Ministry for Primary Industries
Manatū Ahu Matua

Marine High Risk Site Surveillance Programme

Annual report for all High Risk Sites 2015–16 (Project 12099)

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Executive Summary

The Marine High Risk Site Surveillance (MHRSS) Programme is a national programme of surveys that are targeted at the early detection of particular High Risk marine non-indigenous species (NIS). The primary objective of the MHRSS Programme is to detect incursions of New to New Zealand non-indigenous organisms listed on the Unwanted Organisms Register at High Risk Sites throughout New Zealand. The MHRSS Programme also has two secondary objectives, which are: (i) to detect incursions of marine NIS or cryptogenic organisms not previously recorded in New Zealand, and; (ii) to detect range extensions by marine NIS or cryptogenic organisms that are already established in New Zealand waters. The MHRSS Programme is designed to detect the presence of a group of five primary (*Asterias amurensis, Carcinus maenas, Caulerpa taxifolia, Eriocheir sinensis* and *Potamocorbula amurensis*), and four secondary (*Arcuatula senhousia, Eudistoma elongatum, Sabella spallanzanii* and *Styela clava*) target non-indigenous marine animals and plants.

This Annual Report details the targeted surveillance surveys at the 11 High Risk Sites (ports and marinas) covered by the MHRSS Programme during the periods May–September 2015 (the Winter 2015 round of surveys) and November 2015–March 2016 (the Summer 2015–16 round of surveys).

The number of locations sampled met the target sampling effort on all surveys, apart from the Winter 2015 Otago Harbour survey (99.6% target achieved – sampling count error in the field), with 2934 locations (101.1% of target) surveyed during Winter 2015, and 2918 locations (100.5% of target) surveyed during Summer 2015–16. No primary target species were detected, but all four secondary target species were detected at various locations and times:

- *Arcuatula senhousia* was recorded during the following surveys: Auckland (Winter 2015, Summer 2015–16); and Whangarei (Winter 2015, Summer 2015–16).
- *Eudistoma elongatum* was recorded during the following surveys: Opua (Winter 2015, Summer 2015–16); and Whangarei (Winter 2015, Summer 2015–16).
- *Sabella spallanzanii* was recorded during the following surveys: Auckland (Winter 2015, Summer 2015–16); Lyttelton (Winter 2015), Nelson (Winter 2015, Summer 2015–16); Tauranga (Summer 2015–16); Wellington (Summer 2015–16); and Whangarei (Winter 2015, Summer 2015–16).
- *Styela clava* was recorded during the following surveys: Auckland (Winter 2015, Summer 2015–16); Lyttelton (Winter 2015, Summer 2015–16); Nelson (Winter 2015, Summer 2015–16); Opua (Winter 2015, Summer 2015–16); Otago (Winter 2015, Summer 2015–16); Picton (Winter 2015, Summer 2015–16); Tauranga (Winter 2015, Summer 2015-16); Wellington (Summer 2015–16); and Whangarei (Winter 2015, Summer 2015–16).

Numbers of specimens collected and sent to the Marine Invasives Taxonomic Service (MITS) for formal identification per survey ranged from none to 16, and the total numbers of specimens sent were 28 for the Winter 2015 round of surveys and 72 for the Summer 2015–16 round.

Seven of the 28 specimens sent to MITS from the Winter 2015 survey were NIS, including the red algae *Grateloupia turuturu* and *Schizymenia apoda* (both Lyttelton), the colonial ascidians *Botrylloides leachii* and *Didemnum vexillum* (both Opua), and the bryozoans *Celleporaria nodulosa* (Tauranga) and *Celleporaria umbonatoidea* (Opua).

- The record of *S. apoda* from Lyttelton represents a MHRSS Programme **range extension** (previously known from Otago, Picton and Wellington harbours).

Twenty-seven of the 72 specimens sent to MITS from the Summer 2015–16 survey were NIS, including the brown algae *Stictyosiphon soriferus* (Wellington) and *Undaria pinnatifida* (Port Taranaki and Wellington), the red algae *Grateloupia turuturu* (Port Taranaki) and *Griffithsia crassiuscula* (Otago), the caprellid amphipod *Caprella mutica* (Picton), the annelid (polychaete worm) *Sabella spallanzanii* (Auckland and Tauranga), the colonial ascidian *Botrylloides leachii* (Otago), the solitary ascidians *Ascidiella aspersa* (Otago), *Ciona intestinalis* (Picton), *Clavelina lepadiformis* (Picton), *Polyandrocarpa zorritensis* (Whangarei) and *Styela clava* (Tauranga), the bryozoan *Amathia verticillata* (Auckland, Nelson and Tauranga), and the sponge *Halisarca dujardini* (Wellington).

- The record of *P. zorritensis* from Marsden Cove Marina in Whangarei Harbour represents a MHRSS Programme **range extension** (previously known from Tauranga).
- The record of *C. mutica* from Waikawa Marina in Picton represents a MHRSS Programme **range extension** (previously known from Bluff, Lyttelton and Otago).
- The record of *C. lepadiformis* from Waikawa Marina in Picton represents a MHRSS Programme **range extension** (previously known from Nelson).

A sponge collected during the Whangarei Harbour summer survey (*Phlyctaenopora (Barbozia)* n. sp.) represents a **New to New Zealand** native species.

MPI was informed of the range extensions and New to New Zealand species at the time of collection, or the time that specimen identity was confirmed.

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Introduction

The Marine High Risk Site Surveillance (MHRSS) Programme is a national programme of surveys that are targeted at the early detection of particular High Risk marine non-indigenous marine species (NIS), and is part of the Ministry for Primary Industries' (MPI) wider marine biosecurity programme. The MHRSS Programme, currently delivered by NIWA under contract to MPI, repeats surveillance work developed and undertaken in 2002–04, 2005–06 and 2008–present, also by NIWA, at 11 High Risk Sites around the country (Figure 1).

The 11 High Risk Sites for the MHRSS Programme are (from north to south) as follows:

1. Opua Marina/Waikare Inlet;
2. Whangarei Harbour;
3. Auckland (Waitemata) Harbour (including the Viaduct Basin, Hobson West Marina area, the Westhaven Marina, Bayswater Marina, Devonport and Kauri Point Defence Areas);
4. Tauranga Harbour;
5. Port Taranaki (New Plymouth Harbour);
6. Wellington Harbour;
7. Nelson Harbour;
8. Picton Harbour (including marinas and Havelock Marina);
9. Lyttelton Harbour;
10. Otago Harbour;
11. Bluff Harbour.

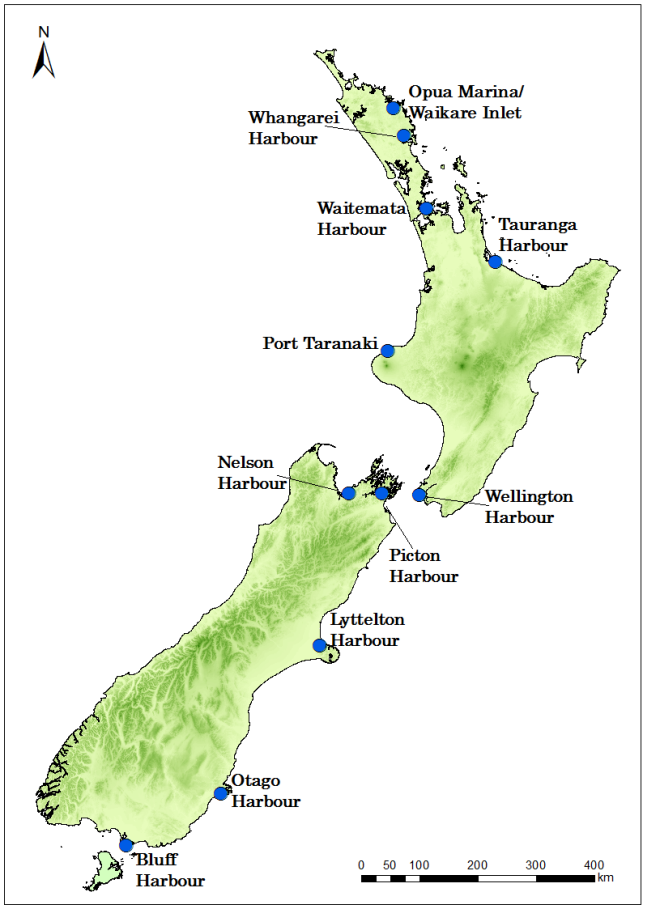

Figure 1: Locations of the 11 High Risk Sites covered by the Marine High Risk Site Surveillance (MHRSS) Programme

Objectives of the Marine High-Risk Site Surveillance Programme

The primary objective of the MHRSS Programme is:

- To detect incursions of New to New Zealand non-indigenous organisms listed on the Unwanted Organisms Register at High Risk Sites throughout New Zealand.

The secondary objectives of the MHRSS Programme are:

- To detect incursions of New to New Zealand non-indigenous or cryptogenic organisms not listed on the Unwanted Organisms Register at High Risk Sites throughout New Zealand.

- To detect incursions (i.e., range extensions) of established non-indigenous or cryptogenic organisms that exhibit characteristics of Pests and Diseases.

Target species

MPI has identified five primary target species which are listed on the Unwanted Organisms register.

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

Additionally, four secondary target organisms[1] are known to be established in New Zealand's coastal waters.

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

This Annual Report details the targeted surveillance in the 11 High Risk Sites covered by the MHRSS Programme in the survey rounds of Winter 2015 and Summer 2015–16.

[1] *Didemnum* sp. was removed from the list of secondary target species by MPI in December 2008 (Email from Brendan Gould, MPIBNZ, to Don Morrisey, NIWA, 12 December 2008). *Sabella spallanzanii* was moved from the primary to the secondary list in June 2011 (MAF Statement of Work for Post Border Surveillance Programmes. National Marine High Risk Site Surveillance Programme – 12099 [10 June 2011])

Summary of survey Activity/Methods

Dates of Marine High Risk Site Surveillance Programme survey activity

The targeted surveillance surveys of the 11 High Risk Sites covered by the MHRSS Programme took place during the periods May–September 2015 (the Winter 2015 round of surveys) and November 2015–March 2016 (the Summer 2015–16 round of surveys). Dates for each survey are provided in Table 1.

Table 1: Dates for the Winter 2015 and Summer 2015–16 Marine High Risk Site Surveillance (MHRSS) Programme surveys

Port	Winter 2015 survey	Summer 2015–16 survey
Auckland (Waitemata) Harbour	8–19 June 2015	30 November–11 December 2015
Bluff Harbour	3–7 August 2015	1–5 February 2016
Lyttelton Harbour	8–12 June 2015	16–20 November 2015
Nelson Harbour	24–28 August 2015	14–18 March 2016
Opua	17–21 August 2015	25–29 January 2016
Otago Harbour	29 June–3 July 2015	30 November–4 December 2015
Picton/Havelock	7–11 September 2015	22–26 February 2016
Port Taranaki	27–31 July 2015	16–20 December 2015
Tauranga Harbour	7–11 September 2015	29 February–4 March 2016
Wellington Harbour	13–17 July 2015	2–6 November 2015
Whangarei Harbour	25–29 May 2015	21–24 and 29–31 March 2016*

*Survey interrupted by unfavourable weather

Marine High Risk Site Surveillance Programme survey techniques

Survey sampling for the MHRSS Programme uses a variety of techniques designed to sample a range of habitat types encompassing soft and hard surface habitats such as mud and gravel bottoms, intertidal rocky shores, and artificial structures, including marina pontoons, pilings, moorings, jetties and commercial vessel berths. The sampling techniques used were: crab condo lines; crab box traps; benthic sled tows; diver searches; and shore searches. The habitats and species targeted by each sampling technique are detailed in Appendix 1.

Sample locations for crab box trap lines, benthic sled tows, and diver searches were pre-allocated prior to the survey by using a grid overlaid on the survey area in GIS. Where a pre-allocated sampling point was not accessible at the time the survey was done (for example, because a berth was occupied by a vessel), the sample was moved to a nearby location and the new coordinates recorded on the data sheet (or tablet computer, as appropriate). Field teams also noted any sampling locations that were not appropriate so that these could be removed from the grid of potential sampling locations for future surveys. Such locations included areas where high vessel traffic makes diving too hazardous or deployment of traps impossible, areas that are not suitable for trapping because they dry at low tide, or they are seafloor cable zones and other restricted areas.

Environmental data collection

Environmental data were recorded at sampling locations during each survey (the principal aim of these records is to develop a database of environmental conditions for each location in the MHRSS Programme, rather than conditions associated with each individual sample). The following parameters were measured: water depth; salinity; temperature; secchi depth; wind

direction and speed; time of sampling (to allow determination of tidal stage); and sediment type (for benthic sled sampling).

MPI Marine High Risk Site Surveillance Programme team: contacts

The MHRSS Programme is administered and funded by MPI's Biosecurity Surveillance Group. Queries relating to this programme should be directed to MPI.

The MPI Operational Liaison for all marine surveillance activity is Tim Riding, Senior Advisor, Marine Surveillance and Incursion Investigation (Tim.Riding@mpi.govt.nz). Alternatively, the Biosecurity Surveillance Group manager can be contacted at the following email address: NZBiosecuritySurveillance@mpi.govt.nz.

The NIWA Marine High Risk Site Surveillance Programme survey team: contacts

The MHRSS Programme surveys were designed by Drs Graeme Inglis (NIWA, Christchurch) and Don Morrisey (now employed by Cawthron Institute), and implemented by the personnel listed in the *Stakeholder communications logs and field team lists* submitted to MPI prior to each MHRSS Programme survey. The NIWA Project Manager for the surveillance programme is Dr Chris Woods (NIWA, Christchurch).

Results

Sample collection

Total numbers of locations surveyed in each MHRSS Programme survey round (Winter 2015 and Summer 2015–16) at each High Risk Site are shown in Table 2. Numbers of locations sampled met the overall target on all surveys, apart from the Winter 2015 Otago Harbour survey (99.6% target achieved), with a total of 2934 locations (101.1% of target 2903) surveyed during Winter 2015, and 2918 locations (100.5% of target) surveyed during Summer 2015–16 survey rounds. Numbers of locations sampled with each method at each High Risk Site are shown in Appendix 2, by sampling round. The achieved sample locations for each sampling technique at each High Risk Site are shown in Appendix 3, by sampling round.

Table 2: Summary of target and achieved numbers of locations sampled at each Marine High Risk Site Surveillance (MHRSS) Programme High Risk Site

High Risk Site	Sampling round	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
Auckland (Waitemata) Harbour	Winter 2015	486	496	102.1
	Summer 2015–16	486	494	101.6
Bluff Harbour*	Winter 2015	225	225	100.0
	Summer 2015–16	225	225	100.0
Lyttelton Harbour	Winter 2015	243	244	100.4
	Summer 2015–16	243	243	100.0
Nelson Harbour	Winter 2015	243	243	100.0
	Summer 2015–16	243	243	100.0
Opua	Winter 2015	248	253	102.0
	Summer 2015–16	248	248	100.0
Otago Harbour	Winter 2015	243	242	99.6
	Summer 2015–16	243	244	100.4
Picton/Havelock	Winter 2015	243	243	100.0
	Summer 2015–16	243	243	100.0
Port Taranaki	Winter 2015	243	245	100.8
	Summer 2015–16	243	243	100.0
Tauranga Harbour	Winter 2015	243	253	104.1
	Summer 2015–16	243	247	101.6
Wellington Harbour	Winter 2015	243	245	100.8
	Summer 2015–16	243	243	100.0
Whangarei Harbour	Winter 2015	243	245	100.8
	Summer 2015–16	243	245	100.8
All sites	**Winter 2015**	**2903**	**2934**	**101.1**
All sites	**Summer 2015–16**	**2903**	**2918**	**100.5**

* By agreement with MPI, the total target number of sampling locations in Bluff Harbour have been reduced compared to earlier surveys (from 243 down to 225), due to the presence of an active sub-surface oyster farm lease to the north of Tikore Island which has resulted in the immediate area being inaccessible for sampling using crab traps and benthic sled tows. The total number of crab traps and benthic sled locations have been reduced (from 80 to 68, and from 100 to 84, respectively), but the total number of dive locations increased (from 30 to 40), with several of those dives allocated to the oyster farming lease area.

Target species collection

Primary target species detected[2]: None

Secondary target species detected[3]: *Eudistoma elongatum*, *Arcuatula senhousia*, *Sabella spallanzanii* and *Styela clava* were recorded during both rounds of surveys (see below).

- *Arcuatula senhousia* was recorded during the following surveys: Auckland (Winter 2015, Summer 2015–16); and, Whangarei (Winter 2015, Summer 2015–16).
- *Eudistoma elongatum* was recorded during the following surveys: Opua (Winter 2015, Summer 2015–16); and Whangarei (Winter 2015, Summer 2015–16).
- *Sabella spallanzanii* was recorded during the following surveys: Auckland (Winter 2015, Summer 2015–16); Lyttelton (Winter 2015); Nelson (Winter 2015, Summer 2015–16); Tauranga (Summer 2015–16); Wellington (Summer 2015–16); and Whangarei (Winter 2015, Summer 2015–16).
- *Styela clava* was recorded during the following surveys: Auckland (Winter 2015, Summer 2015–16); Lyttelton (Winter 2015, Summer 2015–16); Nelson (Winter 2015, Summer 2015–16); Opua (Winter 2015, Summer 2015–16); Otago (Winter 2015, Summer 2015–16); Picton (Winter 2015, Summer 2015–16); Tauranga (Winter 2015, Summer 2015-16); Wellington (Summer 2015–16); and Whangarei (Winter 2015, Summer 2015–16).

Number of specimens collected and sent to MITS

Numbers of specimens sent to the Marine Invasives Taxonomic Service (MITS) for formal identification per survey ranged from none to 16. The total numbers of specimens sent were 28 for the Winter 2015 round and 72 for the Summer 2015–16 round (Table 3 and Table 4).

Seven of the 28 specimens sent to MITS from the Winter 2015 surveys were NIS (Table 5), including the red algae *Grateloupia turuturu* and *Schizymenia apoda* (both Lyttelton), the colonial ascidians *Botrylloides leachii* and *Didemnum vexillum* (both Opua), and the bryozoans *Celleporaria nodulosa* (Tauranga) and *Celleporaria umbonatoidea* (Opua).

- The record of *S. apoda* from Lyttelton represents a MHRSS Programme **range extension** (previously known from Otago, Picton and Wellington), and was communicated to MPI through the MITS reporting procedure.

Twenty-seven of the 72 specimens sent to MITS from the Summer 2015–16 surveys were NIS (Table 6), including the brown algae *Stictyosiphon soriferus* (Wellington) and *Undaria pinnatifida* (Port Taranaki and Wellington), the red algae *Grateloupia turuturu* (Port Taranaki) and *Griffithsia crassiuscula* (Otago), the caprellid amphipod *Caprella mutica* (Picton), the annelid (polychaete worm) *Sabella spallanzanii* (Auckland and Tauranga), the colonial ascidian *Botrylloides leachii* (Otago), the solitary ascidians *Ascidiella aspersa* (Otago), *Ciona intestinalis* (Picton), *Clavelina lepadiformis* (Picton), *Polyandrocarpa zorritensis* (Whangarei) and *Styela clava* (Tauranga), the bryozoan *Amathia verticillata* (Auckland, Nelson and Tauranga) and the sponge *Halisarca dujardini* (Wellington).

- The record of *P. zorritensis* from Marsden Cove Marina in Whangarei Harbour represents a MHRSS Programme **range extension** (refer to the later section on non-target NIS; via the recent Whangarei sample, this species has only just been confirmed as New to New Zealand, being detected during the Summer 2014–15 survey in Tauranga Harbour), and was communicated to MPI through the MITS reporting procedure.

[2] *Asterias amurensis, Carcinus maenas, Caulerpa taxifolia, Eriocheir sinensis, Potamocorbula amurensis*
[3] *Arcuatula senhousia, Eudistoma elongatum, Sabella spallanzanii, Styela clava*

- The record of *C. mutica* from Waikawa Marina in Picton represents a MHRSS Programme **range extension** (previously known from Bluff, Lyttelton and Otago), and was communicated to MPI through the MITS reporting procedure.
- The record of *C. lepadiformis* from Waikawa Marina in Picton represents a MHRSS Programme **range extension** (previously known from Nelson), and was communicated to MPI through the MITS reporting procedure.

A sponge collected from pontoons in the Town Basin in the Whangarei Harbour summer survey (*Phlyctaenopora (Barbozia)* n. sp., sample WRE22186, MITS71970) represents a **New to New Zealand** native species.

Table 3: Summary of numbers and types of specimens collected from each Marine High Risk Site Surveillance (MHRSS) Programme High Risk Site and sent to the Marine Invasives Taxonomic Service (MITS) for formal identification during the Winter 2015 round of surveys

Organism type	Auckland	Bluff	Lyttelton	Nelson	Opua	Otago	Picton/Havelock	Port Taranaki	Tauranga	Wellington	Whangarei	Total	% of total
Algae			2		2		1		8	4		17	**60.7**
Annelid									1			1	**3.6**
Amphipod												0	**0**
Anthozoan												0	**0**
Ascidian					3				1	1	1	6	**21.4**
Bryozoan					1				1		1	3	**10.7**
Crab												0	**0**
Decapod									1			1	**3.6**
Hydroid												0	**0**
Nudibranch												0	**0**
Sponge												0	**0**
Other												0	**0**
Total	**0**	**0**	**2**	**0**	**6**	**0**	**1**	**0**	**12**	**5**	**2**	**28**	**100**

Table 4: Summary of numbers and types of specimens collected from each Marine High Risk Site Surveillance (MHRSS) Programme High Risk Site and sent to the Marine Invasives Taxonomic Service (MITS) for formal identification during the Summer 2015–16 round of surveys

Organism type	Auckland	Bluff	Lyttelton	Nelson	Opua	Otago	Picton/Havelock	Port Taranaki	Tauranga	Wellington	Whangarei	Total	% of total
Algae		3				5		8		9	1	26	**36.1**
Annelid	1						2		1			4	**5.6**
Amphipod							2					2	**2.8**
Anthozoan				1								1	**1.4**
Ascidian						2	12		5	1	1	21	**29.2**
Bryozoan	4			3					1			8	**11.1**
Crab				1	1			1		1		4	**5.6**
Decapod												0	**0.0**
Hydroid							1			1		2	**2.8**
Nudibranch		1										1	**1.4**
Sponge										1	1	2	**2.8**
Other										1		1	**1.4**
Total	**5**	**4**	**0**	**5**	**1**	**7**	**17**	**9**	**7**	**14**	**3**	**72**	**100**

Table 5: Specimens collected and sent to Marine Invasives Taxonomic Service (MITS) for formal identification from each Marine High Risk Site Surveillance (MHRSS) Programme High Risk Site during the Winter 2015 round of surveys

Non-indigenous species are in bold type. Specimens are ordered alphabetically by High Risk Site, then by organism type, taxon and (field) sample number. C1 = cryptogenic species category 1. Species previously recorded from New Zealand whose identity as either native or non-indigenous is ambiguous. Also included in this category are newly described species that have exhibited invasive behaviour in New Zealand, but for which there are no known records outside the New Zealand region; Indeterminate = specimens that could not be reliably identified to species level. This group includes: (1) organisms that were damaged or juvenile and lacked morphological characteristics necessary for identification, and; (2) taxa for which there is not sufficient taxonomic or systematic information available to allow identification to species level; NIS = non-indigenous species. Species range extensions for the MHRSS Programme are highlighted in blue and marked with an asterisk (*).

High Risk Site	Organism type	Taxon	Biosecurity status	Sample number	MITS code	Survey method
Lyttelton	**Algae**	***Grateloupia turuturu***	**NIS**	**LYT21197**	**71329**	**Diver search**
Lyttelton	**Algae**	***Schizymenia apoda****	**NIS**	**LYT21198**	**71330**	**Diver search**
Opua	Algae	*Cyanophyceae sp.*	Indeterminate	OPX21200	71406	Diver search
Opua	Algae	*Plocamium angustum*	Native	OPX21032	71407	Benthic sled
Opua	**Ascidian**	***Botrylloides leachii***	**NIS**	**OPX21207**	**71404**	**Diver search**
Opua	**Ascidian**	***Botrylloides leachii***	**NIS**	**OPX21210**	**71402**	**Diver search**
Opua	**Ascidian**	***Didemnum vexillum***	**NIS**	**OPX21200**	**71403**	**Diver search**
Opua	**Bryozoan**	***Celleporaria umbonatoidea***	**NIS**	**OPX21199**	**71412**	**Diver search**
Picton	Algae	*Aeodes nitidissima*	Native	PCN21235	71415	Shore search
Tauranga	Algae	*Ceramium* sp.	Indeterminate	TRG21185	71427	Diver search
Tauranga	Algae	*Ceramium* sp.	Indeterminate	TRG21225	71422	Shore search
Tauranga	Algae	*Ceramium* sp.	Indeterminate	TRG21248	71425	Shore search
Tauranga	Algae	*Chondracanthus chapmanii*	Native	TRG21246	71424	Shore search
Tauranga	Algae	*Gigartina atropurpurea*	Native	TRG21224	71421	Shore search
Tauranga	Algae	*Griffithsia* sp.	Indeterminate	TRG21225	71428	Shore search
Tauranga	Algae	*Haraldiophyllum crispatum*	Native	TRG21185	71419	Diver search
Tauranga	Algae	*Hydroclathrus clathratus*	Native	TRG21229	71423	Shore search
Tauranga	Annelid	*Bispira bispira A*	Native	TRG21192	71418	Diver search
Tauranga	Ascidian	*Botrylloides magnicoecum*	Native	TRG21185	71420	Diver search
Tauranga	**Bryozoan**	***Celleporaria nodulosa***	**NIS**	**TRG21210**	**71417**	**Diver search**
Tauranga	Decapod	*Philocheras hamiltoni*	Native	TRG21070	71416	Benthic sled
Wellington	Algae	*Hincksia* sp.	Indeterminate	WLG21201	71401	Diver search
Wellington	Algae	*Polysiphonia* sp.	Indeterminate	WLG21192	71396	Diver search
Wellington	Algae	*Polysiphonia* sp.	Indeterminate	WLG21201	71394	Diver search
Wellington	Algae	*Polysiphonia* sp.	Indeterminate	WLG21203	71395	Diver search
Wellington	Ascidian	*Pyura subuculata*	Native	WLG21182	71393	Diver search
Whangarei	Ascidian	Polyclinidae	Indeterminate	WRE21100	71327	Benthic sled
Whangarei	Bryozoan	*Celleporina* cf. *sinuata*	Native	WRE21050	71326	Benthic sled

* MHRSS Programme range extension

Table 6: Specimens collected and sent to Marine Invasives Taxonomic Service (MITS) for formal identification from each Marine High Risk Site Surveillance (MHRSS) Programme High Risk Site during the Summer 2015–16 round of surveys

Non-indigenous species are in bold type. Specimens are ordered alphabetically by High Risk Site, then by organism type, taxon and (field) sample number. C1 = cryptogenic species category 1. Species previously recorded from New Zealand whose identity as either native or non-indigenous is ambiguous. Also included in this category are newly described species that exhibited invasive behaviour in New Zealand, but for which there are no known records outside the New Zealand region; Indeterminate = specimens that could not be reliably identified to species level. This group includes: (1) organisms that were damaged or juvenile and lacked morphological characteristics necessary for identification, and; (2) taxa for which there is not sufficient taxonomic or systematic information available to allow identification to species level; NIS = non-indigenous species. Species range extensions for the MHRSS Programme are highlighted in blue and marked with an asterisk (*). Species that are New to New Zealand are highlighted in purple and marked with a double asterisk (**).

High Risk Site	Organism type	Taxon	Biosecurity status	Sample number	MITS code	Survey method
Auckland	**Annelid**	***Sabella spallanzanii***	**NIS**	**AKL22491**	**71531**	**Shore search**
Auckland	**Bryozoan**	***Amathia verticillata***	**NIS**	**AKL22371**	**71532**	**Diver search**
Auckland	**Bryozoan**	***Amathia verticillata***	**NIS**	**AKL22414**	**71533**	**Diver search**
Auckland	**Bryozoan**	***Amathia verticillata***	**NIS**	**AKL22416**	**71534**	**Diver search**
Auckland	**Bryozoan**	***Amathia verticillata***	**NIS**	**AKL22416**	**71535**	**Diver search**
Bluff	Algae	*Plocamium microcladioides*	Native	BLU22209a	71536	Diver search
Bluff	Algae	Kallymeniaceae	Indeterminate	BLU22209a	71537	Diver search
Bluff	Algae	Kallymeniaceae	Indeterminate	BLU22191	71538	Diver search
Bluff	Nudibranch	*Alloiodoris lanuginata*	Native	BLU22184	71539	Diver search
Nelson	Anthozoan	Actinaria	Indeterminate	NSN22196a	71942	Diver search
Nelson	**Bryozoan**	***Amathia verticillata***	**NIS**	**NSN22193a**	**71952**	**Diver search**
Nelson	**Bryozoan**	***Amathia verticillata***	**NIS**	**NSN22200a**	**71940**	**Diver search**
Nelson	**Bryozoan**	***Amathia verticillata***	**NIS**	**NSN22203a**	**71941**	**Diver search**
Nelson	Crab	*Nectocarcinus antarcticus*	Native	NSN22034	71953	Benthic sled
Opua	Crab	*Nepinnotheres* sp.	Native	OPX22104	71530	Benthic sled
Otago	Algae	Ectocarpaceae	Indeterminate	DUD22182	71508	Diver search
Otago	Algae	Ectocarpaceae	Indeterminate	DUD22226	71510	Shore search
Otago	**Algae**	***Griffithsia crassiuscula***	**NIS**	**DUD22244**	**71511**	**Diver search**
Otago	Algae	*Medeiothamnion lyallii*	Native	DUD22210	71507	Diver search
Otago	Algae	*Polysiphonia* sp.	Indeterminate	DUD22226	71509	Shore search
Otago	**Ascidian**	***Ascidiella aspersa***	**NIS**	**DUD22202**	**71513**	**Diver search**
Otago	**Ascidian**	***Botrylloides leachii***	**NIS**	**DUD22205**	**71512**	**Diver search**
Picton/Havelock	Amphipod	*Caprella equilibra*	C1	PCN22186b	71872	Diver search
Picton/Havelock	**Amphipod**	***Caprella mutica****	**NIS**	**PCN22186b**	**71939**	**Diver search**
Picton/Havelock	Annelid	*Acrocirrus trisectus*	Native	PCN22185a	71914	Diver search
Picton/Havelock	Annelid	*Bispira bispira-A*	Native	PCN22185a	71870	Diver search
Picton/Havelock	Ascidian	*Asterocarpa humilis*	C1	PCN22207a+b	71873	Diver search
Picton/Havelock	**Ascidian**	***Ciona intestinalis***	**NIS**	**PCN22199b**	**71874**	**Diver search**
Picton/Havelock	**Ascidian**	***Clavelina lepadiformis****	**NIS**	**PCN22200a**	**71877**	**Diver search**
Picton/Havelock	Ascidian	*Cnemidocarpa bicornuta*	Native	PCN22016	71881	Shore search
Picton/Havelock	Ascidian	*Cnemidocarpa bicornuta*	Native	PCN22109c	71880	Shore search
Picton/Havelock	Ascidian	*Cnemidocarpa bicornuta*	Native	PCN22186a	71871	Diver search

High Risk Site	Organism type	Taxon	Biosecurity status	Sample number	MITS code	Survey method
Picton/Havelock	Ascidian	*Molgula mortenseni*	C1	PCN22188b	71869	Diver search
Picton/Havelock	Ascidian	*Molgula mortenseni*	C1	PCN22195a	71875	Diver search
Picton/Havelock	Ascidian	*Molgula mortenseni*	C1	PCN22195b	71876	Diver search
Picton/Havelock	Ascidian	*Molgula mortenseni*	Native	PCN22200b	71965	Diver search
Picton/Havelock	Ascidian	*Pyura rugata*	Native	PCN22200b	71878	Diver search
Picton/Havelock	Hydroid	*Ectopleura* sp.	Indeterminate	PCN22220	71879	Shore search
Port Taranaki	Algae	*Anotrichium crinitum*	Native	NPL22186	71498	Diver search
Port Taranaki	Algae	*Anotrichium crinitum*	Native	NPL22198	71505	Diver search
Port Taranaki	Algae	*Dasya subtilis*	Native	NPL22198	71504	Diver search
Port Taranaki	**Algae**	***Grateloupia turuturu***	**NIS**	**NPL22198**	**71499**	**Diver search**
Port Taranaki	Algae	*Hincksia granulosa*	Native	NPL22186	71497	Diver search
Port Taranaki	Algae	*Hincksia mitchelliae*	Native	NPL22198	71506	Diver search
Port Taranaki	Algae	*Polysiphonia* sp.	Indeterminate	NPL22188	71496	Diver search
Port Taranaki	**Algae**	***Undaria pinnatifida***	**NIS**	**NPL22188**	**71495**	**Diver search**
Port Taranaki	Crab	*Liocarcinus corrugatus*	Native	NPL22004	71494	Benthic sled
Tauranga	**Annelid**	***Sabella spallanzanii***	**NIS**	**TRG22237**	**71904**	**Shore search**
Tauranga	Ascidian	*Microcosmus squamiger*	C1	TRG22191	71959	Diver search
Tauranga	**Ascidian**	***Styela clava***	**NIS**	**TRG22184**	**71905**	**Diver search**
Tauranga	**Ascidian**	***Styela clava***	**NIS**	**TRG22191**	**71906**	**Diver search**
Tauranga	**Ascidian**	***Styela clava***	**NIS**	**TRG22203**	**71907**	**Diver search**
Tauranga	**Ascidian**	***Styela clava***	**NIS**	**TRG22204**	**71908**	**Diver search**
Tauranga	**Bryozoan**	***Amathia verticillata***	**NIS**	**TRG22200**	**71909**	**Diver search**
Wellington	Algae	*Antithamnionella* sp.	Indeterminate	WLG22190	71475	Diver search
Wellington	Algae	*Antithamnionella* sp.	Indeterminate	WLG22198	71480	Diver search
Wellington	Algae	*Bryopsis vestita*	Native	WLG22194	71484	Diver search
Wellington	Algae	*Codium* sp.	Indeterminate	WLG22194	71479	Diver search
Wellington	Algae	*Griffithsia crassiuscula*	Native	WLG22194	71478	Diver search
Wellington	Algae	*Polysiphonia* sp.	Indeterminate	WLG22202	71476	Diver search
Wellington	**Algae**	***Stictyosiphon soriferus***	**NIS**	**WLG22202**	**71483**	**Diver search**
Wellington	**Algae**	***Undaria pinnatifida***	**NIS**	**WLG22182**	**71474**	**Diver search**
Wellington	**Algae**	***Undaria pinnatifida***	**NIS**	**WLG22206**	**71477**	**Diver search**
Wellington	Ascidian	*Styela plicata*	C1	WLG22092	71466	Benthic sled
Wellington	Crab	*Heterozius rotundifrons*	Native	WLG22212	71481	Crab condo
Wellington	Hydroid	*Obelia dichotoma*	Native	WLG22185	71482	Diver search
Wellington	Other	Angiosperm	Indeterminate-	WLG22100	71473	Benthic sled
Wellington	**Sponge**	***Halisarca dujardini***	**NIS**	**WLG22196**	**71467**	**Diver search**
Whangarei	Algae	*Vaucheria* sp.	Indeterminate	WRE22203	71969	Diver search
Whangarei	**Ascidian**	***Polyandrocarpa zorritensis****	**NIS**	**WRE22201**	**71968**	**Diver search**
Whangarei	Sponge	*Phlyctaenopora (Barbozia)* n. sp.**	Native	WRE22186	71970	Diver search

* MHRSS Programme range extension
** New to New Zealand

Distribution of target and non-target species

Distribution maps were plotted for target species and for non-target species in the following categories: new records for New Zealand; those that have expanded their ranges (within MHRSS Programme records); and those that currently have a restricted distribution. The maps show locations where each species was recorded (as red dots) and also locations where it was absent (Appendix 4), based on appropriate sampling methods for each species (see Appendix 1).

Species plotted (and the methods by which they might be collected) are: *Acentrogobius bifrenatus* (crab trap, benthic sled, diver search); *Amathia verticillata* (benthic sled, diver search, shore search); *Arcuatula senhousia* (benthic sled, crab trap, shore search); *Arenigobius bifrenatus* (crab trap, benthic sled, diver search); *Ascidiella aspersa* (benthic sled, crab trap, diver search, shore search); *Botrylloides giganteum* (benthic sled, diver search, shore search); *Caprella mutica* (benthic sled, diver search, shore search); *Celleporaria nodulosa* (crab trap, benthic sled, diver search); *Celleporaria umbonatoidea* (crab trap, benthic sled, diver search); *Charybdis (Charybdis) japonica* (benthic sled, crab trap, crab condos, diver search, shore search); *Clavelina lepadiformis* (diver search, shore search); *Didemnum vexillum* (benthic sled, diver search, shore search); *Eudistoma elongatum* (benthic sled, diver search, shore search); *Ficopomatus enigmaticus* (benthic sled, diver search, shore search); *Grateloupia turuturu* (benthic sled, diver search, shore search); *Griffithsia crassiuscula* (benthic sled, diver search); *Halisarca dujardnii* (benthic sled, diver search, shore search); *Hydroclathrus clathratus* (benthic sled, diver search, shore search); *Limaria orientalis* (benthic sled); *Metapenaeus bennettae* (benthic sled, crab trap, diver search); *Nassarius burchardi* (benthic sled); *Phoronis ijimai* (benthic sled, diver search); *Phlyctaenopora (Barbozia)* n. sp (benthic sled, diver search, shore search); *Polyandrocarpa zorritensis* (benthic sled, diver search, shore search); *Pyromaia tuberculata* (benthic sled, crab trap); *Sabella spallanzanii* (benthic sled, crab trap, diver search, shore search); *Schizymenia apoda* (benthic sled, diver search, shore search*); Stictyosiphon soriferus* (benthic sled, diver search, shore search); *Styela clava* (benthic sled, diver search, shore search); *Theora lubrica* (benthic sled); and *Undaria pinnatifida* (benthic sled, crab trap, diver search, shore search). Records are shown for both the Winter 2015 and Summer 2015–16 survey rounds.

Secondary target non-indigenous species

Arcuatula senhousia

Arcuatula senhousia was recorded (predominantly in benthic sled tows) during both surveys of Auckland and Whangarei harbours. Distributions within each High Risk Site were as follows:

- Auckland: recorded off Kauri Point and the Devonport Wharf during the winter survey, and off Kauri Point in the summer survey. Recorded at a total of three out of 496 (0.6%) sampling locations during the winter survey, and at three out of 494 (0.6%) sampling locations during the summer survey. This reflects a limited distribution and abundance similar to other recent surveys.
- Whangarei: recorded at the Town Basin (winter survey only), around Te Matau a Pohe Bridge, Limestone Island and the Portland, Wellington, Tamaterau and Shell Cut reaches and in Marsden Cove Marina during both surveys. Recorded at a total of 28 out of 245 (11.4%) sampling locations during the winter survey, and at 20 out of 245 (8.2%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys, apart from the more limited distribution recorded in the Winter 2014 and Summer 2014–15 survey rounds, when there were no detections in the lower harbour or Marsden Cove Marina.

Eudistoma elongatum

Eudistoma elongatum was recorded (predominantly during dive and shore searches) during both surveys of Opua and Whangarei Harbour. Distributions within each High Risk Site were as follows:

- Opua: recorded at the Opua Wharf and in and around the Opua Marina, as well as at Okiato Point during both surveys, but more widespread during the summer survey with detections at Motumaire and Toretore islands, the Paihia jetties, Te Waihapu

Point and Mukimuki. Recorded at a total of 13 out of 253 (5.1%) sampling locations during the winter survey, and at 40 out of 248 (16.1%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys.

- Whangarei: recorded at the Portland Arm and near Limestone Island during both surveys, and near Kissing Point and Parua Bay in the summer survey. Recorded at a total of six out of 245 (2.4%) sampling locations during the winter survey, and at nine out of 245 (3.7%) sampling locations during the summer survey. This reflects a slightly expanded distribution compared to earlier surveys, and the field team noted that where it was detected it appeared to be at higher abundance than in previous survey rounds.

Sabella spallanzanii

Sabella spallanzanii was recorded (predominantly during dive searches) during both surveys of Auckland (Waitemata), Nelson and Whangarei harbours, the winter survey of Lyttelton Harbour, and the summer surveys of Tauranga and Wellington harbours. Distributions within each High Risk Site were as follows:

- Auckland: recorded throughout the port, Bayswater, Orakei, Westhaven and Westpark marinas, Devonport, the channel between the Harbour Bridge and Kauri Point, and in the upper harbour. Recorded at a total of 115 out of 496 (23.2%) sampling locations during the winter survey, and at 109 out of 494 (22.1%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys.
- Lyttelton: Recorded at the Oil Berth in the port during the winter survey as a single specimen. Recorded at a total of one site out of 244 (0.4%) sampling locations. This reflects a continued sparse distribution and abundance subsequent to a delimitation and removal programme commissioned by MPI for this species in 2008–09 following its detection here as a New to New Zealand NIS during the Lyttelton Summer 2008 MHRSS Programme survey.
- Nelson: Recorded on pontoons in the Nelson Marina as single specimens during both surveys. Recorded at a total of one out of 243 (0.4%) sampling locations during both surveys. This reflects a continued sparse distribution and abundance in the marina.
- Tauranga: recorded at the Tauranga (Sulphur Point) Marina and Trinity Wharf as single specimens. Recorded at a total of two out of 247 (0.8%) sampling locations during the summer survey. This reflects a similar sparse distribution and abundance to other recent surveys. This species is subject to ongoing delimitation and removal surveys by Bay of Plenty Regional Council.
- Wellington: recorded as biofouling on a recreational yacht (along with *S. clava*) in Chaffers Marina. The vessel was removed from the water for cleaning as a MPI Response. Recorded at a total of one out of 243 (0.4%) sampling locations during both the summer survey. This reflects the sporadic detection of this species as vessel biofouling within the marina.
- Whangarei: recorded at Port Nikau and Marsden Cove Marina during both surveys, and Parua Bay during the summer survey. Recorded at a total of 12 out of 245 (4.9%) sampling locations during the winter survey, and at 12 out of 245 (4.9%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys.

Styela clava

Styela clava was recorded (predominantly during dive and shore searches) during both surveys of Auckland, Lyttelton, Nelson, Opua, Otago, Picton, Tauranga and Whangarei

harbours, and during the summer survey of Wellington Harbour. Distributions within each High Risk Site were as follows:

- Auckland: recorded throughout the port, Bayswater, Orakei, Westhaven and Westpark marinas, Devonport, the channel between the Harbour Bridge and Kauri Point, and both the upper and lower harbour during both surveys. Recorded at a total of 41 out of 496 (8.3%) sampling locations during the winter survey, and at 72 out of 494 (14.6%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys.
- Lyttelton: recorded throughout the port, at Cashin Quay, in Magazine Bay Marina and in Charteris Bay during both surveys, and Quail Island during the winter survey. Recorded at a total of 22 out of 244 (9%) sampling locations during the winter survey, and at 23 out of 243 (9.5%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys.
- Nelson: recorded throughout the port, the Slipway Basin, the Nelson Marina and the Haven during both surveys. Recorded at a total of 32 out of 243 (13.2%) sampling locations during the winter survey, and at 25 out of 243 (10.3%) sampling locations during the summer survey. This reflects an increasing distribution and abundance relative to other recent surveys.
- Opua: recorded throughout the Opua Marina, at the Opua Wharf, Okiato and Te Waihapu points, and Russell during both surveys, Toretore Island and Waitangi Bridge during the winter survey, and Motumaire Island, the Paihia jetties and Mukimuki during the summer survey. Recorded at a total of 57 out of 253 (22.5%) sampling locations during the winter survey, and at 41 out of 248 (16.5%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys, although more *S. clava* were seen on reefs during the summer survey shore searches.
- Otago: recorded throughout Port Otago from the Town Basin up to the Leith Marina during both surveys, and at Ravensbourne Wharf and underneath the boat shed near Andersons Bay during the winter survey. Recorded at a total of 17 out of 242 (7%) sampling locations during the winter survey, and at 16 out of 244 (6.6%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys, although the field team did note the increasing occurrence of *S. clava* on natural substratum.
- Picton: recorded in the Waikawa Marina during both surveys and also outside the marina during the winter survey. Recorded at a total of two out of 243 (0.8%) sampling locations during the winter survey, and at one out of 243 (0.4%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys following its first detection here as a range extension in the Winter 2014 survey, and a subsequent delimitation and removal survey in June 2014 commissioned by Marlborough District Council and MPI.
- Tauranga: recorded in the port during both surveys, in the Tauranga Bridge Marina during the winter survey, and in the Tauranga (Sulphur Point) Marina and at Trinity Wharf during the summer survey. Recorded at a total of three out of 253 (1.2%) sampling locations during the winter survey, and at six out of 247 (2.4%) sampling locations during the summer survey. This reflects a similar sparse distribution and abundance to other recent surveys, and this species is subject to ongoing delimitation and removal surveys by Bay of Plenty Regional Council.
- Wellington: recorded as biofouling on a recreational yacht (along with *S. spallanzanii*) in Chaffers Marina. The vessel was removed from the water for cleaning as an MPI Response. Recorded at a total of one out of 243 (0.4%) sampling locations during the summer survey. This reflects the sporadic detection of this species in the harbour. For example, it has been previously recorded attached to a masking crab (*Notomithrax*

sp.), as vessel biofouling, and in a benthic sled tow (unattached to any substratum); it has not yet been recorded on natural substratum or fixed infrastructure in the harbour.
- Whangarei: recorded in Marsden Cove Marina during both surveys, and at the Northport Berth at Marsden Point during the summer survey. Recorded at a total of 11 out of 245 (4.5%) sampling locations during the winter survey, and at 12 out of 245 (4.9%) sampling locations during the summer survey. This reflects a similar distribution and abundance to other recent surveys.

Non-target, non-indigenous species

Acentrogobius pflaumii

Recorded in Auckland (Waitemata) Harbour during both surveys, and in Whangarei Harbour during the winter survey.

- Auckland: recorded in Westhaven Marina, Viaduct Basin and port during the winter survey, and at Kauri Point during the summer survey.
- Whangarei: recorded in the Town Basin Marina and at Port Nikau.

Amathia verticillata

Recorded in Auckland (Waitemata), Nelson, Tauranga and Whangarei harbours during summer surveys. This NIS has been present in New Zealand since the 1960s, but has a relatively restricted distribution. We have included this species for the summer round of surveys due to increasing recognition of it as a nuisance species that is easily spread by vessels (e.g., Marchini et al 2015), and because samples were taken during the summer survey (with MPI's permission) to aid an international study into the genetic linkages between non-indigenous populations[4].

- Auckland: recorded in the Bayswater, Westhaven and Westpark marinas, Devonport Naval Base, Viaduct Basin and lower harbour.
- Nelson: recorded in the port and Nelson Marina.
- Tauranga: recorded in the harbour, Tauranga Marina, at the Sulphur Point Wharf and in the channel west of Matapihi.
- Whangarei: recorded in Marsden Cove Marina, lower and upper harbour, Parua and McLeod bays, at the Portland Wharf and at Kissing Point.

Arenigobius bifrenatus

Recorded in Whangarei Harbour in the Town Basin during both surveys.

Ascidiella aspersa

Recorded in Bluff Harbour during the winter survey, and Otago Harbour during the summer survey.

- Bluff: recorded at Tiwai Point, Town Wharf, Fishermen's wharves and in the channel heading towards Tikore Island.
- Otago: recorded in the Town Basin.

Botrylloides giganteum

Recorded in Auckland (Waitemata), Opua and Tauranga harbours during the winter surveys.

- Auckland: recorded at the Devonport Naval Base.
- Opua: recorded at the Opua Wharf.
- Tauranga: recorded at the Mount Maunganui wharves in the port.

[4] Approval for these sample collections was confirmed with MPI on 27 October 2015.

Caprella mutica

Recorded in Waikawa Marina during the Picton Harbour summer survey. This represents a MHRSS Programme **range extension** into Picton Harbour for this species (previously recorded from Bluff, Lyttelton and Otago harbours during MHRSS Programme surveys, but also known from other nearby locations, such as salmon farms, in the Marlborough Sounds).

Celleporaria nodulosa

Recorded in Tauranga Harbour at the Tauranga Bridge Marina during the winter survey.

Celleporaria umbonatoidea

Recorded at the Opua Marina during the winter survey.

Charybdis (Charybdis) japonica

Recorded in Auckland and Whangarei harbours during both surveys. All specimens collected were destroyed.

- Auckland: recorded throughout the port, at Devonport, in Orakei, Bayswater, Westhaven and Westpark marinas, and in the channels in the upper, middle and lower harbour. Only a single native paddle crab, *Ovalipes catharus*, was captured during the summer survey (by Devonport Naval base).
- Whangarei: recorded around the Town Wharf, Limestone Island and Portland Arm, and in Marsden Cove Marina.

Clavelina lepadiformis

Recorded in the Nelson Marina during both surveys, but it appeared to be more widespread in the summer survey. It was also recorded in Picton Harbour during the winter and summer surveys, respectively, where it was noted by divers to be at very low density (i.e., <one colony/m^2). A collection of a sample for identification during the summer survey confirmed this as a MHRSS Programme **range extension** into Picton Harbour for this species (previously recorded from Nelson Harbour during MHRSS Programme surveys).

Didemnum vexillum

Recorded in the Opua Marina during the winter survey.

Ficopomatus enigmaticus

Recorded in the Town Basin of Whangarei Harbour during the summer survey.

Grateloupia turuturu

Recorded in Lyttelton and Wellington harbours during the winter survey, and in Port Taranaki during both surveys.

- Lyttelton: recorded in Magazine Bay Marina and at the Fishermen's (Mediterranean/Low Level Breastwork) wharves in the port.
- Port Taranaki: recorded at Moturoa Wharf during both surveys.
- Wellington: recorded in Chaffers Marina.

Griffithsia crassiuscula

Recorded at King's Wharf in Wellington Harbour during the summer survey.

Halisarca dujardnii

Recorded at Glasgow Wharf during the Wellington Harbour summer survey.

Hydroclathrus clathratus

Recorded in the Tauranga (Sulphur Point) Marina during the winter survey of Tauranga Harbour.

Limaria orientalis

Recorded in Auckland (Waitemata) and Whangarei harbours during both surveys, and Picton/Havelock during the summer survey.

- Auckland: recorded in the main channel in the outer and middle harbours, including the port.
- Picton/Havelock: recorded outside of the Waikawa Marina.
- Whangarei: recorded near Marsden Point and Parua Bay during the winter survey, and in the Tamaterau Reach during the summer survey.

Metapenaeus bennettae

Recorded in Auckland (Waitemata) and Whangarei harbours during both surveys.

- Auckland: recorded in the Bayswater and Westhaven marinas, the port and upper harbour.
- Whangarei: recorded in the Town Basin and Port Nikau, the Portland Reach and in the Marsden Cove Marina. It appeared to be more widespread in the summer survey.

Nassarius burchardi

Recorded in Auckland (Waitemata) and Whangarei harbours during the summer survey.

- Auckland: recorded throughout the port, and in Westhaven, Bayswater and Orakei marinas.
- Whangarei: recorded at the Town Basin, Port Nikau, around Limestone Island and in Parua Bay.

Phlyctaenopora (Barbozia) n. sp.

Recorded in the Town Basin in Whangarei Harbour during the summer survey. This represents a **New to New Zealand** native species record. This sponge is the second only known example of the Southwest Pacific genus *Phlyctaenopora (Barbozia)*. The only other example of this species is known from deeper water (600–850 m) near the Wanganella Trough, just outside the New Zealand Economic Exclusion Zone.

Polyandrocarpa zorritensis

Recorded in Marsden Cove Marina in Whangarei Harbour during the summer survey. Two specimens of this ascidian were collected earlier from the Tauranga (Sulphur Point) Marina during the Summer 2014–15 survey of Tauranga Harbour (NIWA sample TRG71304) and initially identified as *Polyandrocarpa* sp. (c.f. *robusta*). However, on the basis of the recent collection of mature, well preserved specimens during the Summer 2015–16 in Whangarei (NIWA sample WRE71968), both submissions can be confirmed as *P. zorritensis* (Van Name, 1931). Thus, the Tauranga detection in the Summer 2014–15 survey represents the first detection (**New to New Zealand**) of this species in New Zealand, and the detection from Whangarei in the Summer 2015–16 survey is technically a MHRSS Programme **range extension**.

Phoronis ijimai

Recorded in Marsden Cove Marina in Whangarei Harbour during the winter survey.

Pyromaia tuberculata

Recorded in Auckland (Waitemata) and Whangarei harbours, and Opua during both surveys, and in Port Taranaki during the winter survey.

- Auckland: recorded in the main channel of the upper, middle and lower harbour, and at Devonport Naval Base.
- Opua: recorded around Hermione Rock, near Paihia and in the Veronica Channel near the Opua Wharf.
- Port Taranaki: recorded at Moturoa Wharf.
- Whangarei: recorded at Port Nikau, near Kaiwaka Point, in the Tamaterau Reach and at the Northport Berth at Marsden Point.

Schizymenia apoda

Recorded at Wharf No. 5 in Lyttelton Harbour during the winter survey. This represents a MHRSS Programme **range extension** (previously recorded from Otago, Picton and Wellington harbours during MHRSS Programme surveys).

Stictyosiphon soriferus

Recorded in Chaffers Marina in Wellington Harbour during the summer survey.

Theora lubrica

Recorded in Auckland, Lyttelton, Nelson, Opua, Picton/Havelock, Port Taranaki, Wellington and Whangarei harbours in soft, muddy sediments during both surveys.

- Auckland: recorded throughout the port, Viaduct, Bayswater, Orakei, Westhaven and Westpark marinas, and the upper harbour (to a limited extent).
- Lyttelton: recorded throughout the area immediately outside the port, inside the port, Magazine Bay to Governors Bay, and in the lower harbour (to a limited extent).
- Nelson: recorded throughout the marina, port and inside the Boulder Bank to Haulashore Island.
- Opua: recorded throughout the marina, off the Town Wharf, through the Veronica Channel, as well as off Russell and around Hermione Rock.
- Picton/Havelock: recorded throughout the Picton port and marina, Waimahara Wharf (Shakespeare Bay), Waikawa Marina and the area outside of the marina. Throughout the Havelock Marina and channel immediately leading to the marina.
- Port Taranaki: recorded in the port, predominantly near the commercial berths (Moturoa and Blyde wharves, and Newton King Tanker Terminal).
- Wellington: recorded throughout Evans Bay, the port and from Kaiwharawhara past Ngauranga, as well as the Seaview Marina and around Seaview Wharf/Terminal.
- Whangarei: recorded at Port Nikau, south of Portland Wharf, Marsden Cove Marina and Parua Bay.

Undaria pinnatifida

Recorded in Auckland, Bluff, Lyttelton, Otago, Picton, Port Taranaki and Wellington harbours during both surveys, and in Havelock Marina, Nelson and Tauranga harbours during the winter survey.

- Auckland: recorded throughout the port, Viaduct, Bayswater, Orakei and Westhaven marinas, Devonport, Birkenhead Wharf and the upper harbour near Harrier Point and Island Bay.
- Bluff: recorded throughout the port, around Tiwai Wharf and western side of the harbour up past Tikore Island.

- Lyttelton: recorded throughout the port, western mole to Magazine and Governors bays in the upper harbour, and the southeastern side of the harbour from Charteris Bay to Pile Bay.
- Nelson: recorded throughout the marina, port and inside the Boulder Bank to Haulashore Island. No plants were detected during the summer survey.
- Otago: recorded throughout Port Otago, Port Chalmers, and the lower harbour to Acheron Bay on the northwestern, and to Portobello Bay on the southeastern sides of the harbour.
- Picton/Havelock: recorded throughout Picton port and marina, Waimahara Wharf (Shakespeare Bay), Waikawa Marina and the area outside of the marina. Recorded throughout Havelock Marina and channel immediately leading to the marina during the winter survey.
- Port Taranaki: recorded within the port, predominantly near the commercial berths (Moturoa and Blyde wharves, and Newton King Tanker Terminal) and inside the Lee Breakwater.
- Tauranga: recorded at the base of Mount Maunganui outside and inside the harbour, the port and in Tauranga (Sulphur Point) Marina.
- Wellington: recorded throughout Evans Bay, the port, Chaffers Marina, Clyde Quay Boat Harbour, the northeastern side of the Miramar Peninsula, as well as the Seaview Marina and around Seaview Wharf/Terminal.

Discussion

The Winter 2015 and Summer 2015–16 rounds of MHRSS Programme surveys achieved (overall) the target numbers of sampling locations at the 11 High Risk Sites. No primary target species were detected during the surveys, but the four secondary target species were all recorded: *Arcuatula senhousia* (Auckland and Whangarei); *Eudistoma elongatum* (Opua and Whangarei); *Sabella spallanzanii* (Auckland, Lyttelton, Nelson, Tauranga, Wellington and Whangarei); and *Styela clava* (Auckland, Lyttelton, Nelson, Opua, Otago, Picton, Tauranga, Wellington and Whangarei). All of these target species have been recorded at the respective High Risk Sites during previous surveys. One hundred specimens were collected and sent to MITS for formal identification from both surveys combined (28 from the winter survey and 72 from the summer survey); 34 of these specimens were NIS.

Non-target, non-indigenous species of note recorded during the surveys included the following: *Acentrogobius pflaumii*; *Amathia verticillata*; *Arenigobius bifrenatus*; *Ascidiella aspersa*; *Botrylloides giganteum*; *Caprella mutica* (MHRSS Programme **range extension**); *Celleporaria nodulosa*; *Celleporaria umbonatoidea*; *Charybdis (Charybdis) japonica*; *Clavelina lepadiformis*; *Didemnum vexillum*; *Ficopomatus enigmaticus*; *Grateloupia turuturu*; *Griffithsia crassiuscula*; *Halisarca dujardnii*; *Hydroclathrus clathratus*; *Limaria orientalis*; *Metapenaeus bennettae*; *Nassarius burchardi*; *Polyandrocarpa zorritensis* (MHRSS Programme **range extension**); *Phoronis ijimai*; *Pyromaia tuberculata*; *Schizymenia apoda* (MHRSS Programme **range extension**); *Stictyosiphon soriferus; Theora lubrica*; and *Undaria pinnatifida*.

All *Charybdis* specimens caught in crab traps were euthanized. All *Sabella spallanzanii* found in Lyttelton, Nelson and Tauranga harbours were enclosed in zip-lock bags, removed and disposed of to landfill. All *Styela clava* found in Picton Harbour were collected, and either preserved and sent to MITS or disposed of to landfill. Increasing proliferation of *S. clava* in Nelson and Otago harbours meant that collection and disposal at these High Risk Sites was not undertaken during this round (as in the Summer 2014–15 surveys).

A sponge collected from pontoons in the Town Basin in the Whangarei Harbour summer survey (*Phlyctaenopora (Barbozia)* n. sp.) represents a **New to New Zealand** native species

Recommendations

- Survey sampling techniques as currently employed in the MHRSS Programme still reflect international best practice for effective detection of the MHRSS Programme primary and secondary target species and the results indicate that they are effective at detecting actual and suspect NIS. However, continued evaluation as to their effectiveness in relation to any alternative/emergent detection tools/techniques is advised.
- The distribution of sampling effort in Opua, as proposed in the revised design report (Morrisey et al, 2012a) and based on stochastic scenario tree modelling (Morrisey et al, 2012b), will continue to be used in future rounds of Opua surveys. Stochastic scenario trees were also developed for all other MHRSS Programme High Risk Sites (Morrisey et al, 2012) to estimate the detection sensitivity of different strategies for allocating samples, and also to explore the optimisation of sample allocation for individual target species and estimated current levels of sensitivity. This optimisation approach may be applied to other High Risk Sites in the future, pending decisions on potential review of target sites and species by MPI, and will be explored via further discussion with MPI.

Innovations/efficiencies

In 2015–16, NIWA invested in developing the following innovations to help improve surveillance for marine NIS:

- NIWA invested core-funding ($50 k) to develop sediment and habitat maps from environmental point observations made during the MHRSS Programme. Habitat and sediment maps (and associated estimates of uncertainty in data interpolation) have been generated for all 11 MHRSS Programme High Risk Sites. The maps could be used to refine the survey design for target species.
- NIWA invested in a 3-year PhD scholarship ($25k p.a. + additional operational funding) to support research into the use of settlement plates and next generation sequencing for marine surveillance. The aim of this research is to develop high-throughput tools that will allow faster, more cost-efficient use of this method of detection.
- NIWA invested in the re-development of a quantitative real-time polymerase chain reaction (qPCR) probe for *Sabella spallanzanii*. The probe was developed by the Cawthron Institute and is currently being evaluated for sensitivity to *S. spallanzanii* and specificity. Redesign of the qPCR probe was necessary as an earlier probe developed by SARDI cross-reacted with native NZ sabellid worms. It is intended that the improved probe may be incorporated into future sampling with the MHRSS Programme.

Other

Problems encountered during sampling

Winter 2015 surveys

Heavy vessel traffic and re-piling work (to repair major earthquake damage) on Cashin Quay at the Port of Lyttelton prevented most of the pre-allocated crab trapping and diving from occurring at this location. Consequently, most of the sampling locations pre-allocated to this area were re-allocated to nearby appropriate areas.

Major dredging activities, wharf repairs and tug pilot training rendered the Port Chalmers area (turning basin included) off-limits to all sampling activity during the Otago Harbour survey. Consequently, all sampling locations pre-allocated to this area were pre-allocated to nearby appropriate areas. Gale-force winds also necessitated re-allocation of crab trap locations in the lower harbour region near Taiaroa Head to calmer waters nearer Port Chalmers, Deborah Bay and Portobello in Otago Harbour.

Summer 2015–16 surveys

As in the winter survey, heavy vessel traffic and re-piling work (to repair major earthquake damage) on Cashin Quay at the Port of Lyttelton, combined with strong winds, prevented most of the pre-allocated crab trapping and diving from occurring at this location. Consequently, most of the sampling locations pre-allocated to this area were re-allocated to nearby appropriate areas.

Access to the Port Chalmers wharves was limited during the Otago Harbour survey due the presence of multiple cruise ships and container ships in port. Dive locations on Beach St wharf and crab traps in this area were re-allocated to nearby appropriate areas. Strong winds also prevented safe diver deployment/retrieval on Victoria (T/U, CM and X/Y) and slipway berths in the Town Basin (upper harbour), and on Ravensbourne Wharf. This forced the re-allocation of six sampling locations to more sheltered locations in the upper harbour.

A large logging ship berthed at the Waimahara Wharf prevented access to pre-allocated dive locations at this wharf during the Picton Harbour survey. Affected dive locations were re-allocated to nearby appropriate areas.

Gale-force winds affected the Whangarei Harbour survey, delaying completion of field sampling until the following week.

Difficulties encountered in meeting minimum monitoring requirements

Any difficulties encountered were (overall) successfully managed (see above comments). The sampling count error in the field during the Otago Harbour Winter 2015 survey, where one of the 80 target crab trap lines was not deployed, was discussed with the field team leader, and requirement for all sampling effort to be tallied daily during surveys as part of NIWA's Quality Assurance/Quality Control procedures for the MHRSS Programme was re-iterated.

Problems encountered in reporting surveillance results

None.

Management actions taken to reduce problems

Where pre-allocated sampling locations could not be accessed because of, for example, the presence of a vessel alongside the wharf, the sample was taken (re-allocated) as close as possible to the pre-allocated location and GPS coordinates were recorded.

The working solution to sampling within the marine farming area to the north of Tikore Island in Bluff Harbour is to be maintained with the farm owner's consent and the following modifications to sample design; no trapping or sledding will be conducted in the farm lease area, but diver searches will be allocated there to search the submerged farm structures.

Stakeholder engagement, public awareness and media contact

The response from stakeholders contacted prior to the survey to inform them and obtain permission was generally rapid, and no problems were encountered with regard to access to sample locations. Introduction of the new Health and Safety at Work Act 2015 (HSWA) has seen port and marina companies increasing their health and safety requirements pertaining to external agencies operating in their jurisdiction. This has resulted in new/upgraded operating area induction processes and evidence of appropriate compliance with the HSWA for the MHRSS Programme survey field teams.

The reporting of survey results to stakeholders was conducted via MPI following the completion (and identification of any samples collected) of each survey.

During MHRSS Programme surveys, individuals representing various stakeholders with vested interest in survey locations, biosecurity and education activities sometimes accompanied the field teams to observe sampling activities (see Table 7).

Table 7: Stakeholders observing the Winter 2015 and Summer 2015–16 Marine High Risk Site Surveillance (MHRSS) Programme surveys

Port	Winter 2015 survey	Summer 2015–16 survey
Auckland (Waitemata) Harbour		University of Waikato
Bluff Harbour		
Lyttelton Harbour		
Nelson Harbour	Nelson College	
Opua		
Otago Harbour		
Picton/Havelock		
Port Taranaki	Port Taranaki Ltd	
Tauranga Harbour		
Wellington Harbour	Ministry for Primary Industries	Higher Education Consortium for Urban Affairs
Whangarei Harbour		Northland Regional Council

Following the Winter 2015 Auckland Harbour survey, a film crew joined the survey team to film a segment for the Coast (New Zealand) (Great Southern Film and Television) television episode on exotic organisms in Auckland Harbour and commensurate surveillance for target organisms. Consequently, Coast (New Zealand) episode four (Tāmaki makaurau), which screened on the 10th May 2016, highlighted efforts being made to reduce the impact of this invasive species on New Zealand's marine ecosystems and featured interviews with the NIWA MHRSS Programme dive team and Programme Leader in Marine Biosecurity. During the Whangarei Harbour survey, a film crew also joined the survey team to film a segment for the Big Pacific (Great Southern Film and Television) television episode on how exotic organisms are being monitored and managed.

Casual enquiries from members of the public and marina operators/owners were responded to by the field team leader as per the short-term communications policy between MPI and NIWA.

Acknowledgements

We thank the stakeholders with vested interest at each High Risk Site surveyed for facilitating the surveys. We also thank Tim Riding, the MPI Operational Liaison, for his partnership in facilitating the MHRSS Programme. Thank you to the NIWA survey field team leaders (Stephen Brown, Megan Carter, Crispin Middleton, Kate Neil, Matt Smith and Leigh Tait) for organising and running field surveys, and the enthusiastic and efficient NIWA field team members. Thank you to Leigh Tait for reviewing a draft version of this report.

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Appendix 1. Summary of sampling methods, target species and habitats in the Marine High Risk Site Surveillance (MHRSS) Programme

Underlined species have been collected using this method during the present or previous target-species surveillance programmes.

Method	Target species	Non-target species	Habitat	Spatial coverage	Effectiveness	Cost effectiveness	Feasibility	Previous surveillance in NZ?	Previous surveillance overseas?
Benthic sled	*Asterias amurensis* *Eudistoma elongatum* *Arcuatula senhousia* *Potamocorbula amurensis* *Sabella spallanzanii* *Styela clava*	*Acentrogobius pflaumii* *Chaetopterus* sp. *Charybdis (Charybdis) japonica* *Didemnum* sp. *Grateloupia turuturu* *Hypnea* sp. *Pyromaia tuberculata* *Theora lubrica*	Subtidal soft sediments. Particular focus on known shellfish beds (for *Asterias*) and areas next to public access (e.g. wharves, boat ramps, marinas, etc. *Caulerpa*, *Sabella*).	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.	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 or soft mud that block the mouth of sled.	Yes	Yes

Method	Target species	Non-target species	Habitat	Spatial coverage	Effectiveness	Cost effectiveness	Feasibility	Previous surveillance in NZ?	Previous surveillance overseas?
Box (crab) traps	*Asterias amurensis* *Carcinus maenas* *Eriocheir sinensis*	*Acentrogobius pflaumii* *Charybdis (Charybdis) japonica* *Pyromaia tuberculata*	Adjacent to wharf pilings and other artificial habitats. Intertidal and shallow subtidal rocky shores, breakwalls and saltmarsh. Particular focus on habitats with complex physical structure (e.g. mussel beds, seagrass beds)	Sampled area is dependent on dispersion of bait odour. High replication possible.	Effectively sample other species of crabs (e.g. *Hemiplax hirtipes*, *Notomithrax* spp., *Ovalipes catharus*, *Metacarcinus novaezelandiae*) and echinoderms (e.g. *Patiriella regularis*, *Coscinasterias muricata*). Also sample 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. *Styela clava* attached to masking crabs)	Quick to deploy and recover, so high replication possible.	Most locations and weather conditions.	Yes	Yes (Hewitt and Martin, 2001; May and Brown, 2001; Thresher et al, 2003; Yamada et al, 2005)

Method	Target species	Non-target species	Habitat	Spatial coverage	Effectiveness	Cost effectiveness	Feasibility	Previous surveillance in NZ?	Previous surveillance overseas?
Crab condos	*Carcinus maenas* *Eriocheir sinensis*	*Acentrogobius pflaumii* *Charybdis (Charybdis) japonica* *Pyromaia tuberculata*	Intertidal and shallow subtidal banks of rivers. Particular focus on brackish water habitats with complex physical structure (e.g. saltmarsh or fringing vegetation).	High replication possible. Availability of suitable estuarine habitat may limit deployment.	Effectively sample other species of crabs (e.g. *Austrohelice crassa*, *Hemigrapsus crenulatus*, *Hemiplax hirtipes*). Higher rates of detection of crabs than bated traps in muddy river banks (Veldhuizen, 2000).	Quick to deploy and recover, so high replication possible.	High – access problems at some locations (shallow water, deep mud, private land).	Yes	Yes (Veldhuizen, 2000)

Method	Target species	Non-target species	Habitat	Spatial coverage	Effectiveness	Cost effectiveness	Feasibility	Previous surveillance in NZ?	Previous surveillance overseas?
Shoreline searches	*Carcinus maenas* *Eriocheir sinensis* *Eudistoma elongatum* *Arcuatula senhousia* *Sabella spallanzanii* *Styela clava*	*Chaetopterus* sp. *Charybdis (Charybdis) japonica* *Clavelina lepadiformis* *Didemnum* sp. *Grateloupia turuturu* *Hypnea* sp. *Pyromaia tuberculata*	Sloping sandy shorelines, intertidal rocky reefs and areas where drift material is likely to accumulate. Prevailing winds on preceding days are a useful guide to where material may accumulate.	Wide – can cover long stretches of intertidal habitat quickly.	Used effectively in delimitation studies of *Styela.*	High	High – access to intertidal areas may be limiting.	Yes	Yes
Diver searches	*Asterias amurensis* *Carcinus maenas* *Eudistoma elongatum* *Sabella spallanzanii* *Styela clava*	*Caprella mutica* *Chaetopterus* sp. *Charybdis (Charybdis) japonica* *Clavelina lepadiformis* *Didemnum* sp. *Grateloupia turuturu* *Hypnea* sp. *Pyromaia tuberculata*	Wharf piles, marina piles and pontoons and other artificial structures, intertidal and shallow subtidal reefs.	Good – large numbers of piles or lengths of hard substratum can be searched in detail.	Dependent on water clarity and level of biofouling.	Cost-effective in reasonable water clarity, can be time-consuming under poor conditions.	Feasibility dependent on water currents, weather, water clarity and safety issues for divers.	Yes	Yes

Appendix 2. Summaries of target versus achieved number of sampling locations for Winter 2015 and Summer 2015–16 Marine High Risk Site Surveillance (MHRSS) Programme surveys

AUCKLAND (WAITEMATA) HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	16	16	100.0
Crab (box) trap lines	160	160	100.0
Benthic sled tows	200	201	100.5
Diver searches	60	60	100.0
Shore searches	50	59	118.0
Sample total	**486**	**496**	**102.1**
SUMMER 2015–16			
Crab condo lines	16	16	100.0
Crab (box) trap lines	160	160	100.0
Benthic sled tows	200	200	100.0
Diver searches	60	60	100.0
Shore searches	50	58	116.0
Sample total	**486**	**494**	**101.6**

BLUFF HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	68	68	100.0
Benthic sled tows	84	84	100.0
Diver searches	40	40	100.0
Shore searches	25	25	100.0
Sample total	**225**	**225**	**100.0**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	68	68	100.0
Benthic sled tows	84	84	100.0
Diver searches	40	40	100.0
Shore searches	25	25	100.0
Sample total	**225**	**225**	**100.0**

LYTTELTON HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	101	101.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**244**	**100.0**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**243**	**100.0**

NELSON HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**243**	**100.0**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**243**	**100.0**

OPUA

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	84	105.0
Benthic sled tows	105	105	100.0
Diver searches	30	30	100.0
Shore searches	25	26	104.0
Sample total	**248**	**253**	**102.0**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	105	105	100.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**248**	**248**	**100.0**

OTAGO HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	79	98.8*
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**242**	**99.6**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	31	103.3
Shore searches	25	25	100.0
Sample total	**243**	**244**	**100.4**

*Sampling count error in the field

PICTON/HAVELOCK

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**243**	**100.0**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**243**	**100.0**

PORT TARANAKI

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	102	102.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**245**	**100.8**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**243**	**100.0**

TAURANGA HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	35	140.0
Sample total	**243**	**253**	**104.1**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	29	116.0
Sample total	**243**	**247**	**101.6**

WELLINGTON HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	102	102.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**245**	**100.8**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	79	98.8
Benthic sled tows	100	100	100.0
Diver searches	30	31	103.3
Shore searches	25	25	100.0
Sample total	**243**	**243**	**100.0**

*One trap line missing

WHANGAREI HARBOUR

Sampling method	Target number of sampling locations	Achieved number of sampling locations	% of target achieved
WINTER 2015			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	80	100.0
Benthic sled tows	100	100	100.0
Diver searches	30	30	100.0
Shore searches	25	27	108.0
Sample total	**243**	**245**	**100.8**
SUMMER 2015–16			
Crab condo lines	8	8	100.0
Crab (box) trap lines	80	81	101.3
Benthic sled tows	100	101	101.0
Diver searches	30	30	100.0
Shore searches	25	25	100.0
Sample total	**243**	**245**	**100.8**

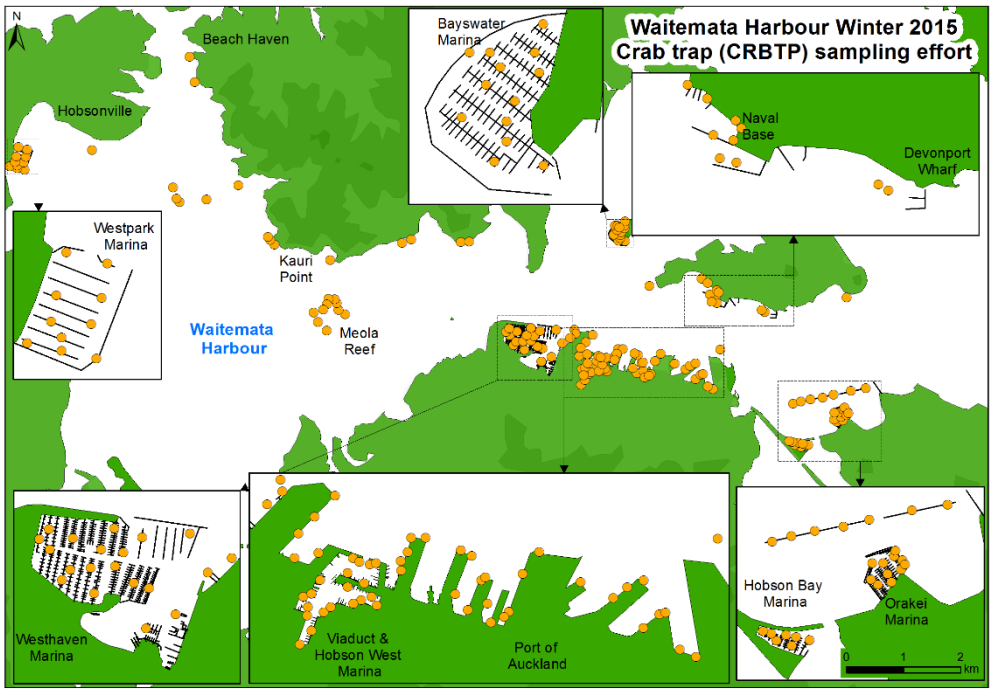
Appendix 3. Maps showing locations sampled in Winter 2015 and Summer 2015–16 Marine High Risk Site Surveillance (MHRSS) Programme surveys

NOTE THAT NUMBERS OF LOCATIONS PLOTTED MAY APPEAR SMALLER THAN THOSE SHOWN IN APPENDIX 2 DUE TO POINTS PLOTTING ON TOP OF EACH OTHER AS A RESULT OF THE SPATIAL RESOLUTION OF THESE MAPS

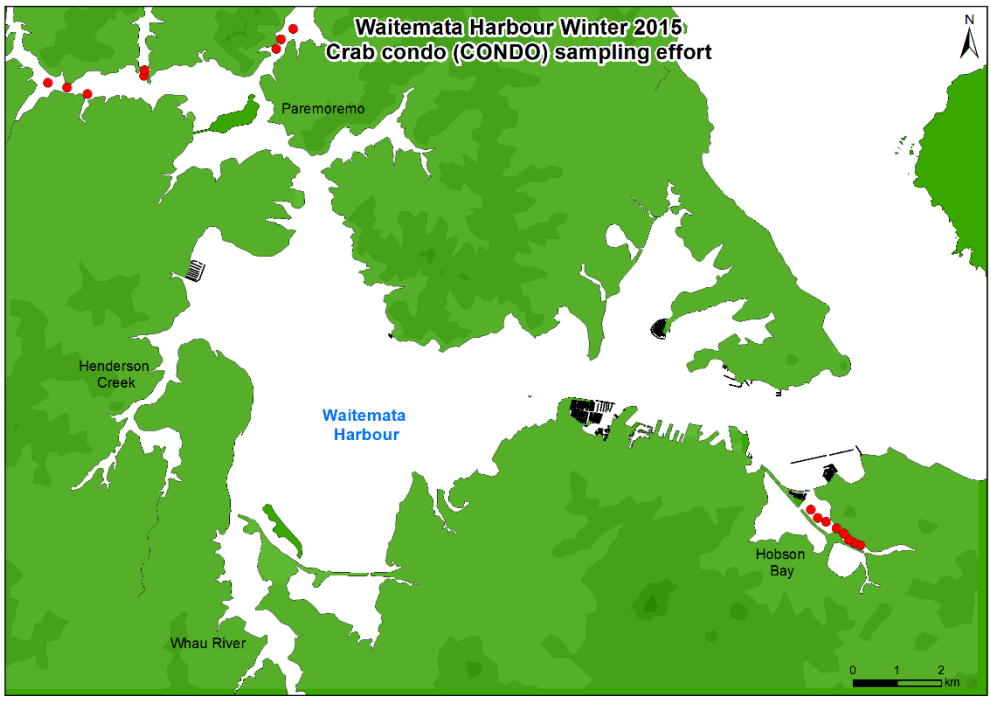
Auckland (Waitemata) Harbour

Winter 2015

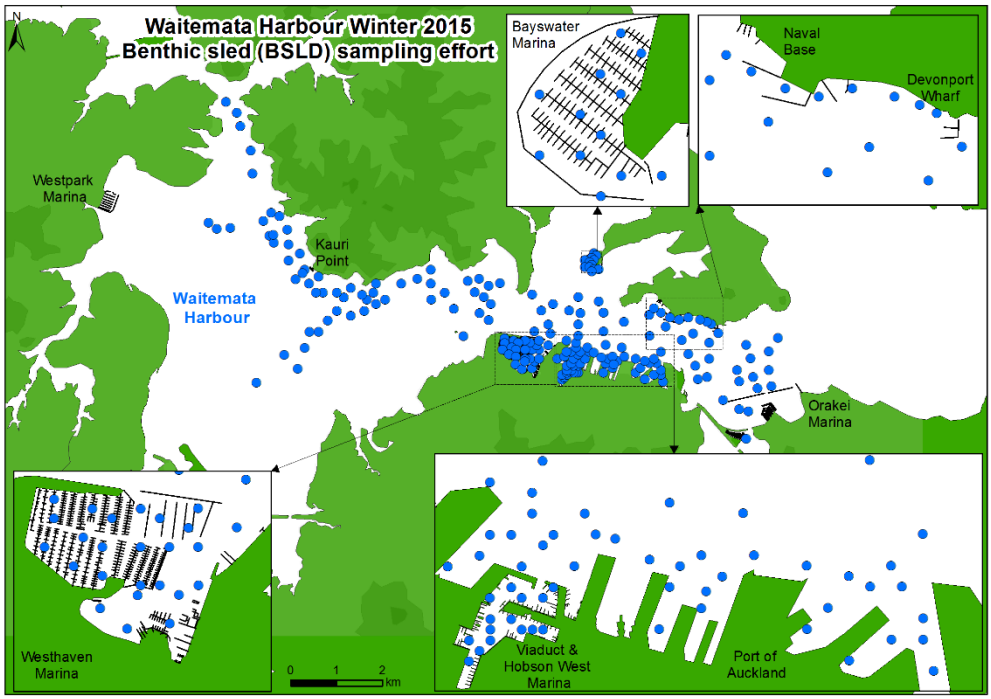
Crab (box) trapping locations



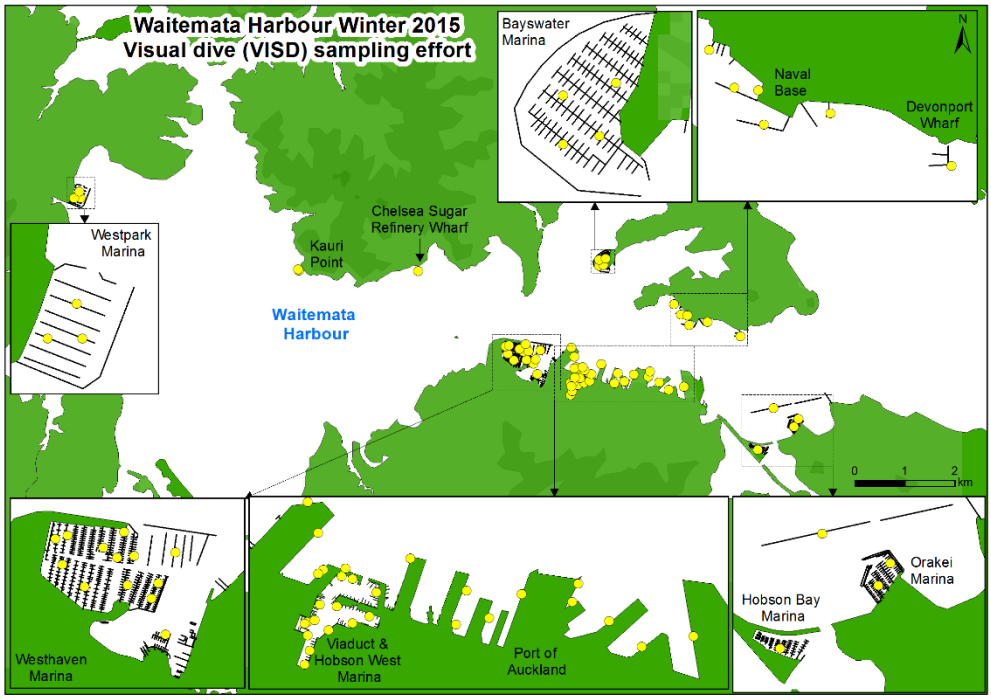
Crab condo locations



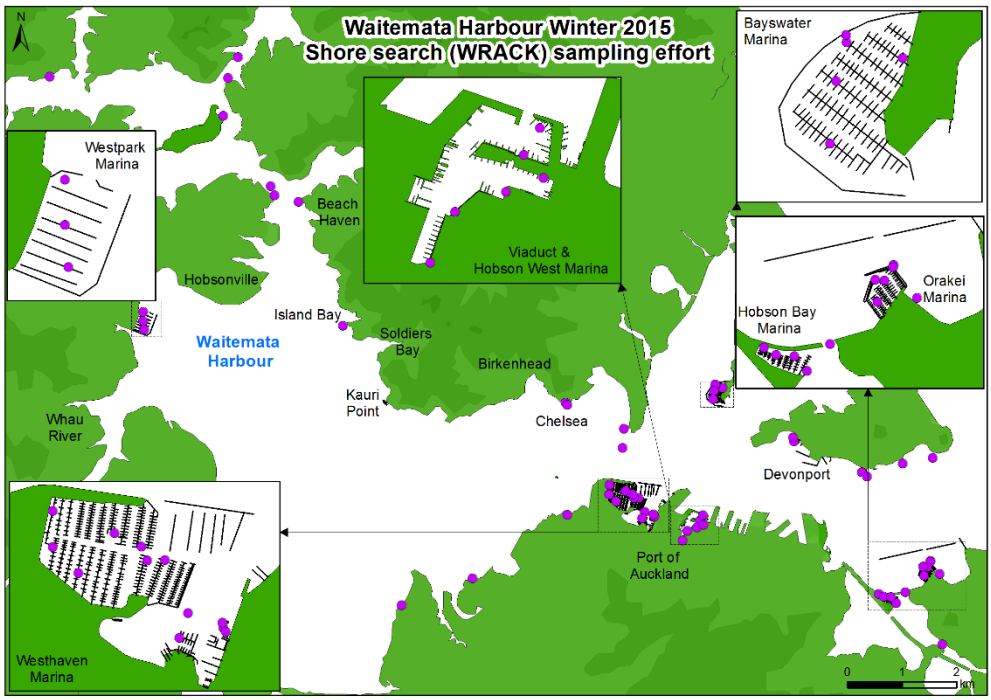
Sledding locations



Dive search locations

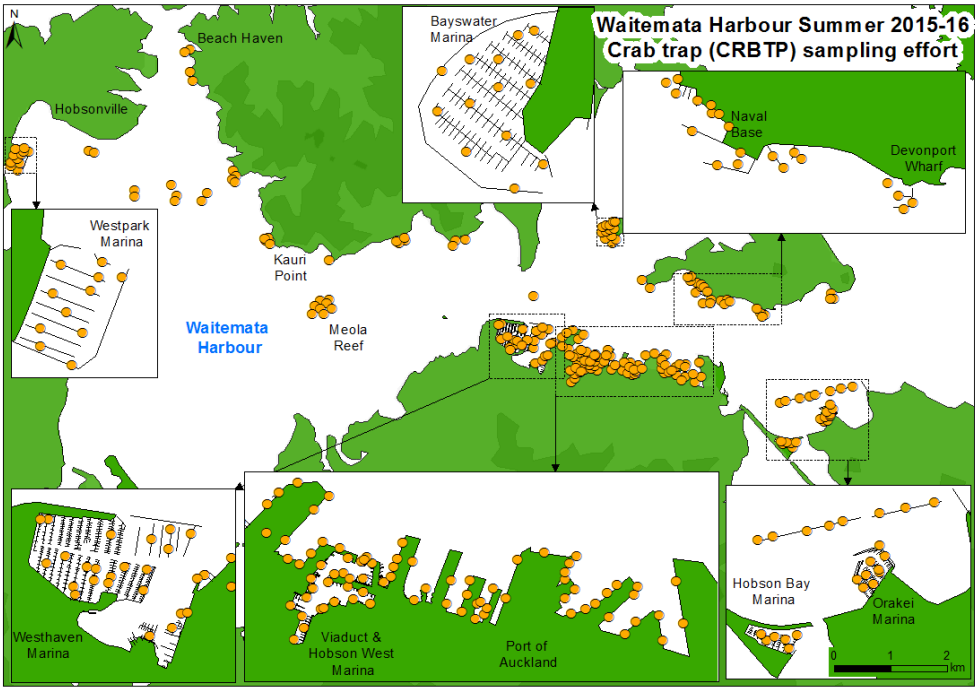


Shore search locations

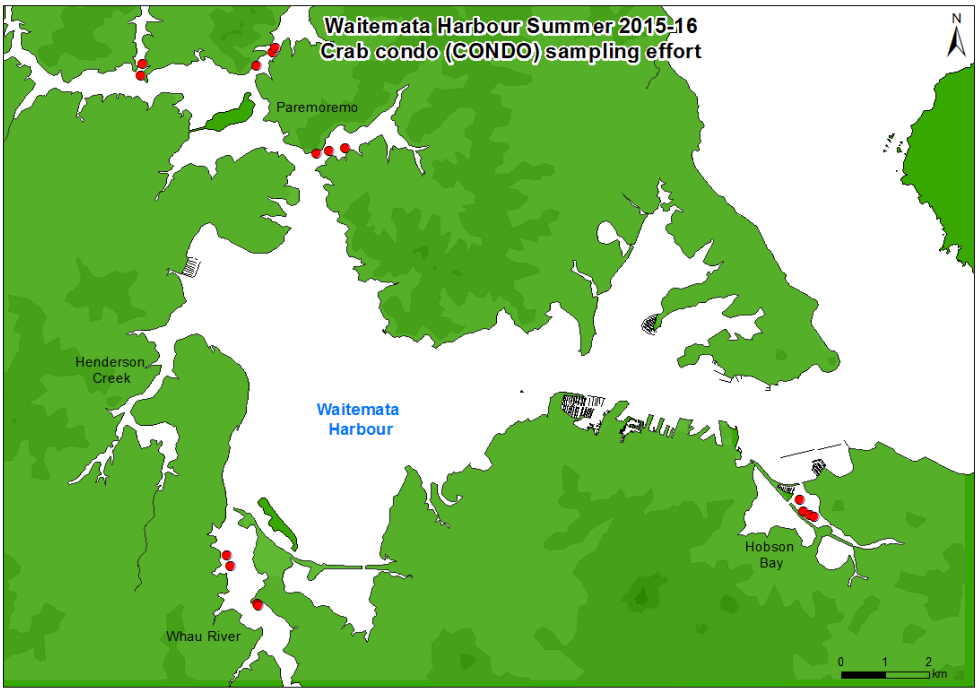


Summer 2015–16

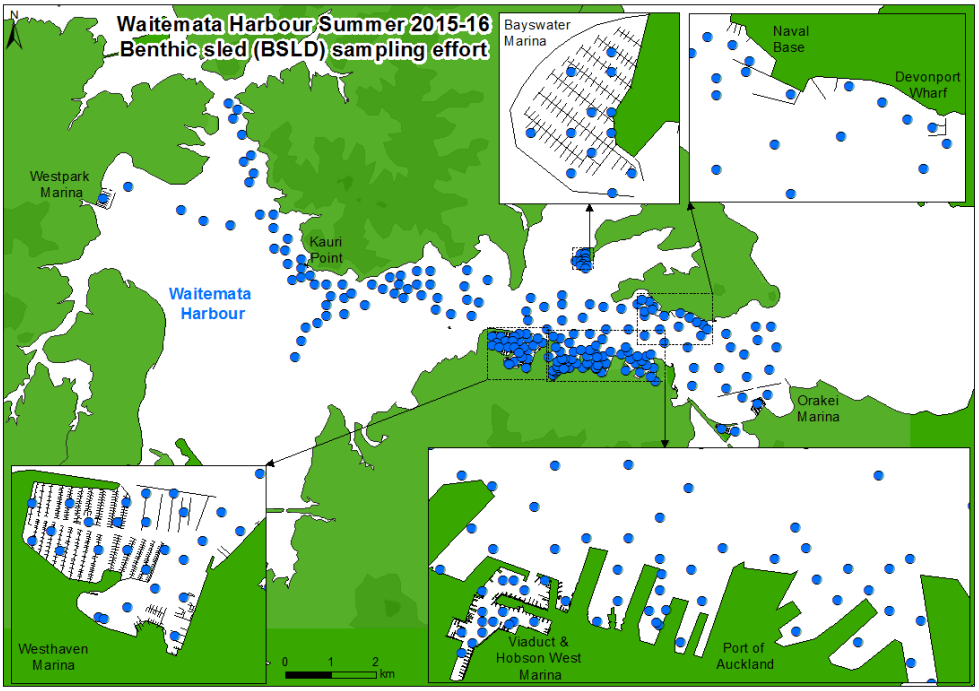
Crab (box) trapping locations



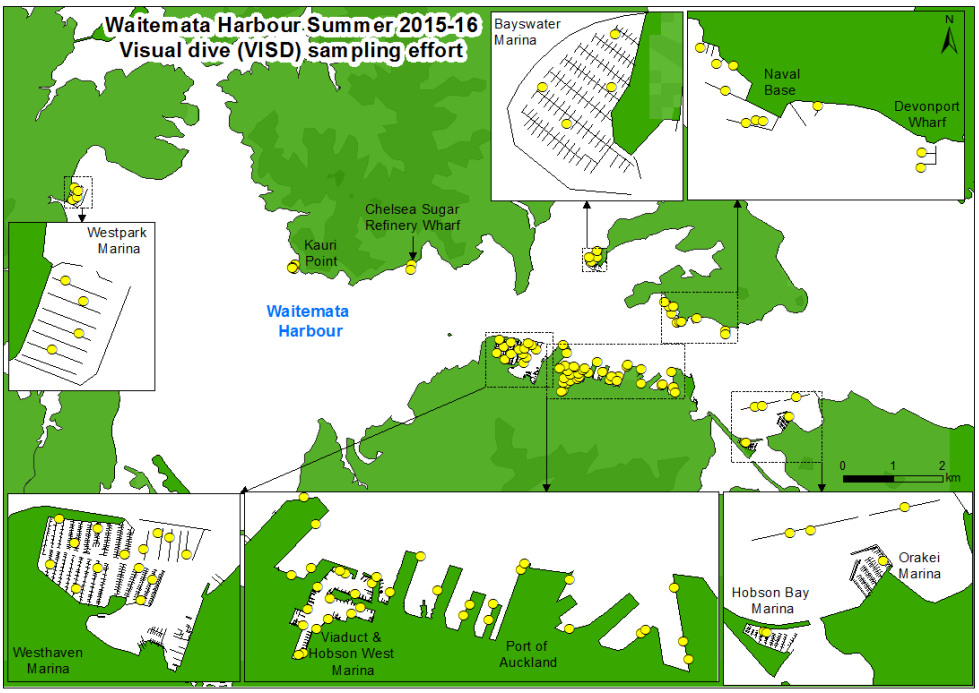
Crab condo locations



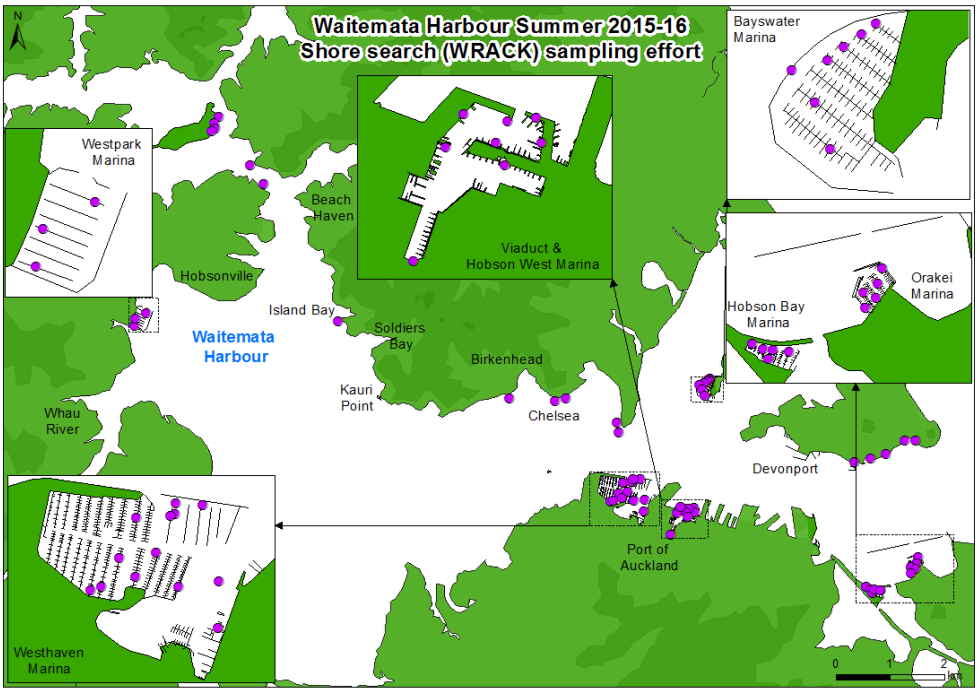
Sledding locations



Dive search locations



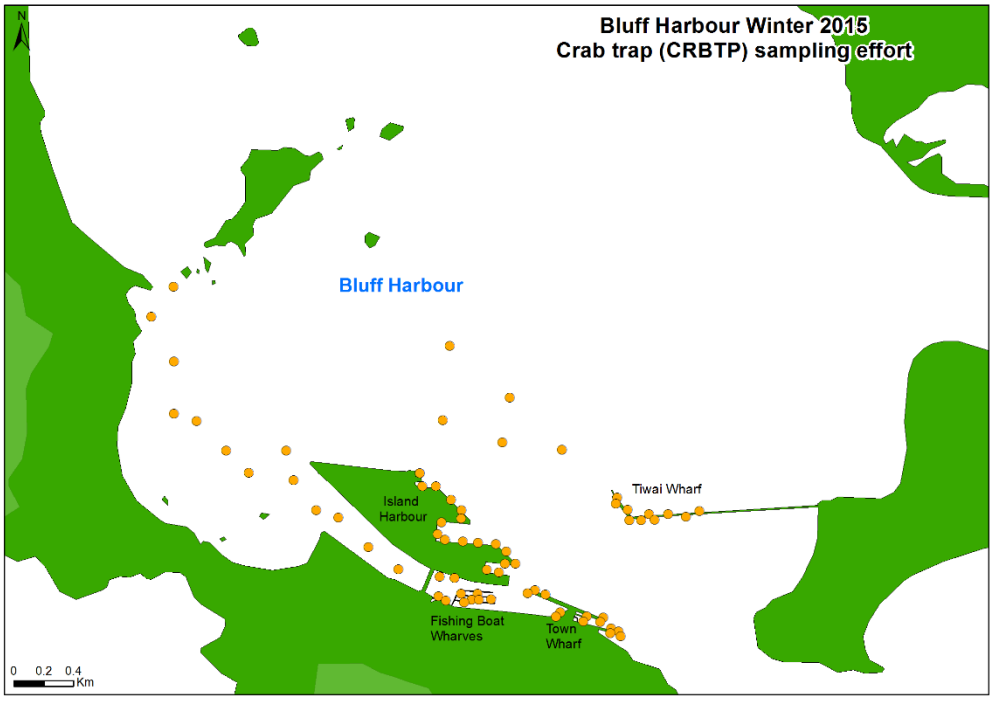
Shore search locations



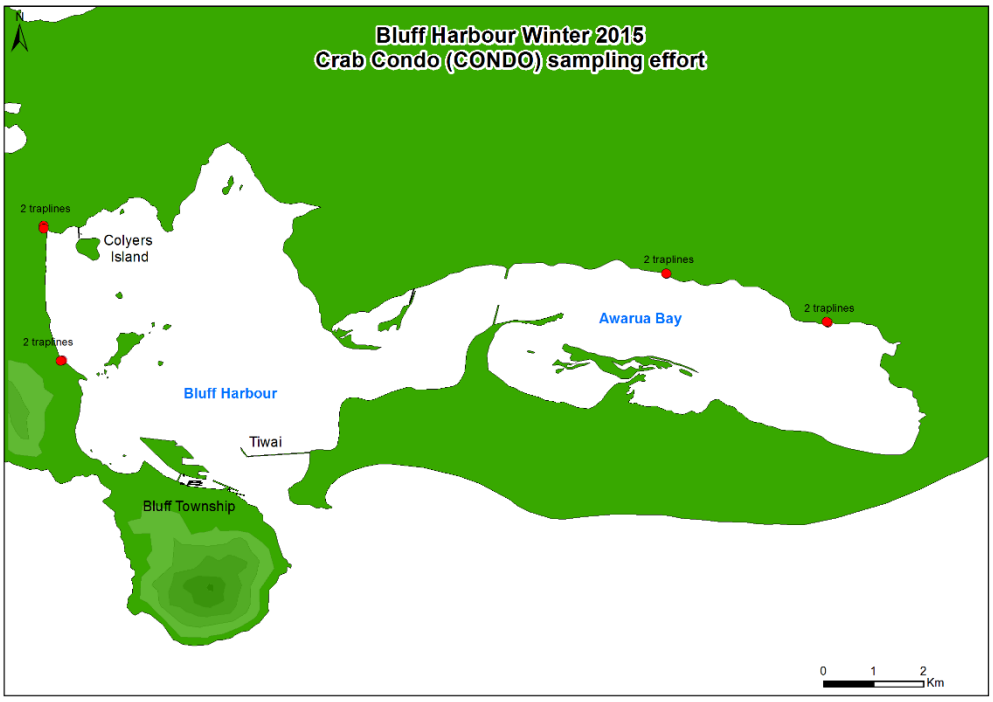
Bluff Harbour

Winter 2015

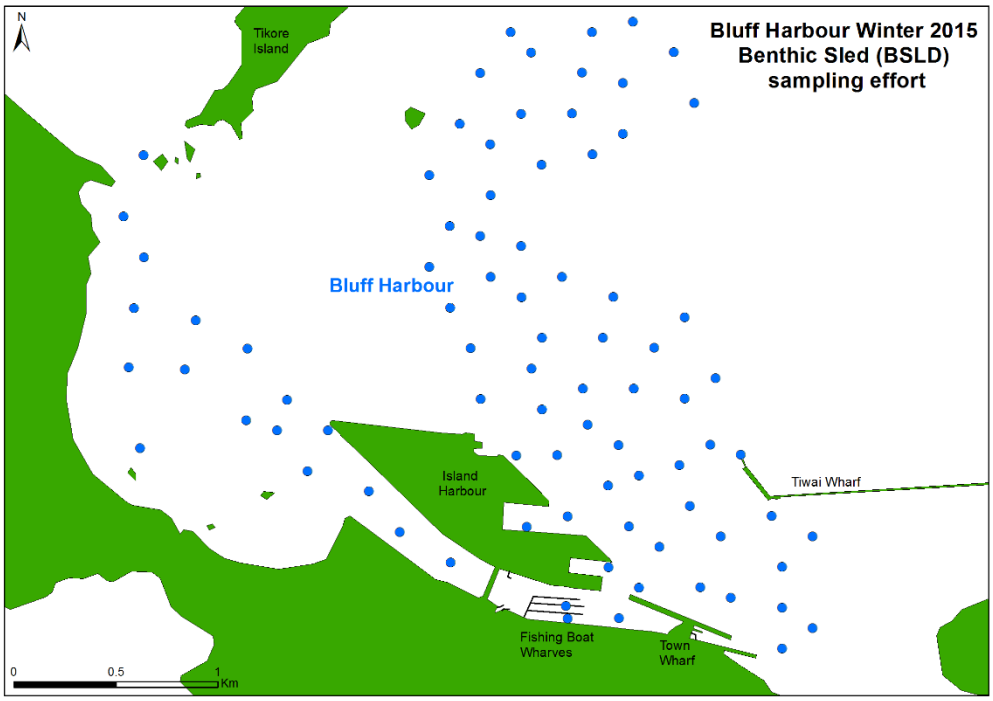
Crab (box) trapping locations



Crab condo locations



Sledding locations



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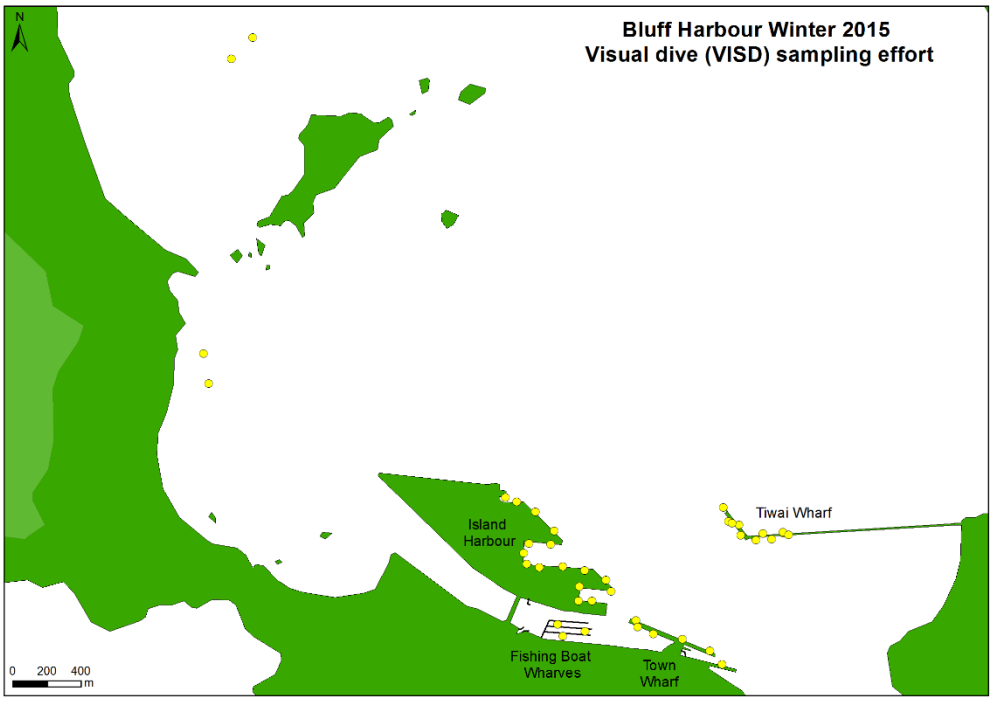

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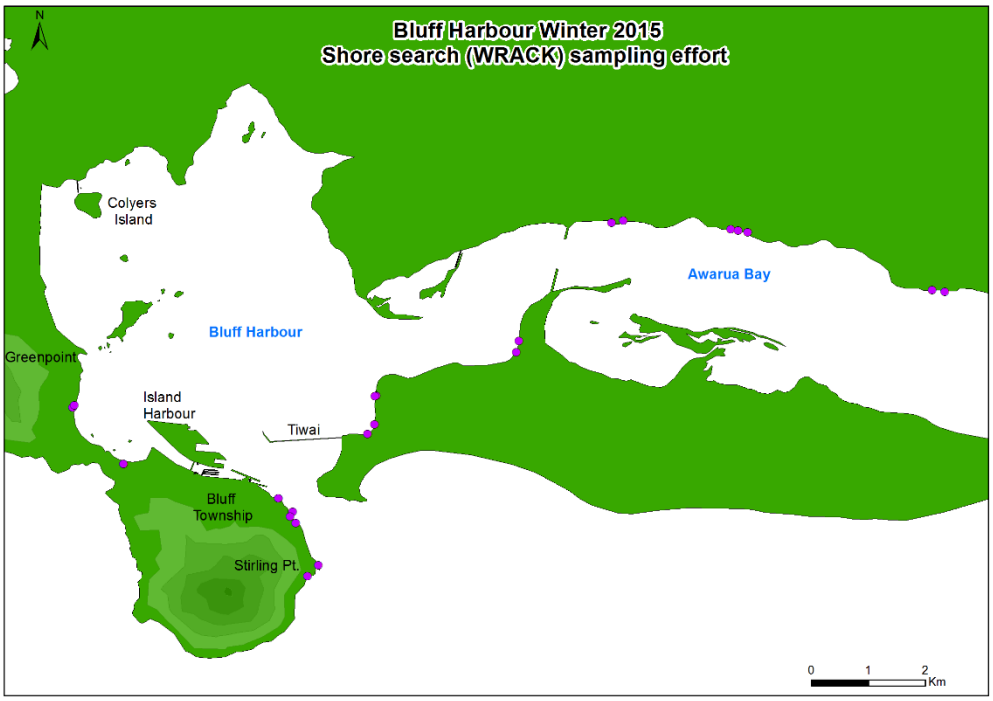
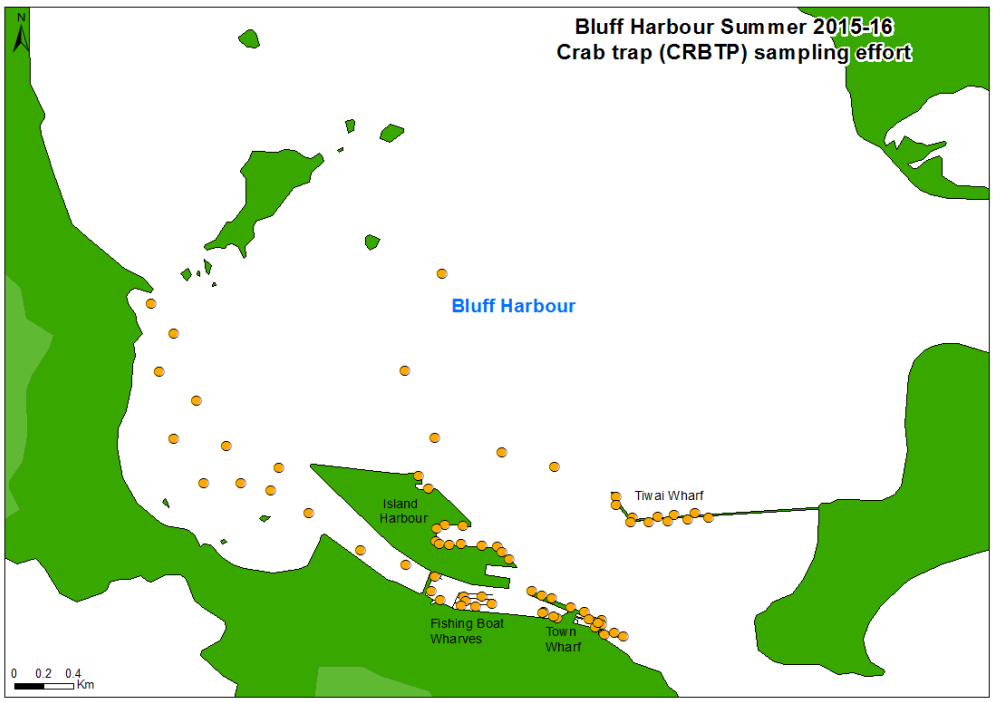
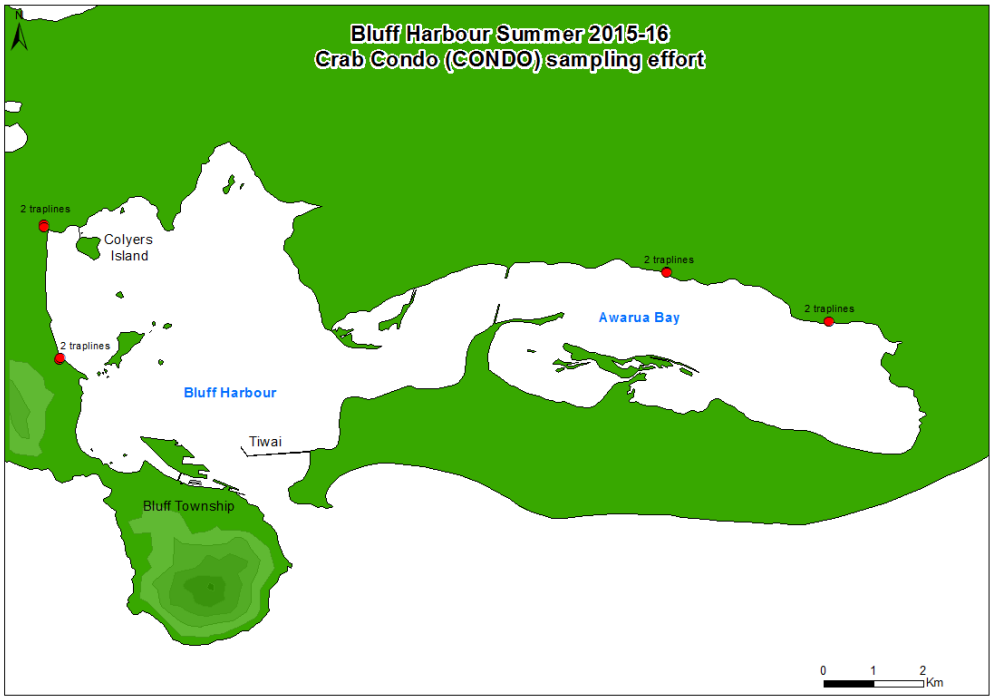


Summer 2015–16

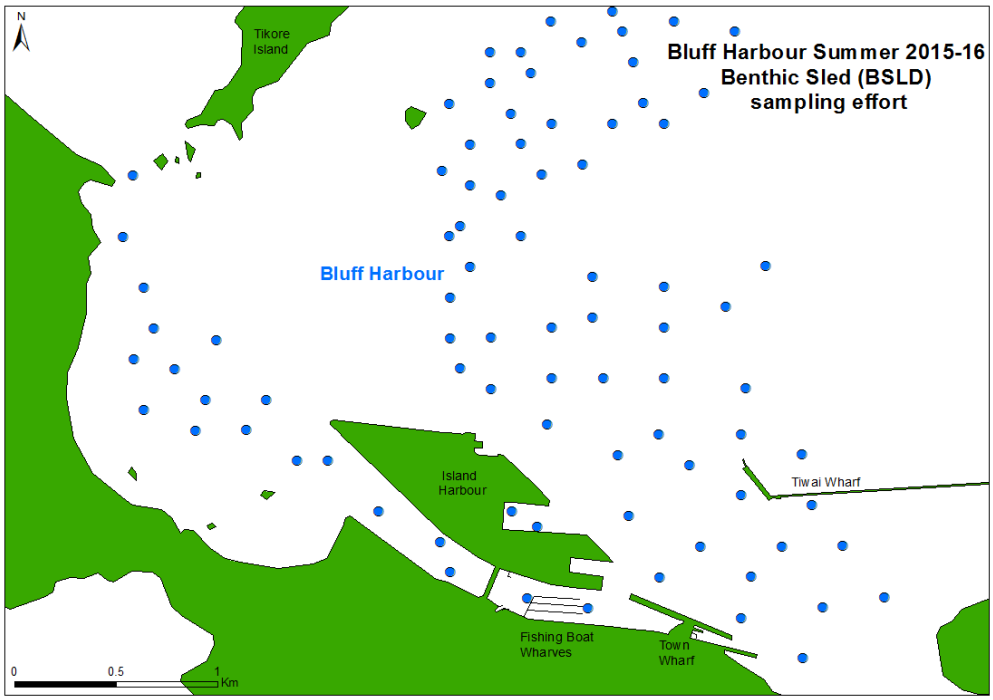
Crab (box) trapping locations



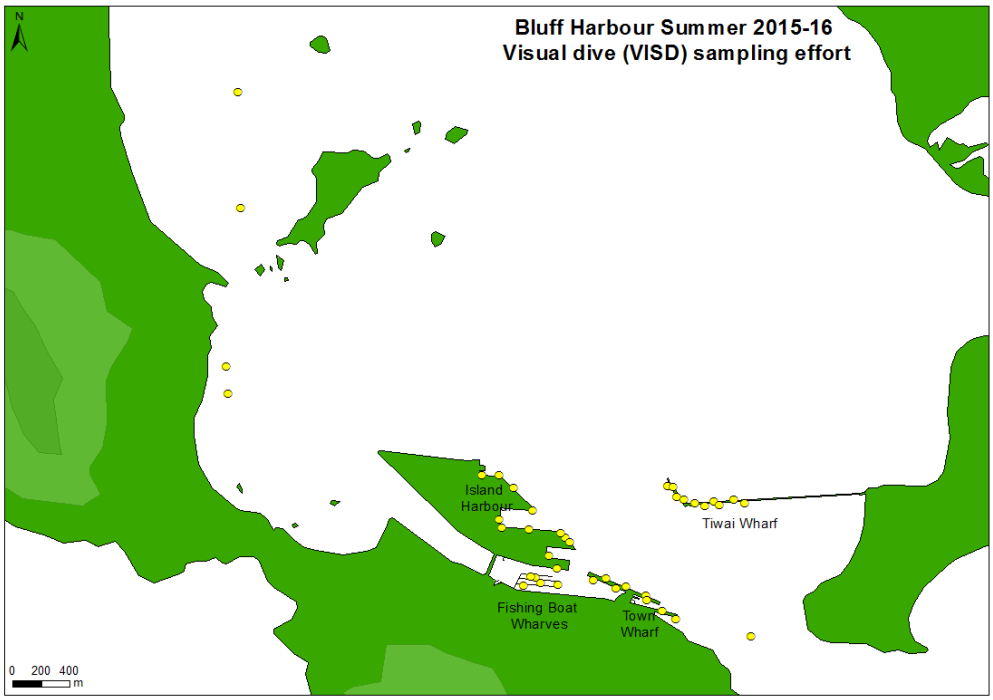
Crab condo locations



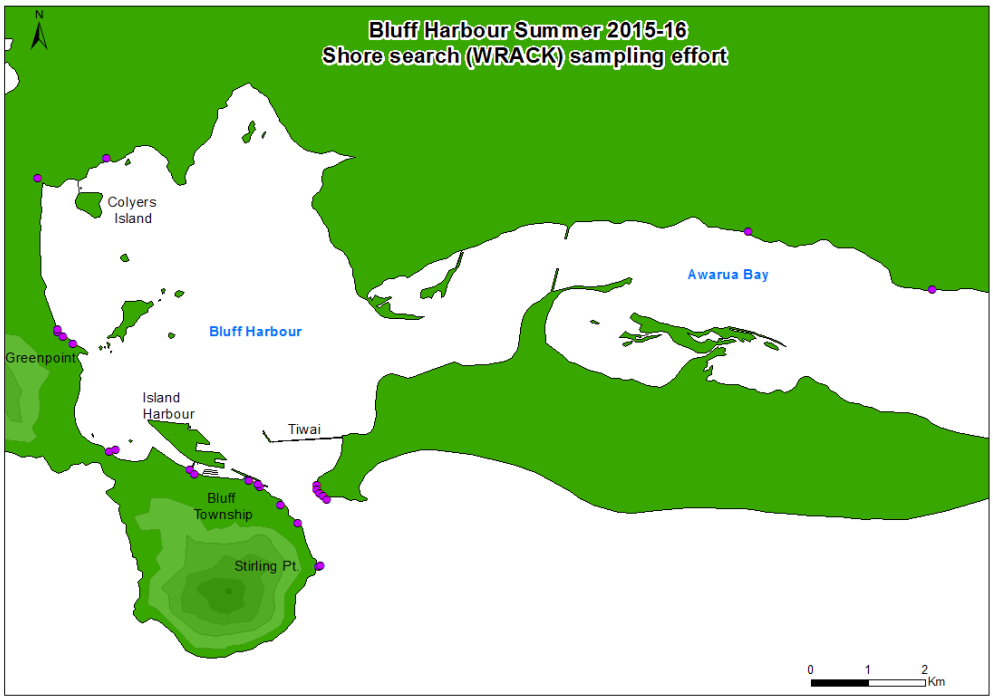
Sledding locations



Dive search locations



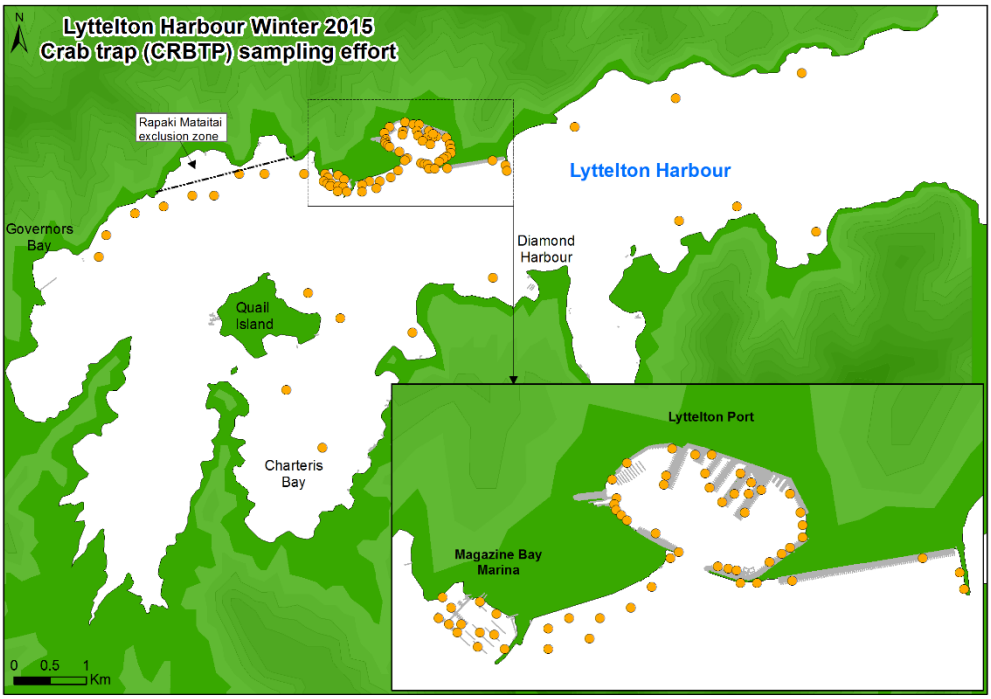
Shore search locations



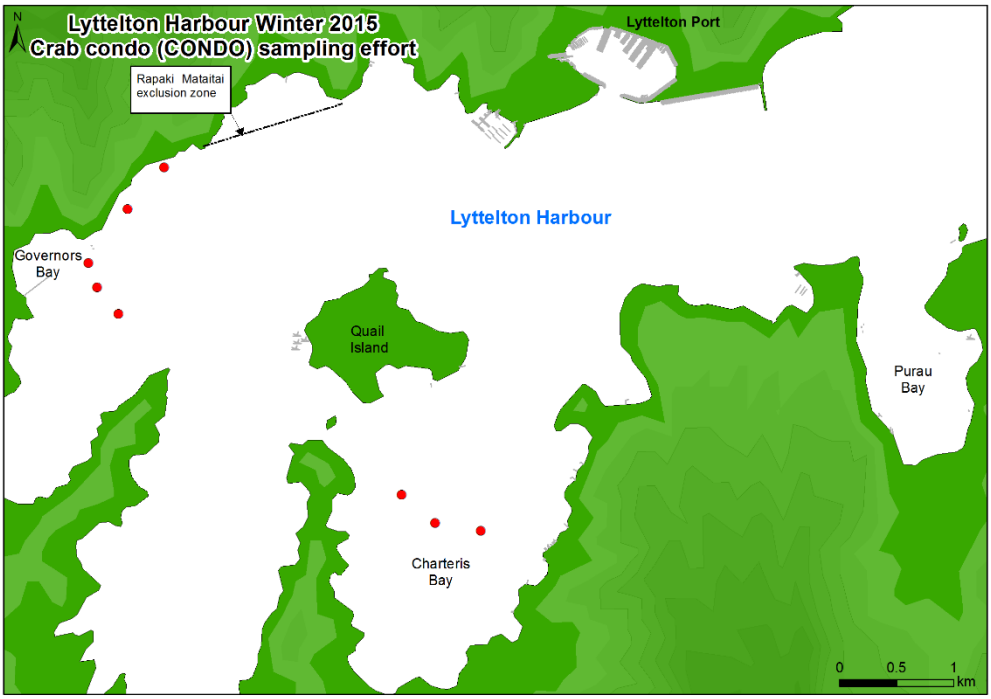
Lyttelton Harbour

Winter 2015

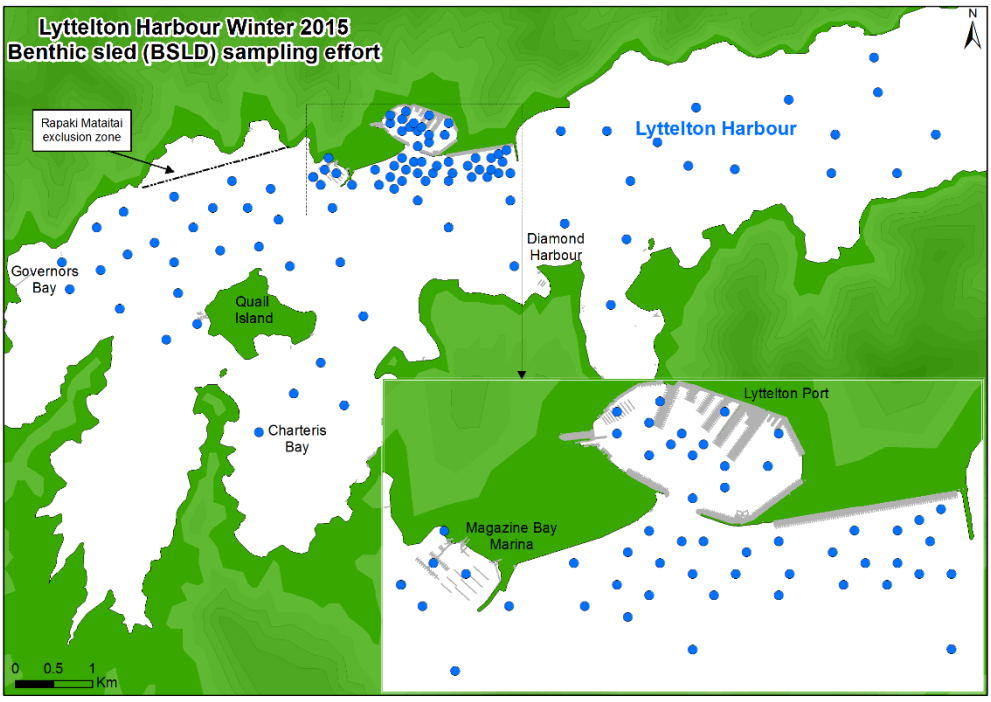
Crab (box) trapping locations



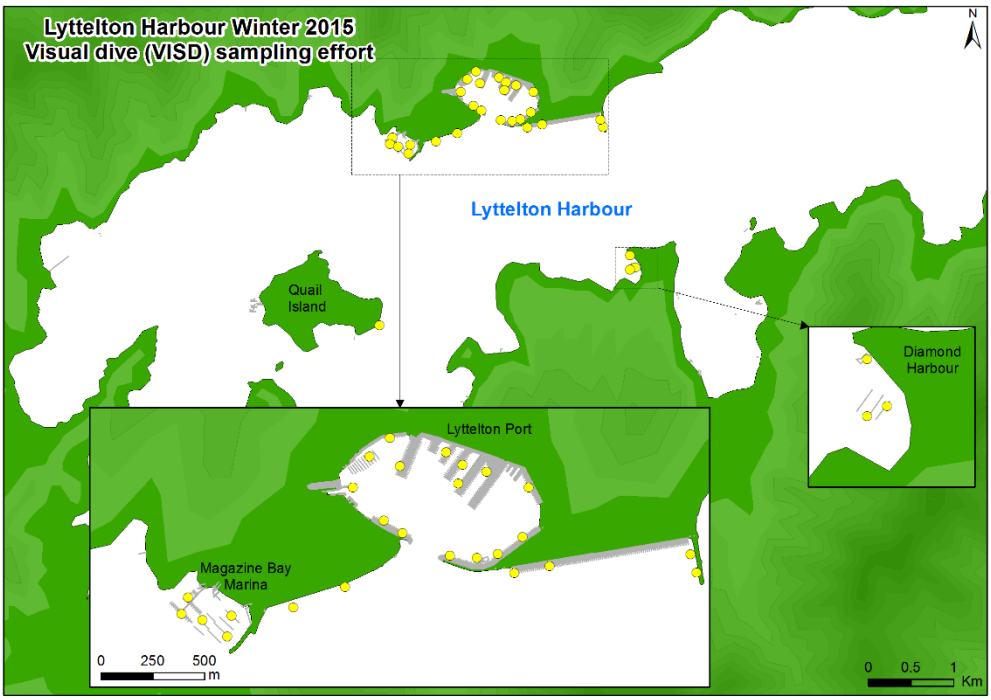
Crab condo locations



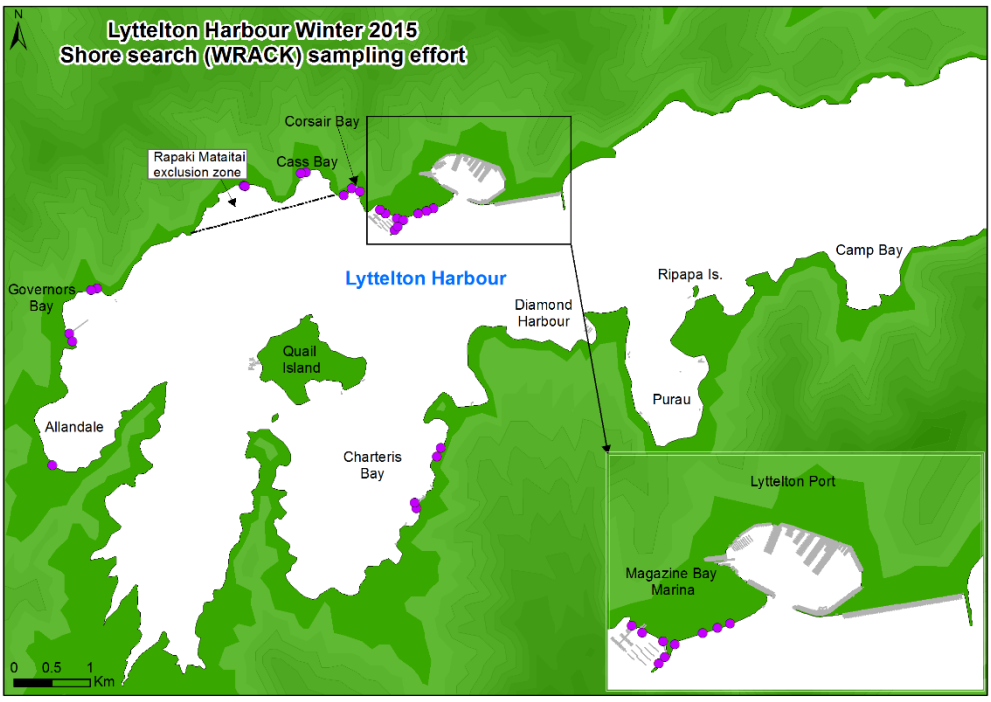
Sledding locations



Dive search locations

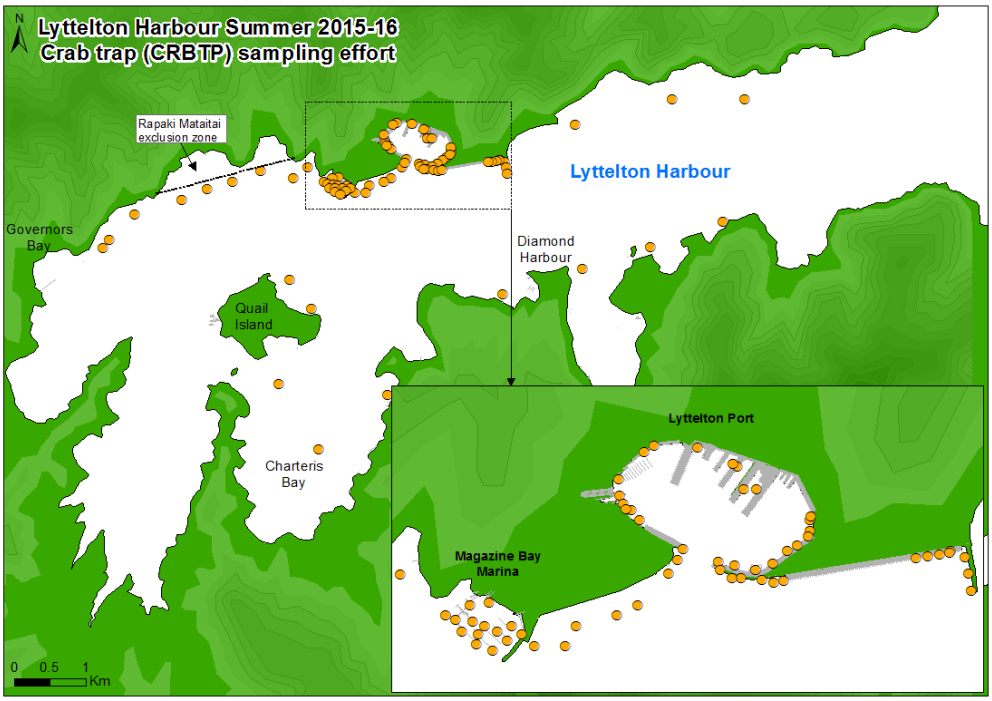


Shore search locations

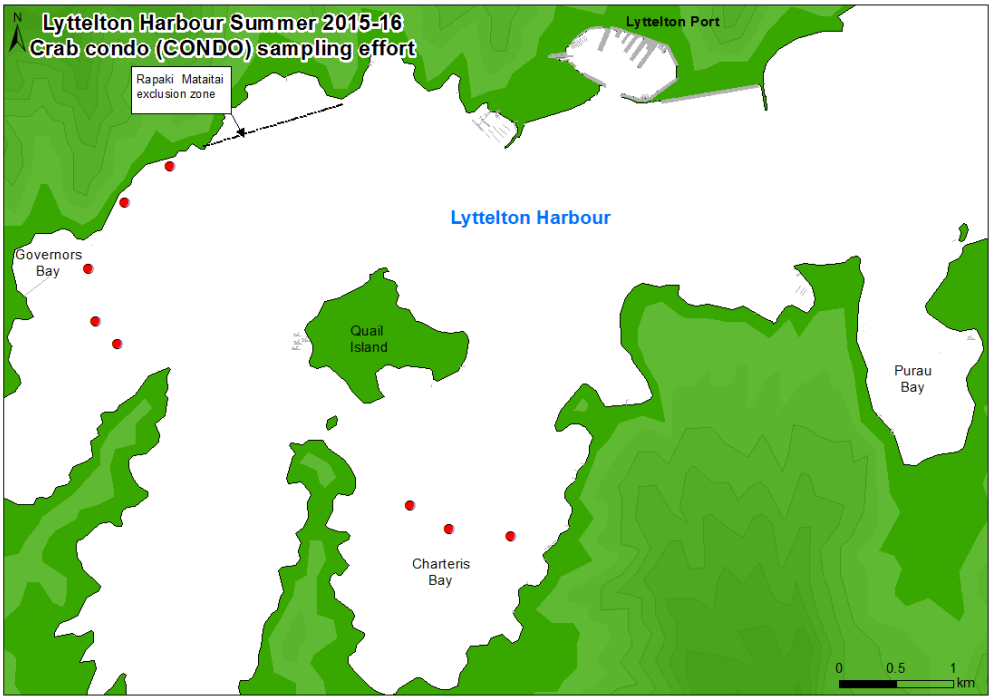


Summer 2015–16

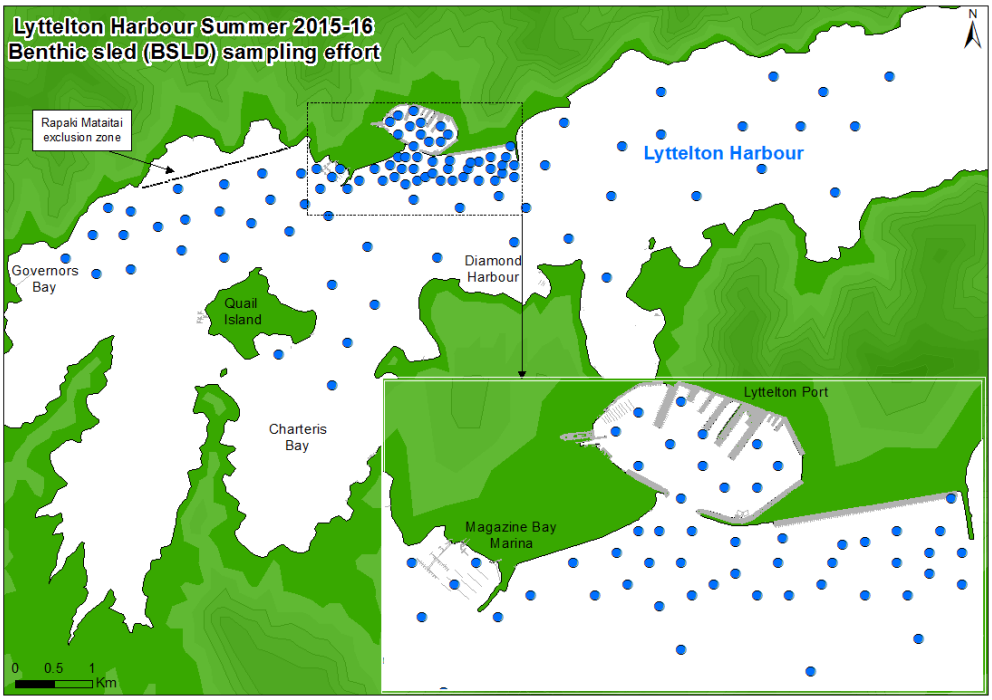
Crab (box) trapping locations



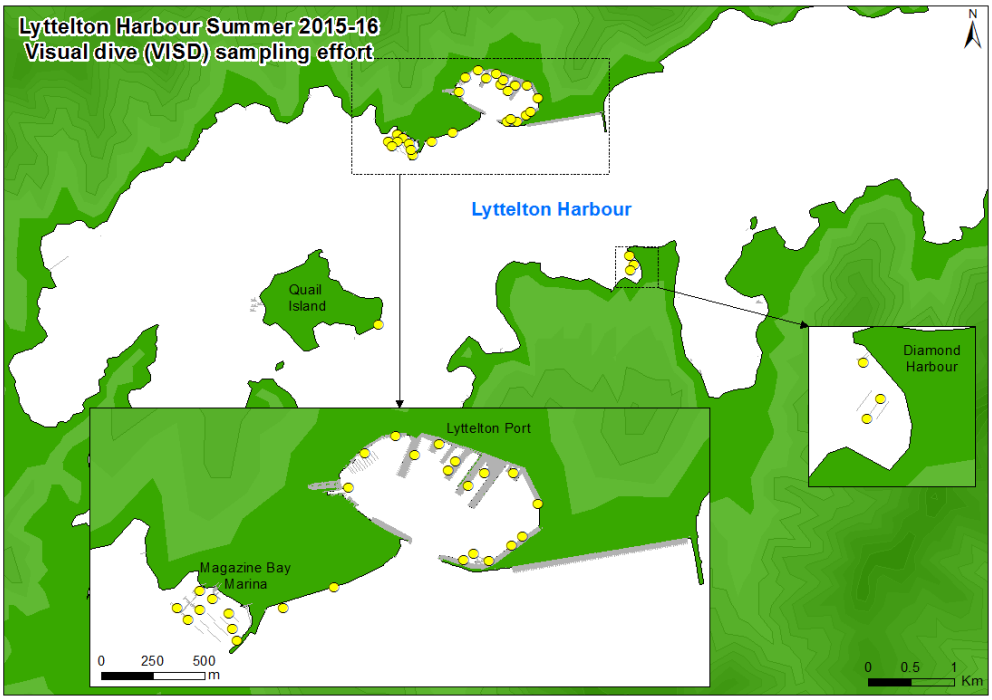
Crab condo locations



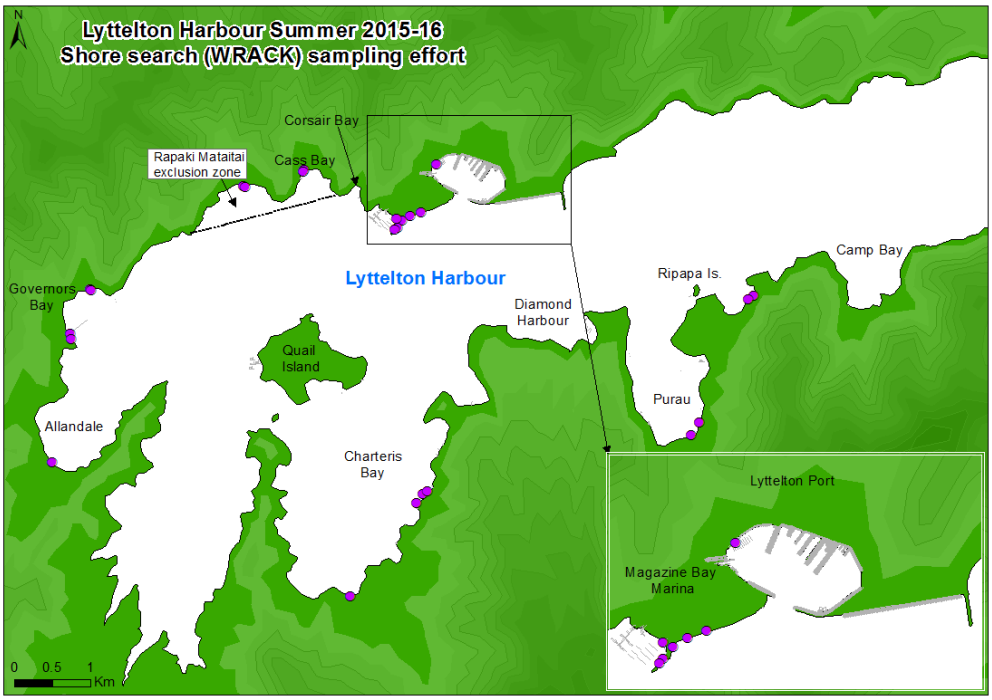
Sledding locations



Dive search locations



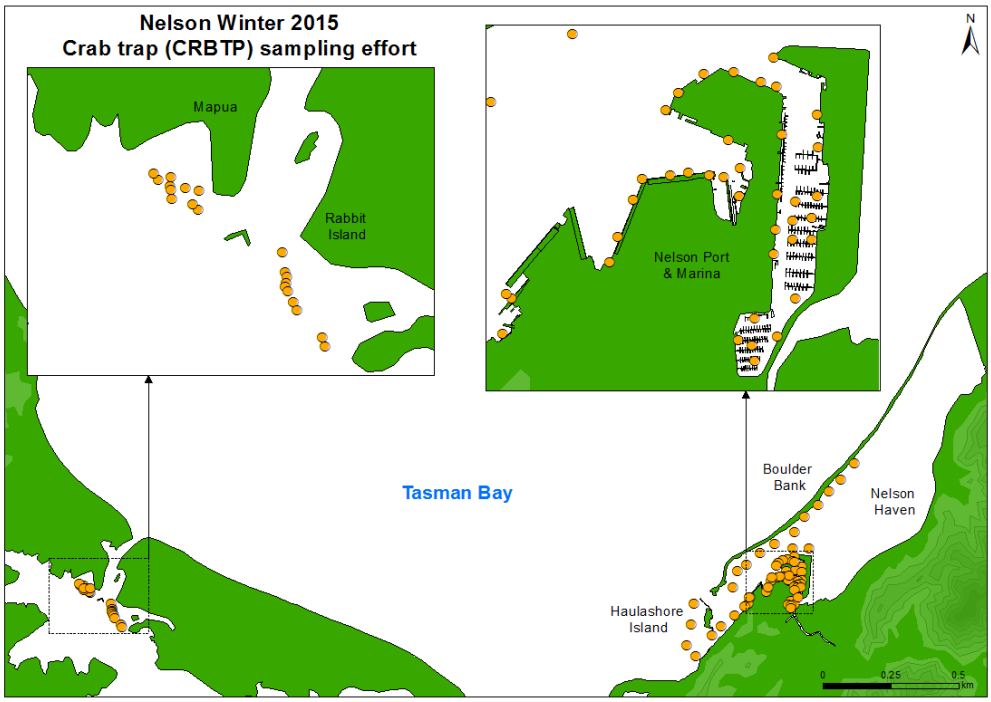
Shore search locations



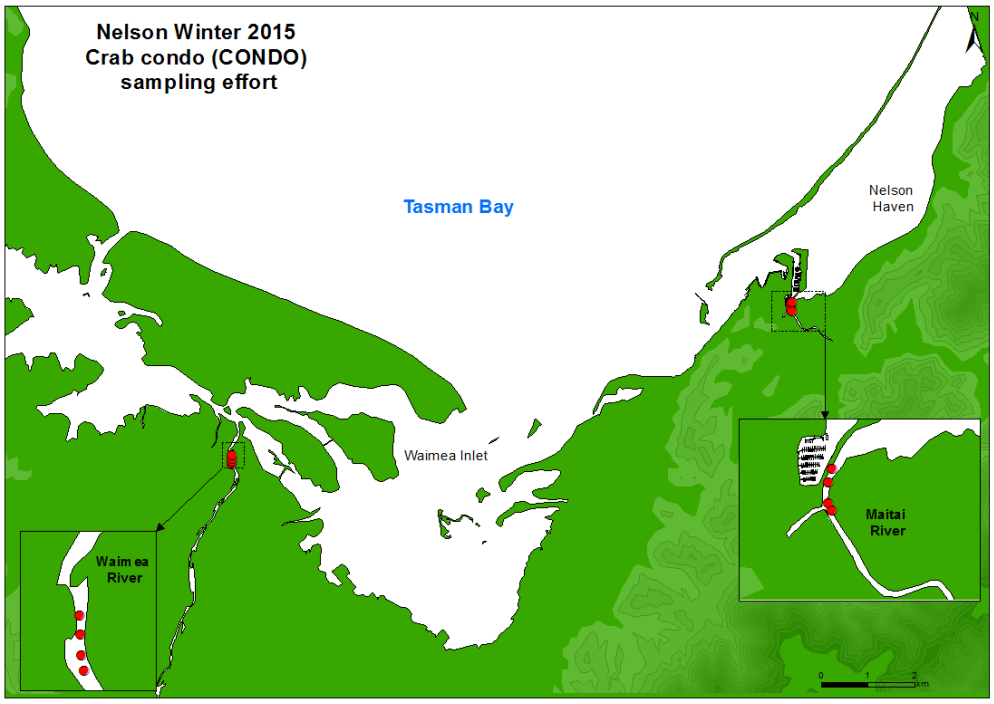
Nelson Harbour

Winter 2015

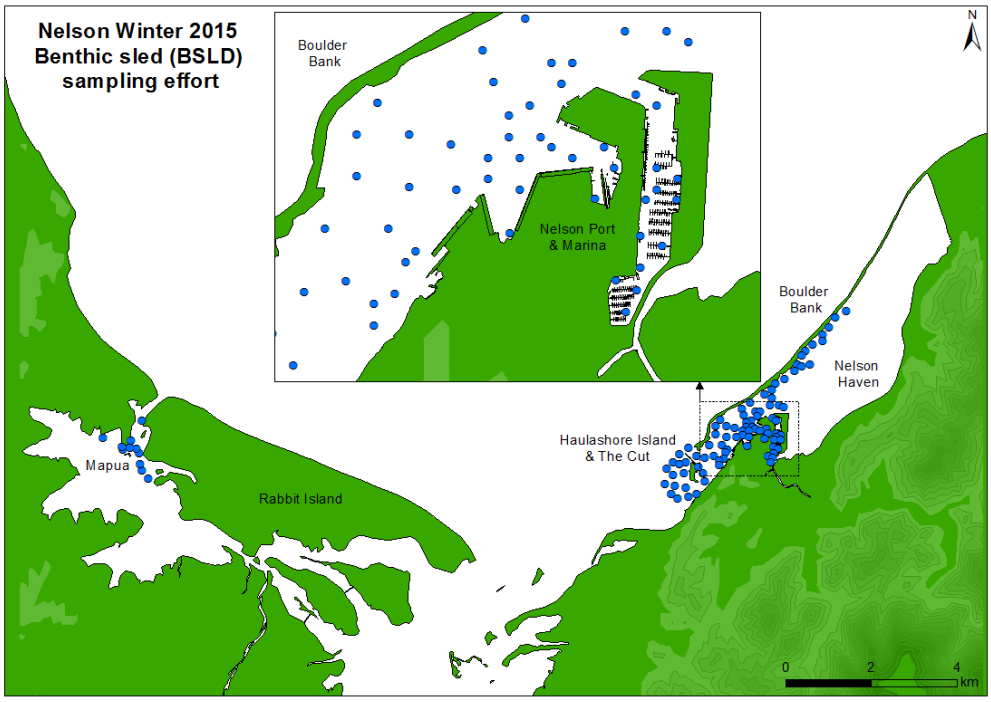
Crab (box) trapping locations



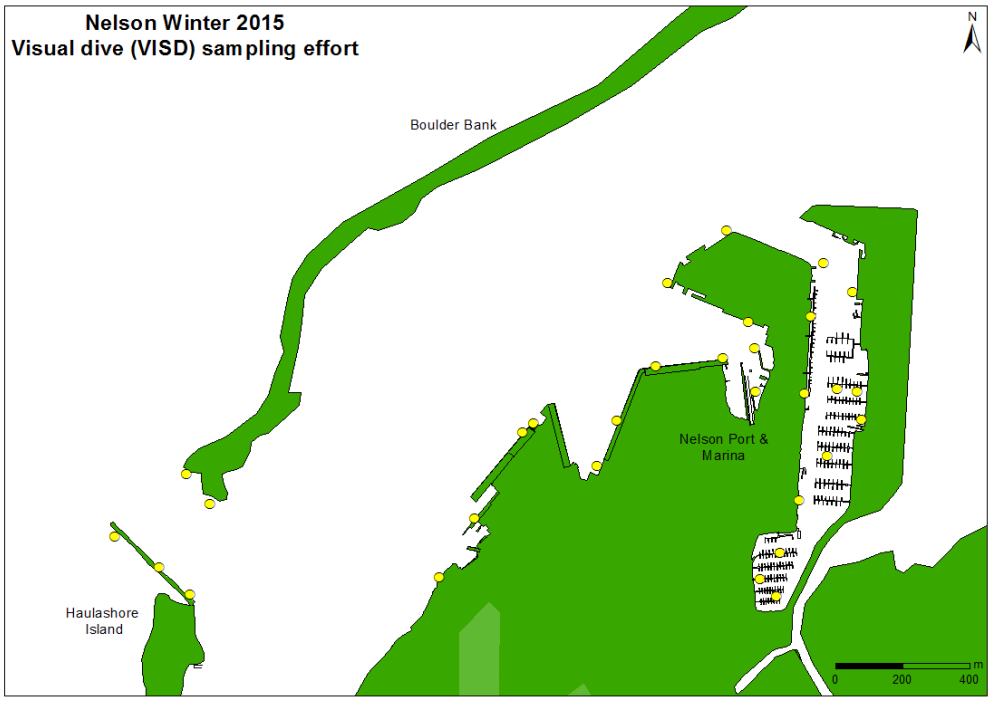
Crab condo locations



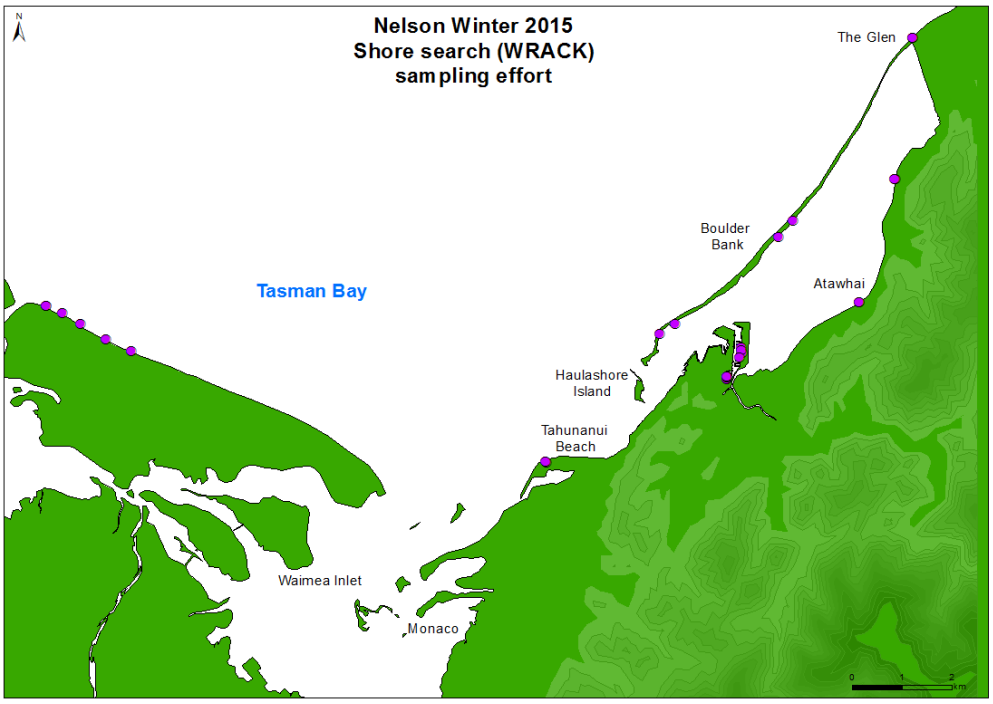
Sledding locations



Dive search locations

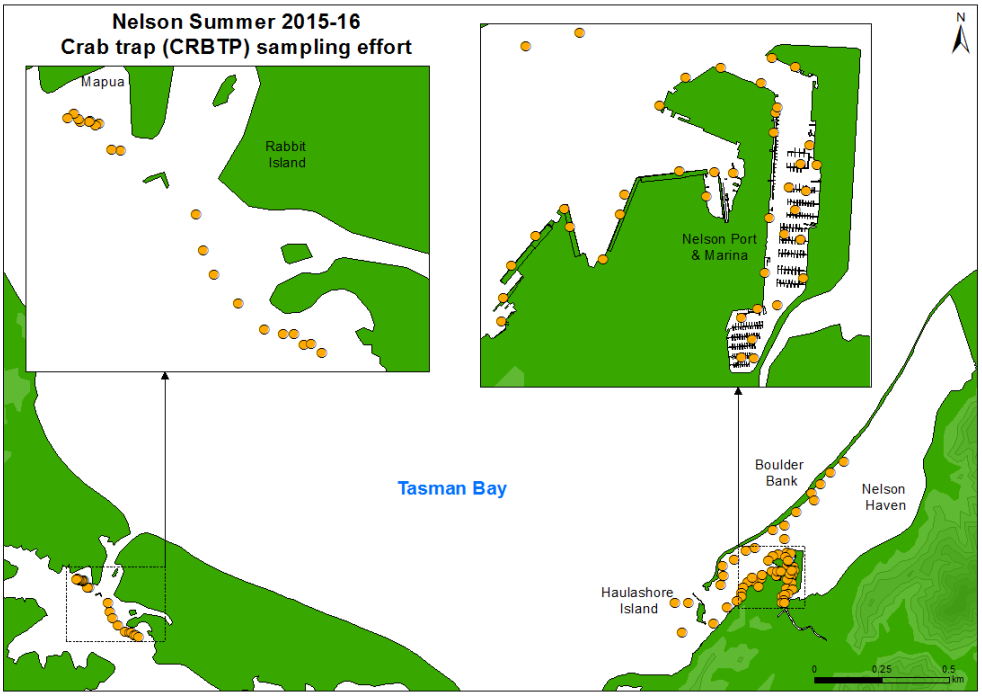


Shore search locations

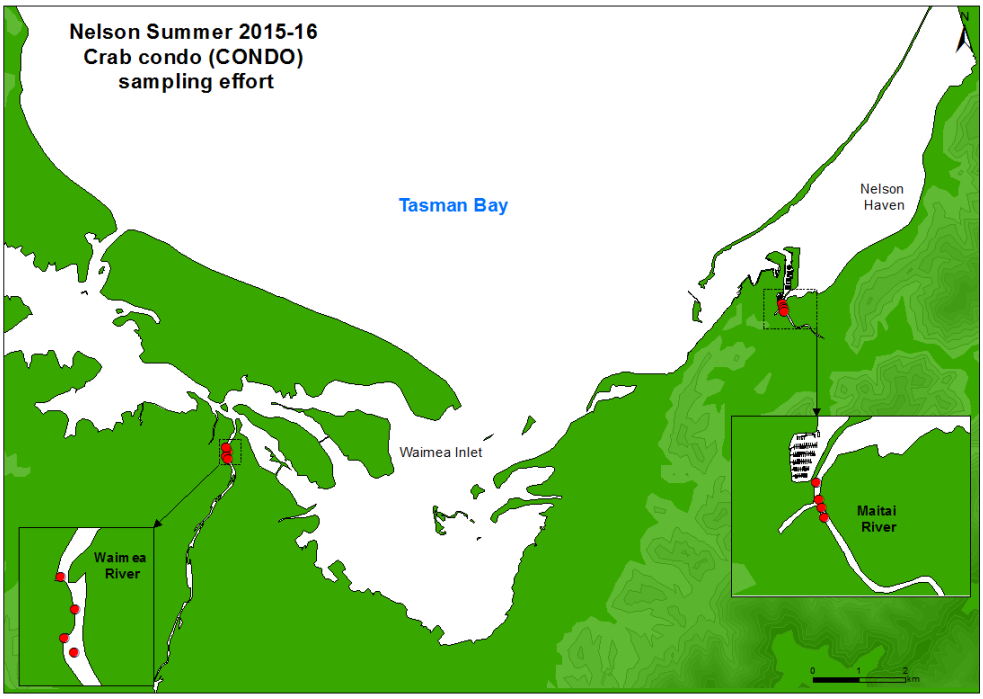


Summer 2015–16

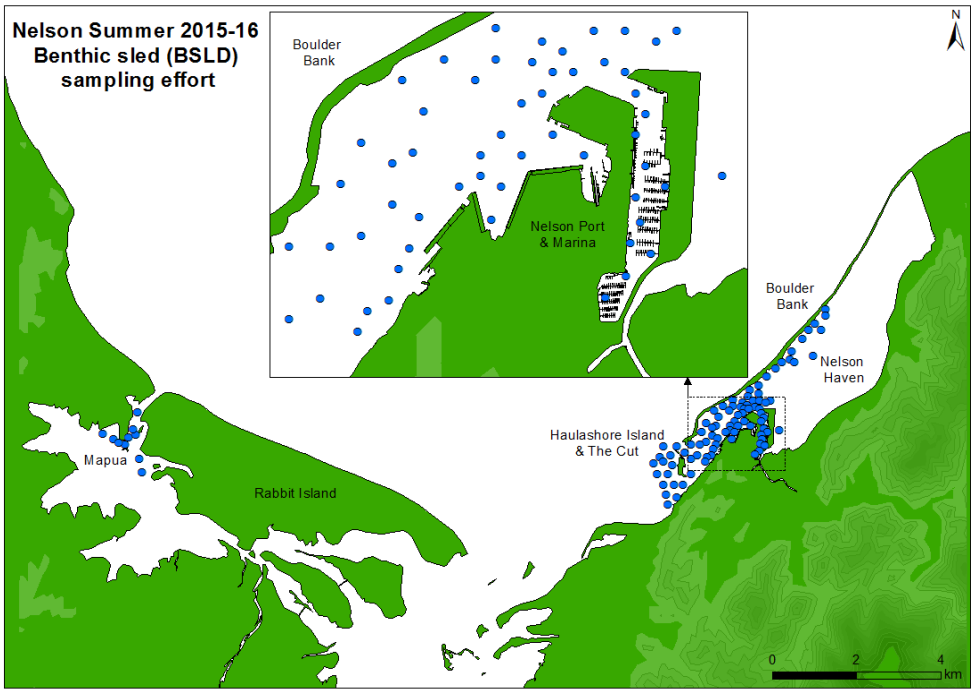
Crab (box) trapping locations



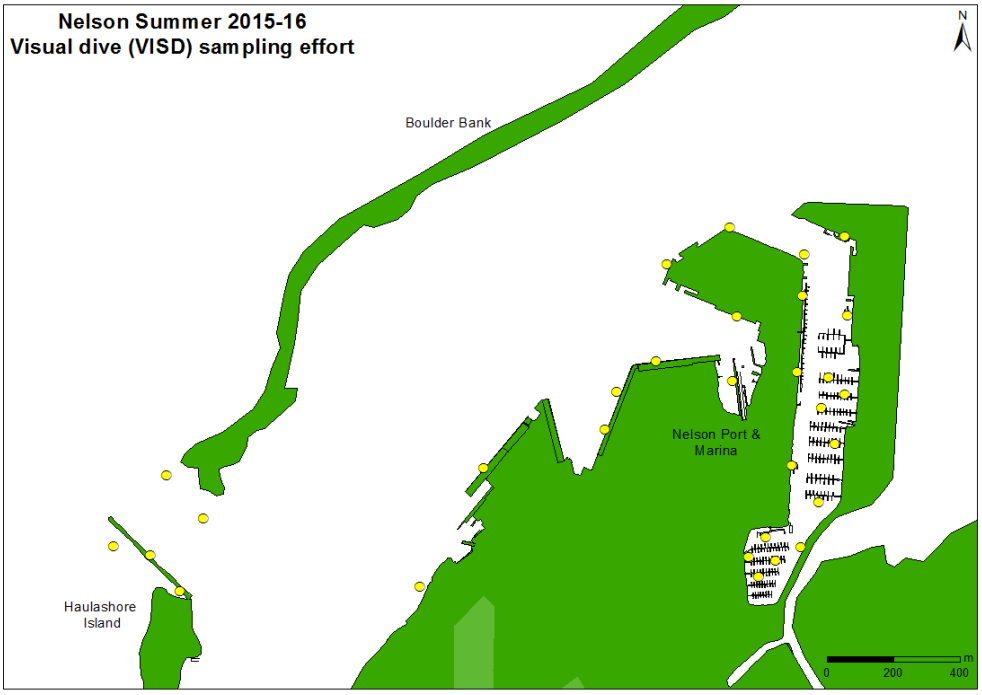
Crab condo locations



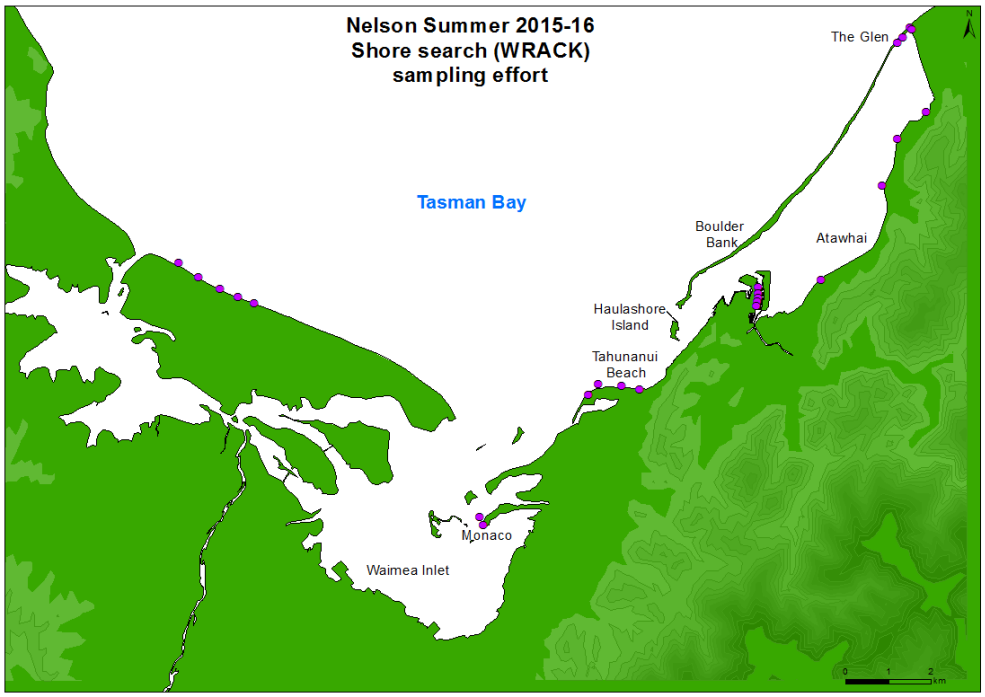
Sledding locations



Dive search locations



Shore search locations

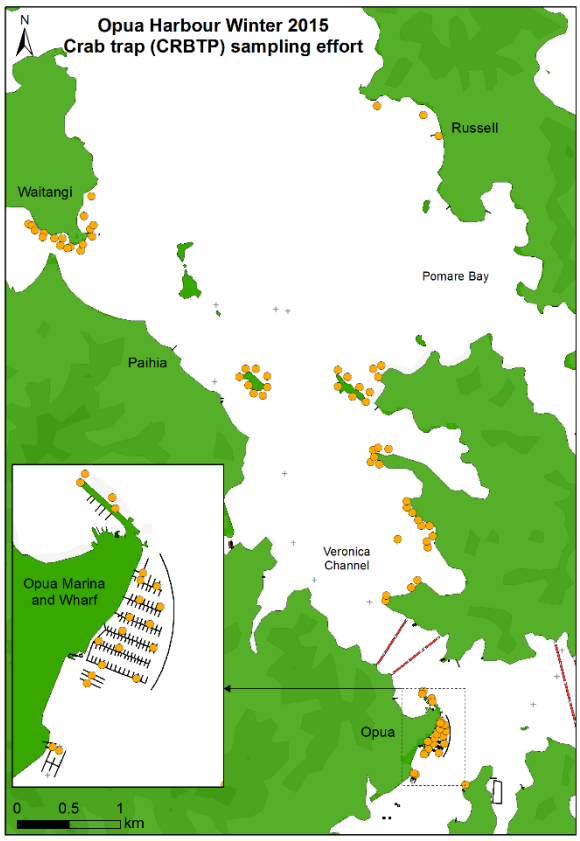


Opua

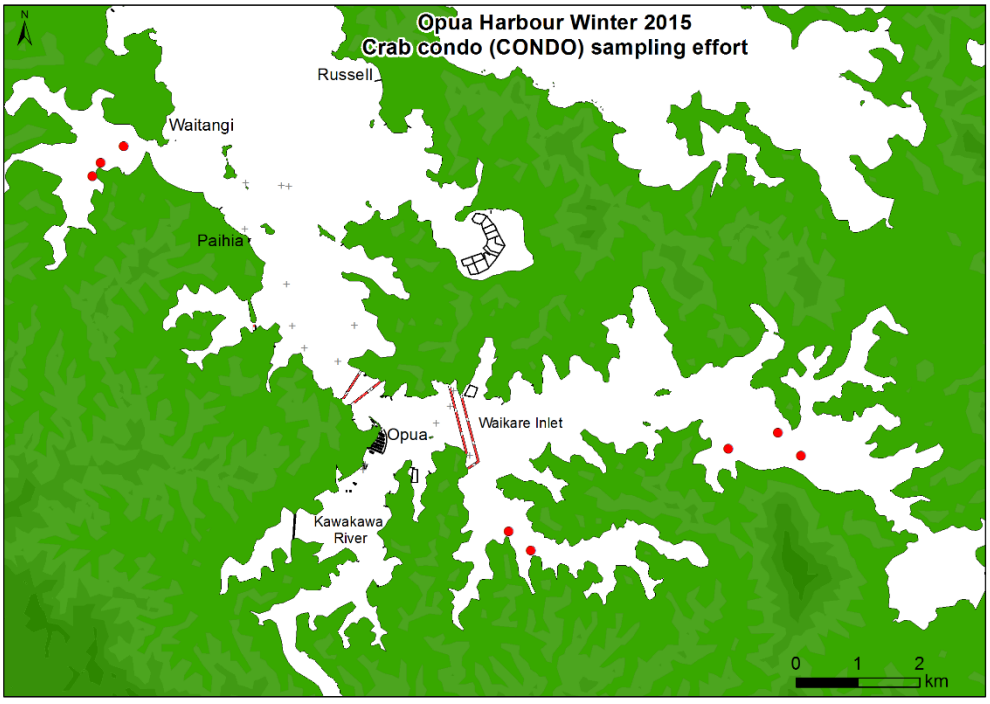
Note: grey crosses indicate navigational markers

Winter 2015

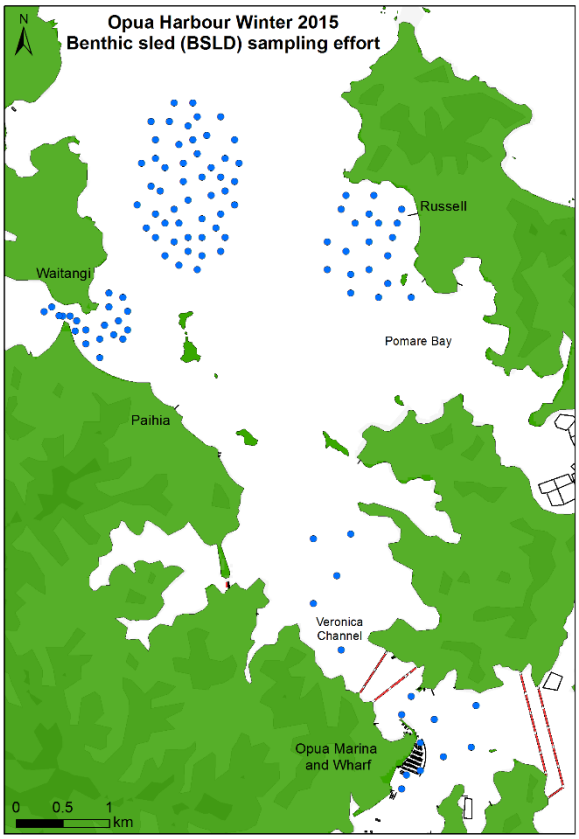
Crab (box) trapping locations



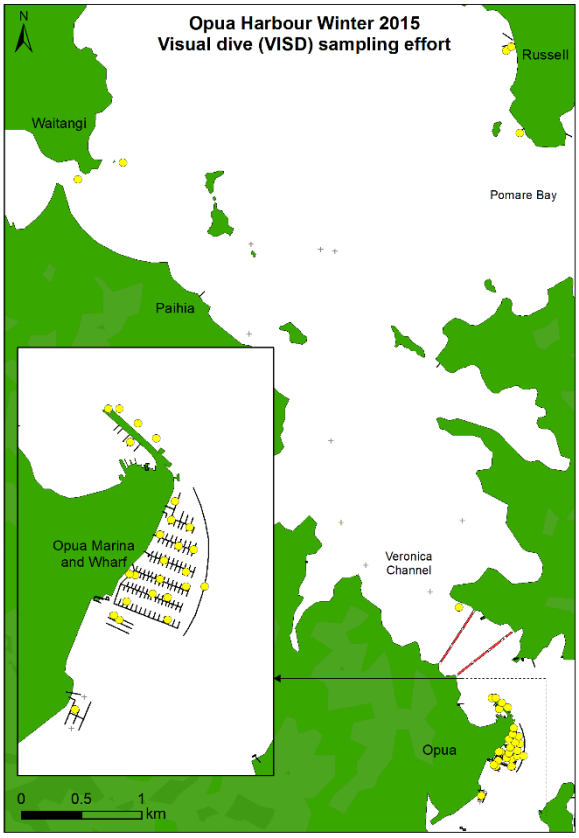
Crab condo locations



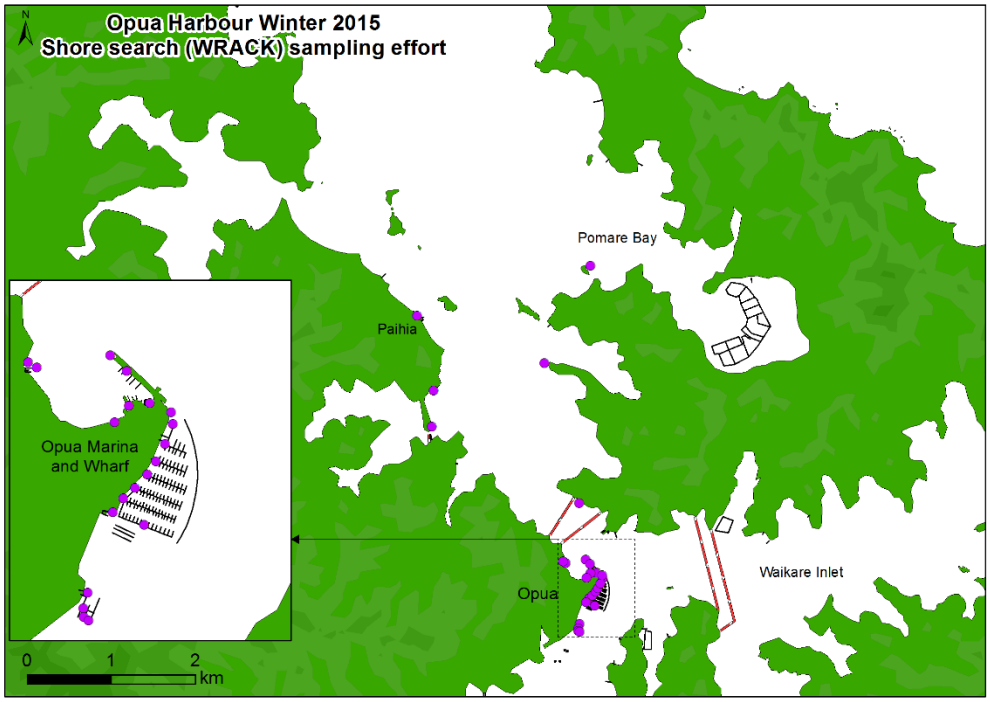
Sledding locations



Dive search locations

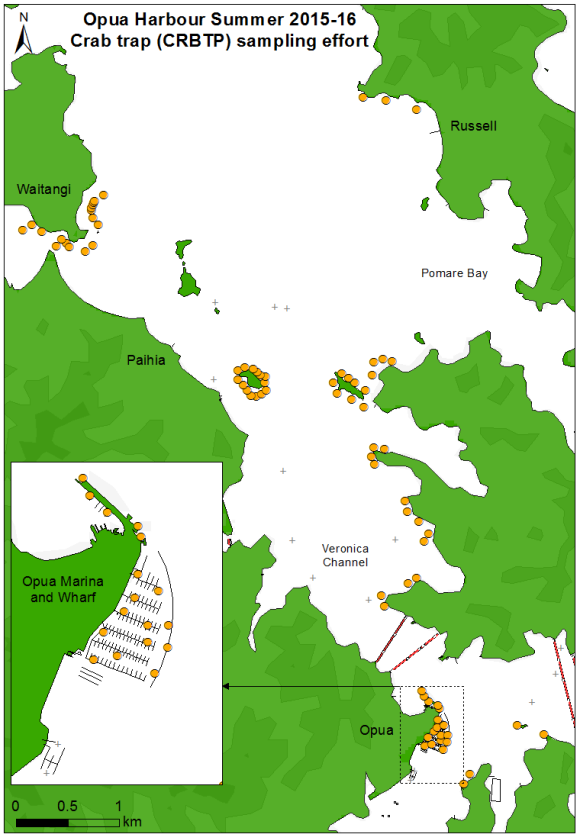


Shore search locations

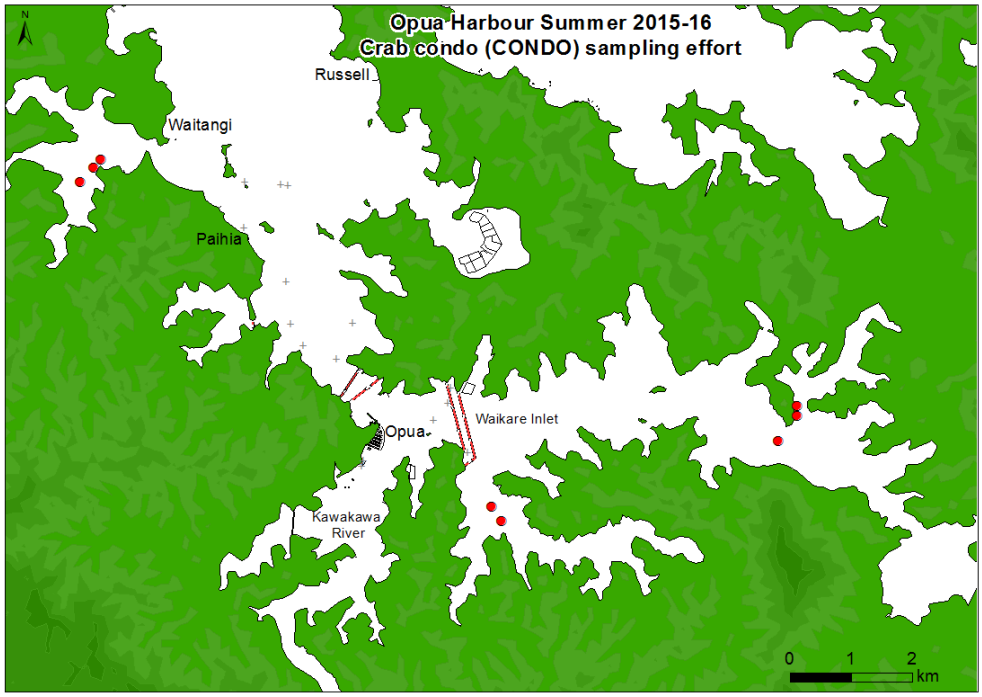


Summer 2015–16

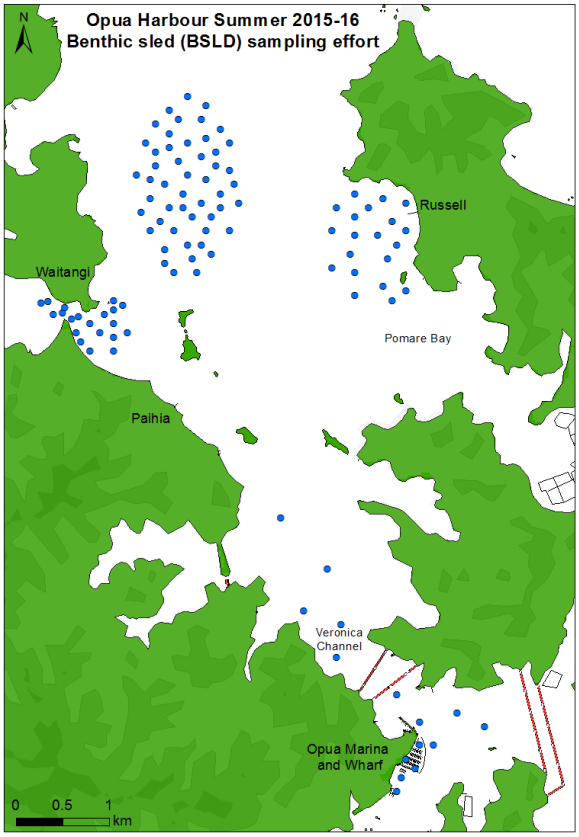
Crab (box) trapping locations



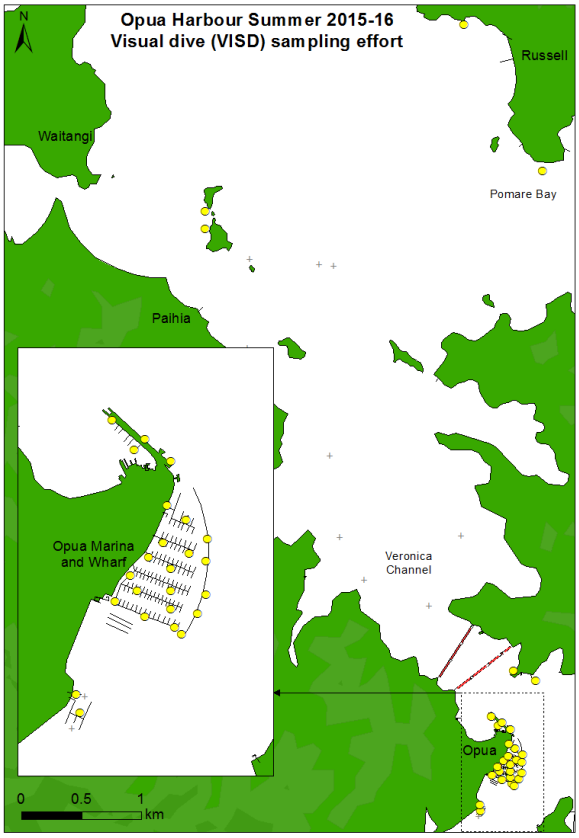
Crab condo locations



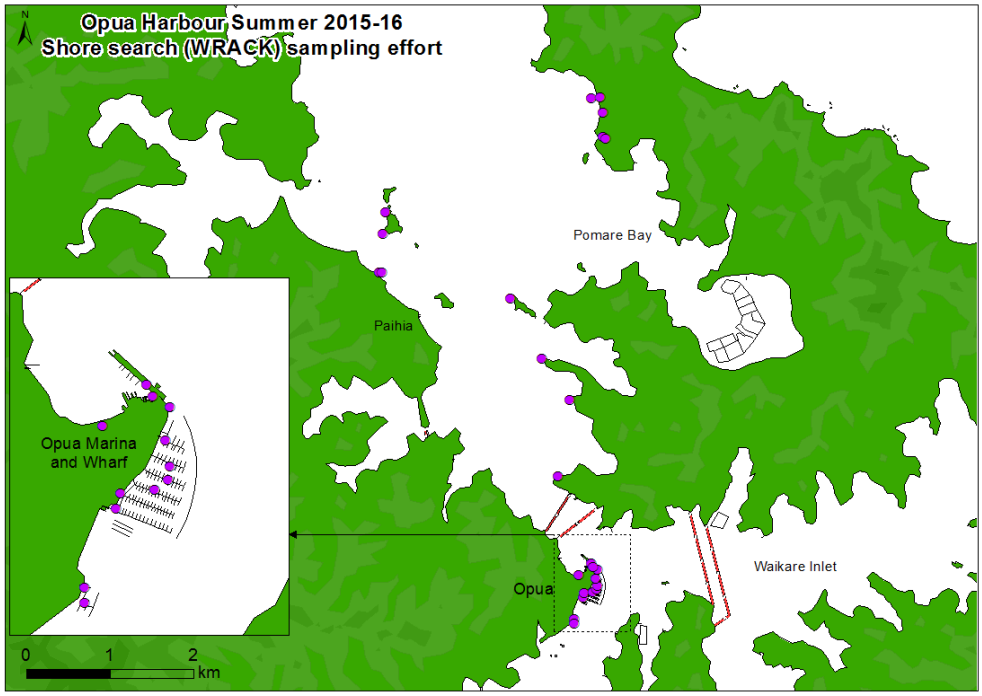
Sledding locations



Dive search locations



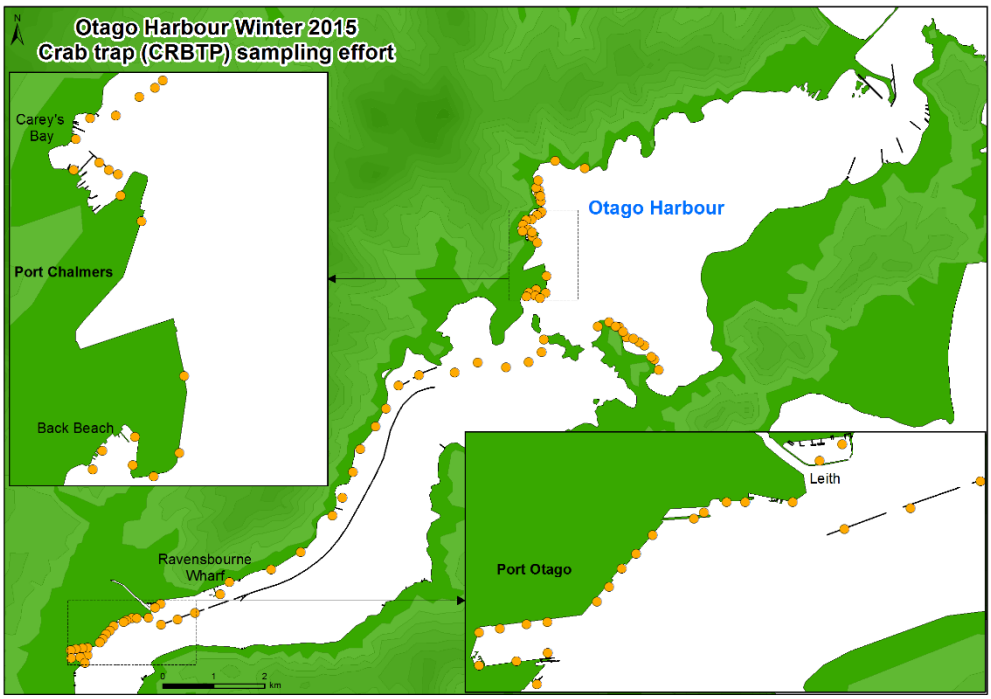
Shore search locations



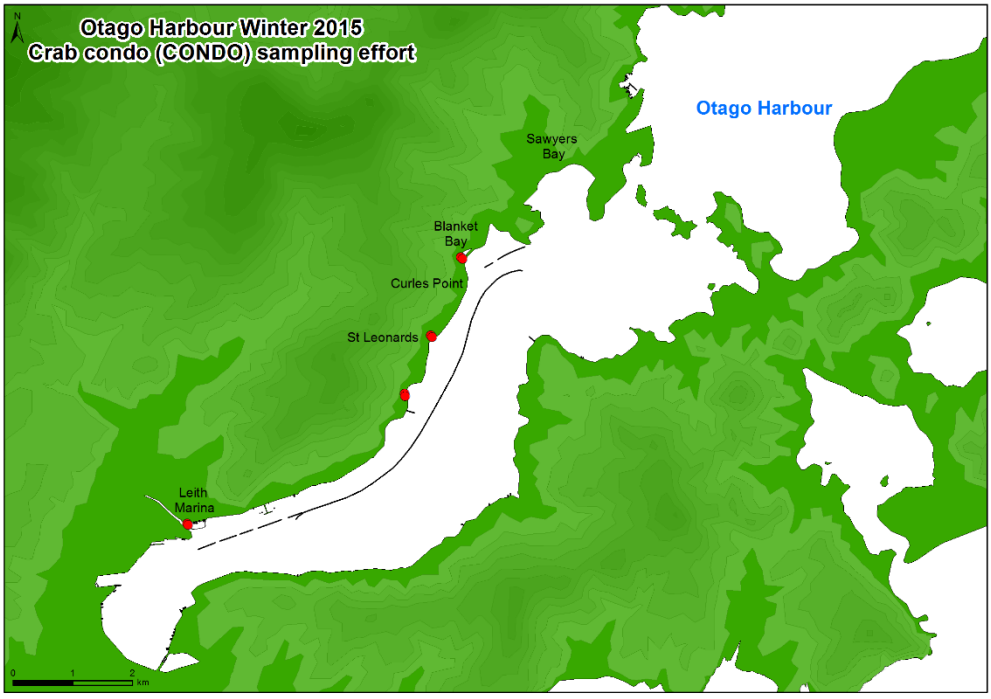
Otago Harbour

Winter 2015

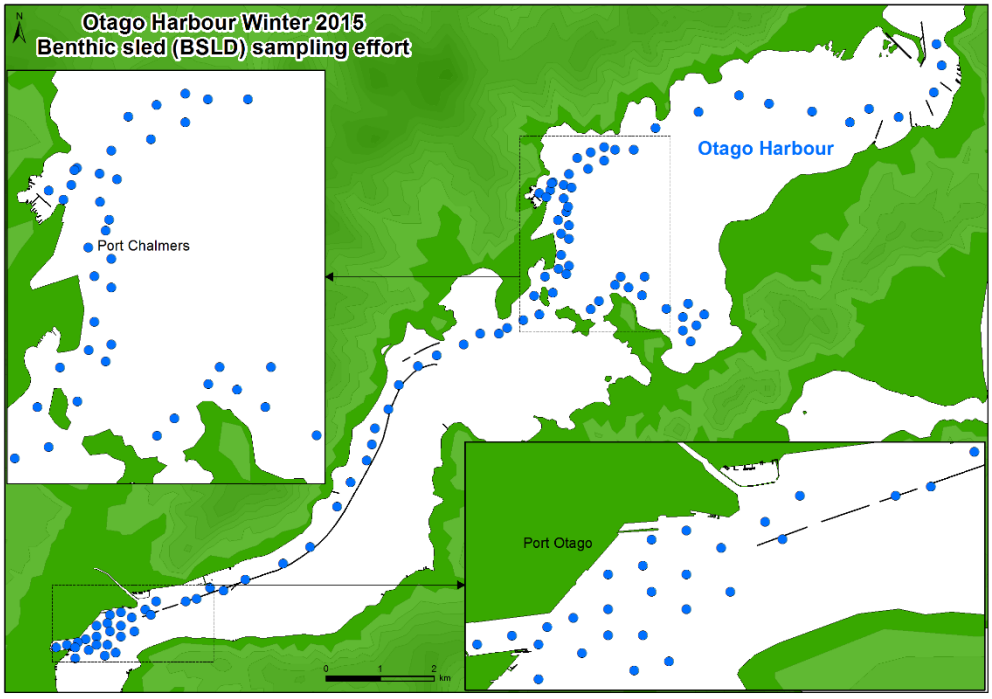
Crab (box) trapping locations



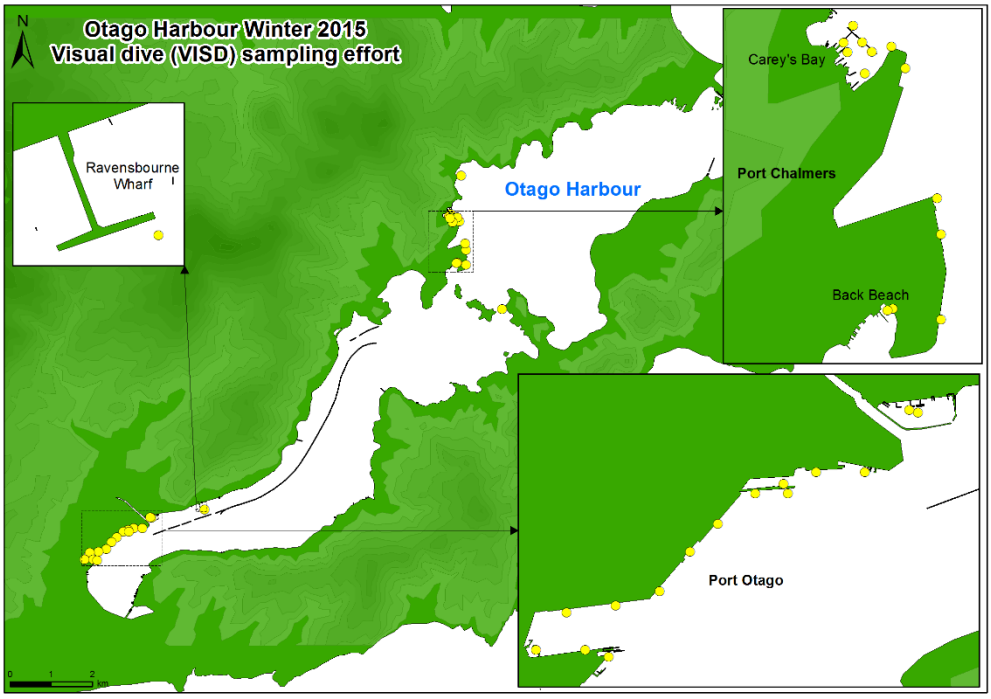
Crab condo locations



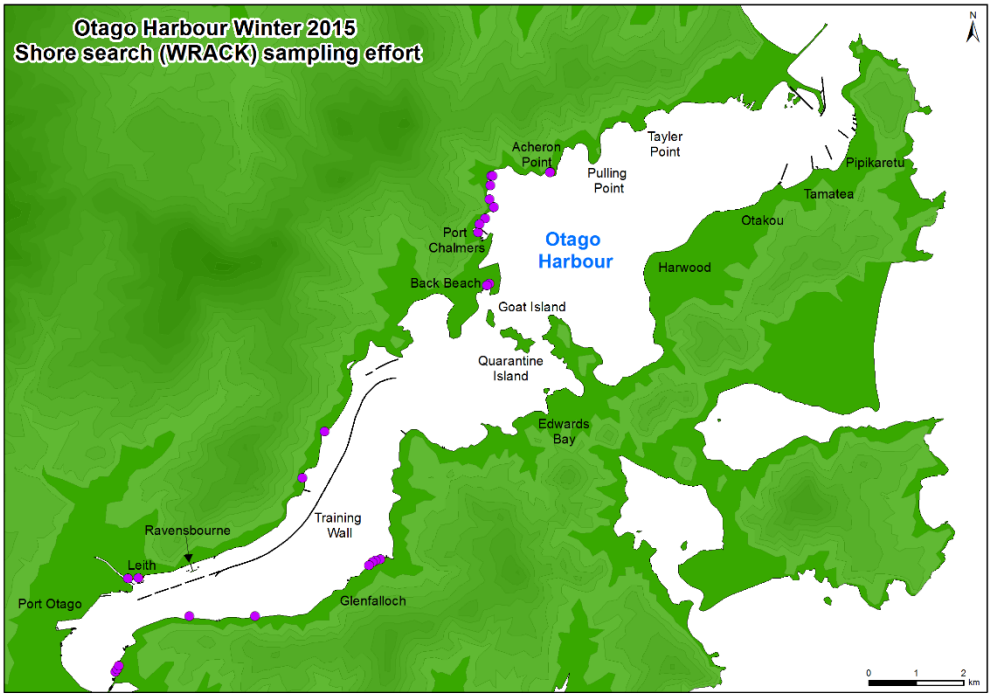
Sledding locations



Dive search locations

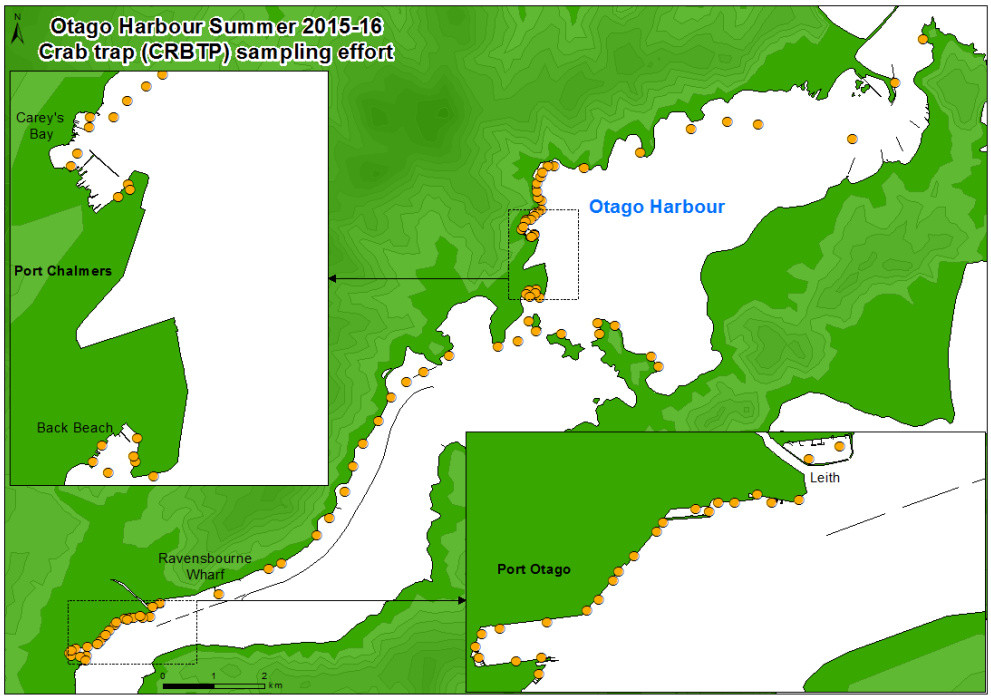


Shore search locations

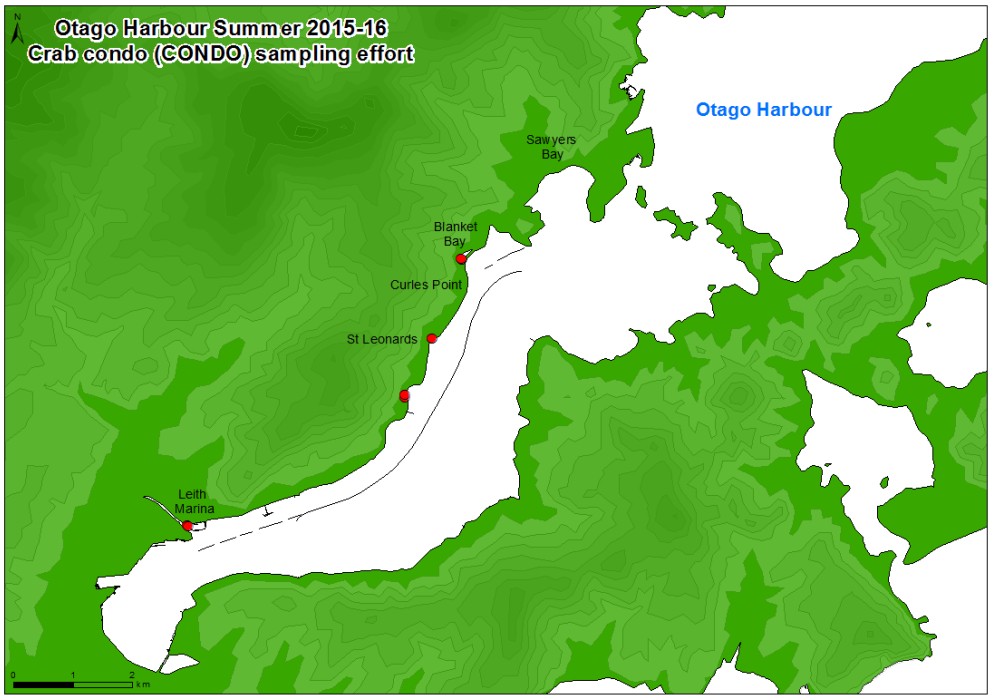


Summer 2015–16

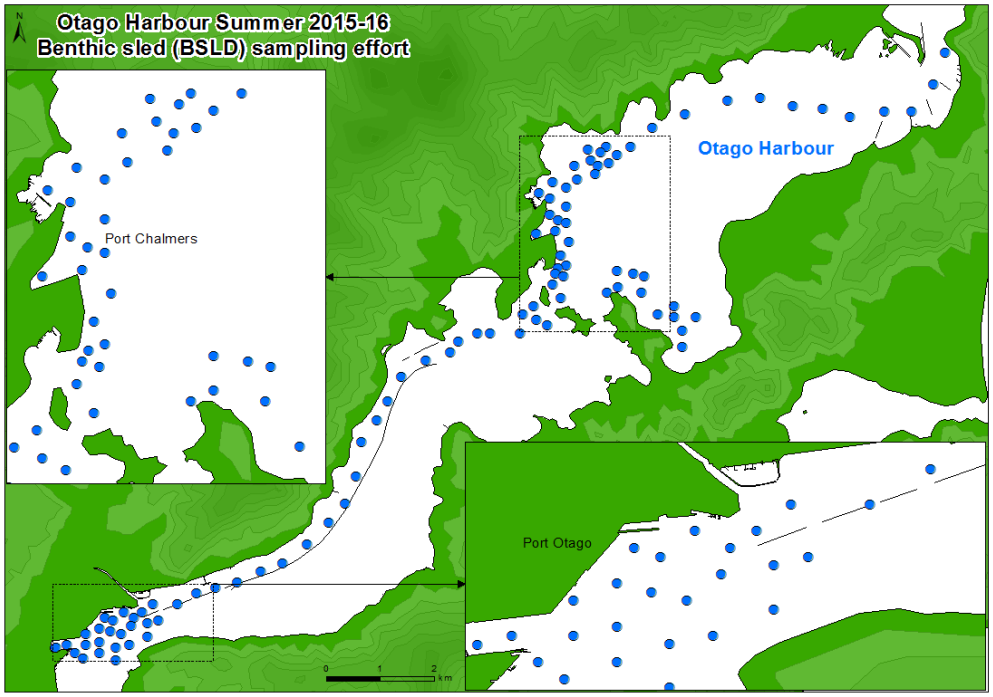
Crab (box) trapping locations



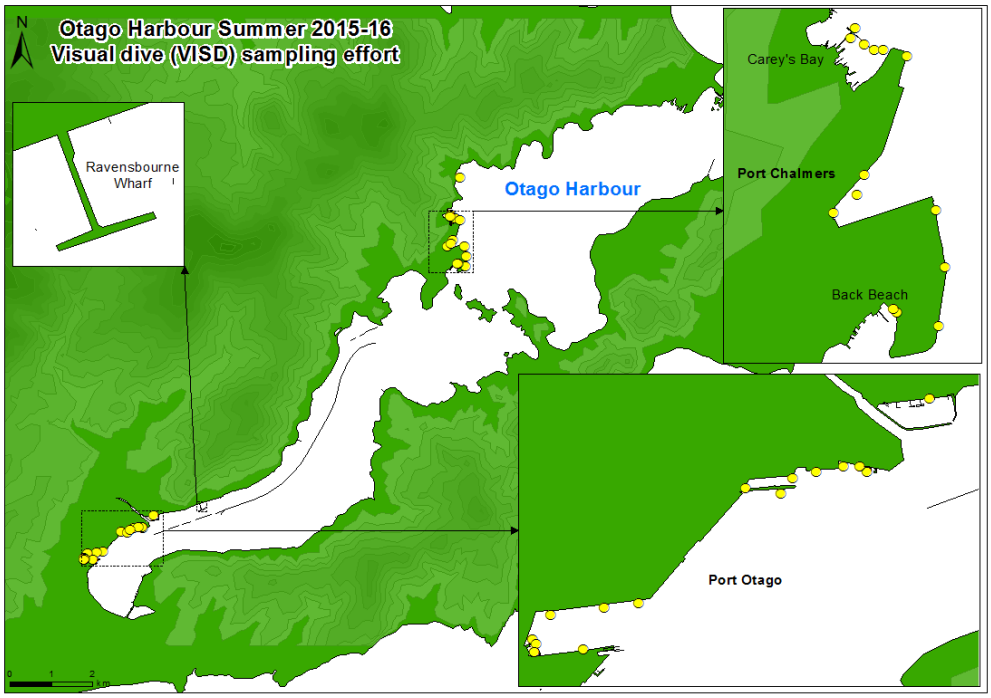
Crab condo locations



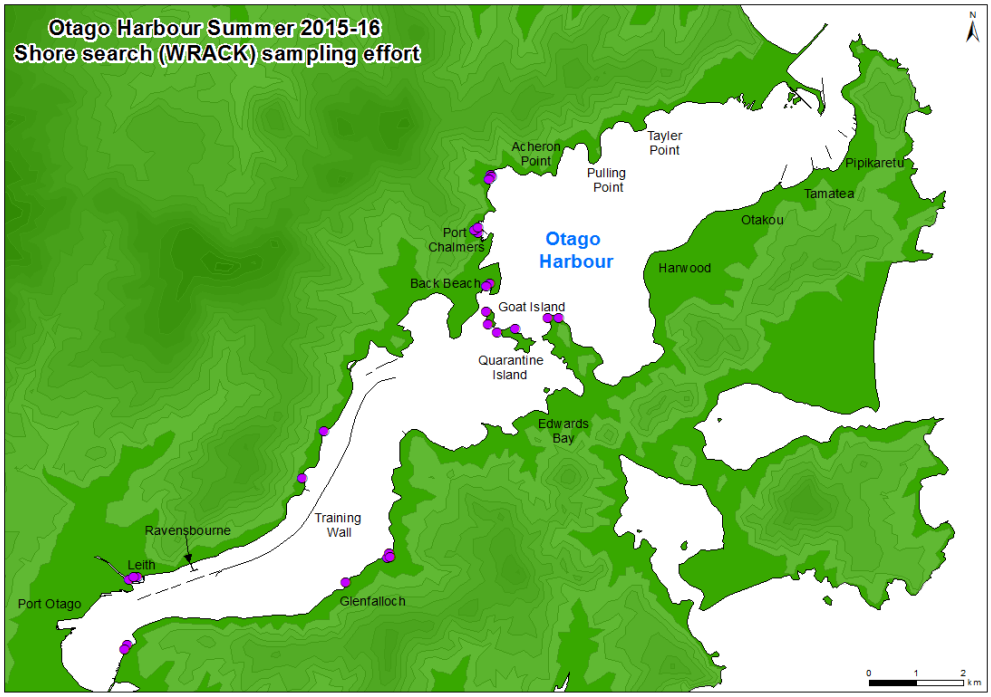
Sledding locations



Dive search locations



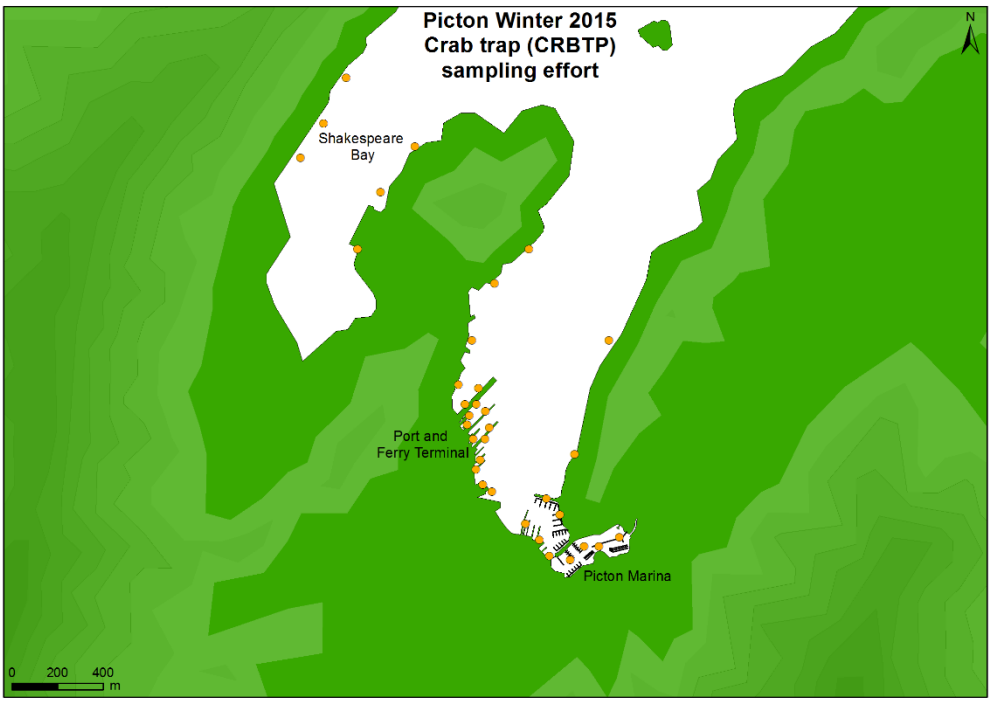
Shore search locations



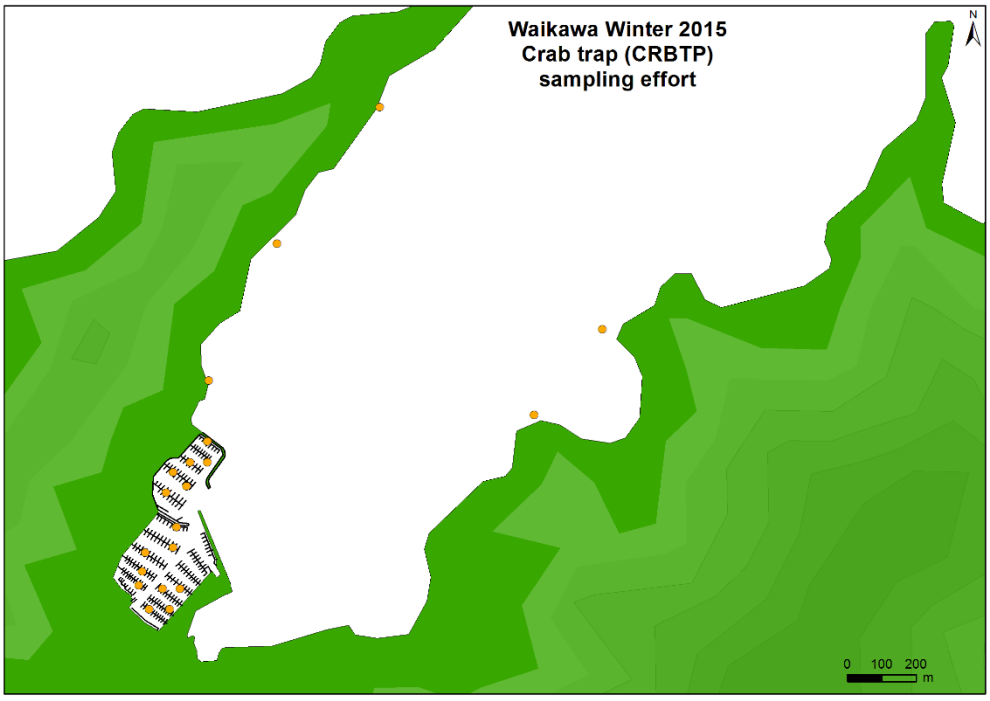
Picton/Havelock

Winter 2015

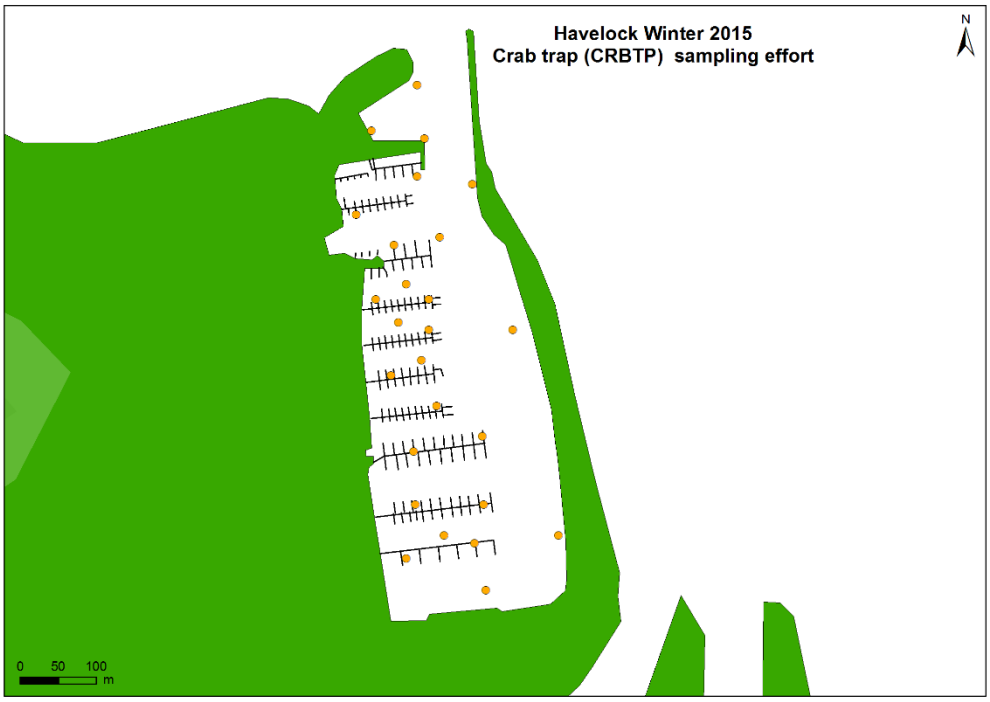
Crab (box) trapping locations (Picton)



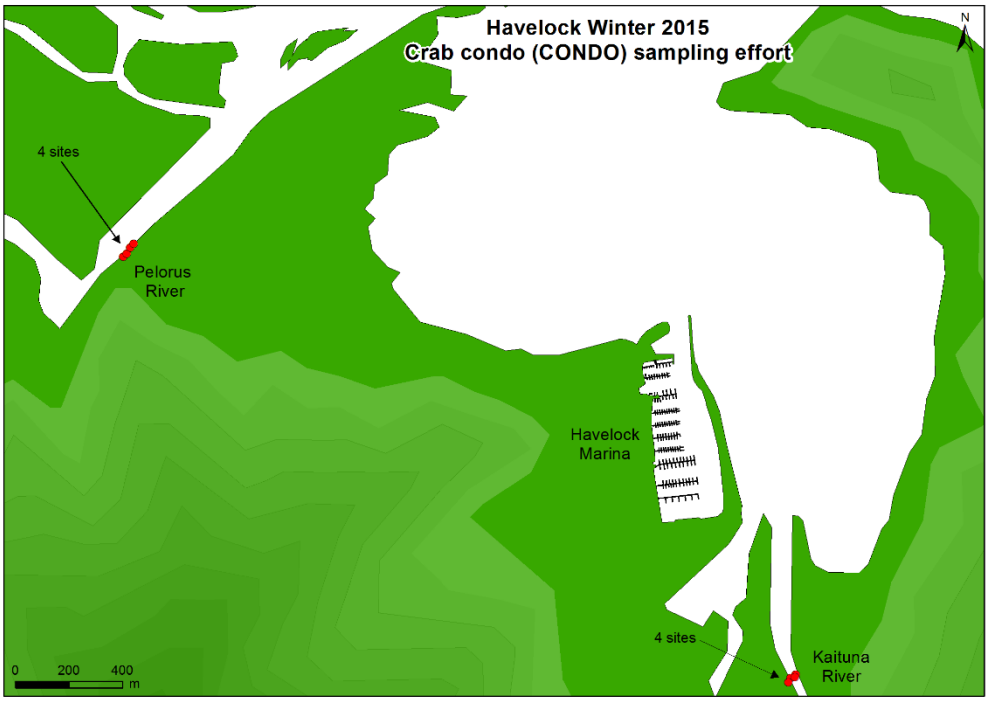
Crab (box) trapping locations (Waikawa Marina)



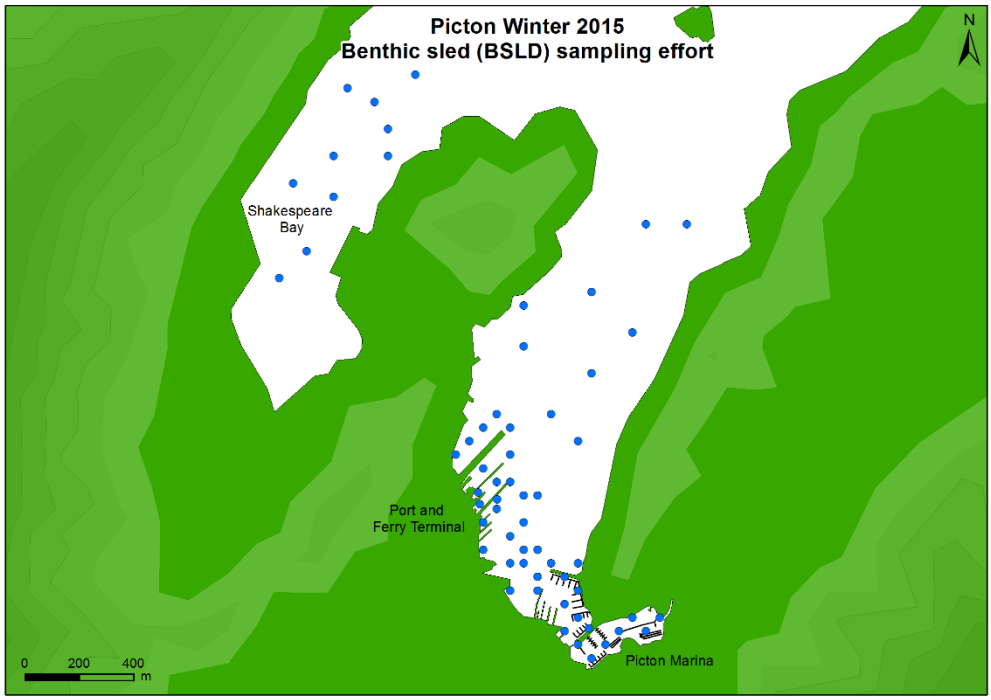
Crab (box) trapping locations (Havelock Marina)



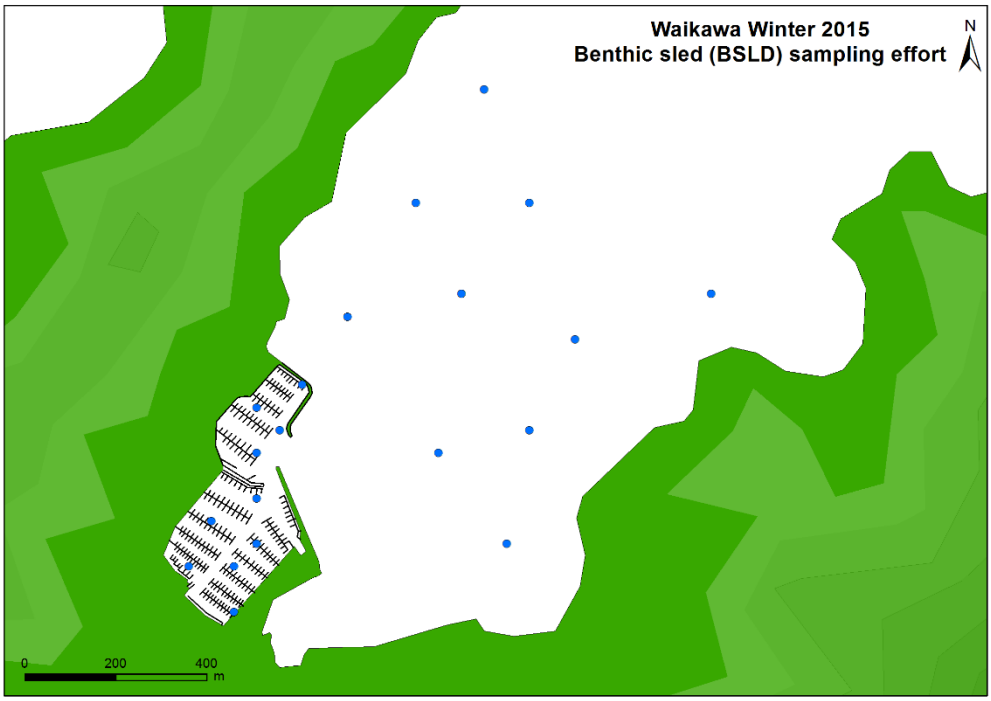
Crab condo locations (Havelock Marina)



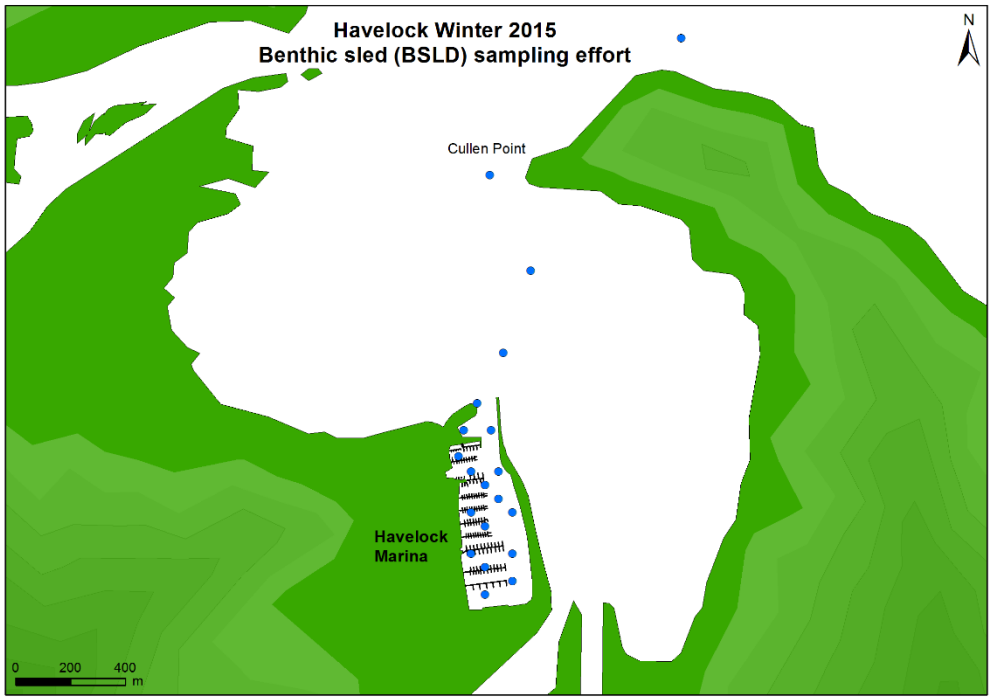
Sledding locations (Picton)



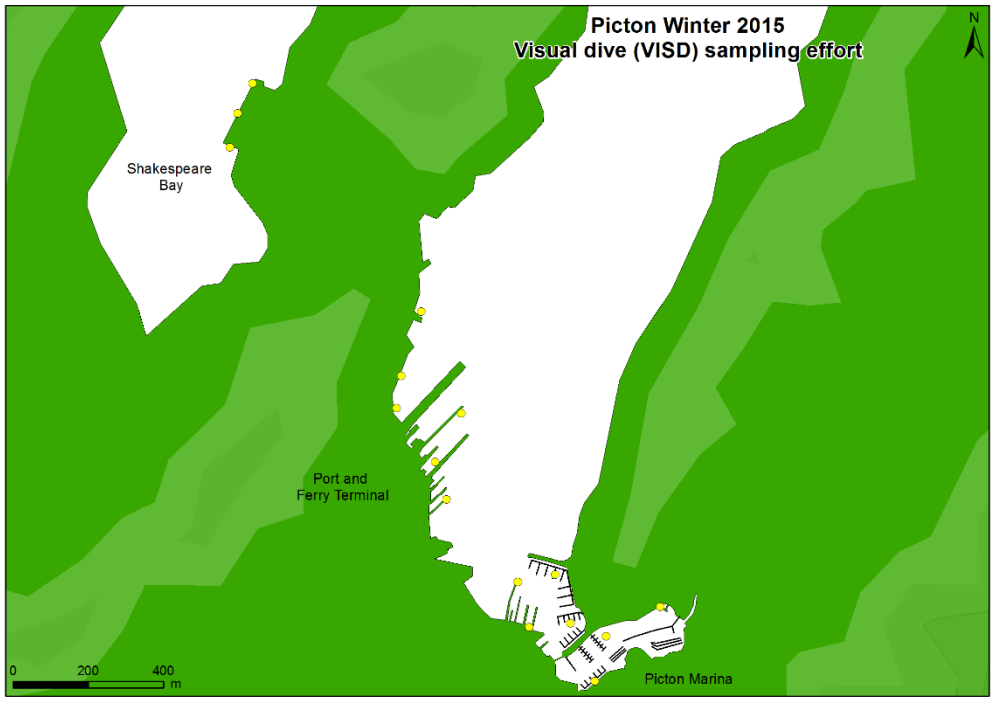
Sledding locations (Waikawa Marina)



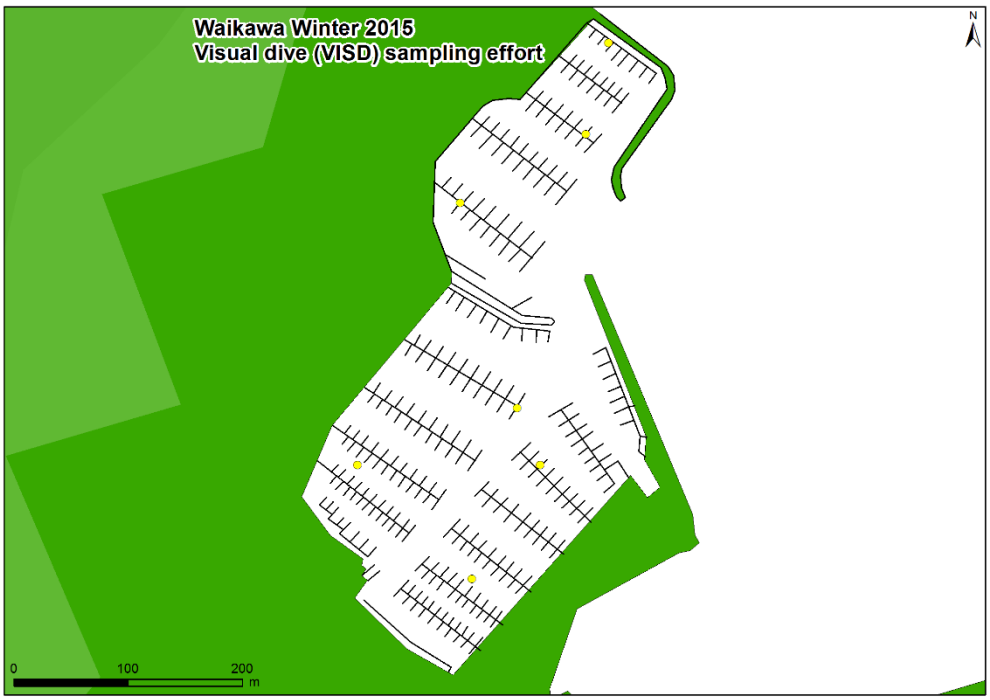
Sledding locations (Havelock Marina)



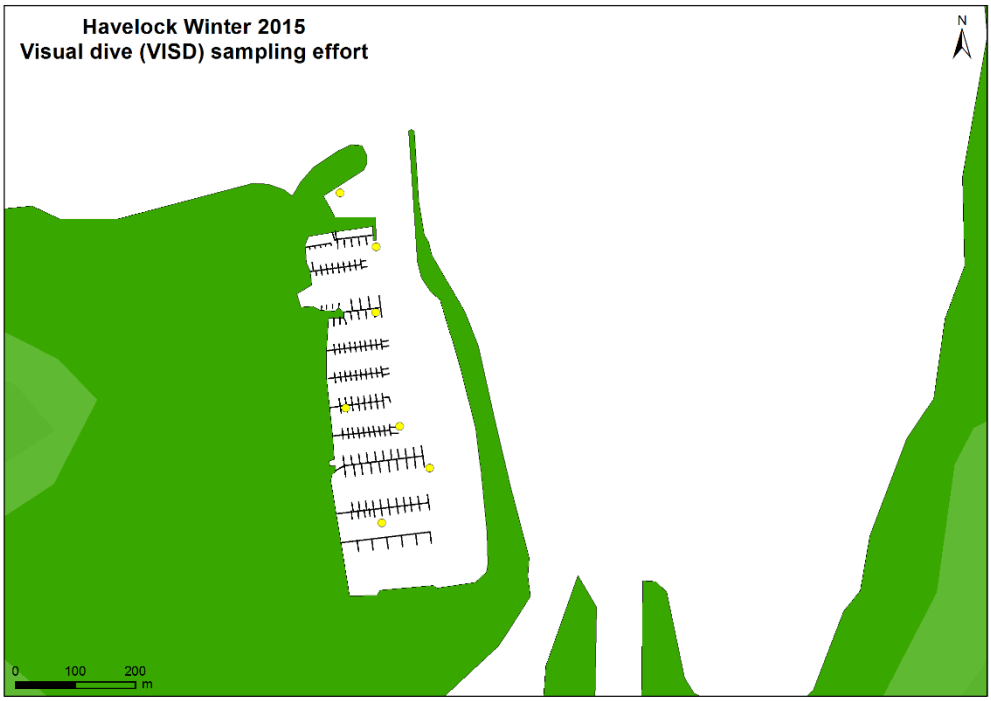
Dive search locations (Picton)



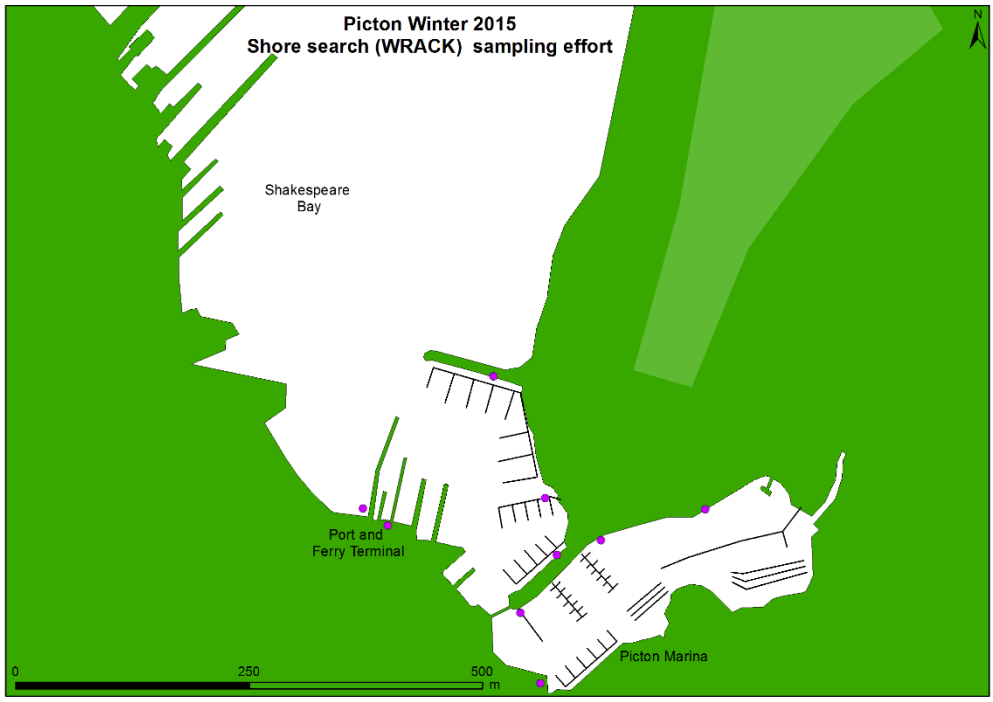
Dive search locations (Waikawa Marina)



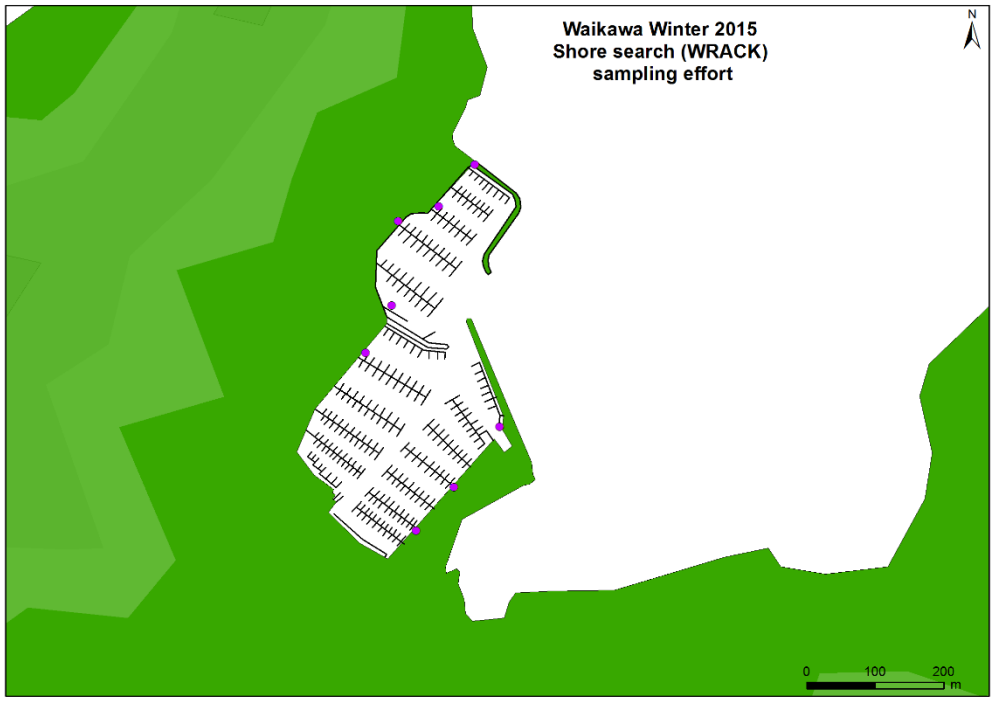
Dive search locations (Havelock Marina)



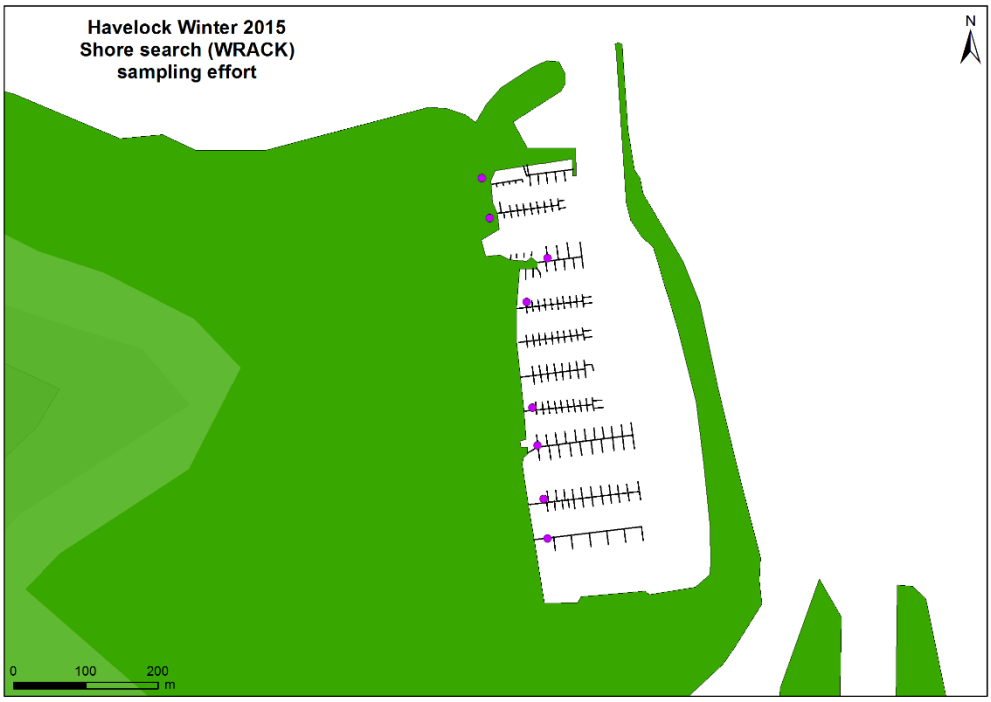
Shore search locations (Picton)



Shore search locations (Waikawa Marina)

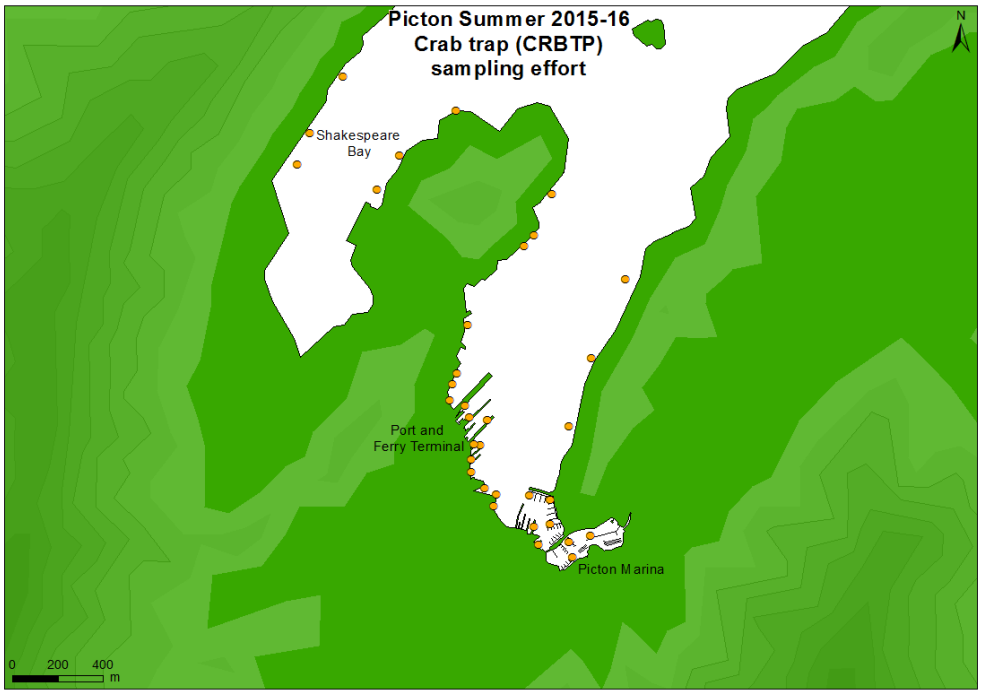


Shore search locations (Havelock Marina)

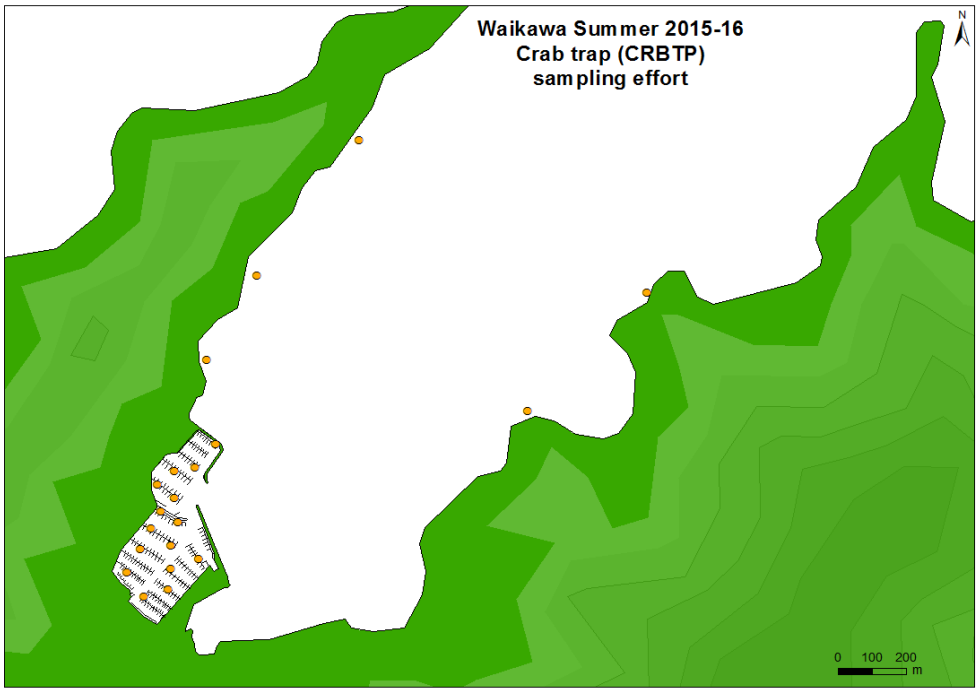


Summer 2015–16

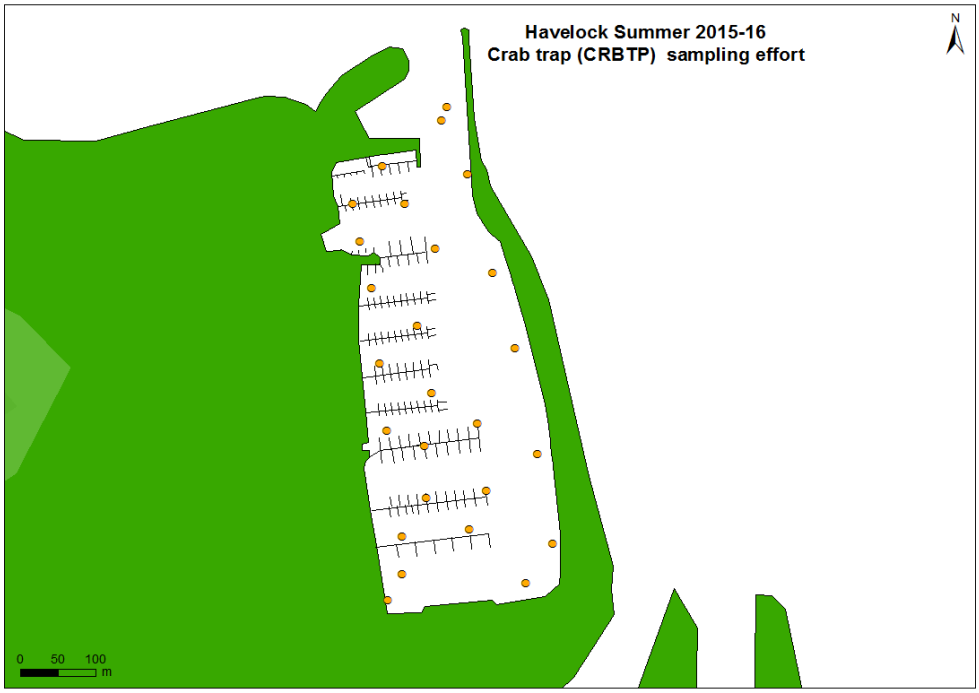
Crab (box) trapping locations (Picton)



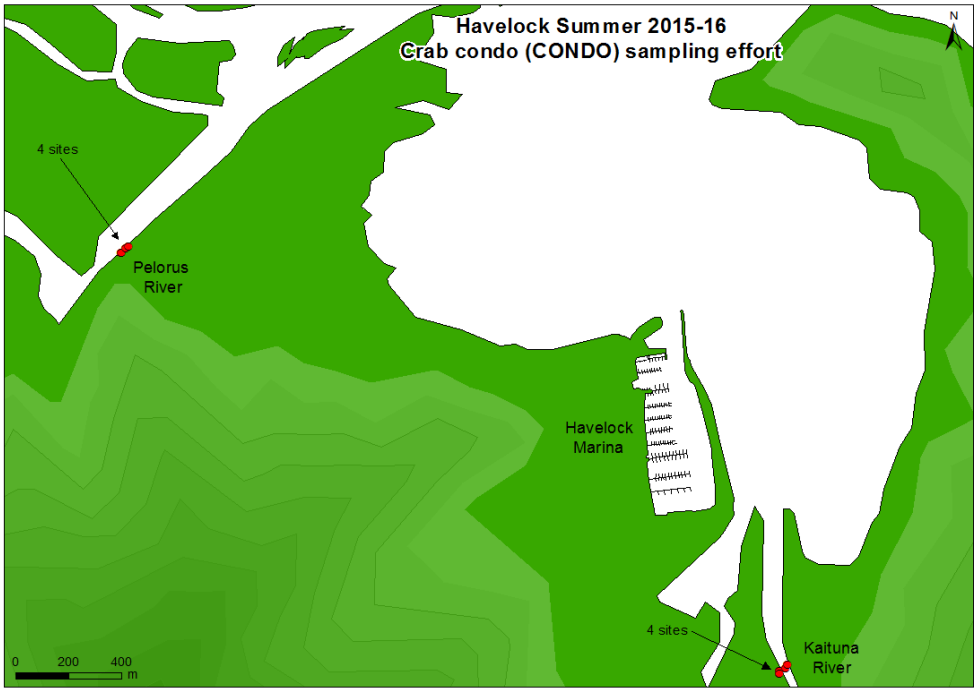
Crab (box) trapping locations (Waikawa Marina)



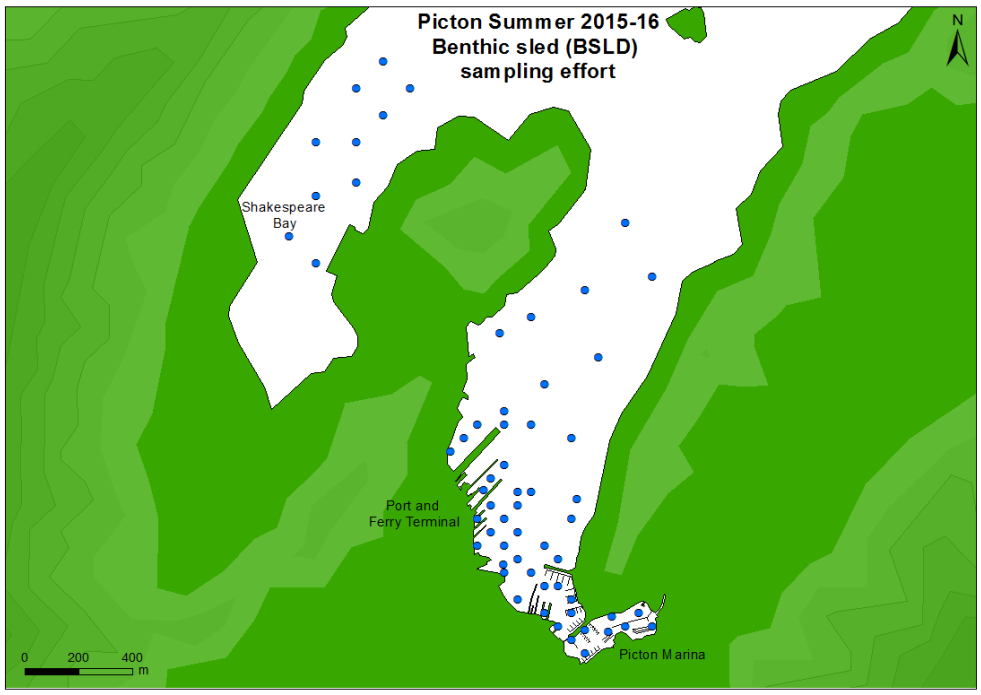
Crab (box) trapping locations (Havelock Marina)



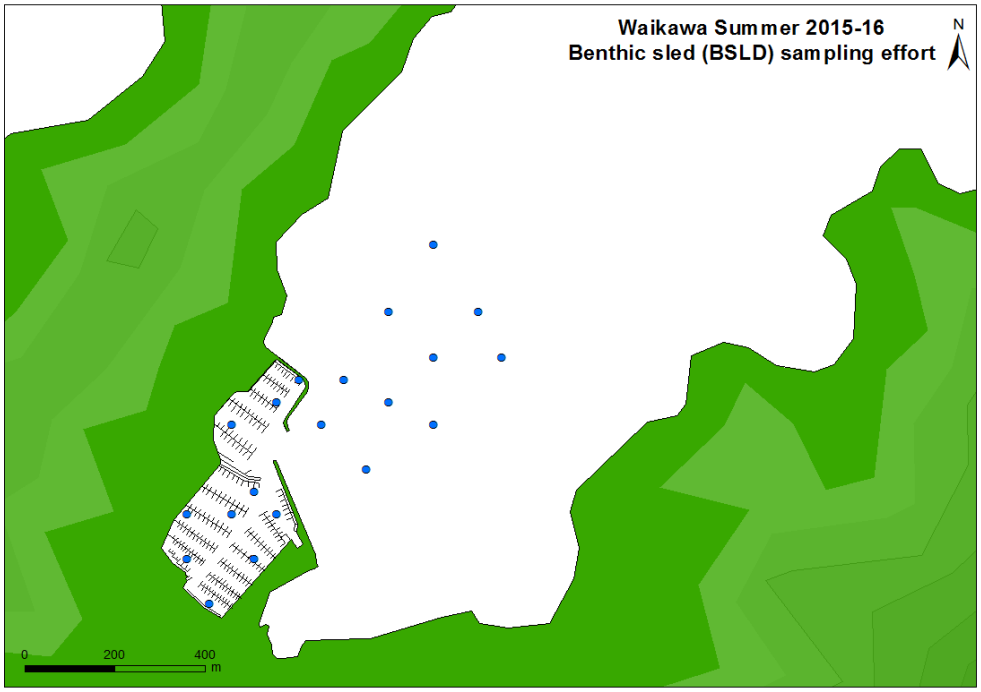
Crab condo locations (Havelock Marina)



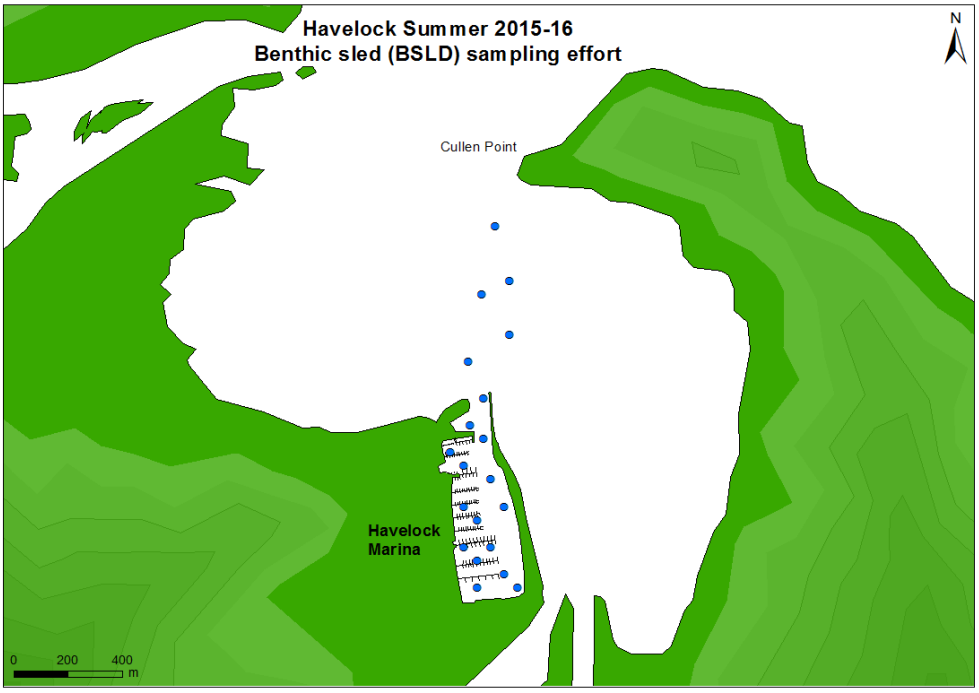
Sledding locations (Picton)



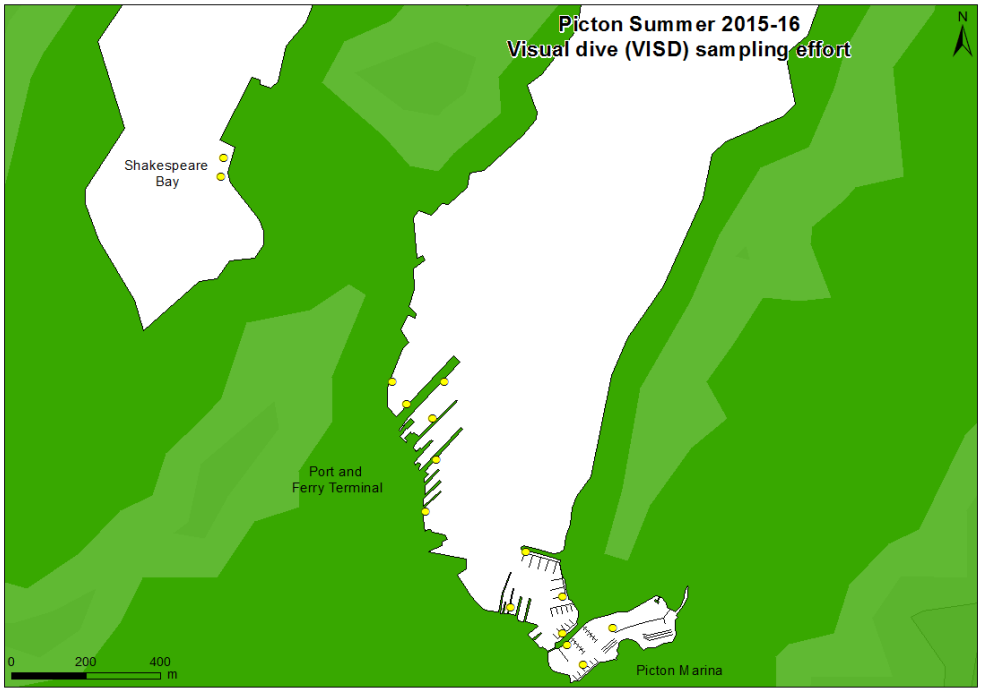
Sledding locations (Waikawa Marina)



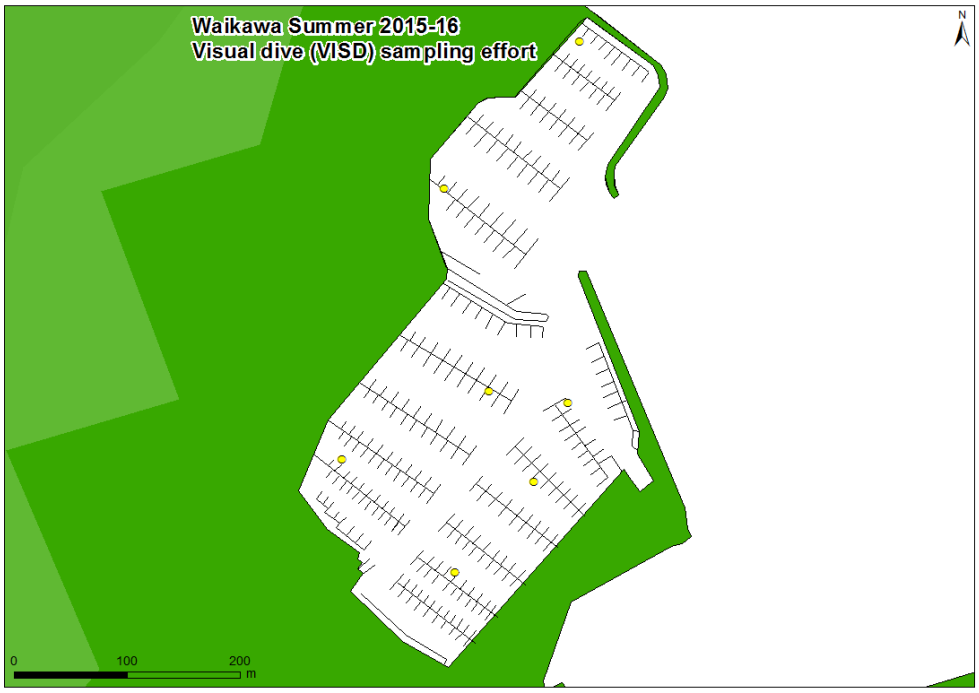
Sledding locations (Havelock Marina)



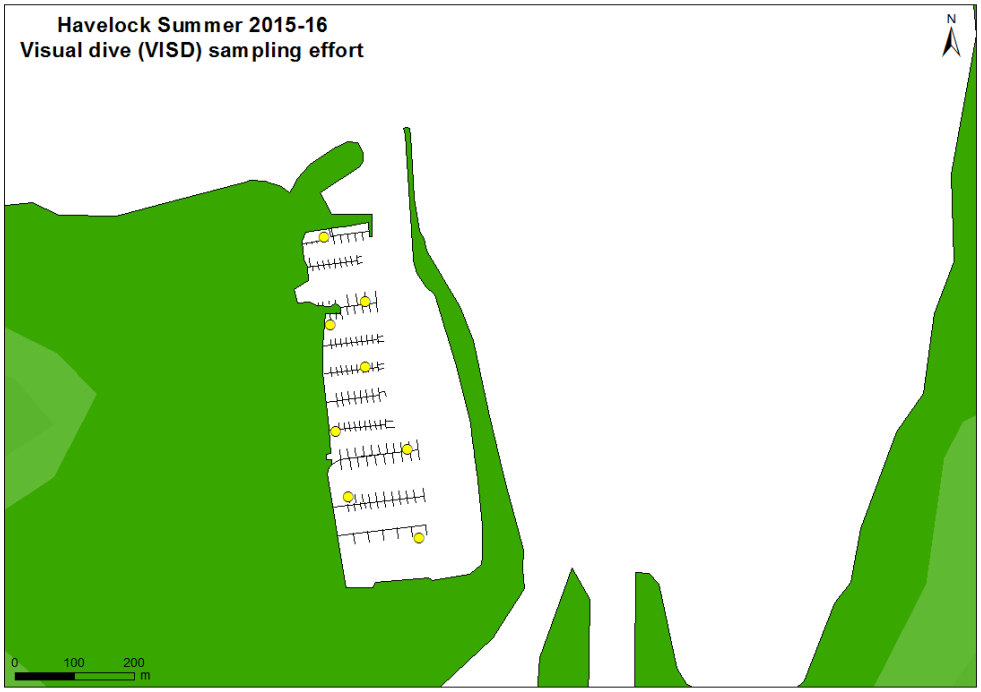
Dive search locations (Picton)



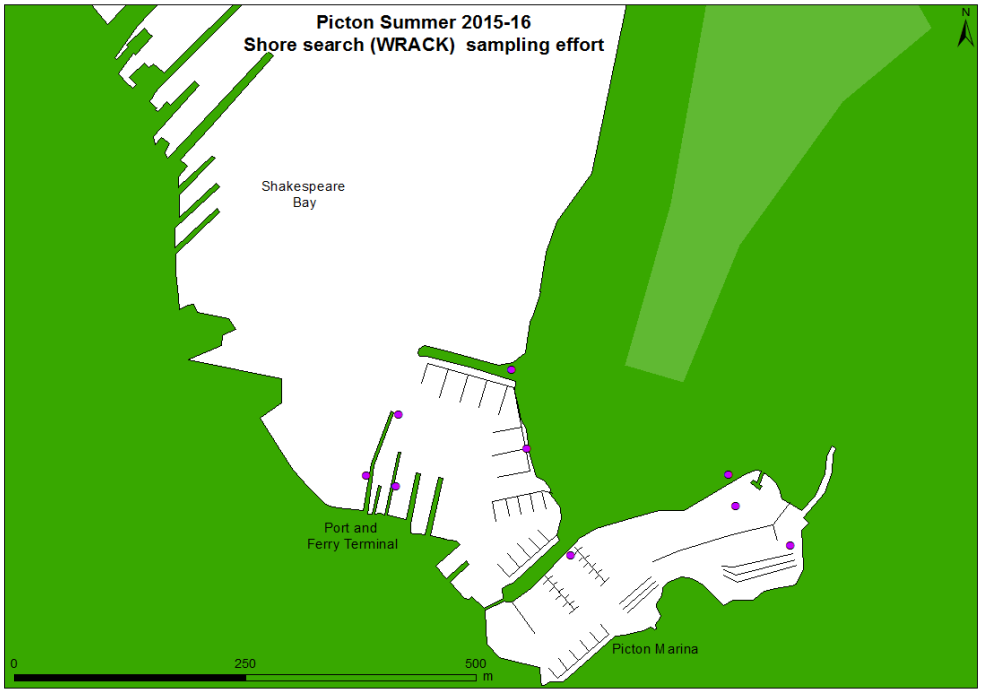
Dive search locations (Waikawa Marina)



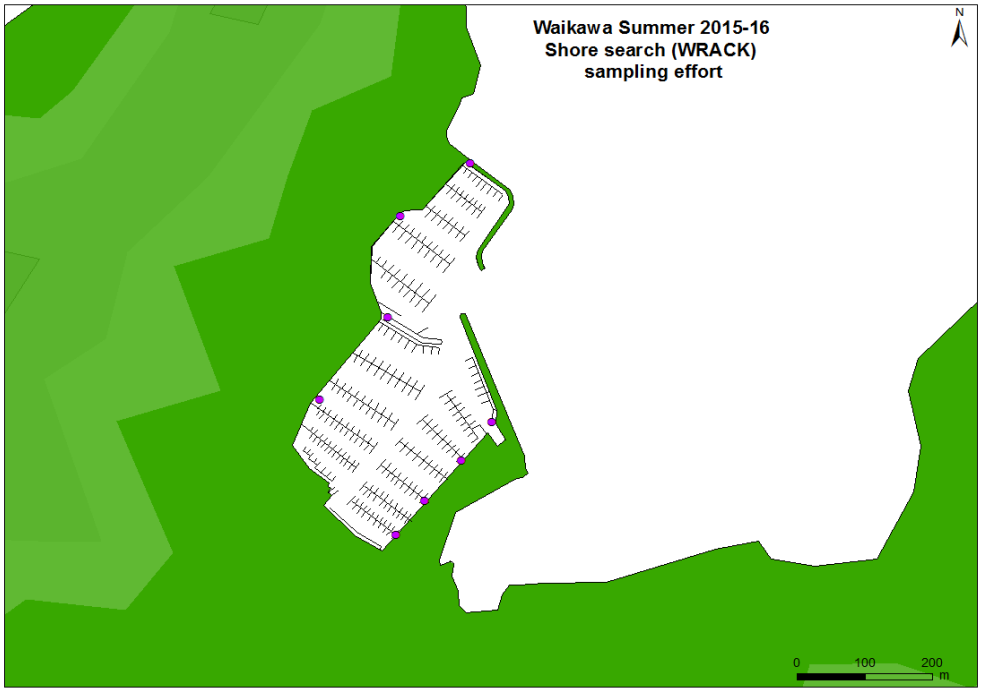
Dive search locations (Havelock Marina)



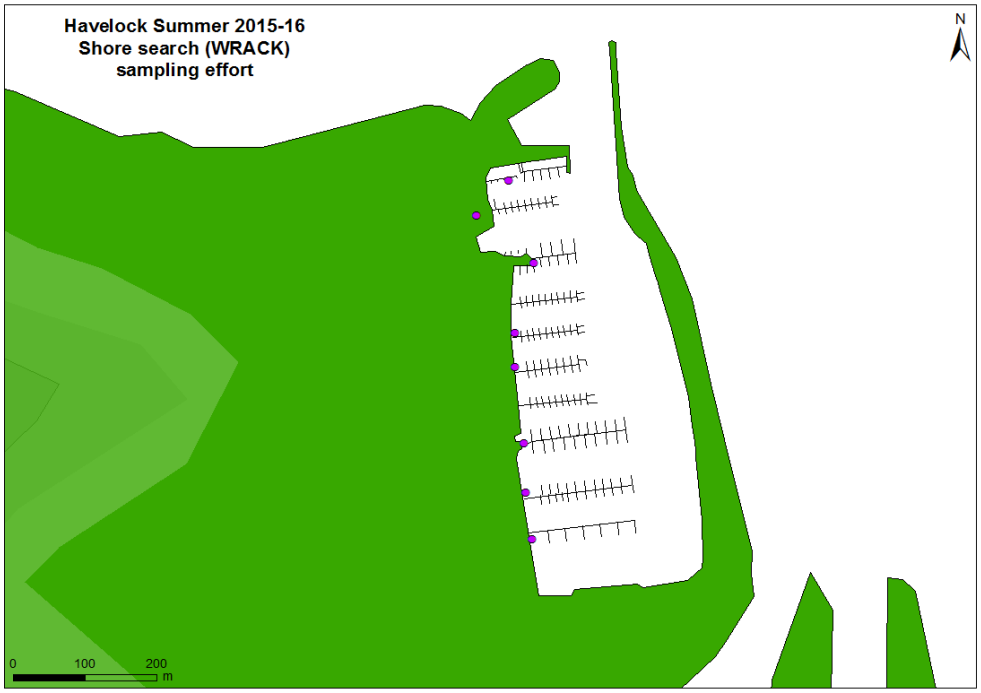
Shore search locations (Picton)



Shore search locations (Waikawa Marina)



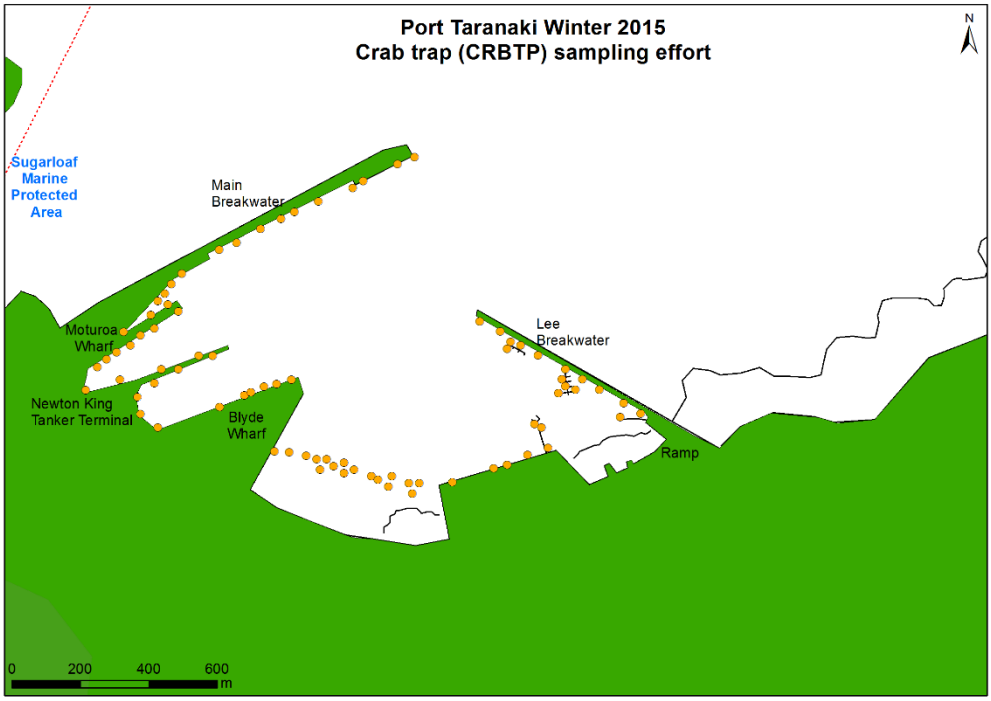
Shore search locations (Havelock Marina)



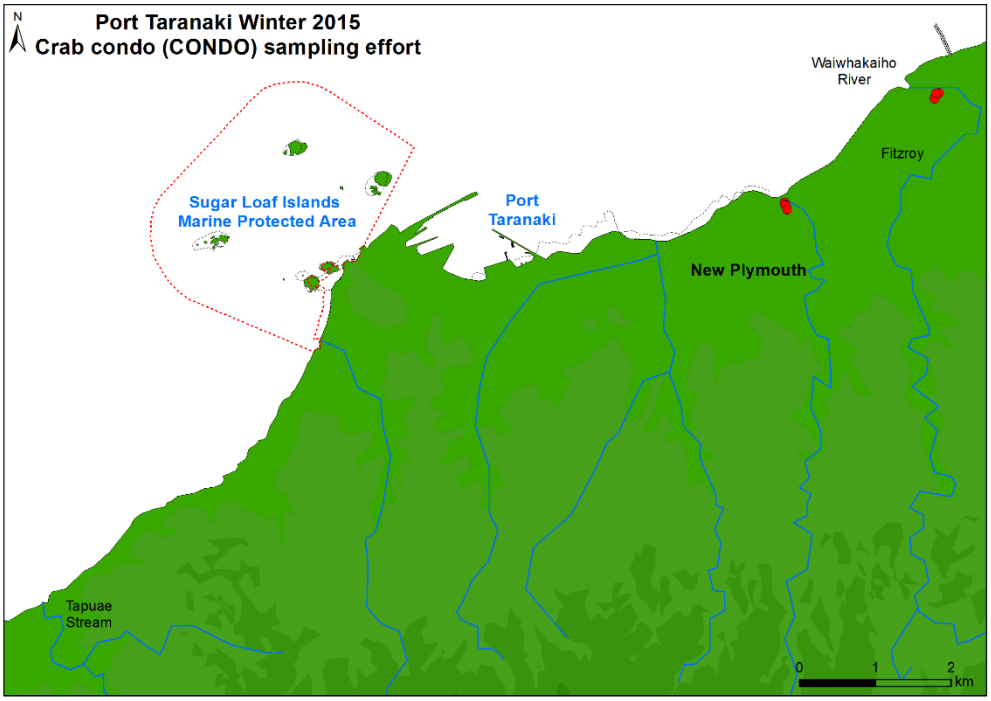
Port Taranaki

Winter 2015

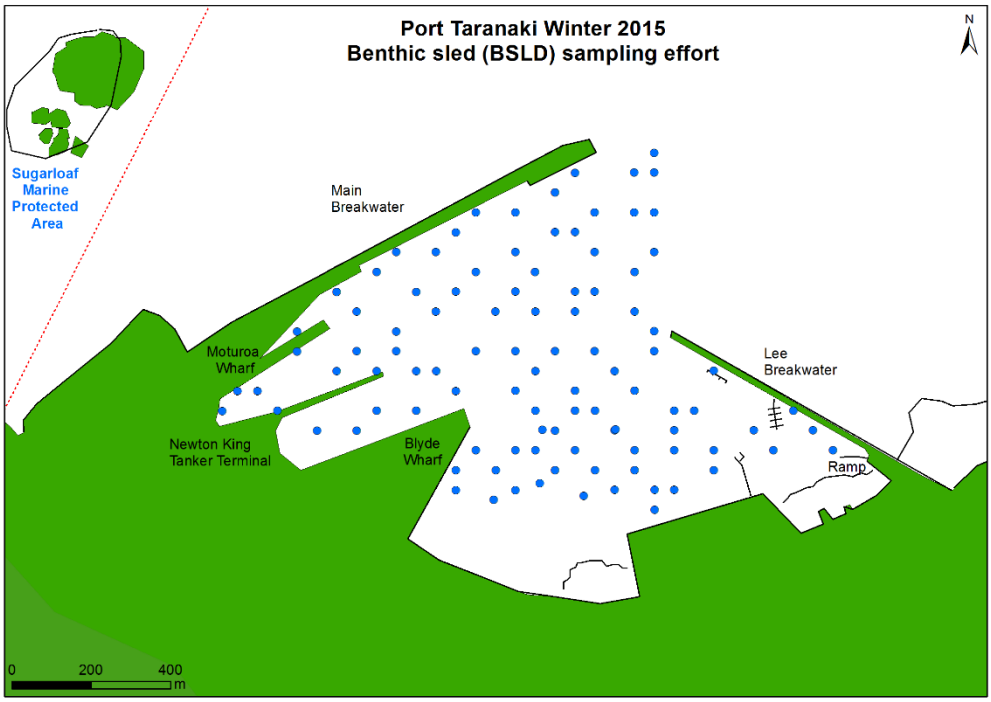
Crab (box) trapping locations



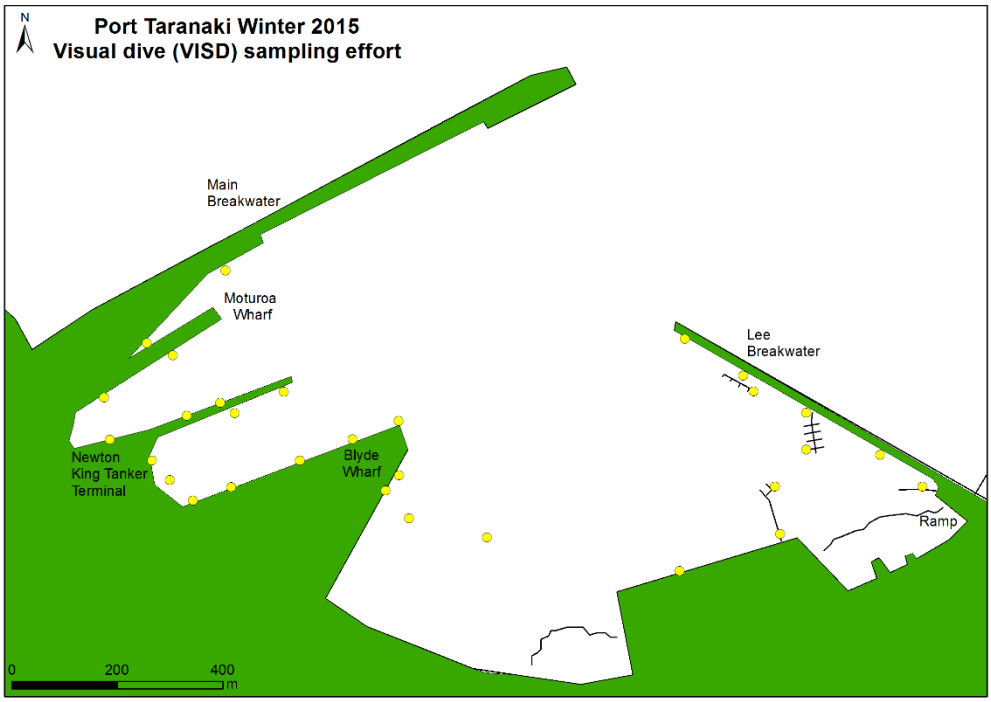
Crab condo locations



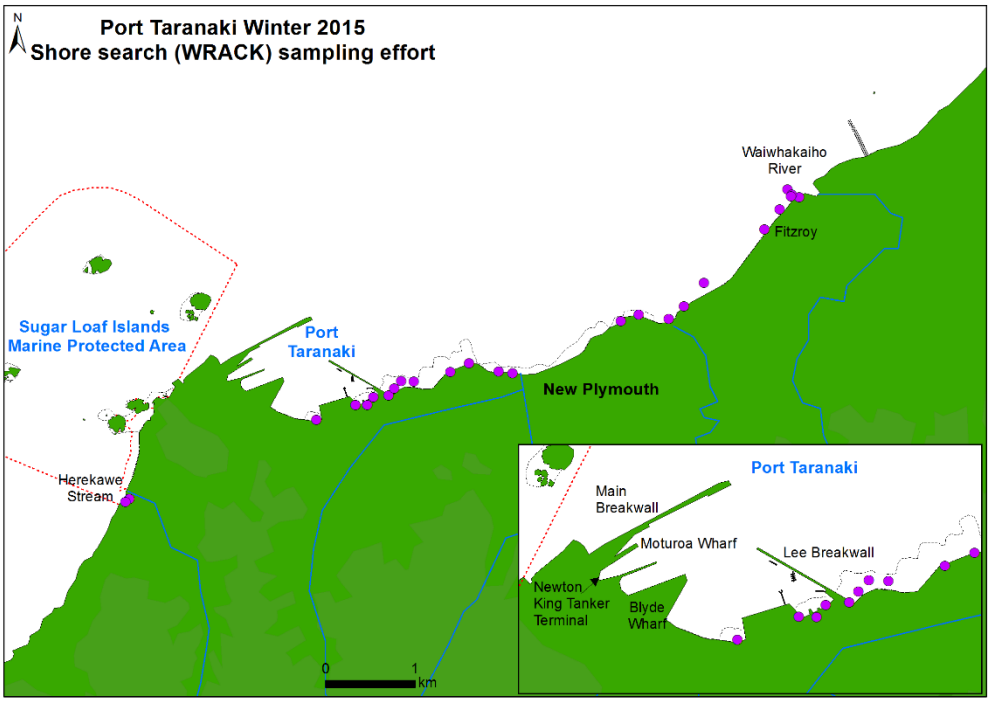
Sledding locations



Dive search locations

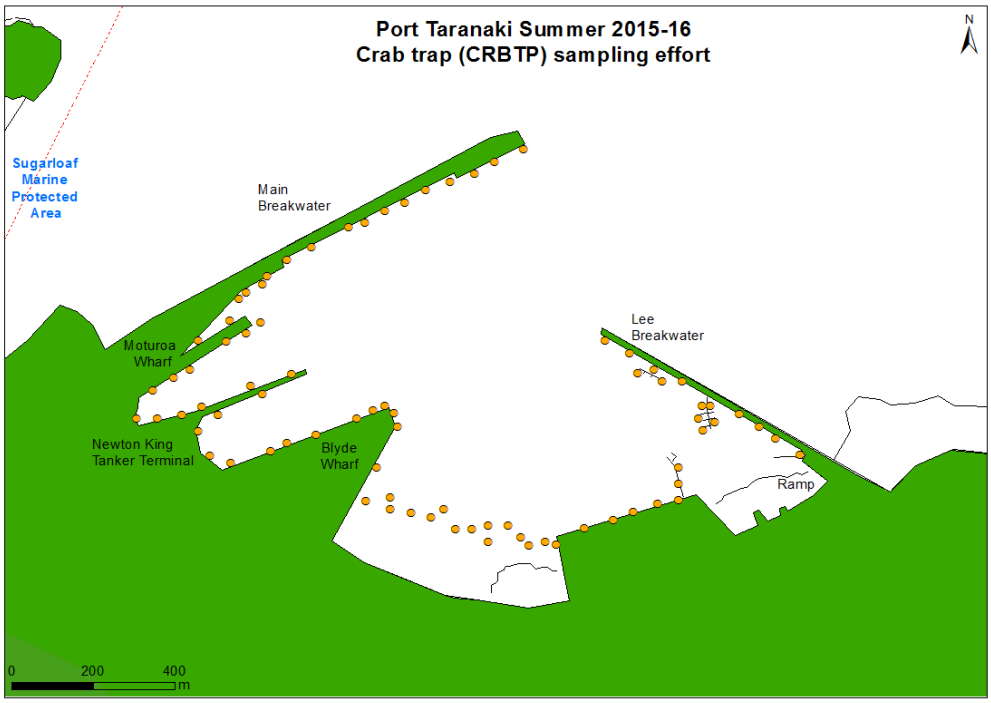


Shore search locations

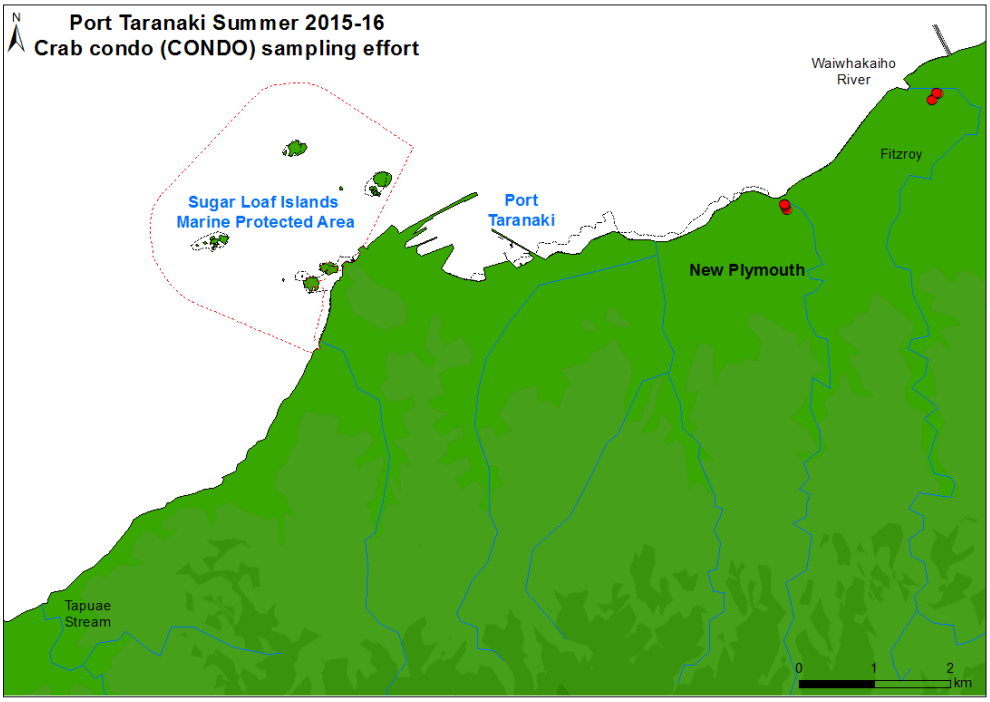


Summer 2015–16

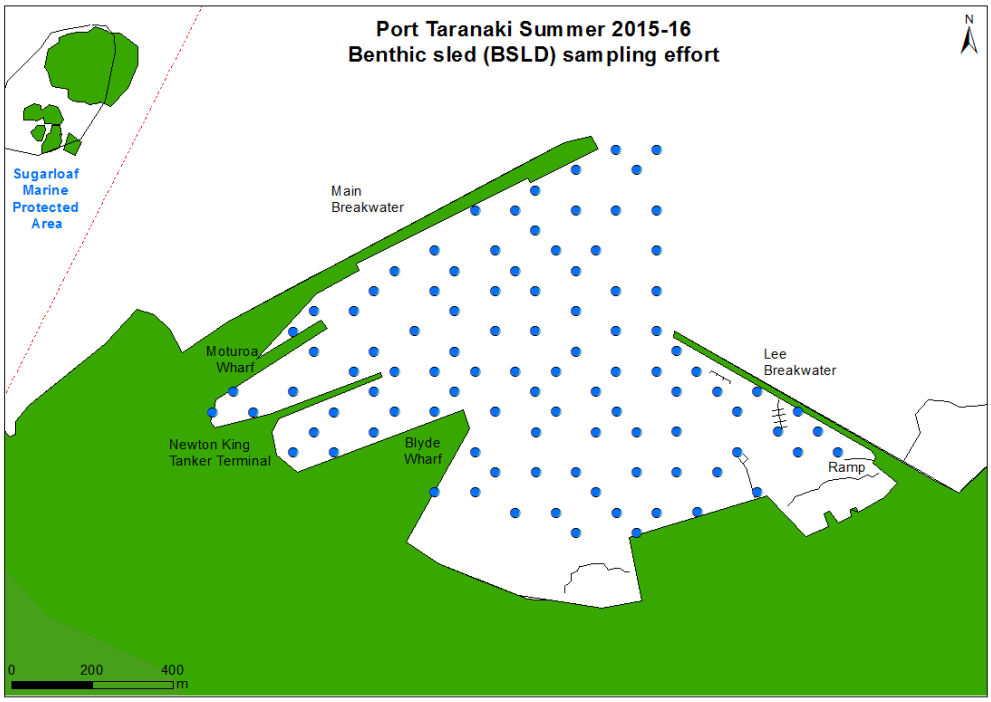
Crab (box) trapping locations



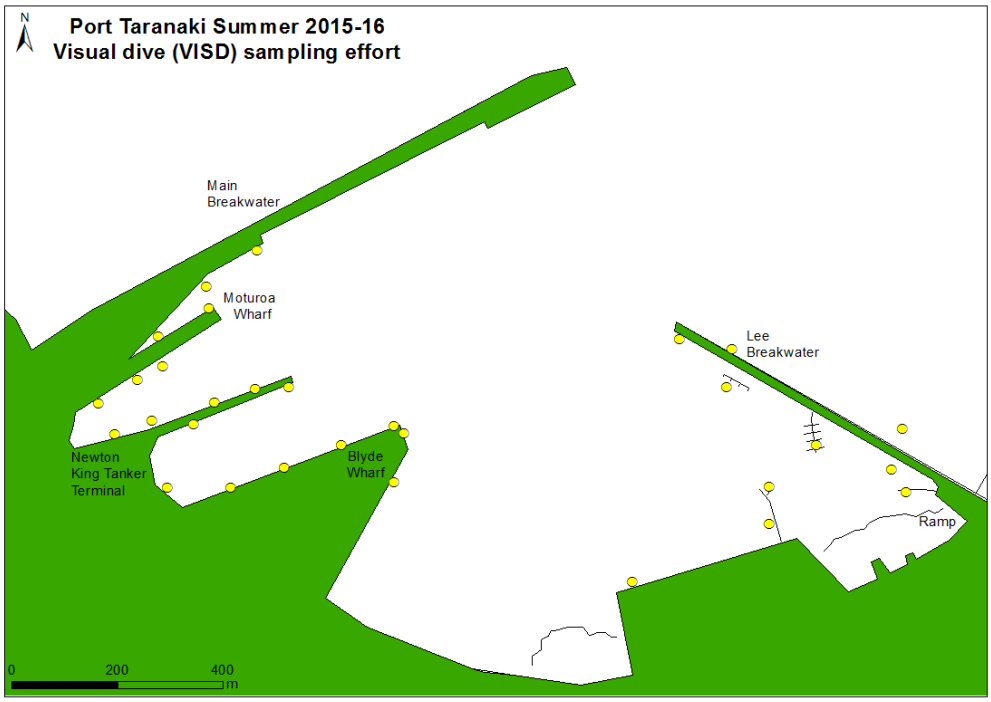
Crab condo locations



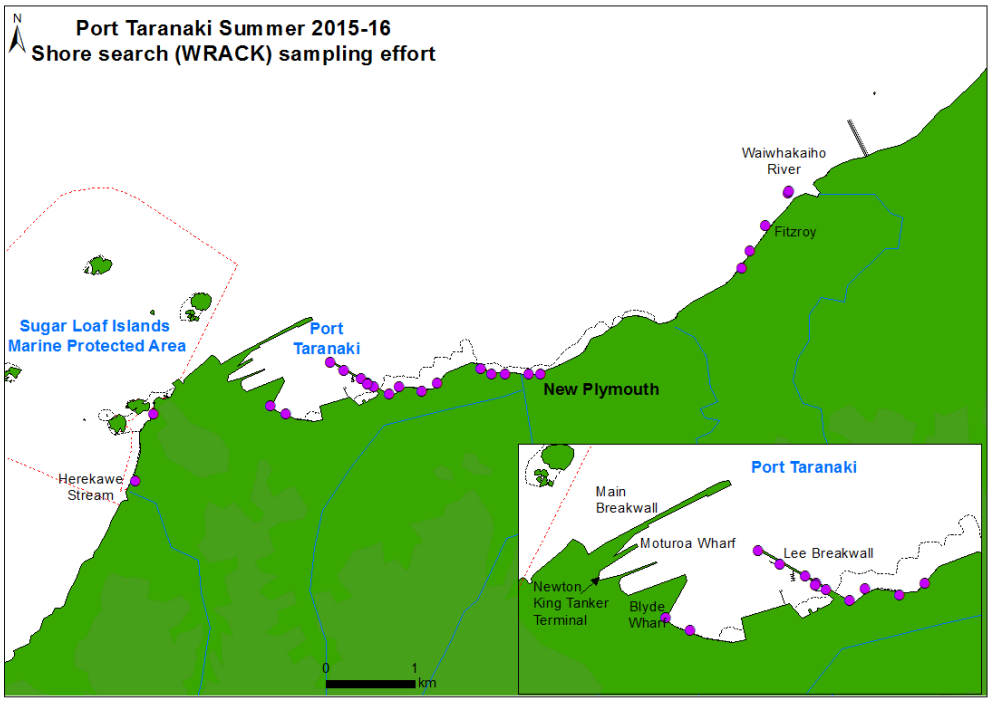
Sledding locations



Dive search locations



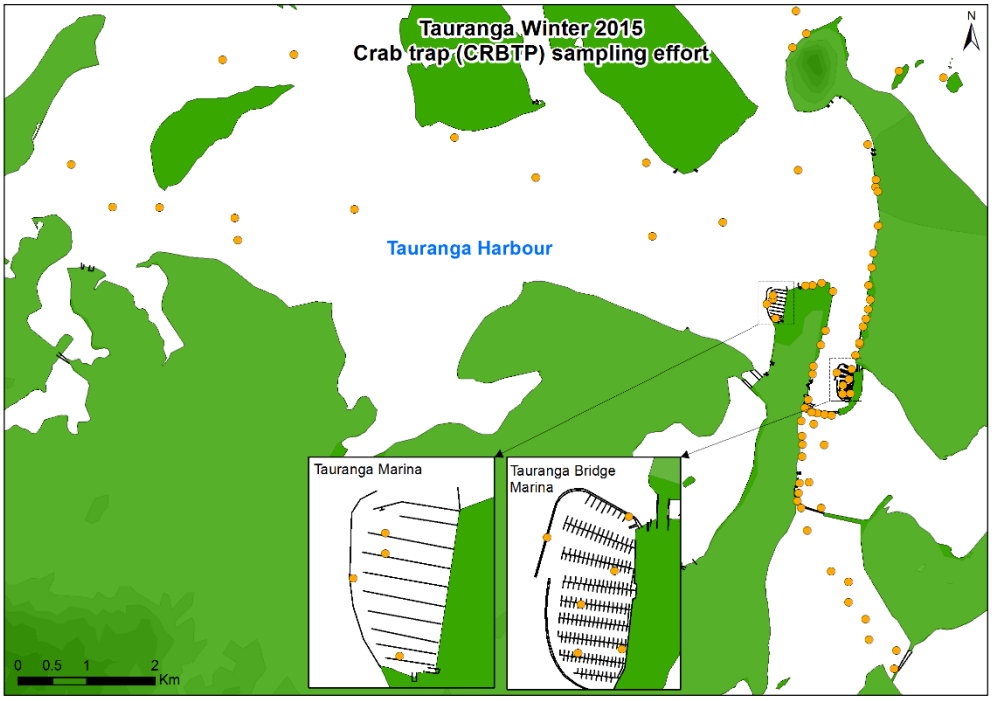
Shore search locations



Tauranga Harbour

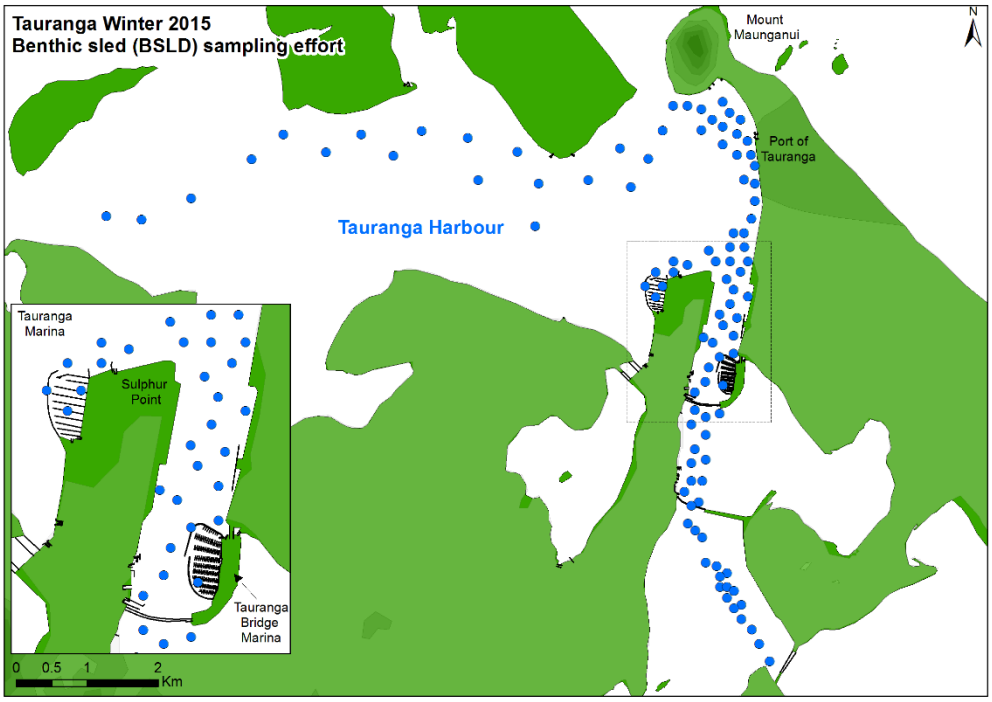
Winter 2015

Crab (box) trapping locations

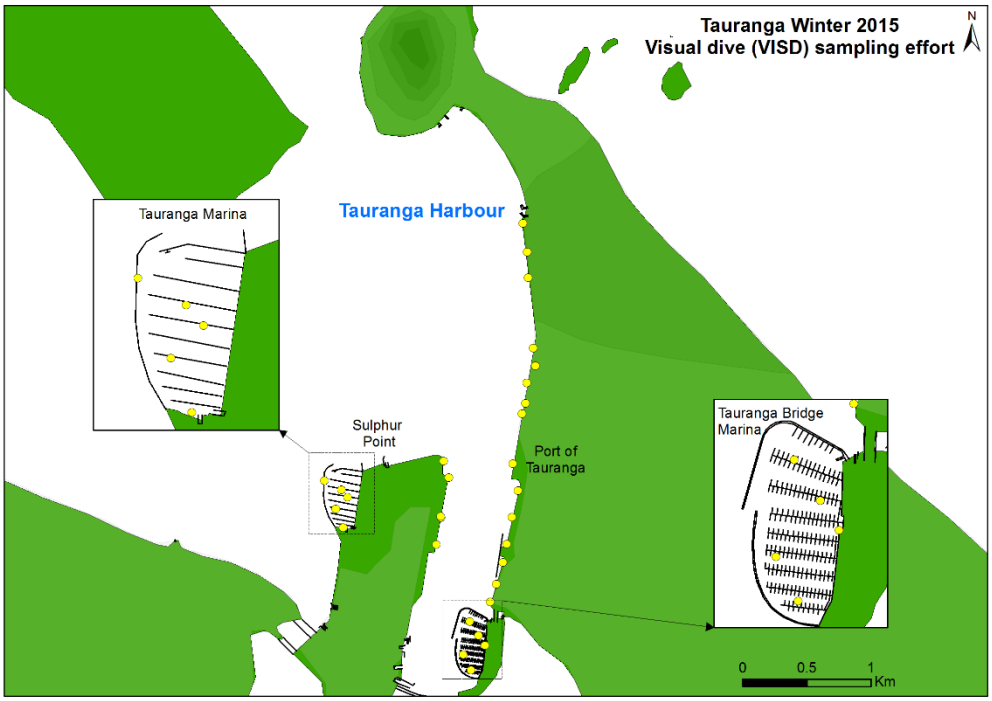


Crab condo locations

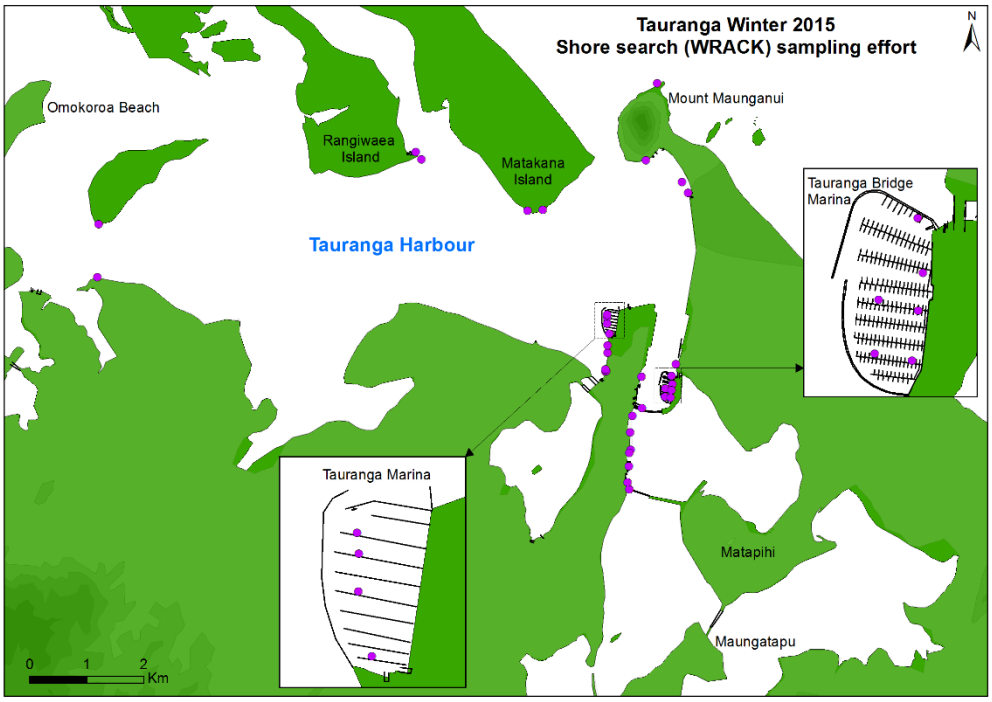
Sledding locations



Dive search locations

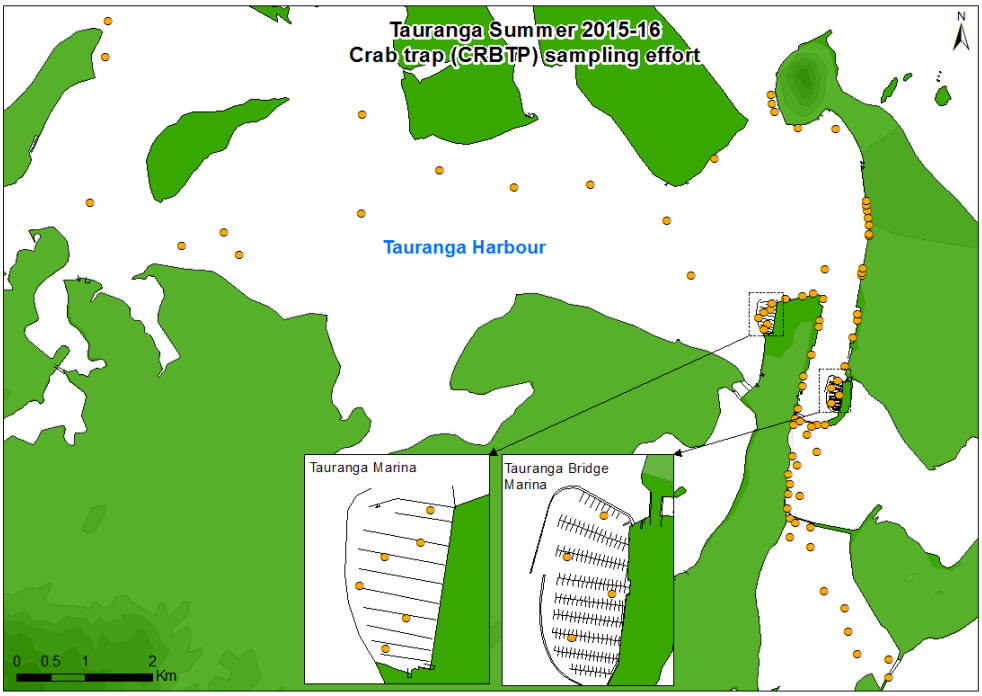


Shore search locations



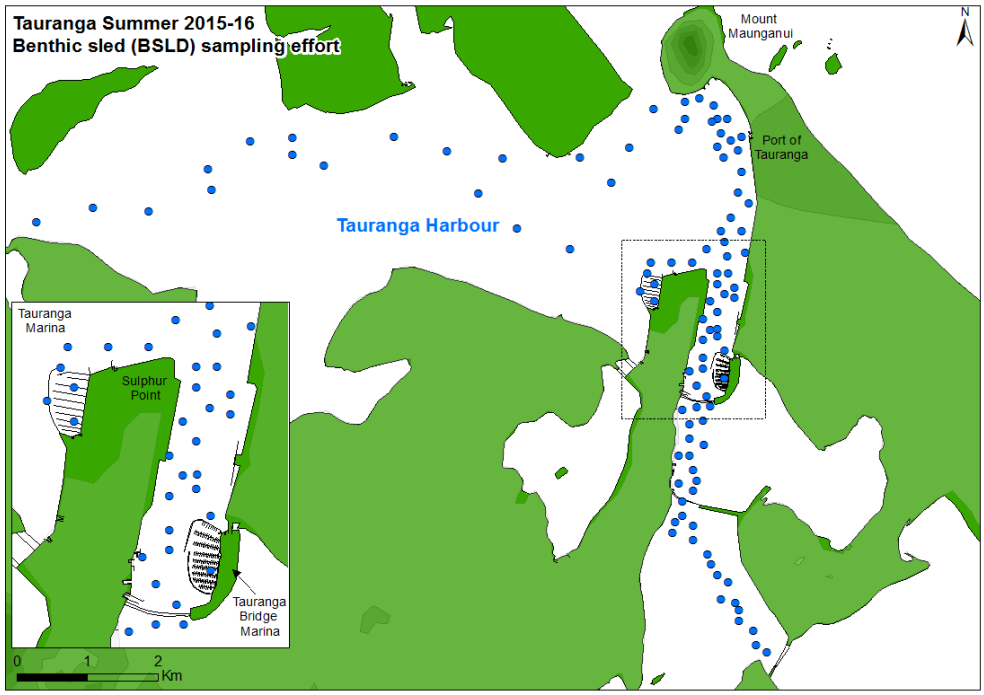
Summer 2015–16

Crab (box) trapping locations

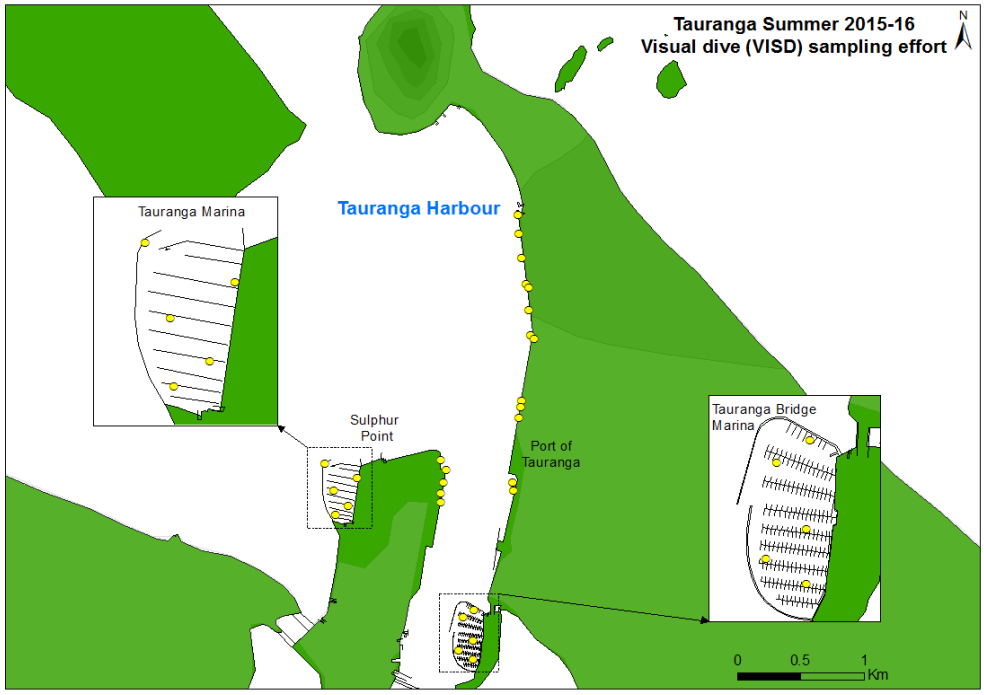


Crab condo locations

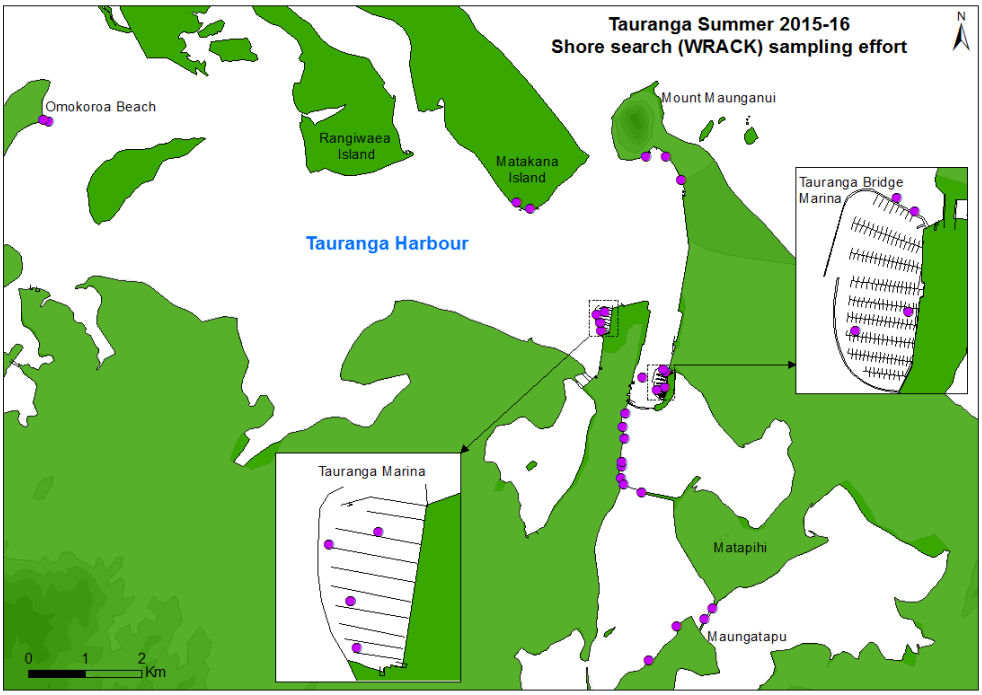
Sledding locations



Dive search locations



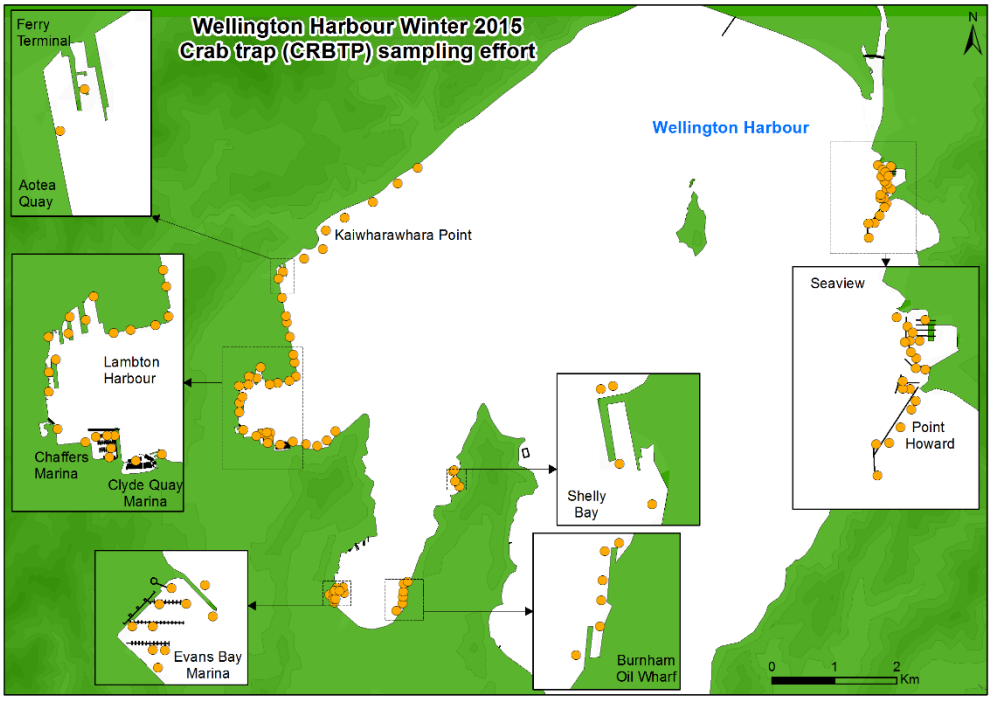
Shore search locations



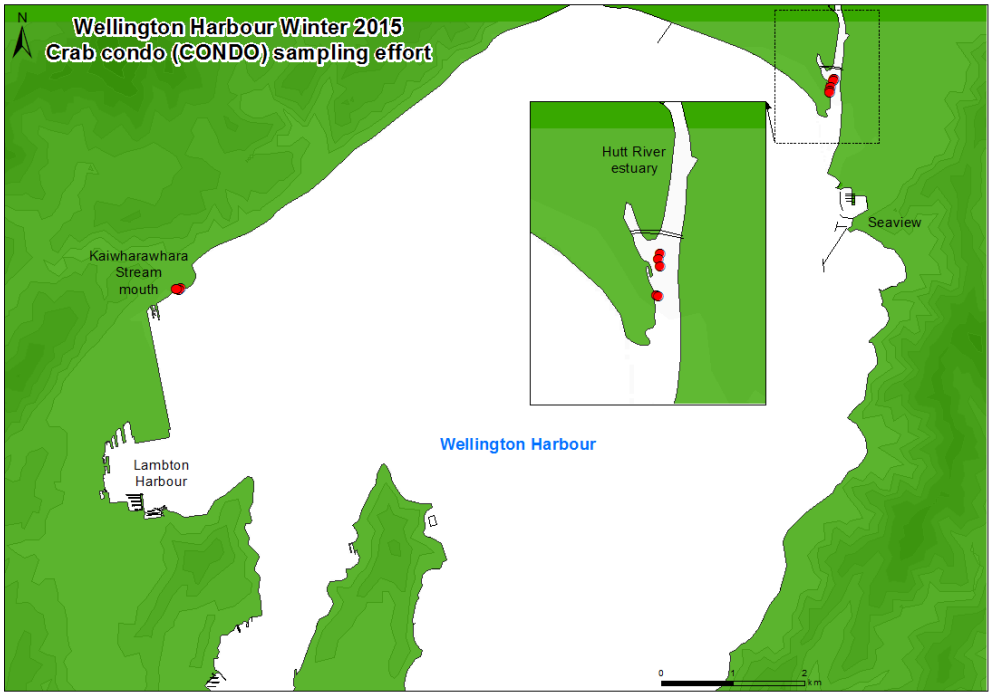
Wellington Harbour

Winter 2015

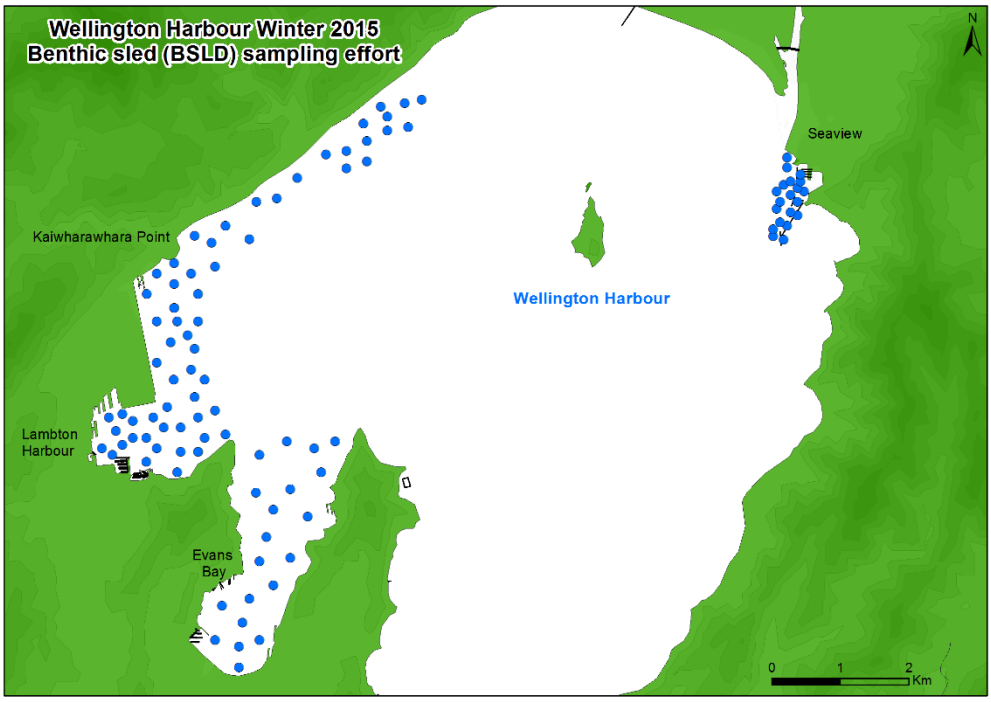
Crab (box) trapping locations



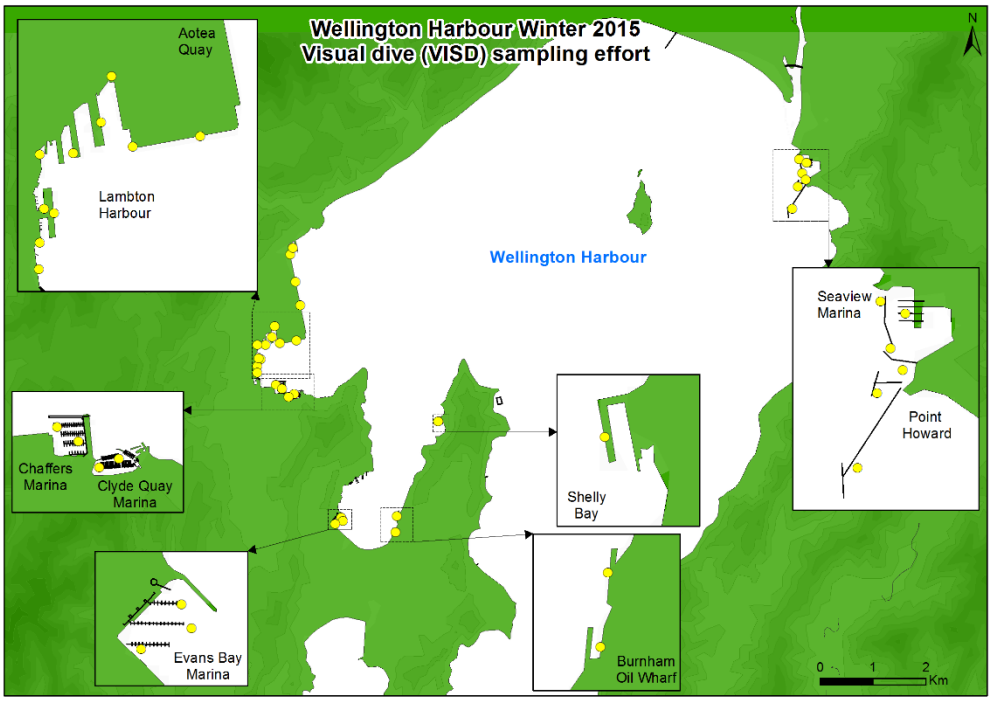
Crab condo locations



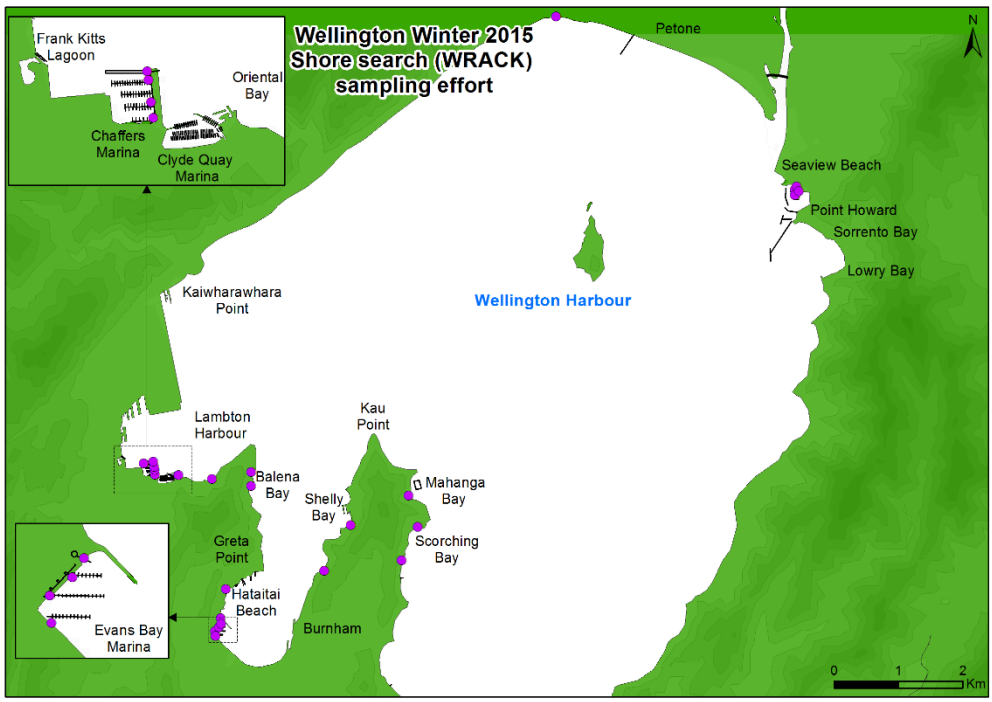
Sledding locations



Dive search locations

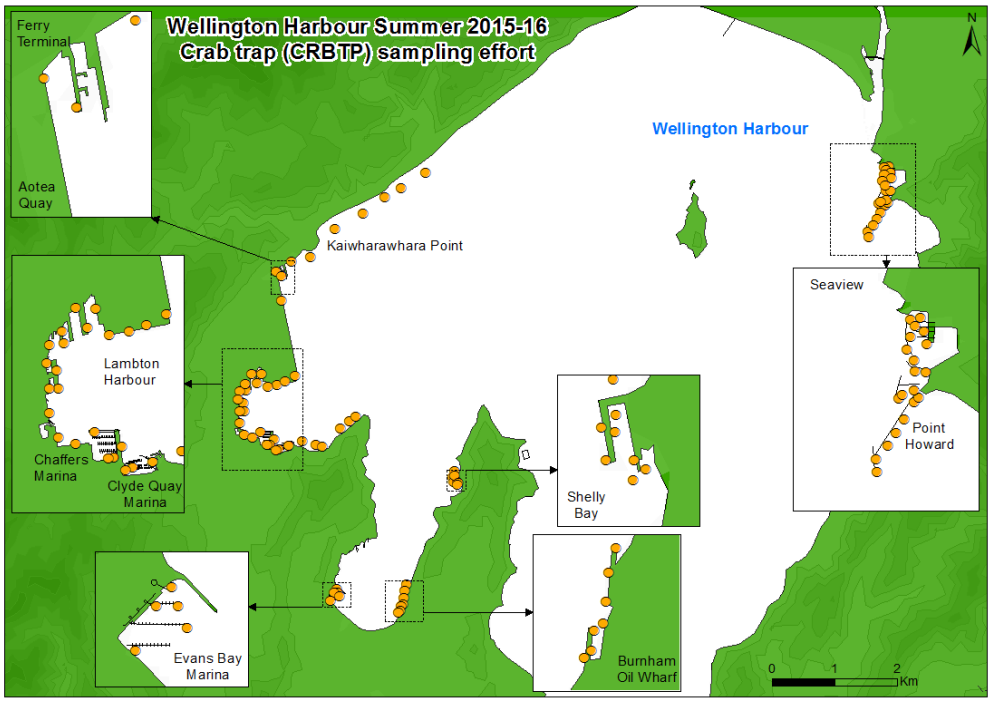


Shore search locations

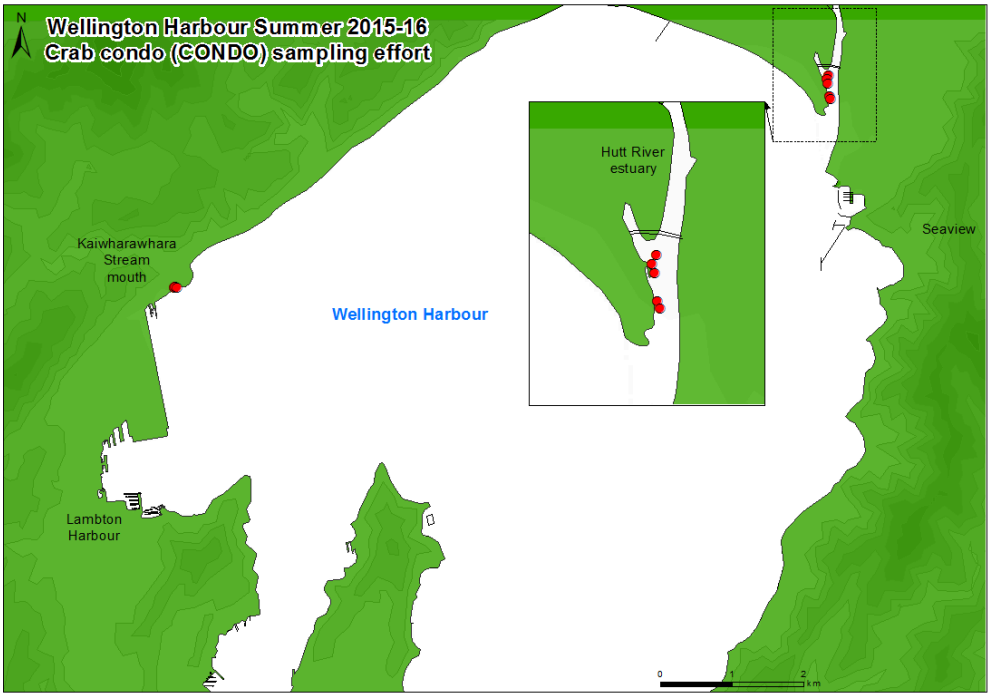


Summer 2015–16

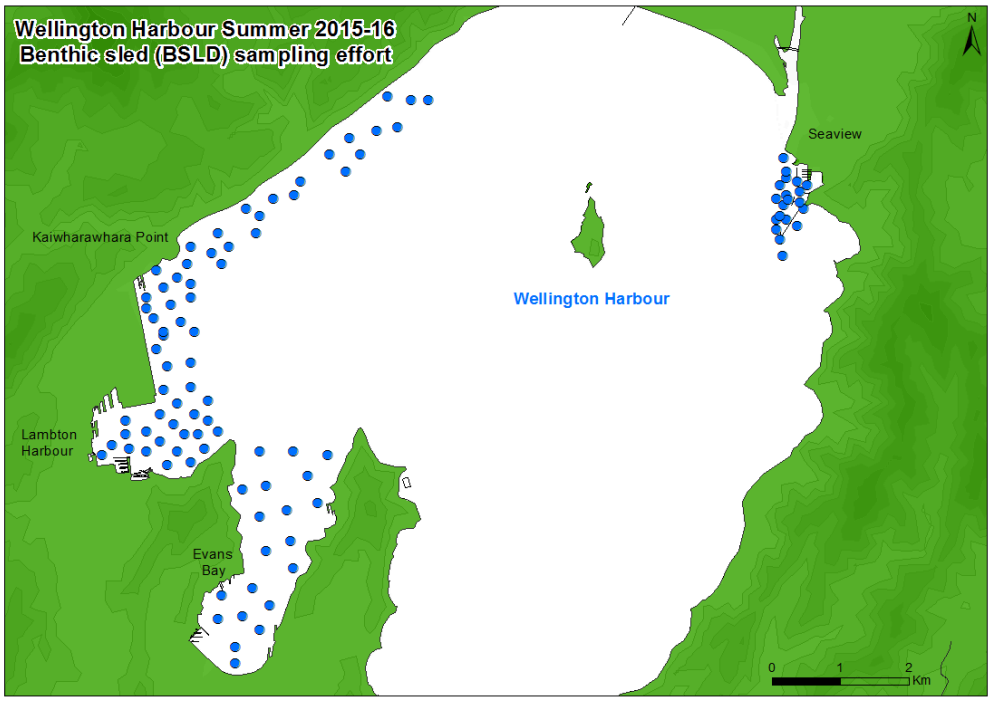
Crab (box) trapping locations



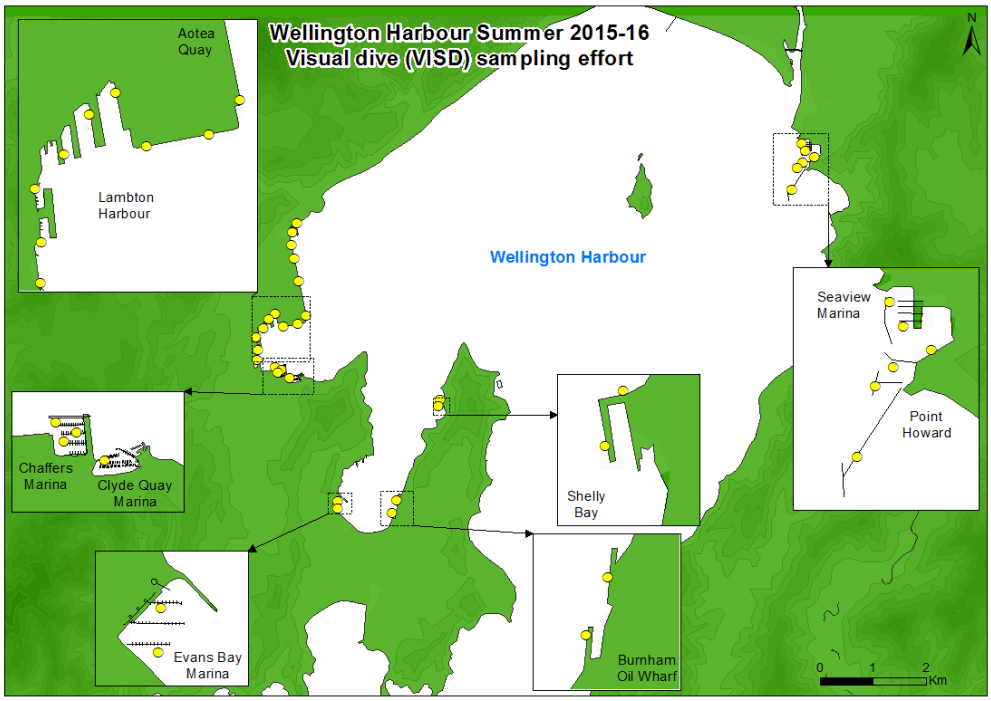
Crab condo locations



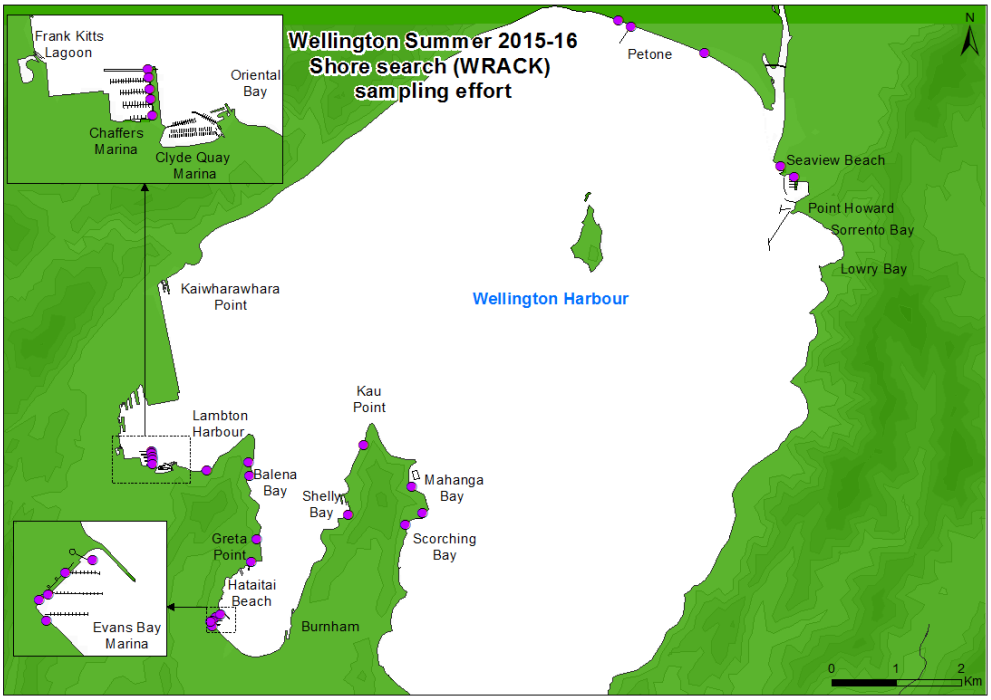
Sledding locations



Dive search locations



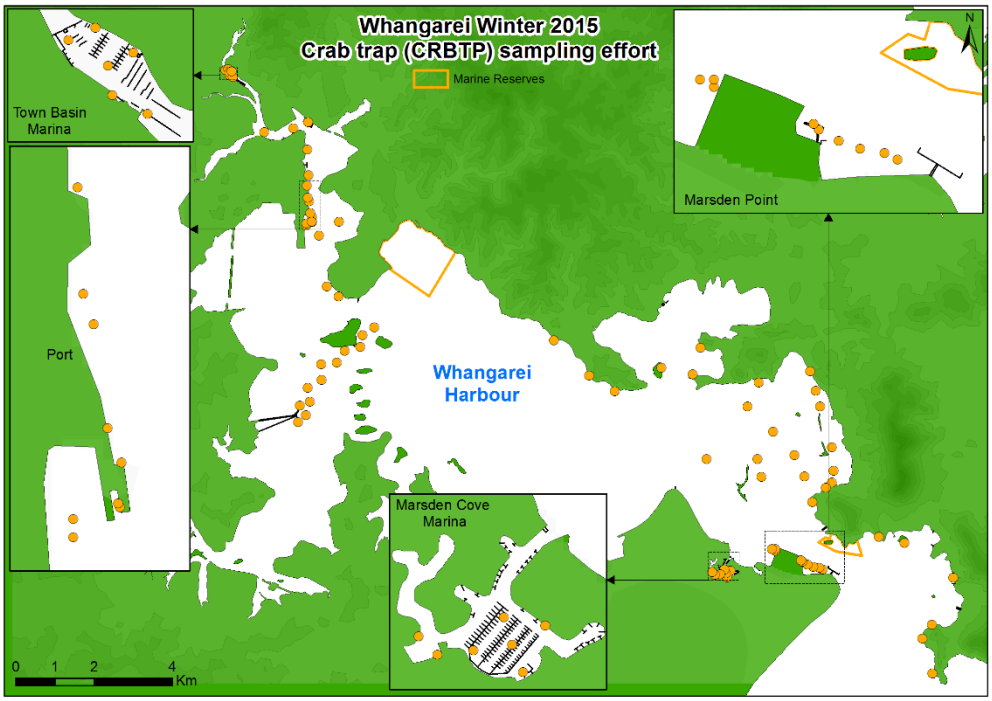
Shore search locations



Whangarei Harbour

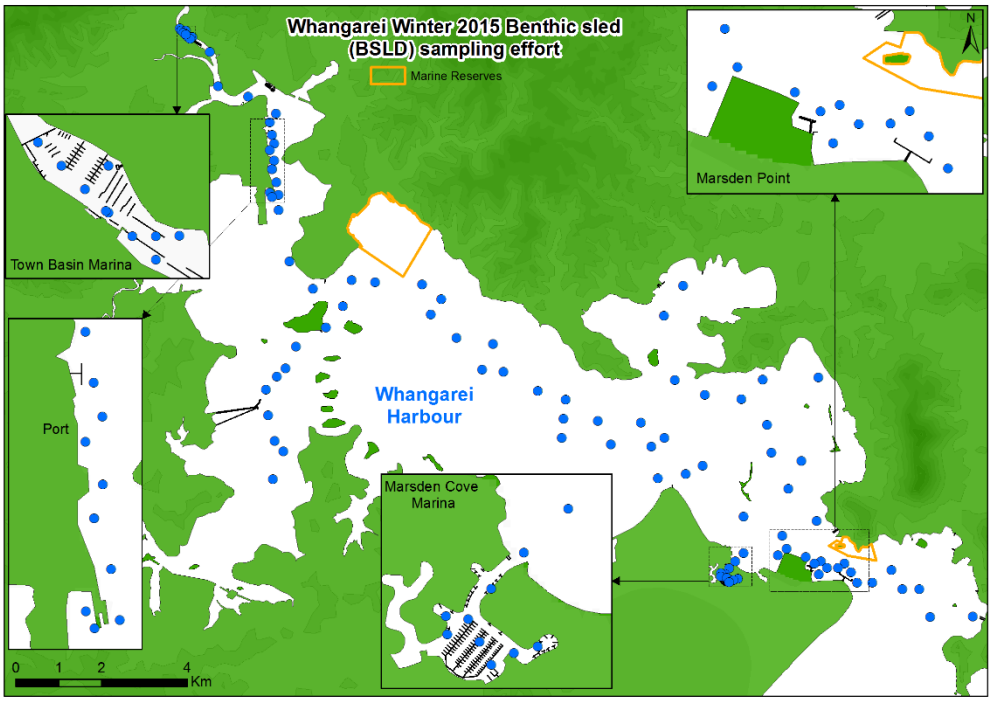
Winter 2015

Crab (box) trapping locations

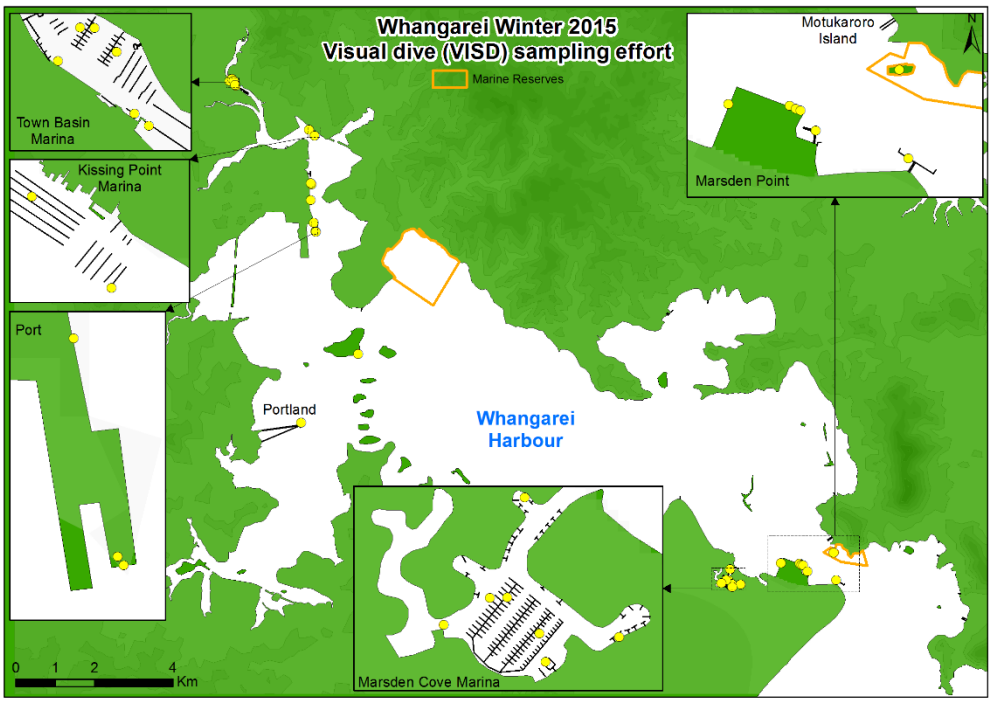


Crab condo locations

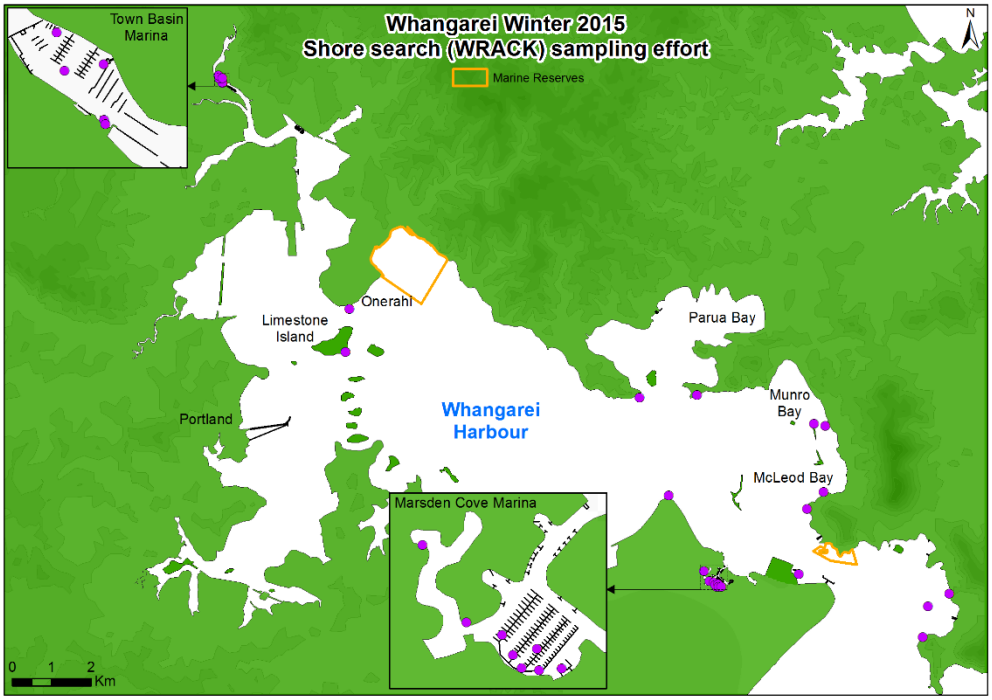
Sledding locations



Dive search locations

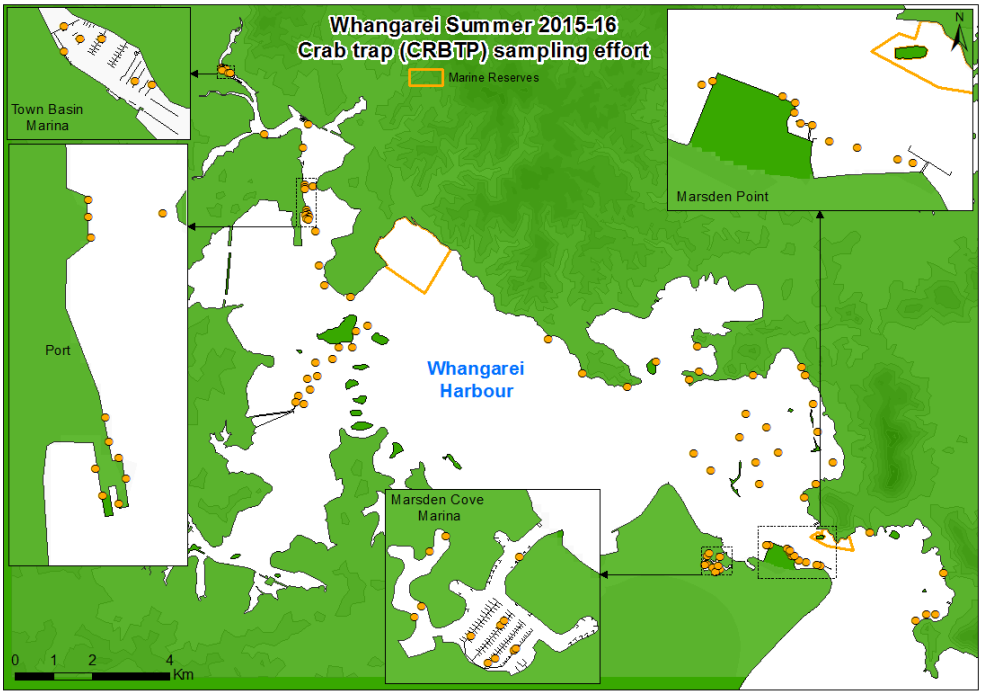


Shore search locations

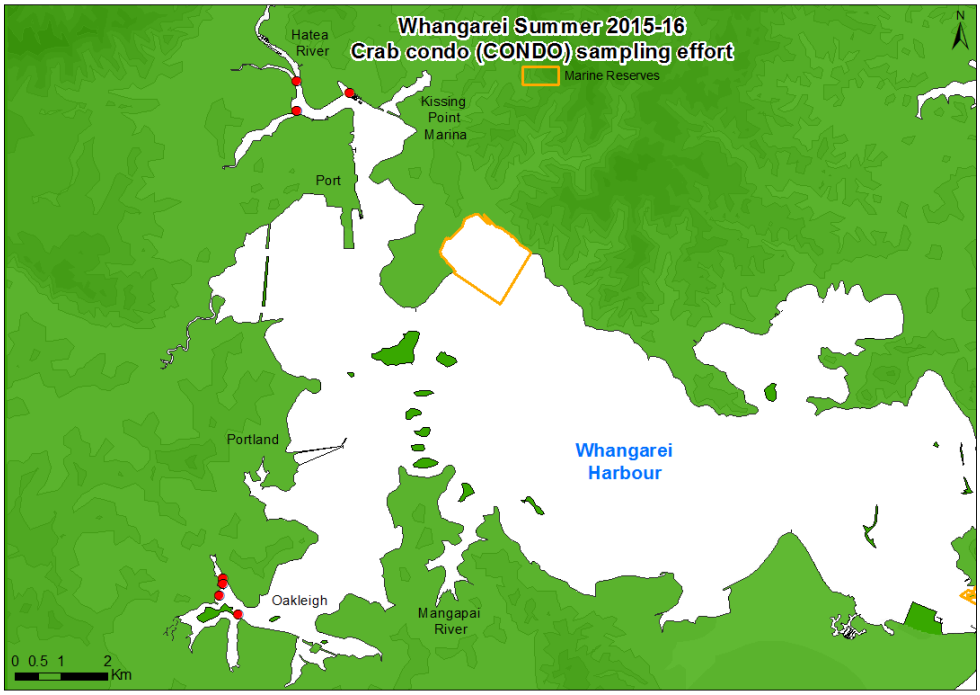


Summer 2015–16

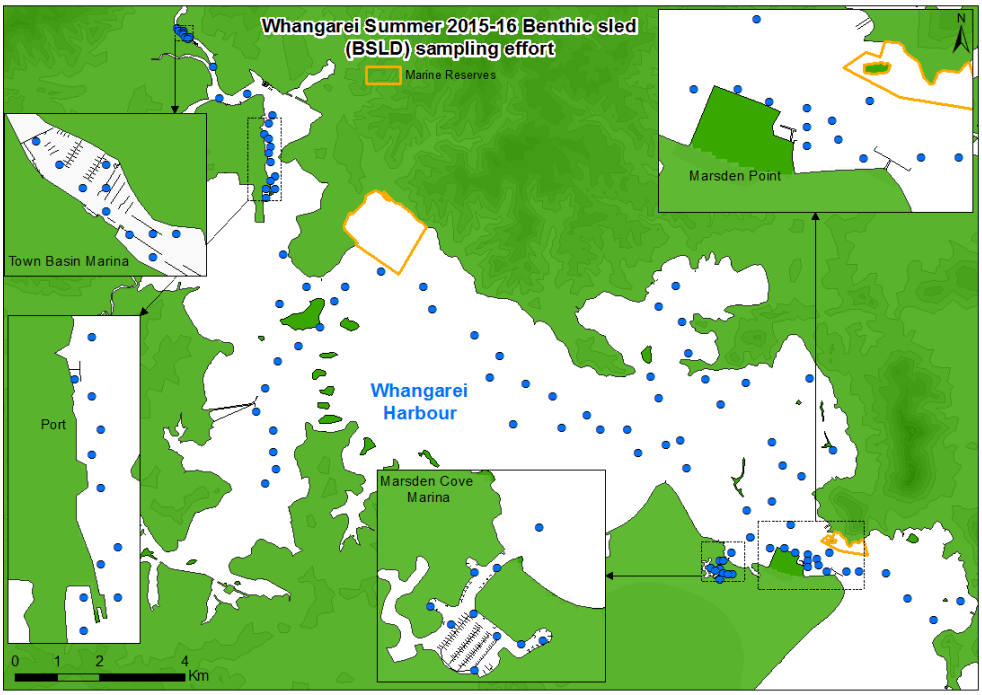
Crab (box) trapping locations



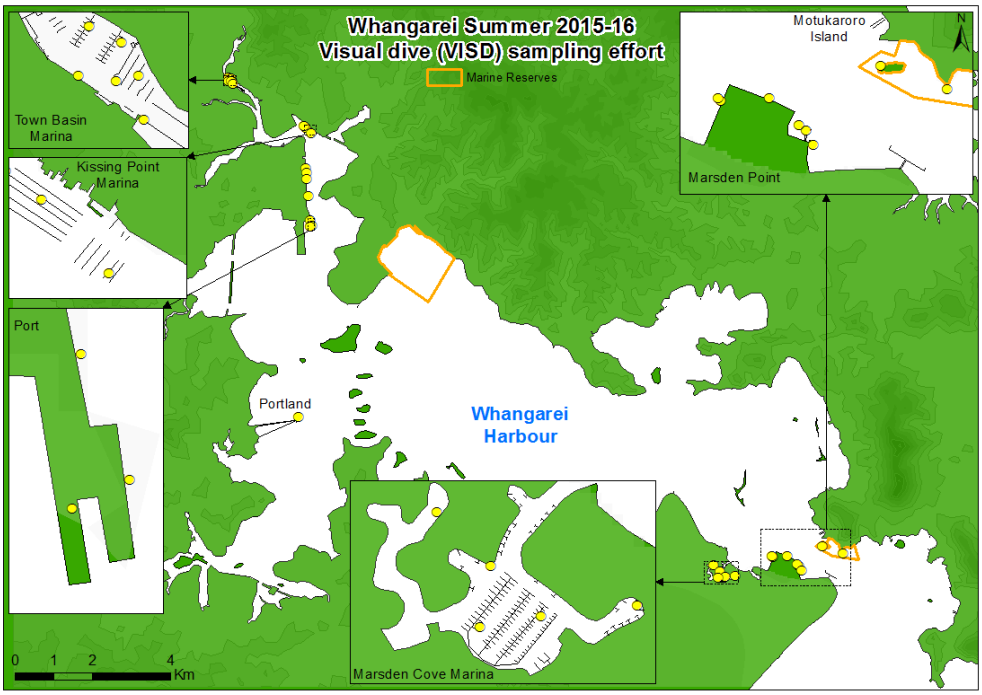
Crab condo locations



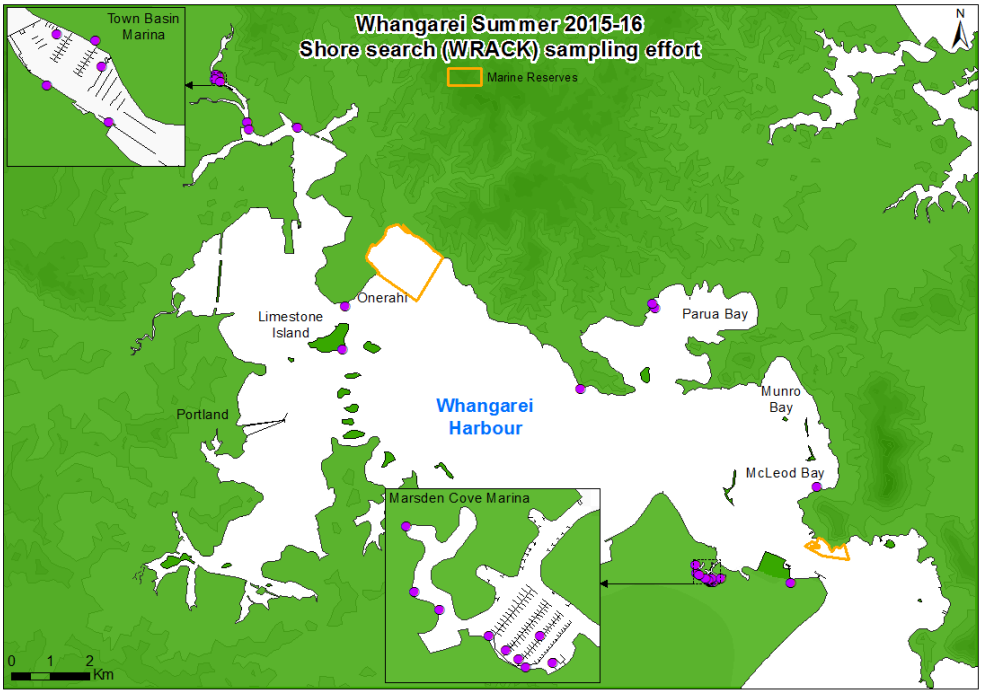
Sledding locations



Dive search locations



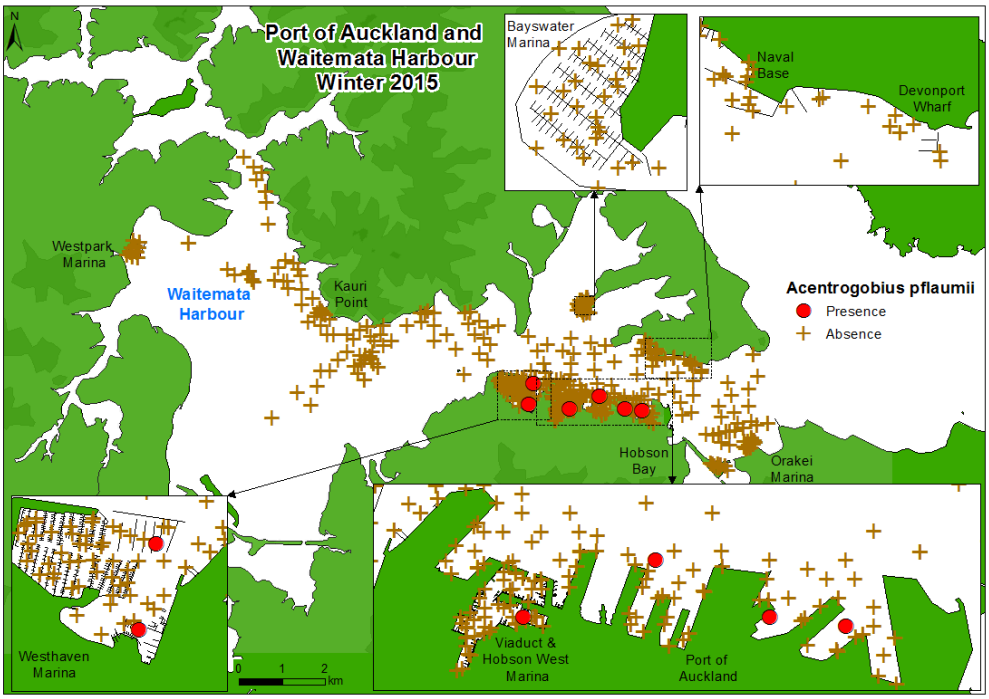
Shore search locations



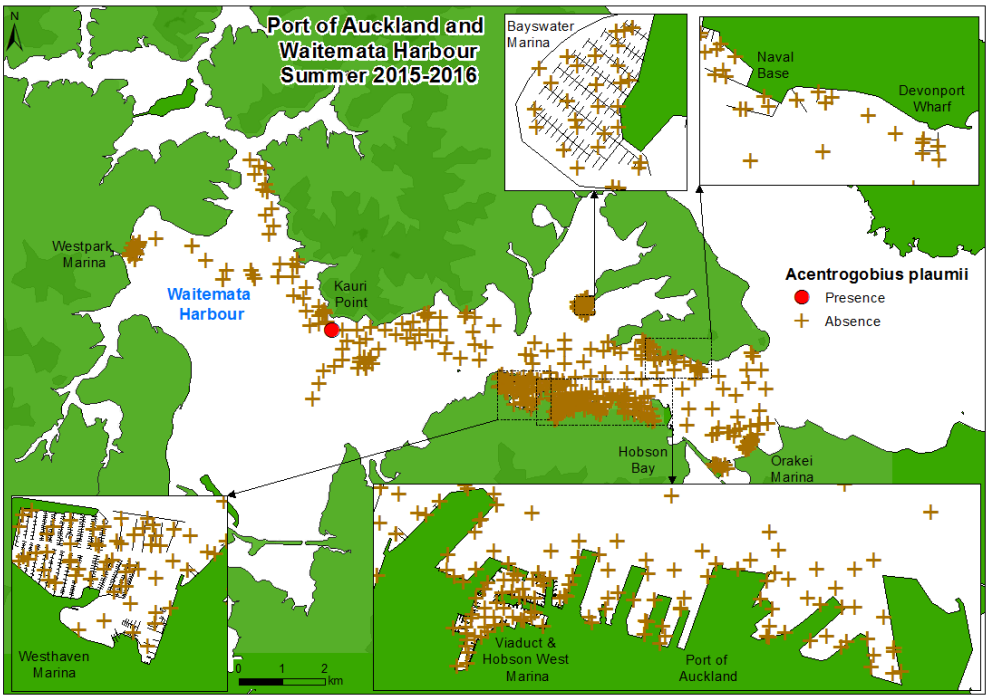
Appendix 4. Distribution maps for target and selected non-target species detected during Winter 2015 and Summer 2015–16 Marine High Risk Site Surveillance (MHRSS) Programme surveys

Acentrogobius pflaumii

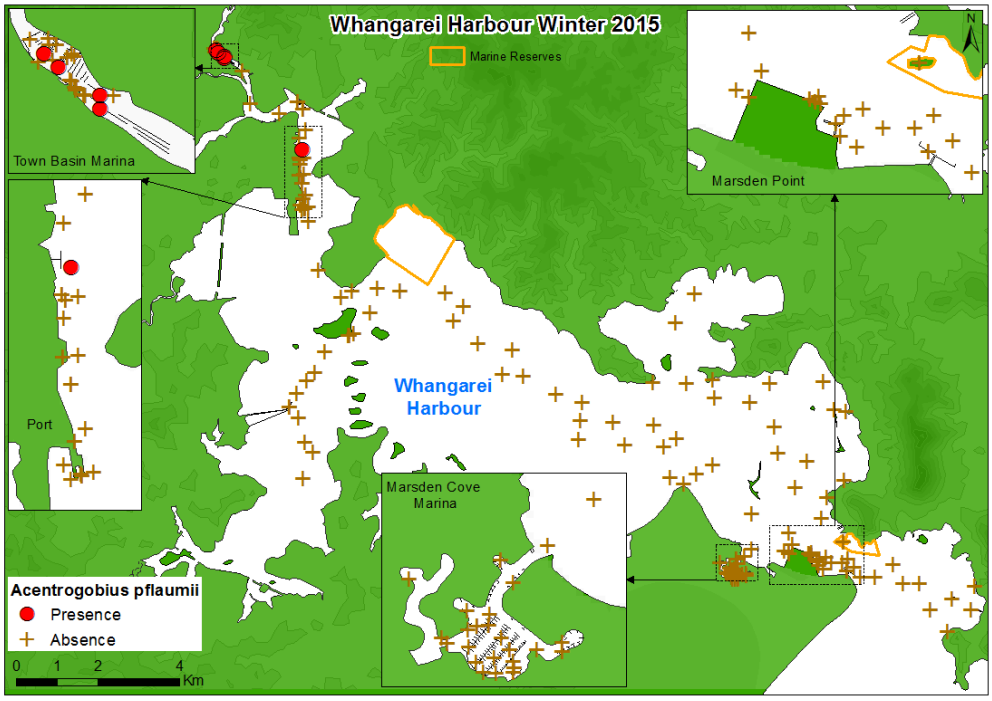
Auckland (Waitemata) Harbour Winter 2015



Auckland (Waitemata) Harbour Summer 2015–16

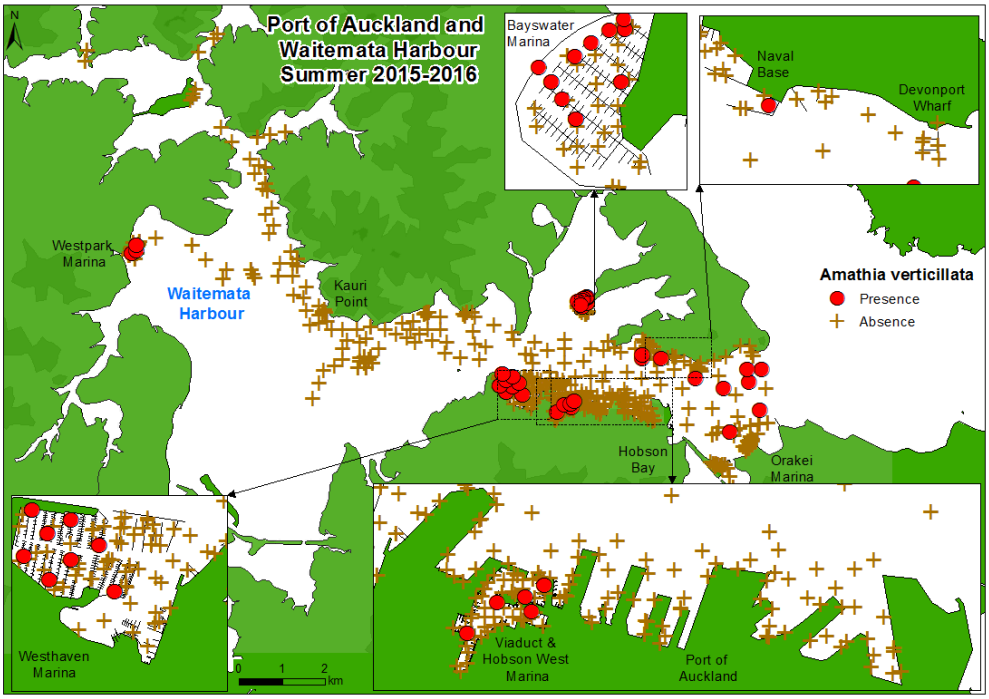


Whangarei Harbour Winter 2015

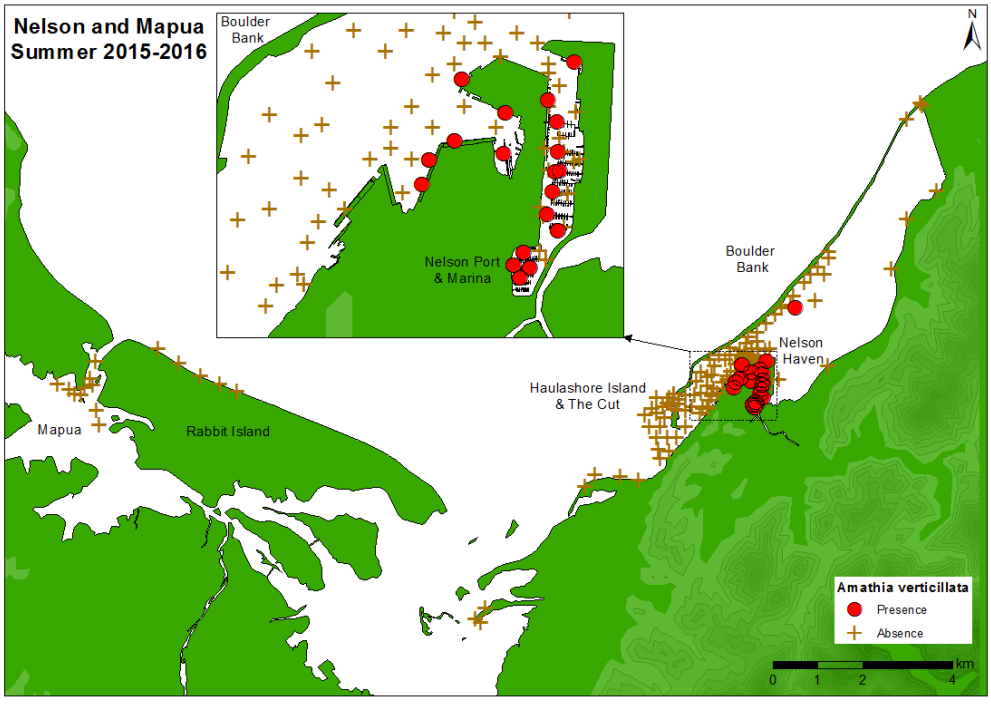


Amathia verticillata

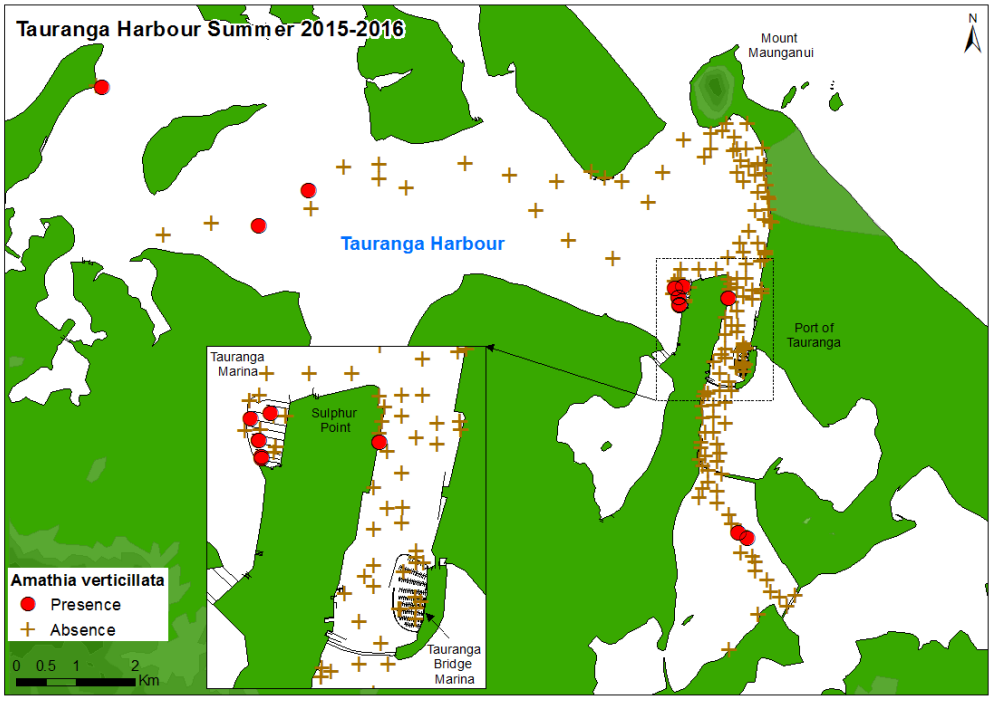
Auckland (Waitemata) Harbour Summer 2015–16



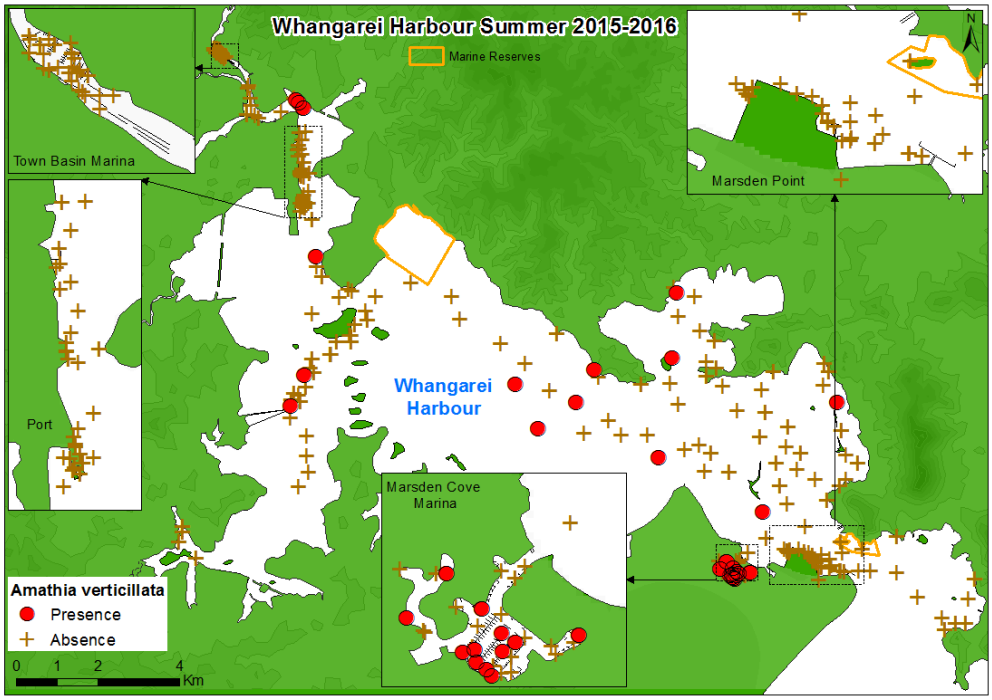
Nelson Harbour Summer 2015–16



Tauranga Harbour Summer 2015–16

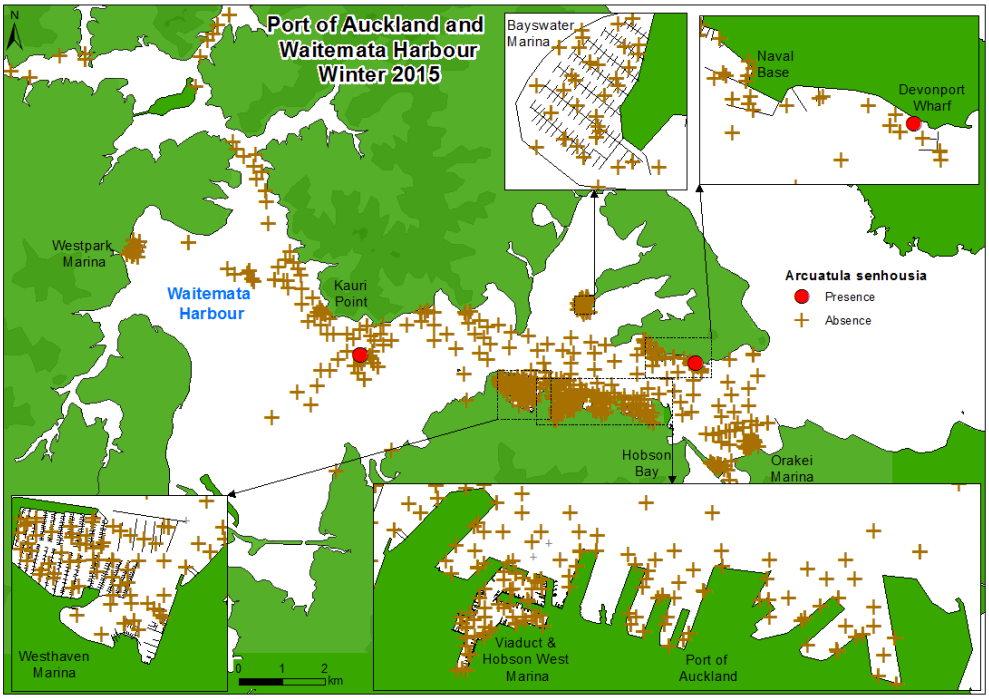


Whangarei Harbour Summer 2015–16

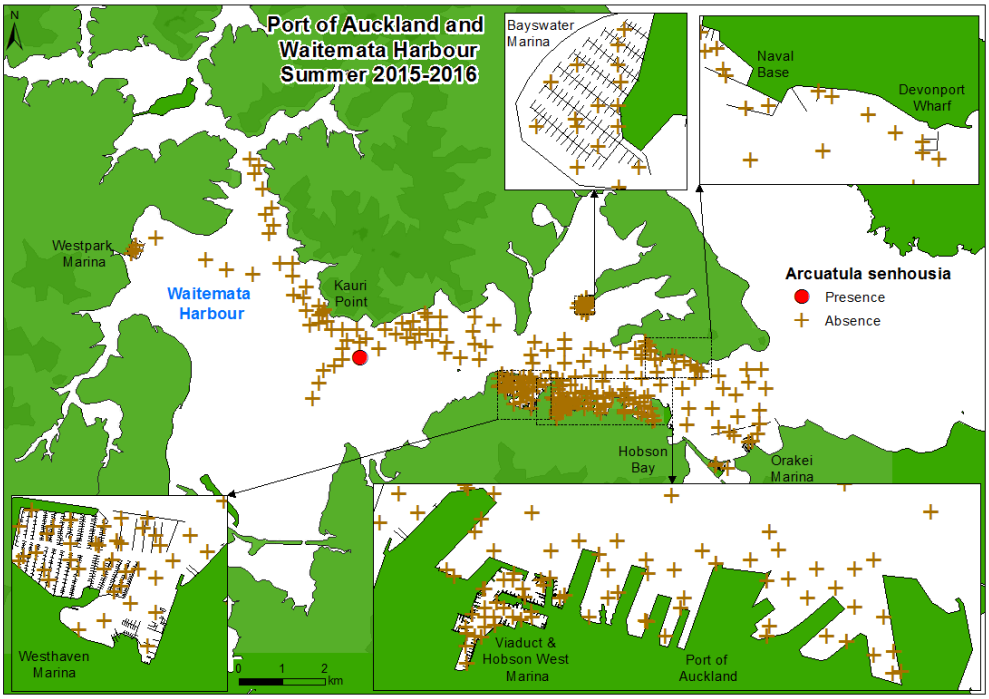


Arcuatula senhousia

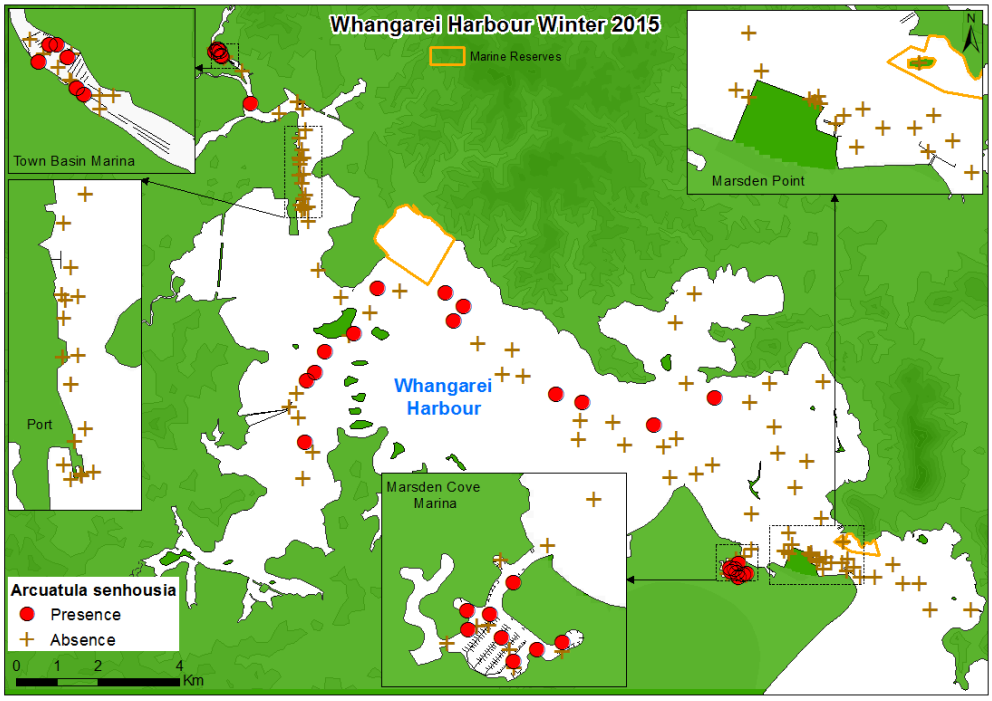
Auckland (Waitemata) Harbour Winter 2015



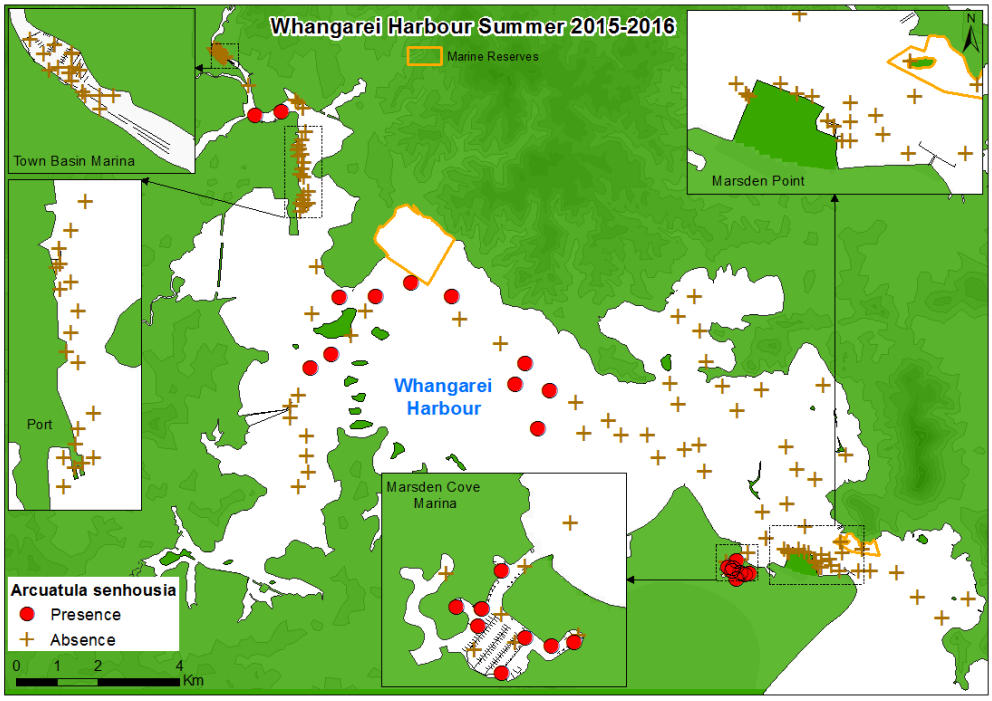
Auckland (Waitemata) Harbour Summer 2015–16



Whangarei Harbour Winter 2015

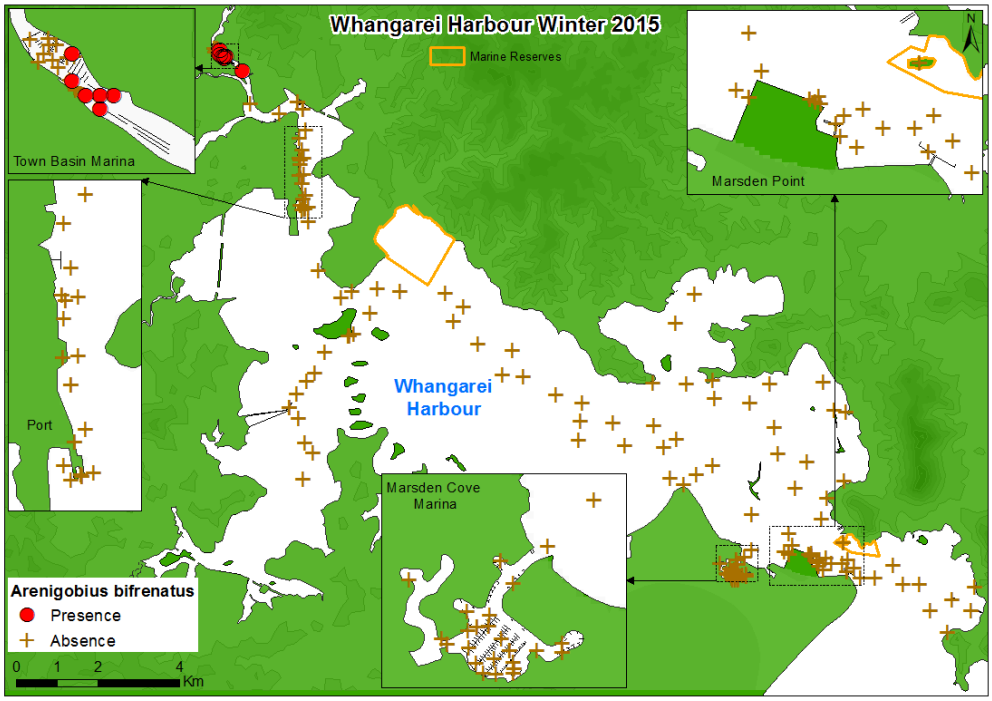


Whangarei Harbour Summer 2015–16

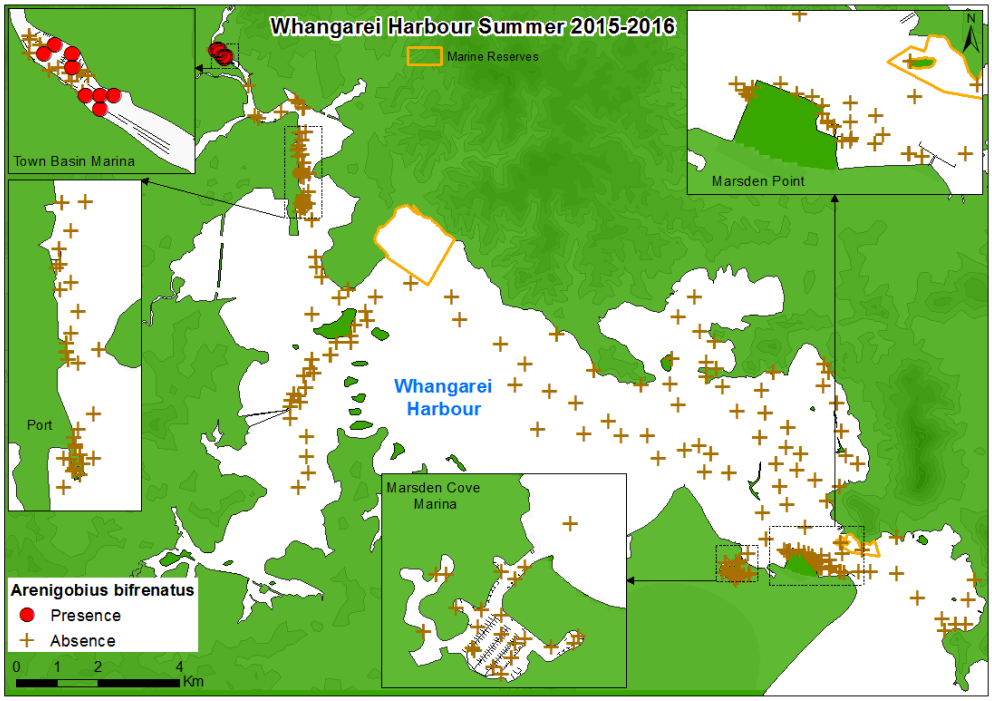


Arenigobius bifrenatus

Whangarei Harbour Winter 2015

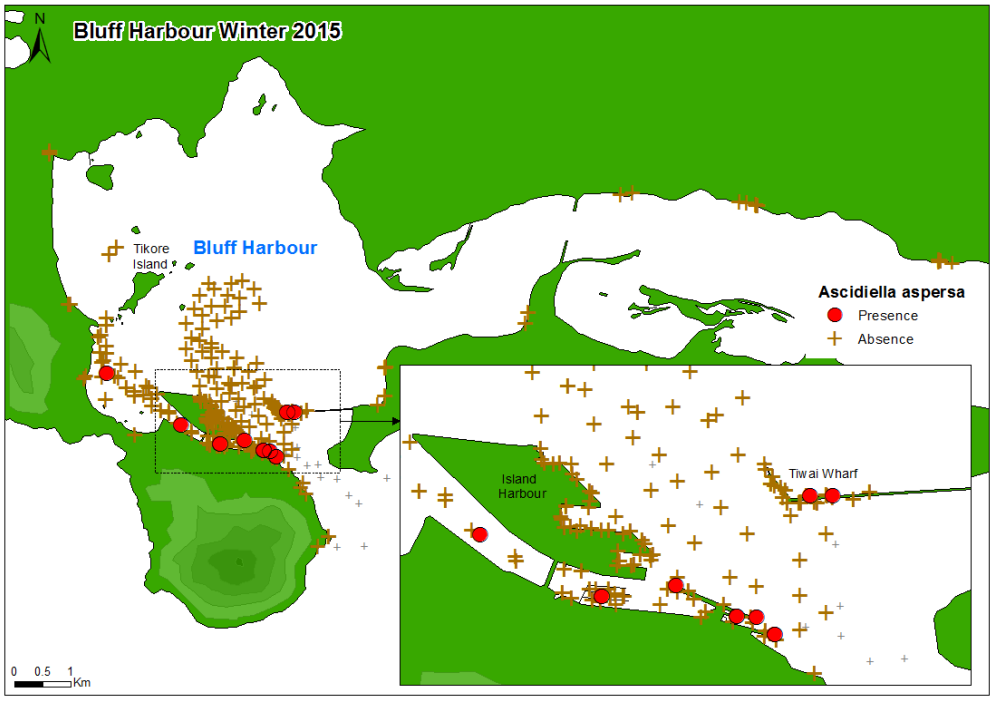


Whangarei Harbour Summer 2015–16

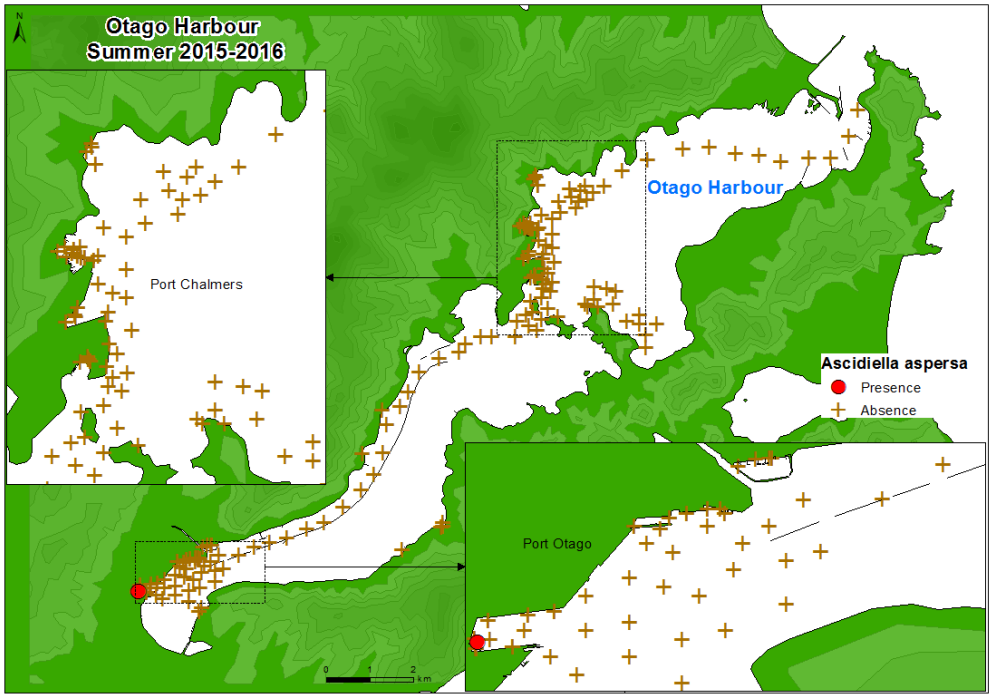


Ascidiella aspersa

Bluff Harbour Winter 2015

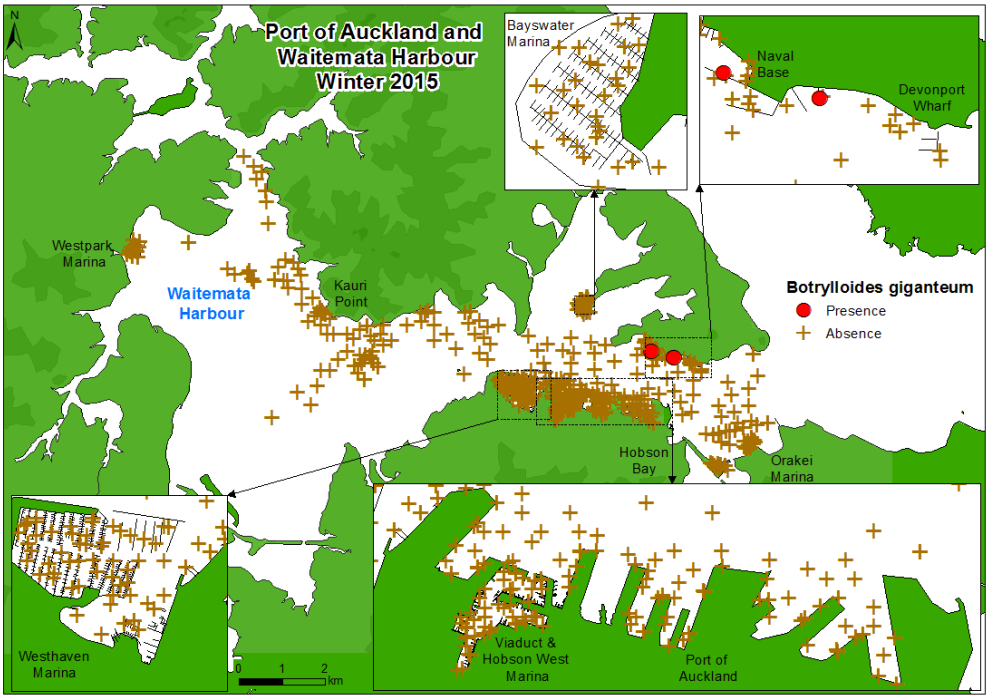


Otago Harbour Summer 2015–16

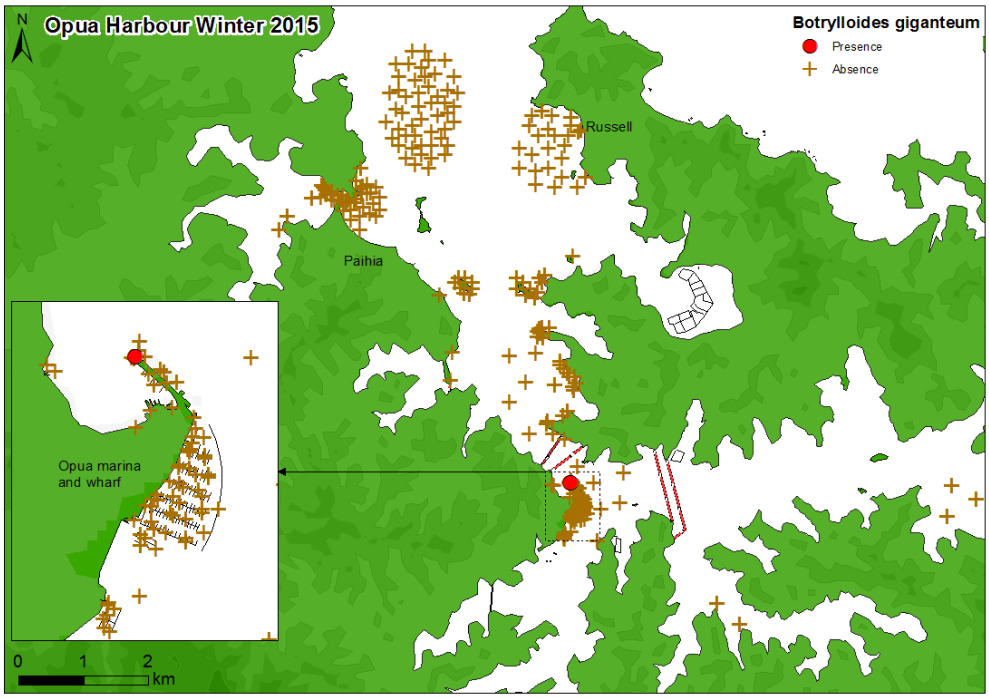


Botrylloides giganteum

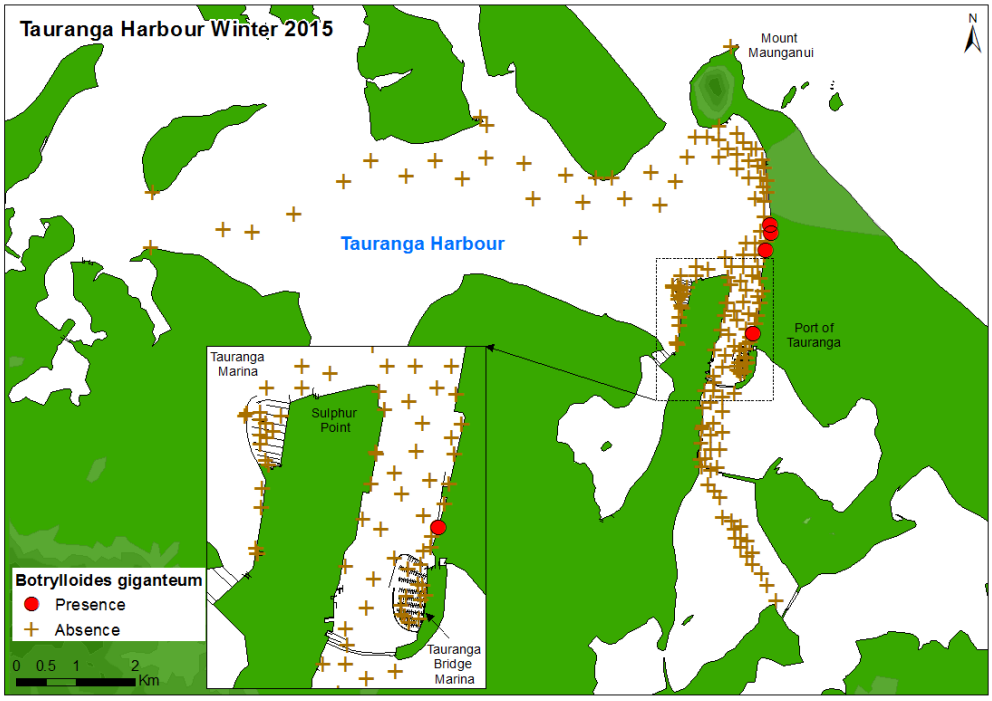
Auckland (Waitemata) Harbour Winter 2015



Opua Winter 2015

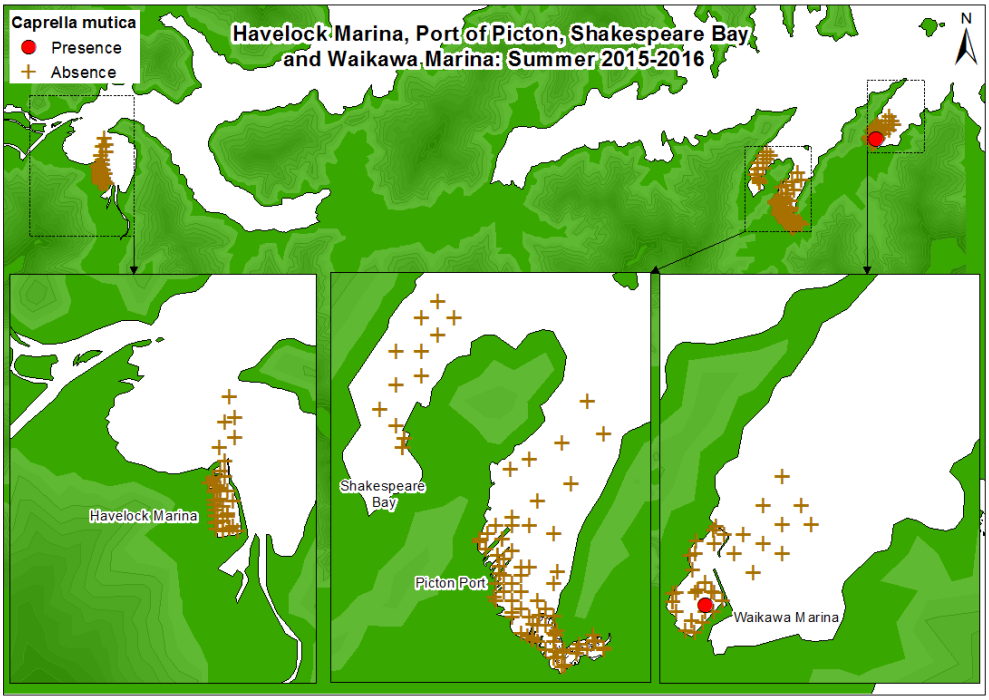


Tauranga Harbour Winter 2015



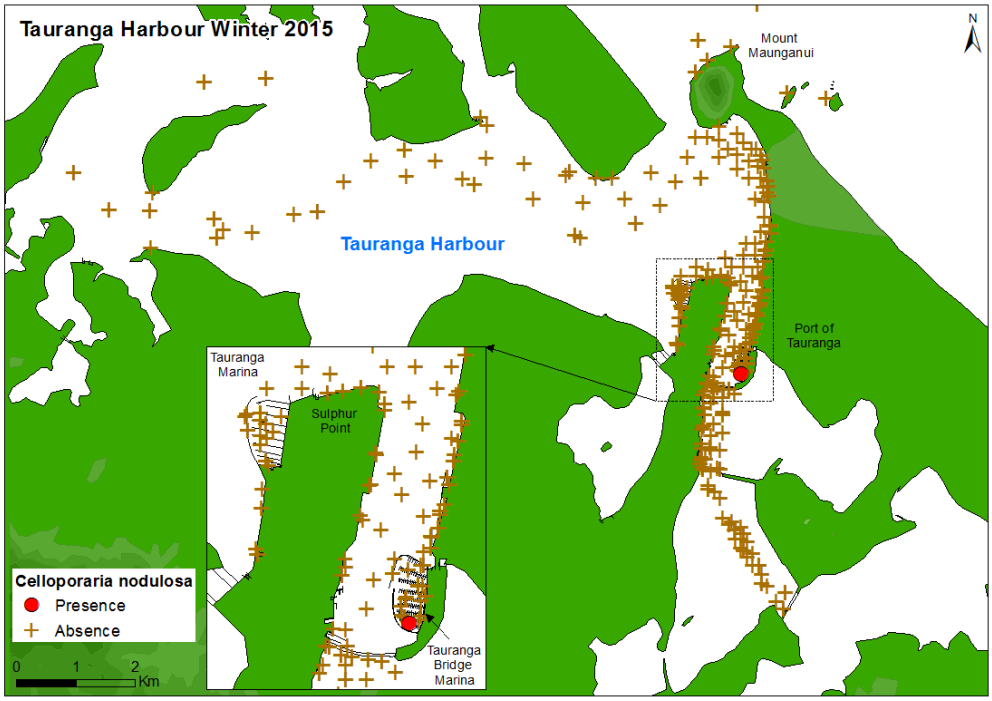
Caprella mutica

Picton Harbour Summer 2015–16



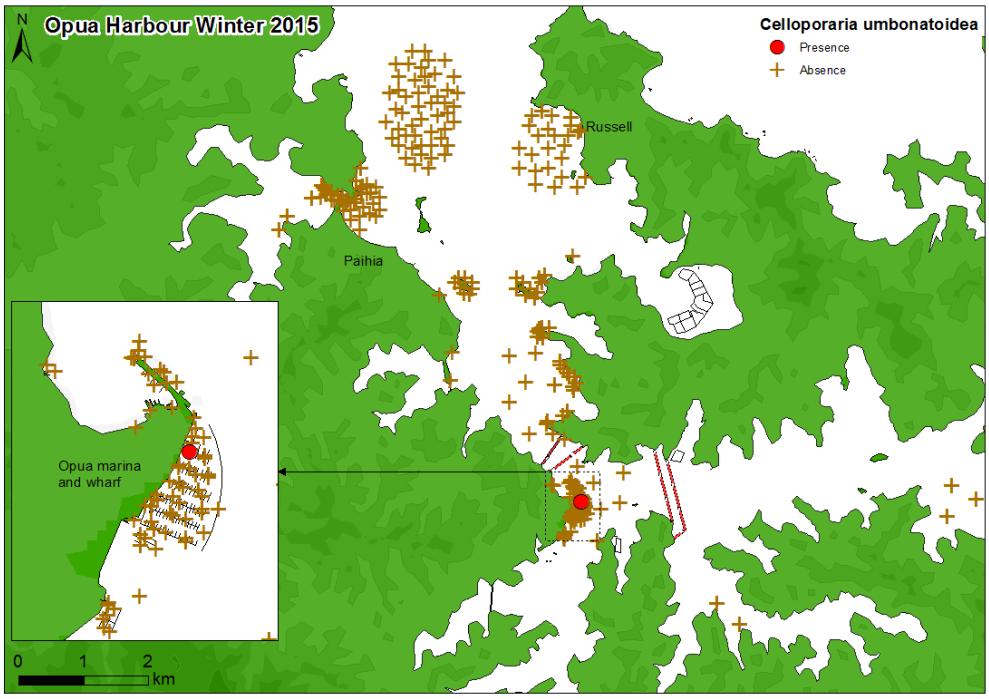
Celleporaria nodulosa

Tauranga Harbour Winter 2015



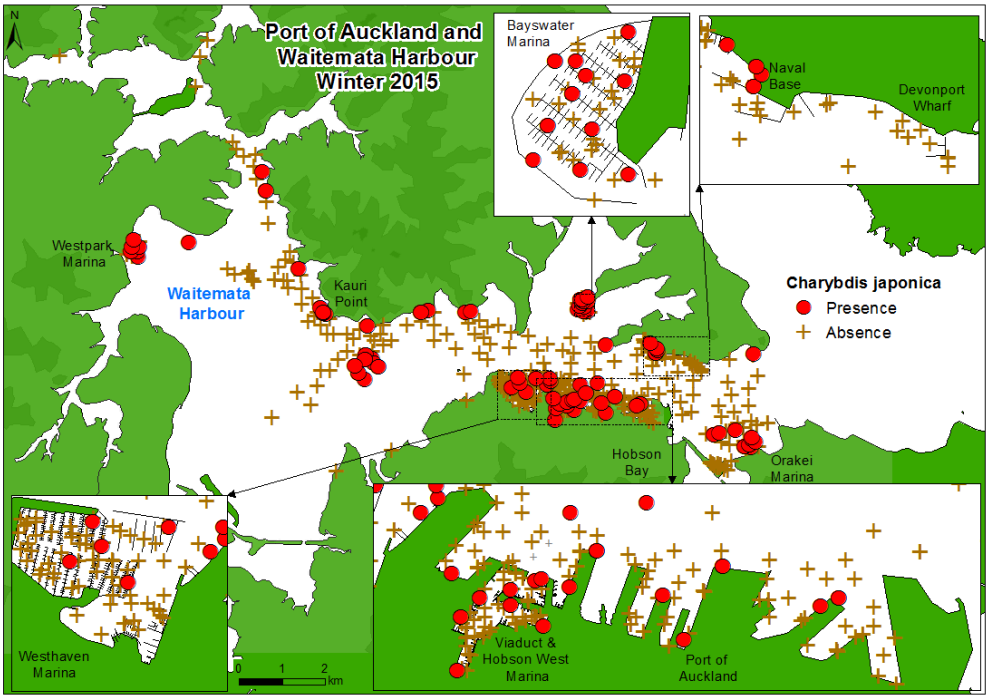
Celleporaria umbonatoidea

Opua Winter 2015

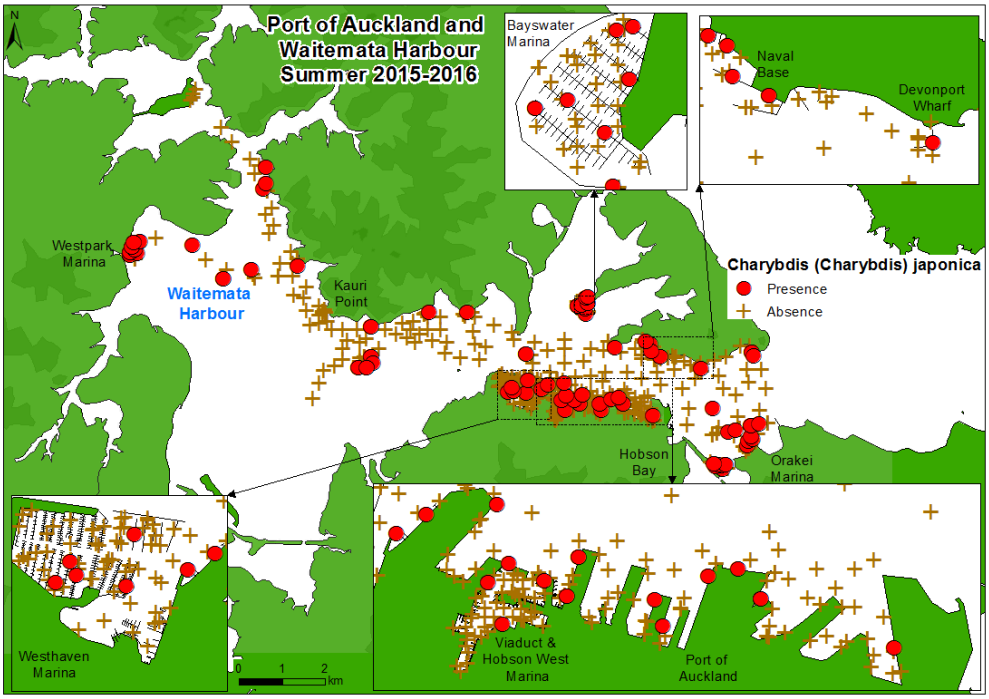


Charybdis (Charybdis) japonica

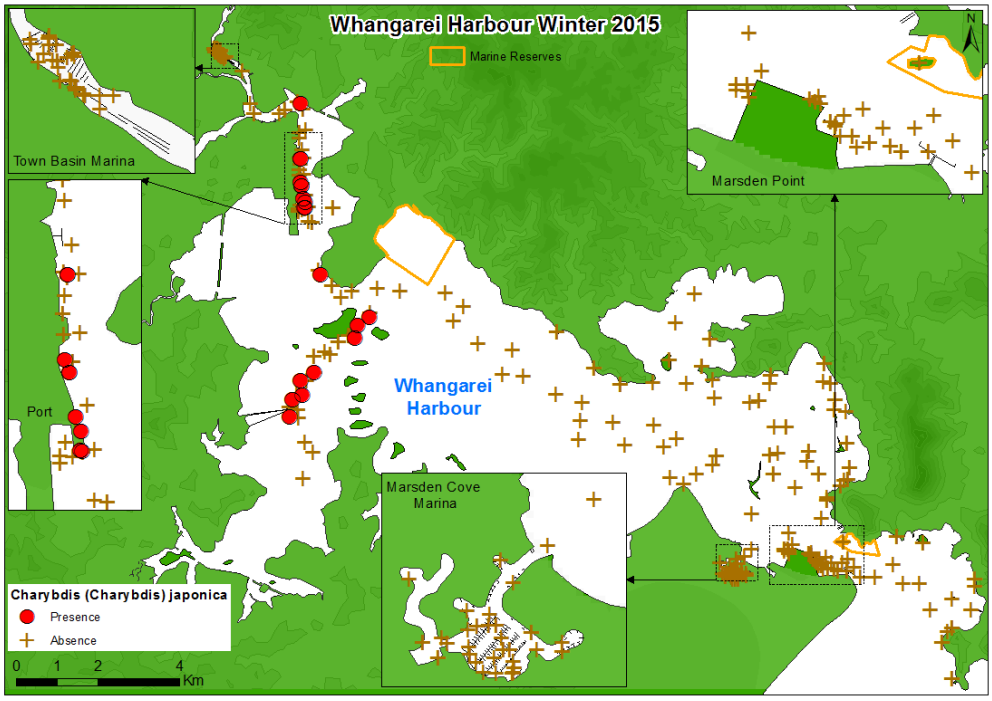
Auckland (Waitemata) Harbour Winter 2015



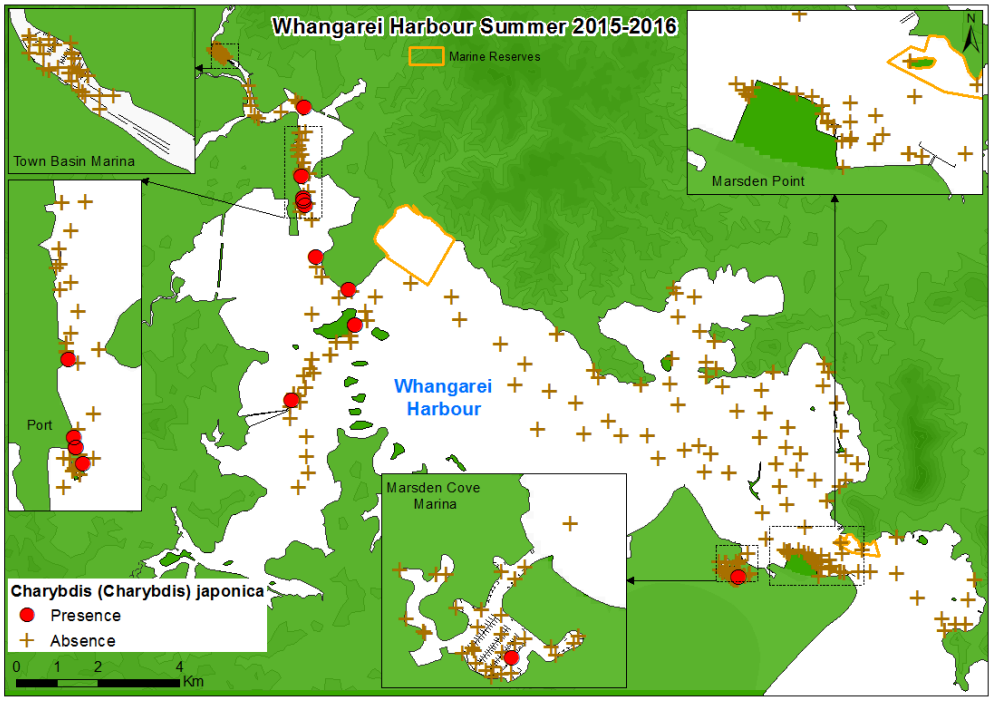
Auckland (Waitemata) Harbour Summer 2015–16



Whangarei Harbour Winter 2015

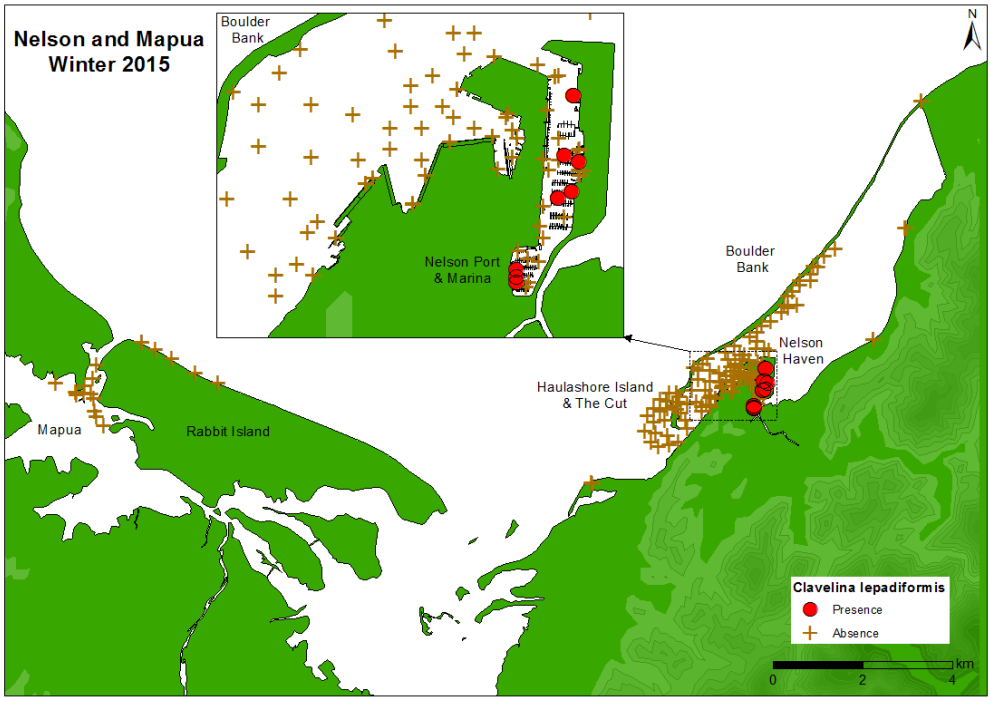


Whangarei Harbour Summer 2015–16

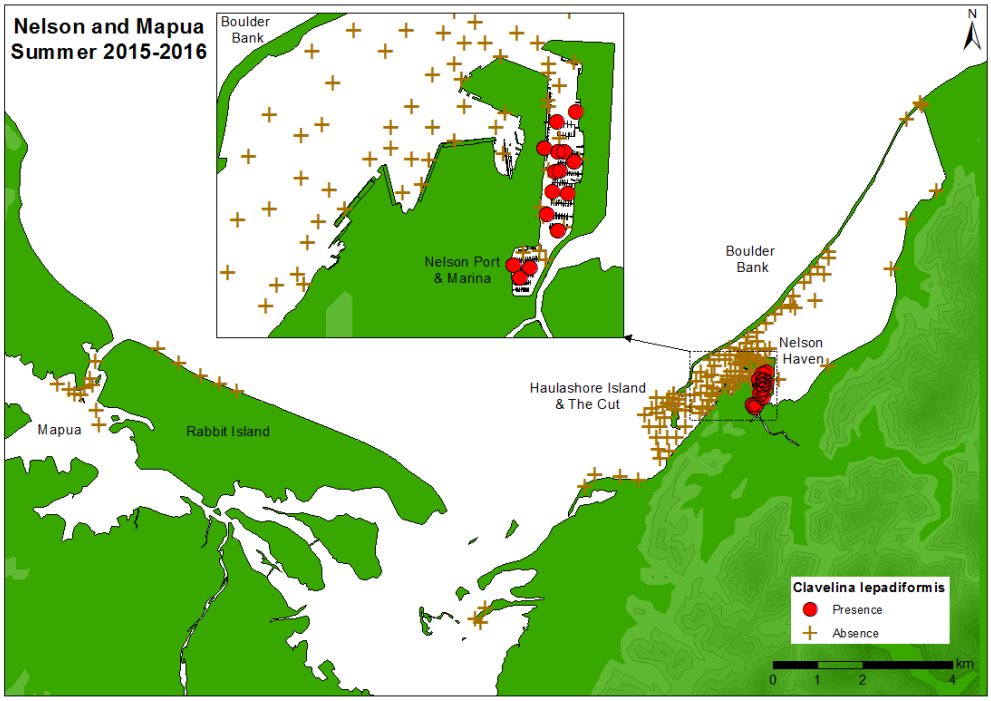


Clavelina lepadiformis

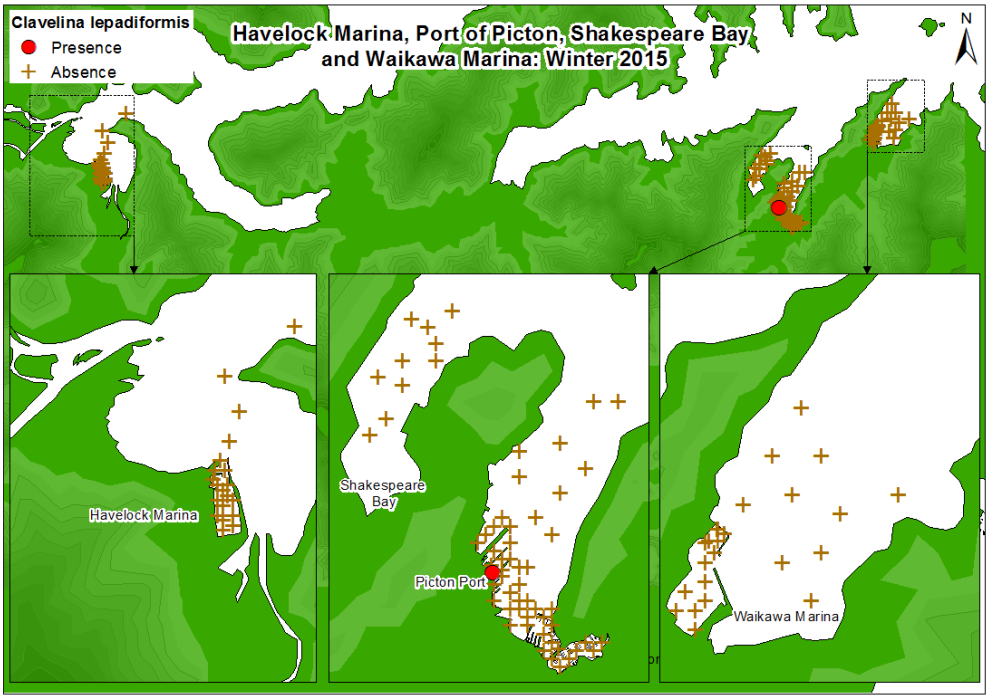
Nelson Harbour Winter 2015



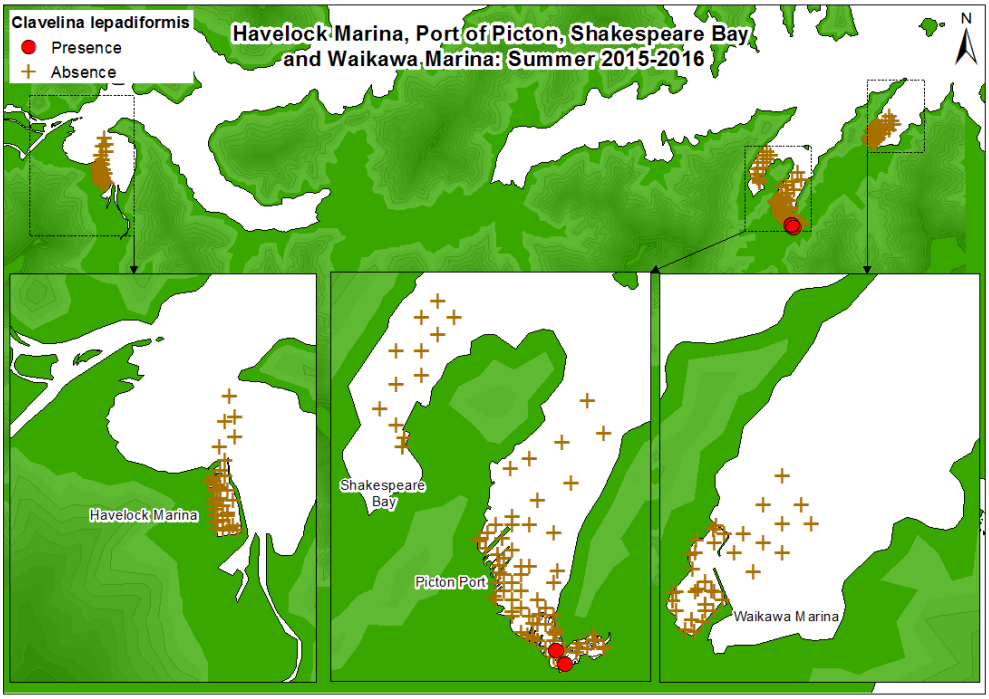
Nelson Harbour Summer 2015–16



Picton Harbour Winter 2015

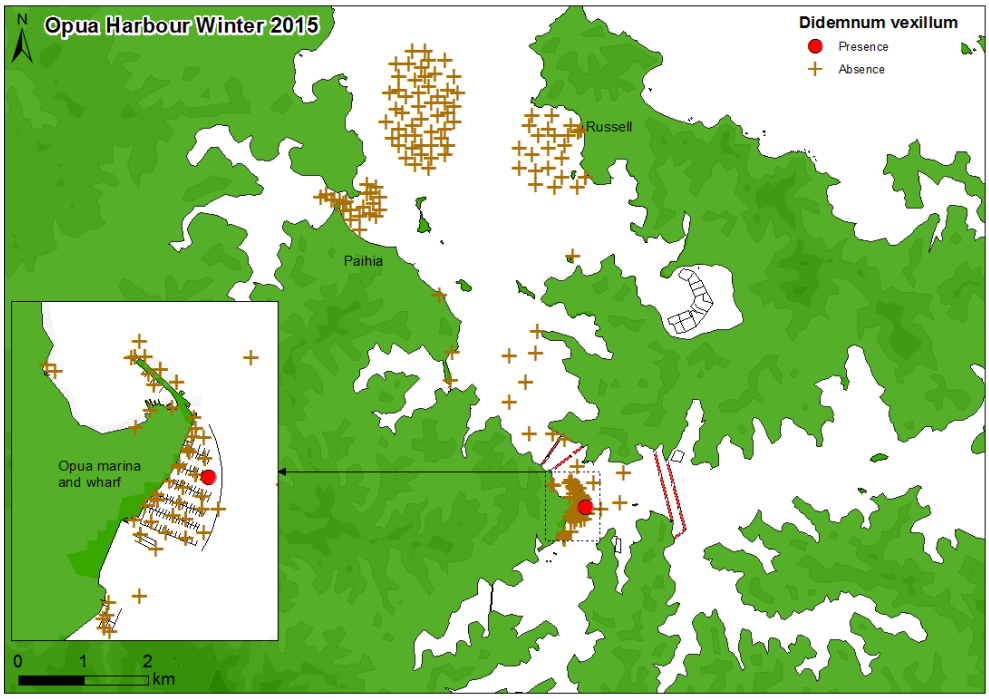


Picton Harbour Summer 2015–16



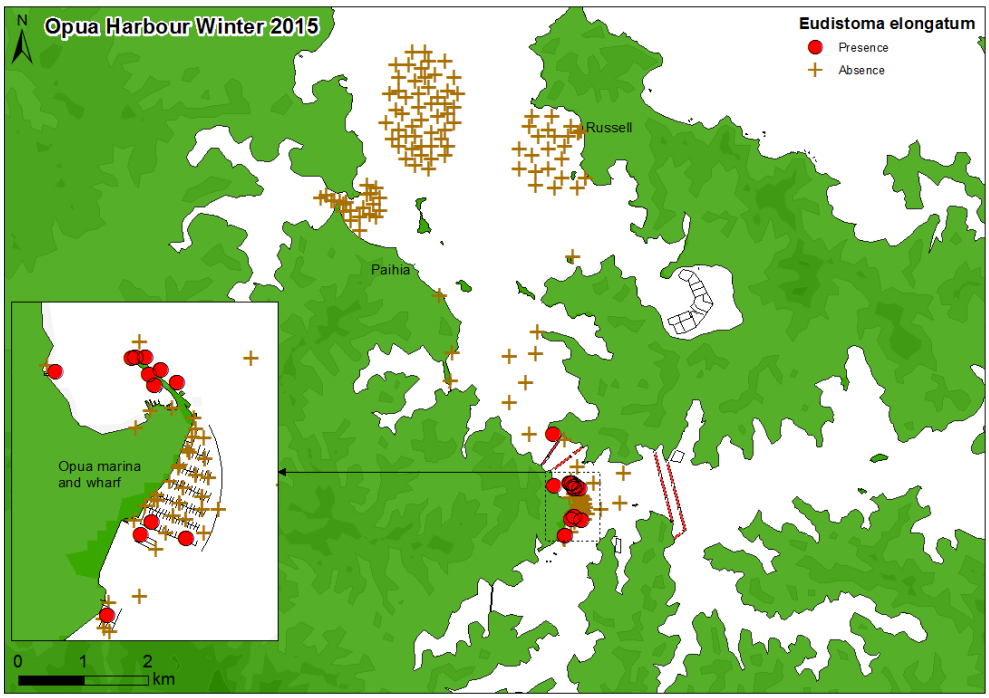
Didemnum vexillum

Opua Winter 2015

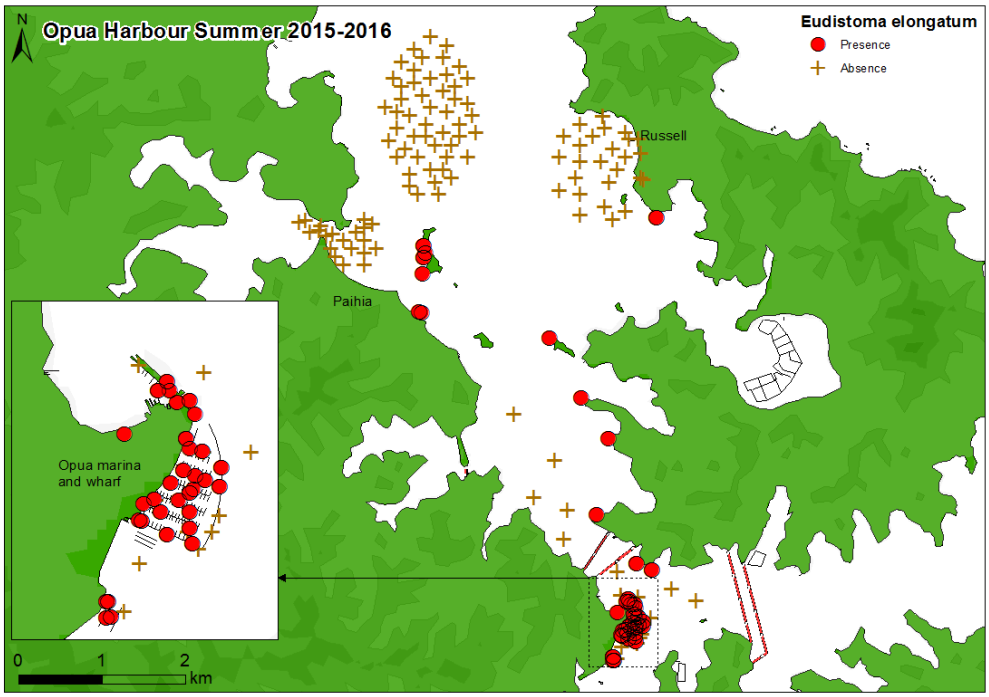


Eudistoma elongatum

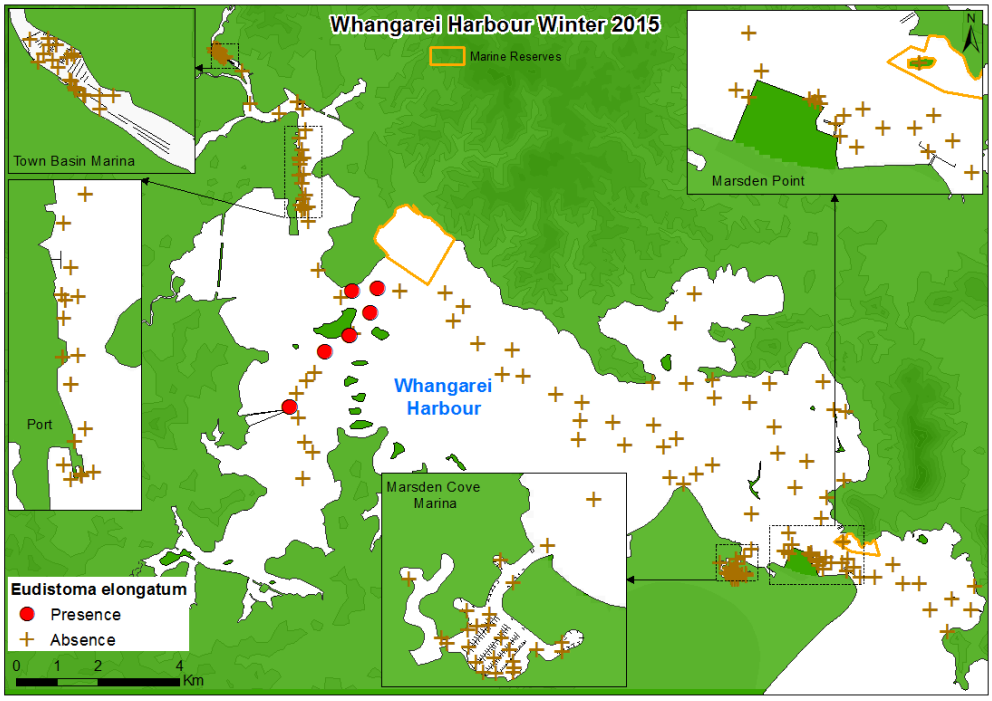
Opua Winter 2015



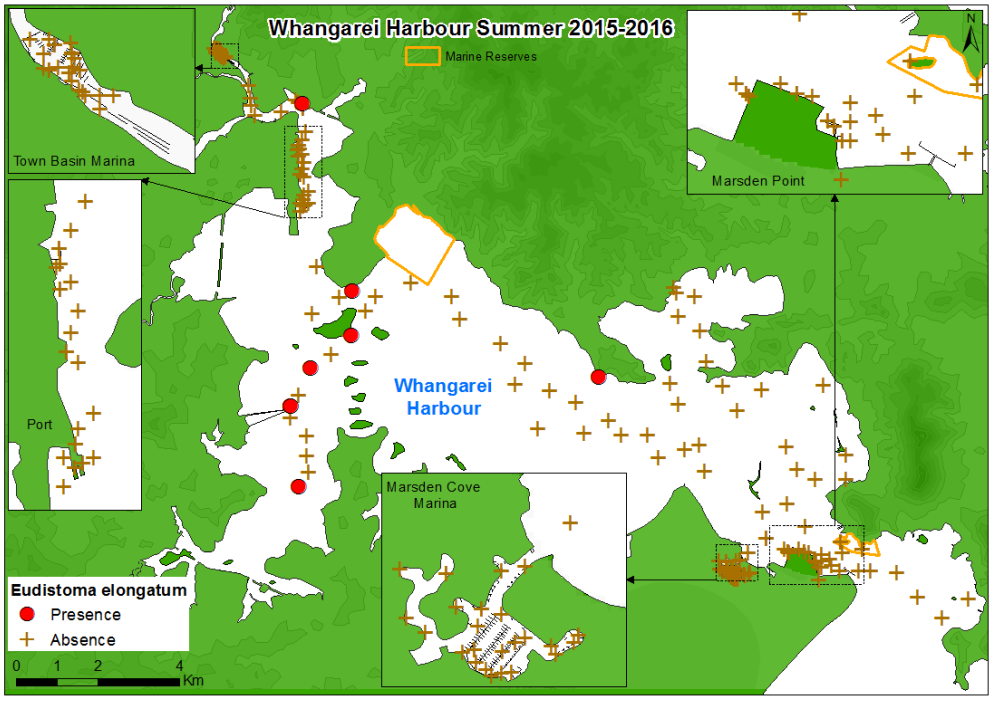
Opua Summer 2015–16



Whangarei Harbour Winter 2015

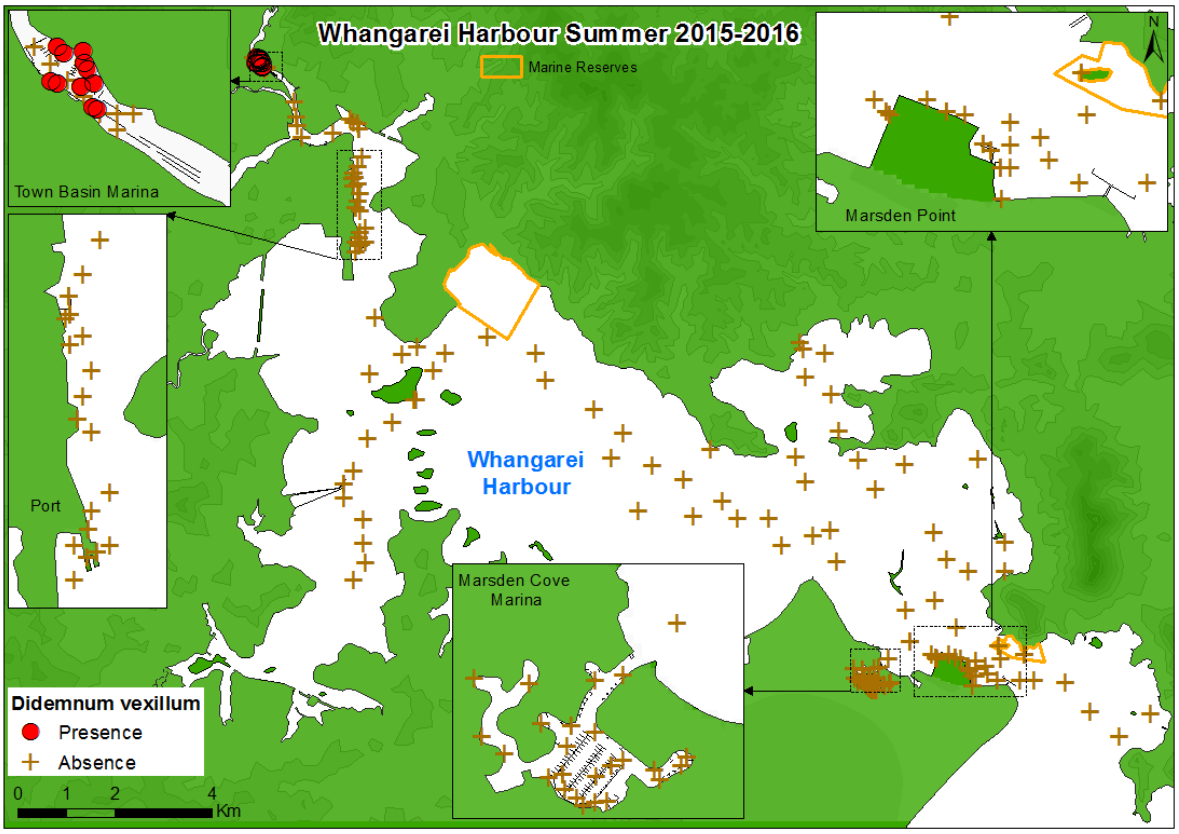


Whangarei Harbour Summer 2015–16



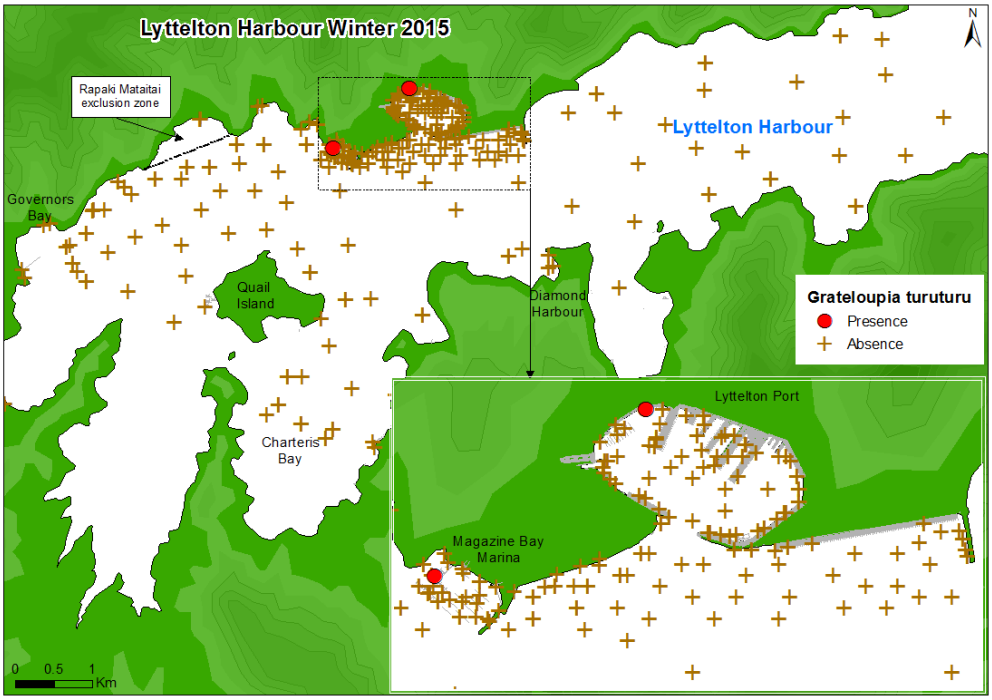
Ficopomatus enigmaticus

Whangarei Harbour Summer 2015–16

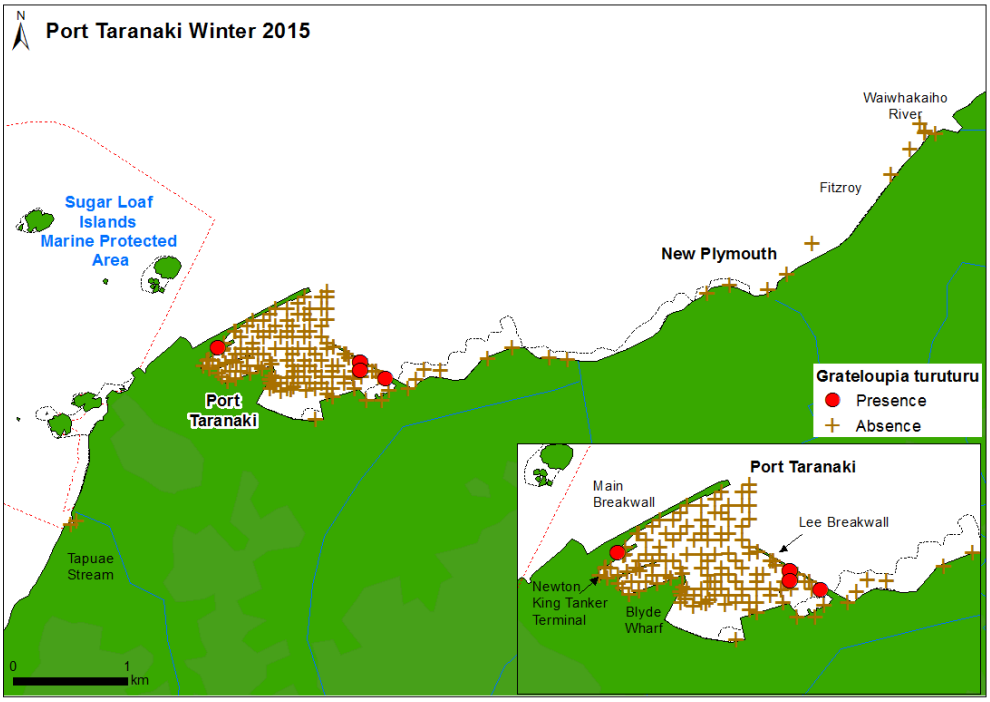


Grateloupia turuturu

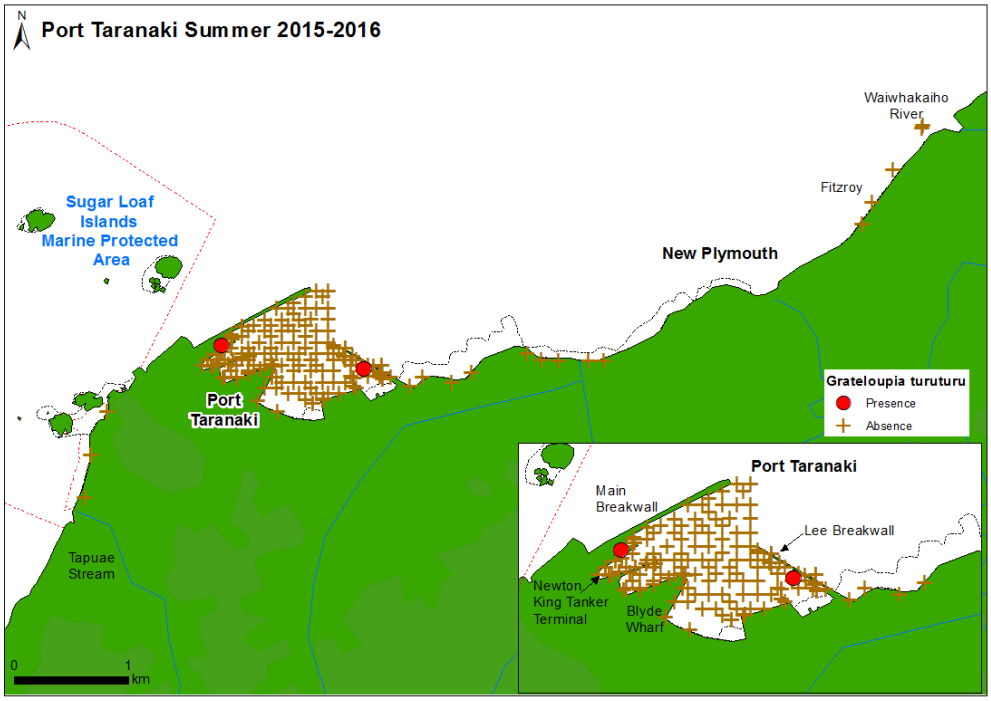
Lyttelton Harbour Winter 2015



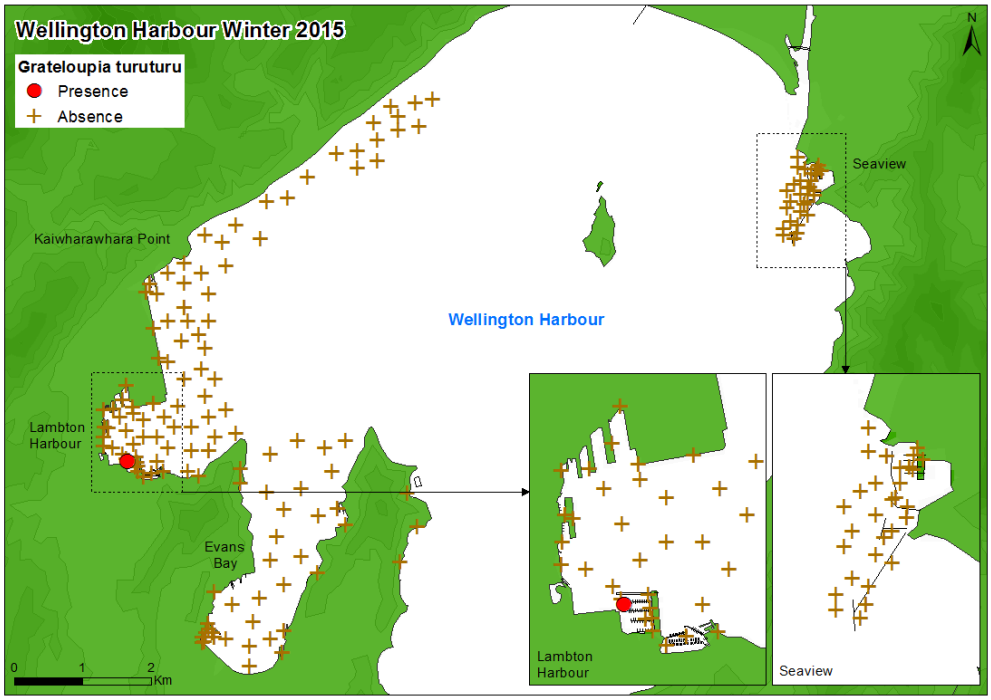
Port Taranaki Winter 2015



Port Taranaki Summer 2015–16

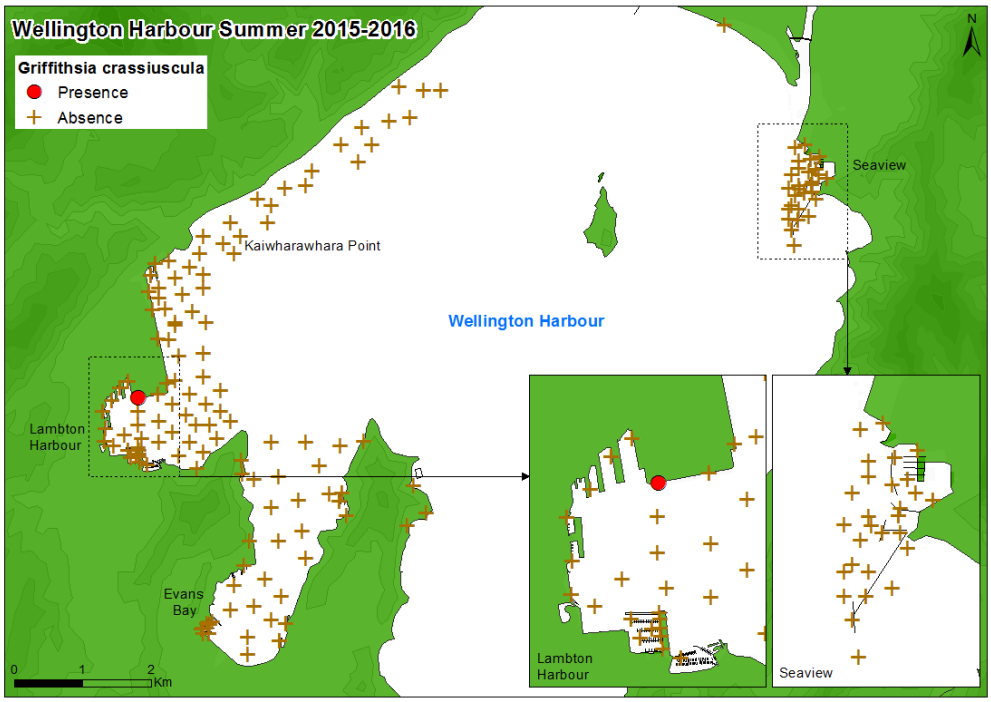


Wellington Harbour Winter 2015



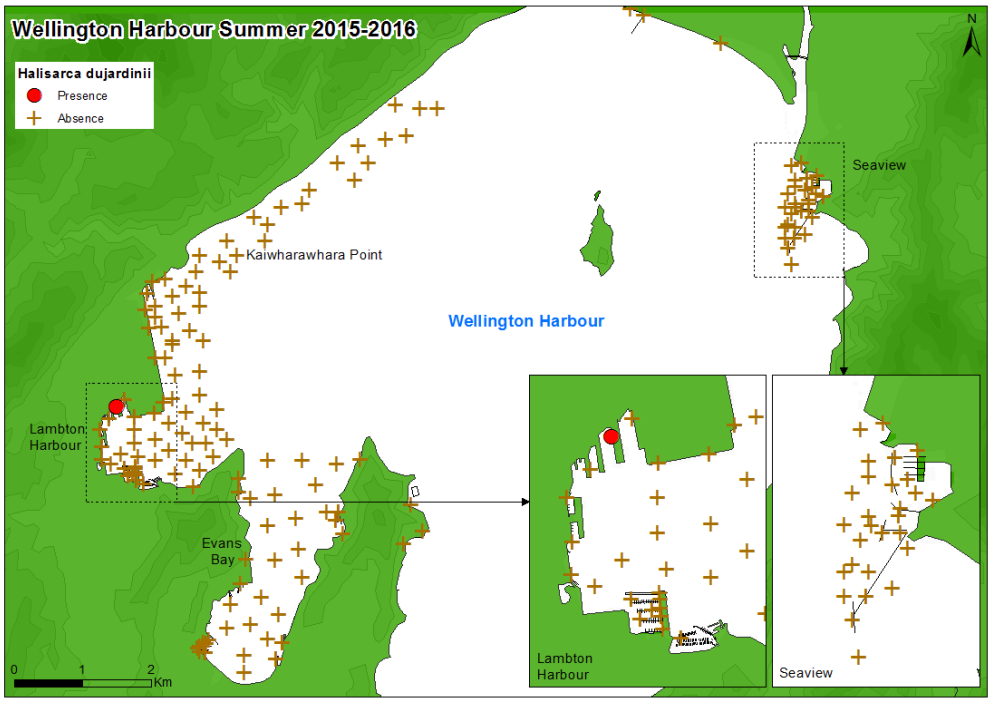
Griffithsia crassiuscula

Wellington Harbour Summer 2015–16



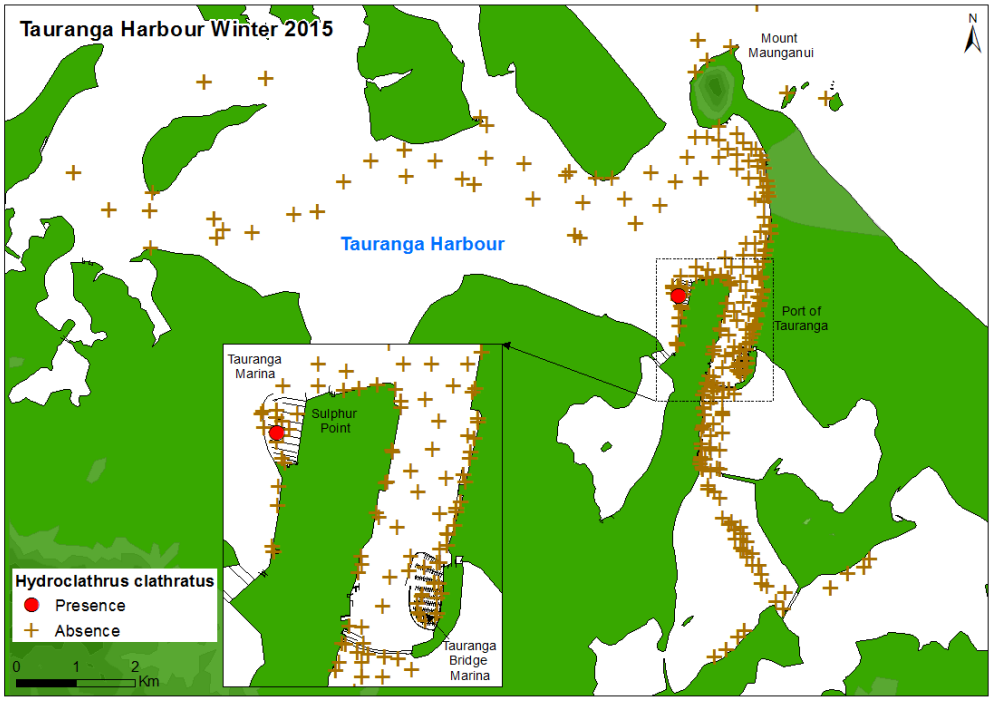
Halisarca dujardnii

Wellington Harbour Summer 2015–16



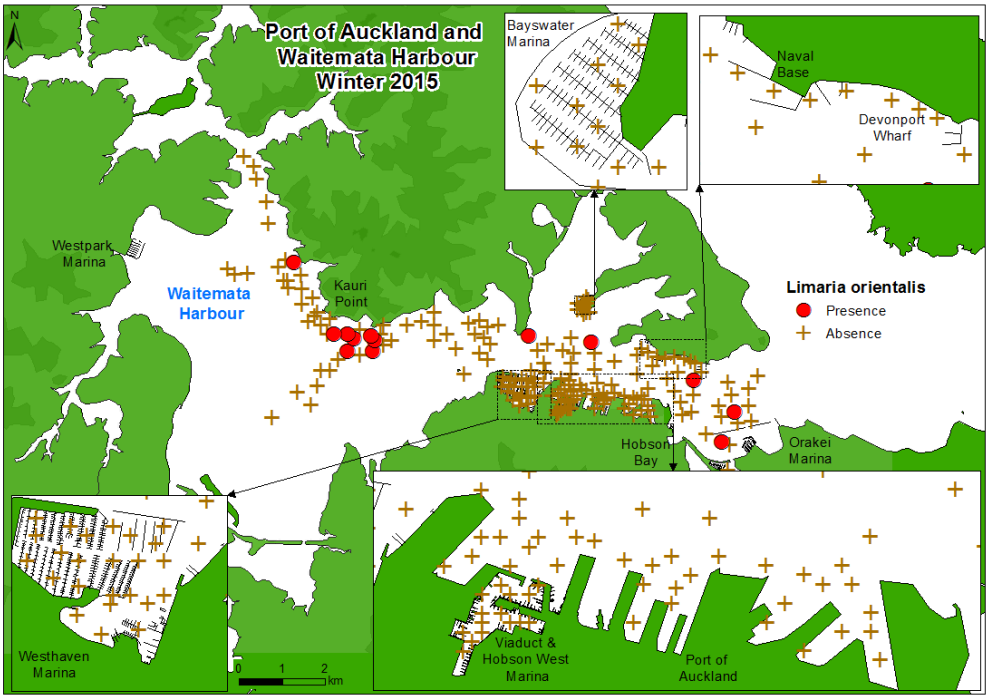
Hydroclathrus clathratus

Tauranga Harbour Winter 2015

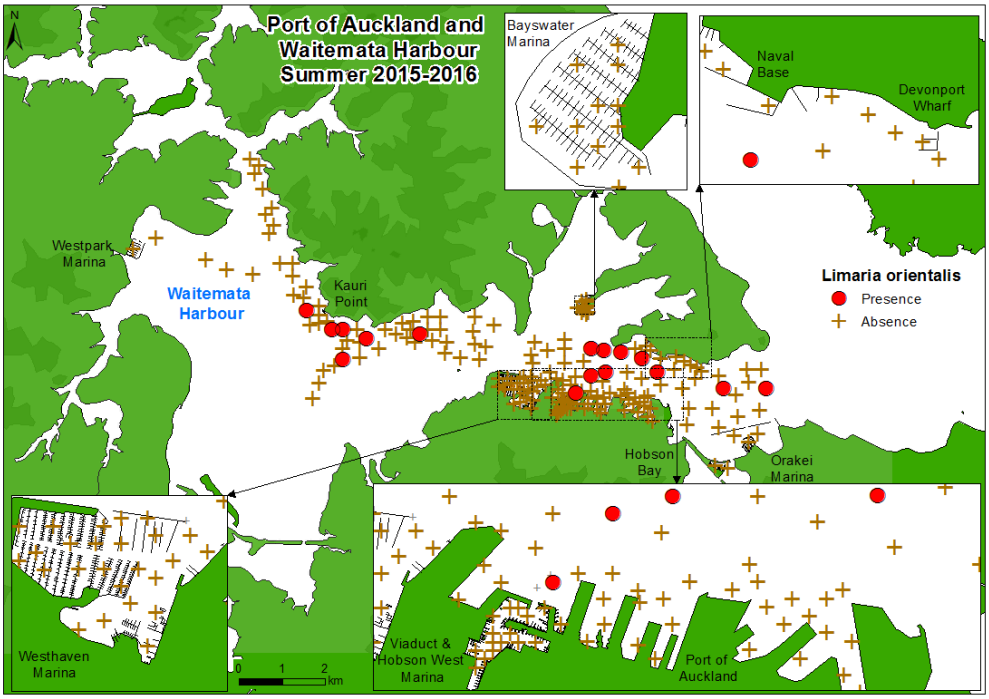


Limaria orientalis

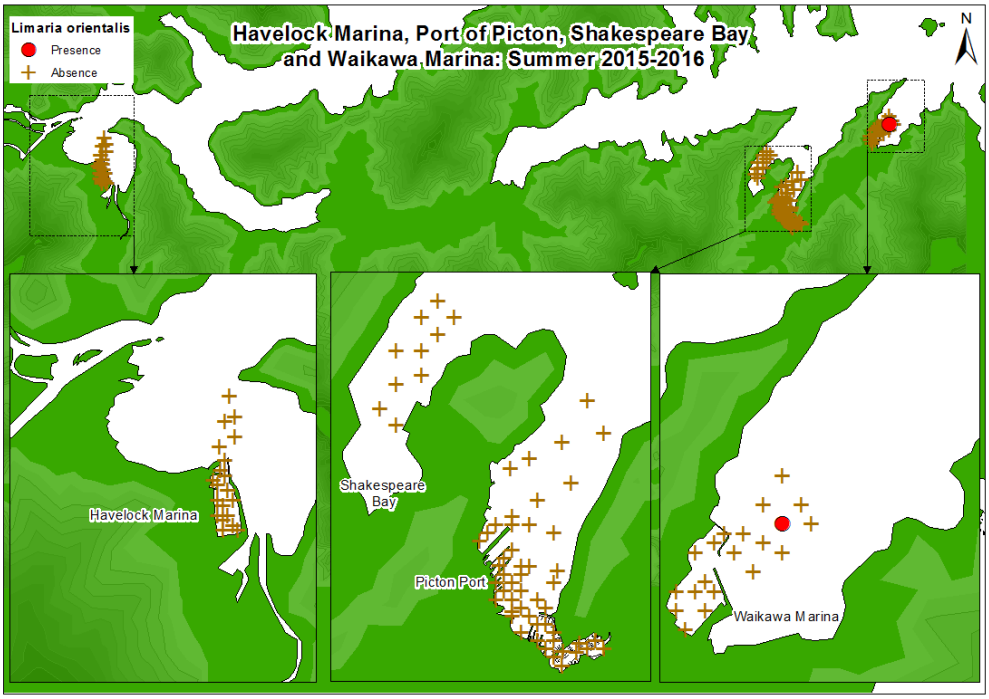
Auckland (Waitemata) Harbour Winter 2015



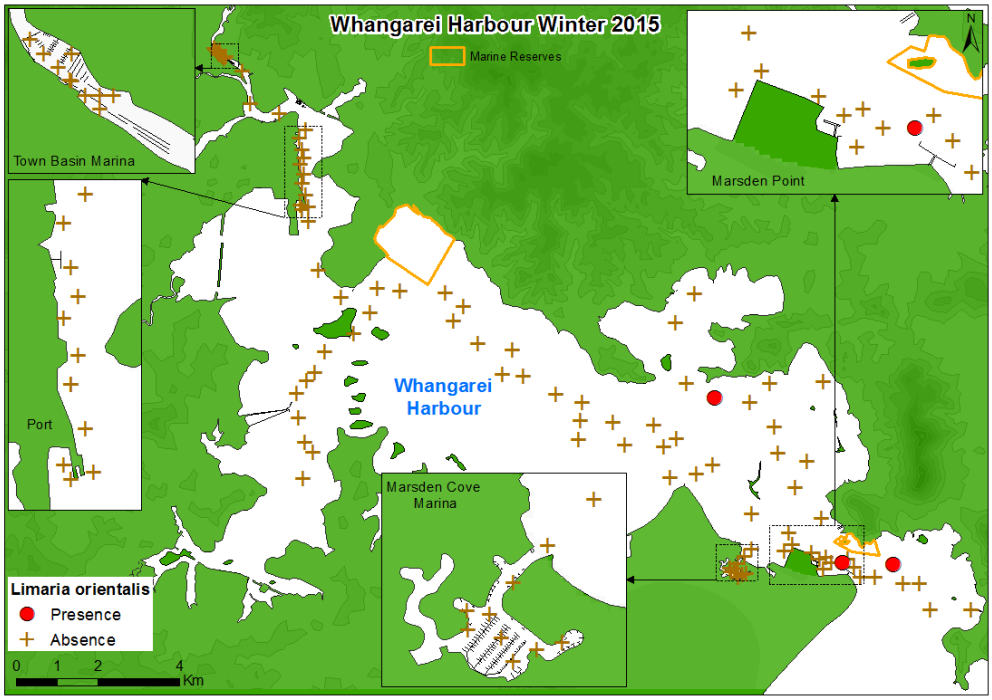
Auckland (Waitemata) Harbour Summer 2015–16



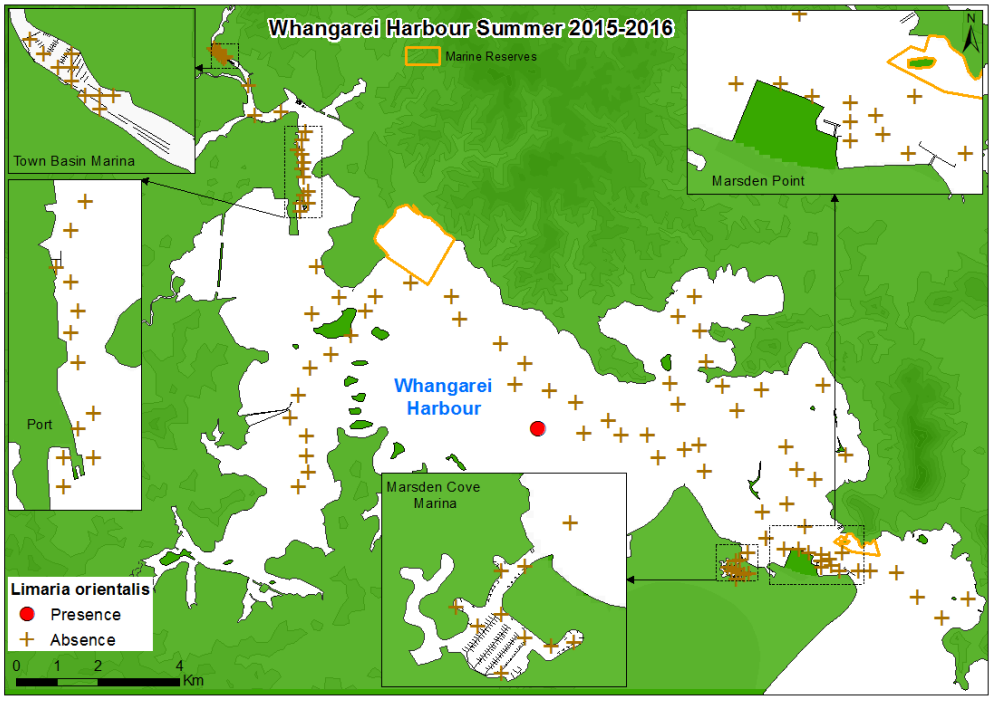
Picton/Havelock Summer 2015–16



Whangarei Harbour Winter 2015

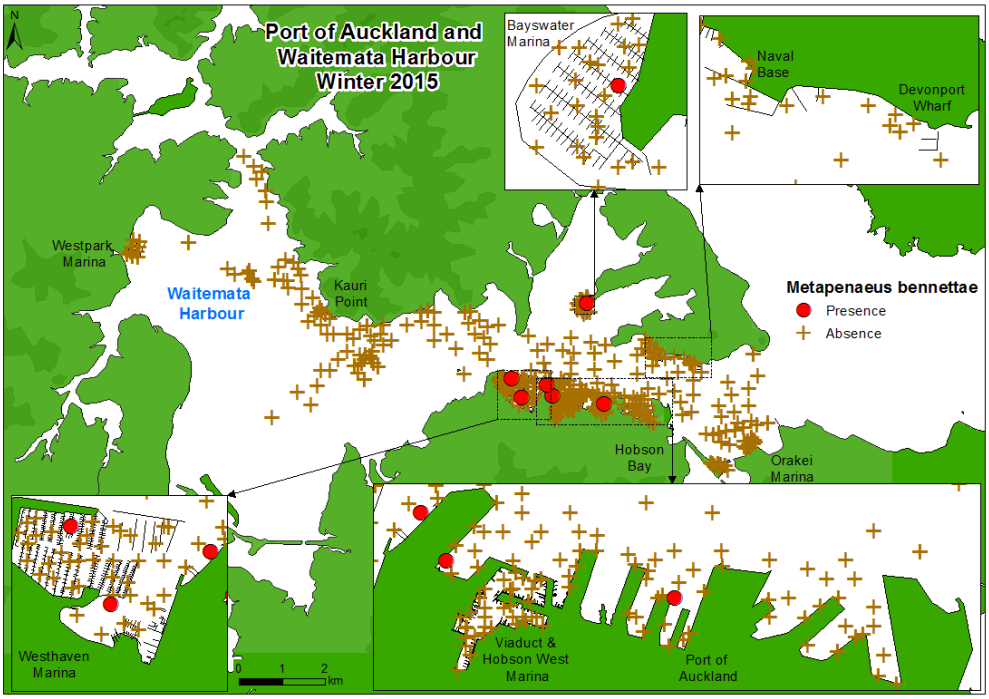


Whangarei Harbour Summer 2015–16

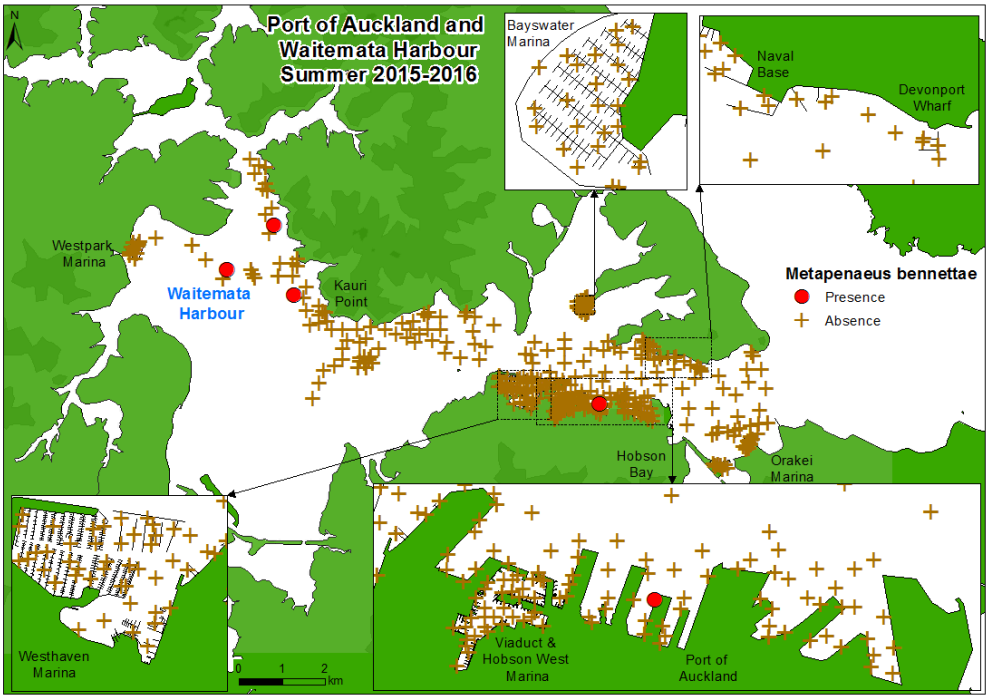


Metapenaeus bennettae

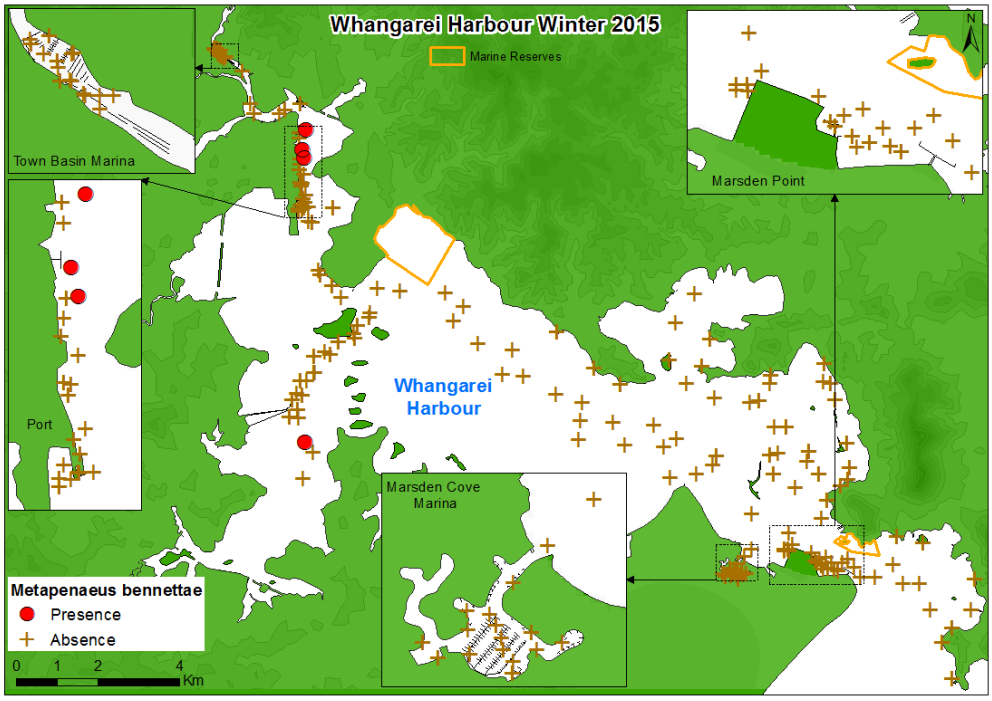
Auckland (Waitemata) Harbour Winter 2015



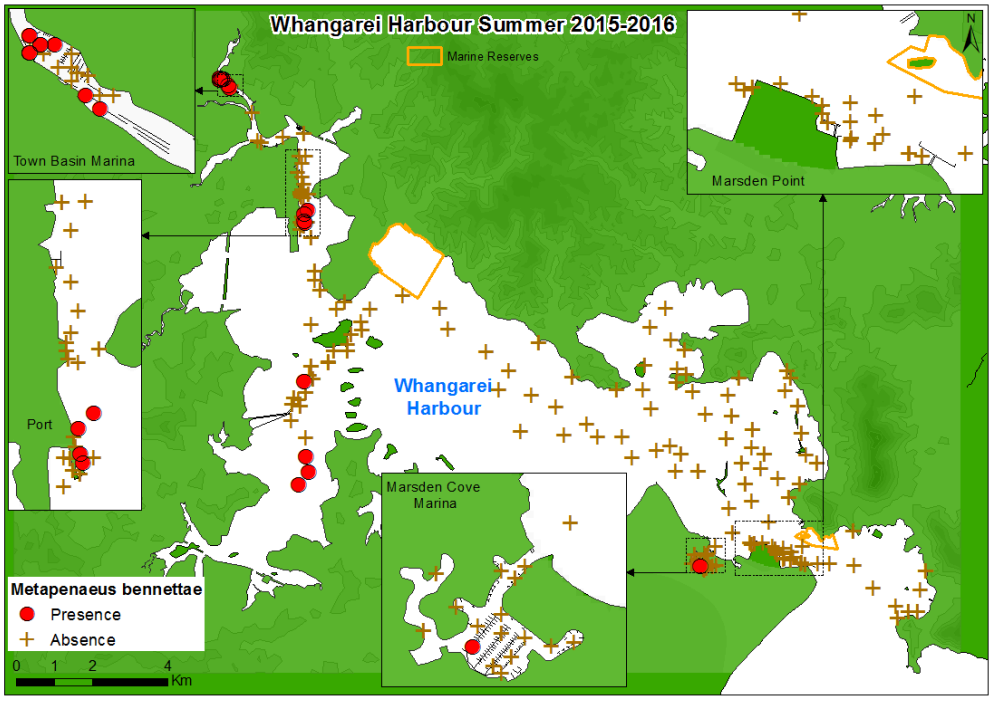
Auckland (Waitemata) Harbour Summer 2015–16



Whangarei Harbour Winter 2015

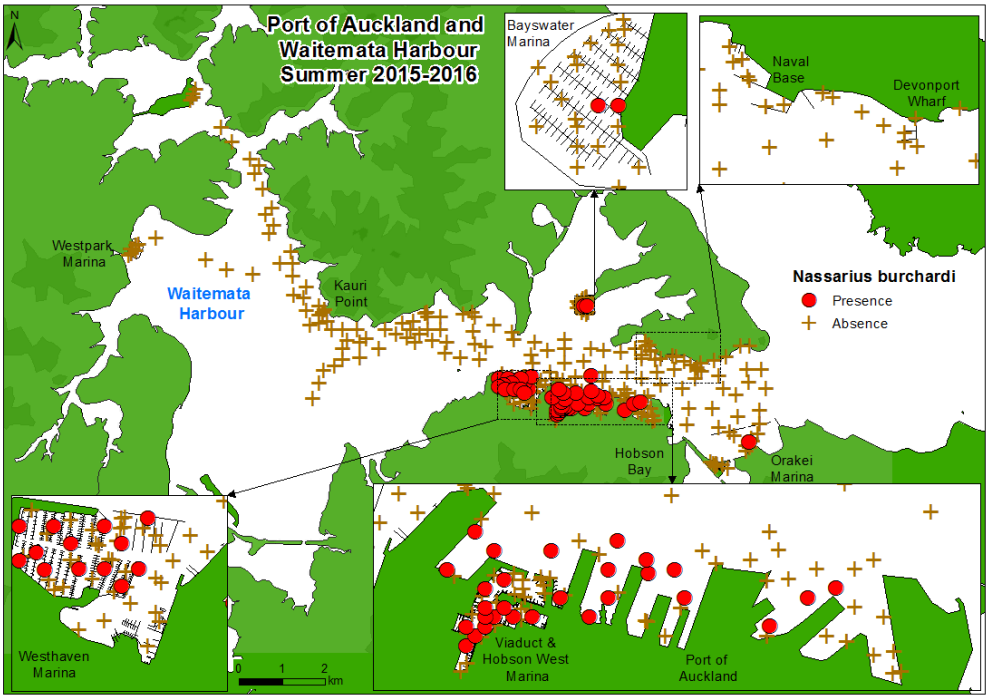


Whangarei Harbour Summer 2015–16

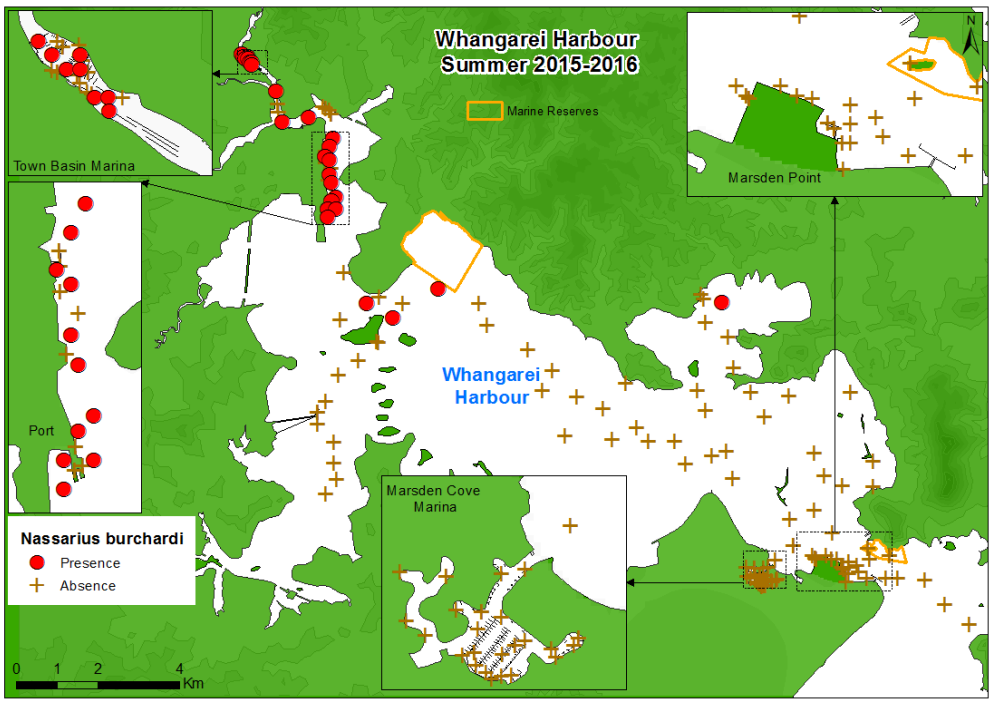


Nassarius burchardi

Auckland (Waitemata) Harbour Summer 2015–16

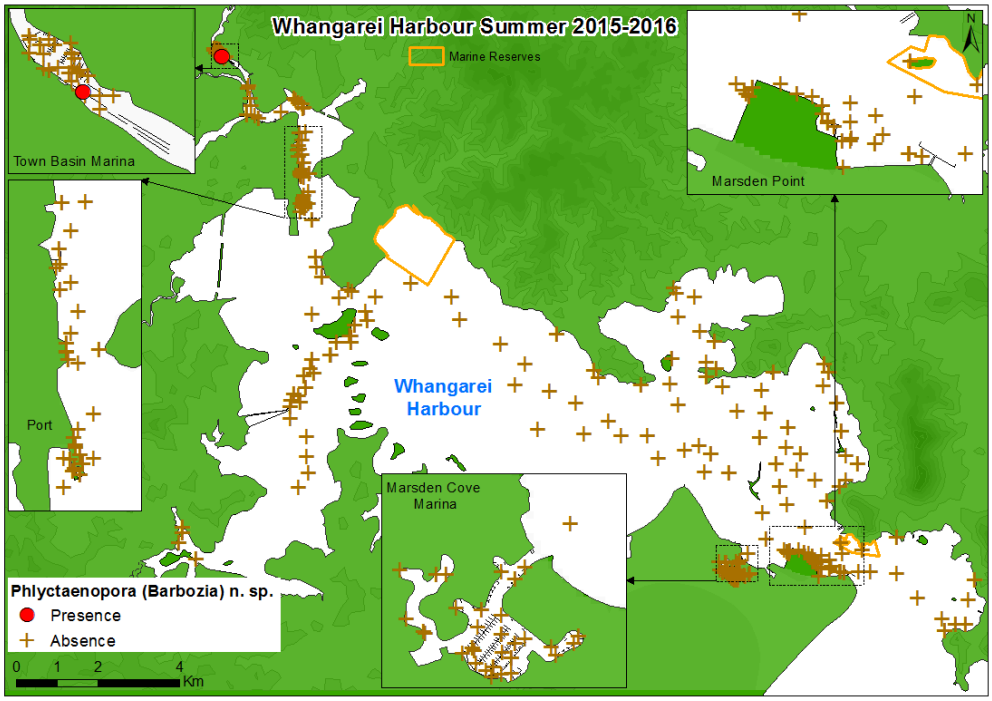


Whangarei Harbour Summer 2015–16



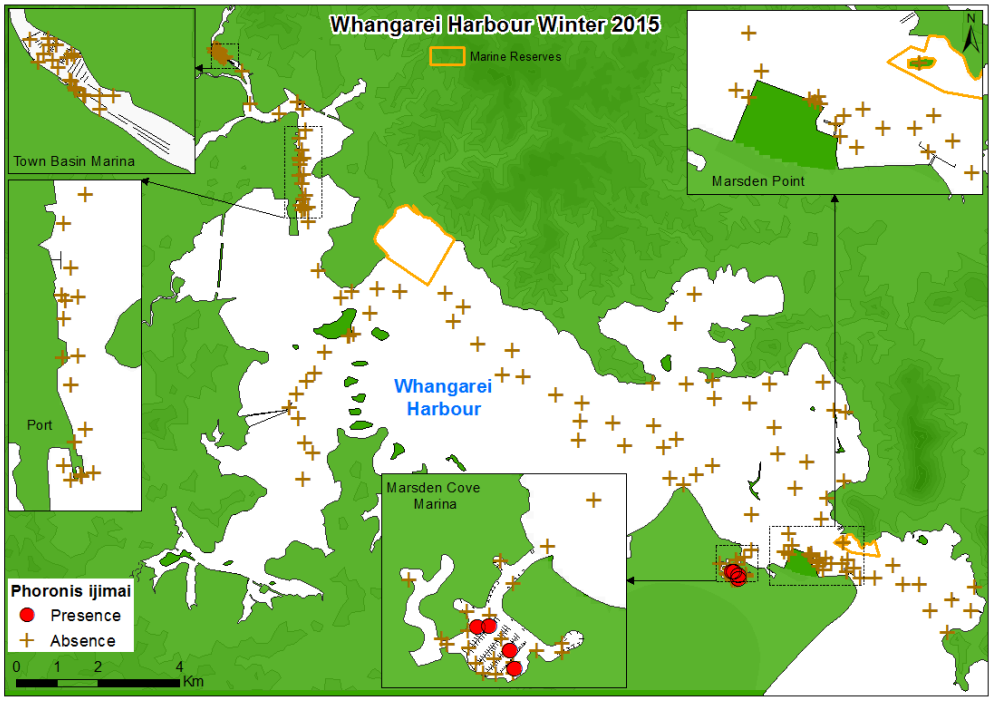
Phlyctaenopora (Barbozia) n. sp.

Whangarei Harbour Summer 2015–16



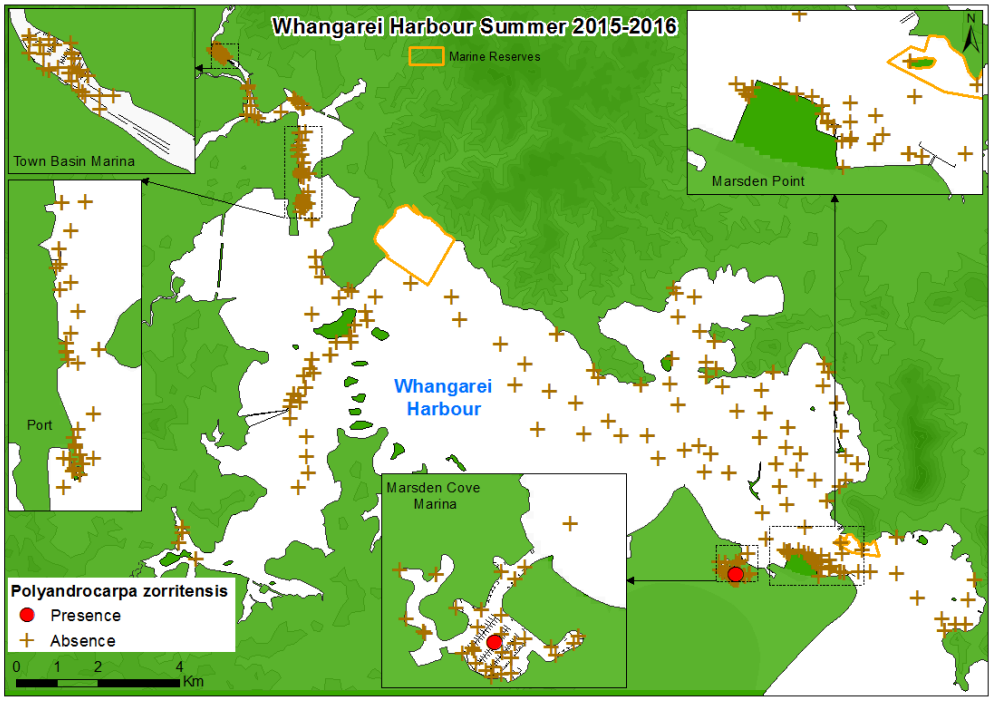
Phoronis ijimai

Whangarei Harbour Winter 2015



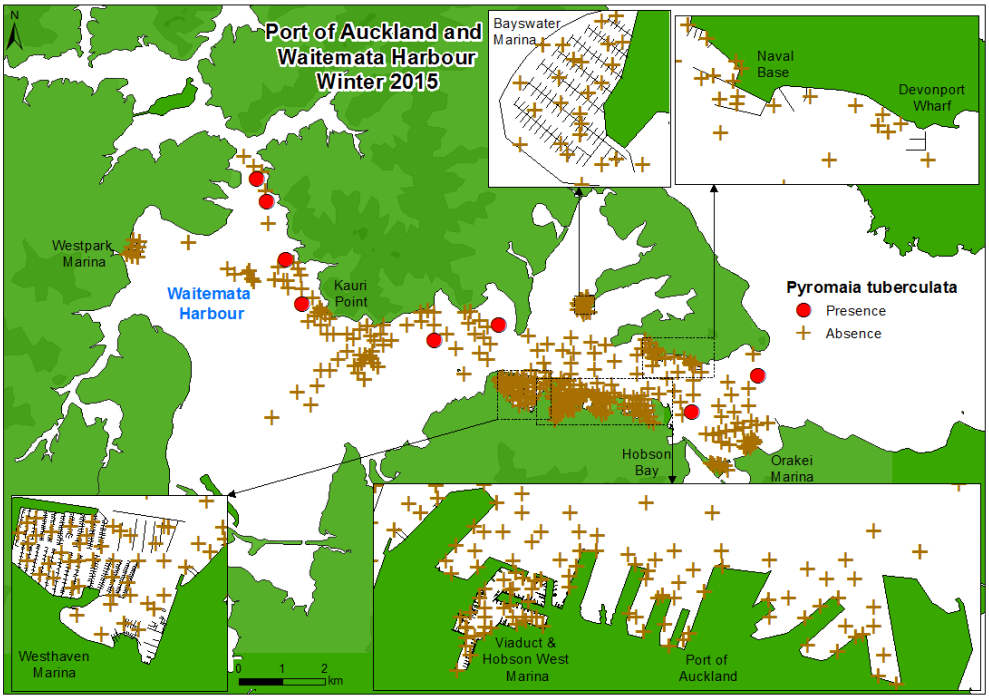
Polyandrocarpa zorritensis

Whangarei Harbour Summer 2015–16

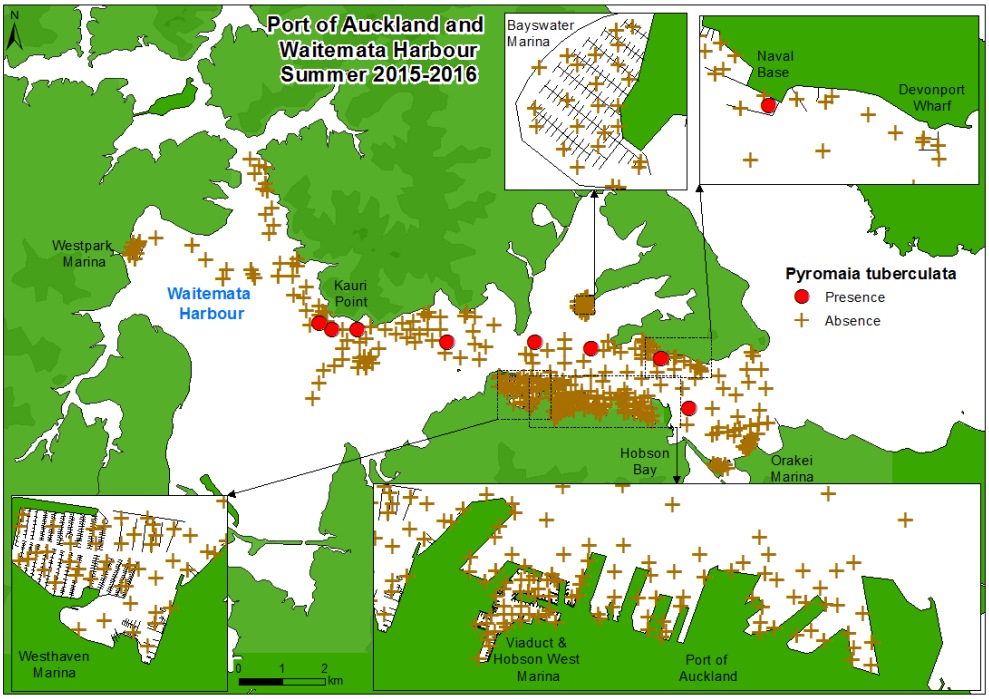


Pyromaia tuberculata

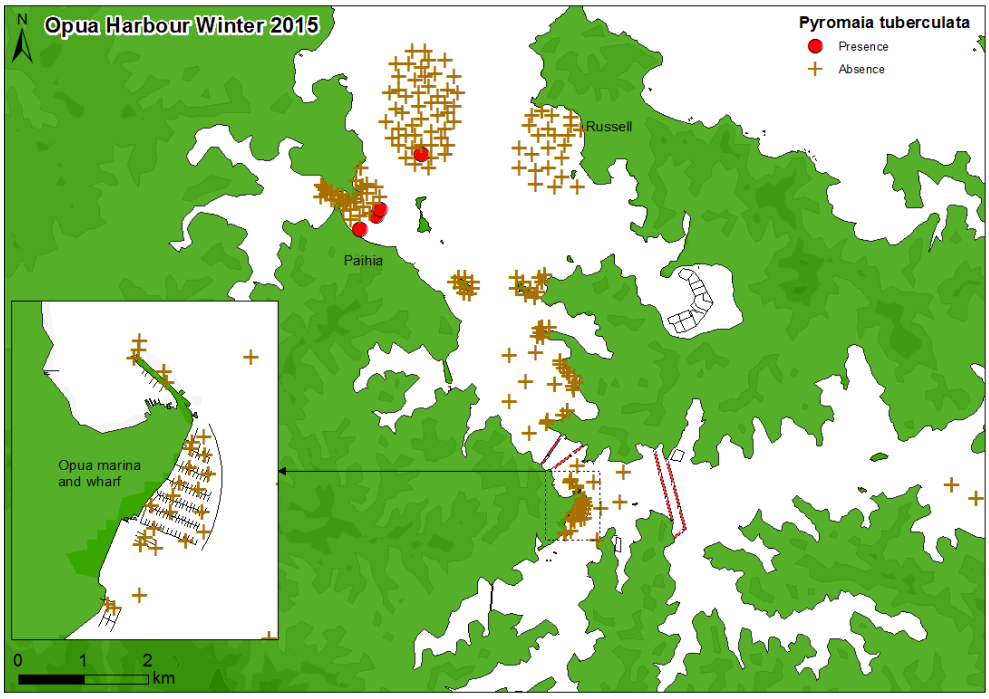
Auckland (Waitemata) Harbour Winter 2015



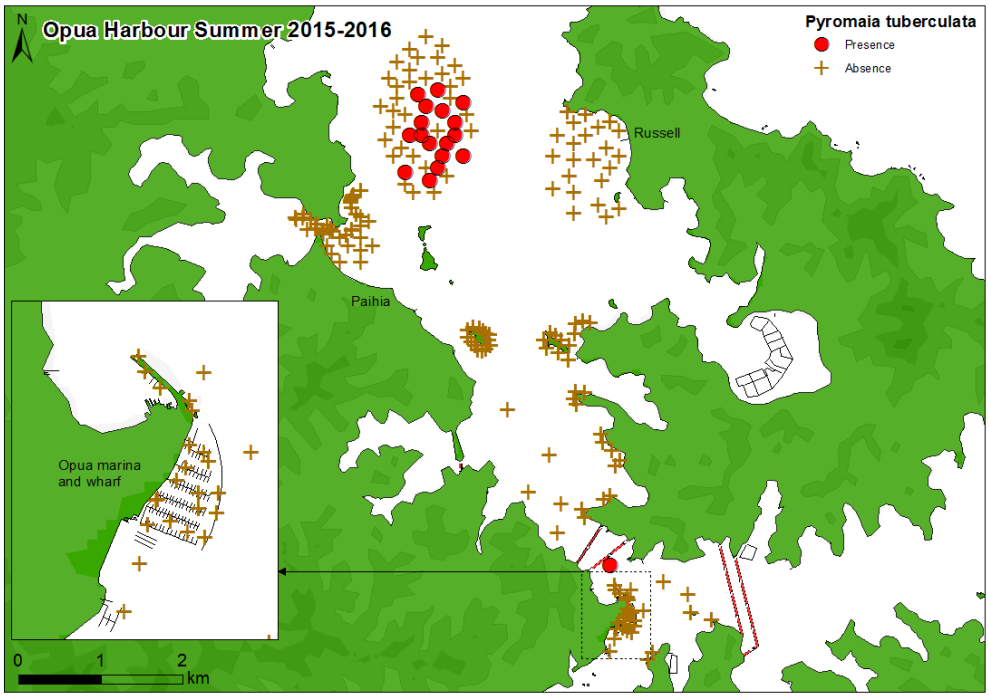
Auckland (Waitemata) Harbour Summer 2015–16



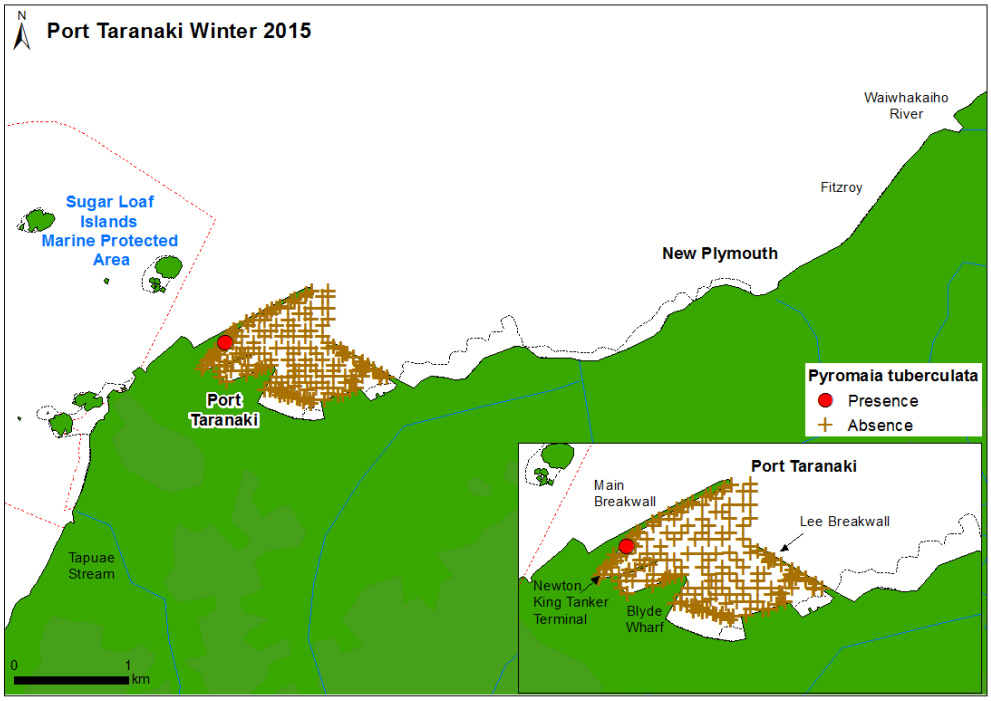
Opua Winter 2015



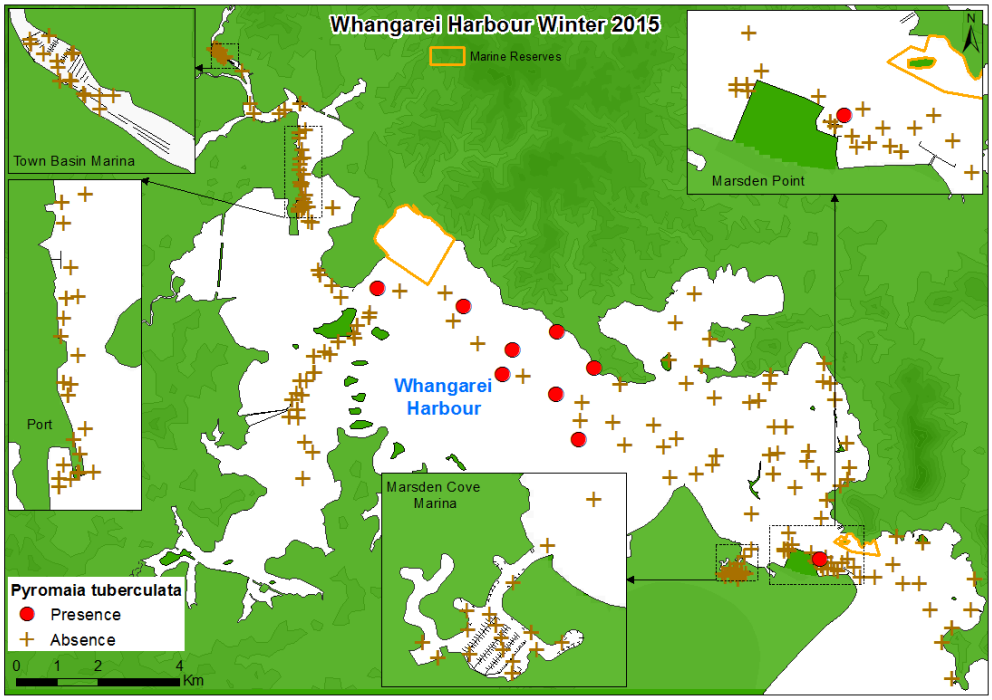
Opua Summer 2015–16



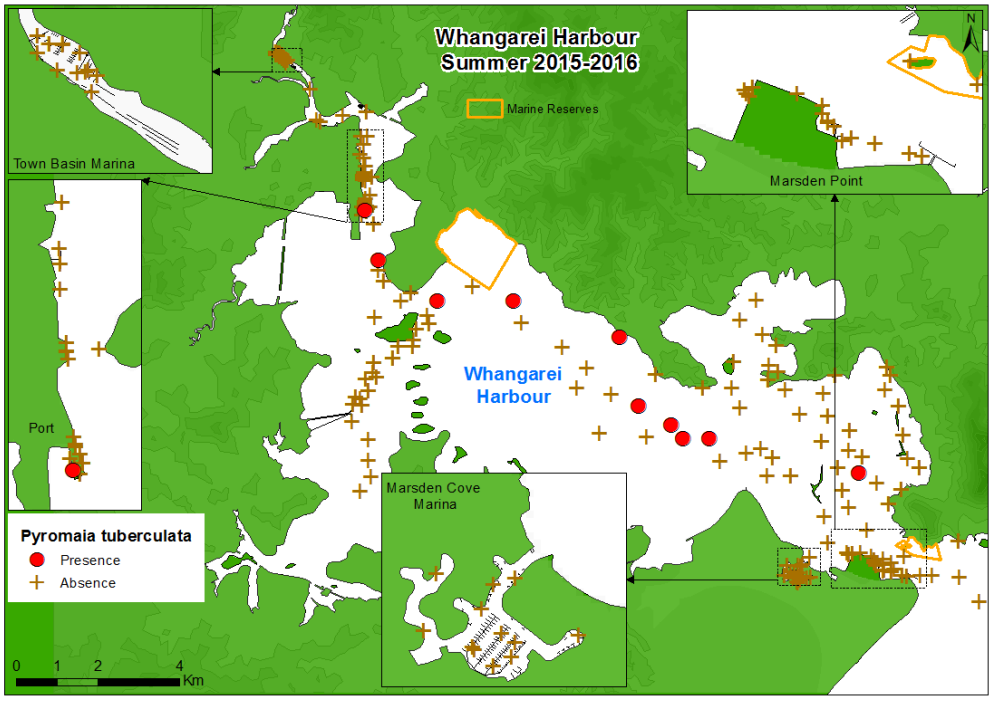
Port Taranaki Winter 2015



Whangarei Harbour Winter 2015

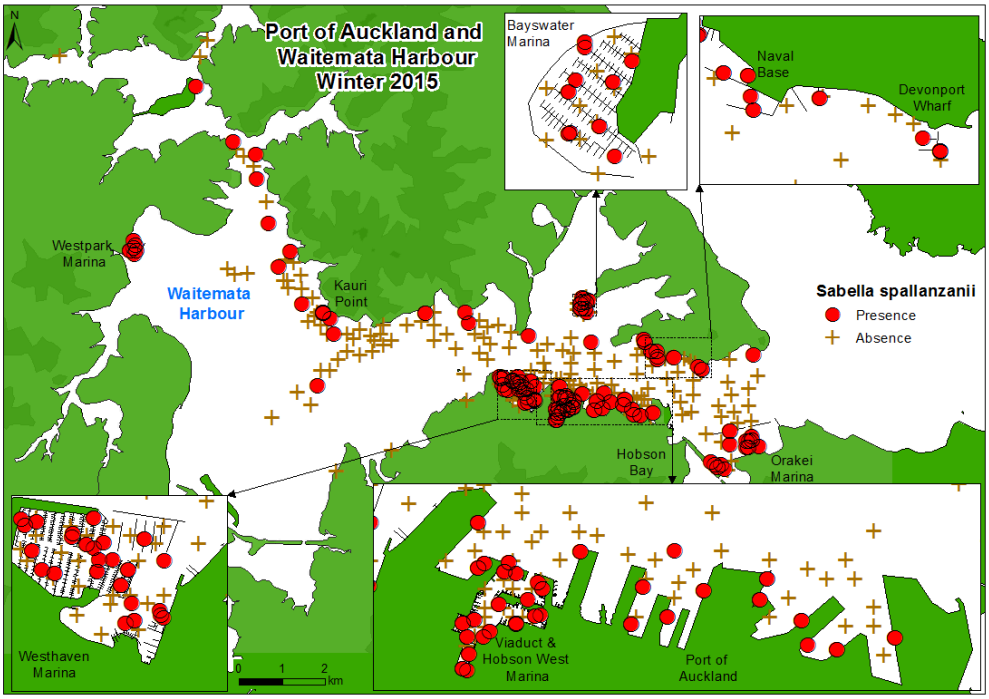


Whangarei Harbour Summer 2015–16

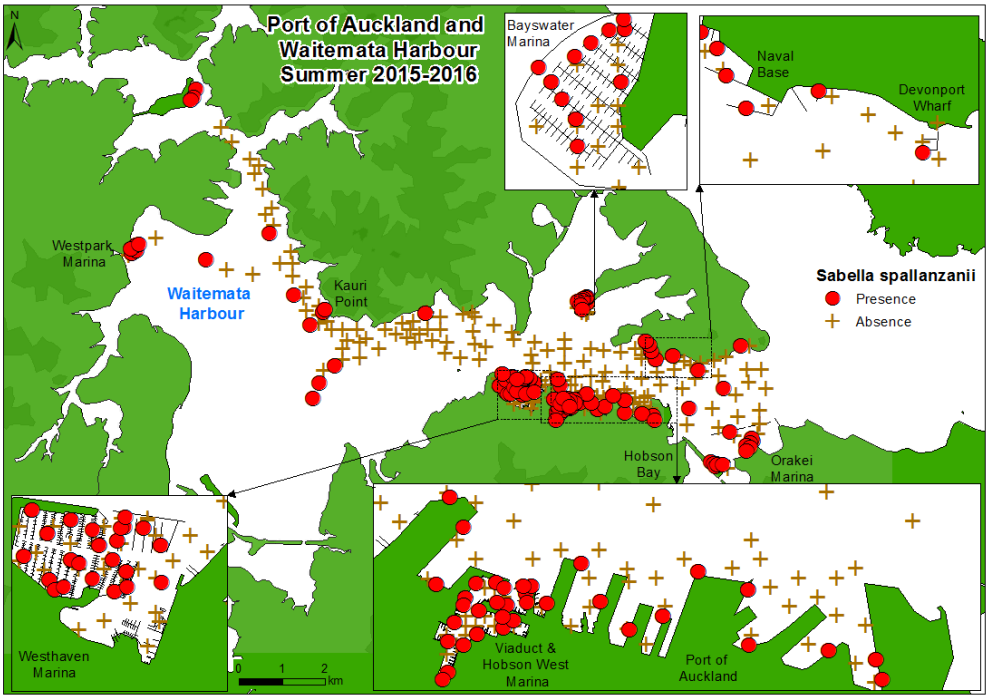


Sabella spallanzanii

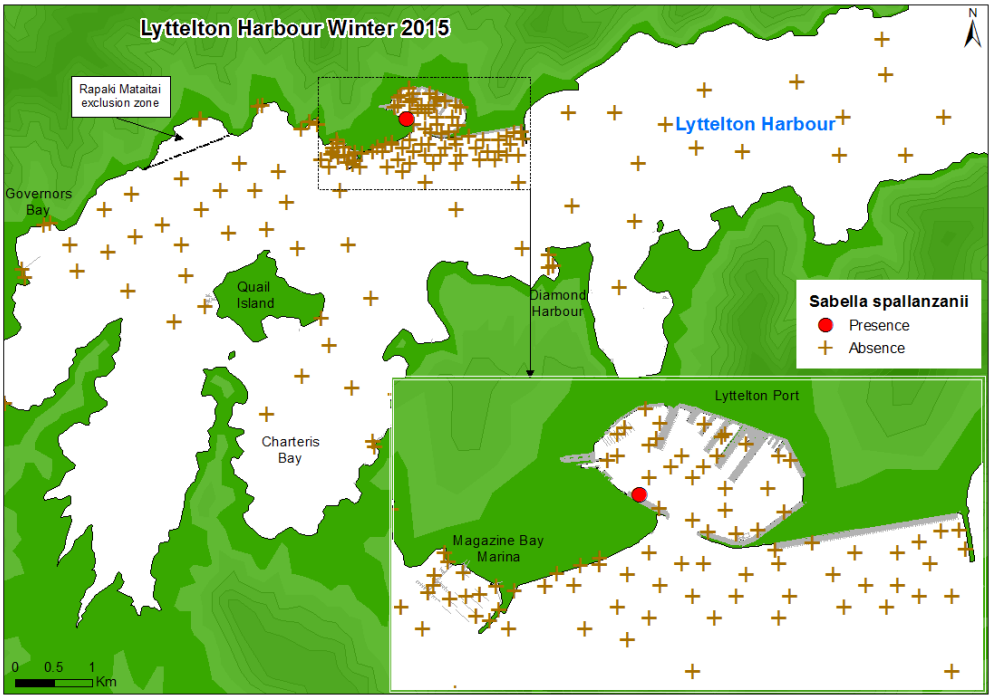
Auckland (Waitemata) Harbour Winter 2015



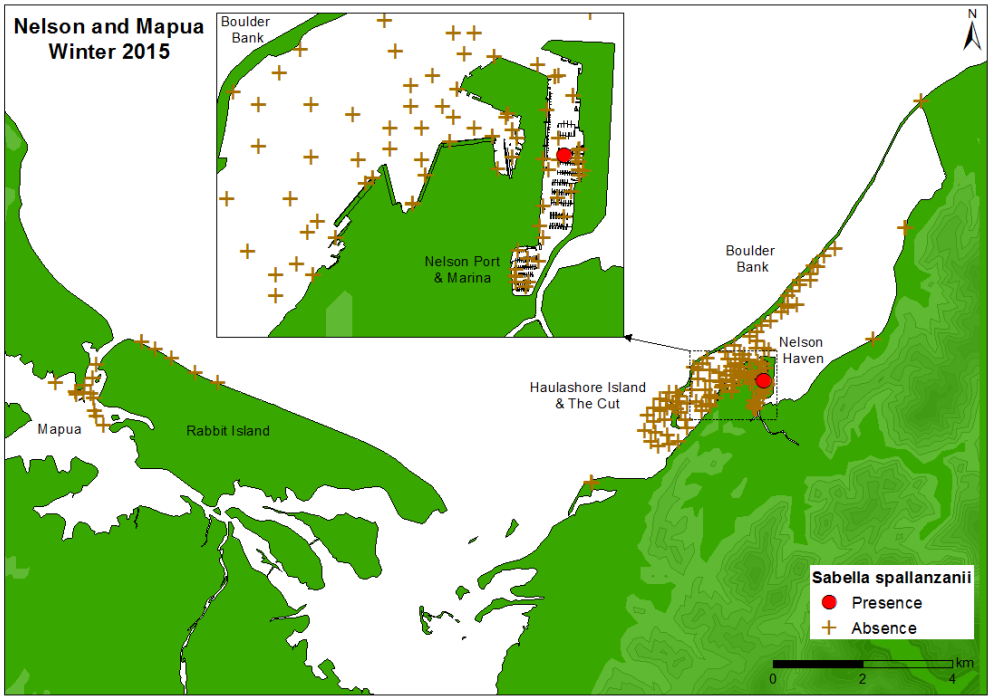
Auckland (Waitemata) Harbour Summer 2015–16



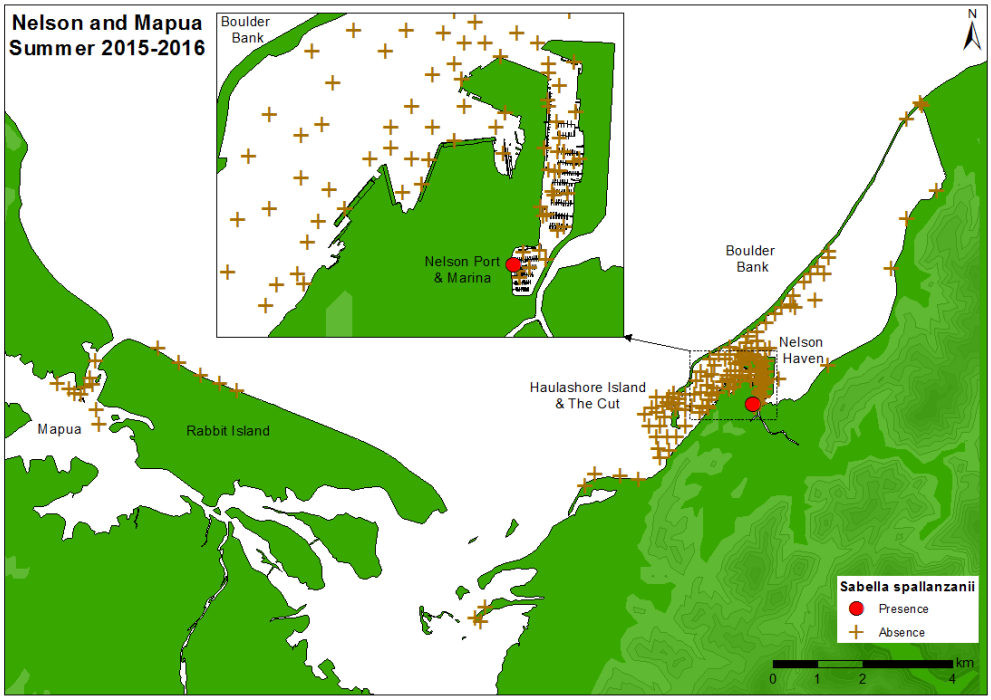
Lyttelton Harbour Winter 2015



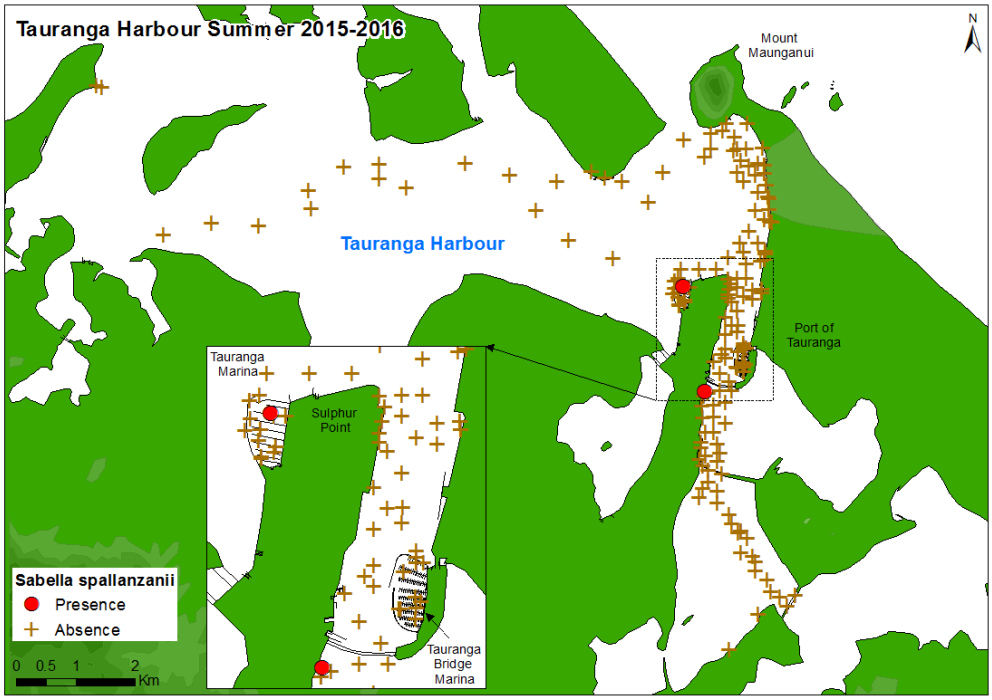
Nelson Harbour Winter 2015



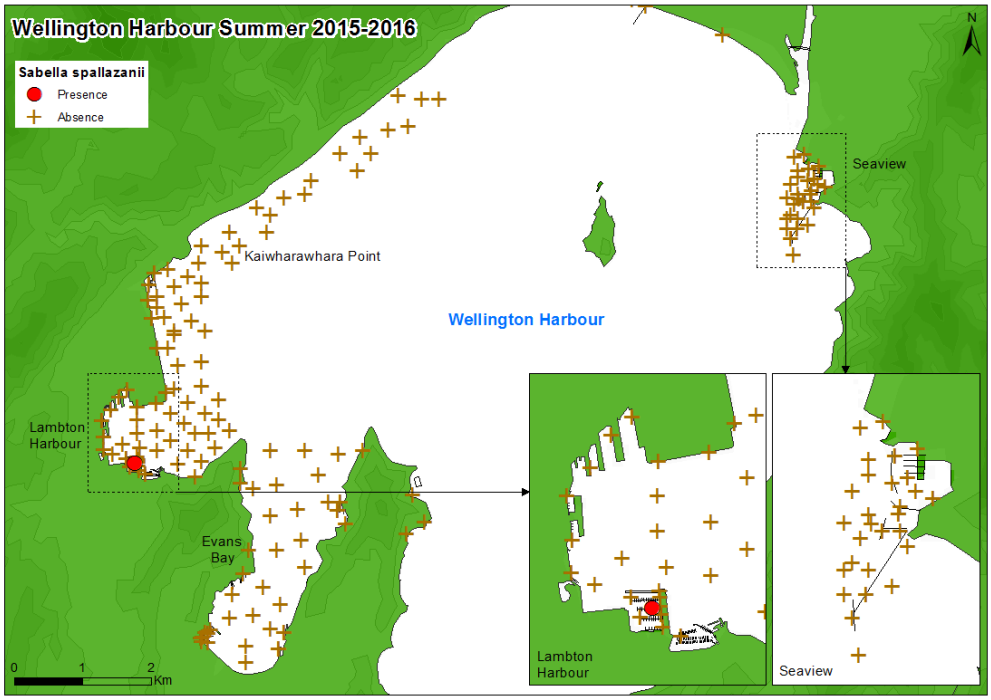
Nelson Harbour Summer 2015–16



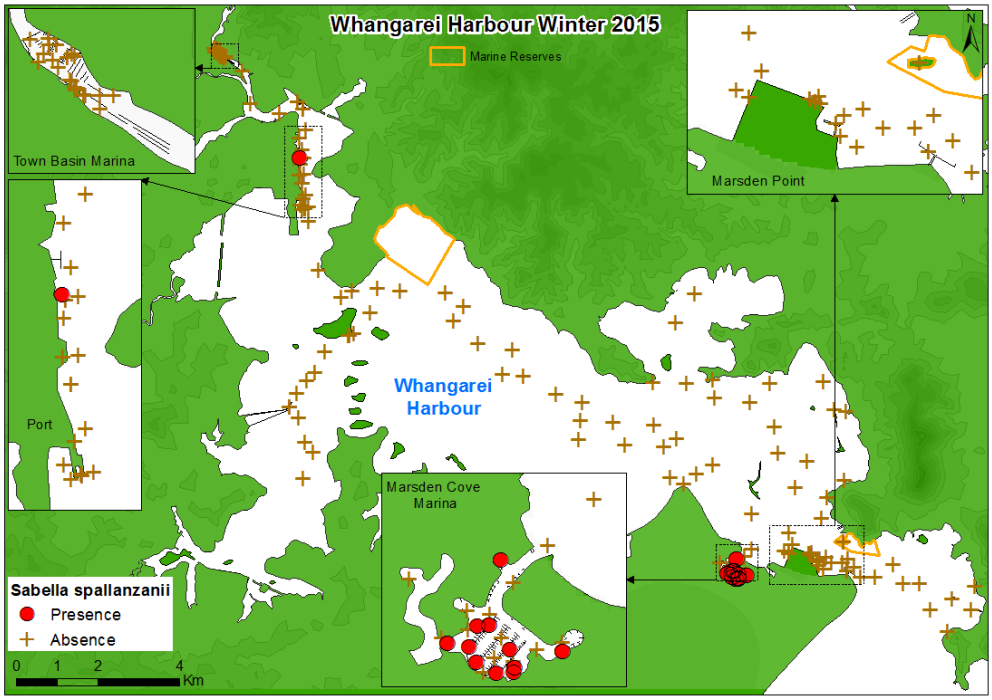
Tauranga Harbour Summer 2015–16



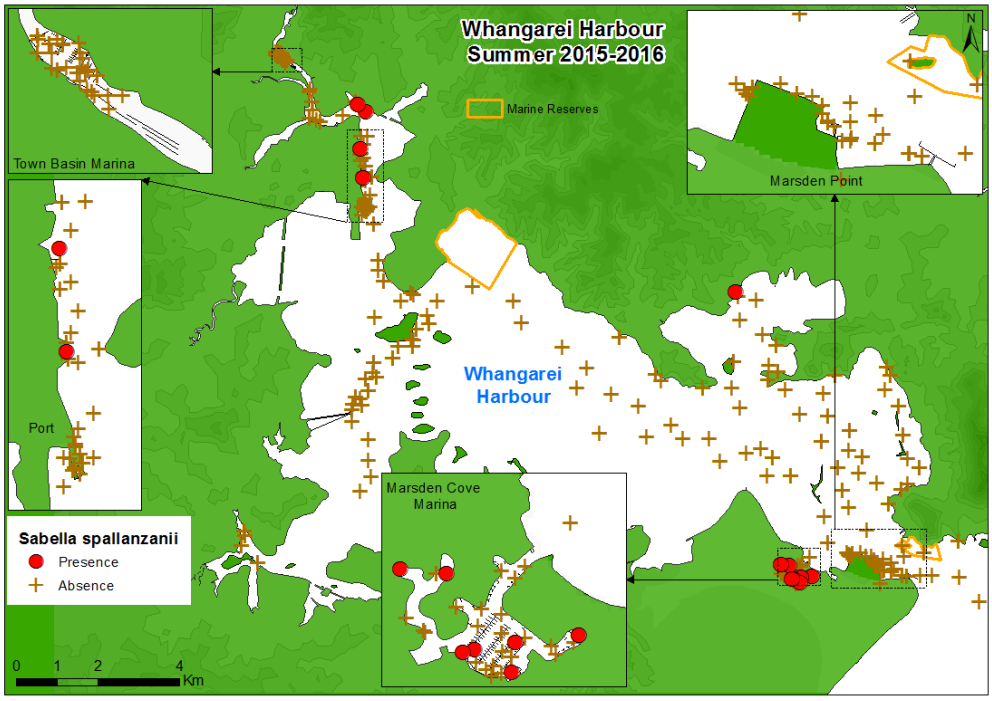
Wellington Harbour Summer 2015–16



Whangarei Harbour Winter 2015

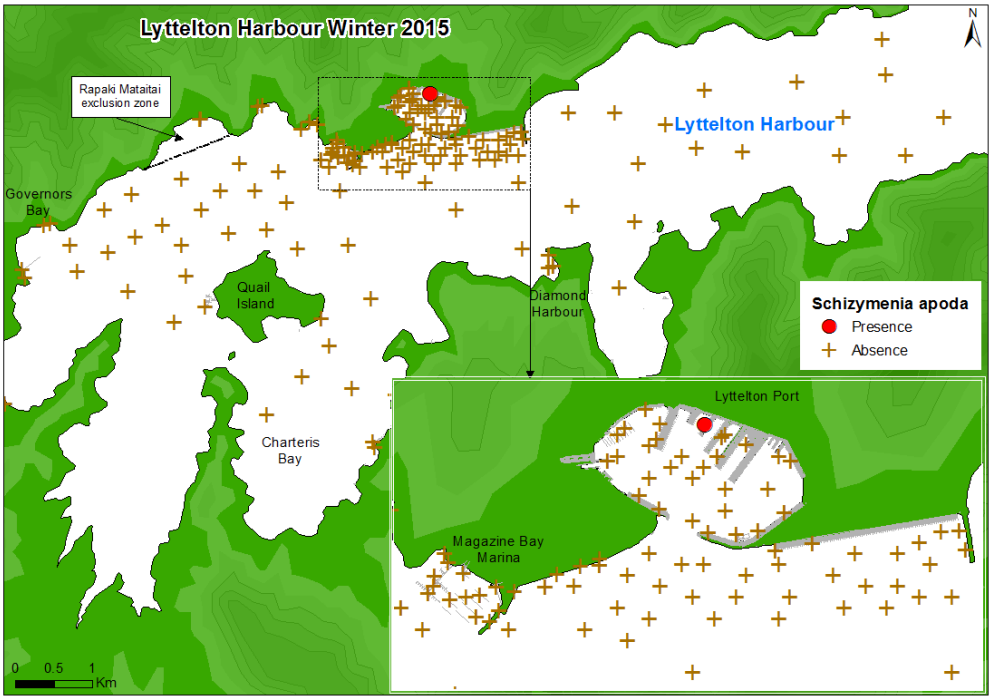


Whangarei Harbour Summer 2015–16



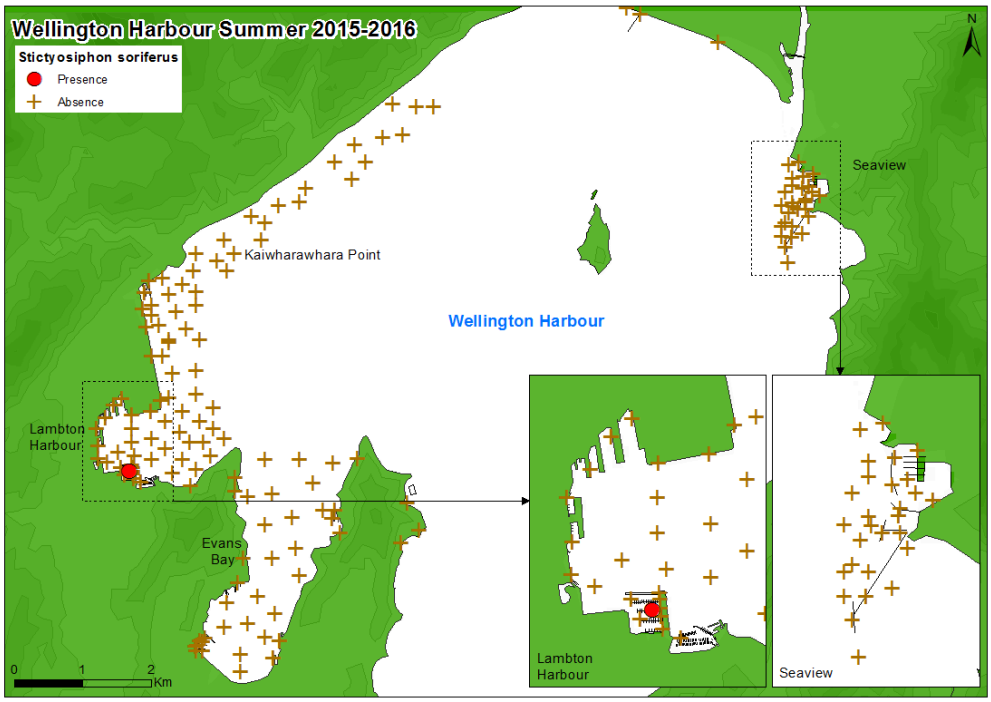
Schizymenia apoda

Lyttelton Harbour Winter 2015



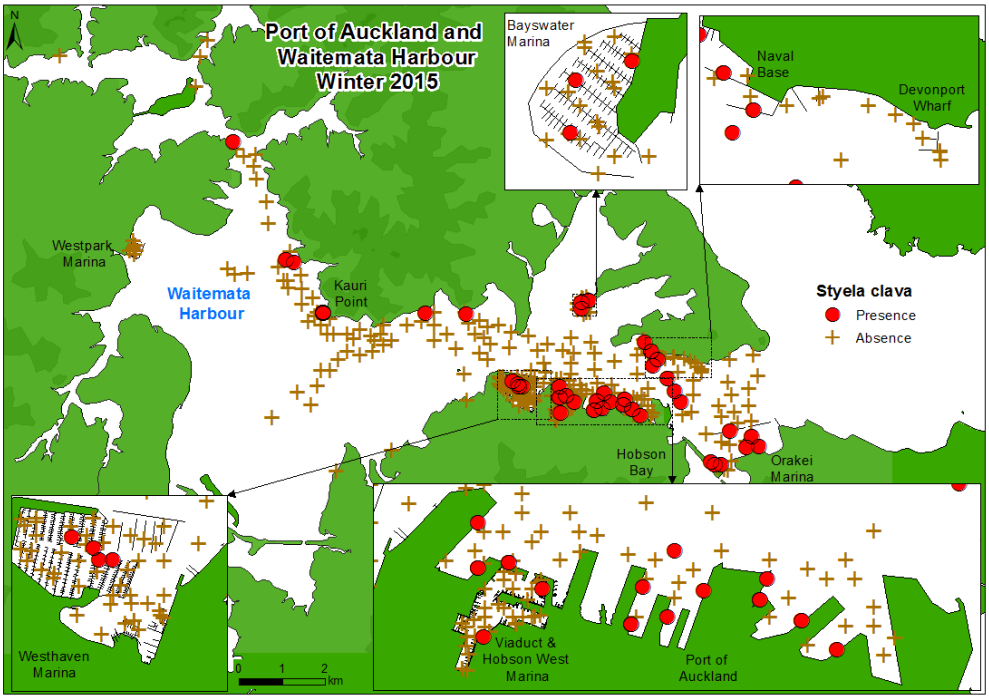
Stictyosiphon soriferus

Wellington Harbour Summer 2015–16

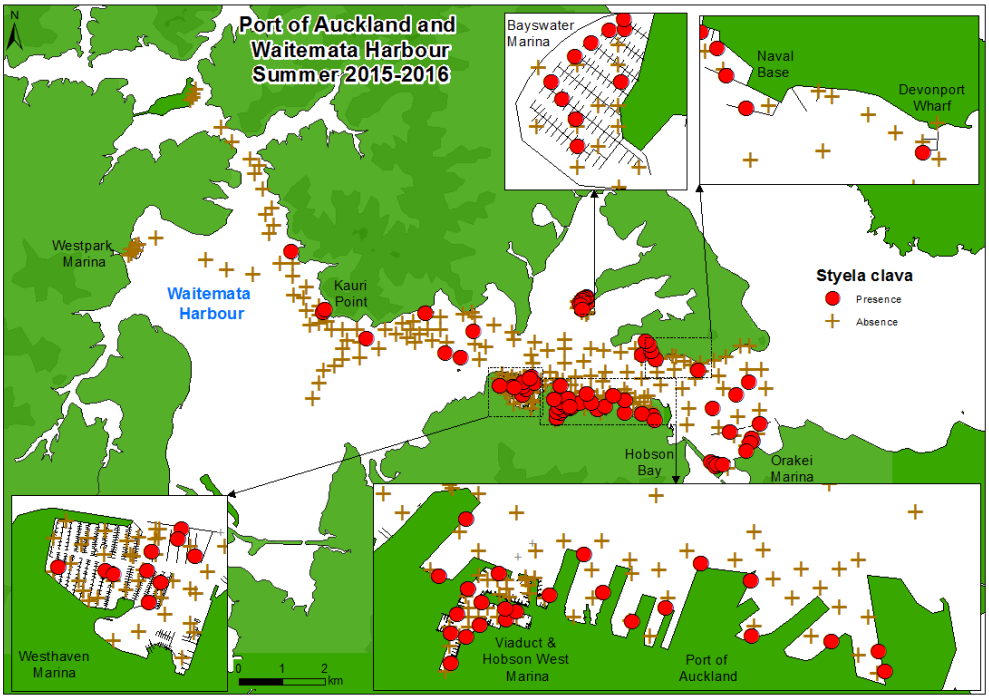


Styela clava

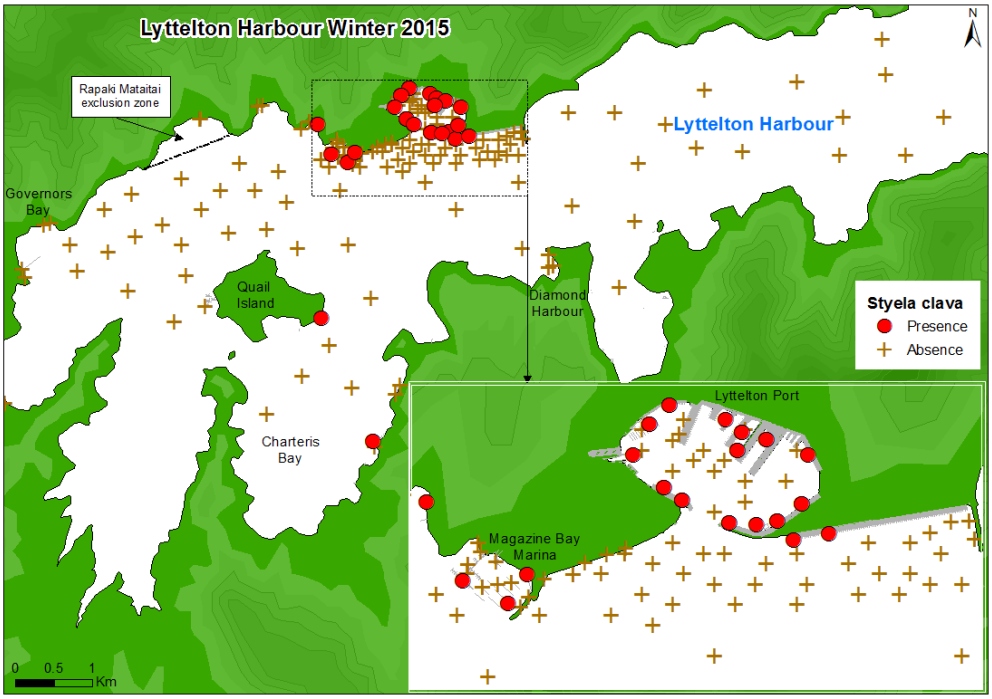
Auckland (Waitemata) Harbour Winter 2015



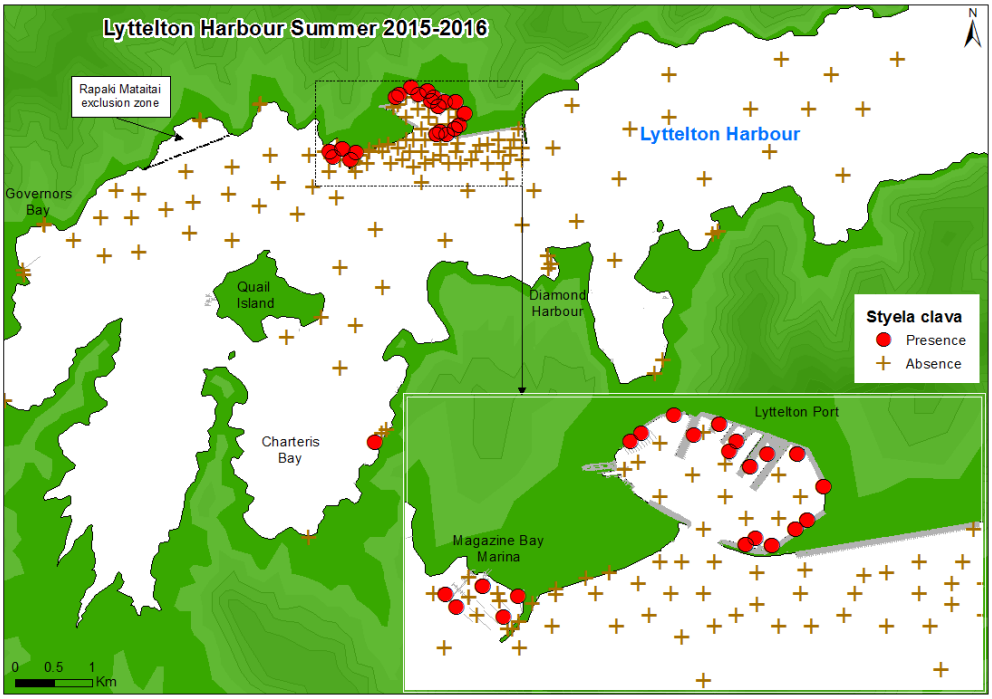
Auckland (Waitemata) Harbour Summer 2015–16



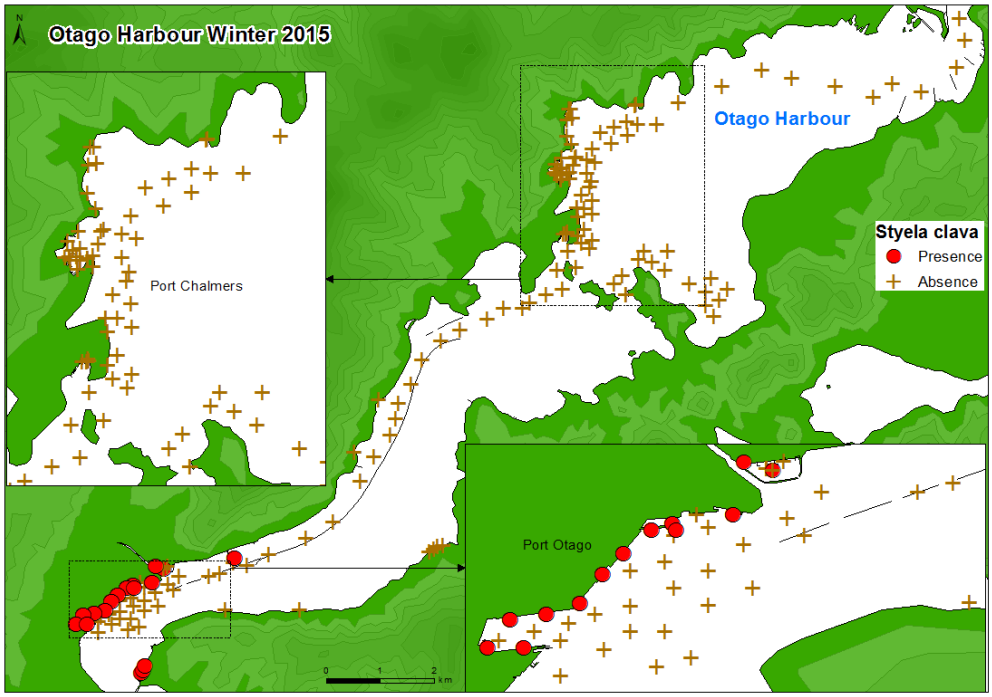
Lyttelton Harbour Winter 2015



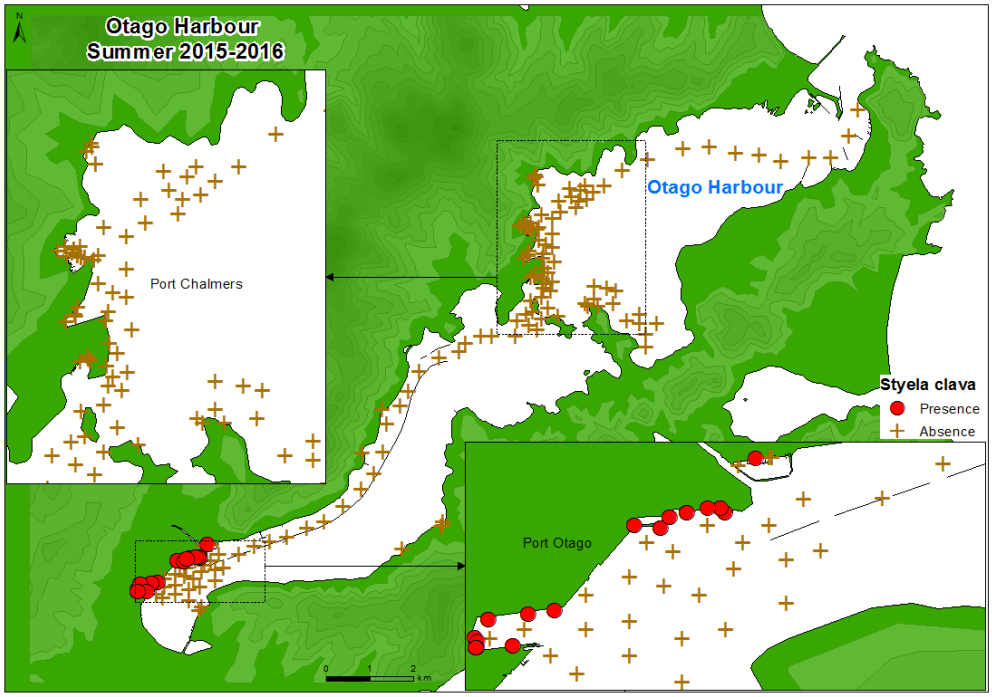
Lyttelton Harbour Summer 2015–16



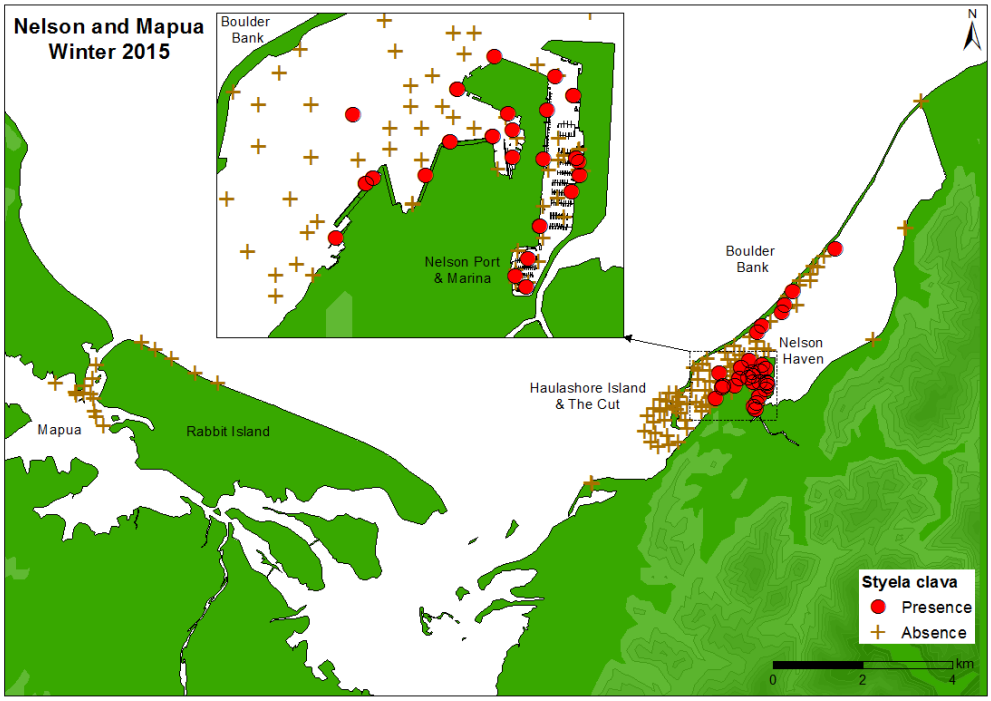
Otago Harbour Winter 2015



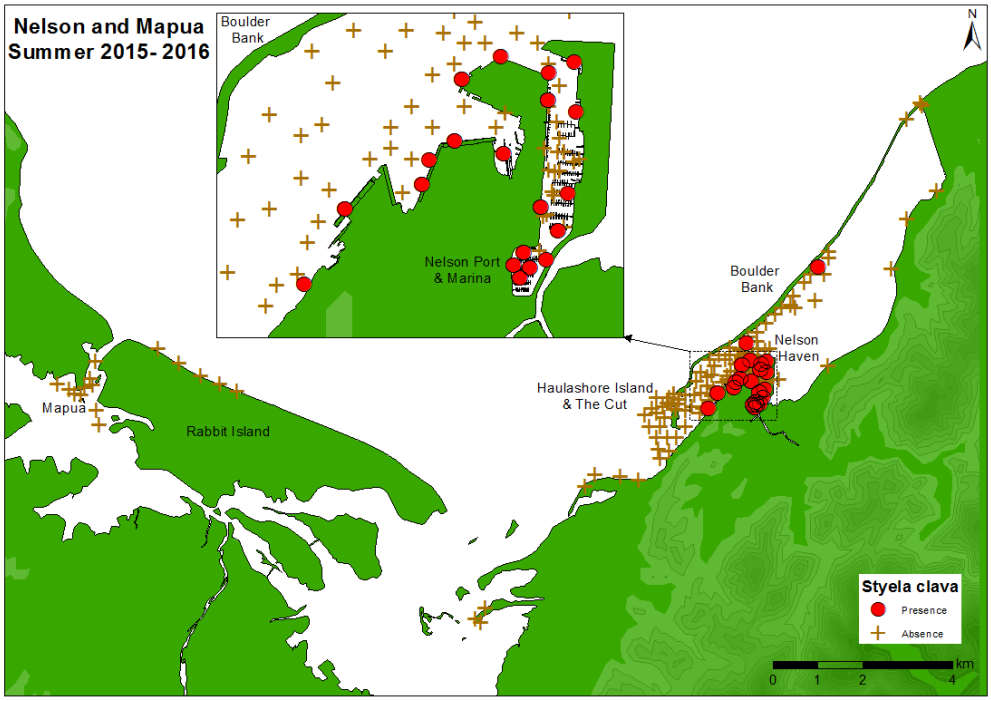
Otago Harbour Summer 2015–16



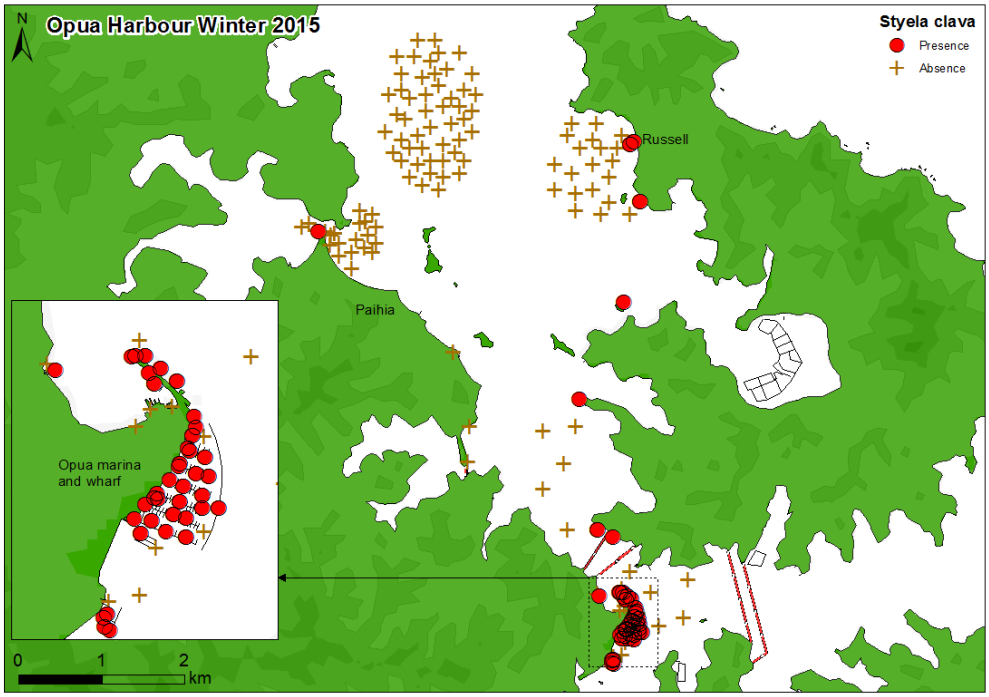
Nelson Harbour Winter 2015



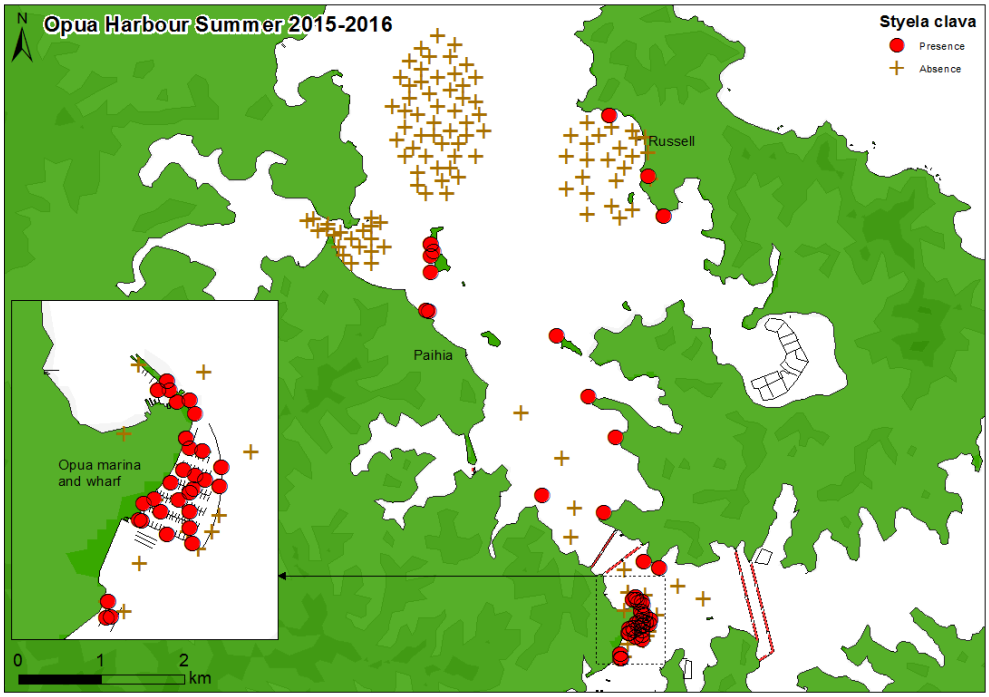
Nelson Harbour Summer 2015–16



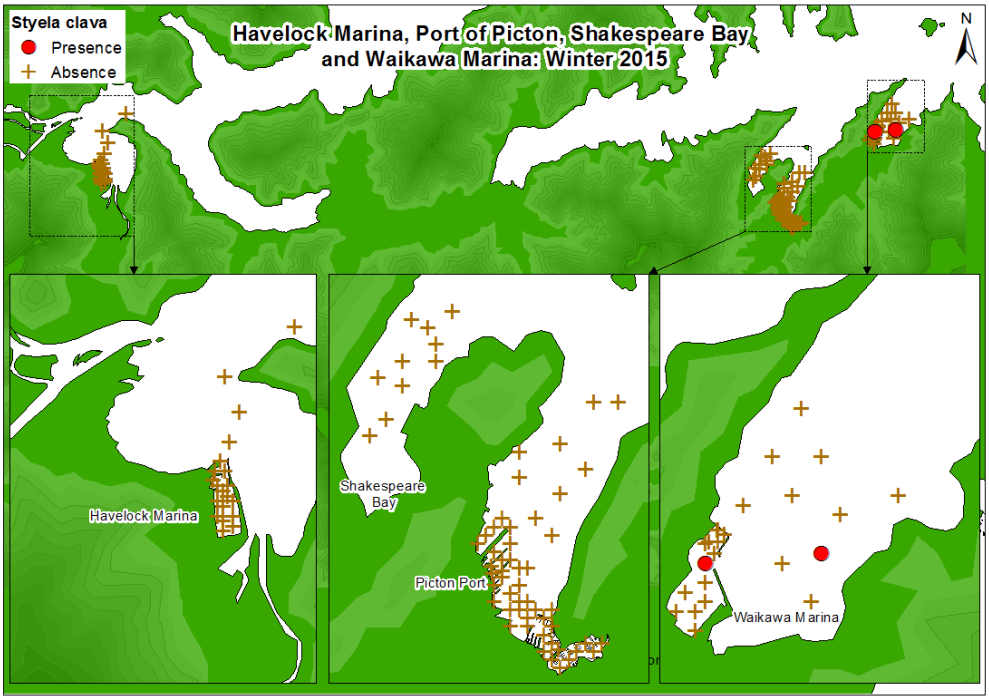
Opua Winter 2015



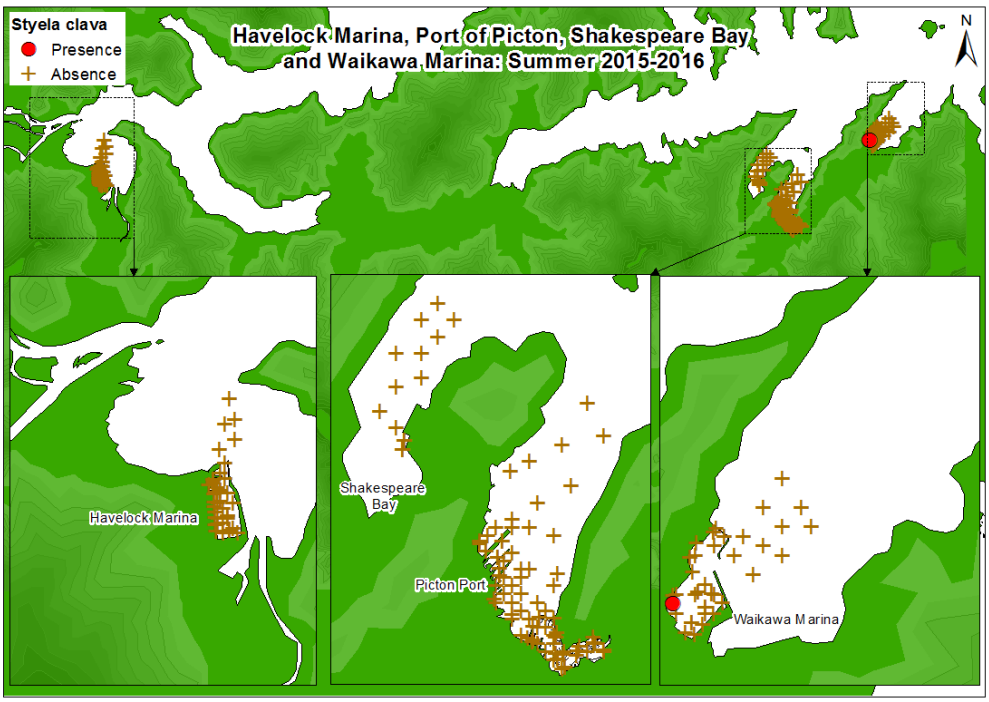
Opua Summer 2015–16



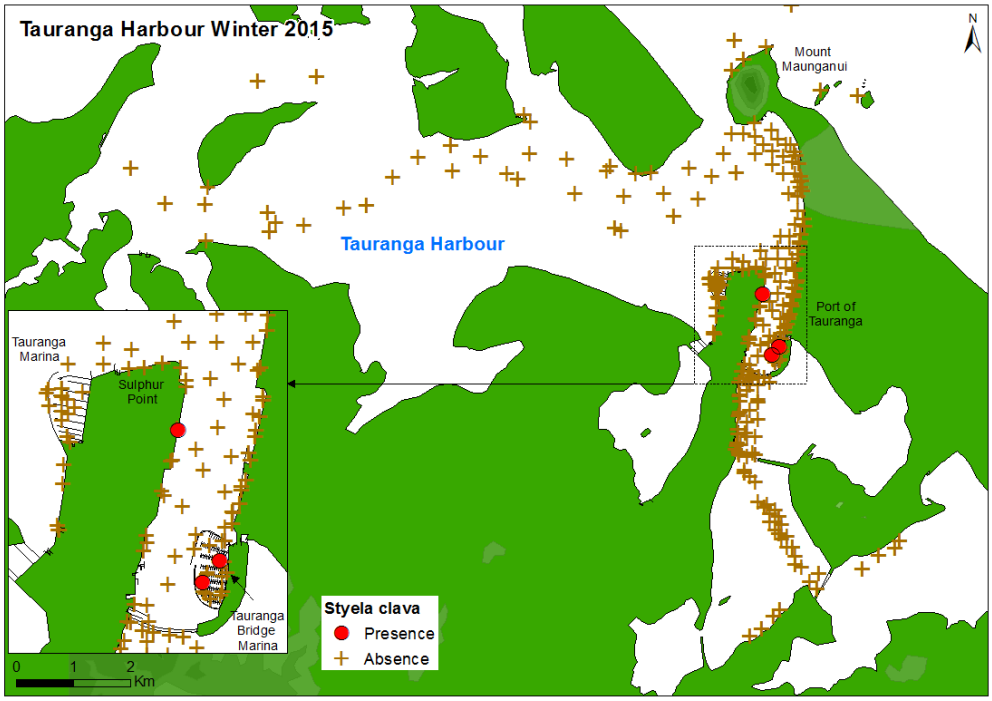
Picton/Havelock Winter 2015



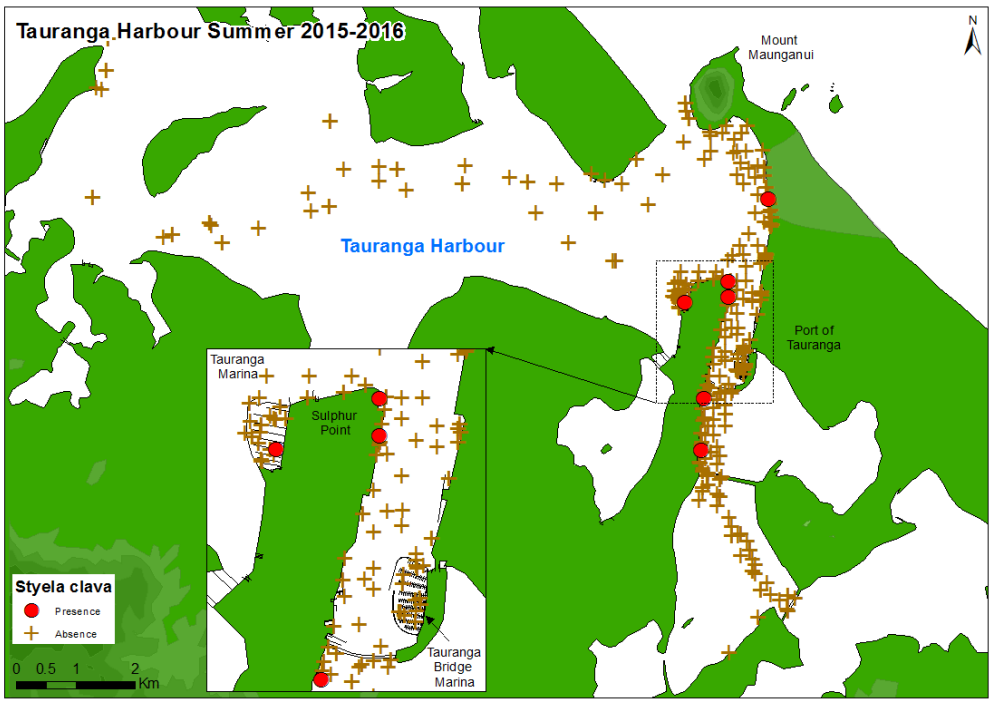
Picton/Havelock Summer 2015–16



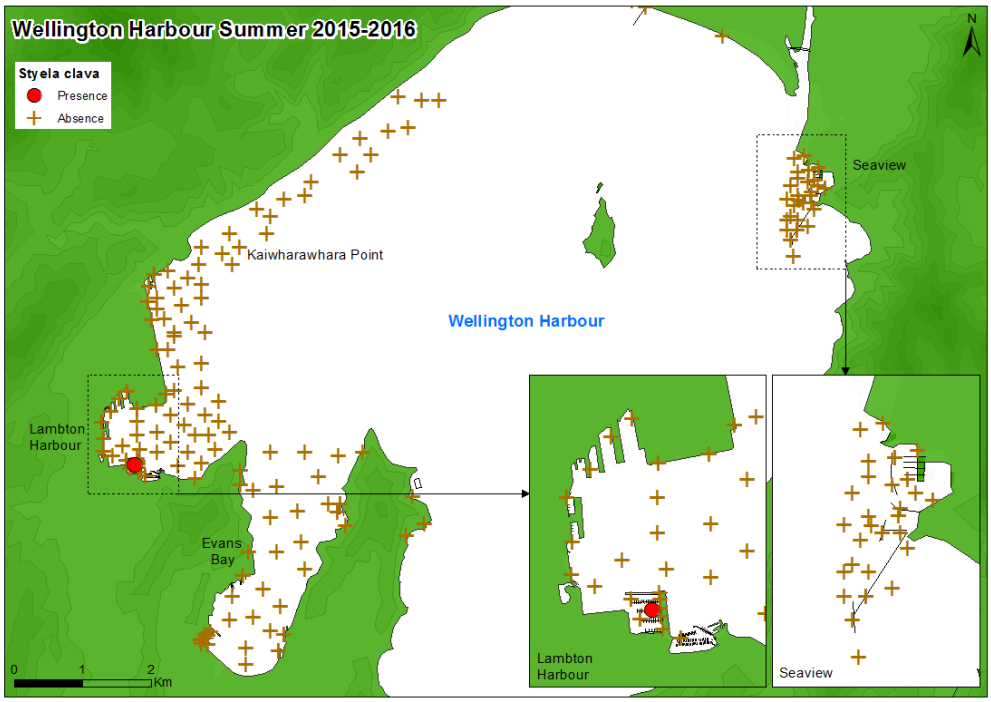
Tauranga Harbour Winter 2015



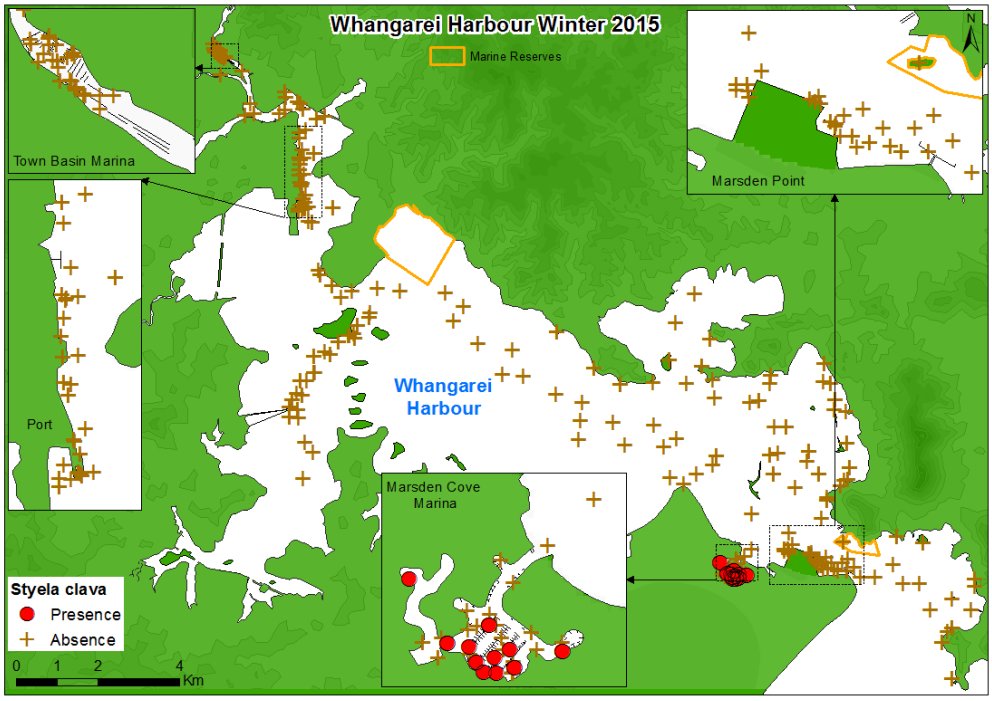
Tauranga Harbour Summer 2015–16



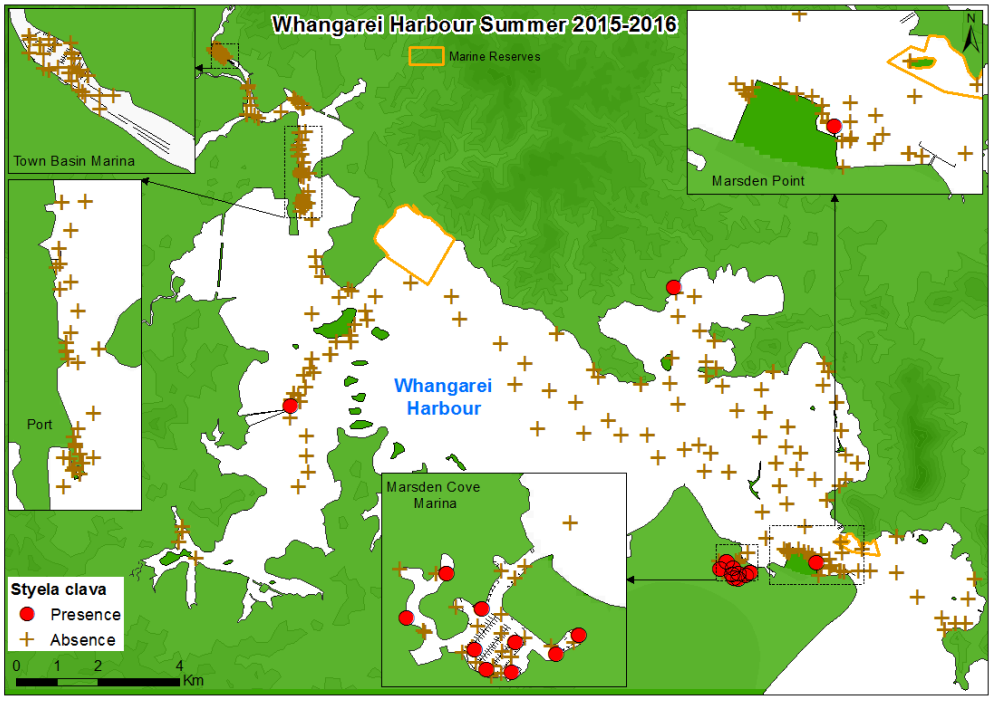
Wellington Harbour Summer 2015–16



Whangarei Harbour Winter 2015

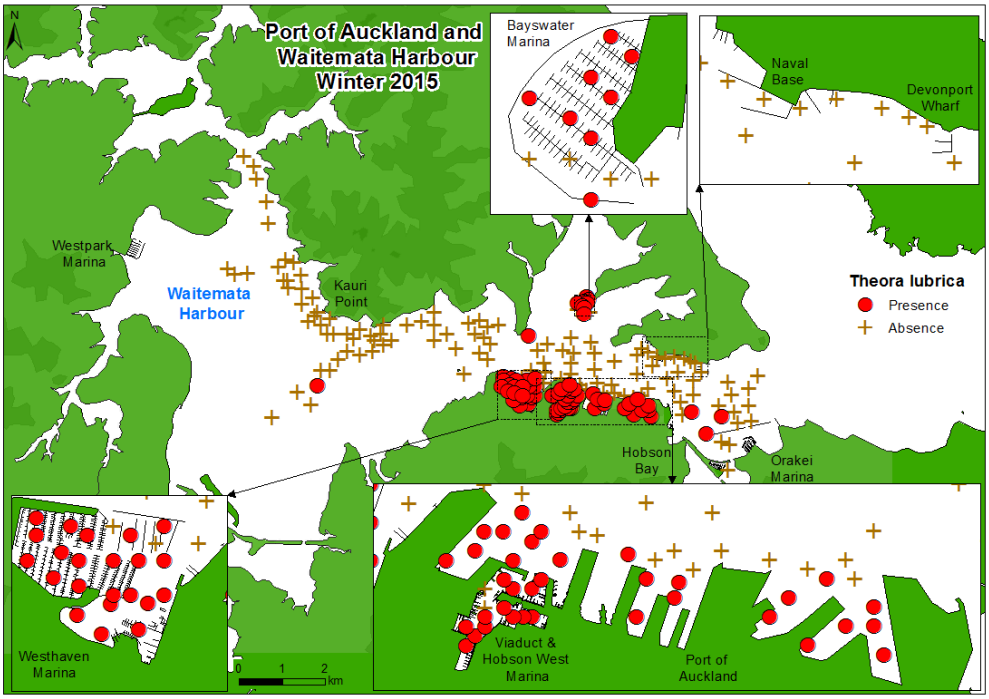


Whangarei Harbour Summer 2015–16

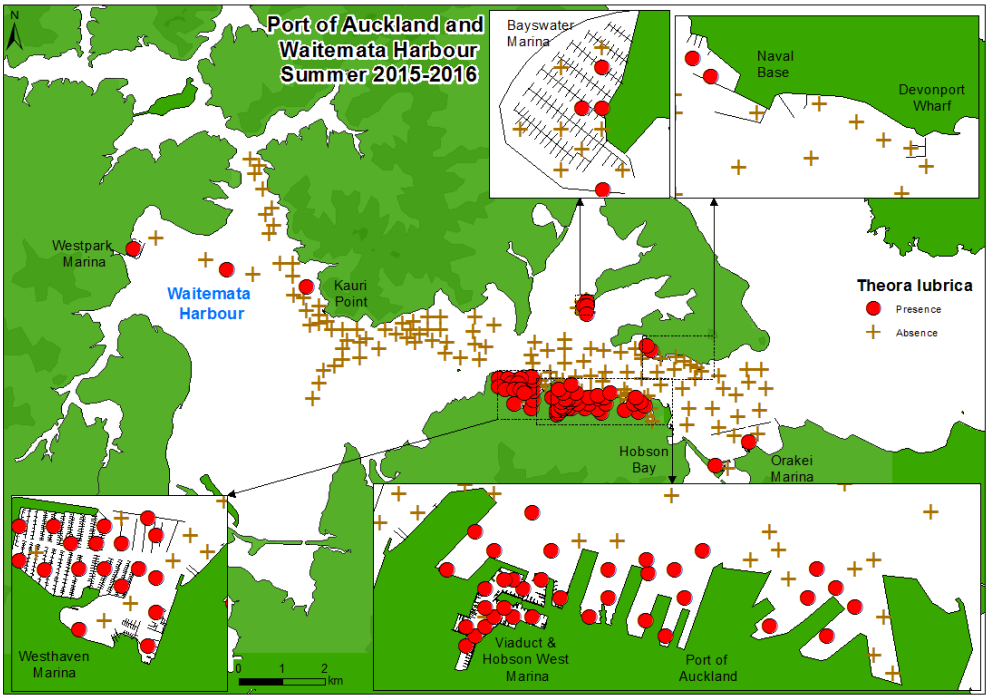


Theora lubrica

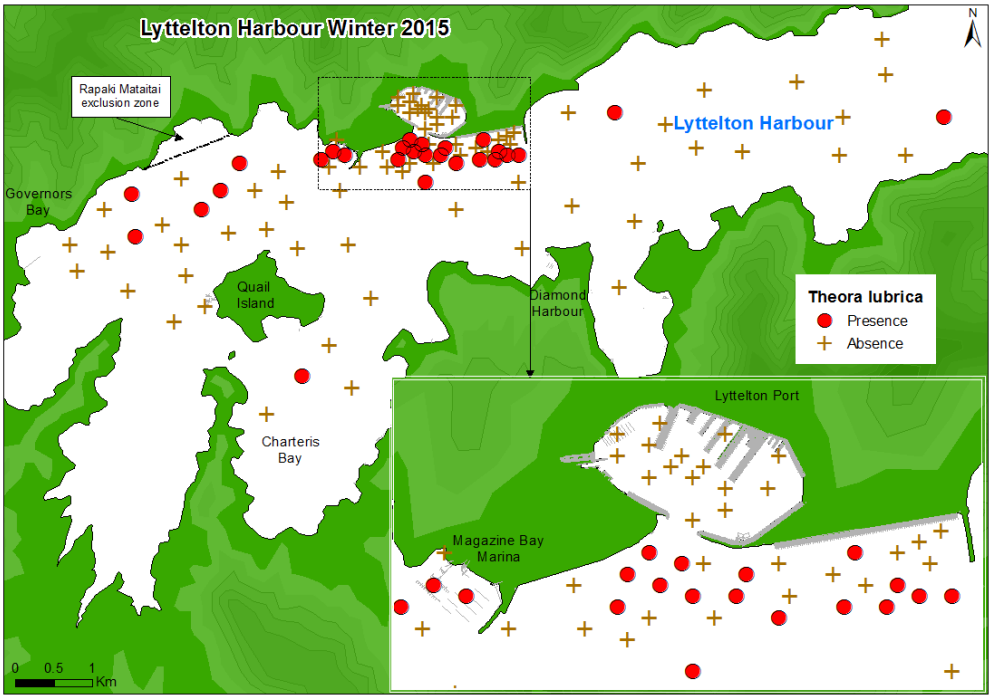
Auckland (Waitemata) Harbour Winter 2015



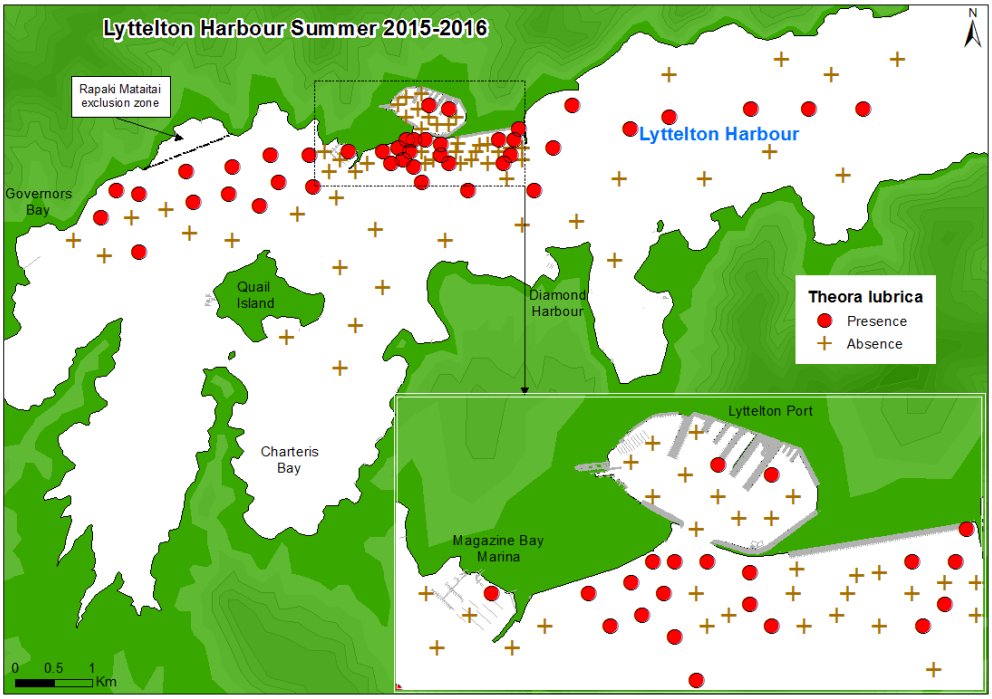
Auckland (Waitemata) Harbour Summer 2015–16



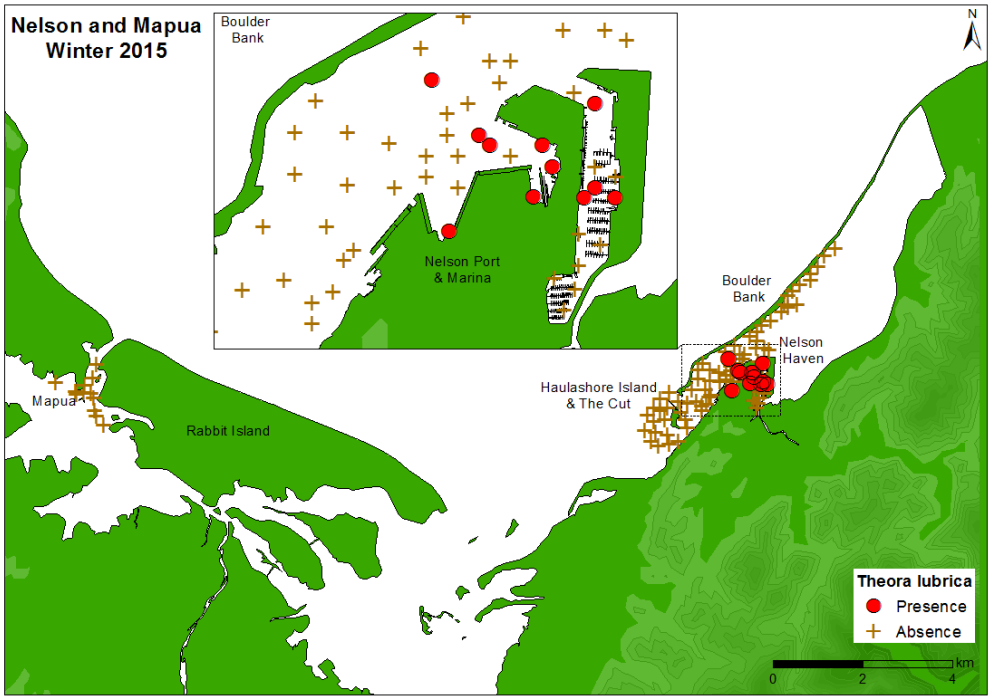
Lyttelton Harbour Winter 2015



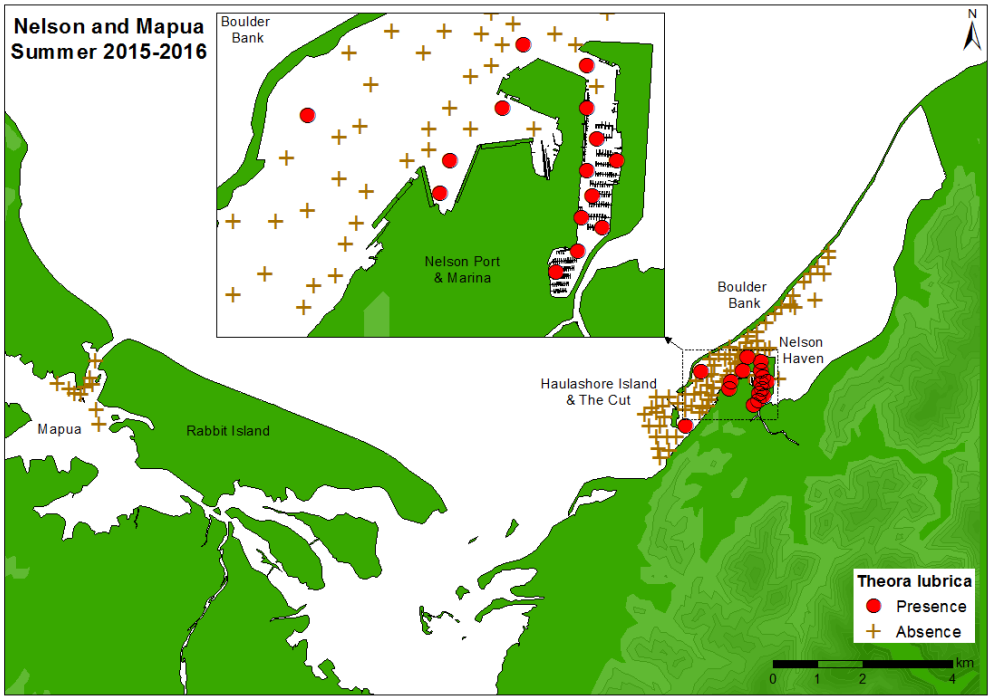
Lyttelton Harbour Summer 2015–16



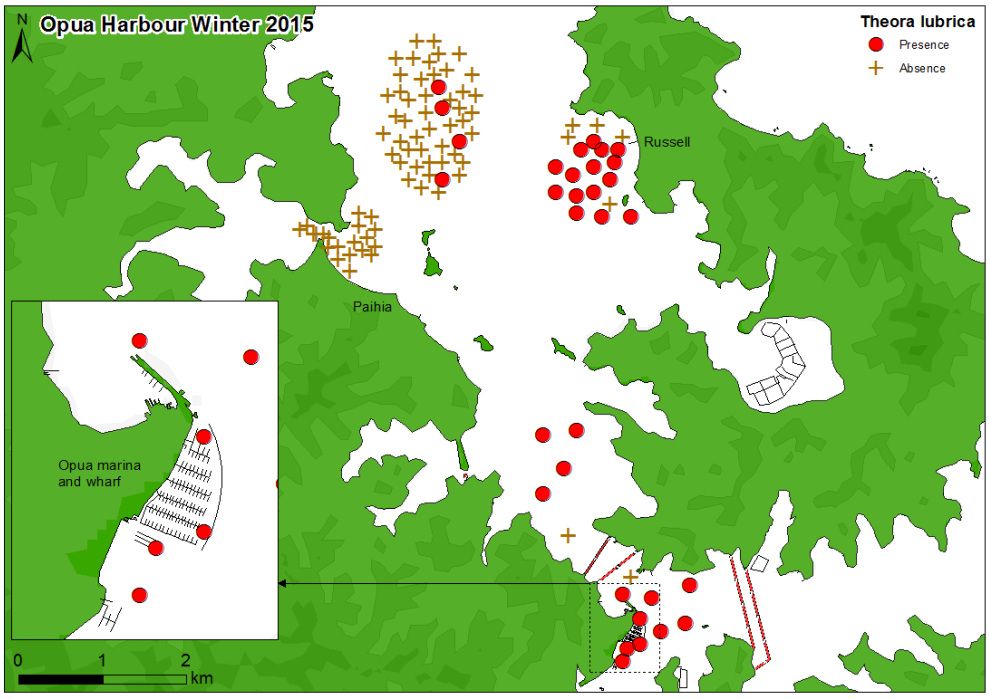
Nelson Harbour Winter 2015



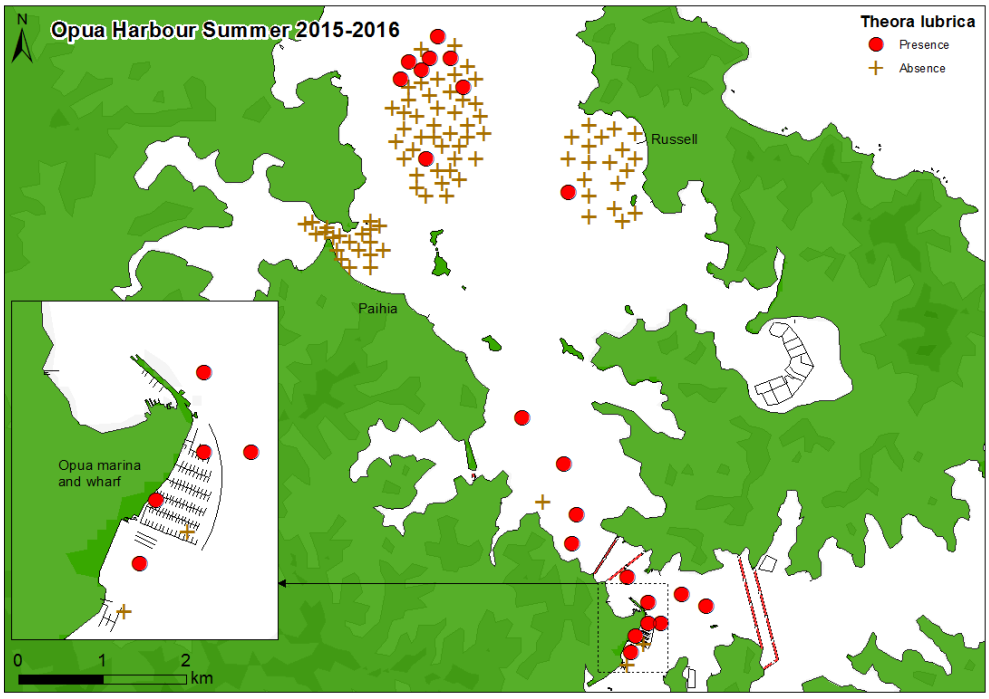
Nelson Harbour Summer 2015–16



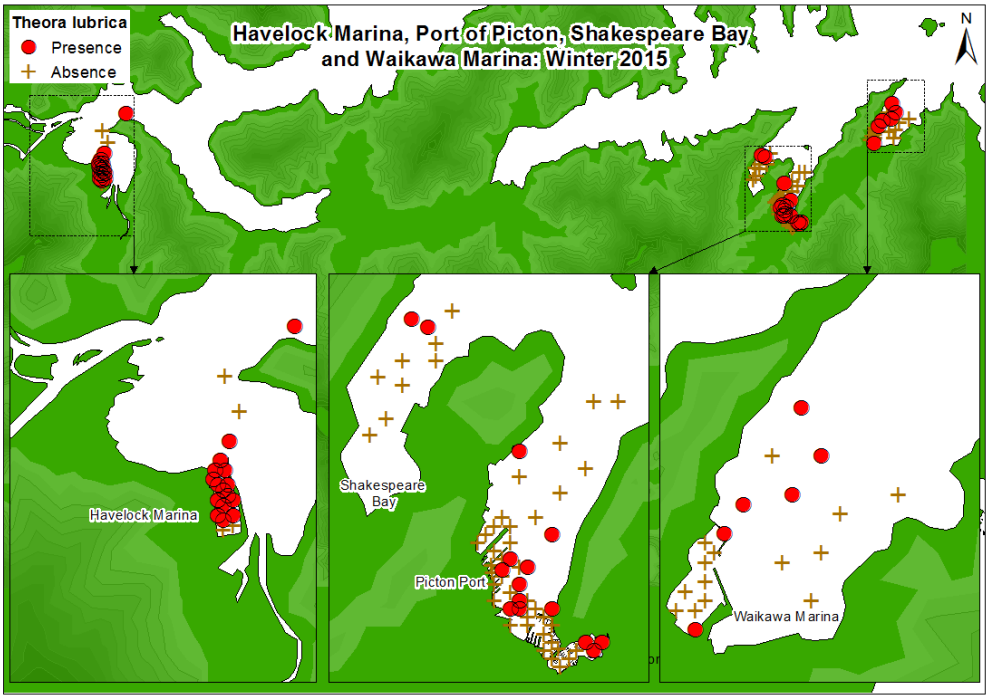
Opua Winter 2015



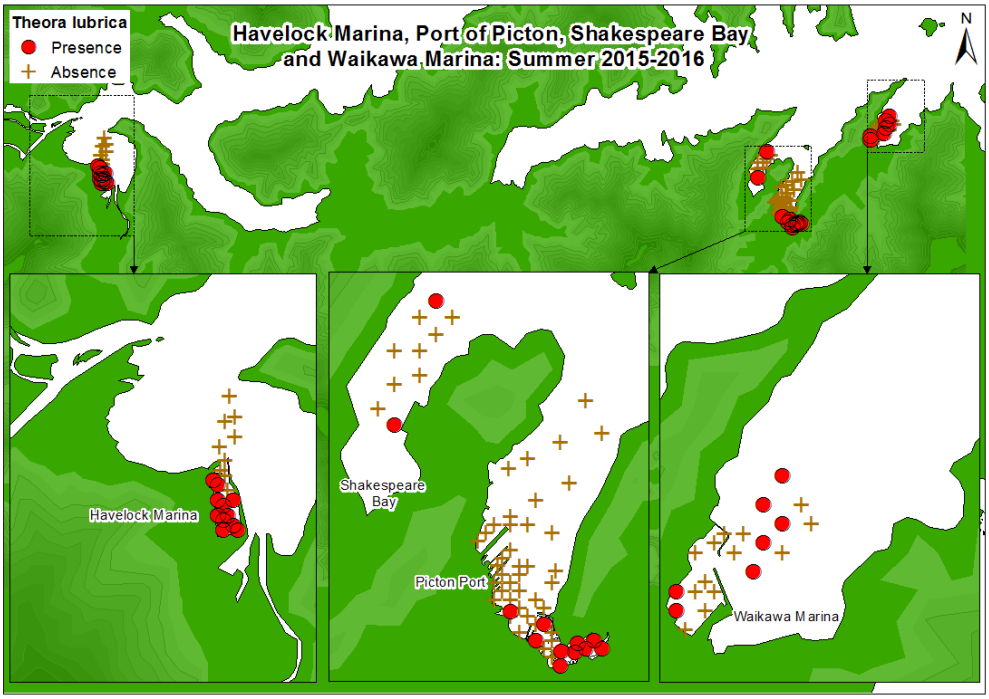
Opua Summer 2015–16



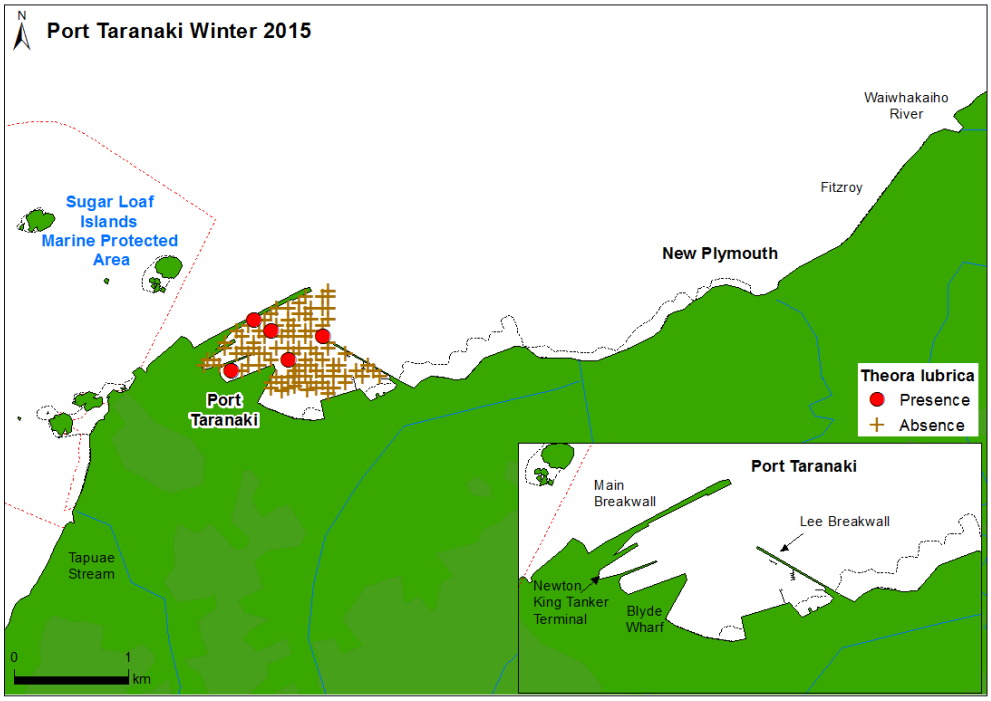
Picton/Havelock Winter 2015



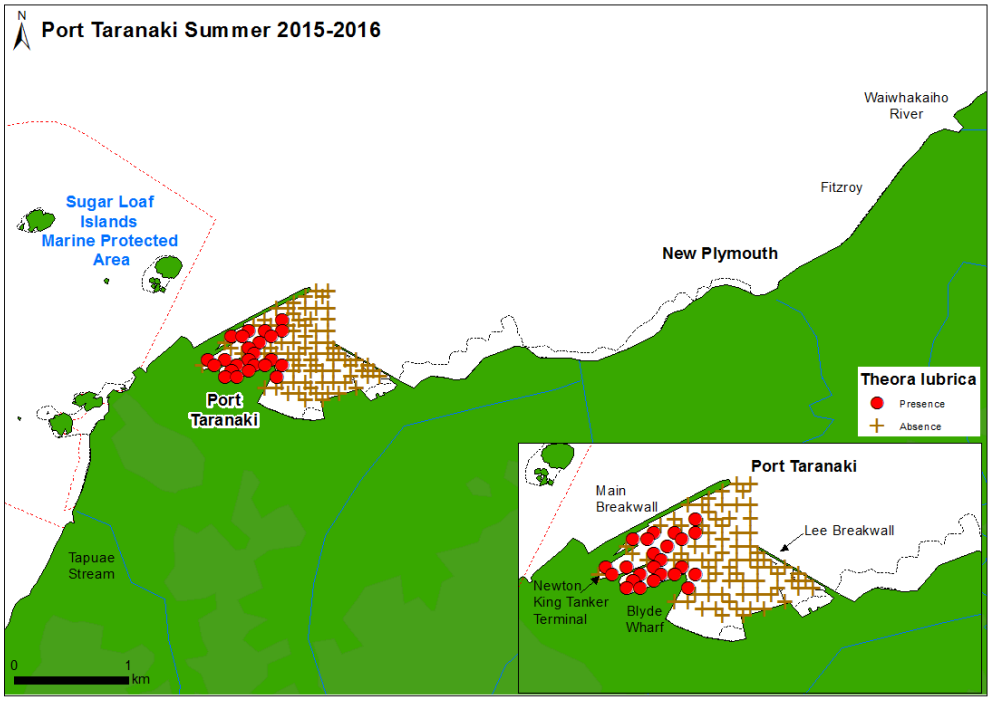
Picton/Havelock Summer 2015–16



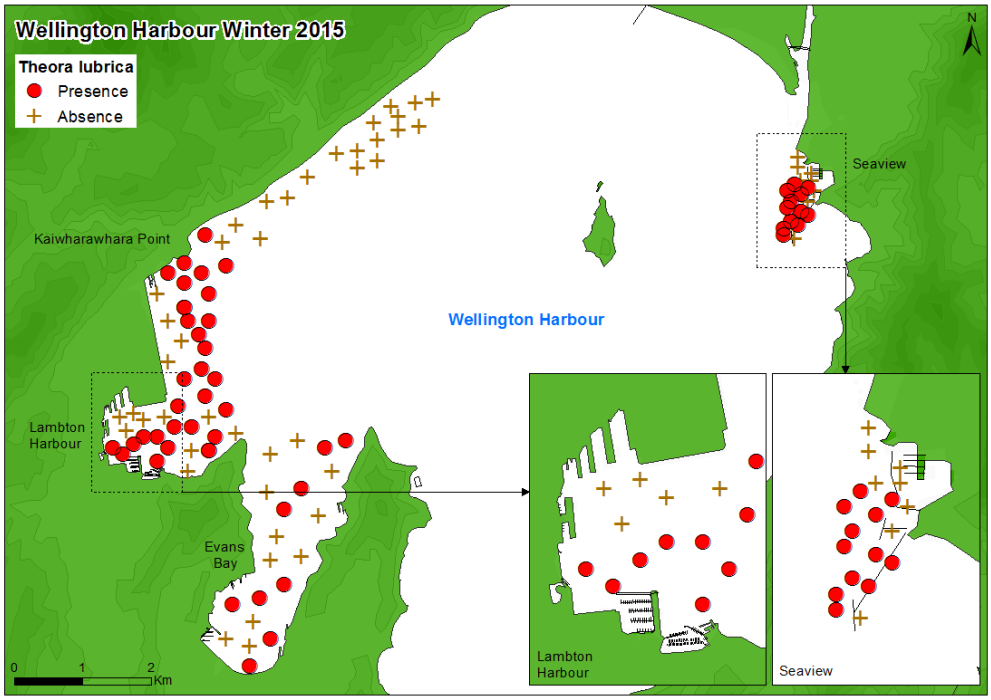
Port Taranaki Winter 2015



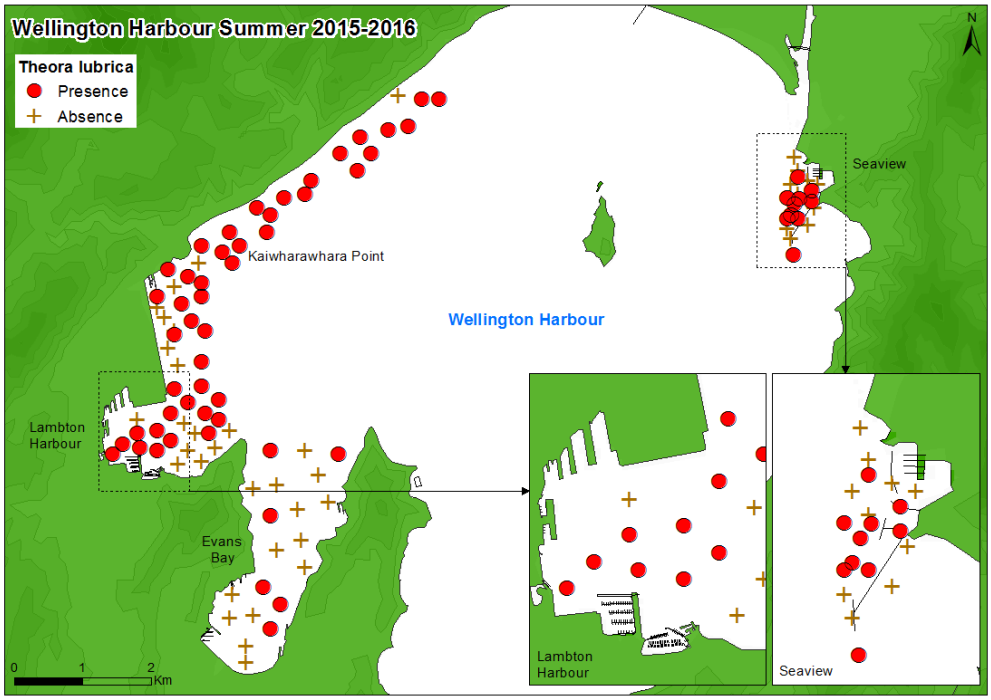
Port Taranaki Summer 2015–16



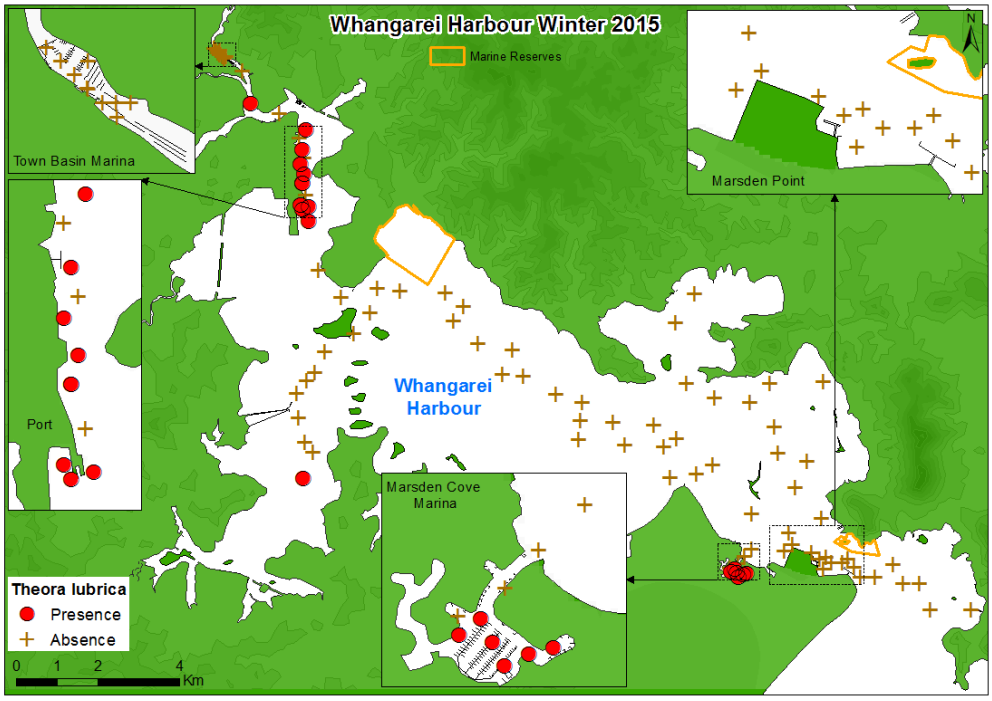
Wellington Harbour Winter 2015



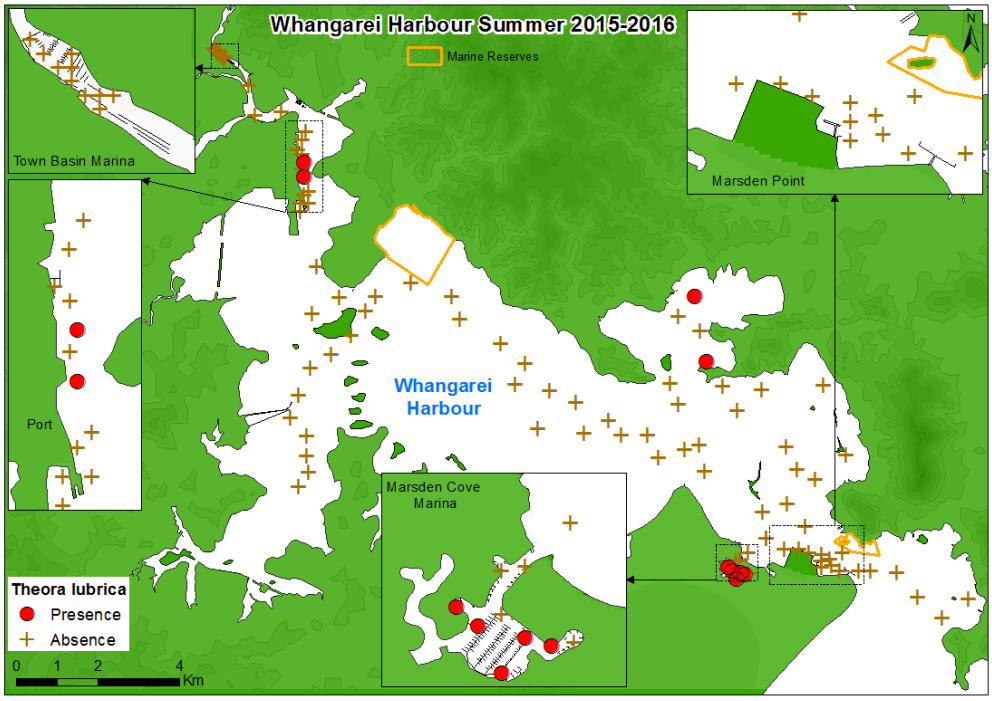
Wellington Harbour Summer 2015–16



Whangarei Harbour Winter 2015

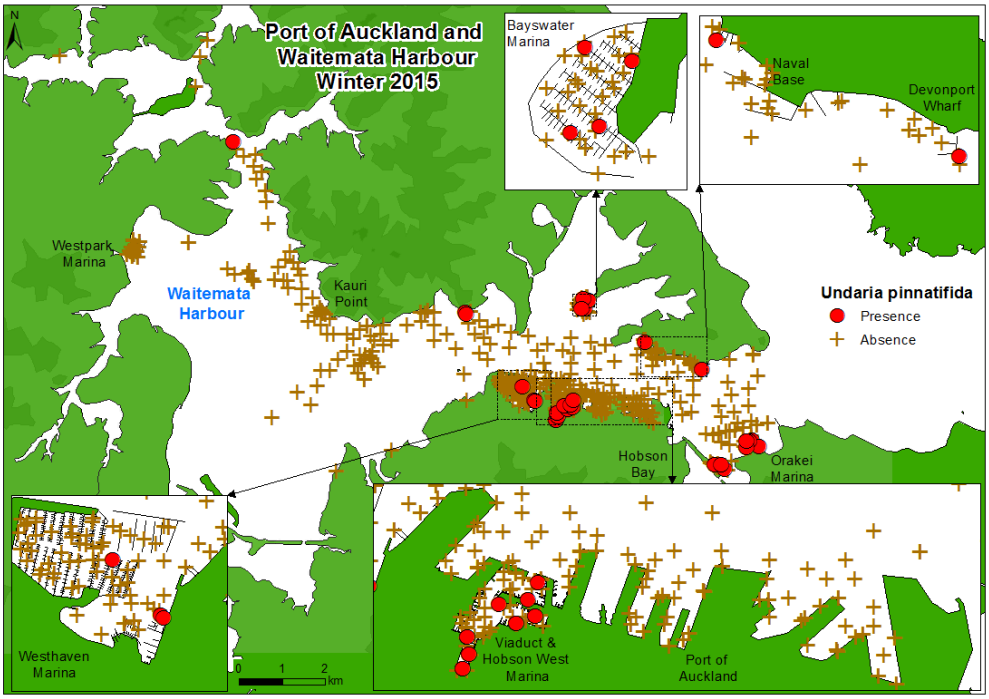


Whangarei Harbour Summer 2015–16

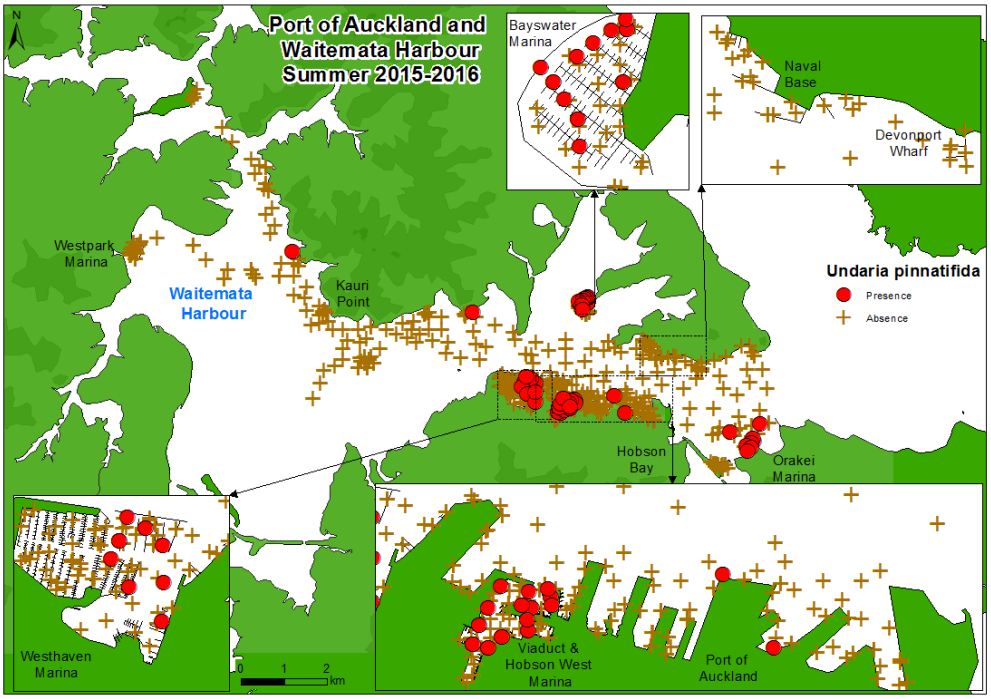


Undaria pinnatifida

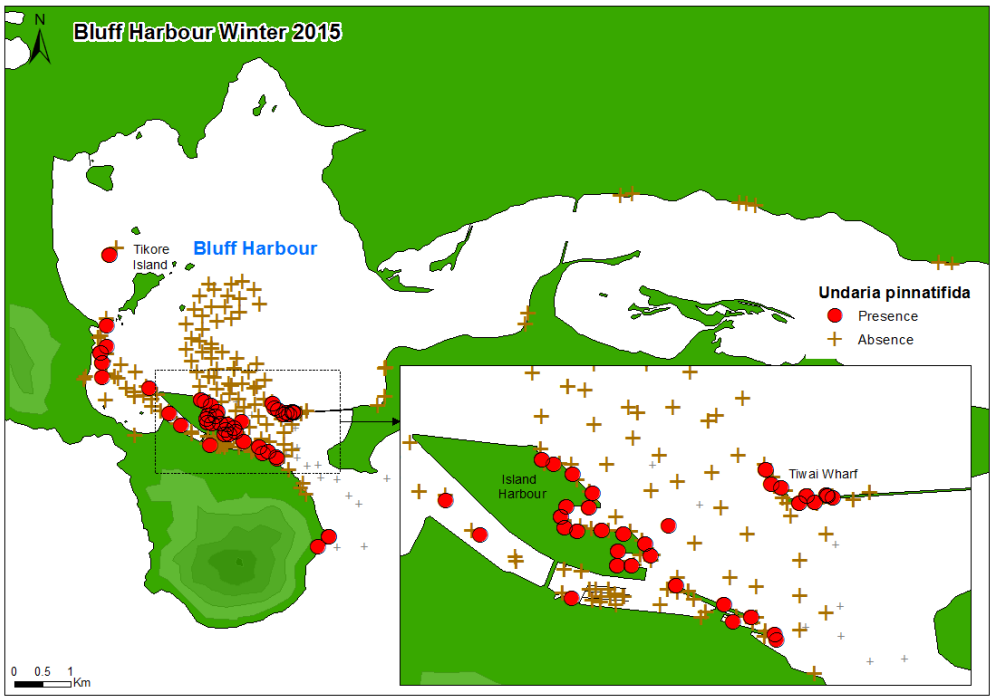
Auckland (Waitemata) Harbour Winter 2015



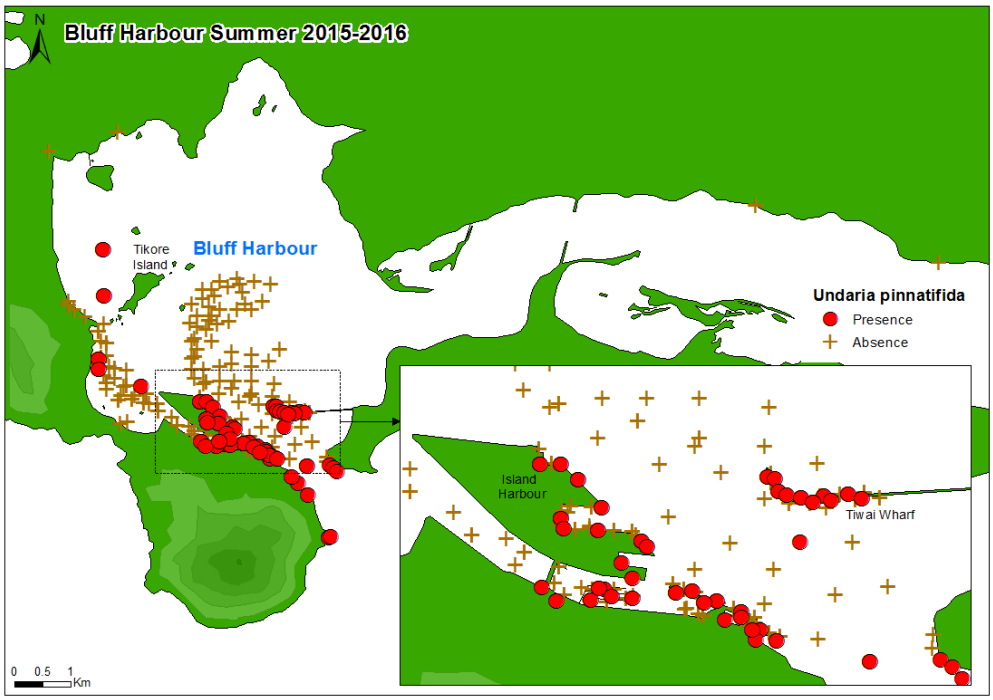
Auckland (Waitemata) Harbour Summer 2015–16



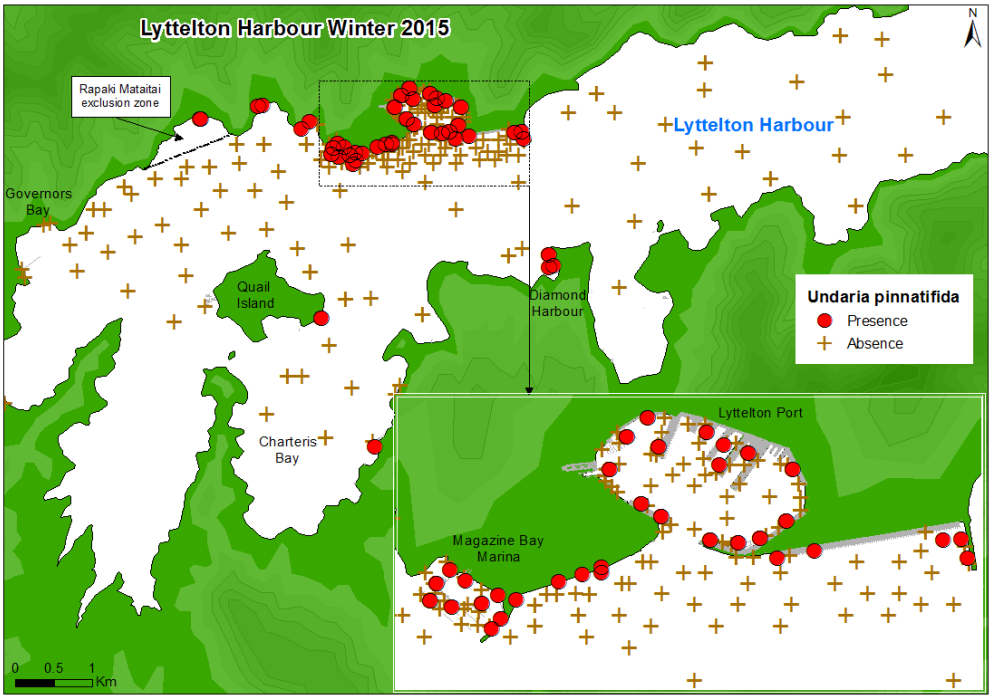
Bluff Harbour Winter 2015



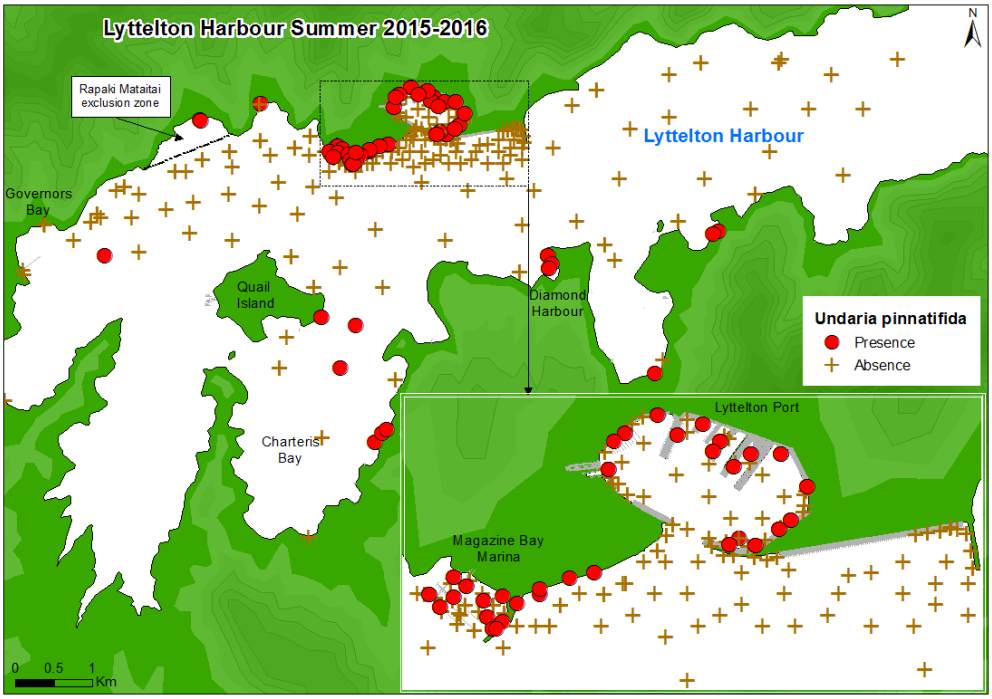
Bluff Harbour Summer 2015–16



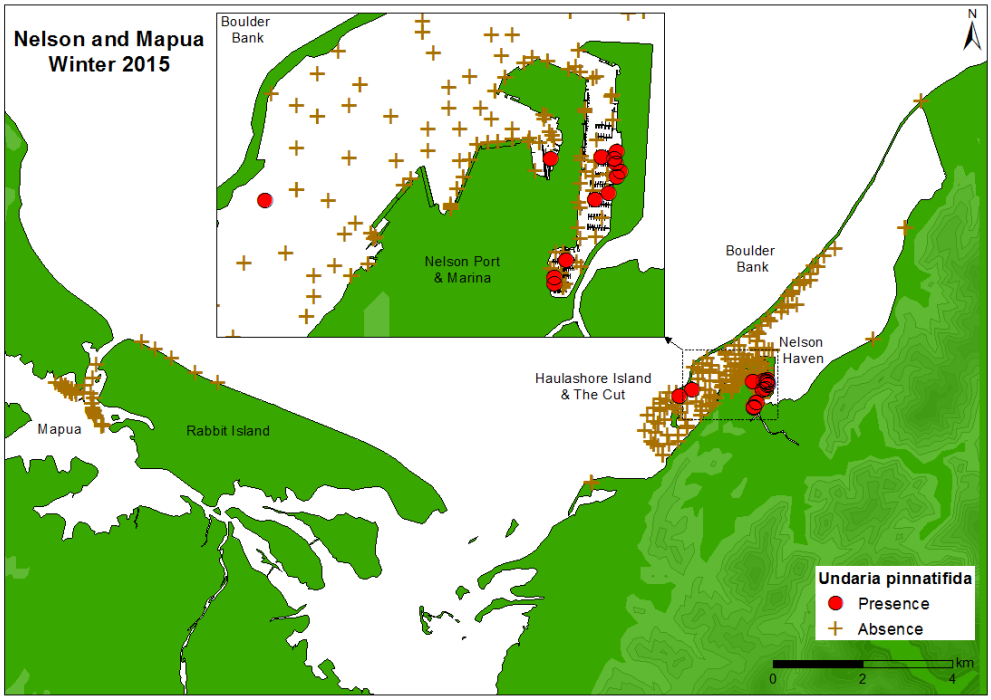
Lyttelton Harbour Winter 2015



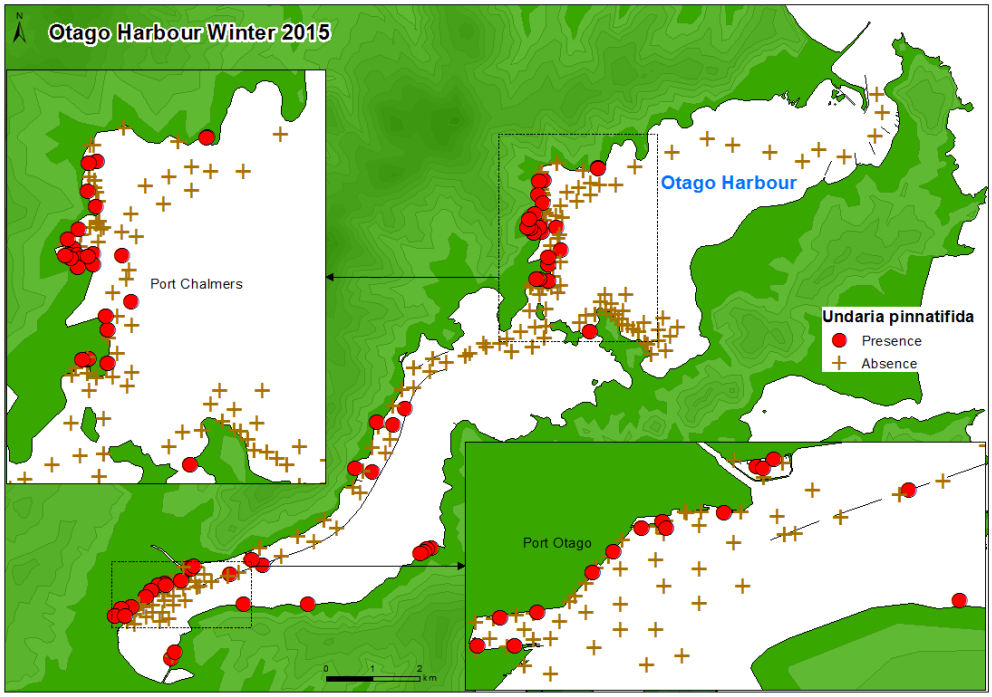
Lyttelton Harbour Summer 2015–16



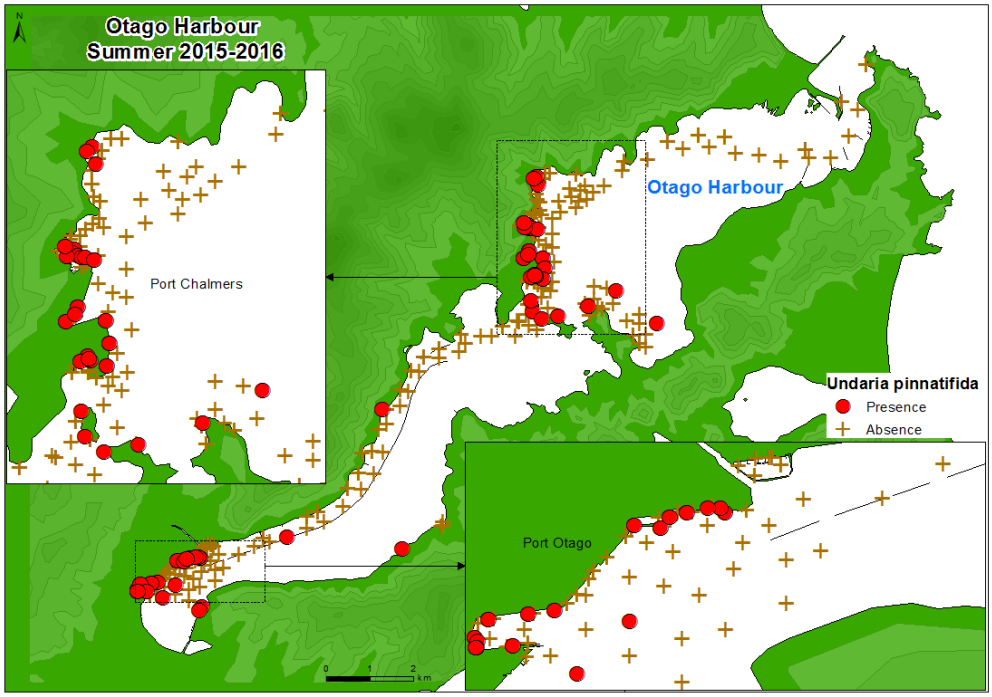
Nelson Harbour Winter 2015



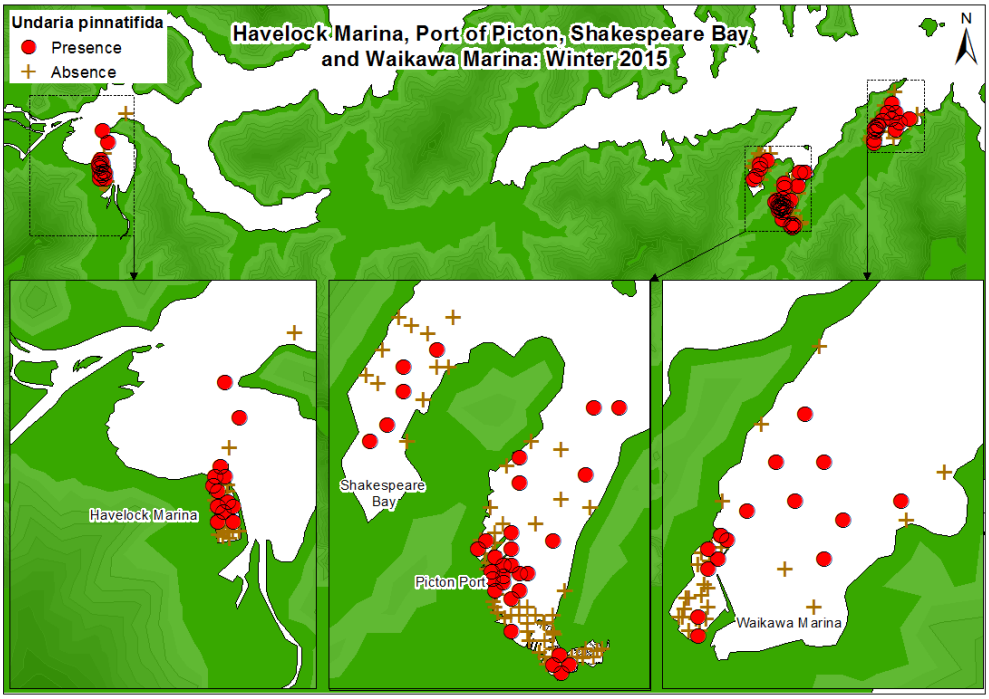
Otago Harbour Winter 2015



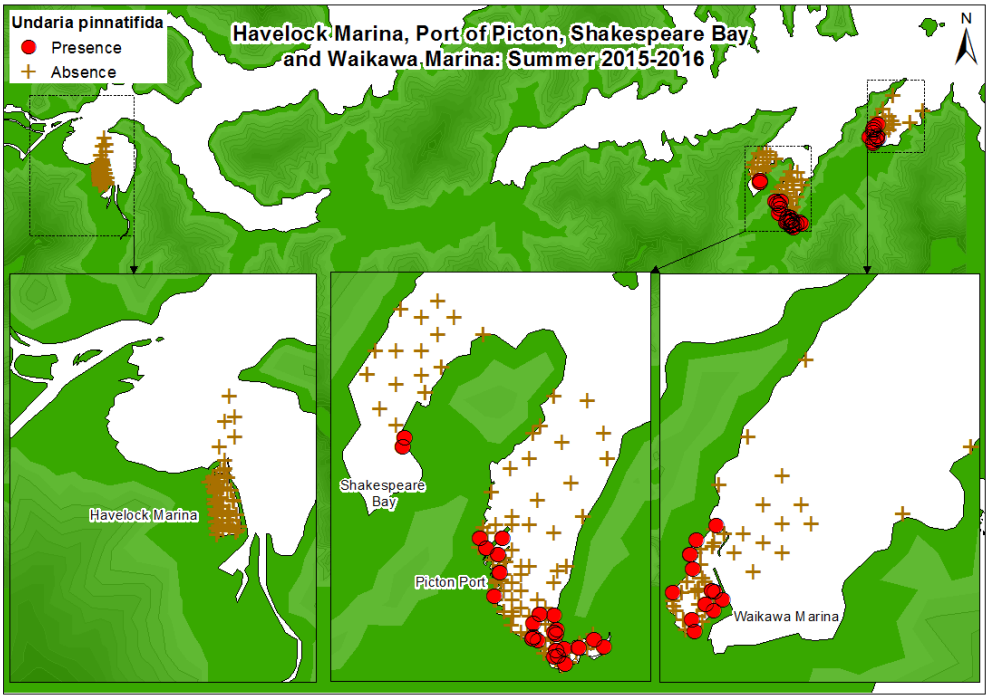
Otago Harbour Summer 2015–16



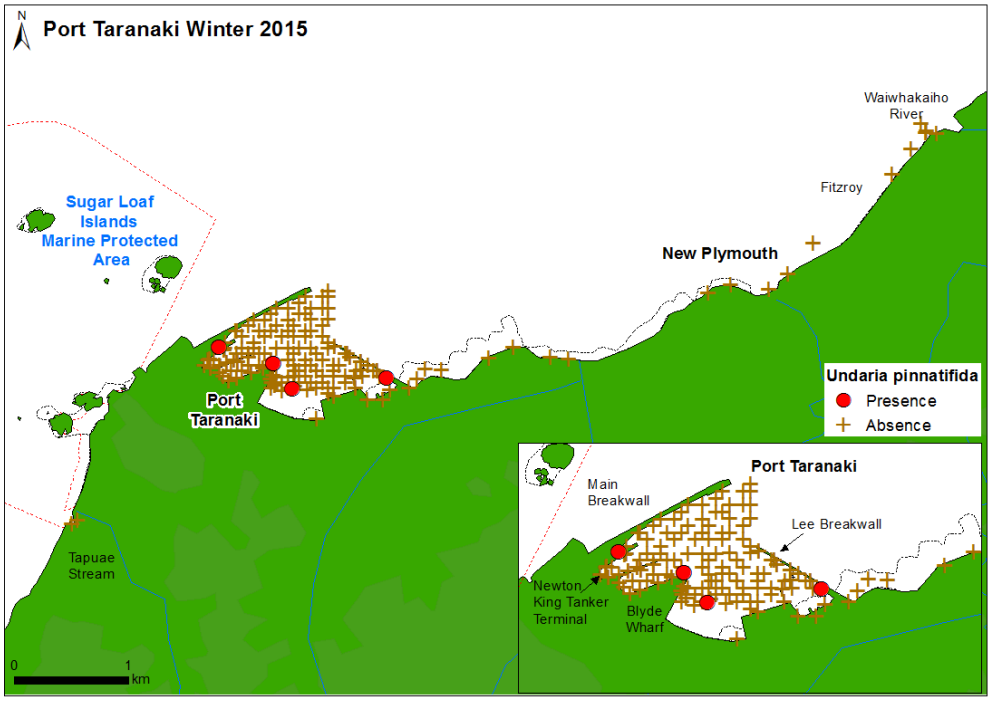
Picton/Havelock Winter 2015



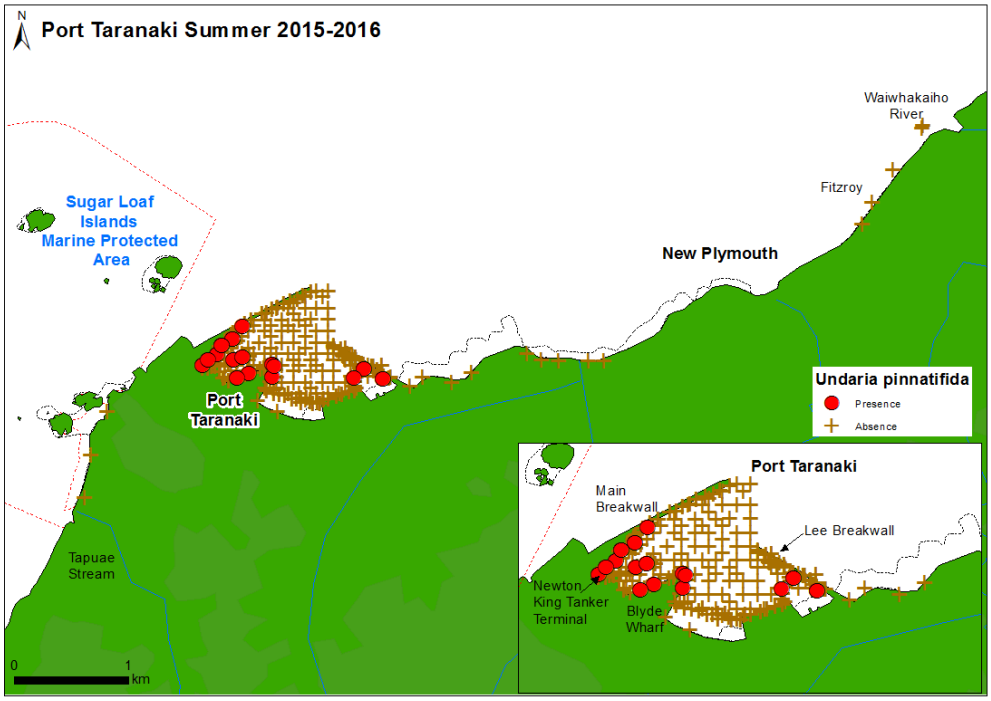
Picton/Havelock Summer 2015–16



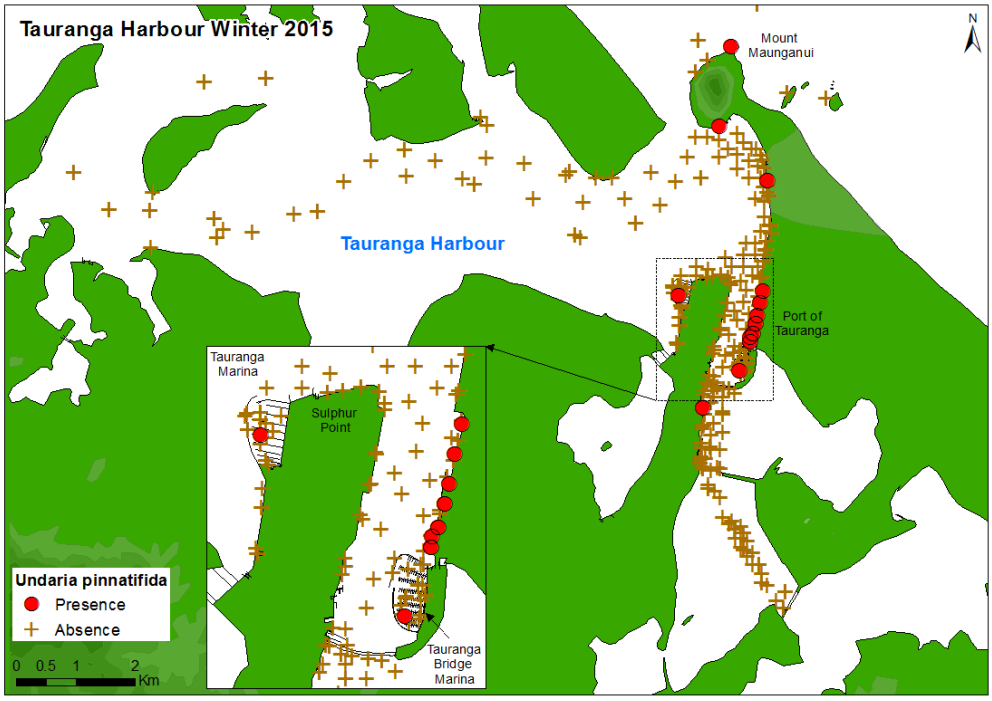
Port Taranaki Winter 2015



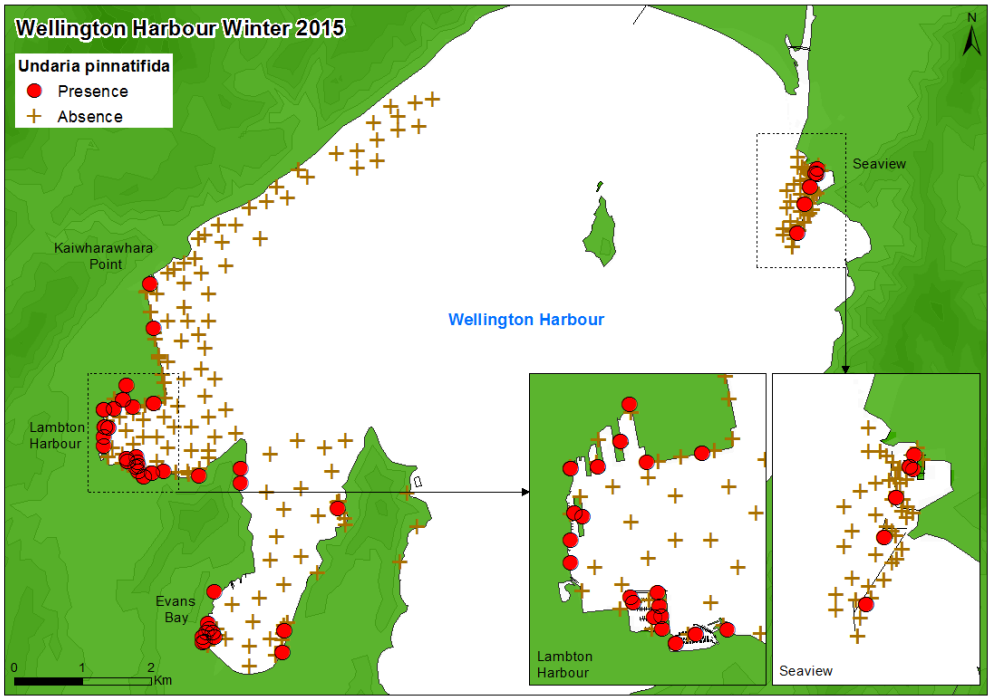
Port Taranaki Summer 2015–16



Tauranga Harbour Winter 2015



Wellington Harbour Winter 2015



Wellington Harbour Summer 2015–16