
**Targeted survey for non-indigenous
marine species in Port Taranaki, New
Zealand**

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Targeted survey for non-indigenous marine species in Port Taranaki, New Zealand

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Prepared for

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Executive Summary

The objectives of the targeted survey for non-indigenous marine species in Port Taranaki, commissioned by Tasman District Council, were to detect incursions of seven primary and three secondary target marine species and, where possible, to detect incursions of other non-indigenous species not previously known from Port Taranaki or the surrounding area. The primary target species are listed on the unwanted organisms register under the Biosecurity Act 1993 and are considered to present a significant risk of arriving and establishing in New Zealand: the alga *Caulerpa taxifolia*, the Japanese kelp *Undaria pinnatifida*, the polychaete worm *Sabella spallanzanii*, the bivalve *Potamocorbula amurensis*, the crab *Carcinus maenas*, the seastar *Asterias amurensis* and the ascidian (seasquirt) *Styela clava*. Two of these species (*S. spallanzanii* and *S. clava*) are already present in New Zealand but at a limited number of locations, while *U. pinnatifida* is widespread along the east coast of the South Island and southern North Island. The secondary species are known to be established in New Zealand's coastal waters but are confined to a limited number of geographic locations: the bivalve *Musculista senhousia* and the seasquirts *Didemnum* sp. and *Eudistoma elongatum*. Methods used were compatible with those used in the surveys for MAF Biosecurity New Zealand's (MAFBNZ) targeted surveillance programme for non-indigenous marine species, delivered by NIWA at other ports and harbours around New Zealand. The target-species survey of Taranaki follows a baseline biological survey of Golden Bay, including Port Taranaki, commissioned by MAFBNZ in 2007.

A total of 87 locations was surveyed in Port Taranaki in July 2010, using a variety of techniques designed to sample a range of habitat types encompassing soft and hard surfaces, such as mud and gravel bottoms and artificial structures, including pontoons, pilings, moorings, jetties and commercial vessel berths. The sampling techniques used were crab box traps, starfish traps, epibenthic sled tows, and diver and shore searches. Target location numbers were met for all sample types.

Five specimens were collected during the survey and sent to the Marine Invasives Taxonomic Service (MITS) for identification, including three ascidians, one bryozoan and one fish.

Two primary target species, the clubbed tunicate *Styela clava* and the Japanese kelp *Undaria pinnatifida*, were collected. *Undaria* was first recorded in Port Taranaki in 2002 but *Styela* has not previously been reported from this location. Several other non-indigenous species already known to be widespread in New Zealand were also recorded, of which the most conspicuous was the colonial ascidian *Didemnum* sp. *Didemnum* was first recorded in Port Taranaki in 2006.

1. Introduction

1.1 Objectives of the target-species survey in Port Tarakohe

The primary objective of the target-species survey in Port Tarakohe was to detect incursions of seven primary target marine species (see Section 1.3, below). The secondary objectives were to:

- Detect incursions of non-target non-indigenous or cryptogenic¹ species not previously recorded in New Zealand
- Detect incursions of established non-indigenous or cryptogenic species which are exhibiting invasive characteristics (i.e. range extensions of established organisms).

The present target-species survey of Port Tarakohe follows a baseline biological survey of Golden Bay, including Port Tarakohe, commissioned by Ministry of Agriculture and Forestry Biosecurity New Zealand (MAFBNZ) in November 2007 (Stuart et al. 2009). Baseline biological surveys are designed to provide a snapshot of the species of animals and plants (indigenous and non-indigenous) present at a given location at a given time. Target-species surveys such as the present one, in contrast, are designed to provide surveillance for identified high-risk species at one or more locations.

Target-species surveys employ rapid, cost-effective methods appropriate to the target species and focus on high-risk habitats (i.e. those where the target species are most likely to arrive and/or settle). The use of rapid, cost effective methods allows the intensity (and frequency in cases where the survey is part of a continuing programme) of sampling to be maximised, thereby maximising the likelihood of detecting an incursion of a target species given the resources available for the survey. MAFBNZ currently commissions a target-species surveillance programme, run by NIWA, covering eleven ports throughout the country that are surveyed at six-monthly intervals². A smaller-scale survey was run in Tutukaka Harbour for Northland Regional Council in April 2010 (also by NIWA).

¹ Cryptogenic species are those whose status as indigenous or non-indigenous is uncertain because their taxonomy is uncertain or because their natural range is not known.

² For further information see <http://www.biosecurity.govt.nz/about-us/our-publications/technical-papers#surveillance-design-for-early-detection>.

1.2 Survey area

Port Tarakohe (40° 49'S, 172° 54'E) is a small, artificial harbour in the southeast corner of Golden Bay (Figure 1). The survey area consisted of the area enclosed within the breakwalls of Port Tarakohe (Figure 1). This area includes a public boat ramp and floating pontoon for recreational vessels on the western side. The eastern side of the harbour contains a commercial wharf, 125 m long and constructed from wooden piles supporting a concrete deck. Construction of the breakwalls and southern part of the commercial wharf began in 1977 (Stuart et al. 2009). Vessels using the southern half of the wharf include barges and others servicing the mussel farms in Golden Bay. The older, northern half is in poor state of repair and, at the time of the present survey, was occupied by a former trawler (see below for further discussion of this vessel). North of the wharf lies a marina for 61 vessels (10-30 m), including approximately 40 recreational vessels and 20 commercial (mussel barges and a range of small commercial vessels)³. The marina was opened in 2005 and consists of piles and floating pontoons. The outer harbour contains 12 swing moorings. The breakwalls are constructed of limestone riprap boulders. The marina will be enlarged in the near future to accommodate 100-120 vessels. The number of swing moorings will not change but they will be moved into the western side of the inner basin, near the boat club.

Port Tarakohe is a local hub for recreational yachts and is also the home port for vessels servicing mussel farms in Golden Bay and for local fishing vessels, including scalloping. It is also used by small coastal bulk carriers, support vessels for the oil industry and small cruise liners. Between 2005-2007, there were typically 180-200 movements per month of mussel aquaculture vessels from Port Tarakohe, approximately 20 movements of fishing vessels (rising to up to 390 per month during August to October), and 1-8 movements of tugs and barges (Stuart et al. 2009). Between 5,000 and 10,000 vessels use the boat ramp each year (Stuart et al. 2009).

The harbour was designed to be self-flushing and has only been dredged once since its construction, in 1979. A hydrographic survey in 2007 showed very little change from the dredged depth.

³ Information on the port and marina was supplied by Alan Kilgour, Harbour Manager Port Golden Bay, 16 August 2010.



Figure 1: The location of Port Tarakohe at the top of the South Island, New Zealand, and features of the port. Note that a 70-m long extension to the western breakwall is not shown in this image. This extension is located to the north of the boat ramp area, runs perpendicular to the main breakwall, and mirrors the extension on the eastern side that protects the north side of the marina.

1.3 Target species in Port Tarakohe

Eight marine organisms are defined as Unwanted Organisms under the Biosecurity Act 1993 and have been identified as primary target organisms for the MAFBNZ target-species surveillance programme. These are:

- The green alga *Caulerpa taxifolia*,
- The Japanese kelp *Undaria pinnatifida*
- The northern Pacific seastar *Asterias amurensis*,
- The Mediterranean fanworm *Sabella spallanzanii*,
- The European green crab *Carcinus maenas*,
- The Chinese mitten crab *Eriocheir sinensis*,
- The Asian clam *Potamocorbula amurensis*,

- The clubbed tunicate (ascidian or ‘seasquirt’) *Styela clava*.

Seven of these species were included as target species in the present survey of Port Tarakohe. The Chinese mitten crab was not included because target habitats for detecting this species (river mouths and estuaries) are not present in the survey area. *Undaria pinnatifida* is widespread throughout New Zealand, and has previously been recorded in Port Tarakohe (Stuart et al. 2009). There are established populations of *Styela clava* in Whangarei Harbour, the Waitemata Harbour and Hauraki Gulf, Lyttelton Harbour and Otago Harbour. Small numbers were detected in Port Nelson in May 2010. There are established populations of *Sabella spallanzanii* in Lyttelton and Waitemata Harbours.

Three secondary target organisms have also been identified as part of the MAFBNZ target-species surveillance programme. These are not currently listed as Unwanted Organisms and are known to be established in New Zealand’s coastal waters. These are:

- The Asian date mussel *Musculista senhousia*,
- The Australian droplet tunicate *Eudistoma elongatum*,
- The colonial tunicate *Didemnum* sp.⁴

Didemnum sp. was removed from the list of secondary target species in MAFBNZ’s target-species surveillance programme in 2008 but all three species were included in the present survey. *Didemnum* sp. was included because, following its first detection in Port Tarakohe in 2006, it was the subject of a subsequent attempt at eradication (Stuart et al. 2009).

Notable non-indigenous species that have been detected in Port Nelson during the last 1-2 years and that might, therefore, potentially arrive in Tarakohe, include the red alga *Grateloupia turuturu*, the tunicates *Clavelina lepadiformis* (the light-bulb ascidian) and *Styela canopus*, and the fish *Arenigobius bifrenatus* (the Australian bridled goby).

2. Port Tarakohe surveillance

The targeted surveillance survey of Port Tarakohe took place from 29-30 July 2010 during a period of calm, sunny weather. The design of the survey was based on those of the MAFBNZ target-species surveillance programme.

⁴ Given the difficulty in identifying *Didemnum* to species in the field (or in the laboratory: Mike Page, NIWA, pers. comm.), we have referred to it here as *Didemnum* sp. rather than try to identify it to species level.

2.1 Sample collection

A total of 87 locations were surveyed during the survey (Table 1), using 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 pontoons, pilings, moorings, jetties and commercial vessel berths. The sampling techniques used were crab box traps, starfish traps, epibenthic sled tows, and diver and shore searches (Table 1). The habitats and species targeted by traps and sled tows are shown in Appendix 1. Diver searches target any surface-living target and non-target species. Shore searches target living organisms in the intertidal and shallow subtidal area and also beach-cast material such as seaweeds, bivalves and the moulted exoskeletons of crabs. The sample locations for each technique are shown in Appendix 2. Sampling locations were recorded at the time of sampling using a hand-held GPS.

Table 1 Sampling effort summary for Port Tarakohe survey.

Sampling method	Target habitat	Target number of survey locations	Locations surveyed	% of target
Crab (box) trap lines ^{1*}	Soft sediment (mud)	20	20	100
Starfish trap lines ²	Soft sediment (mud)	9	9	100
Epibenthic sled tows	Soft sediment (mud/gravel)	20	25	125
Diver searches	Hard substrata (artificial structures)	20	21	105
Shore searches	Beaches, intertidal rock and artificial structures	12	12	100
Sample total		81	87	107

¹ 3 traps per line, ² 2 traps per line

2.2 Target species recorded

Primary target species detected³: Two (*Styela clava* and *Undaria pinnatifida*)

Secondary target species detected⁴: One (*Didemnum* sp.)

³ *Asterias amurensis*, *Carcinus maenas*, *Caulerpa taxifolia*, *Sabella spallanzanii*, *Potamocorbula amurensis*, *Styela clava*, *Undaria pinnatifida*

⁴ *Musculista senhousia*, *Eudistoma elongatum*, *Didemnum* sp.

2.3 Specimens collected

Five specimens were collected and sent to the Marine Invasives Taxonomic Service (MITS) for identification, including three ascidians, a bryozoan and a fish. Full details and identifications are given in Table 2. MITS is a service run by NIWA on behalf of MAFBNZ and receives all marine biosecurity related specimens submitted to MAFBNZ (including those collected during MAFBNZ's target-species surveillance programme). MITS catalogues each specimen, ensures correct handling and preservation, and sends specimens out to appropriate experts for identification. When the specimen has been identified, MITS forwards the information to MAFBNZ and archives the specimen.

Table 2 Sample collection information for specimens collected from the survey. Site numbers correspond to those shown in Appendix 2. MITS identification numbers are also shown.

MITS ID	Site ID	Method	Latitude	Longitude	Species	Taxon	Status
69714	TKH161	Dive	40° 49.295S	172° 53.834E	<i>Asterocarpa cerea</i>	Ascidian	Indigenous
69715	TKH107	Sled	40° 49.319S	172° 53.717E	<i>Forsterygion lapillum</i>	Fish	Indigenous
69716	TKH157	Dive	40° 49.331S	172° 53.834E	<i>Celleporaria nodulosa</i>	Bryozoan	Non-indigenous
69717	TKHExtra1	Dive	40° 49.335S	172° 53.831E	<i>Styela clava</i>	Ascidian	Non-indigenous
69718	TKHExtra1	Dive	40° 49.335S	172° 53.831E	<i>Botrylloides leachi</i>	Ascidian	Cryptogenic

3. Distribution of non-indigenous species within the port

Distribution maps were plotted for target species (*Didemnum* sp., *Styela clava* and *Undaria pinnatifida*) and the non-indigenous bivalve *Theora lubrica* (Appendix 3). The maps show locations where each species was recorded (as red dots) and also locations where it was absent (based on sampling methods appropriate to that species).

Didemnum vexillum was identified from Port Tarohe in June 2006 (Stuart et al. 2009) and eradication was attempted by wrapping infected structures in plastic sheeting. *D. vexillum* had not been recorded during a previous baseline survey in April 2005 (Bennett et al. 2006, cited in Stuart et al. 2009) nor was it among the nine non-indigenous and 13 cryptogenic species recorded in Golden Bay during the baseline survey in November 2007 (Stuart et al. 2009). During the present survey, however, *Didemnum* sp. was widespread and abundant on artificial structures including the boat-ramp pontoon, marina pontoons and piles in the marina and commercial wharf (Appendix 3). It was not generally present on the rip-rap rock wall around the inside of the harbour, other than around the boat ramp.

Styela clava has not previously been reported from Port Tarakohe (or elsewhere in Golden Bay). This Unwanted Organism was first recorded in New Zealand (Waitemata Harbour) in August 2005 and has subsequently been detected in the Hauraki Gulf, Lyttelton Harbour, Whangarei Harbour, Tutukaka Harbour and Otago Harbour, although there have not been any further records from Tutukaka since the original detection (and removal of all individuals found) in November 2005. Small numbers of individuals were found on the hulls of vessels in Waikawa Marina (near Picton) and Port Nelson in 2005 and 2006, respectively. No further specimens were collected in either location during subsequent target-species surveys until May 2010, when four individuals were collected from piles in Port Nelson.

A single individual of *Styela clava* was found during the present survey, on the hull of the former fishing vessel the *Hemnestral*, moored on the older part of the commercial wharf (Appendix 3). This vessel had previously been in Lyttelton Harbour for three years and is thought to have arrived in Port Tarakohe in 2010⁵. The specimen was found on the port side of the *Hemnestral's* stern, just under the water line. It was surrounded by small (~1.5 cm) blue mussels so that only ~2 cm of the ascidian (including siphons) was exposed. It was ~6.5 cm long and in reproductive condition (Mike Page, NIWA, pers. comm.).

Theora lubrica has been present in New Zealand since at least 1971. It is known to have a very wide distribution in both the North and South Islands, including Nelson, Havelock and Picton Harbours, occurring in fine, muddy sediments. It was recorded in a previous survey of the fauna of sediments within the harbour in April 2005, particularly around the boat ramp (Bennett et al. 2006, cited in Stuart et al. 2009). It was not recorded in the baseline survey in 2007 (Stuart et al. 2009). During the present survey it was recorded in sled tows around the entrance to the harbour, the outer basin, the western part of the inner basin and in the marina.

Undaria pinnatifida has been present on marine farms at Collingwood since 1998 and was first recorded from vessels in Port Tarakohe in 2002 (see references in Stuart et al. 2009). It was also present on fixed structures in the harbour by April 2005. It was recorded during the baseline survey in November 2007 (Stuart et al. 2009). *Undaria* was not widespread during the present survey and was only recorded on the northern part of the marina, on piles on the older part of the commercial wharf, and on the hull of the vessel *Hemnestral* berthed on the wharf.

Celleporaria nodulosa is an introduced bryozoan (colonial, often encrusting animals) and has been recorded from several locations in New Zealand, including Nelson. It

⁵ Email from Al Campbell, Top of the South Marine Biosecurity Partnership Coordinator, to Lindsay Vaughan, Tasman District Council, 5 August 2010.

was not recorded during the previous surveys of Port Tarakohe in 2005 and 2007 (Stuart et al. 2009).

4. Acknowledgements

Thanks to Lindsay Vaughan and Steve Hainstock (TDC), Dirk de Vries (Department of Conservation) and Stephen Brown, Dan Cairney and Megan Carter (NIWA) for their help with the field work. Thanks to Kim Seaward (NIWA) for preparation of maps and Anna Bradley (NIWA) for data entry.

5. References

Bennett, C., Butcher, R., Stevens, L. (2006). Baseline monitoring of Port Tarakohe, Golden Bay. Cawthron Institute Report No. 1143, prepared for Tasman District Council.

Stuart, M., Jones, E., Piola, R., McClary, D. (2009). Golden Bay non-indigenous species port survey. Baseline surveys of new ports and marinas. Report prepared by Golder Associates and the Cawthron Institute for MAF Biosecurity New Zealand, Wellington, August 2009, 58 p.

Appendix 1: Summary of sampling methods, target species and habitats. Underlined species have been collected using this method during targeted species surveillance programmes in New Zealand.

Method	Target species	Example non-target species	Habitat	Spatial coverage	Effectiveness	Cost effectiveness	Feasibility
Epibenthic sled tows	<i>Asterias amurensis</i> <i>Caulerpa taxifolia</i> <u><i>Eudistoma elongatum</i></u> <u><i>Musculista senhousia</i></u> <i>Potamocorbula amurensis</i> <u><i>Sabella spallanzanii</i></u> <i>Styela clava</i>	<u><i>Acentrogobius pflaumii</i></u> <u><i>Chaetopterus</i> sp.</u> <i>Charybdis japonica</i> <u><i>Didemnum</i> sp.</u> <i>Grateloupia turuturu</i> <i>Hypnea</i> sp. <u><i>Pyromaia tuberculata</i></u> <u><i>Theora lubrica</i></u>	Subtidal soft sediments Particular focus on known shellfish beds (for <i>Asterias</i>) and areas next to public access (e.g. wharves, boat ramps, Harbours, etc. <i>Caulerpa</i> , <i>Sabella</i>)	Narrow width but 50 m tow length and high replication (100+ per location) enables a reasonably large area to be sampled (ca 2500 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 fill mouth of sled
Starfish traps	<i>Asterias amurensis</i> <i>Carcinus maenas</i>	<u><i>Charybdis japonica</i></u> <u><i>Pyromaia tuberculata</i></u>	Adjacent to wharf pilings and other artificial habitats	Sampled area is dependent on dispersion of bait odour. High replication possible.	Has been used effectively to monitor <i>Asterias</i> in Australia and benthic predators around marine farms in NZ	Quick to deploy and recover, so high replication possible	Most locations and weather conditions
Box (crab) traps	<i>Carcinus maenas</i>	<u><i>Acentrogobius pflaumii</i></u> <u><i>Charybdis japonica</i></u> <u><i>Pyromaia tuberculata</i></u>	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 (<i>Ovalipes</i> , <i>Macrophthalmus</i> , <i>Charybdis</i>)	Quick to deploy and recover, so high replication possible	Most locations and weather conditions

Appendix 2 Maps showing locations in Port Taranaki sampled in July 2010.

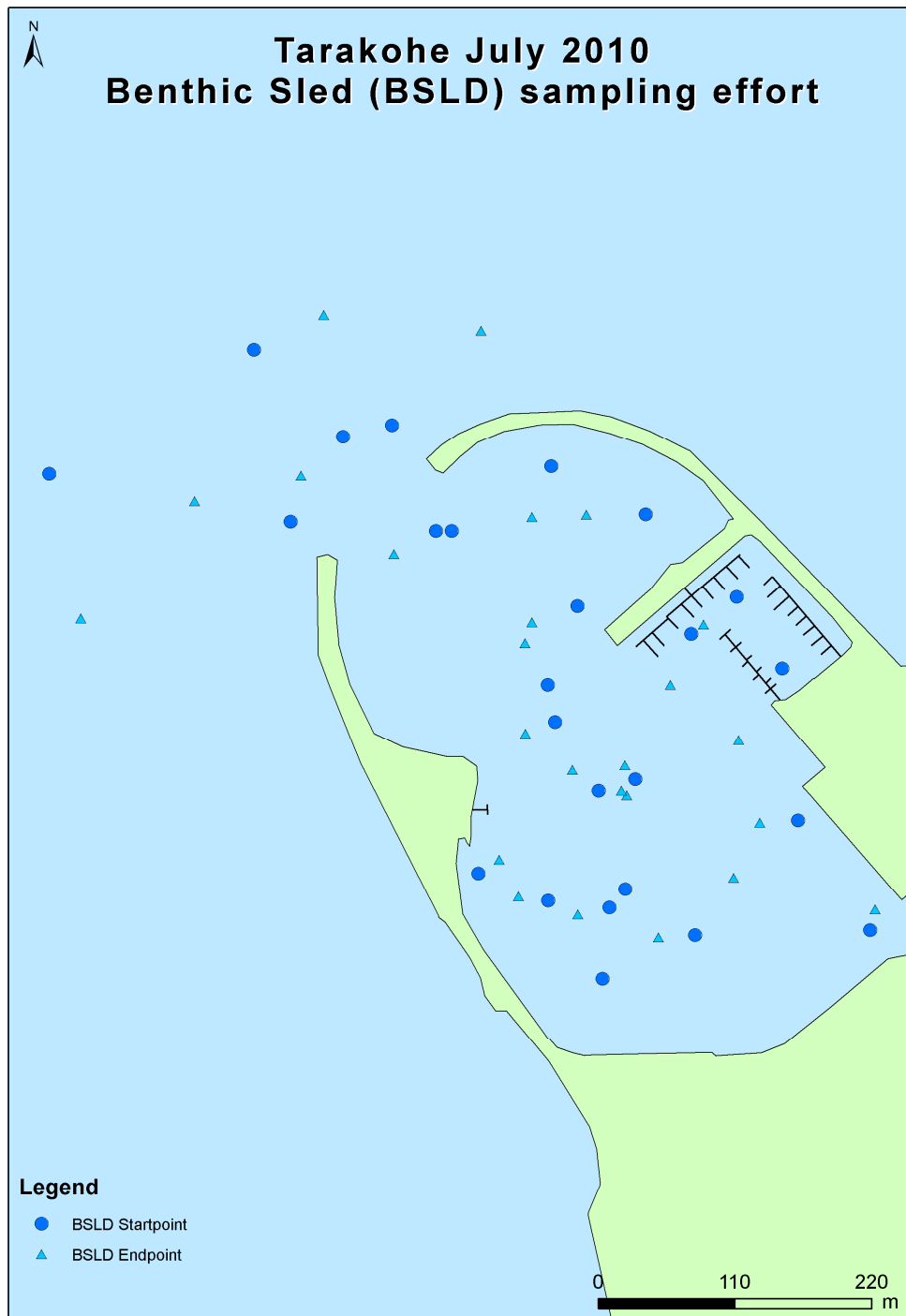
Crab (box) trapping locations



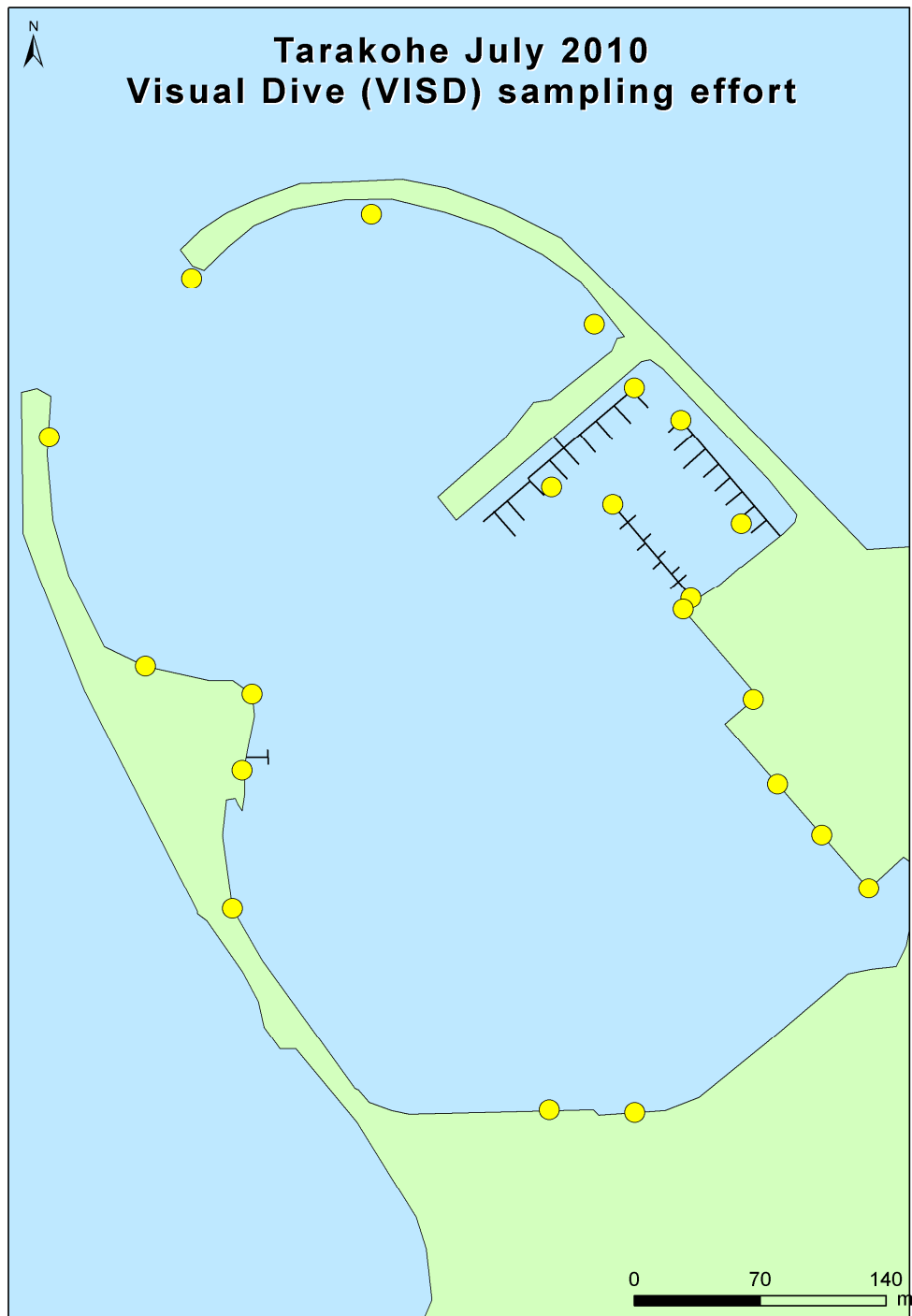
Starfish trapping locations



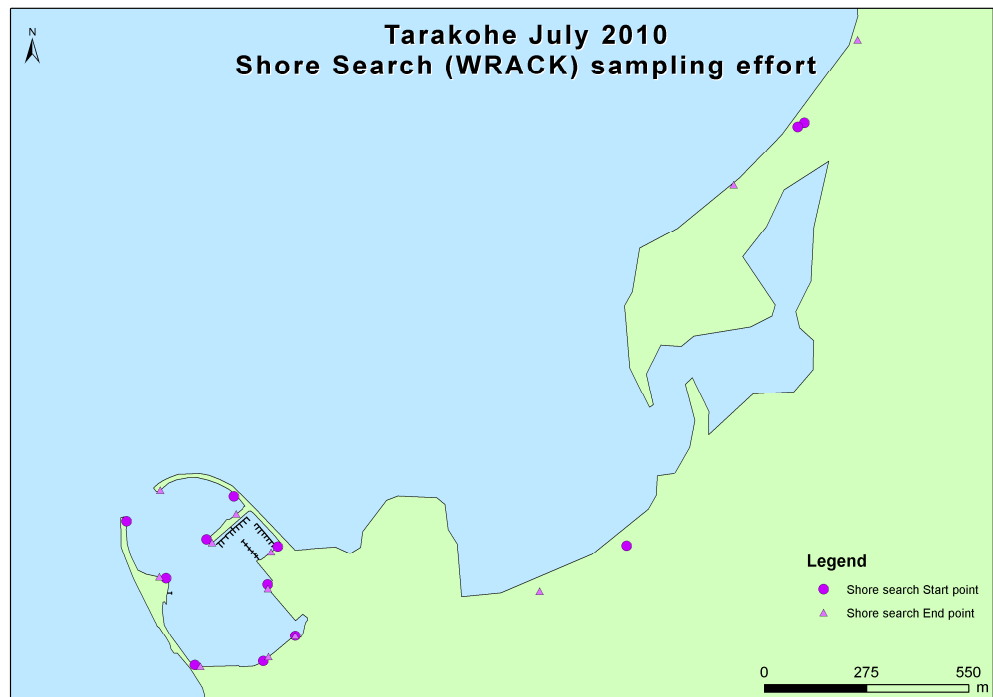
Sledding locations



Dive search locations

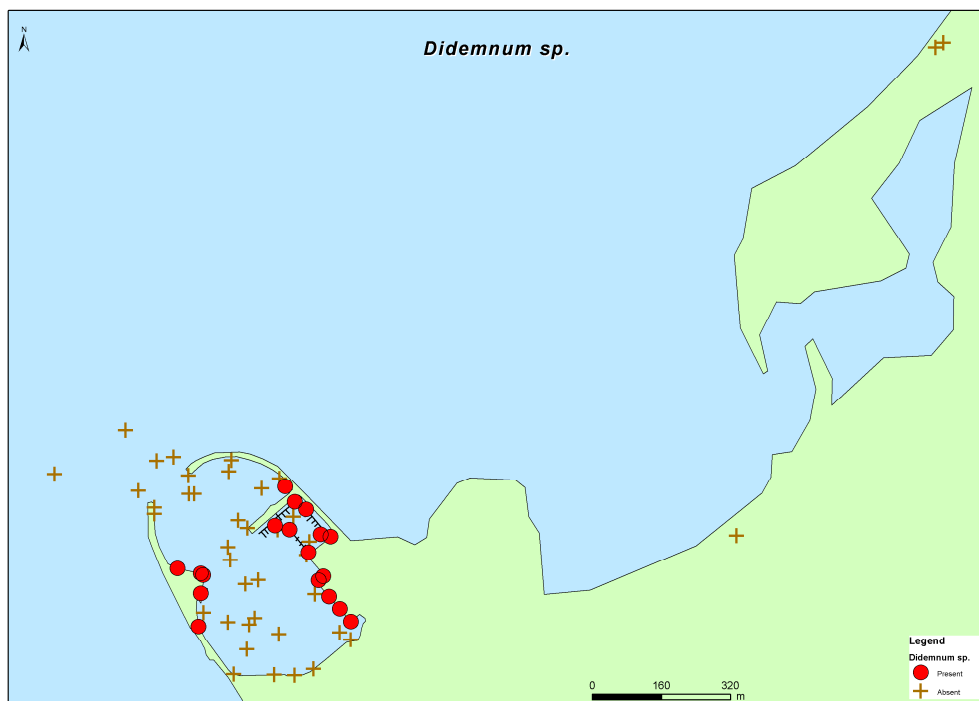


Shore search locations

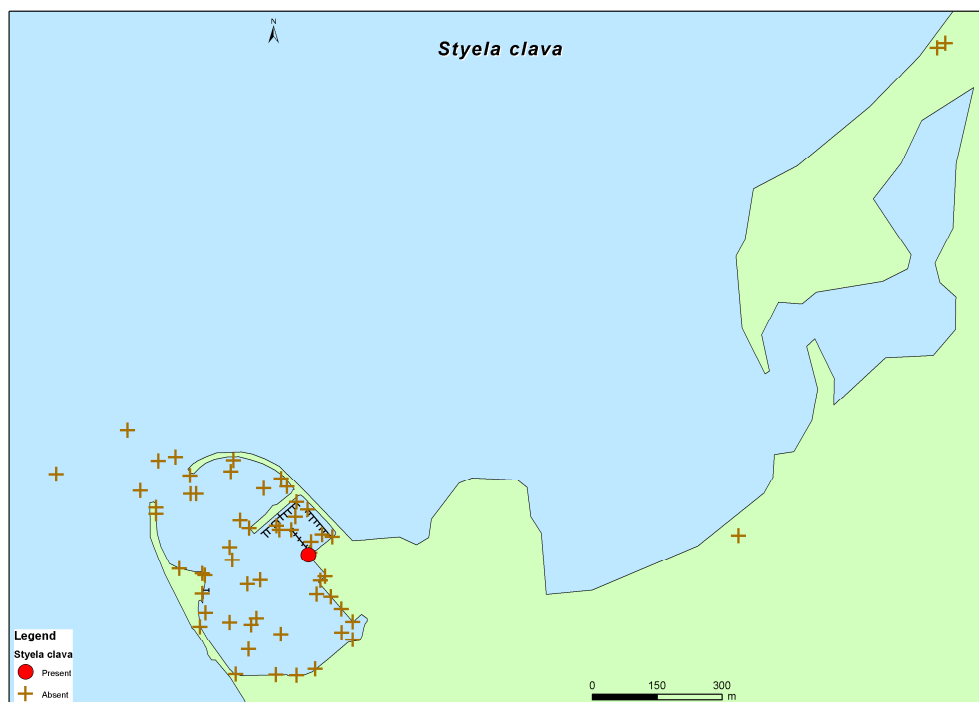


Appendix 3 Distribution maps for selected non-target species in Port Tarakohe in July 2010.

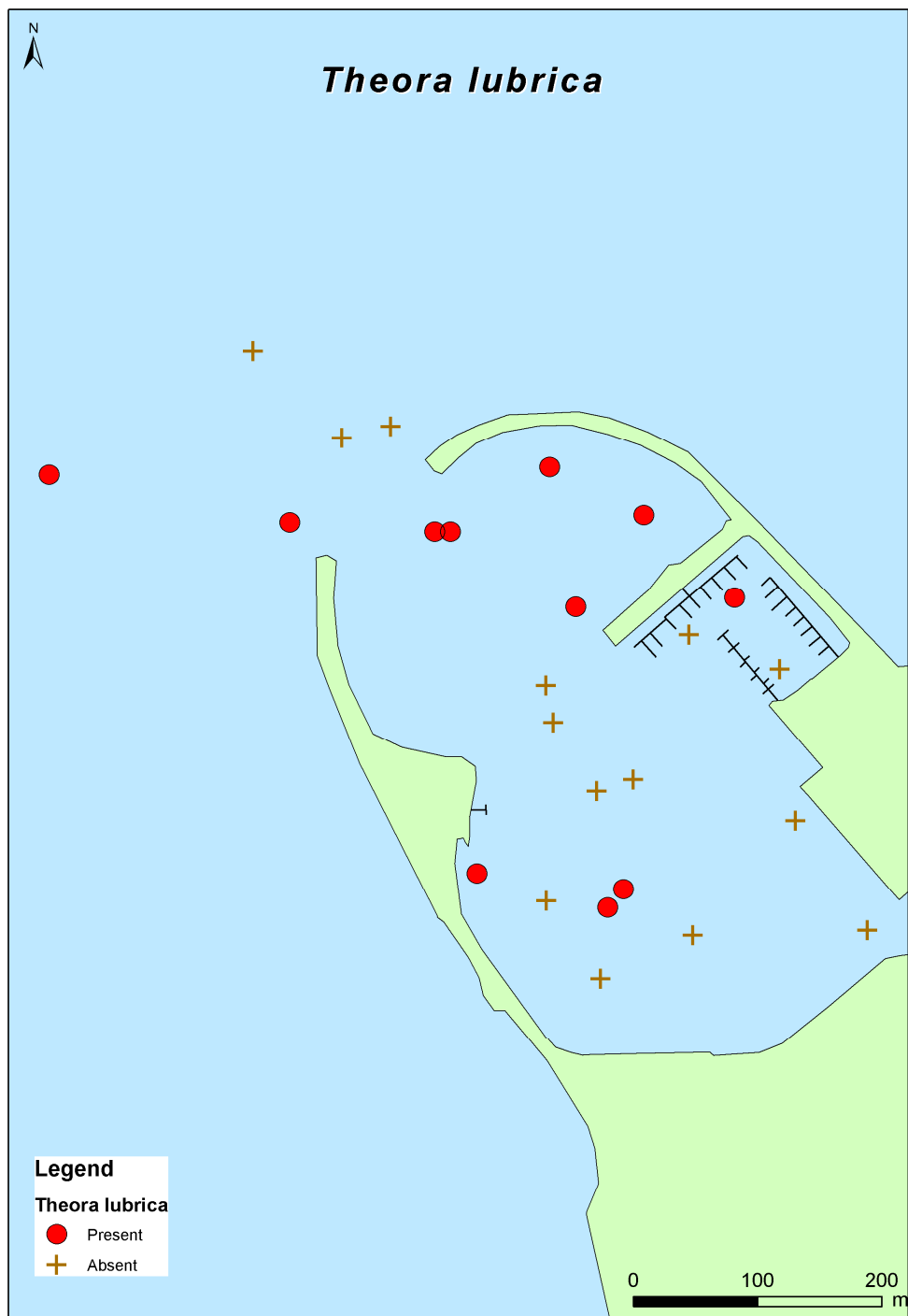
Didemnum sp. Absences are based on sled tows, diver and shore searches.



Styela clava. Absences are based on sled tows, diver and shore searches.



Theora lubrica. Absences are based on sled tows.



Undaria pinnatifida. Absences are based on sled tows, diver and shore searches.

