

# Bilge water as a vector for the spread of marine pests



Susie Wood and Grant Hopkins

Top of the South Marine Biosecurity workshop, Nelson, 24 July 2018

#### Background

- National and regional-level initiatives for managing transport pathways for marine non-indigenous species
- Manages all species (problem or not)
- Pathway management plans being developed for a number of regions e.g. Fiordland





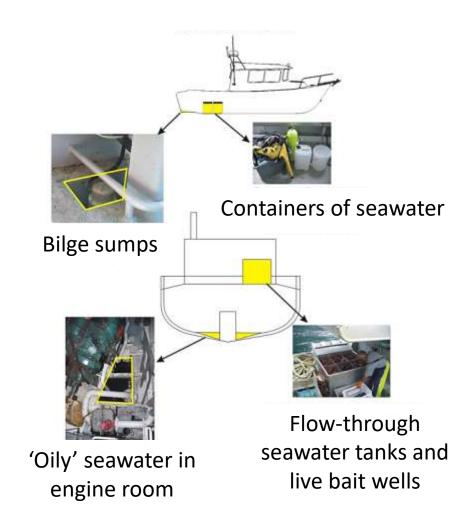




# Bilge water as a transport mechanism

- Sources: waves, leaks, engine cooling, use of deck hose, equipment transfer etc.
- Contaminants: oil, dirt, freshwater, detergents etc.
- Discharged via pumps, not usually treated
- Juvenile and adult life-stages of organisms
- Unknown: potential for bilge water to facilitate introduction and spread of non-indigenous species in NZ





#### What's in bilge water from NZ vessels?

#### Plumbing depths of bilge water



SAMANTHA GEE

A Cawthron Institute intern is hoping to hitch a ride with boaties heading out of Port Nelson this summer so she can test their bilge pump water as part of a biosecurity project.

Ports are often a hub of invasive species and there are species living in Nelson that are not present anywhere else in New Zealand, says Cawthron Institute marine ecologist Lauren Fletcher.

She said it was possible that larvae or small fragments of problem species could end up elsewhere through bilge water disposal and start a population in a different location.

Frietner said there had been vork done on the effects of ballast vater discharge from ships but othing was known about the risk f bilge water from vessels operatng in coastal waters.

The project will examine what s in the bilge water and whether it coses a biosecurity risk.

cawinfon scientists are conducting this research in conjunction with the National Institute of Water and Atmospheric Research (Niwa). Rebecca Stafford-Smith is a

Rebecca Stafford-Smith is a student at the University of Birmingham in England and is completing a placement at Nelson's Cawthron Institute as part of her Bachelor of Science in Environmental Science.

She will be working on the project until the end of May.

The project had involved a lot of planning and because bilge water discharge had not been studied much, there was limited literature on the subject, she said. So far, samples have been taken from boats as they have come in at the ramp.

However, Fletcher said is was important that sample were taken from a variety oboats including yachts, power boats and larger vessels.

"We want to be able to go or and sample the bilge pum while they use it."

She said what was in the water would only be a risk to the environment if it survived once discharged.

The water samples are sieved and preserved in ethanol before they are examined under a microscope.

Genetic probes will be also be used to gather more sensitive data.

Top of the South Marine Biosecurity Partnership chair Lindsay Vaughan said the potential risk to aquaculture was quite significant and the Cawthron Institute research was a key factor in understanding how they could move forward in this area.

"It is all part of the big pic ture," he said.

"The information will sho us where the risks are and ho we can manage them."

Fletcher said boatles need not worry about the quality of their bilge water as the data collected would record the boat type and size, but otherwise it would be anonymous.

O If you are willing to participate, please contact Lauren Fletcher at 548 2319 ext 350 or at lauren fletcher@caythron.org.pz

- 30 small (<20 m) vessels operating out of or arriving in Nelson and Picton
- Local, regional, national and international vessel arrivals
- Biological material present assessed:
  - traditional taxonomic tools
  - molecular tools (metabarcoding)

#### What's in bilge water from NZ vessels? Lots!

#### **Morphological assessment**

No NIS

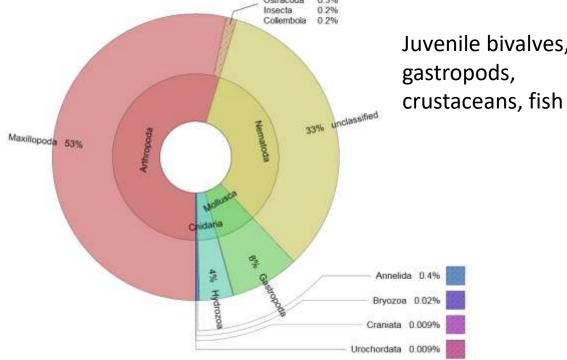
Range of life-stages

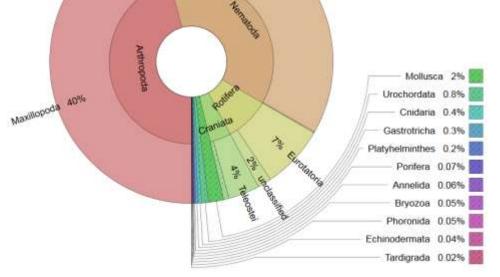
Juvenile bivalves, gastropods, crustaceans, fish

#### Molecular assessment

5 NIS in 23/30 samples

Boccardia proboscidea Amathia imbricata Obelia geniculata Crassostrea gigas Ciona savignyi

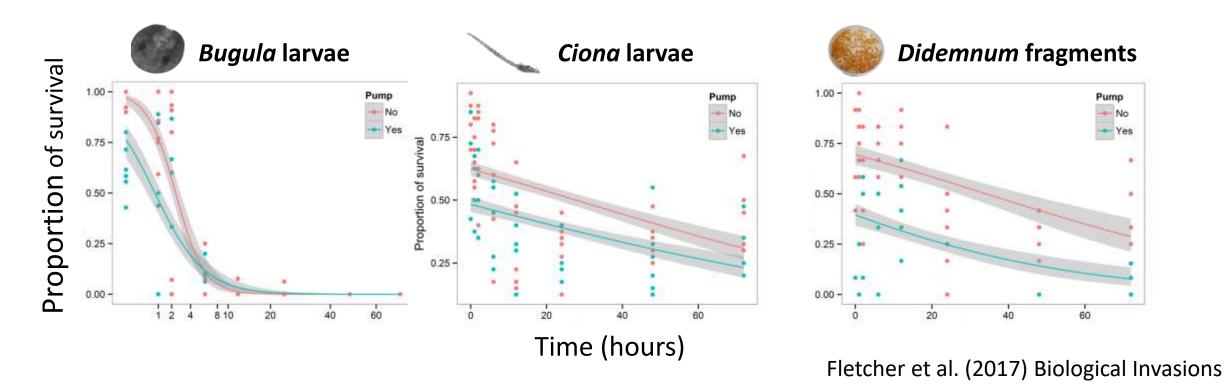






#### Can propagules survive transport and discharge?

- Largely unharmed by pumping process
- Time spent in sump affects discharge, particularly of short-lived larvae, but 3-day survival possible in some species



# Multiple factors influence risk

**Each discharge:** volume, source region, discharge location, contaminants

Each vessel: boater behaviour, bilge system, activities, environment



#### How do vessel systems and operator behaviours affect risk?

- Importance of various risk factors for small vessels
  - yachts, launches, trailer boats, small commercial vessels



- Each vessel scored for a set of risk factors
  - multiplied together to get overall risk score
- Identification of 'risky' vessel types

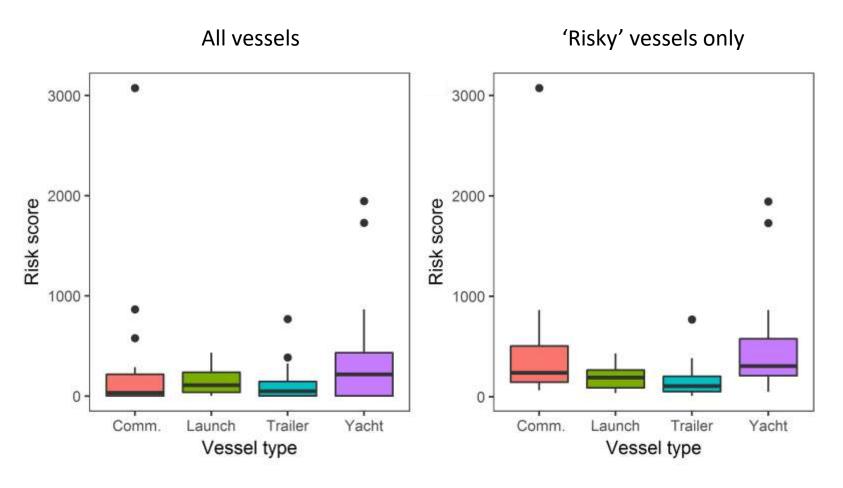


or





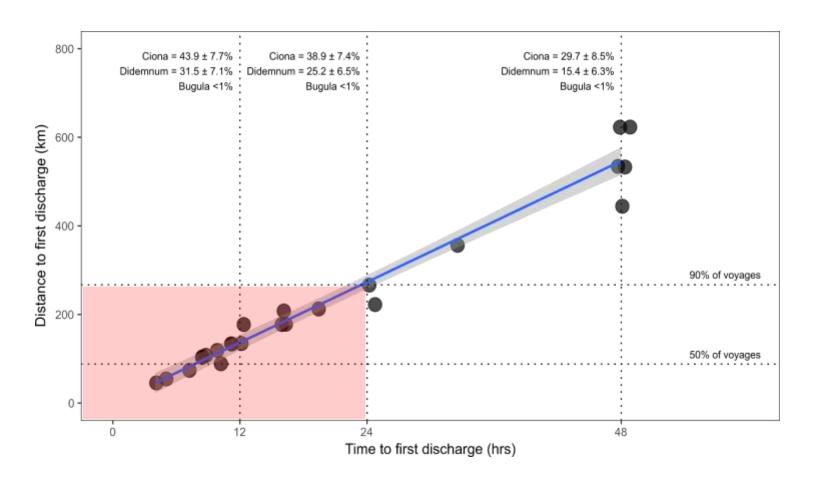
#### How do vessel systems and operator behaviours affect risk?



- Yachts scored the highest risk in both datasets
- Driven by types of trips in past 12 months, the likelihood of having bilge water on board and water volumes
- 35% of vessels surveyed were no risk (risk score = 0)



#### How far are propagules being transported?



- Geographical scale of risk investigated for yachts only (n = 24)
- Theoretical distance and time to first discharge (assumes constant and linear travel)
- Related to propagule survival and typical distances travelled by yachts in NZ (Floerl et al. 2009)



#### Next steps and future research

- Validation of risk-profiles
  e.g. sampling bilge water from vessels arriving from pest hot spots
- Treatment options and best-practice protocols for pathway management plans
- Risk mitigation through improved technology, behavioural change, or both?







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