26/05/13

Final Report on *Sabella* incident May 2013

Introduction

This report to the Nelson City Council reviews actions taken on notification of an incursion of the fanworm *Sabella spallanzanii* in Nelson Harbour. Identification has been confirmed but spawning is unlikely to have occurred due to immaturity of the specimens examined and that there appeared to be a single age class of worms on the vessel.

Actions

Description

General cargo ship MANINI at Auckland 23 Feb 2013.

Built:	1988 1,185 GT 1,210 DWT 67.39m x 11.42m x 3.51m
Flag:	Cook Islands 11 knots ex SPICA, FORTUNA COAST, SOUTHERN TIARE
Owner:	Matson Cook Islands Ltd, Honolulu
Manager:	Tranz Pacific Ship Management, Auckland
MMSI:	518132000
Callsign:	E5U2082
Former name(s):	Spica (Until 2004 Apr) Fortuna Coast (Until 1995)
Vessel type:	General Cargo
Gross tonnage:	1,185 tons
Summer DWT:	1,210 tons
Length:	63 m
Beam:	12 m
Draught:	3.2 m

27 March 2013

Vessel Manini ex-Auckland registered in Rarotonga steams Auckland to Nelson for refit by Amex Marine Services Nelson. Goes onto lay up berth 2 behind Sealords.

26 April 2013

Moved to McGlashen Quay North.

Friday, 3 May 2013

4.30 pm Slipped Caldwell slipway Nelson. Inspected underwater by Bruce Lines for fit on slip and he noted infestation of suspect organisms.

5.57 pm Email from Don Morrisey, NIWA, to Peter Lawless and Lindsay Vaughan

Hi

I've just had a call (Friday evening) from Bruce Lines (NZ Diving Services) to say that there is a boat on the Caldwell Slipway in Nelson with a heavy infestation of Sabella spallanzanii on its hull. He does not know where it has come from but thinks it has been sitting on the layup berth in Nelson for 3-4 weeks before going up on the slip. The vessel is the Manini, registered in Raratonga, and Bruce reckons it is about 100m (sic) *long. It seems like the slipway has not started work on cleaning it yet.*

I've let BNZ know via their 0800 number and just spoke to Rissa Williams about it. I'll try to get into the slipway tomorrow morning (Saturday) to have a look and collect a sample and photos.

I'll be in the office on Monday if you want to discuss.

Best wishes.
Don

Peter Lawless tried to ring Martin Workman and Lindsay Vaughan at home but no answer so forwarded emails.

Saturday, 4 May 2013

7.00 am Water blasting began with Nelson City water at 6000psi. All water and material washed to contained sump. Water behind dam with some leakages around seals down slipway into harbour. Sump hand cleaned of debris which was placed in wool sacks for transit to land fill in York valley. All water reaching sump pumped out through plate settlers for discharge to sewer. Sewer goes to Bell's Island with transit time of 15 to 20 days.

11.58 am Email from Don Morrisey NIWA to Rissa William MPI, Peter Lawless, Lindsay Vaughan and others.

Hi Rissa

I went down to the slip this morning (Sat), having phoned them and been told that no--one would be working, to find that the Manini was being water blasted. I managed to get onto the slip as Bruce suggested, and collected some worm tubes off the underside of the hull towards the bow, and took some photos. Couldn't get to the stern as they were working there. I've preserved the specimens and will send to MITS on Monday. I had a word with the skipper, who has recently bought the boat – it has been in Auckland for some months prior to arriving in Nelson 3-4 weeks ago, as Bruce indicated. Since arriving in Nelson it has been on the layup berths.
Will be back in the office on Monday.

Cheers.
Don

Monday, 6 May 2013

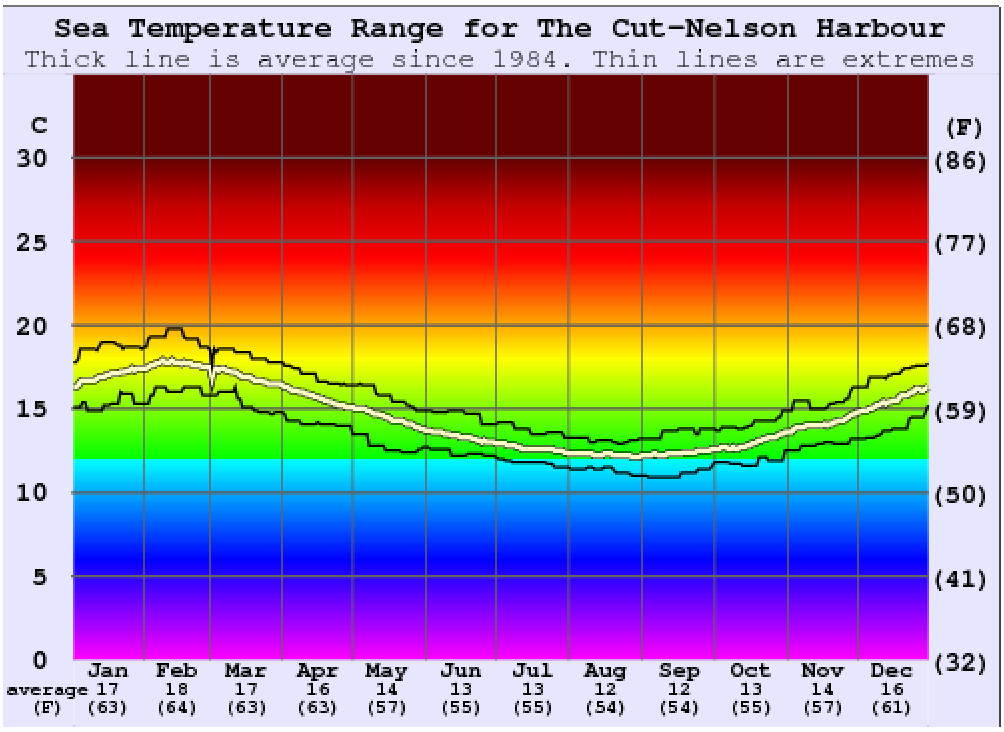
8.15 am	Rang Martin Workman and briefed him.
8.20 am	Rang Don Morrisey NIWA and got advice on status of his work. Sending samples to MITS this morning. ID uncertain.
8.25 am	Rang Rissa Williams MPI and agreed that I would deal with Caldwell slipway.
8.30 am	Rang Caldwell slipway – no answer.
8.32 am	Rang Thomas Marchant Port Nelson who advised that I continue ringing the slip and who offered to gather information on the vessel's movements.
8.45 am	Rang Caldwell slipway and talked with Andy Wills the supervisor and agreed to meet on site.
10.00 am	Met on site with Matt Molloy, Barrie Forrest, Grant Hopkins (Cawthron), Don Morrisey and other NIWA and Cawthron staff. Worms inspected by scientists and suggested they were 70% certain they were *Sabella*. Leathery striated casing were positive indicators but all worms were dead so crown could not be seen. The tubes seen were just over 100mm long and Andy Wills said the longest he saw removed were 120mm. Vessel reportedly last anti-fouled February 2012 in Papua New Guinea. Andy Wills also reported that he had enquiry to slip the Daniel Solander which is also in Auckland and likely fouled with fanworm. He will let us know if that will take place.

11.46 am Matt Molloy followed up with Bruce Lines to thank Bruce for his prompt action.

12.55 pm Discussed with Don McKenzie Northland Regional Council. Don Advised that at temperatures of 19 to 20°C Sabella is just getting gravid now. The males have already released their sperm and the eggs are maturing in the females. The release is triggered by a drop in temperature. In Northland they grow 1cm per month. This means that surveying in October November would be optimal when the chances of discovery were highest and they will not yet be ready to spawn. Hand removal by divers is the best treatment. They are most likely to be at the bottom of the piles adjacent to where the vessel was berthed and eradication is real possibility. He recommends using NZ Dive and Salvage in association with local divers for best results.

Today's The Cut-Nelson Harbour sea temperature is 15.7 °C.

Statistics for **06 May** (1981–2005) – **mean: 15.1 °C**, range: 13.7 °C to 16.5 °C



Wednesday, 8 May 2013

Report from Dr Geoff Read NIWA - 10:21 a.m

Hi Don

The parcel came in this morning. The worms in the sample are immature. Body size would need to be twice the length and oocytes would need to be around 200- 250 um at spawning. Report as follows:

Sabella spallanzanii, x9, 4/05/2013, Nelson, Calwell Slipway, Vessel "Manini", forward on hull, collected Don Morrisey, exposed 1 day after slipping. Fixed 10% formalin.

Sample of nine young S. spallanzanii, longest BL (excludes fan) 64 mm, smallest BL 40 mm. These are too small to be reproductively mature. Coelomic fluid examined for two specimens.

#1 BL 55 mm, no gametes
#2 BL 62 mm, a few oocytes, max 70 um dia.

Geoff

Don Morrisey NIWA - 11.56 am

The worms I collected from the Manini on Saturday have been identified by Geoff Read today, and his report is below. Bad news is that they are S. spallanzanii, but all of those collected were much smaller than reproductive size, and there were no mature oocytes in the 2 worms Geoff took coelomic fluid from. The information has been sent to Rissa Williams at MPI. I didn't see any larger specimens among the worms we picked out of the debris on Monday - max length of any tubes I saw was 10cm - did anyone else see anything larger?

We'll try to include Lay Up Berth 2 in our next surveillance survey (27-31 May) but it is very unlikely anything that if any worms had settled as larvae from this boat they would be large enough to see by then. However, worms could have been knocked off the hull so we'll try to search the seabed at the berth using our ROV or possibly divers, unless there are plans to do any searching before then (eg. using NZ Diving Services).

Cheers.
Don

Contacted Martin Workman and asked for direction on media.

Discussed with Rissa Williams, MPI, who offered to identify an MPI comms person.

Offered to draft a press release – accepted by Martin Workman.

Contacted Environment Waikato media person and offered them a briefing as they have a similar incident in Coromandel Harbour:

Stephen Ward
senior media advisor
Waikato Regional Council
07 859 0782 or 021 756 310.

Talked with Andy Wills and briefed him and thanked him.

Completing report noticed suggestion from Don Morrisey for some further searching for worms that might have been knocked off.

4.00 pm Talked to Bruce Lines who recommended a grid search of the area round the slipway. He said the other sites should be okay as the worms have hung onto the hull for the voyage and would not have been disturbed in the lay up berth. Estimated cost for a thorough job $2K to $3K.

Emailed Martin and Rissa recommending a grid search in this area

Close off 27 May 2013

The Caldwell Slipway was thoroughly searched by Bruce Lines (funded by MPI) and no further *Sabella* were found. The other areas the Manini was berthed will be searched by NIWA in the survey commencing 27 May. All areas will be further checked in the summer survey. The Daniel Solander is no longer coming to Nelson.

A press release was issued by Nelson City Council and this was picked by local and national media.

The learnings from the event were incorporated into the incident exercise as part of the annual Partnership meeting. The report of the incident exercise should be read with this report.

The Organism

DESCRIPTION, DISTRIBUTION AND HABITAT

The fanworm is a tube-dwelling species with a crown of feeding tentacles that can vary in colour from a uniform dull white to brightly banded with stripes of orange, purple and white. Adult worms from base of tube to crown range in size from c. 90-400 mm.

The fanworm is native to the Mediterranean, and Atlantic coast of Europe and South America. It has established non-indigenous populations in Australia and NZ. Populations in NZ are well-established in Lyttelton and Auckland, and subject to an eradication attempt in Whangarei. There was also a recent incursion on a vessel in the Waikato region.

It is found in subtidal areas (up to 30m depth), and is described as a habitat generalist, occurring in a variety of habitats such as artificial structures, rock and soft sediments. It is described as having a preference for sheltered nutrient-rich waters.

BASIC BIOLOGY AND TOLERANCES

Fanworms have separate sexes, with gametes broadcasted (spawned) into the water column to be fertilised and develop into larvae. Knowledge of reproductive biology is sketchy and appears variable among different geographic regions. For example, in Australia spawning occurs during the winter months, coinciding with falling water temperatures, and sexual maturity is reached at c. 50 mm compared with c. 150 mm in its native range. The growth rate in Australia has been recorded as c. 15 mm per month during summer, but may be even faster in New Zealand. The fanworm can be found in temperatures ranging from 2°C to 29°C, meaning it could live anywhere in New Zealand, and is thought to live for at least two years.

Adult temperature range	Min 2.0 °C	Max 29.0 °C
Reproductive temperature range	Min 11.0 °C	Max 22.0 °C
Adult salinity range	Min 26.0 ppt	Max 39.0 ppt
Reproductive salinity range		
Depth	Min 0 m	Max 30 m
Habitat type	**Substrate** Bedrock Boulder Sand-coarse Cobble Sand-fine Gravel Sand-medium Silt Concrete Reef Vessel Wood	**Tidal range** Sub-tidal
Vectors for introduction	Vessels Fisheries and Aquaculture Natural dispersal	

KNOWN IMPACTS

Information on the actual effects of the fanworm is poor. It is considered to have the potential to alter native marine ecosystems and compete with native organisms for food and space, and affect nutrient cycling processes due to its high filtering capacity. The species is also considered to have the potential to influence fishing and aquaculture operations, both as a nuisance fouler and as a competitor to cultured filter-feeding species such as oysters and mussels. However, there appears to be little concrete evidence for such effects; one example arises from Australia where “meadows” of fanworm in soft-sediment habitats were reported to interfere with shellfish dredging (eg. clog dredges). Another Australian study termed this species “little more than a slight nuisance”. Nonetheless, in Australia it has been categorised as a “medium priority species”; i.e. a species having “a reasonably high impact/or invasion potential”.

In New Zealand, the fanworm has been found in quite high densities on vessel hulls, but populations in Lyttelton and Waitemata are reasonably dispersed by appear to be quite low density. Irrespective of the New Zealand situation, and the known impacts of the fanworm, it is relevant to consider that the invasiveness and impacts of many marine species can vary greatly, both over time and among locations. On that basis, the safest assumption regarding the fanworm is that it could reach abundances in the TOS that are sufficient to cause adverse ecological of economic effects, or affect other values (eg. alter the natural character of the seascape).

PATHWAYS OF SPREAD

Natural dispersal

Being a species that is fixed to any suitable surface, the fanworm relies on its larvae being spread as planktonic organisms in water currents. After this dispersal period (which can be up to 2-3 weeks), the larvae ”settle” to the seabed (or other suitable surface) to then grow into the adult worm. A 2-3 week planktonic phase means that larvae could be dispersed many tens of kilometres. Of course, the species may not extend its range by that distance, as larvae would need to settle very close to each other in order that successful spawning of the next generation occurred. Nonetheless, the fanworm clearly has considerable potential for spread by natural larval dispersal, especially given settling larvae would have a range of suitable habitats in the TOS (i.e. the fanworm may not encounter natural barriers that restrict its spread in the long term).

Human vectors

Biofouling is likely to be the primary mechanism for rapid and long distance human-mediated spread of the fanworm. The key activities in New Zealand that play a role in the spread of biofouling species are intra- or inter-regional vessel movements, and aquaculture activities such transfers of gear (eg. rope, floats, fish cages) and shellfish seed-stock among growing areas. There are numerous such activities in the TOS that connect different locations in the region and lead to a high connectivity with other regions of New Zealand. I have not attempted to source information on the exact degree of connection with presently infected regions (Lyttelton, Auckland, Northland), and it will vary with vector type, time of year etc. The safest assumption is that some connectivity already exists; for example, in a previous analysis of spread of the clubbed tunicate (*Styela clava*) from Lyttelton, a number of vector connections between Lyttelton and the Marlborough Sounds were identified.

In addition to biofouling, entrainment of larvae in water (eg. vessel bilge or ballast water) is also a potential risk mechanism, but is perhaps not as important as biofouling. In addition to domestic transport pathways, it should be kept in mind that international transport pathways connect the TOS to overseas source regions where the fanworm is present. Hence, a direct introduction of the fanworm from overseas is possible; however, as the fanworm spreads around New Zealand, the relative importance of domestic sources will increase.

MANAGEMENT

Efforts to manage the fanworm in New Zealand

There is no national management programme for the fanworm. MPI led a control programme in Lyttelton Harbour until 2010. However, that work was discontinued after multiple new populations were found in Waitemata Harbour, Auckland, and it was determined that eradication of this pest from New Zealand was no longer feasible. The eradication attempt by Northland Regional Council in Whangarei Harbour is the only active management programme. For the TOS, the absence of effective inter-regional pathway management means that the fanworm will probably spread around New Zealand, creating an increasing number of source populations with pathways linked to this region. MPI is currently trying to address the issue of risk reduction on inter-regional pathways, but most regional councils and unitary authorities are doing nothing to address the issue.

Management techniques available

Routine and effective vessel antifouling (i.e. with a toxic coating), and cleaning to prevent mature fanworms developing on vessels and other vectors is probably the best defence to slow the species' spread. Once vectors become fouled, or populations establish in marine habitats, options become more difficult and limited. Hand removal by divers is the main way that isolated fanworms (individuals or clumps) have been removed to date.
A range of other possible management methods are outlined in Appendix 9 (p. 56) of the TOS Operations Manual V2.3 (July 2012). A technique that has been highly refined in various pest management programmes in New Zealand is plastic encapsulation ("wrapping") of wharf piles, marina pontoons and other structures, as well as vessels and their moorings. The use of relatively eco-friendly chemicals such as bleach and acetic acid has been well-researched, and has application in certain circumstances (eg. by sprays and immersion dips). Simple measures such as air drying, hot water, and freshwater immersion, can also be effective. However, in most cases the specific tolerances of the fanworm to such treatments is unknown. The actual control methods chosen, if any, will very much be situation-specific.

Some considerations for fanworm management in the TOS

Recent history (eg. with the kelp *Undaria* and sea-squirt *Didemnum*) shows that management of marine pests after they have established is very difficult and expensive. By far the best strategy is to prevent introduction, or slow the rate of spread where feasible. Hence effective vector controls are clearly paramount. If response to new populations is considered, a range of technical and other considerations must be evaluated, some of which are outlined in Appendix 7-9 of the TOS Operations Manual.

From a technical perspective, in addition to the questions of whether effective response tools are available, the likelihood of adequate fanworm population delimitation and detection of individuals is a critical consideration. The failures of marine incursion responses in New Zealand to date are primarily attributable to failure of surveillance to detect all reproductive individuals within controlled areas, and unmanaged human mediated spread leading to new populations appearing outside of controlled areas. The downside to not carefully considering these risks is that considerable effort may be spent managing a known incursion, only to later discover other well-established populations that are beyond control.

There are many attributes of both the pest organism and recipient environment that affect the relative ease of surveillance and incursion response; examples are outlined in the Figure below. An additional factor is the recognition that as the fanworm spreads around New Zealand, it becomes increasingly likely that the point of entry to the TOS may not be into a busy vessel hub such as a port or marina. For example, as more and more marinas become infected by the fanworm, recreational vessels from outside the TOS may travel directly to holiday in places such as the Marlborough Sounds and Abel Tasman coastline. The unpredictable nature of such events again highlights the primary importance of inter-regional vector management.

Key features of marine environments and marine pests that affect the feasibility of surveillance and incursion response

A. Receiving environment attributes

Relative ease of surveillance or response	Water clarity	Wave exposure	Bathymetric complexity	Biological complexity	Remoteness	Tidal state	Habitat availability
Easy	Clear	Sheltered	2D	Simple	Accessible	Intertidal	Limited
↓	↓	↓	↓	↓	↓	↓	↓
Difficult	Turbid	Exposed	3D	Complex	Remote	Deep subtidal	Unlimited

B. Invader attributes

Relative ease of surveillance or response	Invasiveness	Invader distribution	Invader conspicuousness	Habitat preferences	Propagule dispersal range
Easy	Low	Confined	Large or conspicuous	Specific	Short
↓	↓	↓	↓	↓	↓
Difficult	High	Widespread	Small or cryptic	General ist	Distant

FURTHER INFORMATION ON THE FANWORM

New Zealand

1. Ministry for Primary Industries website:

http://www.biosecurity.govt.nz/files/pests/mediterranean-fanworm/mediterranean-fanworm-factsheet.pdf

2. Northland Regional Council:

http://www.nrc.govt.nz/upload/11480/Presentation%20-%20February%20%202013%20EMC%20Med%20fanworm%20update.pdf

3. GB Read et al. 2011. Arrival of the alien fanworm *Sabella spallanzanii* (Gmelin, 1791) (Polychaeta: Sabellidae) in two New Zealand harbours. Aquatic Invasions 6(3): 273–279

General

4. Australian Department of Primary Industries:

http://www.dpi.nsw.gov.au/fisheries/pests-diseases/marine-pests/nsw/european-fan-worm

5. Invasive Species Specialist Group:

http://www.issg.org/database/species/ecology.asp?si=1046&fr=1&sts

6. NIMPIS database:

http://adl.brs.gov.au/marinepests/index.cfm?fa=main.spDetailsDB&sp=6000011479