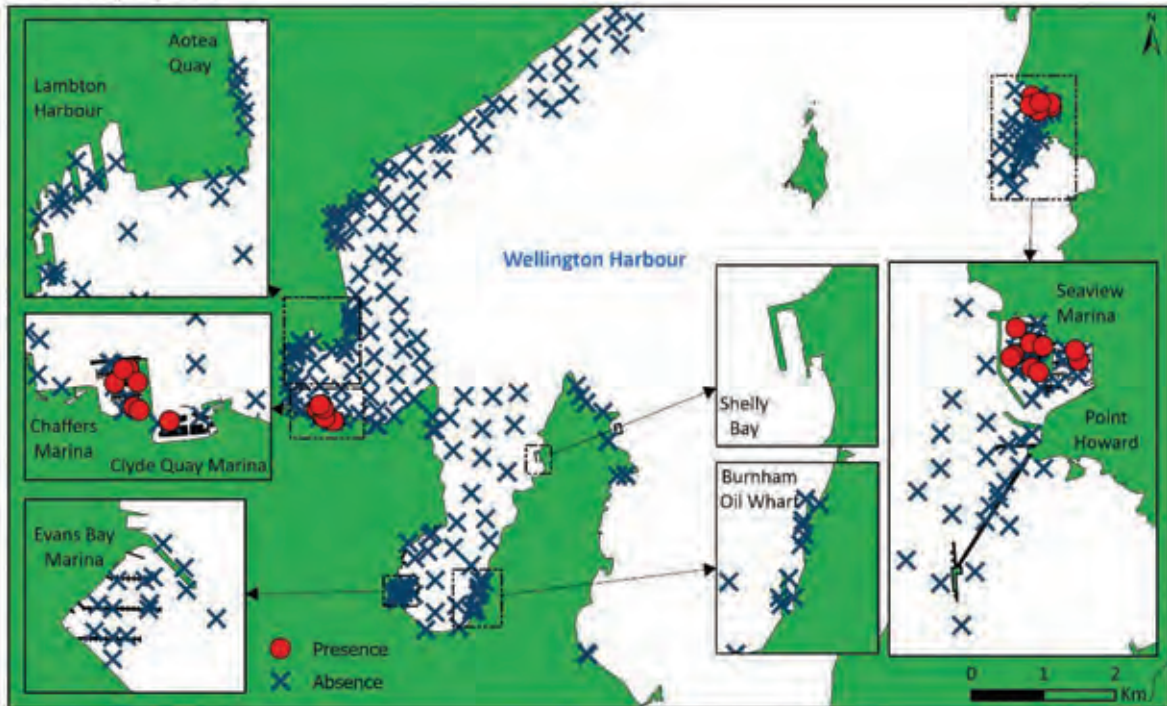
Wellington Harbour

Summer 2023-24

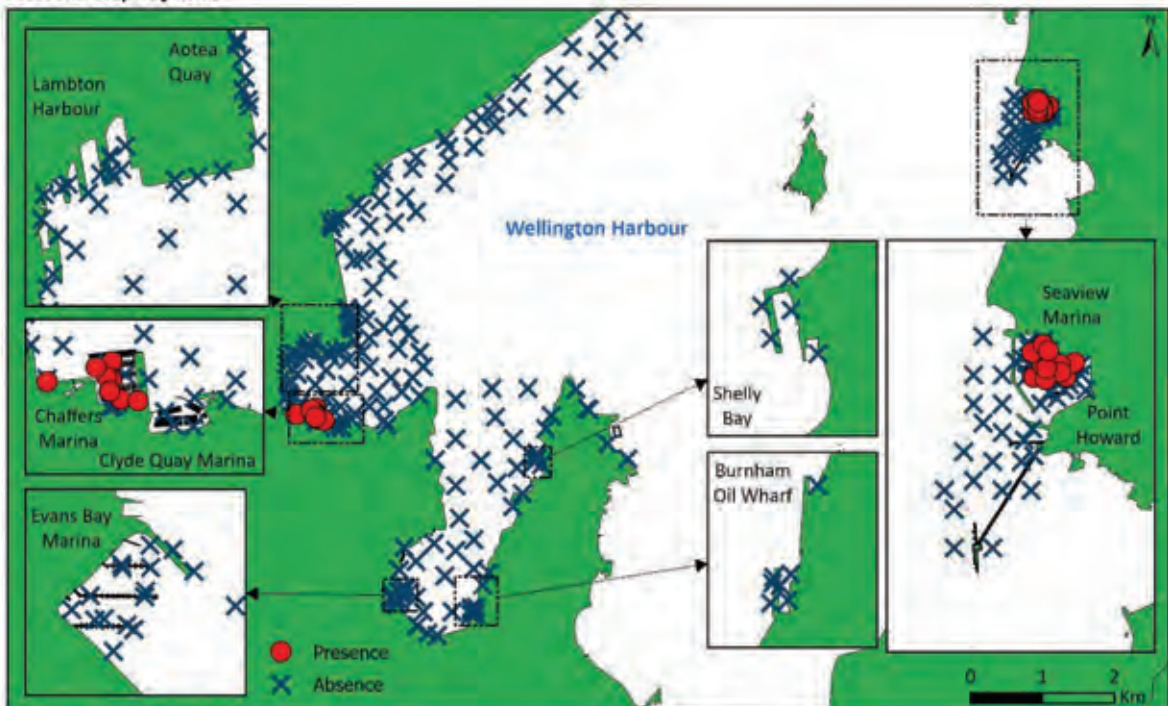
Ciona savignyi



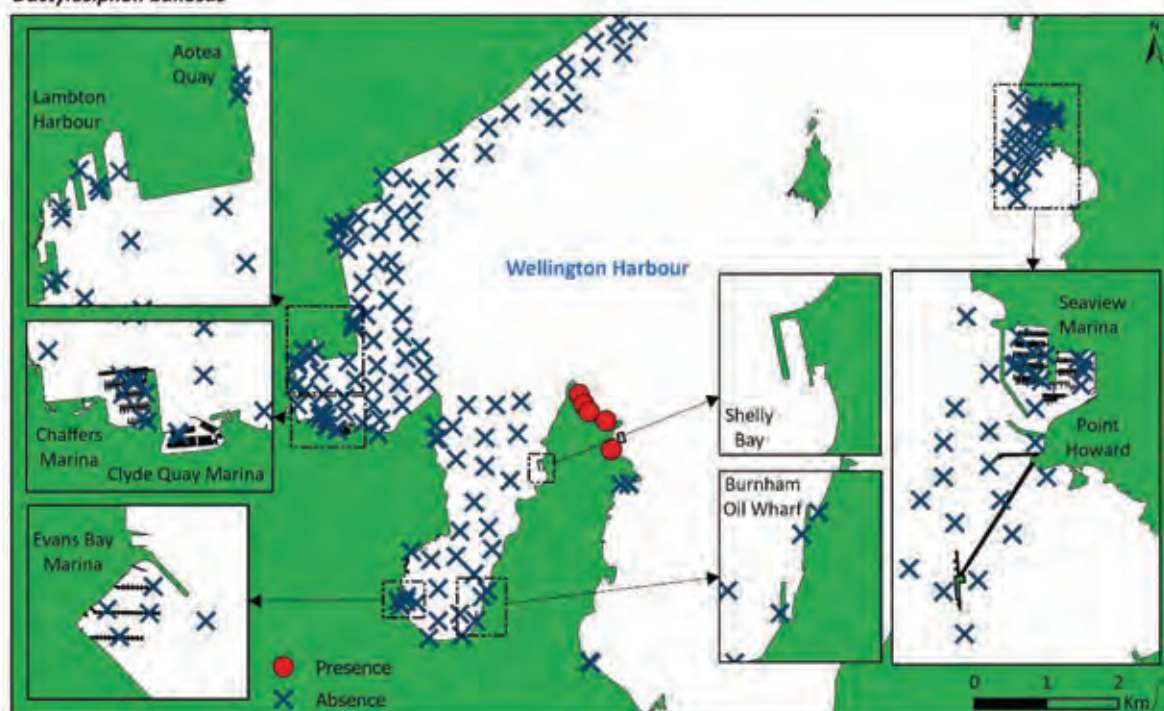
Wellington Harbour
 Winter 2023
Clavelina lepadiformis



Wellington Harbour
 Summer 2023-24
Clavelina lepadiformis



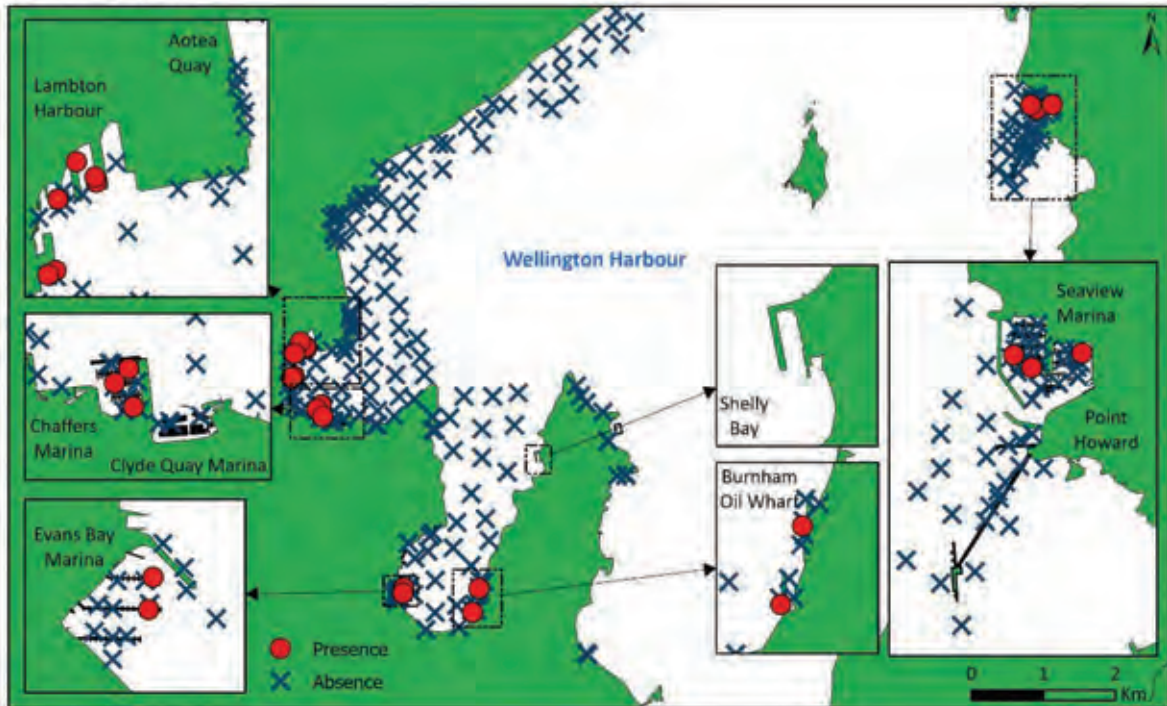
Wellington Harbour
 Winter 2023
Dactylosiphon bullosus



Wellington Harbour

Winter 2023

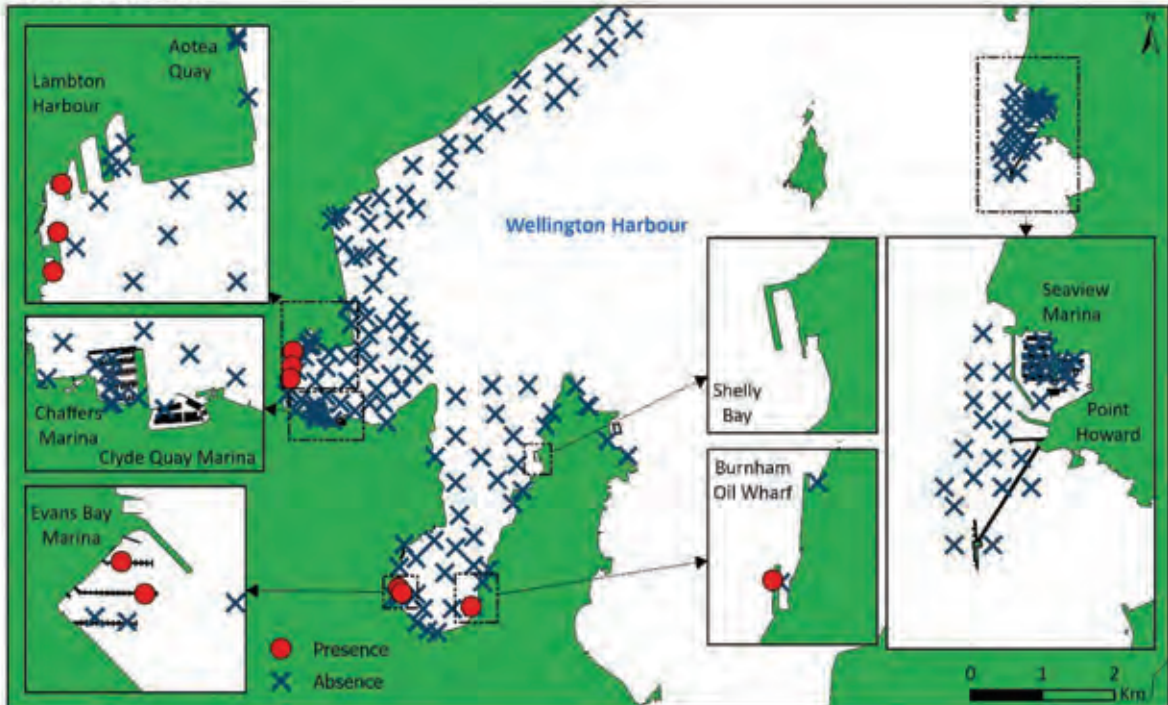
Didemnum vexillum



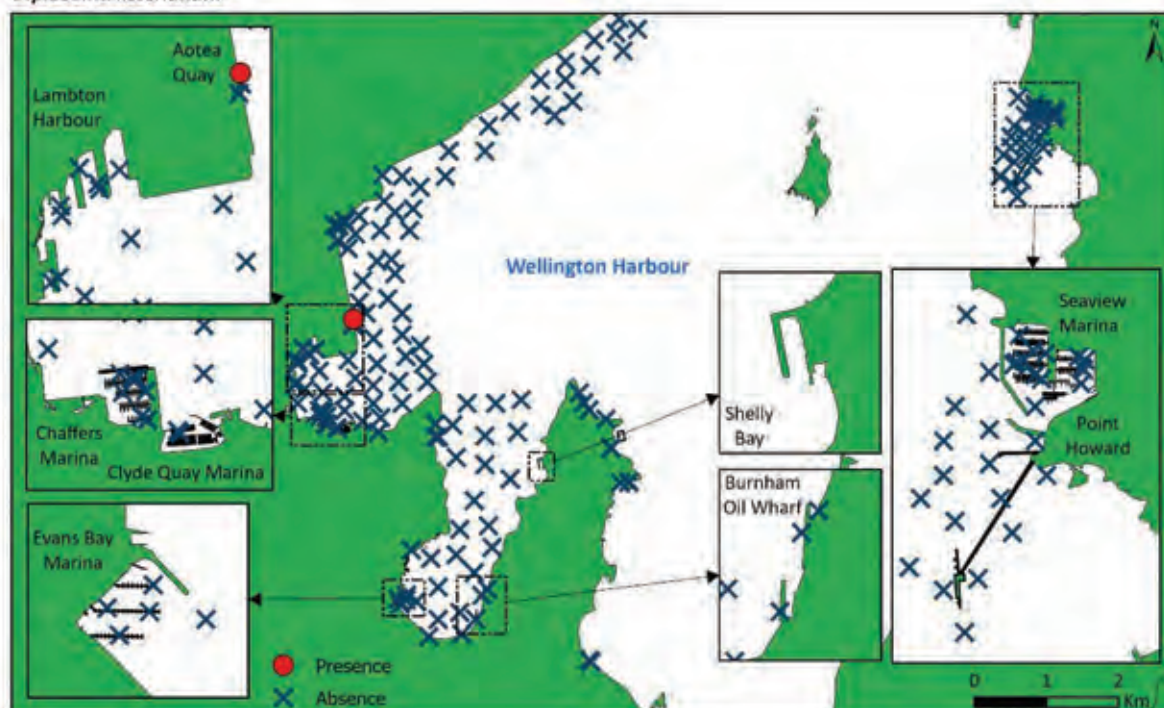
Wellington Harbour

Summer 2023-24

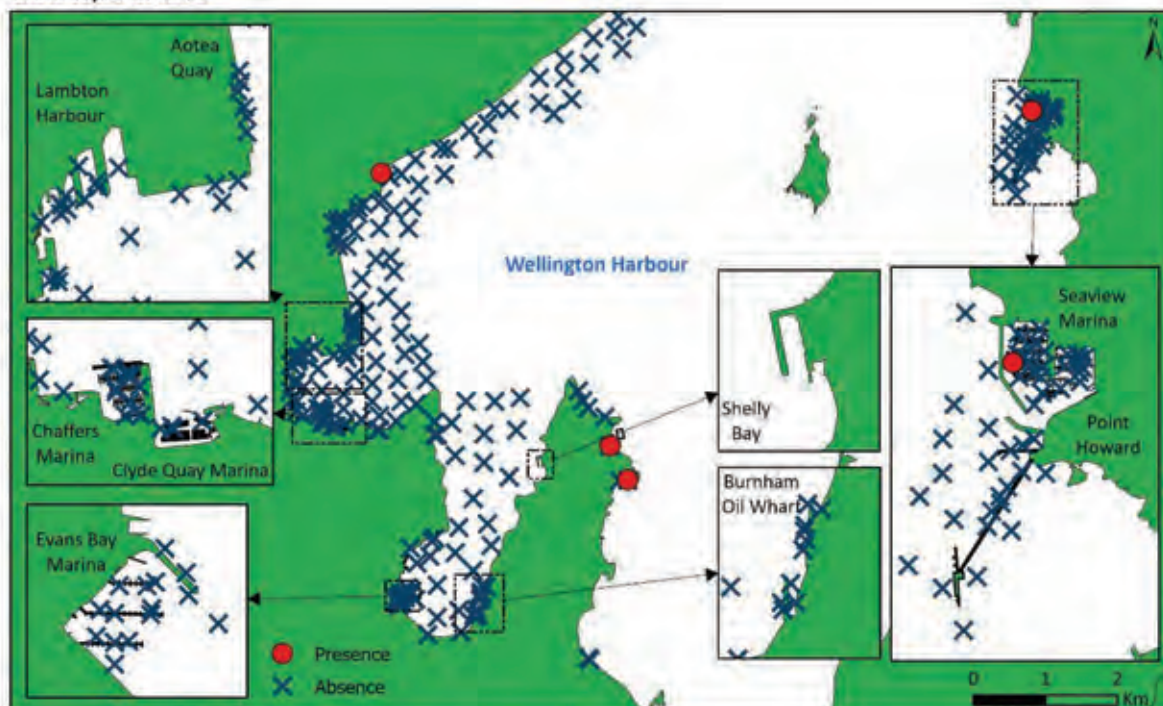
Didemnum vexillum



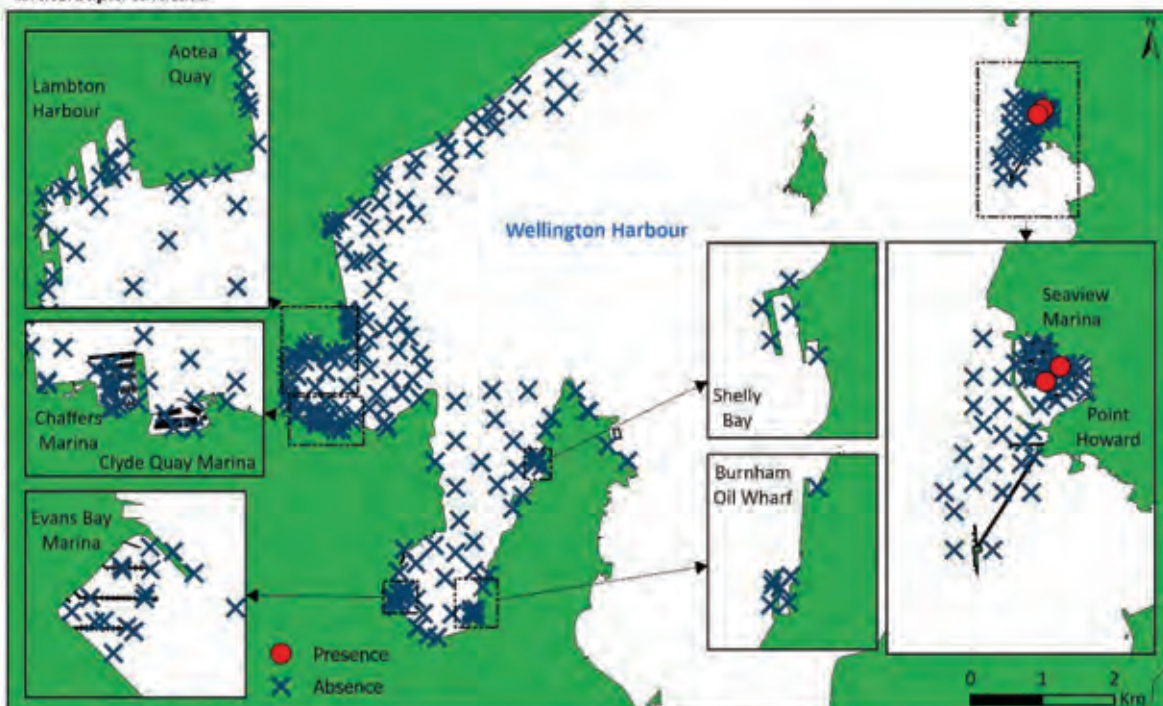
Wellington Harbour
 Winter 2023
Diplosoma listerianum



Wellington Harbour
 Winter 2023
Grateloupia turuturu



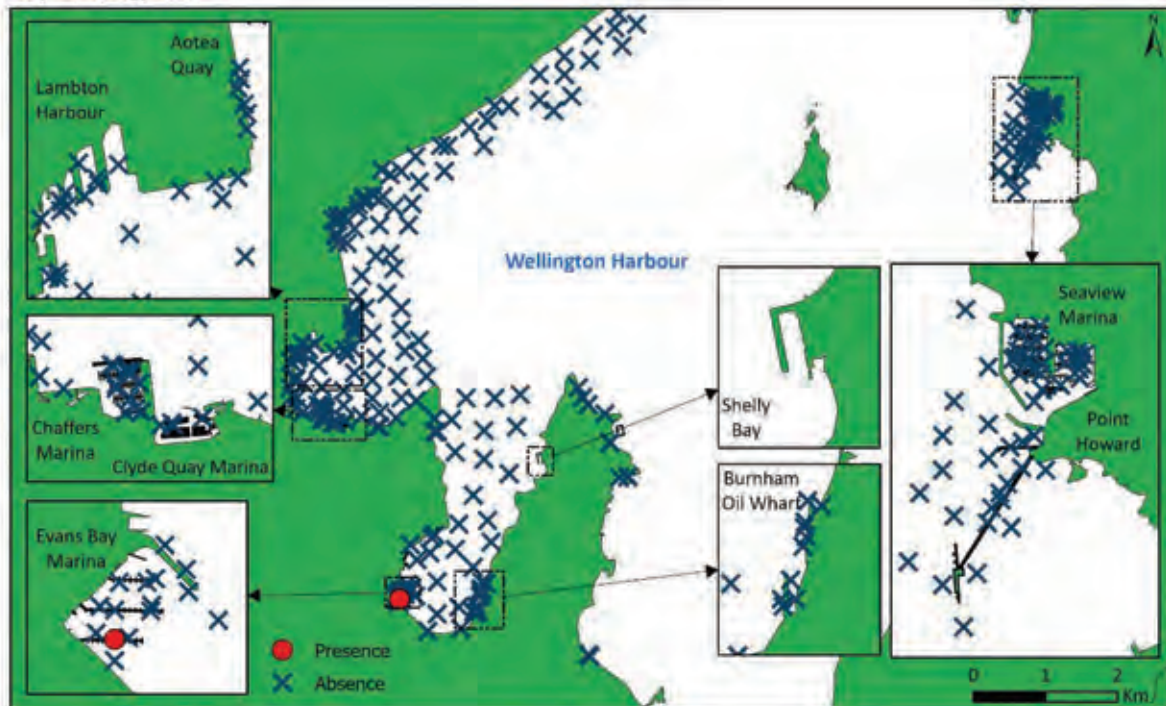
Wellington Harbour
 Summer 2023-24
Grateloupia turuturu



Wellington Harbour

Winter 2023

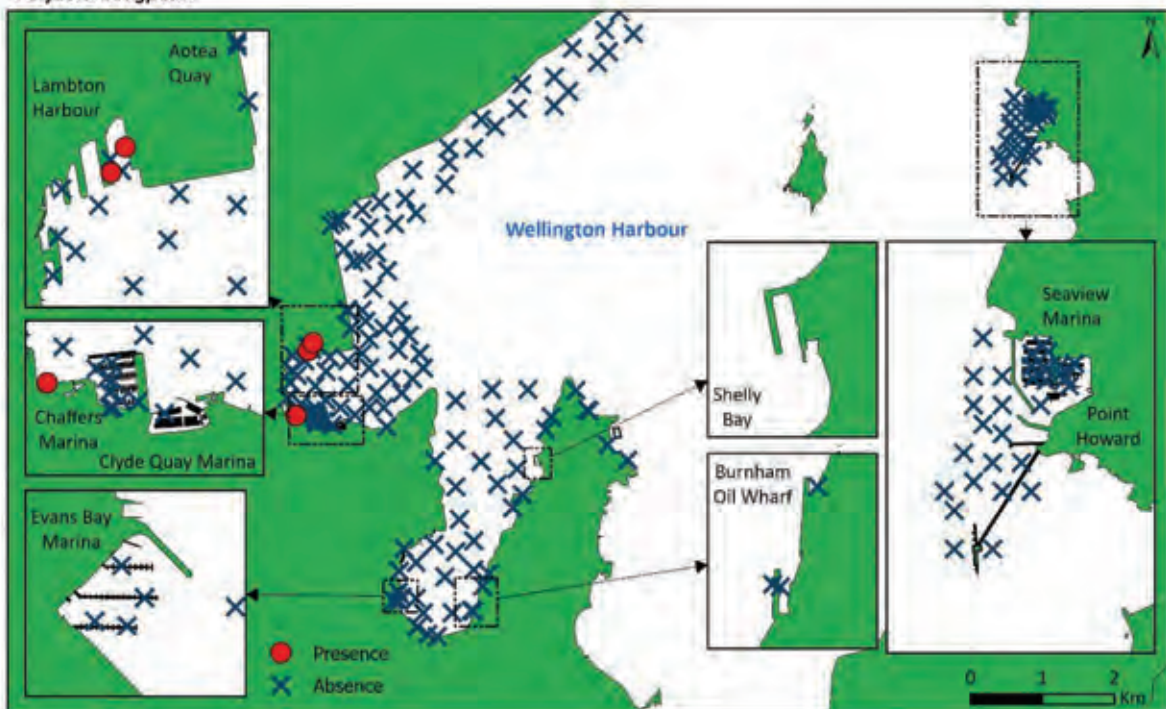
Polycera hedgpethi



Wellington Harbour

Summer 2023-24

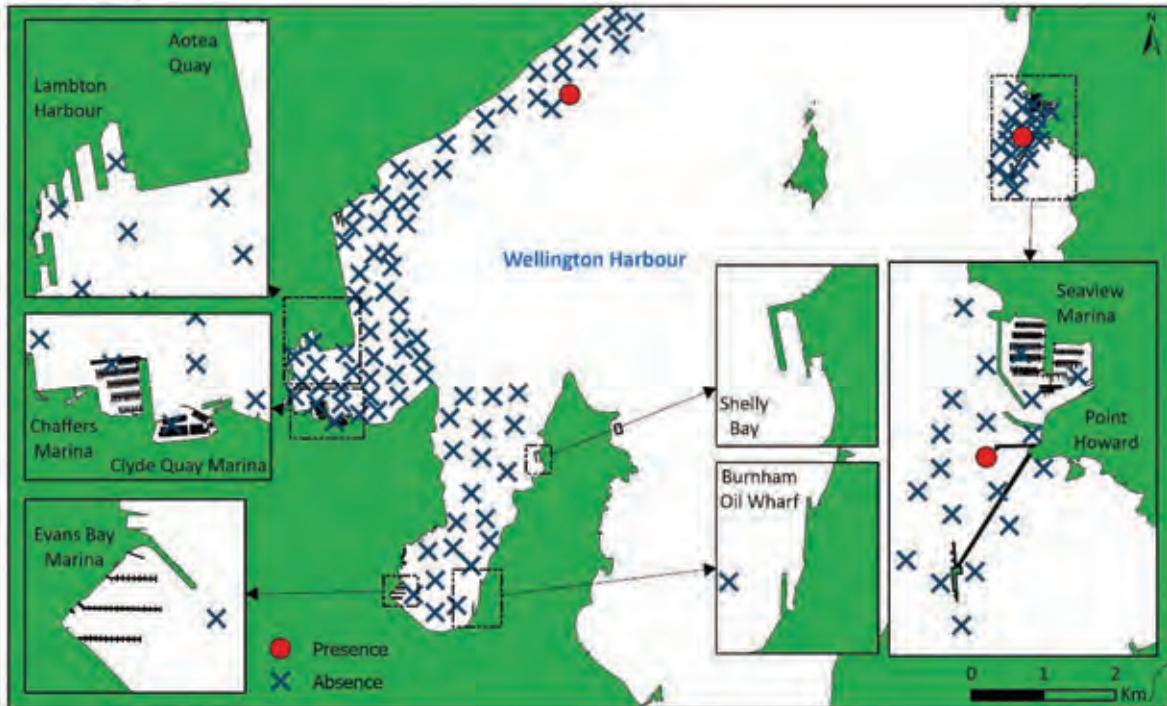
Polycera hedgpethi



Wellington Harbour

Winter 2023

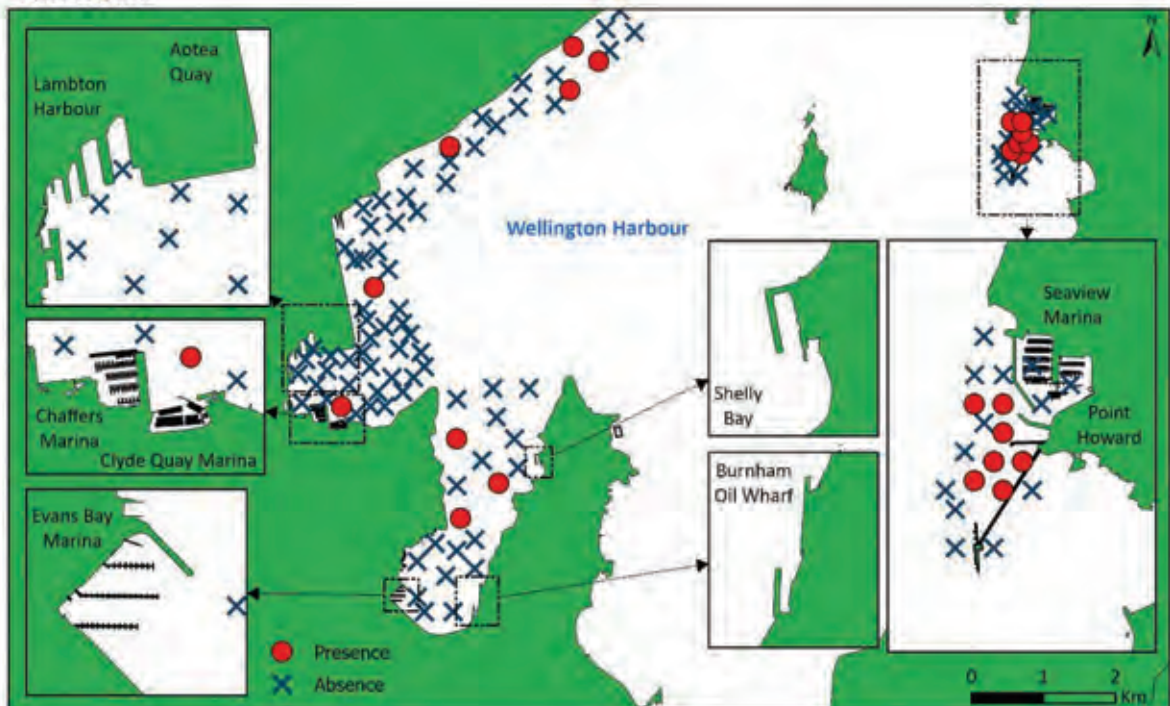
Theora lubrica



Wellington Harbour

Summer 2023-24

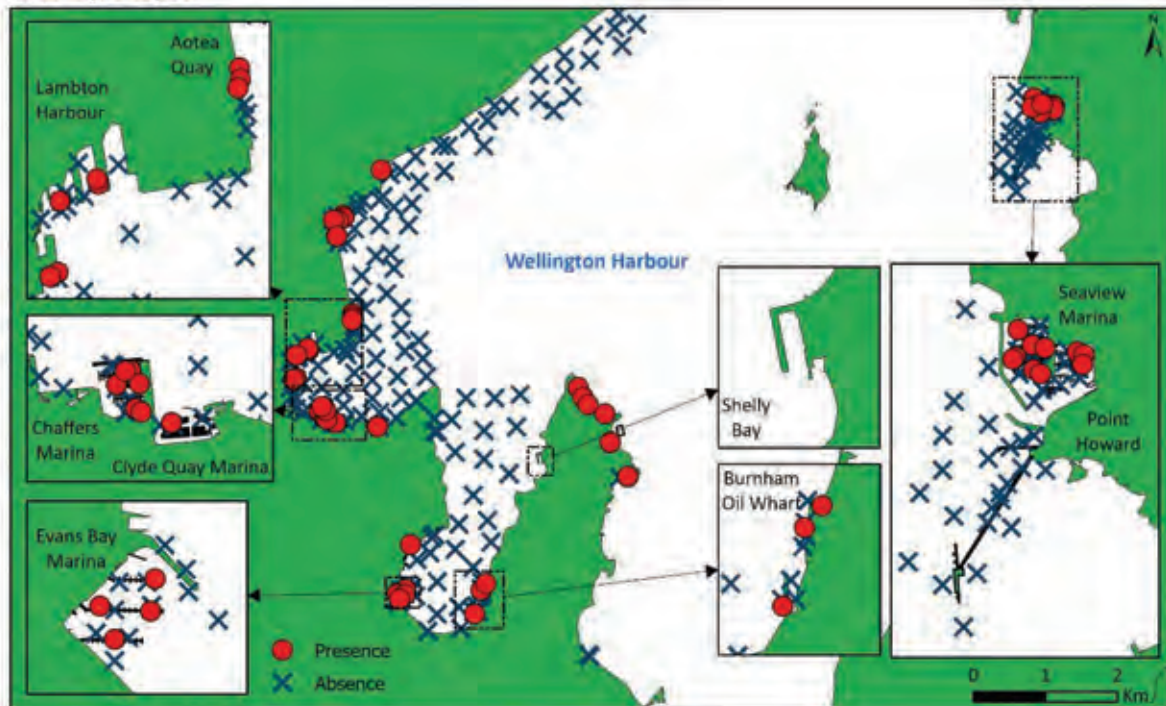
Theora lubrica



Wellington Harbour

Winter 2023

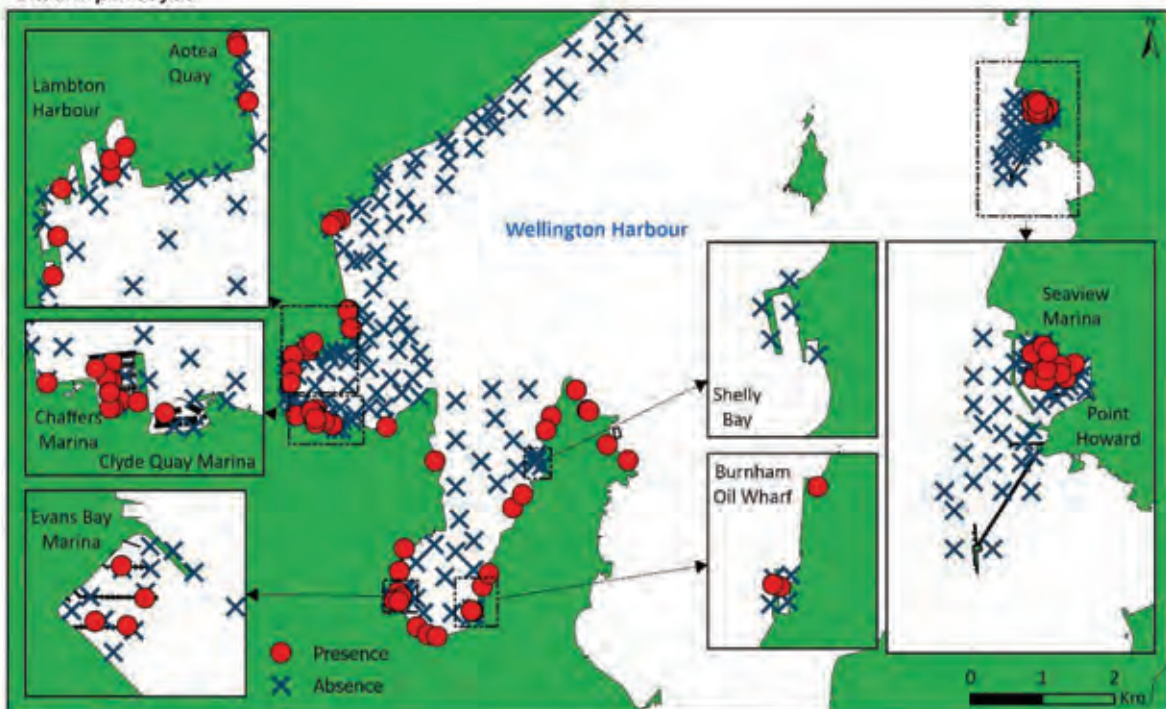
Undaria pinnatifida



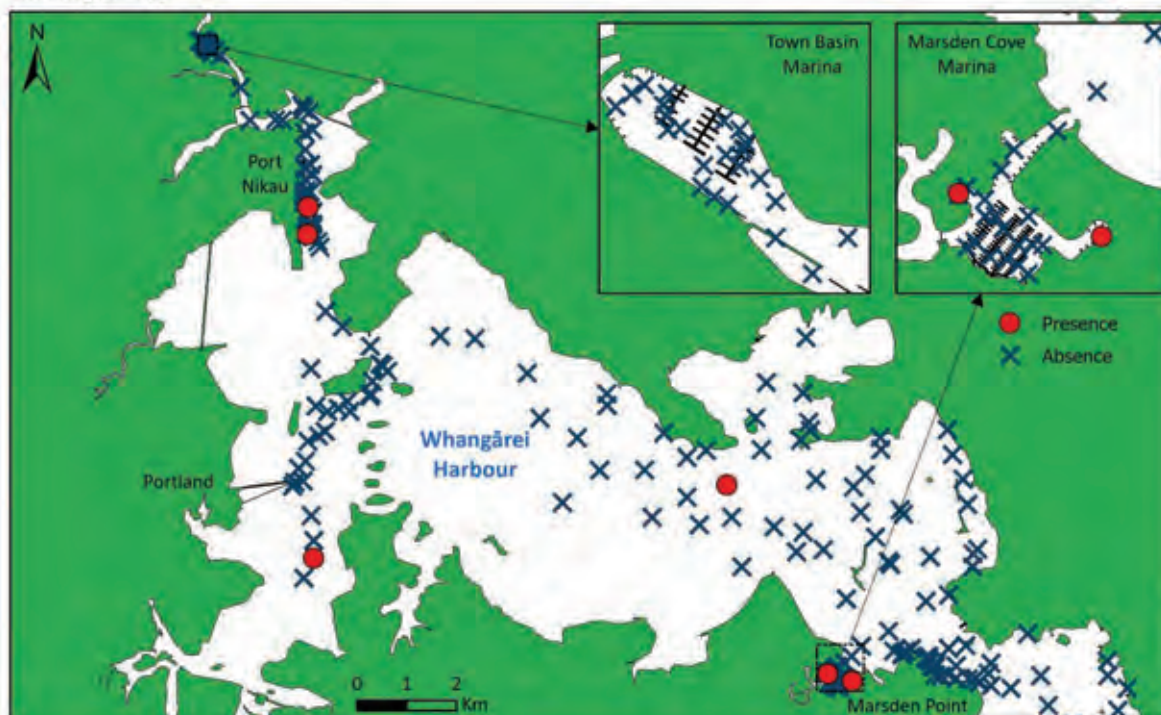
Wellington Harbour

Summer 2023-24

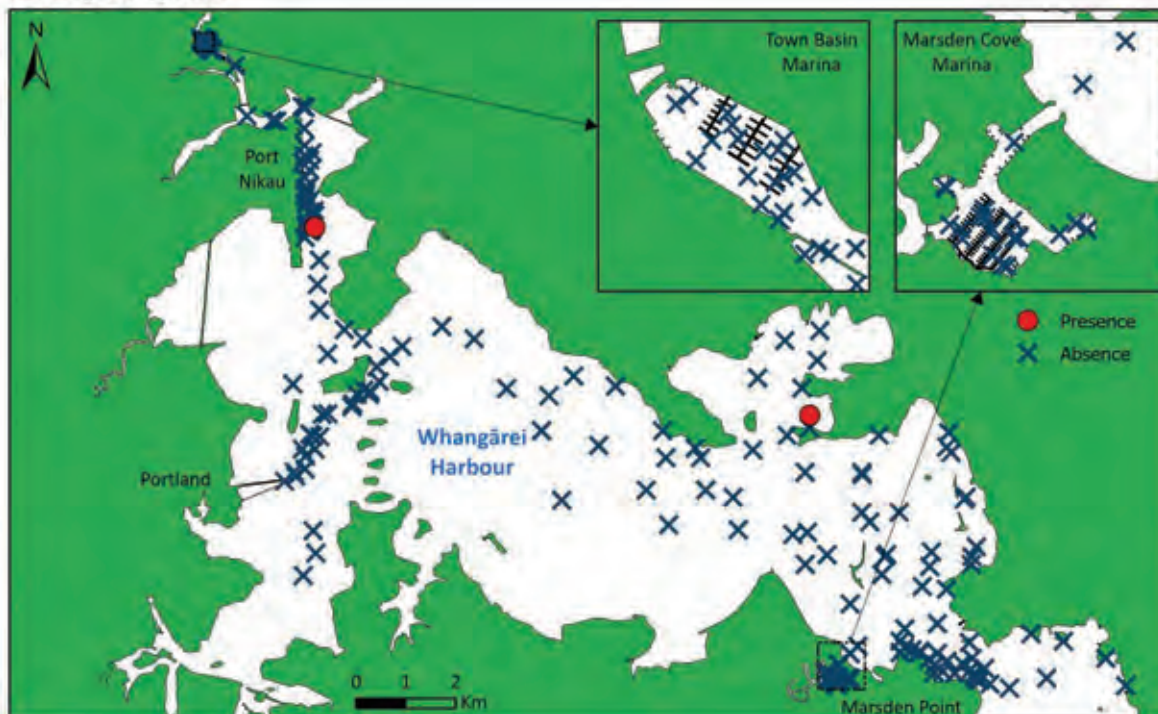
Undaria pinnatifida



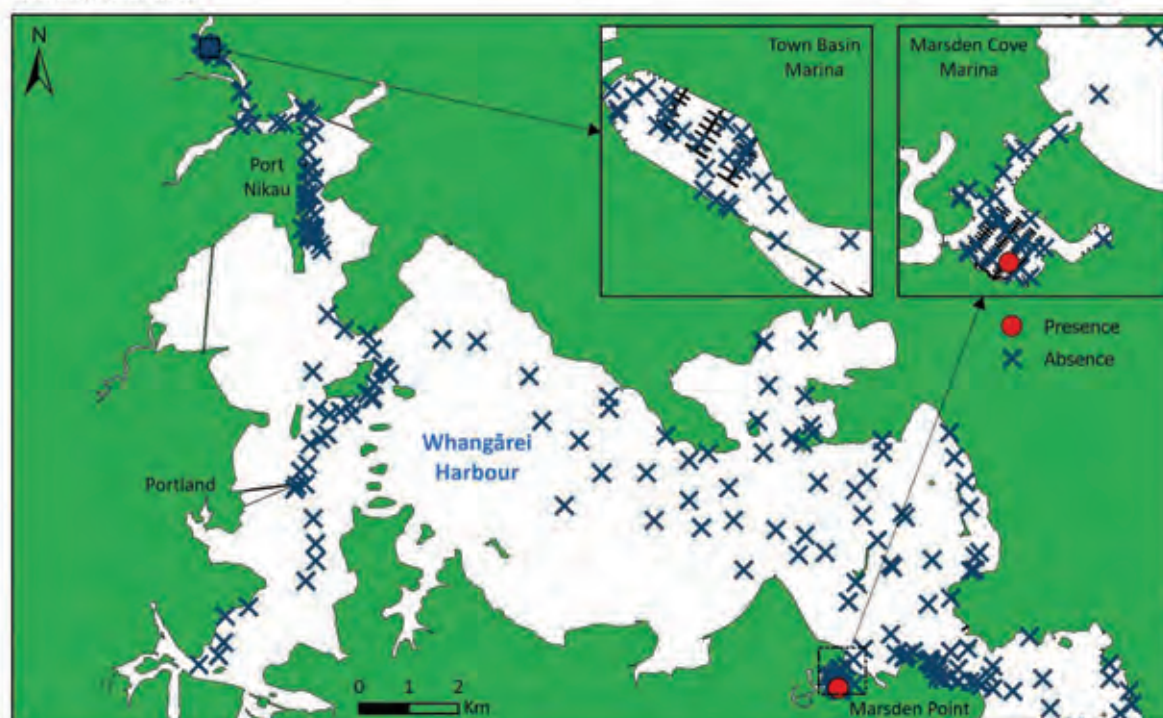
Whangārei Harbour
 Winter 2023
Acentrogobius pflaumii



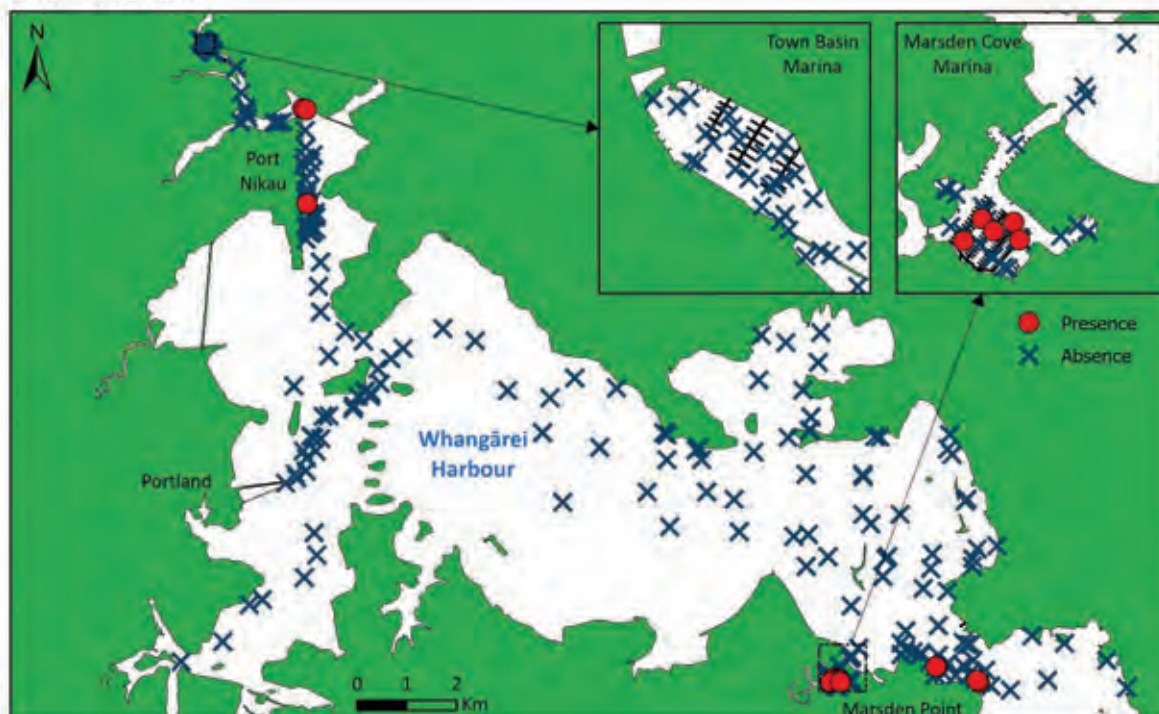
Whangārei Harbour
 Summer 2023-24
Acentrogobius pflaumii



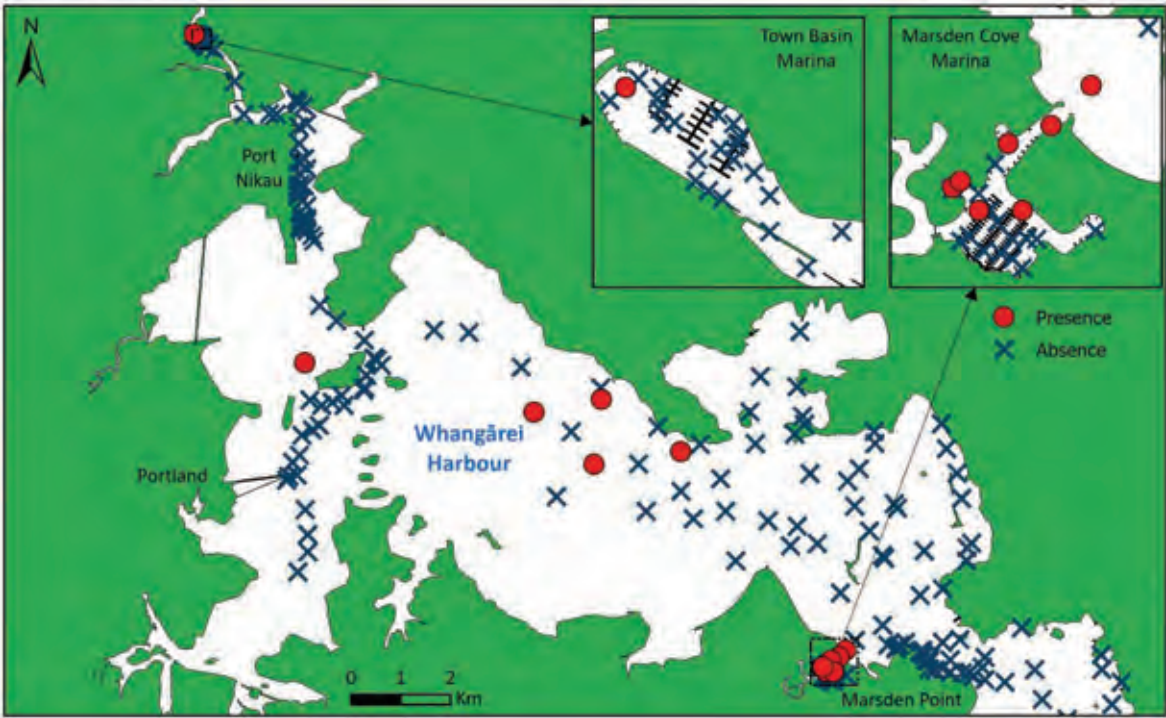
Whangārei Harbour
 Winter 2023
Amathia verticillata



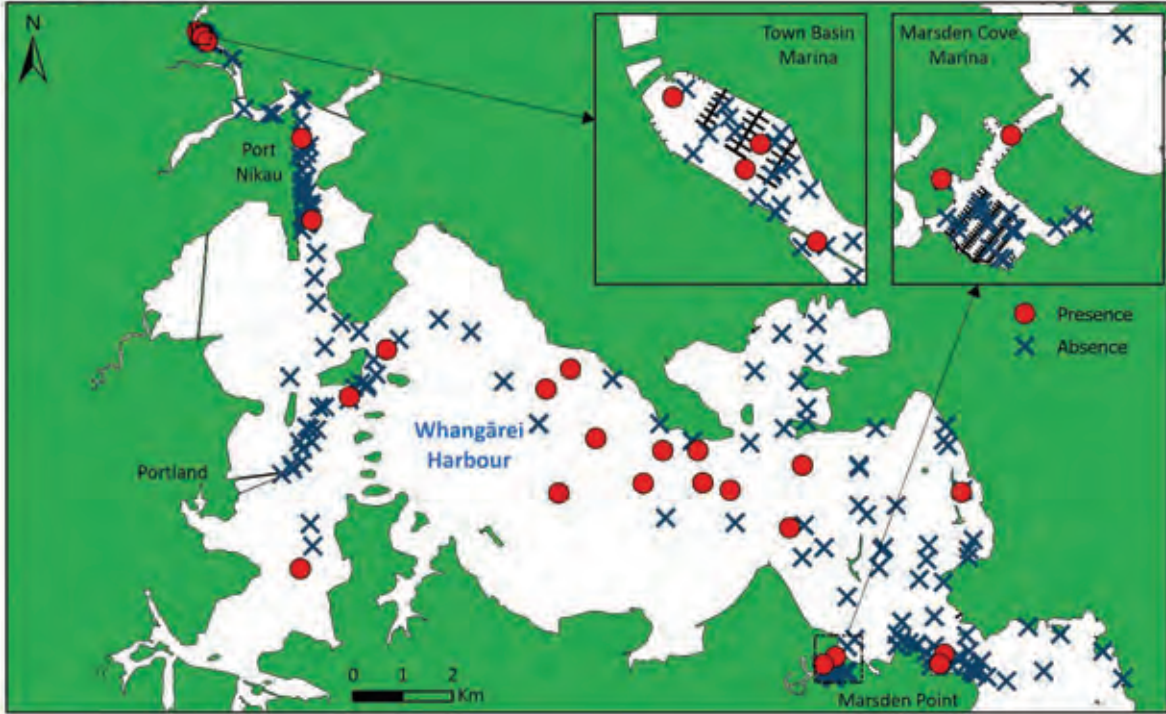
Whangārei Harbour
 Summer 2023-24
Amathia verticillata



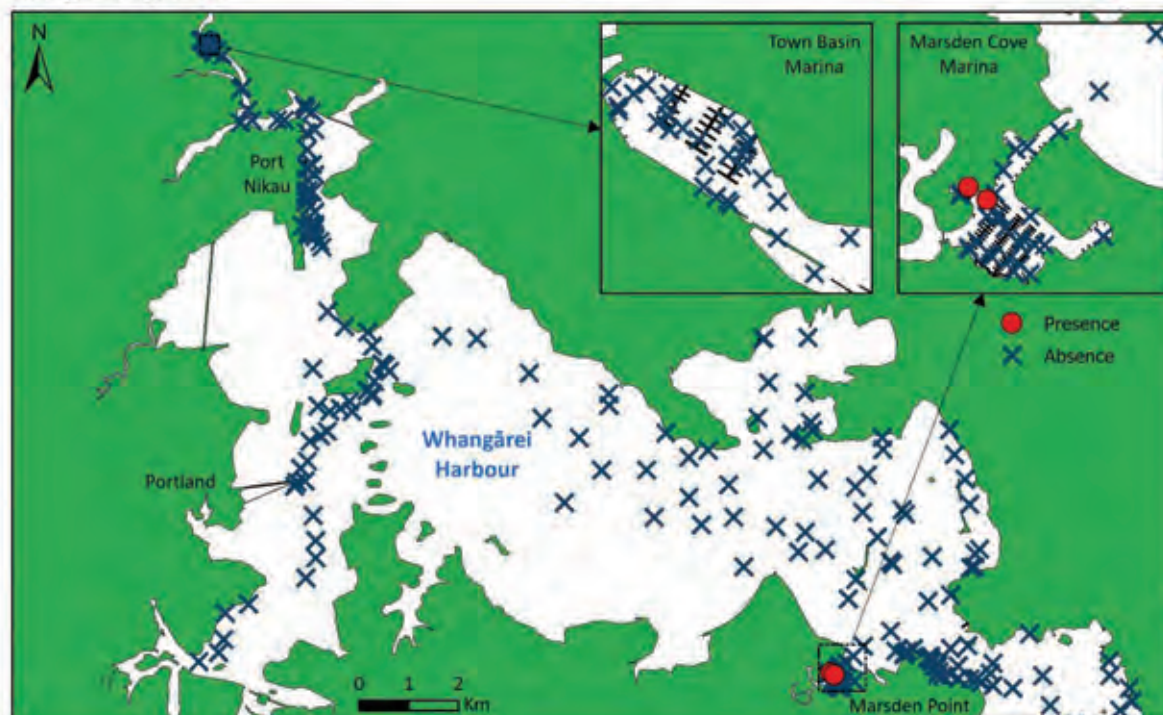
Whangārei Harbour
Winter 2023
Arcuatula senhousia



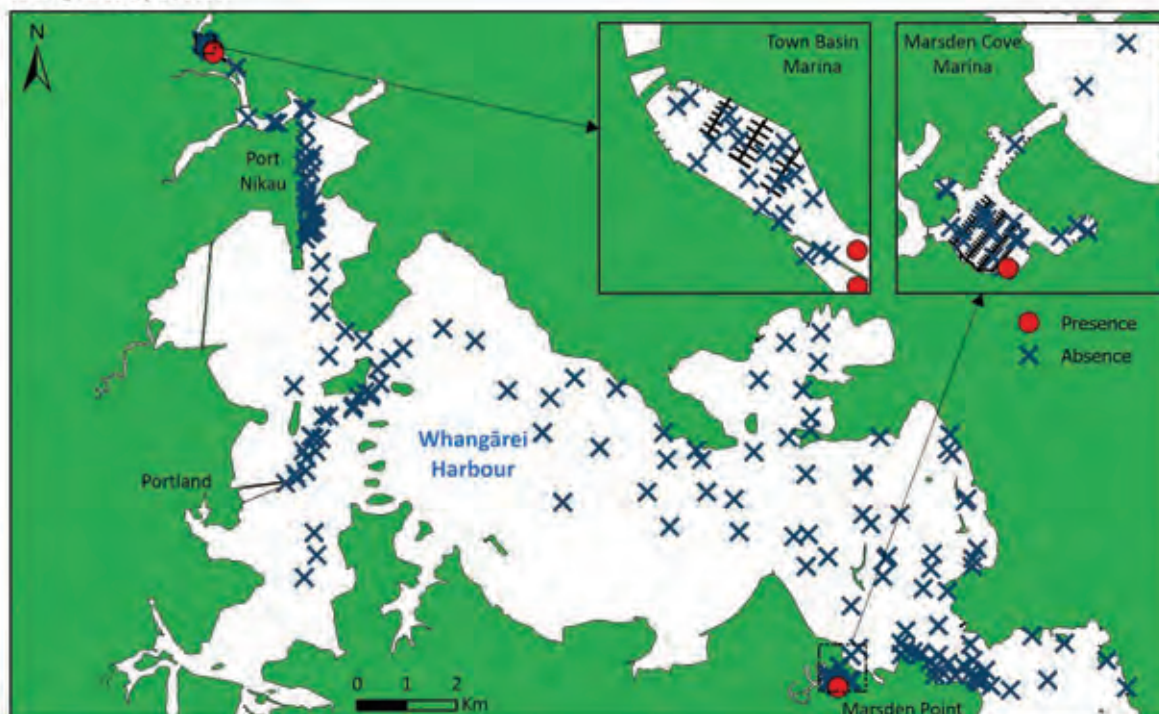
Whangārei Harbour
Summer 2023-24
Arcuatula senhousia



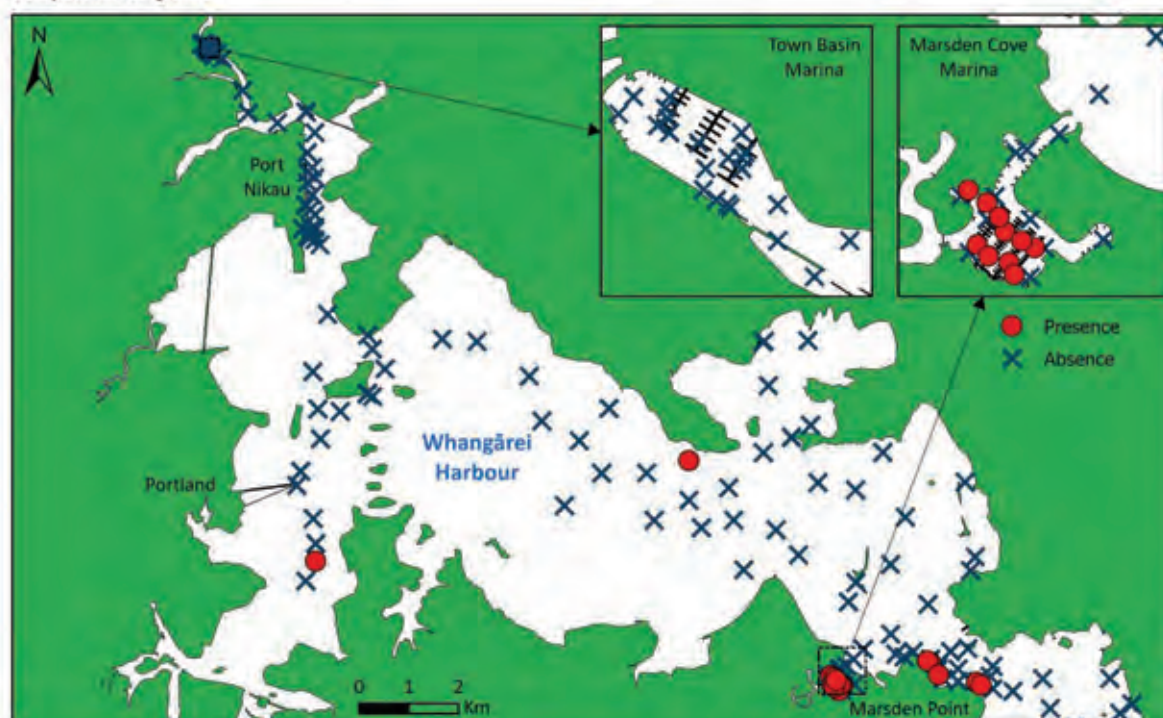
Whangārei Harbour
 Winter 2023
Arenigobius bifrenatus



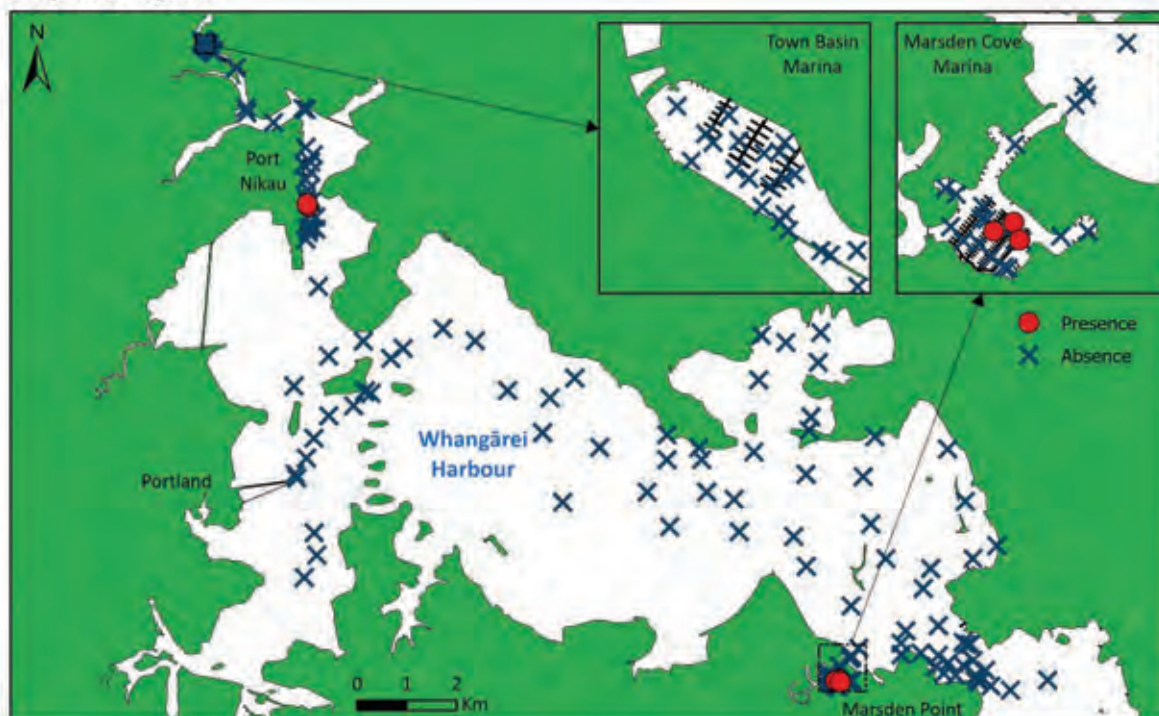
Whangārei Harbour
 Summer 2023-24
Arenigobius bifrenatus



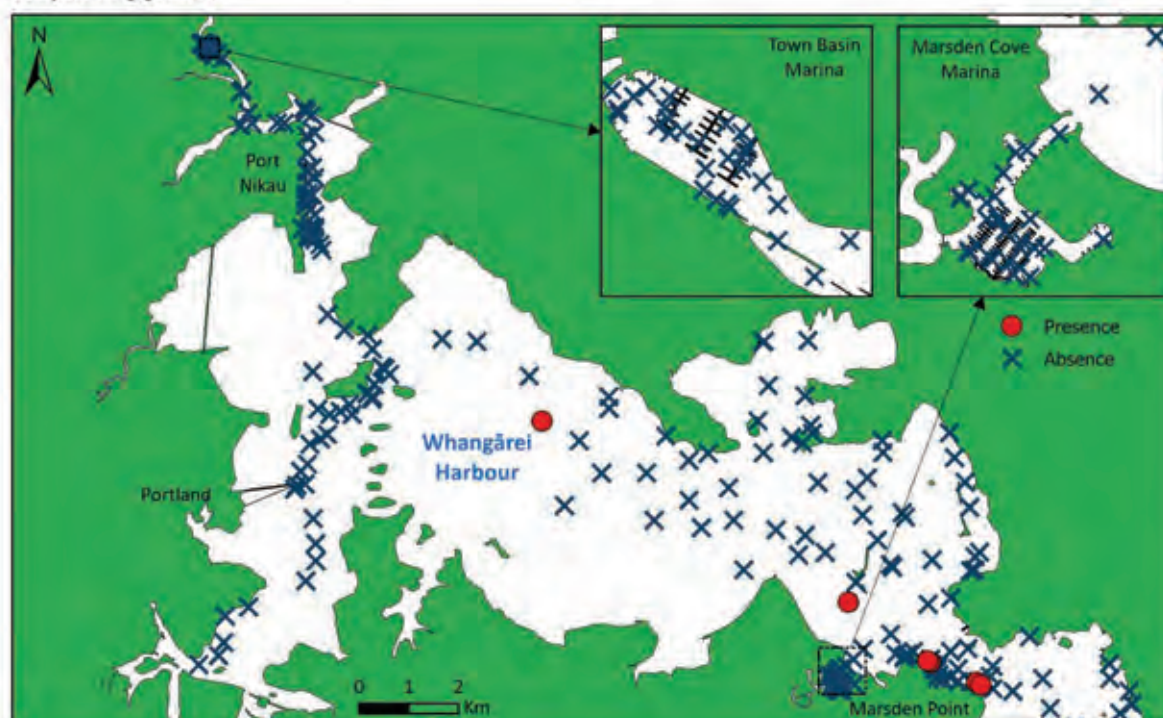
Whangārei Harbour
 Winter 2023
Botrylloides diegensis



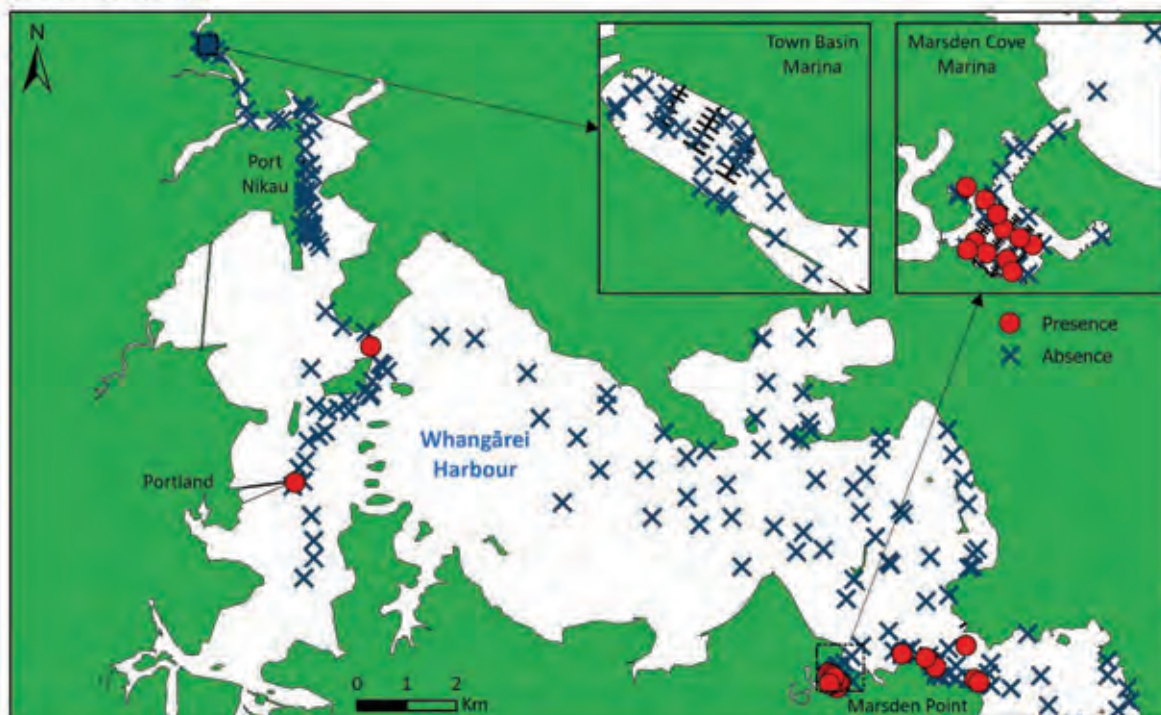
Whangārei Harbour
 Summer 2023-24
Botrylloides diegensis



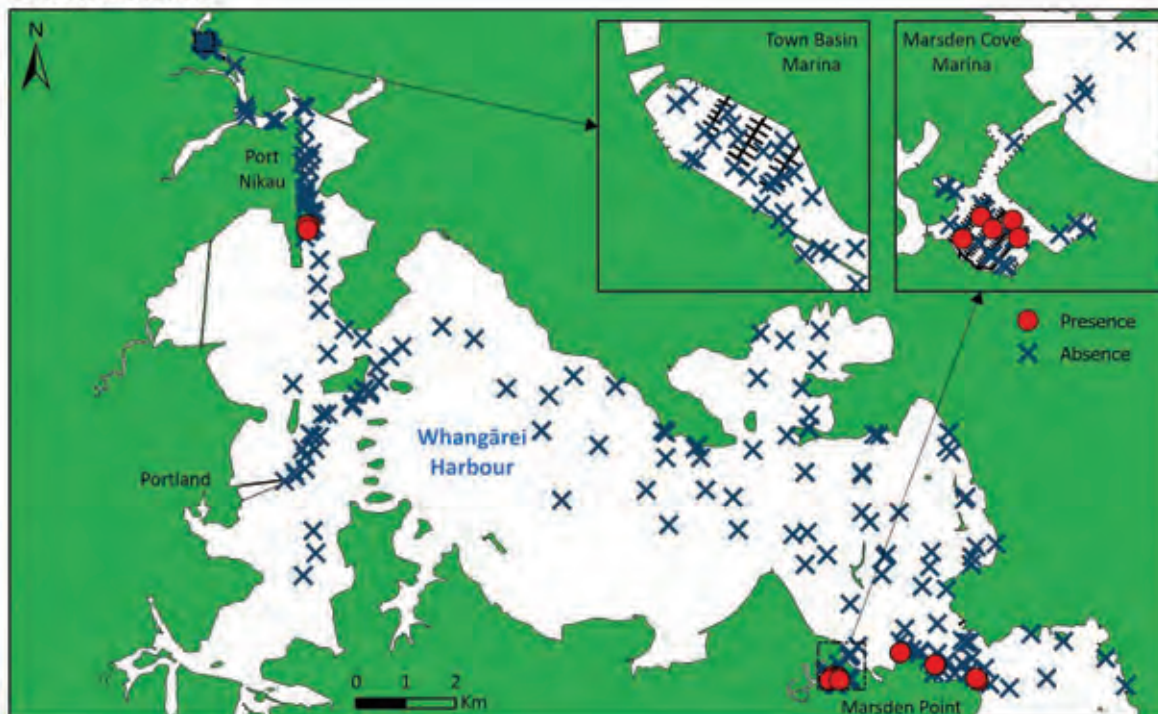
Whangārei Harbour
 Winter 2023
Botrylloides giganteus



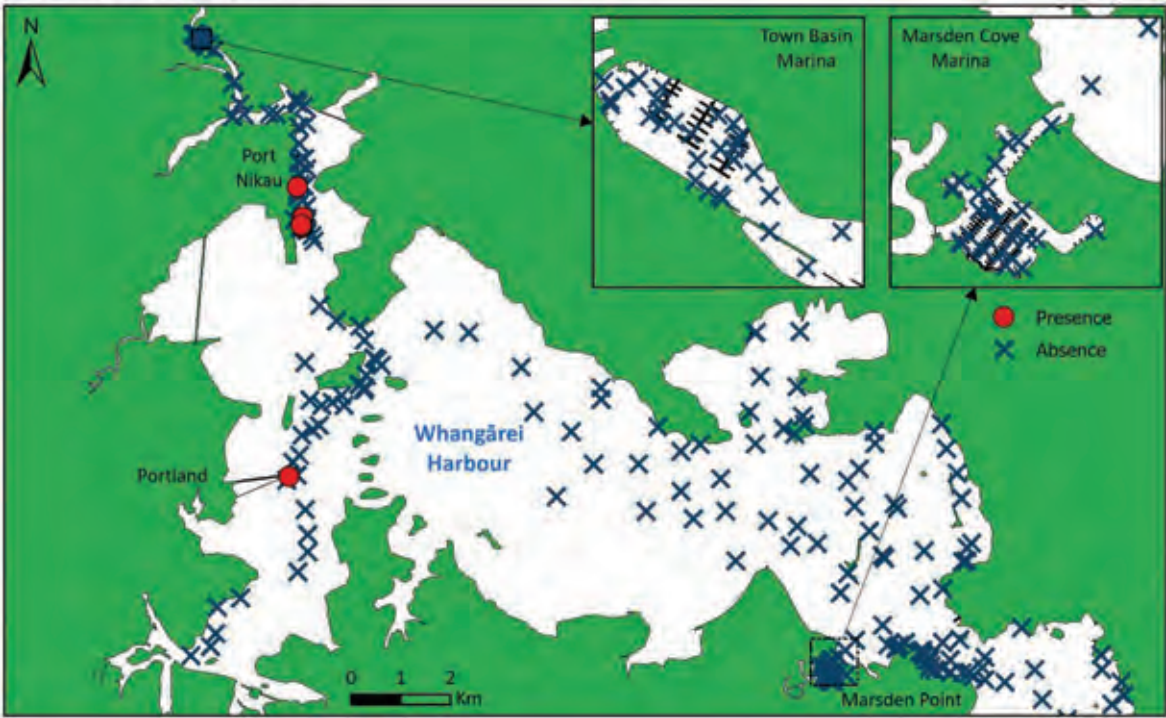
Whangārei Harbour
 Winter 2023
Celleporaria nodulosa



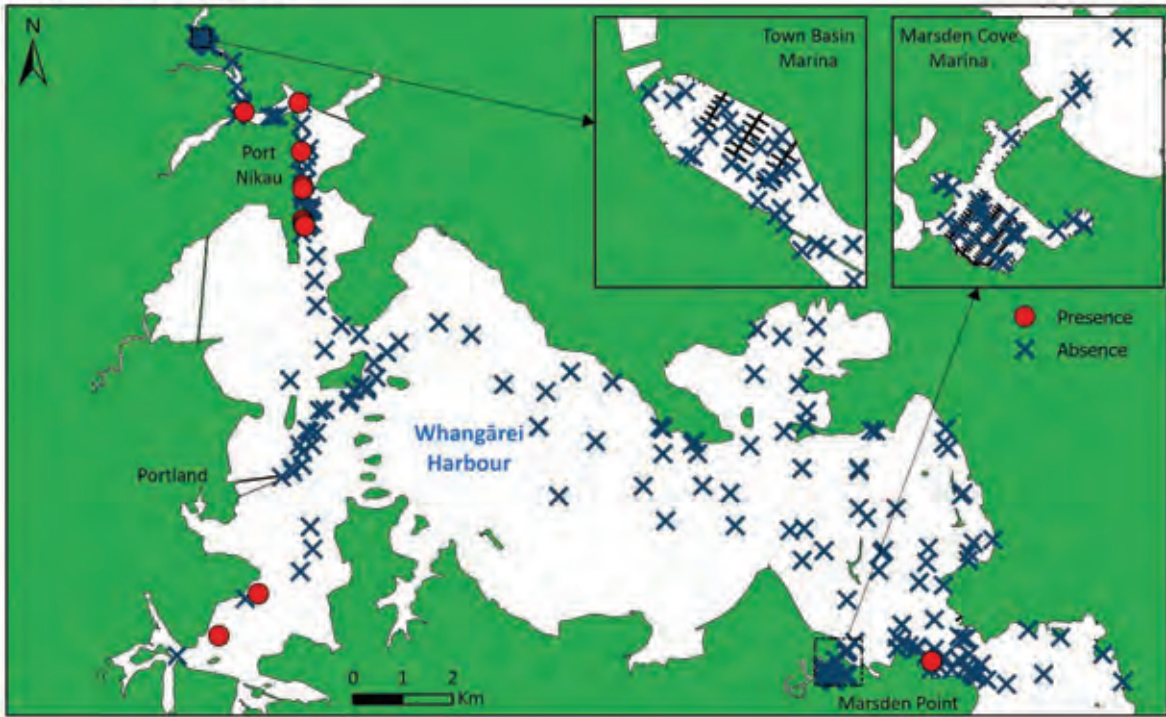
Whangārei Harbour
 Summer 2023-24
Celleporaria nodulosa



Whangārei Harbour
Winter 2023
Charybdis (Charybdis) japonica



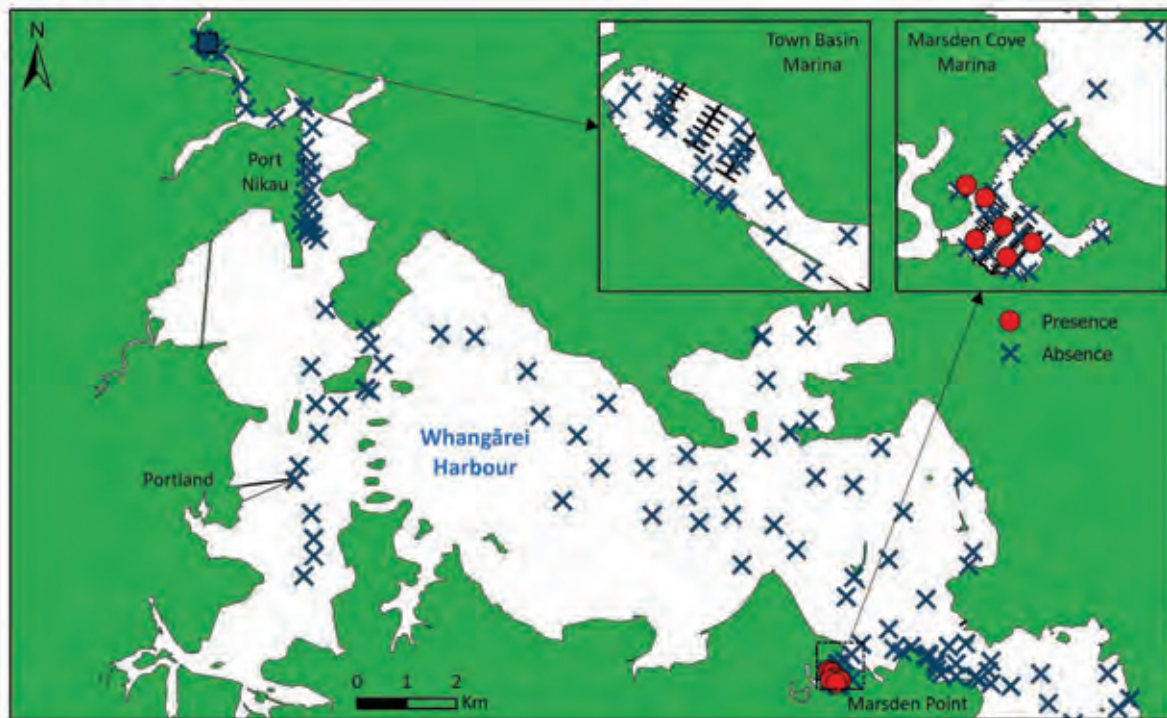
Whangārei Harbour
Summer 2023-24
Charybdis (Charybdis) japonica



Whangārei Harbour

Winter 2023

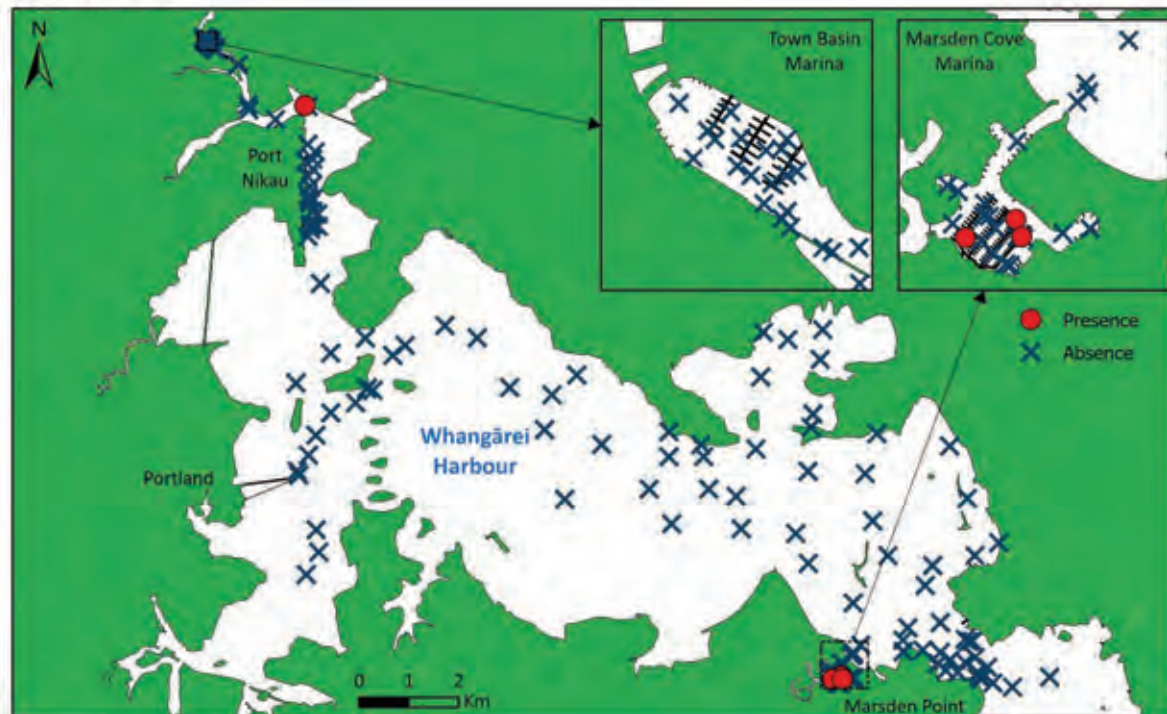
Ciona intestinalis



Whangārei Harbour

Summer 2023-24

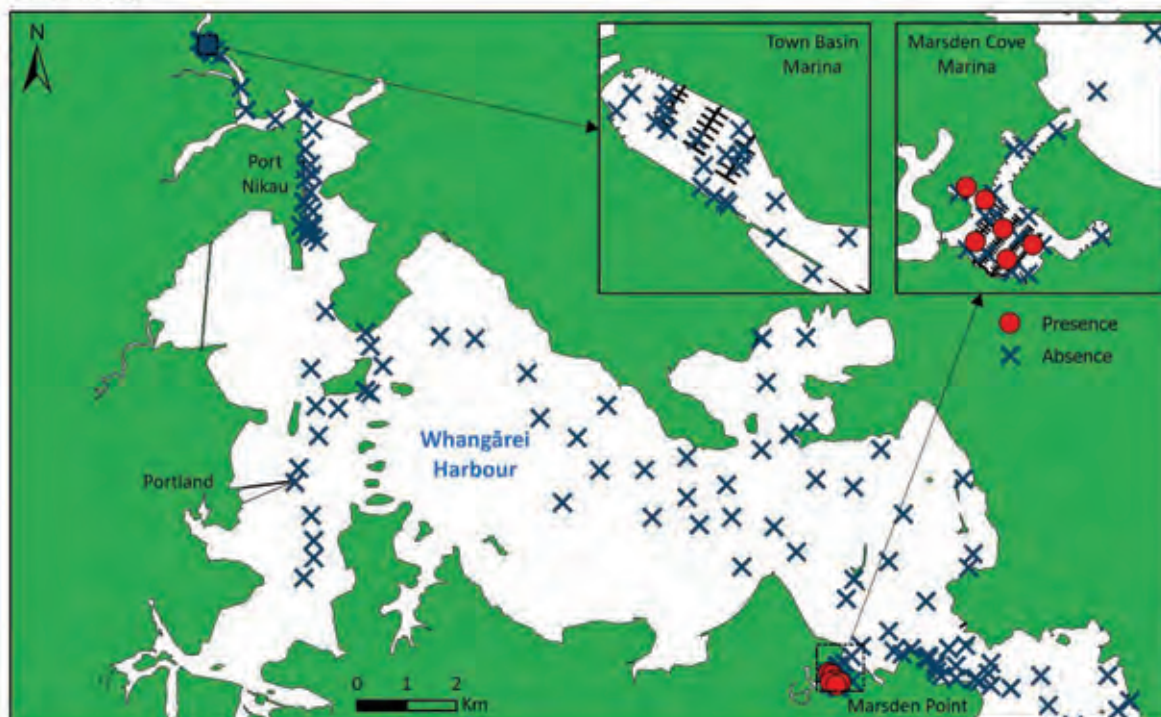
Ciona intestinalis



Whangārei Harbour

Winter 2023

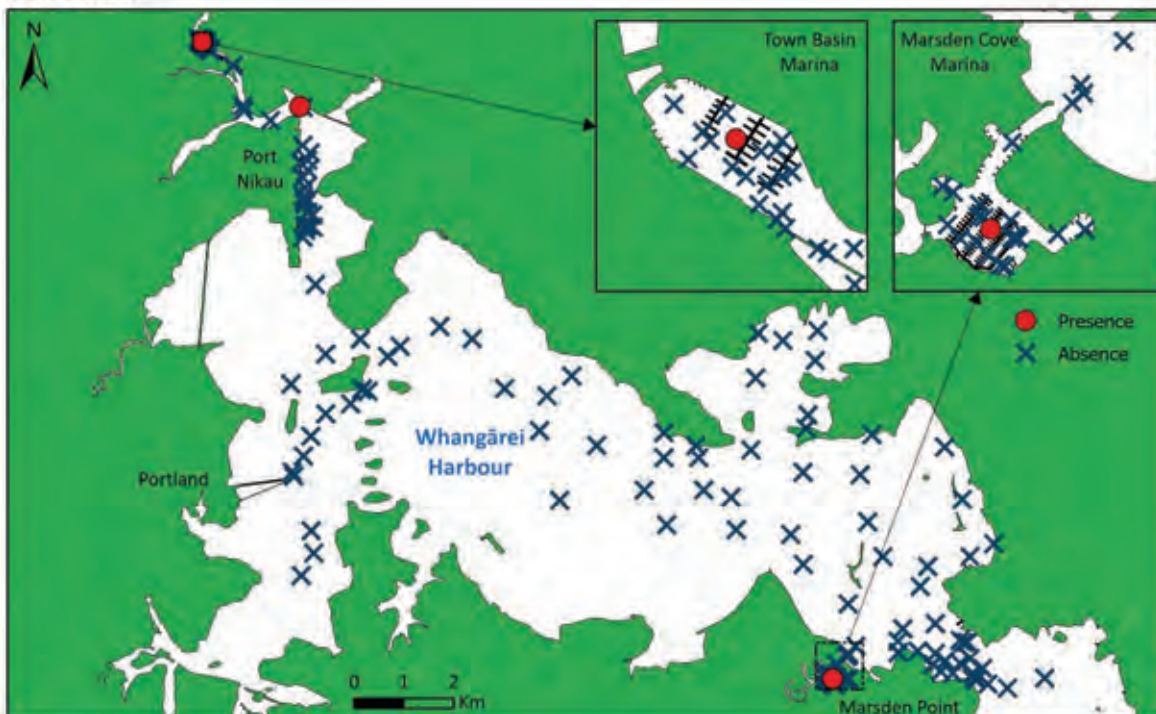
Ciona savignyi



Whangārei Harbour

Summer 2023-24

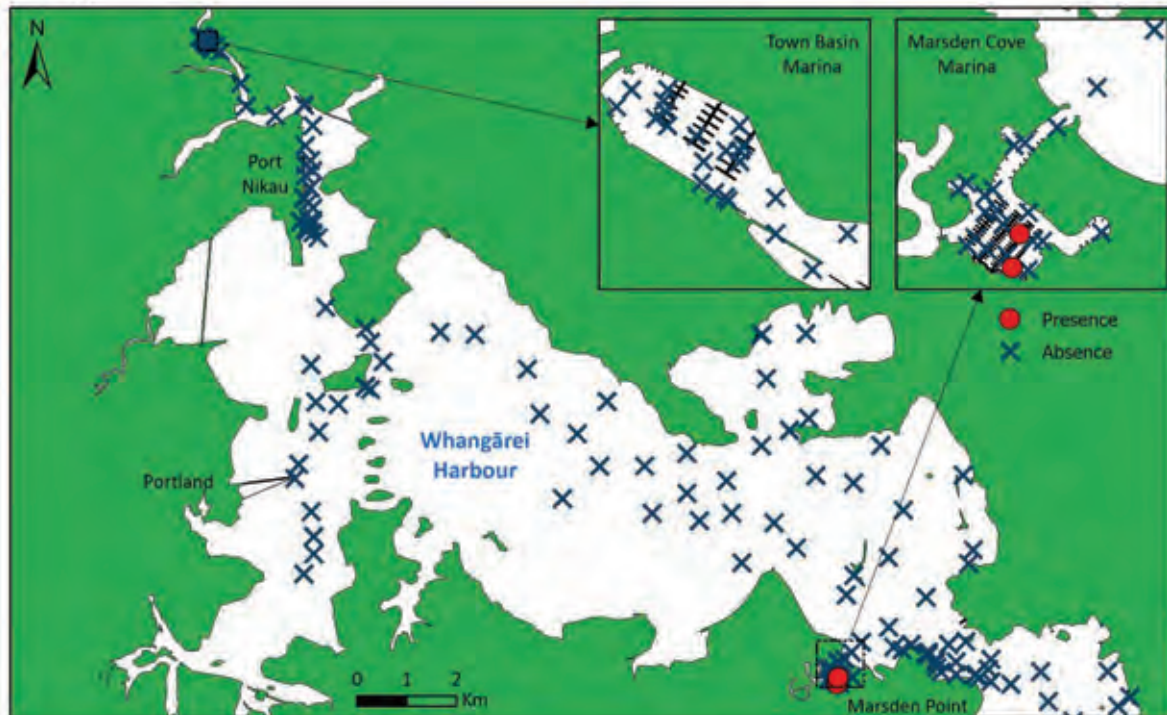
Ciona savignyi



Whangārei Harbour

Winter 2023

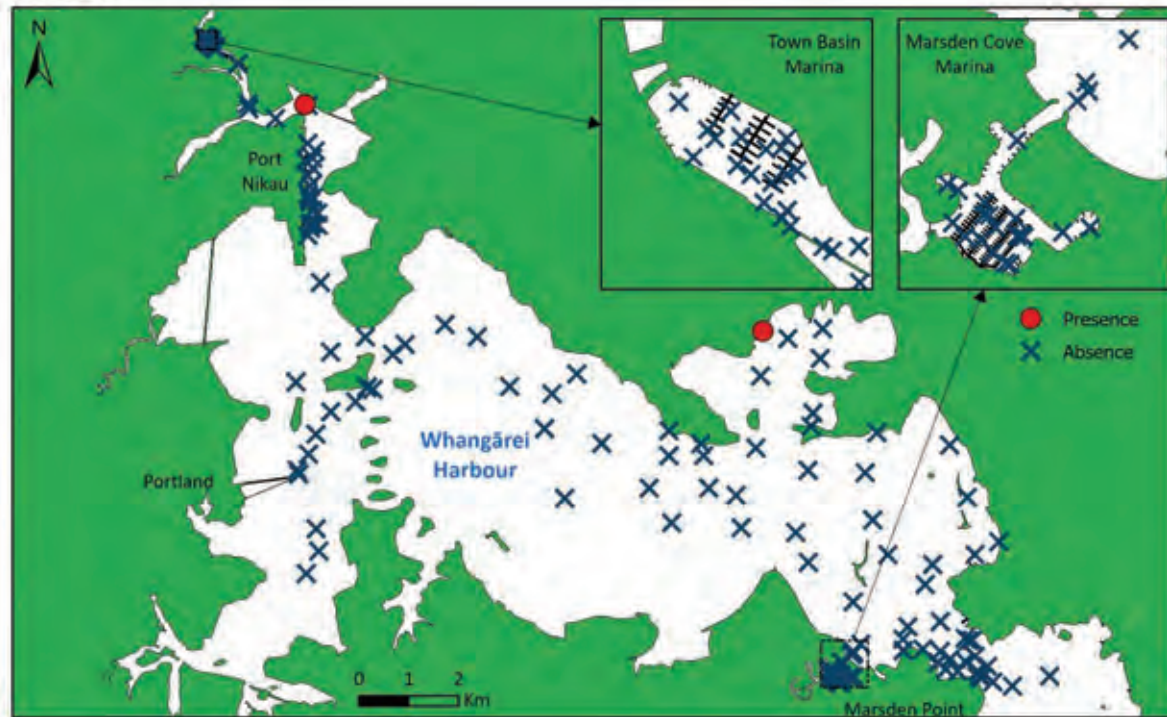
Ciona spp.



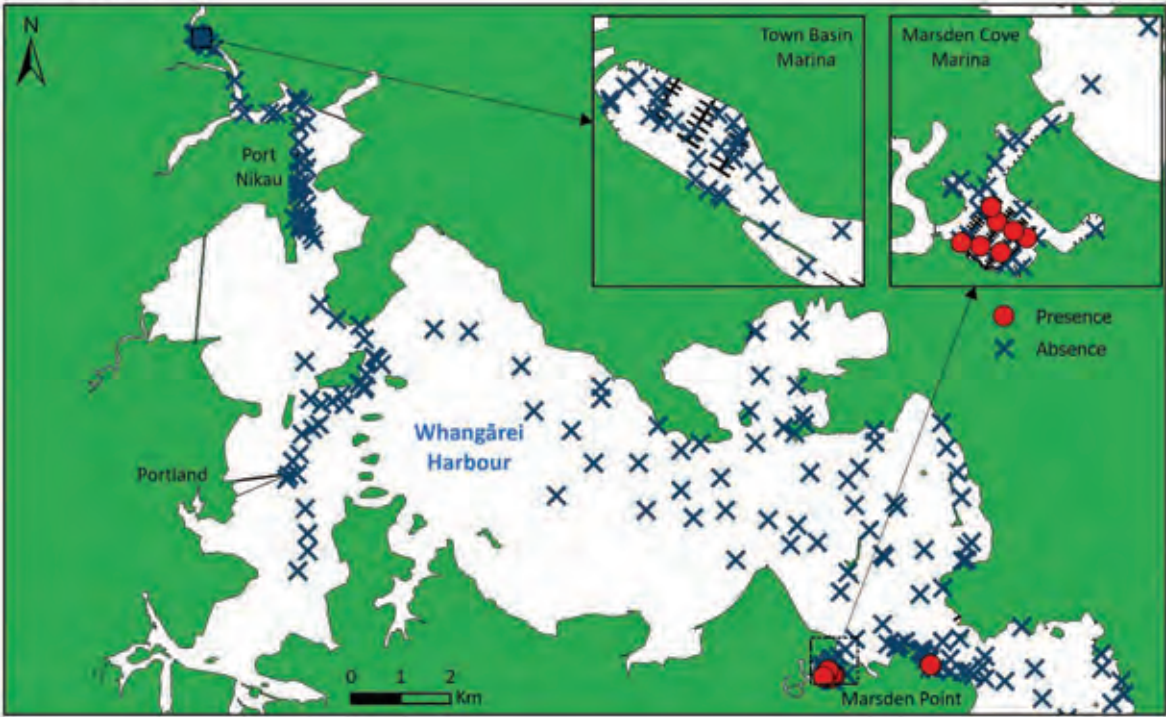
Whangārei Harbour

Summer 2023-24

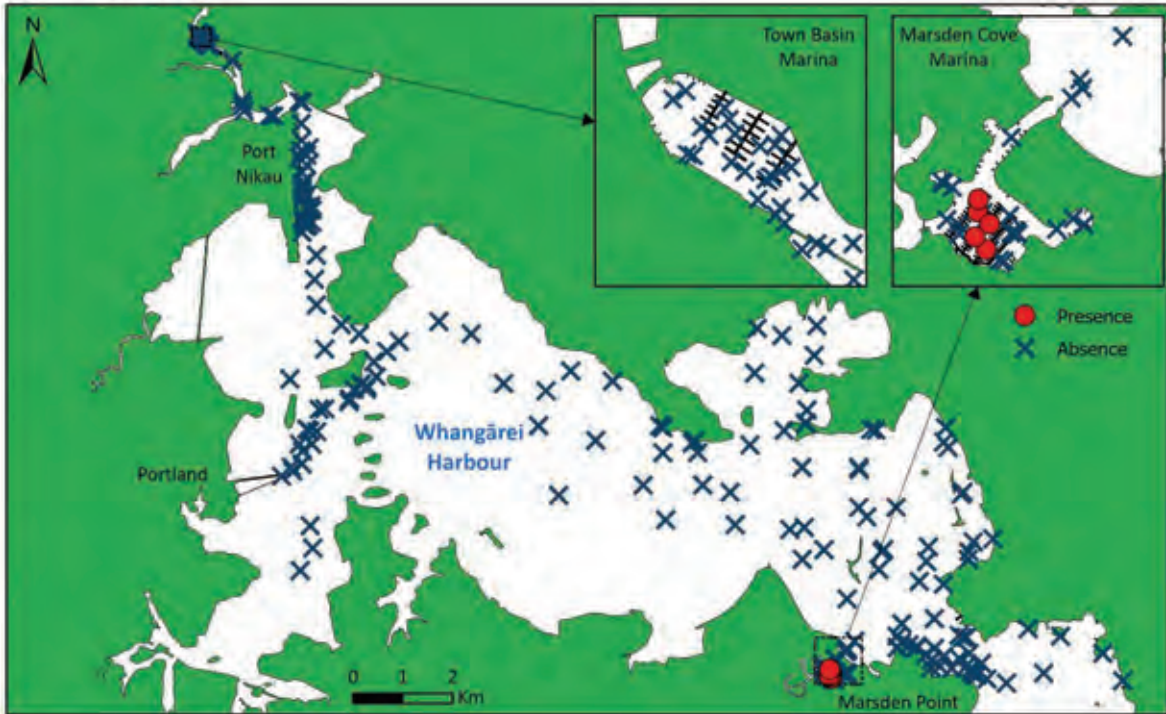
Ciona spp.



Whangārei Harbour
Winter 2023
Clavelina lepadiformis



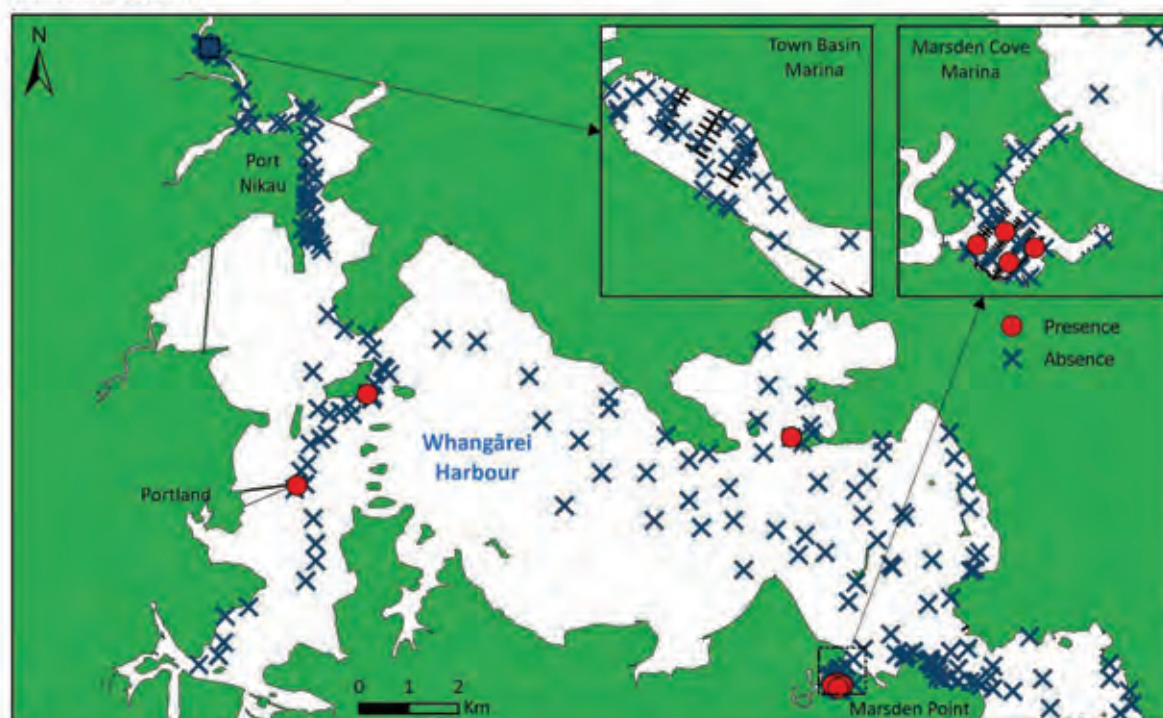
Whangārei Harbour
Summer 2023-24
Clavelina lepadiformis



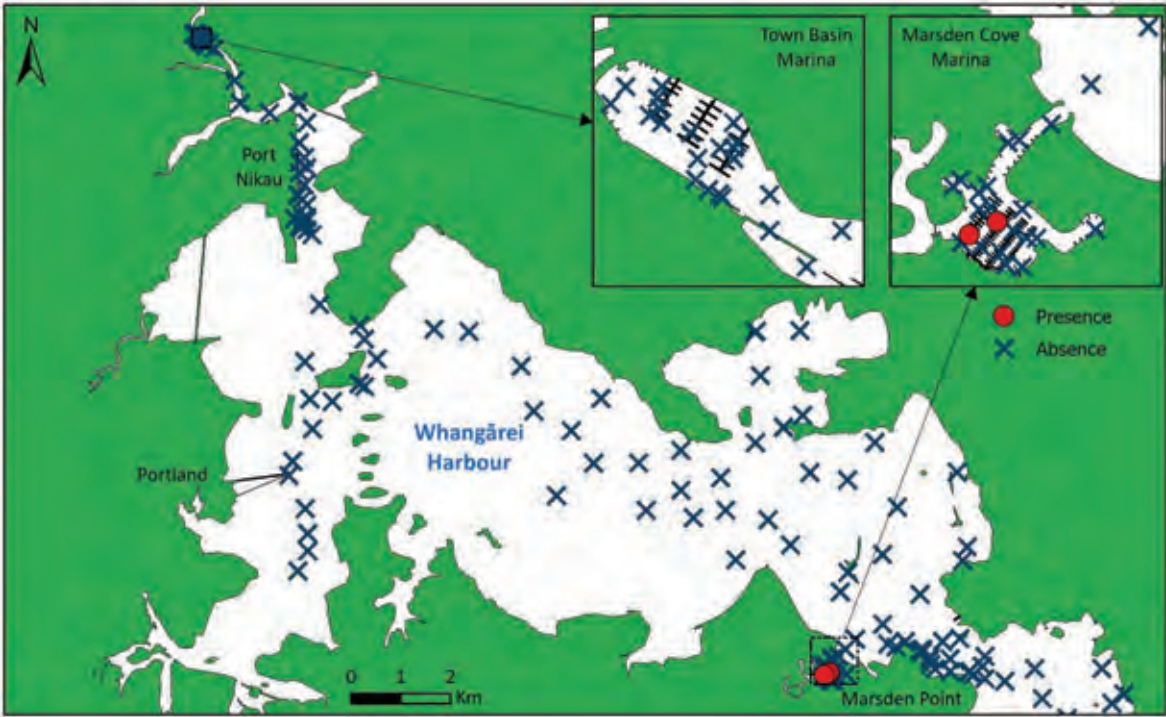
Whangārei Harbour

Winter 2023

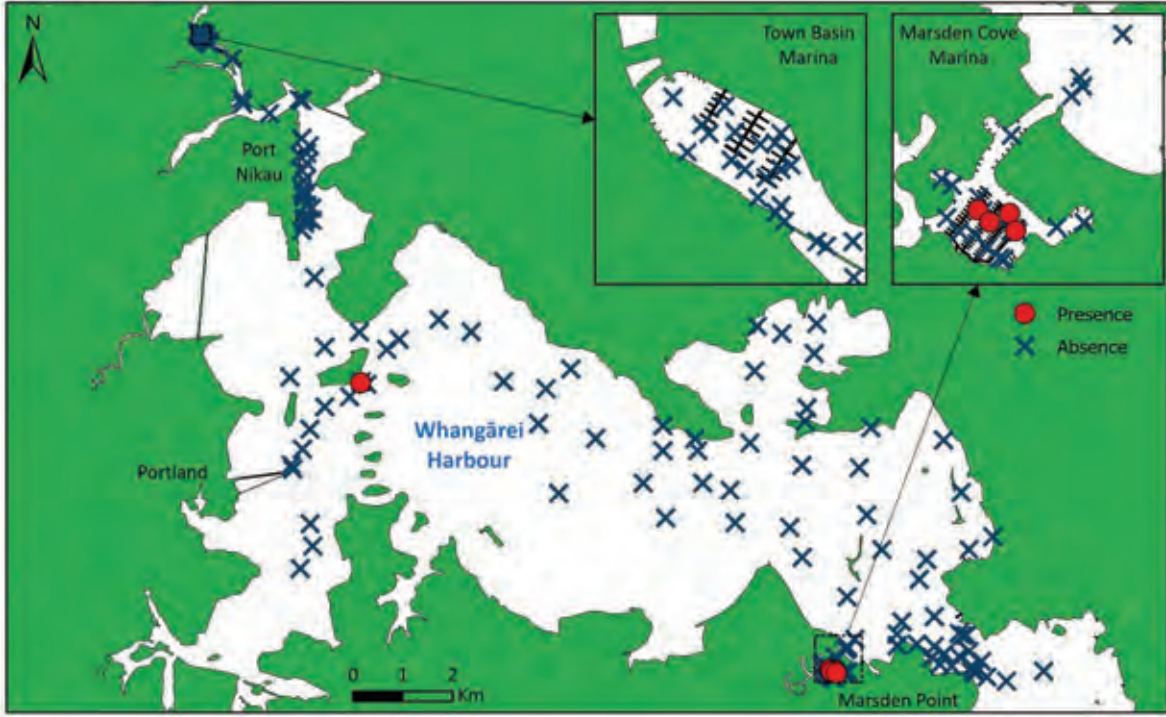
Didemnum vexillum



Whangārei Harbour
Winter 2023
Diplosoma listerianum



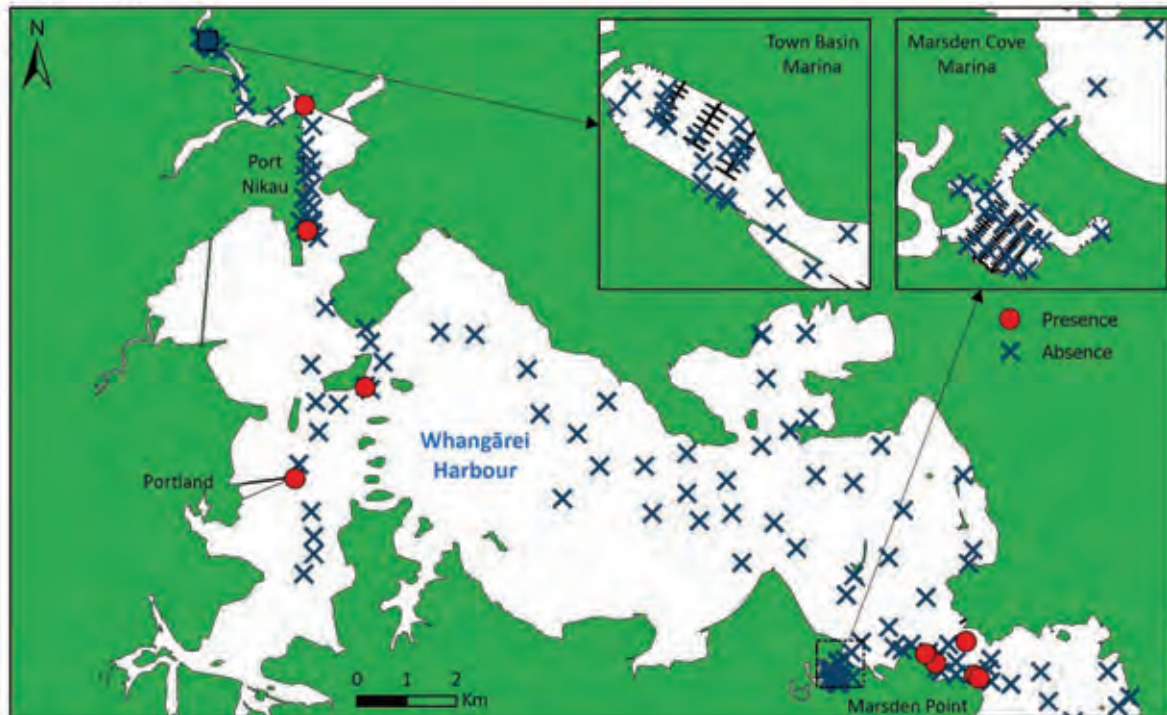
Whangārei Harbour
Summer 2023-24
Diplosoma listerianum



Whangārei Harbour

Winter 2023

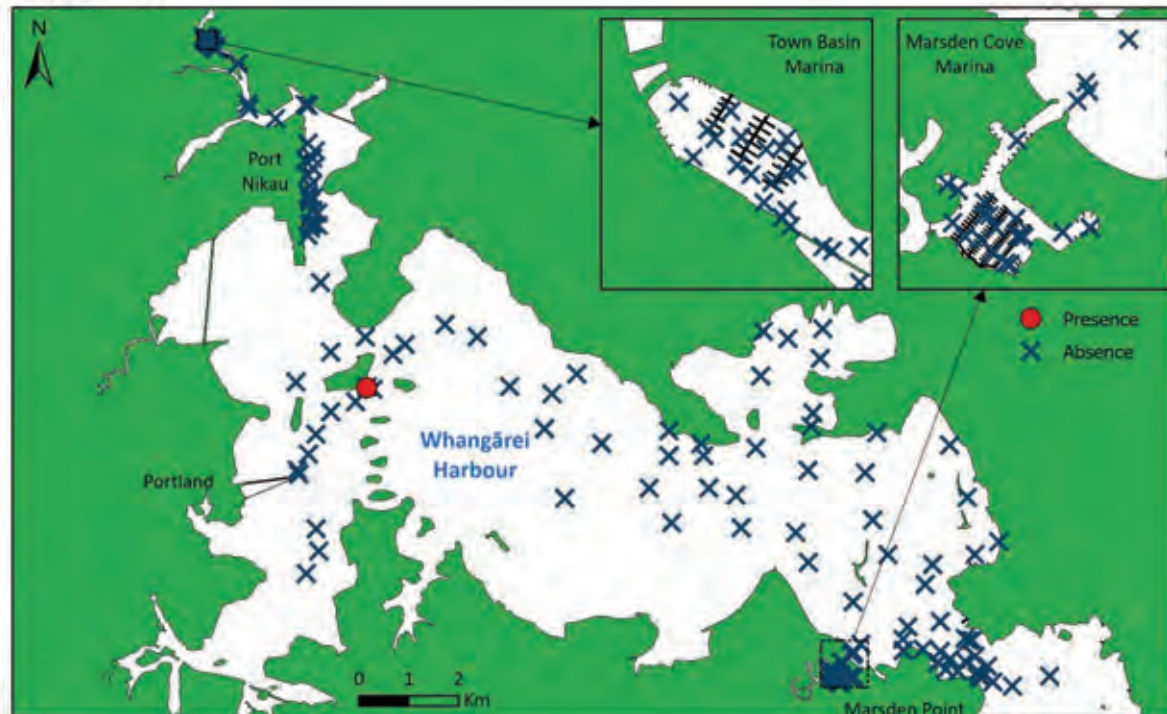
Ectopleura spp.



Whangārei Harbour

Summer 2023-24

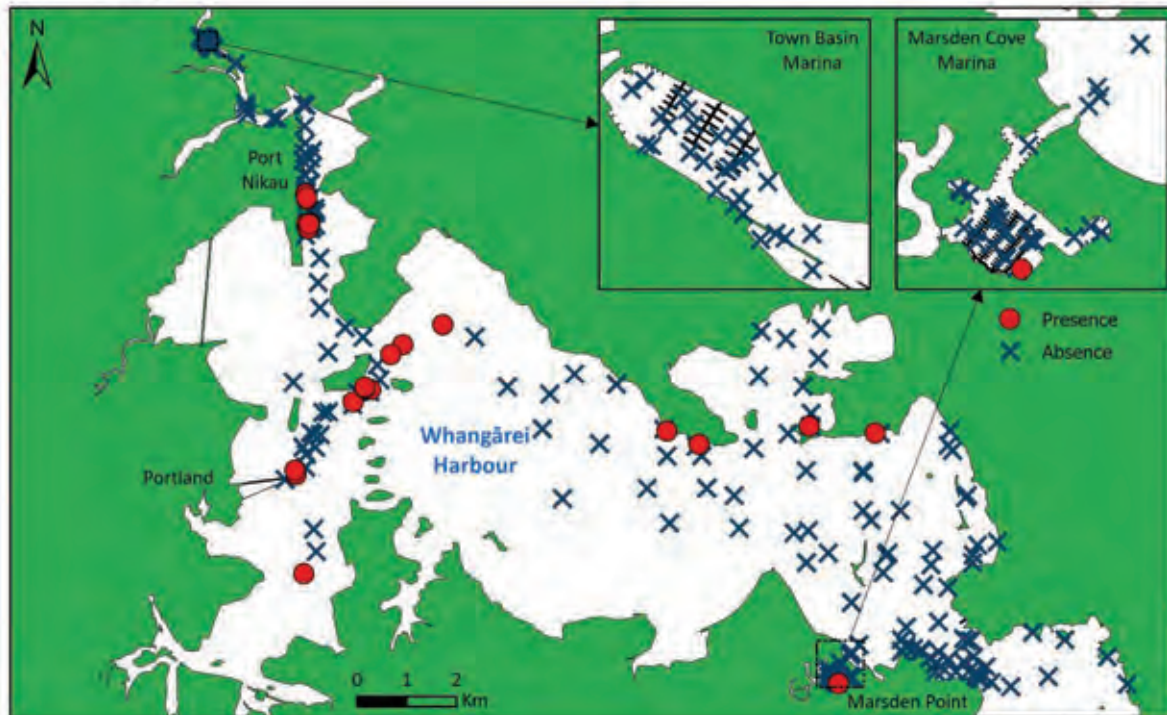
Ectopleura spp.



Whangārei Harbour

Winter 2023

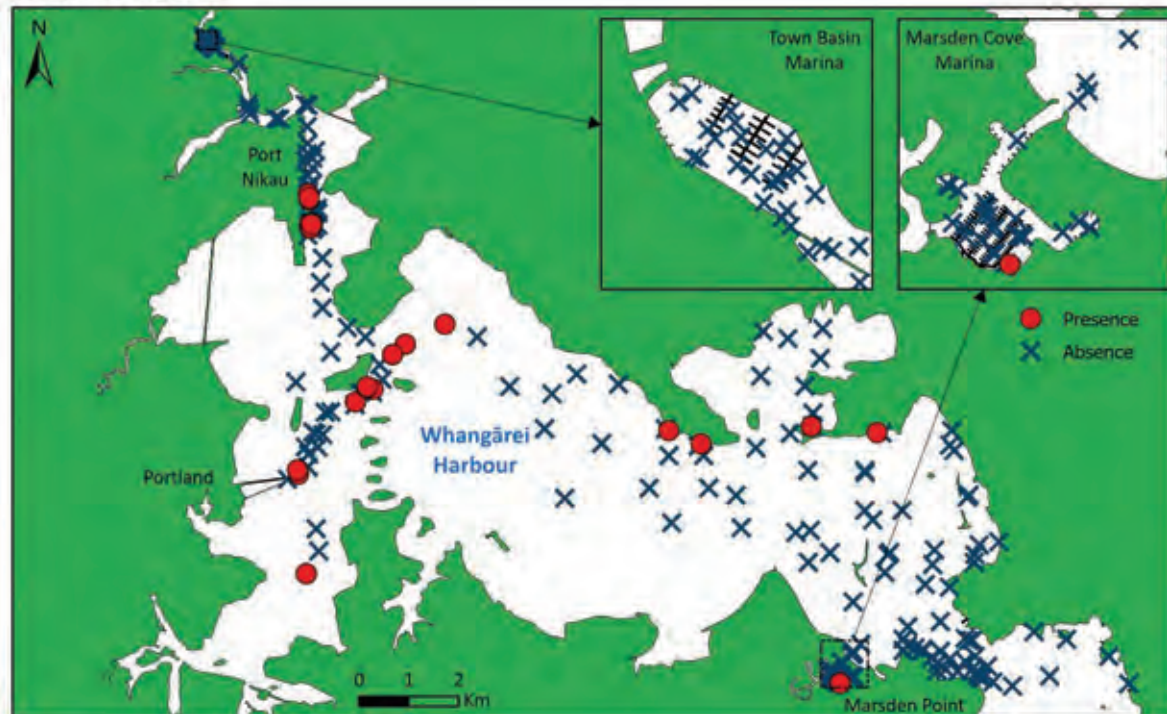
Eudistoma elongatum



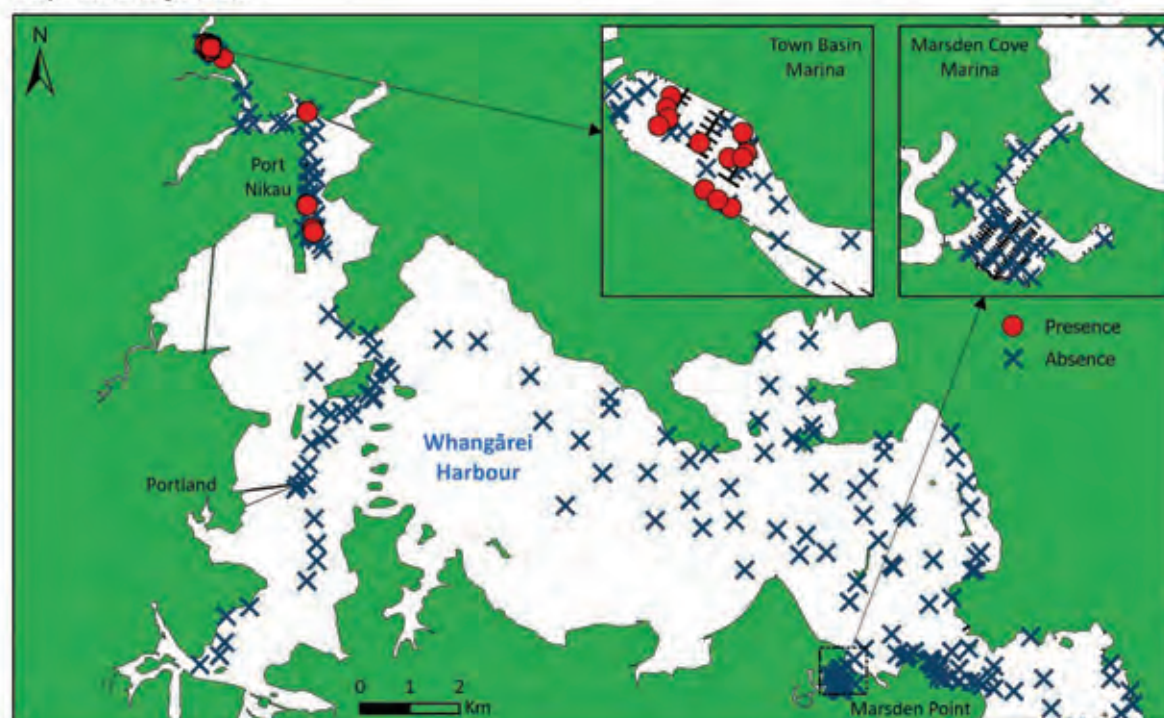
Whangārei Harbour

Summer 2023-24

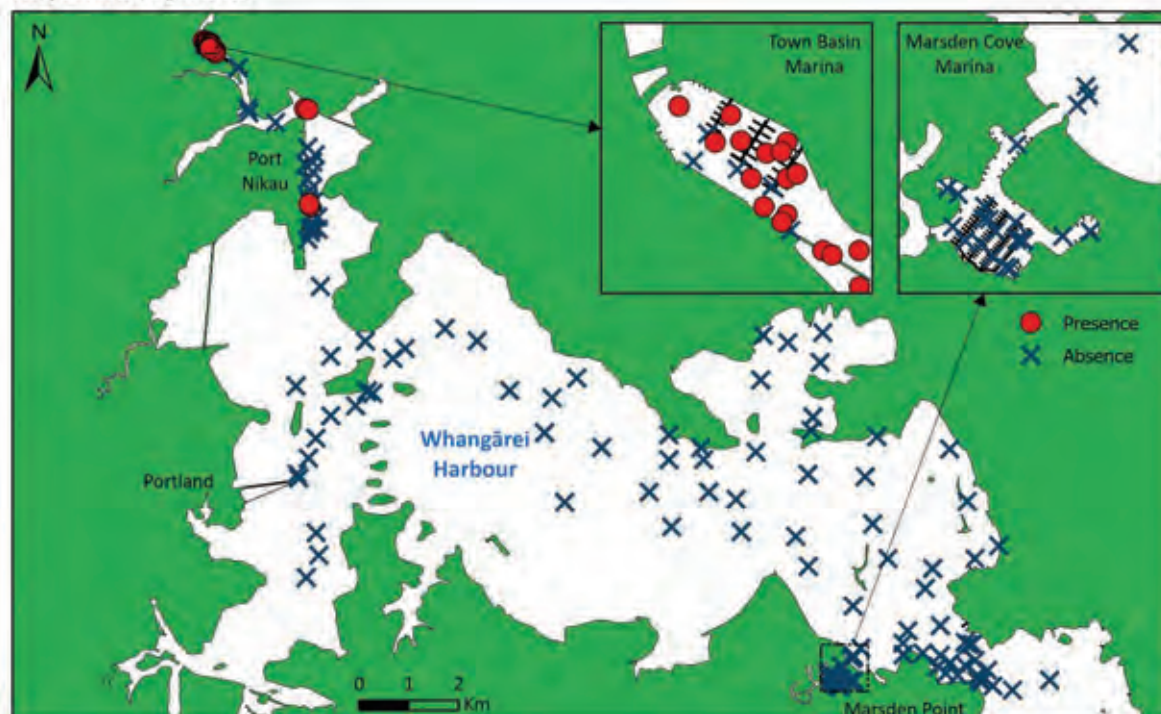
Eudistoma elongatum



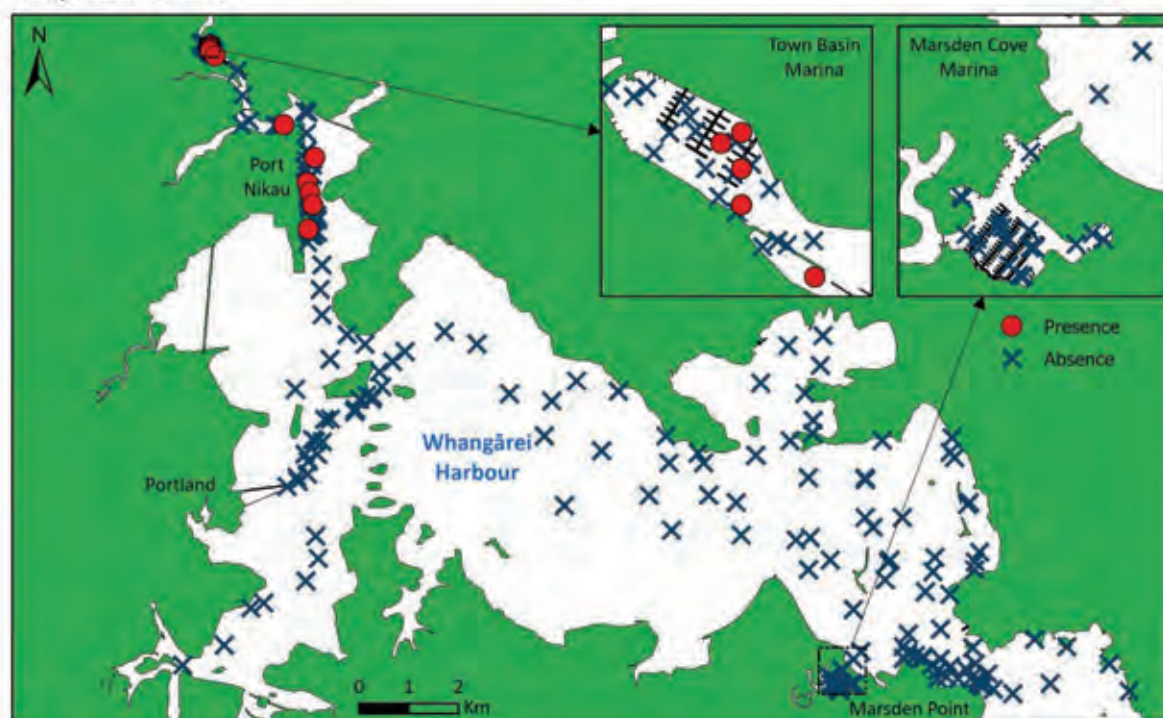
Whangārei Harbour
 Winter 2023
Ficopomatus enigmaticus



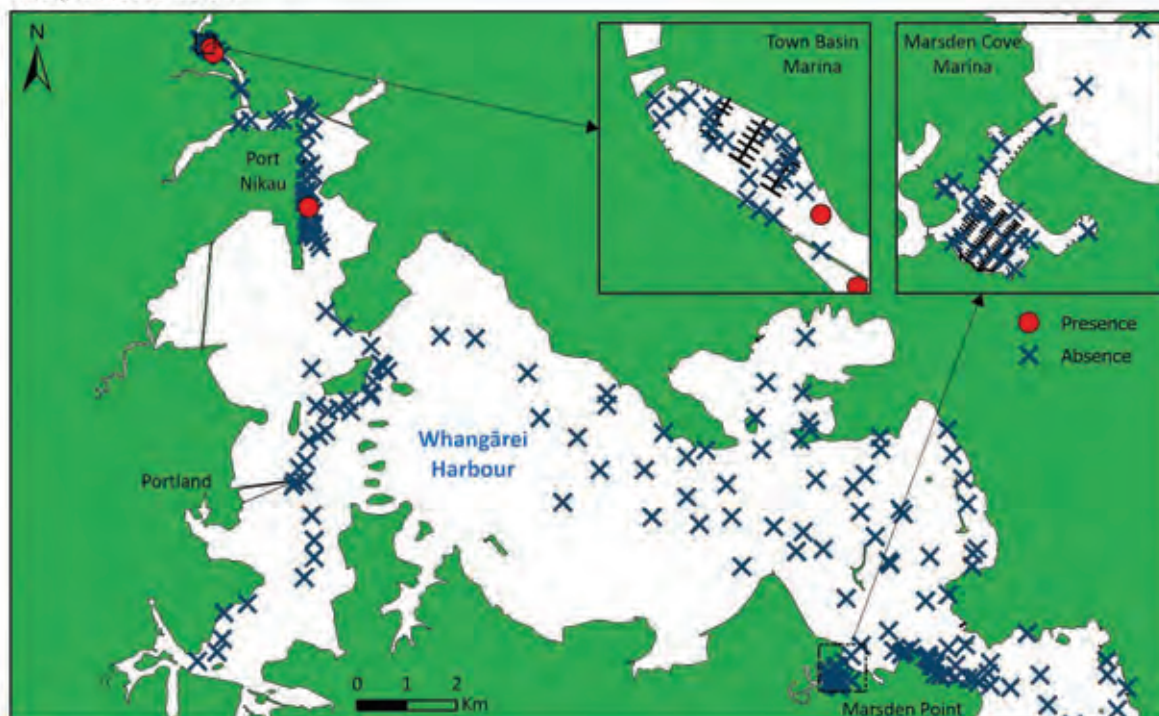
Whangārei Harbour
 Summer 2023-24
Ficopomatus enigmaticus



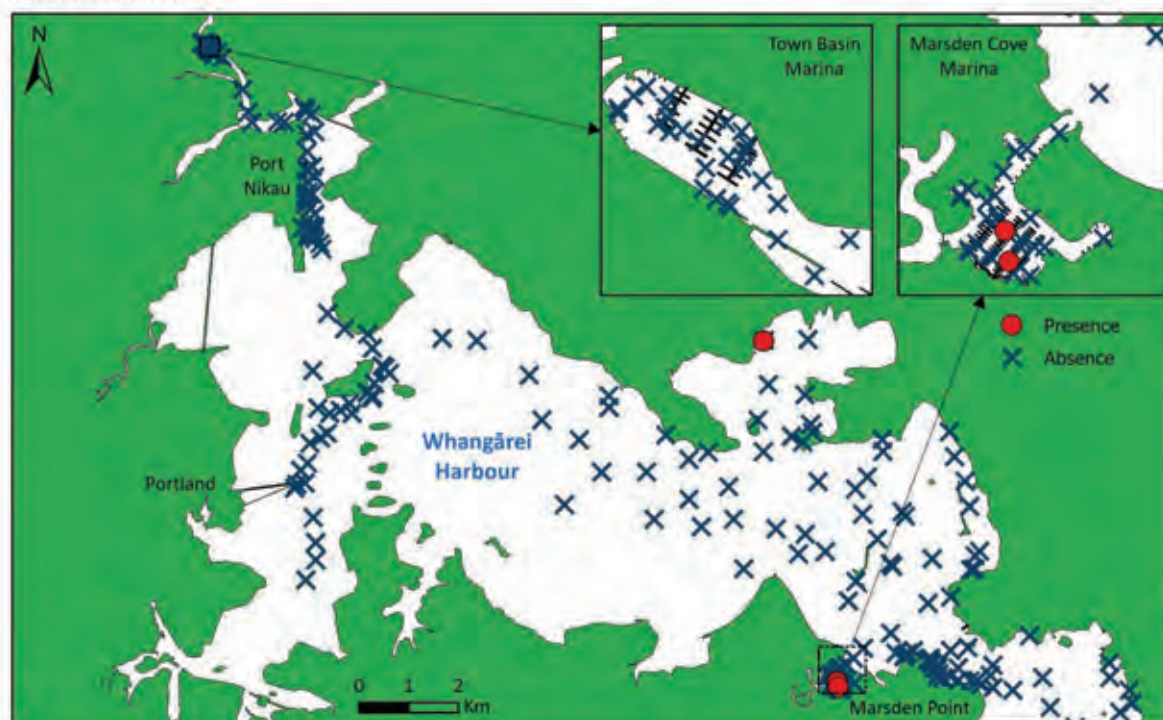
Whangārei Harbour
 Winter 2023
Metapenaeus bennettiae



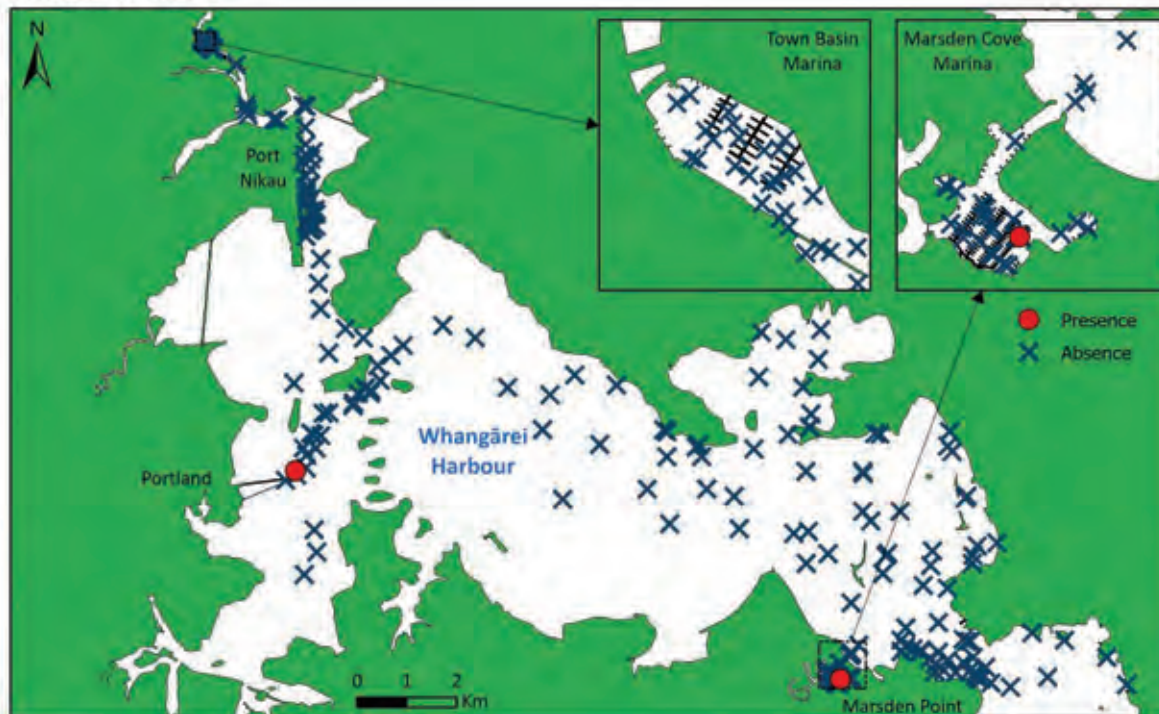
Whangārei Harbour
 Summer 2023-24
Metapenaeus bennettiae



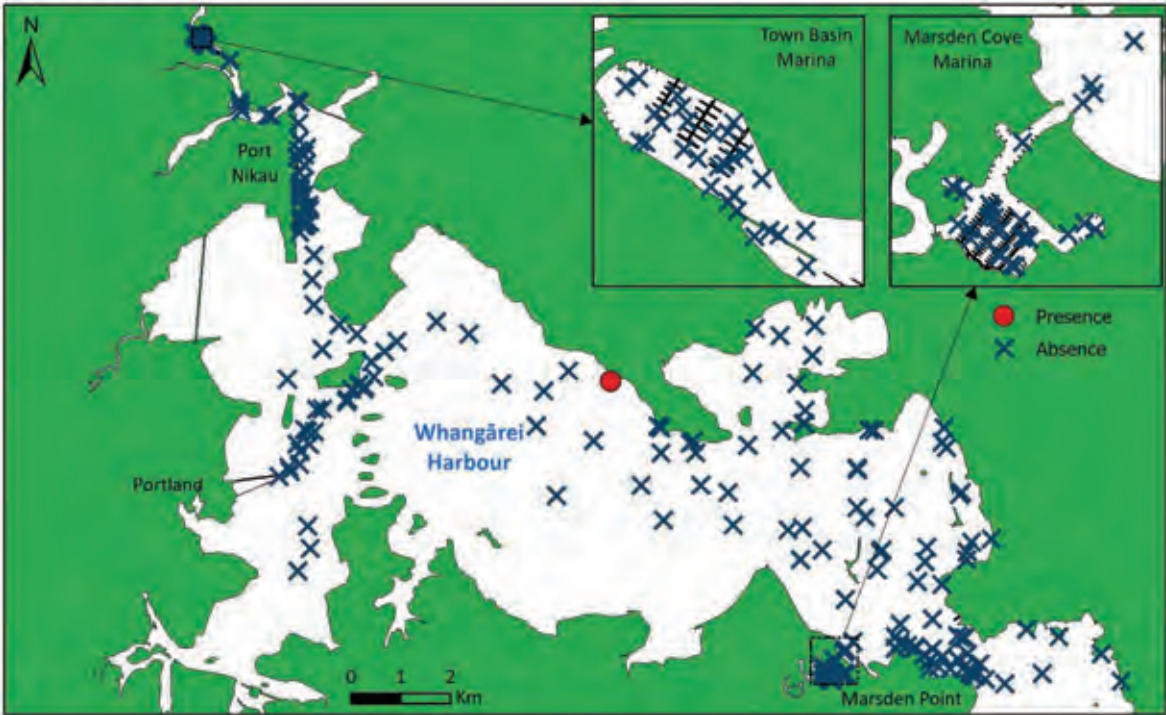
Whangārei Harbour
 Winter 2023
Omobranchus anolius



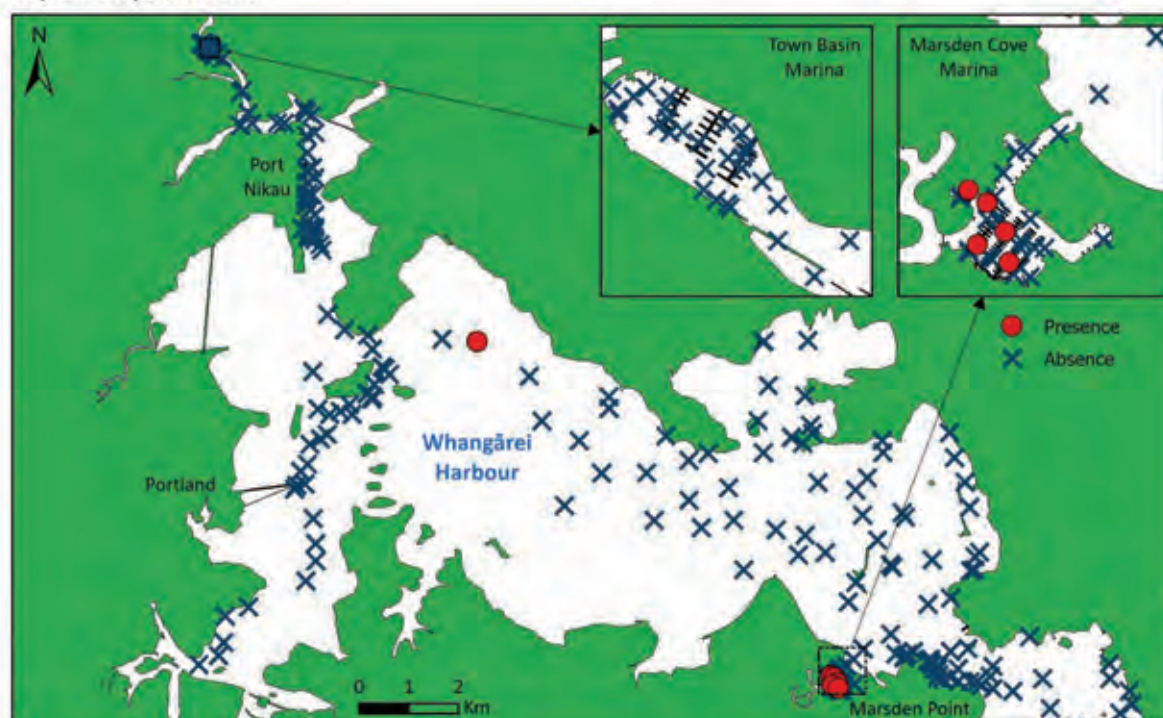
Whangārei Harbour
 Summer 2023-24
Omobranchus anolius



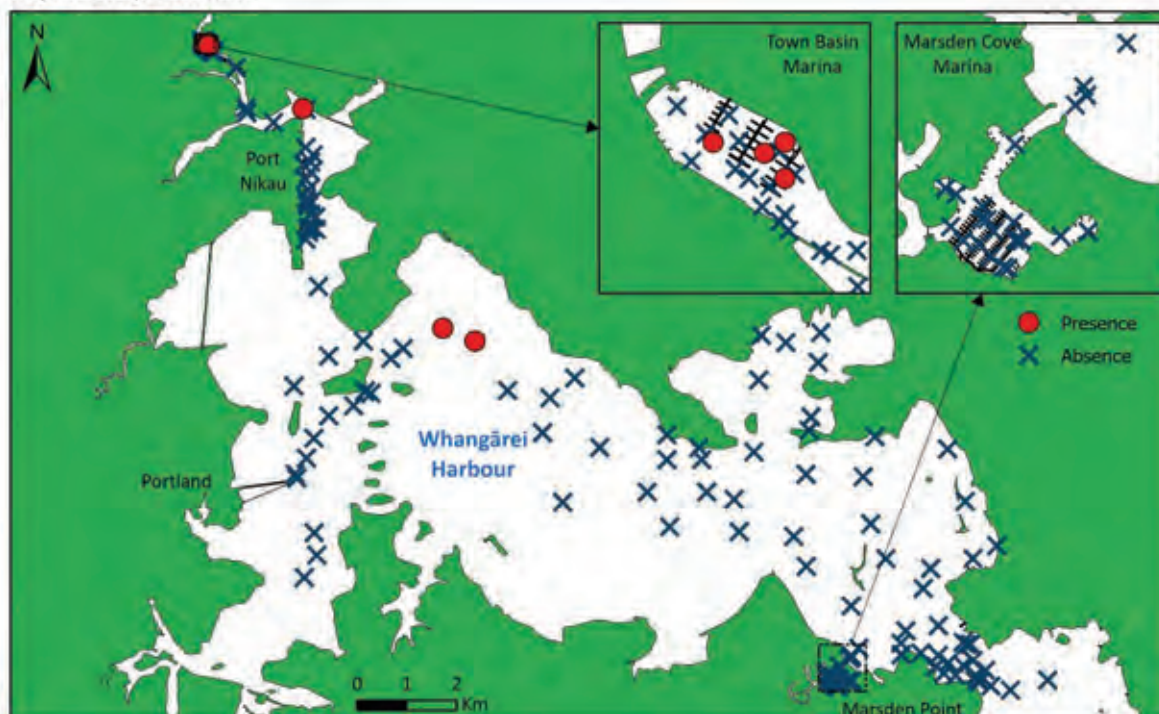
Whangārei Harbour
Summer 2023-24
Oratosquilla oratoria



Whangārei Harbour
 Winter 2023
Polyandrocarpa zorritensis



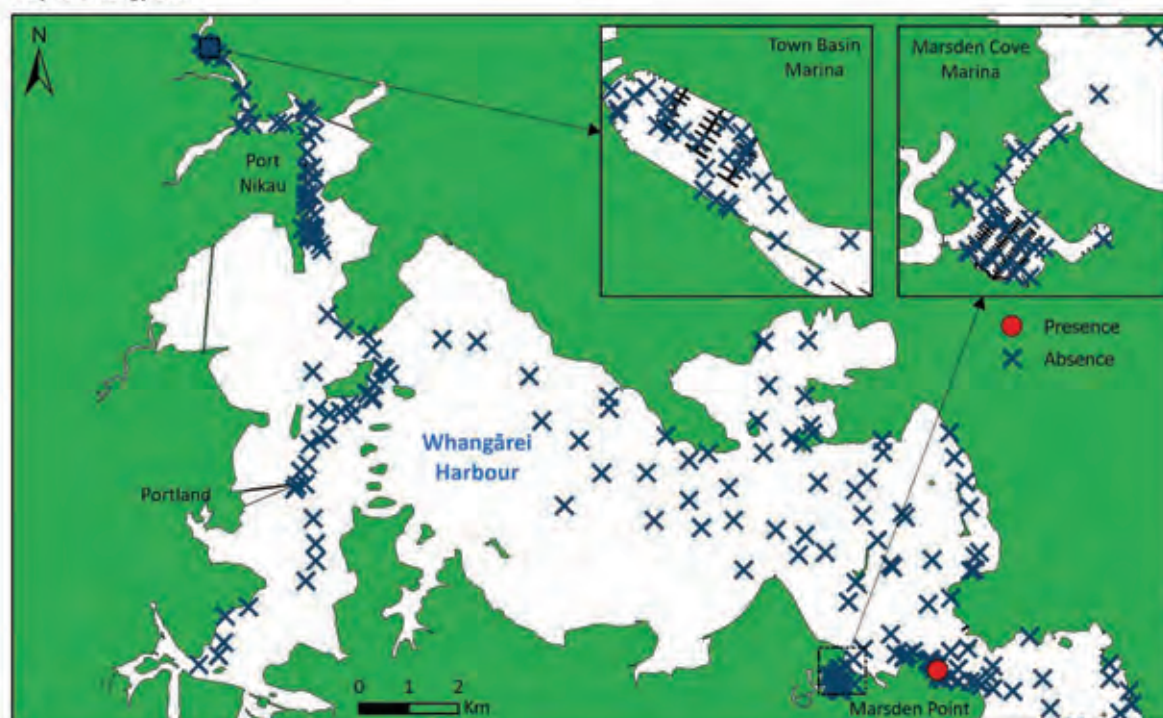
Whangārei Harbour
 Summer 2023-24
Polyandrocarpa zorritensis



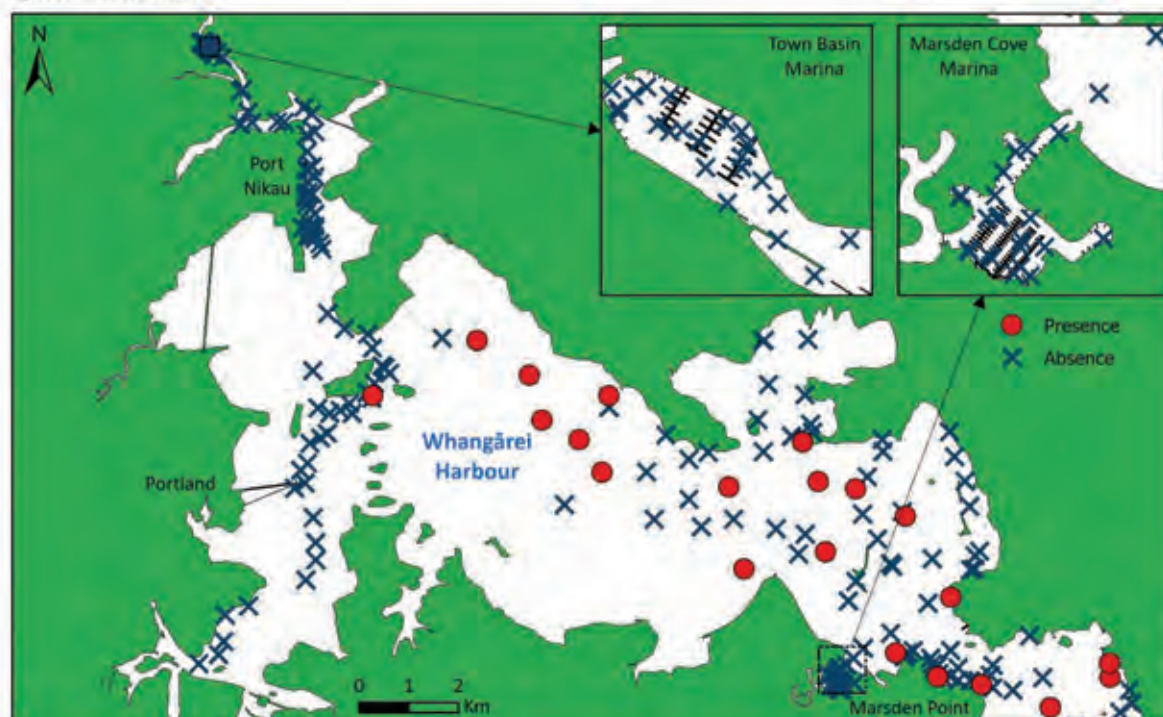
Whangārei Harbour

Winter 2023

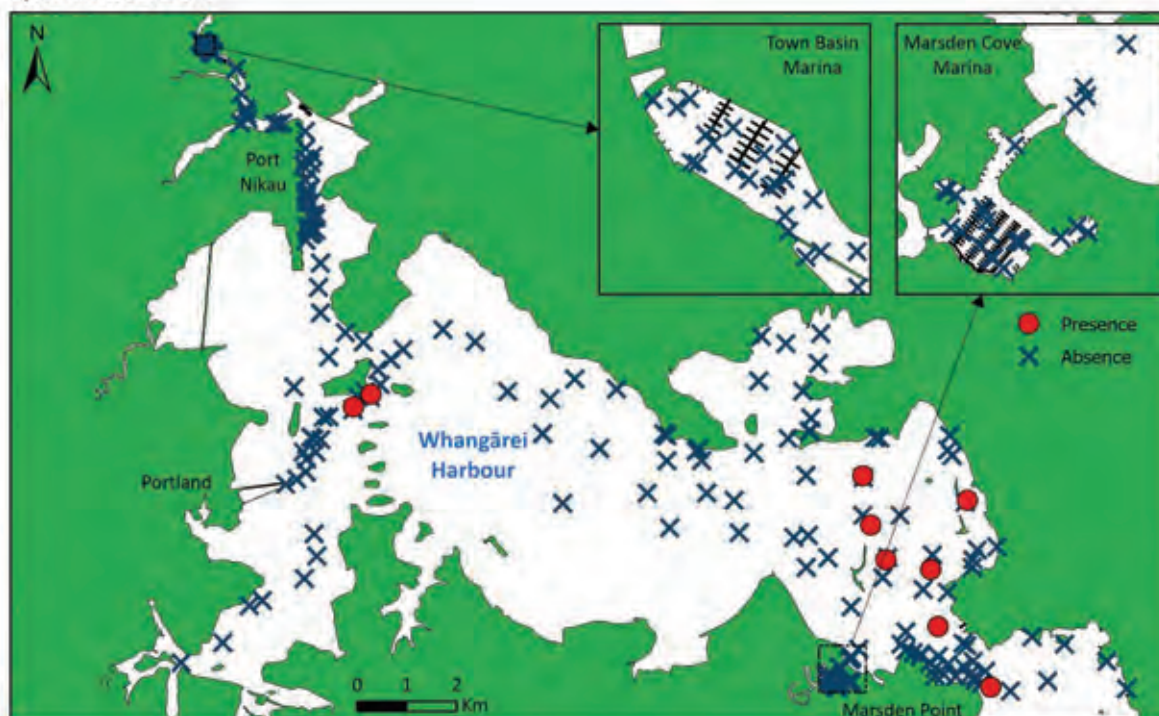
Polycera hedgpethi



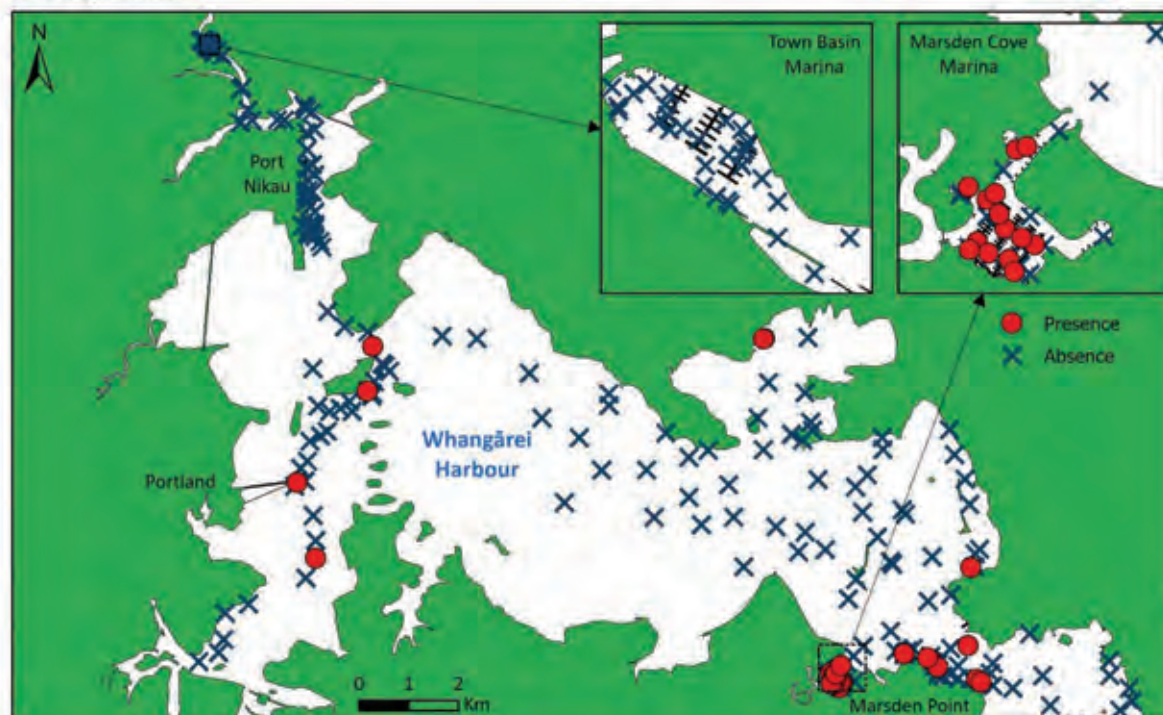
Whangārei Harbour
 Winter 2023
Pyromaia tuberculata



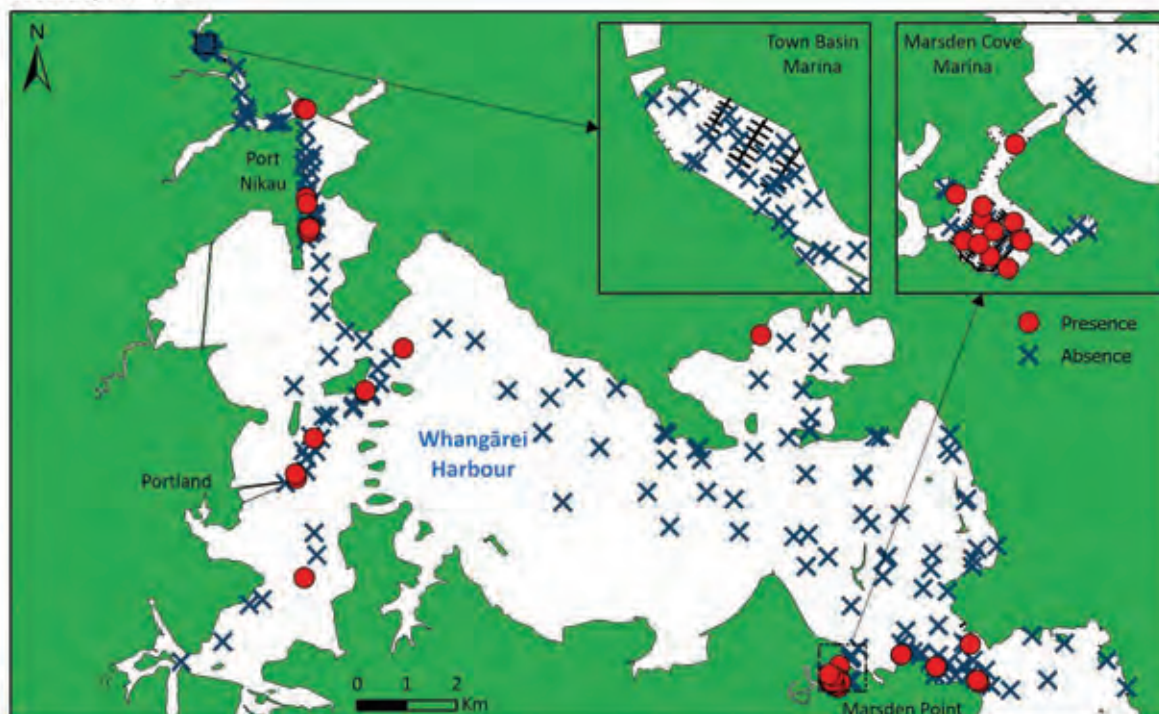
Whangārei Harbour
 Summer 2023-24
Pyromaia tuberculata



Whangārei Harbour
 Winter 2023
Sabella spallanzanii



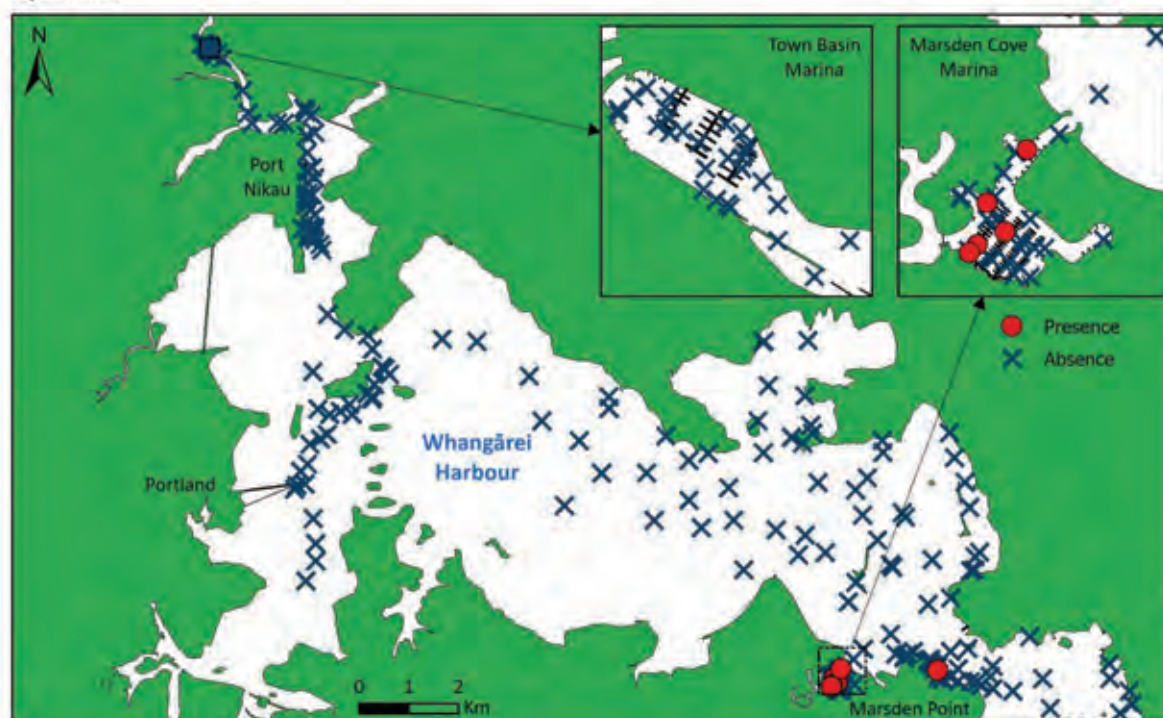
Whangārei Harbour
 Summer 2023-24
Sabella spallanzanii



Whangārei Harbour

Winter 2023

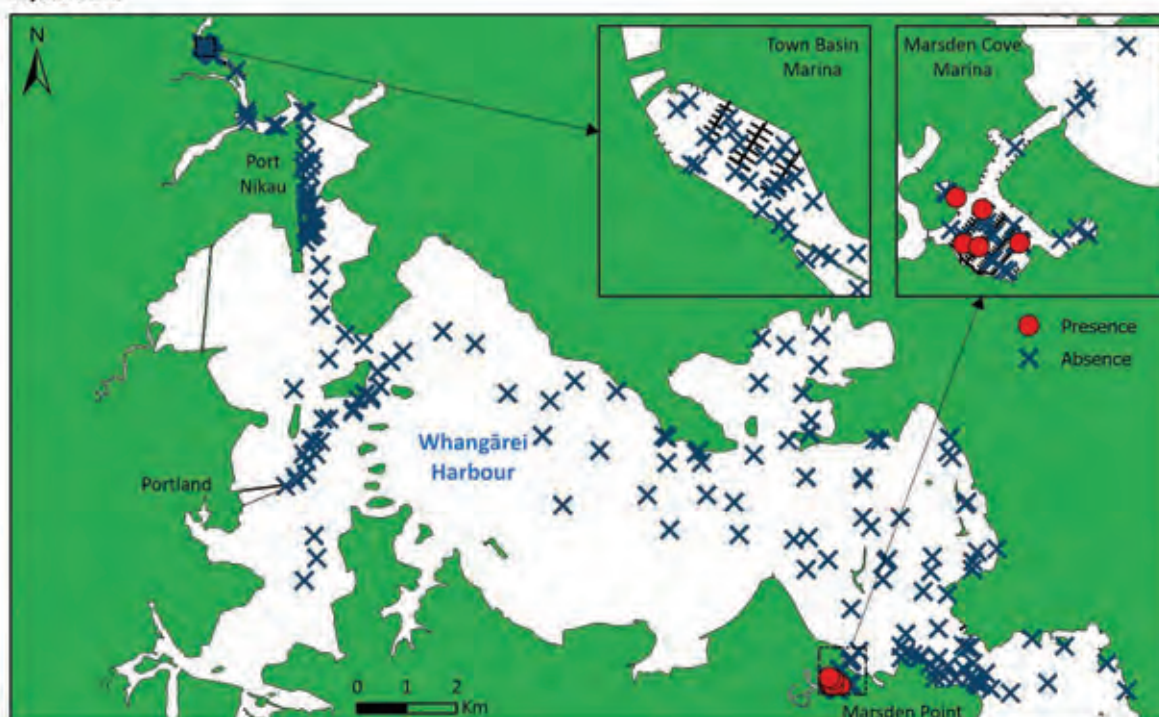
Styela clava



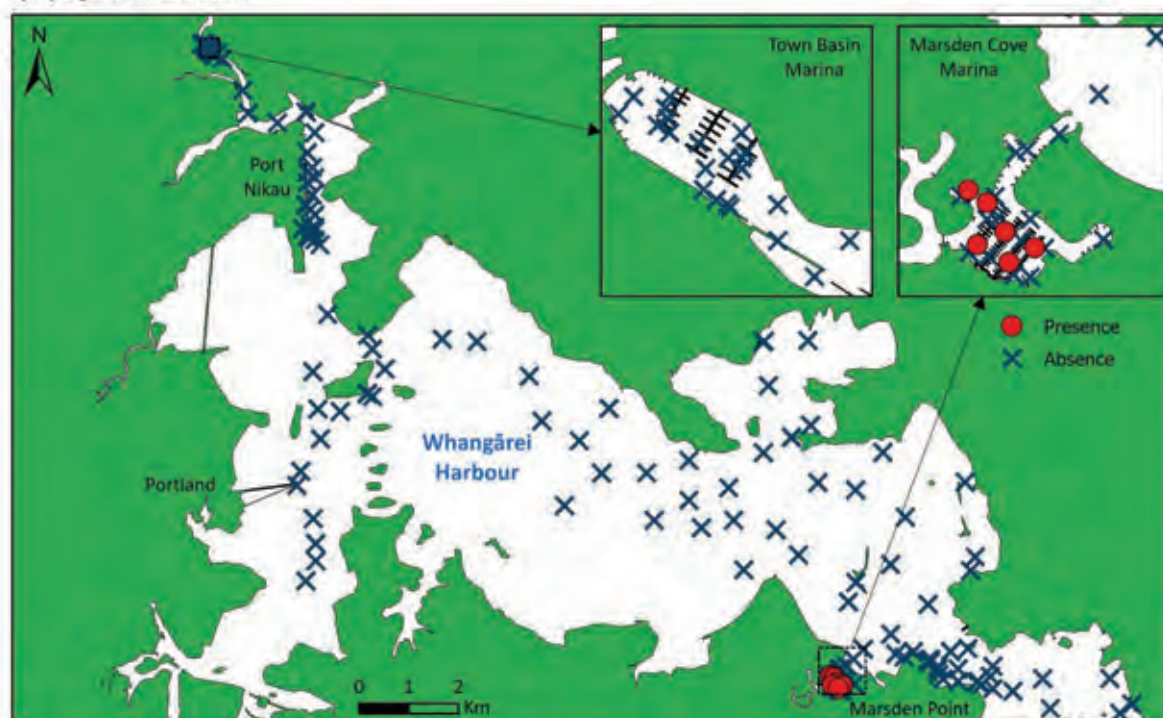
Whangārei Harbour

Summer 2023-24

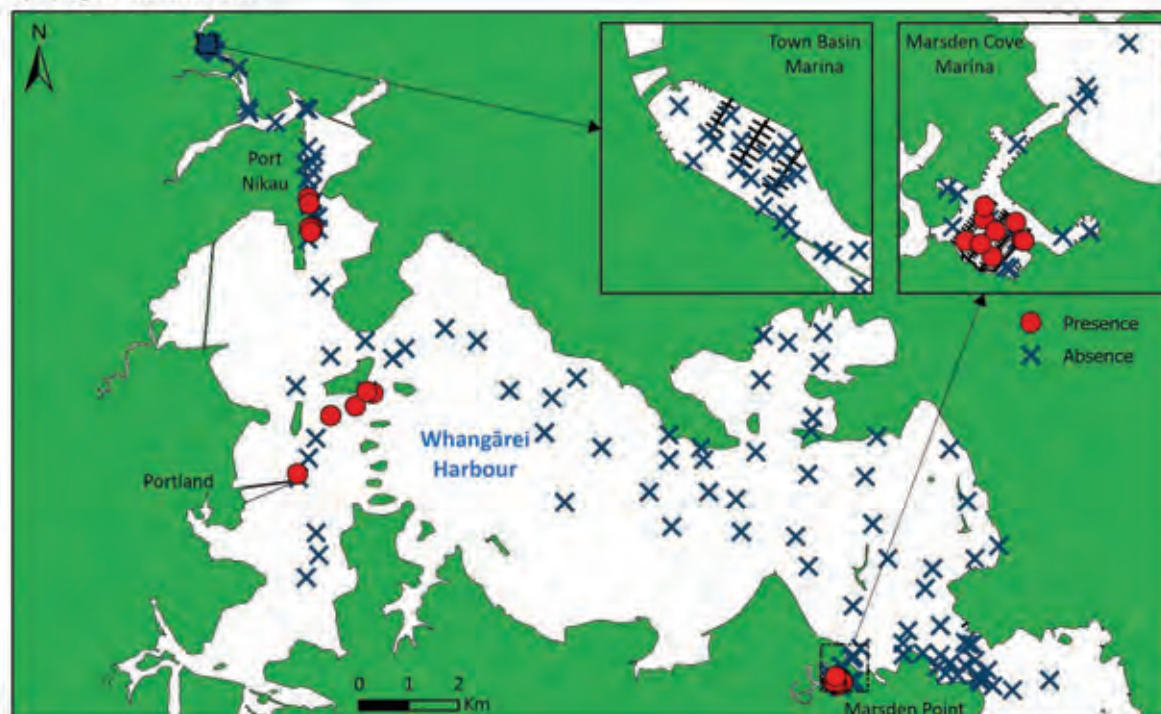
Styela clava



Whangārei Harbour
 Winter 2023
Symplegma brakenhielmi



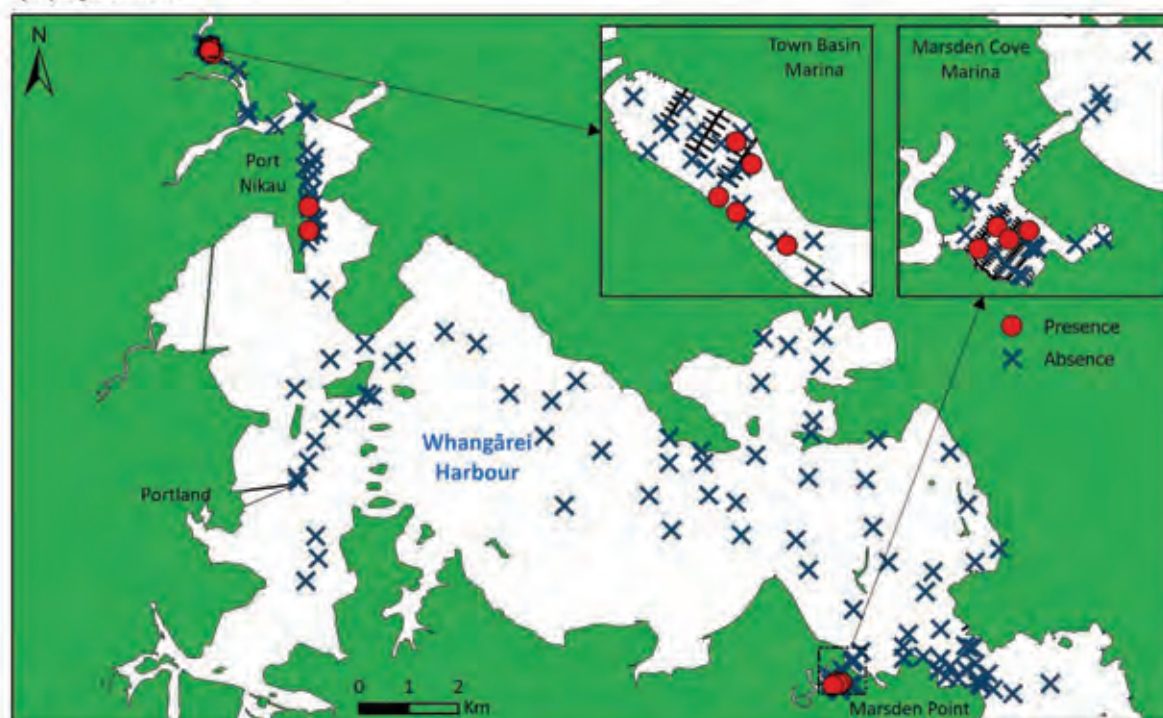
Whangārei Harbour
 Summer 2023-24
Symplegma brakenhielmi



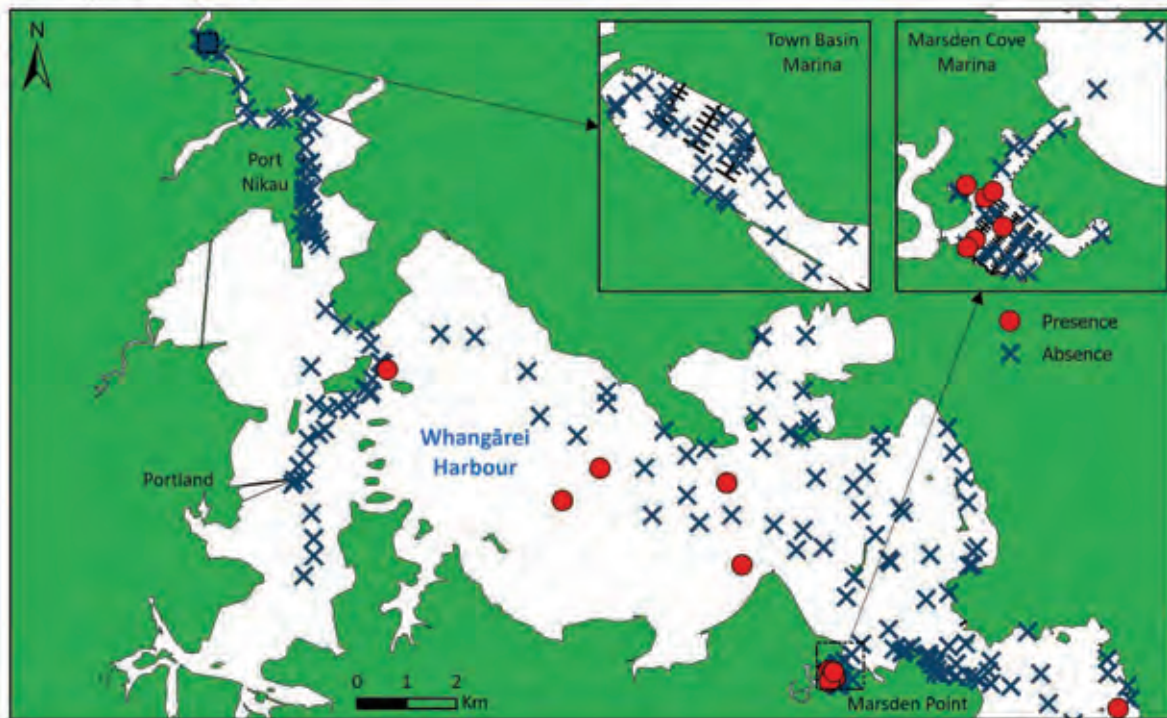
Whangārei Harbour

Summer 2023-24

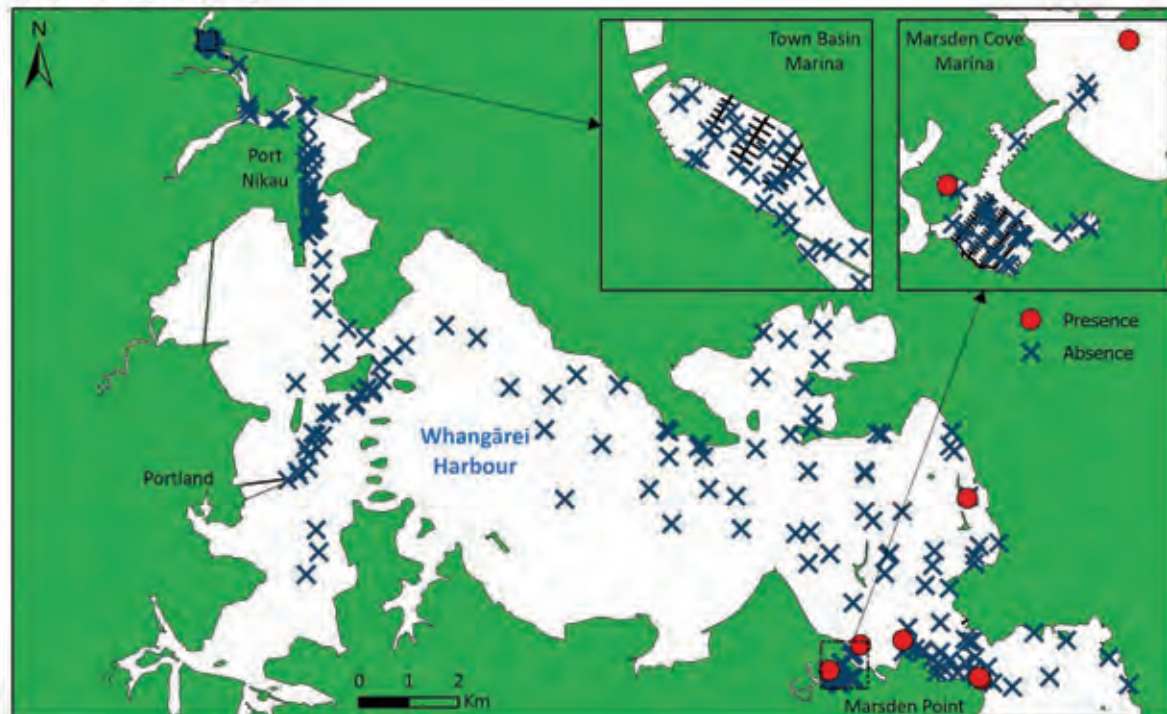
Symplegma rubra



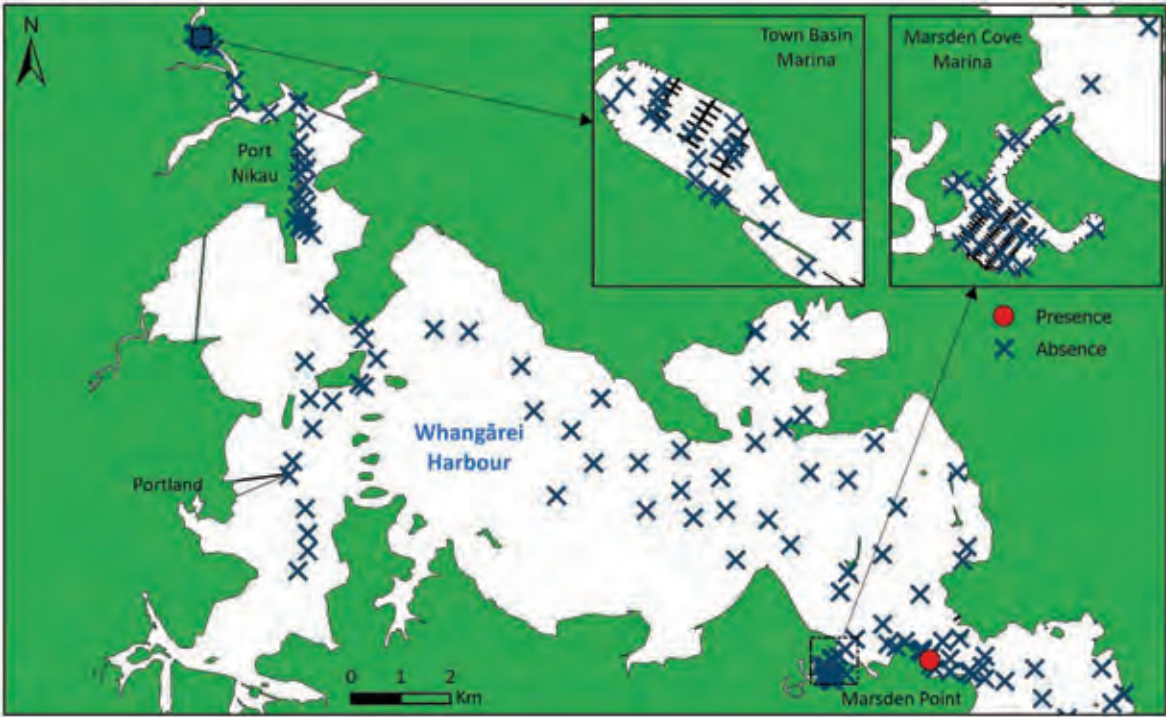
Whangārei Harbour
 Winter 2023
Thalamoporella californica



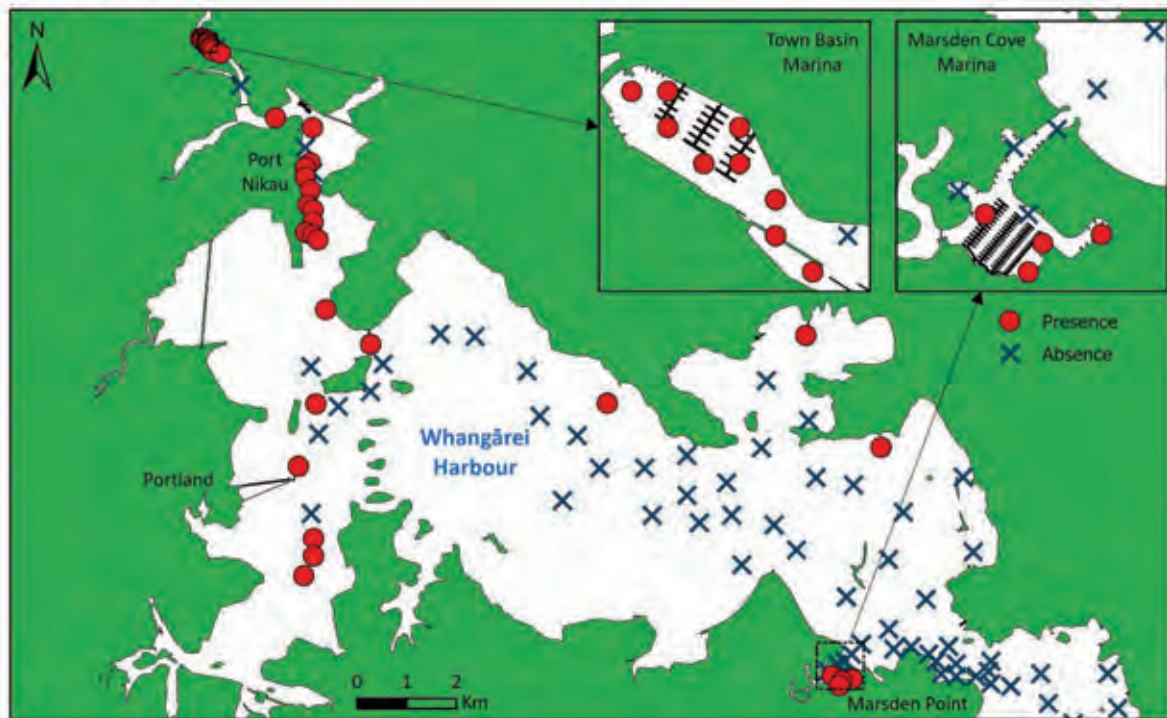
Whangārei Harbour
 Summer 2023-24
Thalamoporella californica



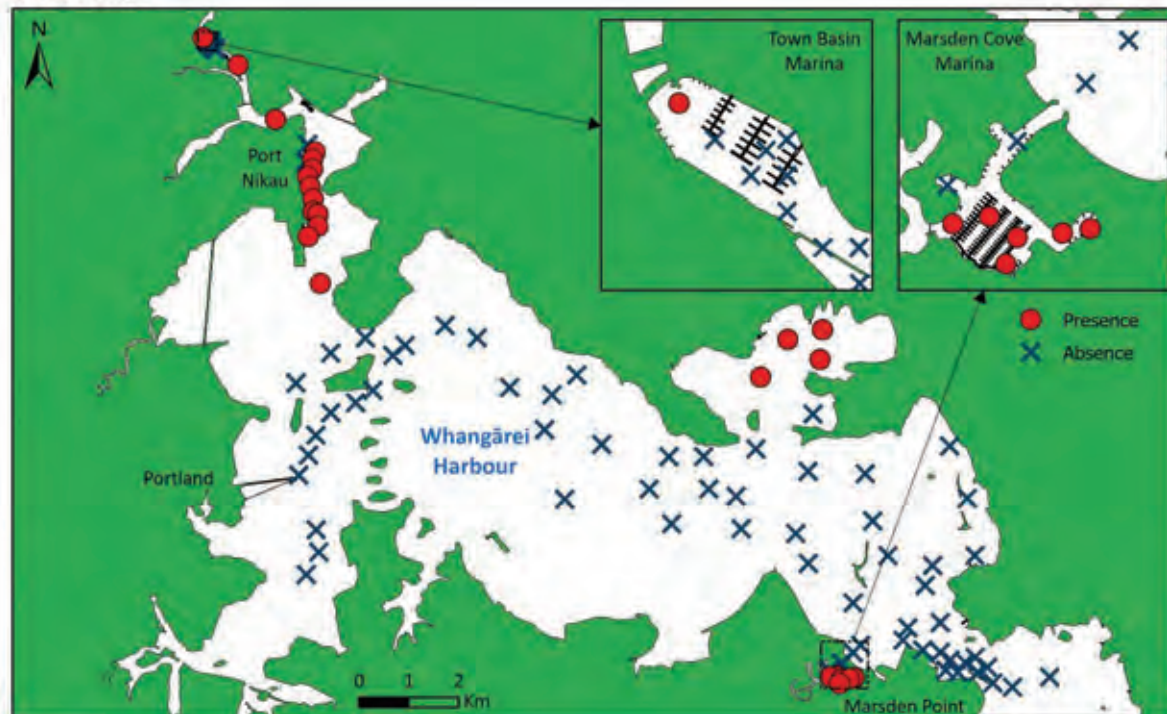
Whangārei Harbour
Winter 2023
Thecacera pennigera



Whangārei Harbour
 Winter 2023
Theora lubrica



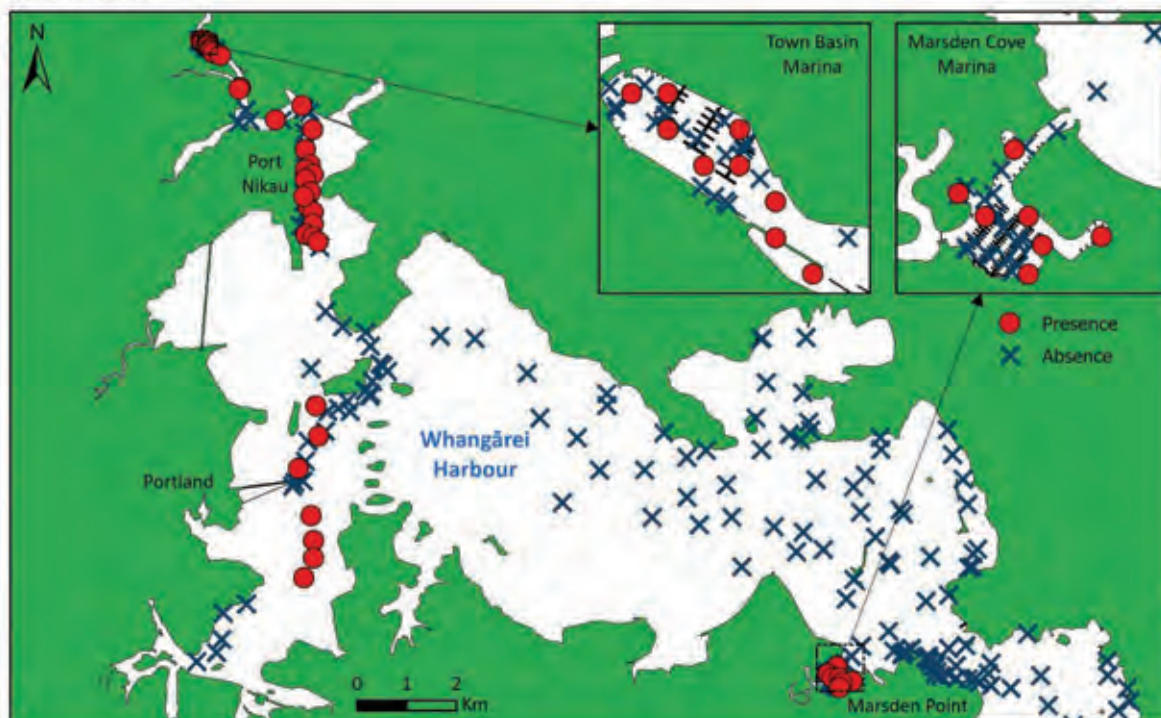
Whangārei Harbour
 Summer 2023-24
Theora lubrica



Whangārei Harbour

Winter 2023

Tritia burchardi



Whangārei Harbour

Summer 2023-24

Tritia burchardi

