Bilge water as a vector for the spread of marine pests

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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)

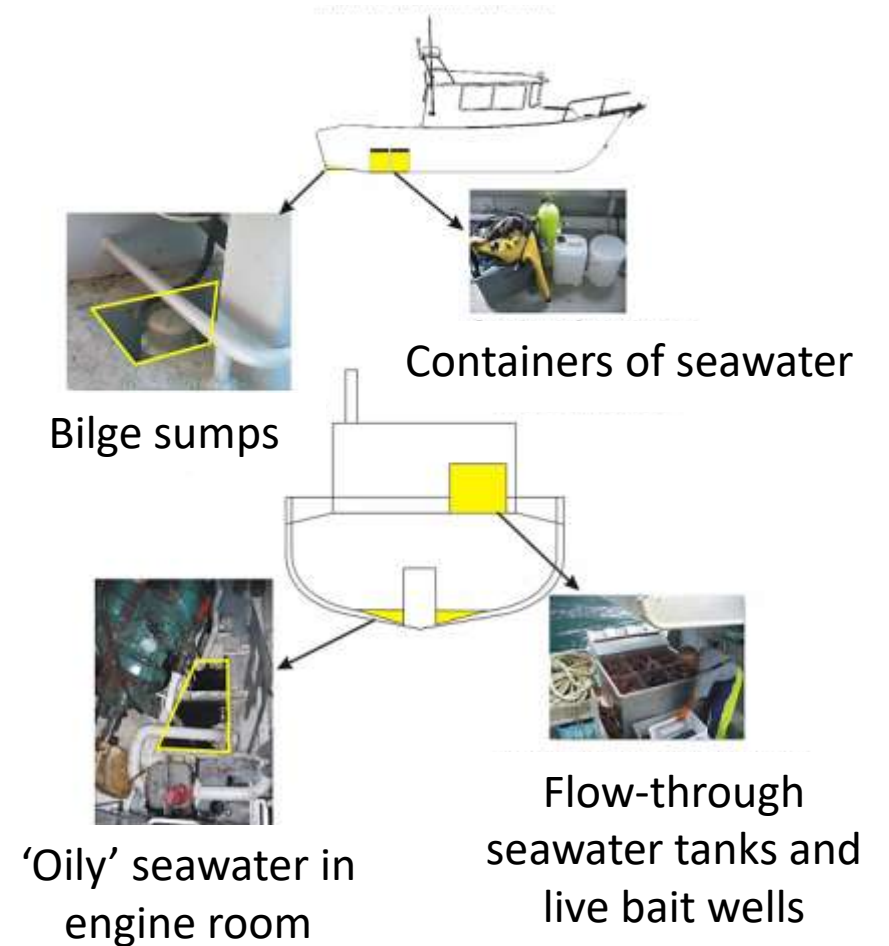- Pathway management plans being developed for a number of regions *e.g.* Fiordland

FIORDLAND MARINE
Regional Pathway
Management Plan

environment SOUTHLAND

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Managing risk from vector hubs

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

Containers of seawater

Bilge sumps

'Oily' seawater in engine room

Flow-through seawater tanks and live bait wells

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What's in bilge water from NZ vessels?

Plumbing depths of bilge water

Cawthron Institute scientists Rebecca Stafford-Smith, left, and Lauren Fletcher are asking for boaties' help with a study they are doing on the organisms found in bilge water. This sample was collected from a yacht at the Nelson Marina. Photo: MARTIN DE RUYTER/FAIRFAX NZ

- 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
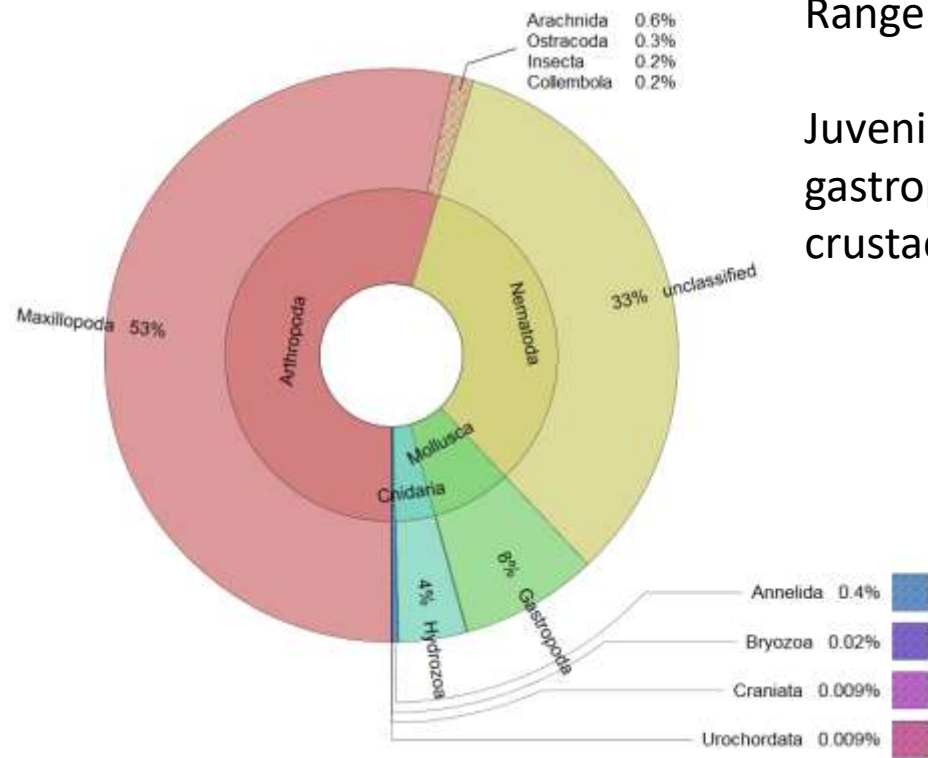   - molecular tools (metabarcoding)

Fletcher et al. (2017) Biological Invasions

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

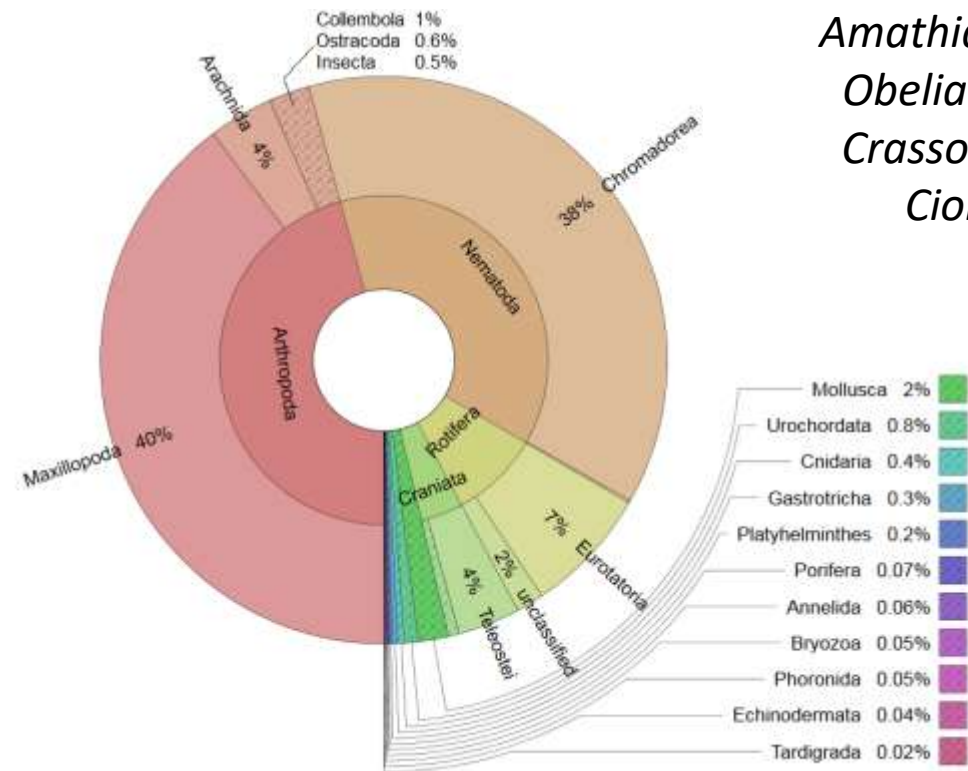**Morphological assessment**

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

Fletcher et al. (2017) Biological Invasions

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

Fletcher et al. (2017) Biological Invasions
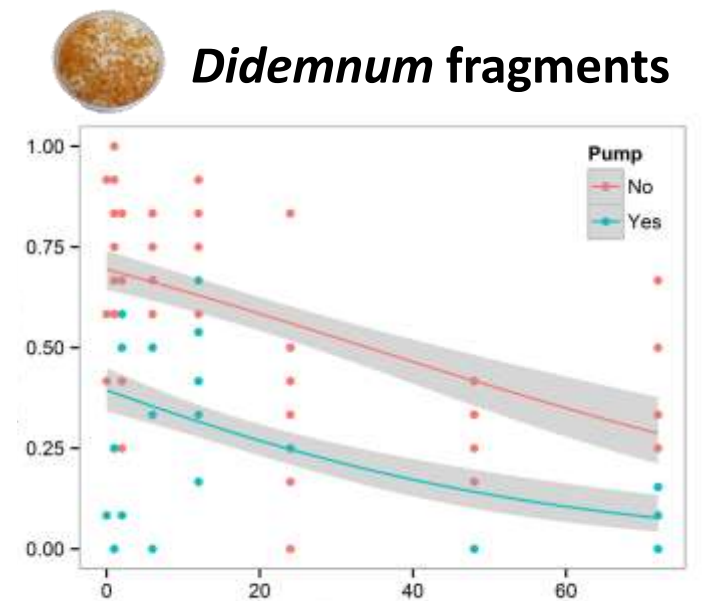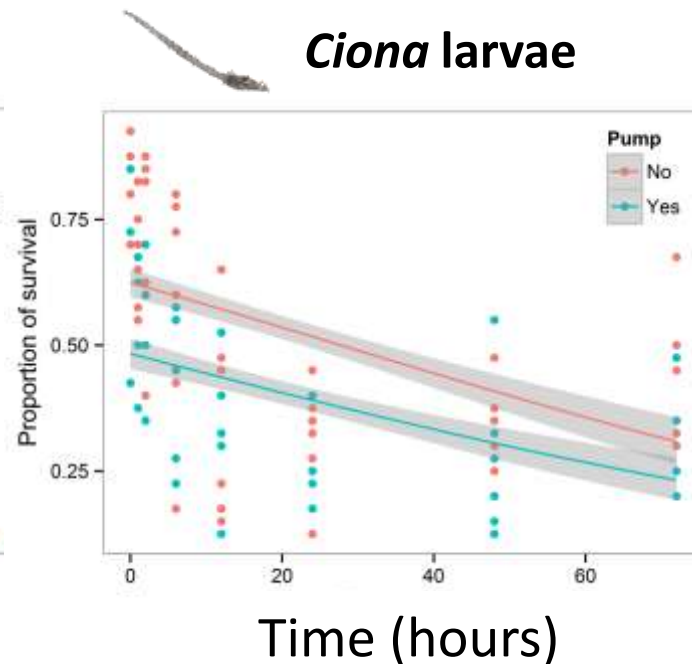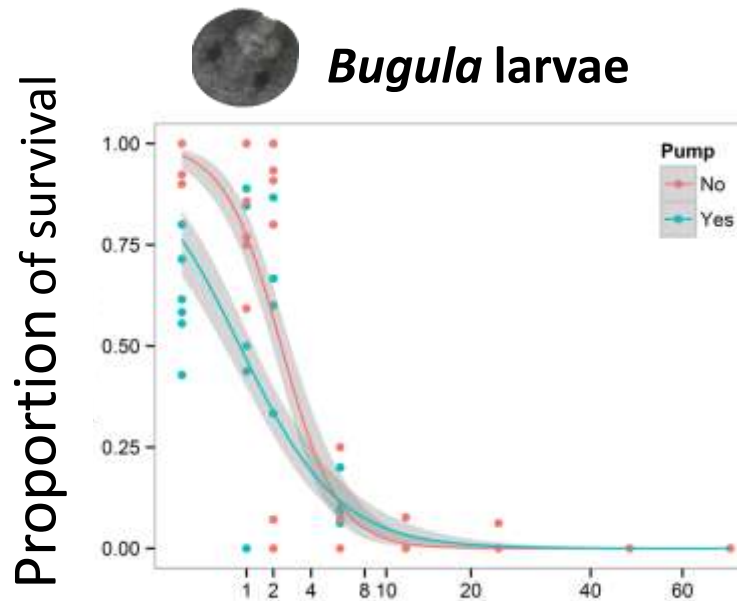
Multiple factors influence risk

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

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

Region A → Region B

Port/marina   vs.   Offshore   vs.   Offshore   Coastal
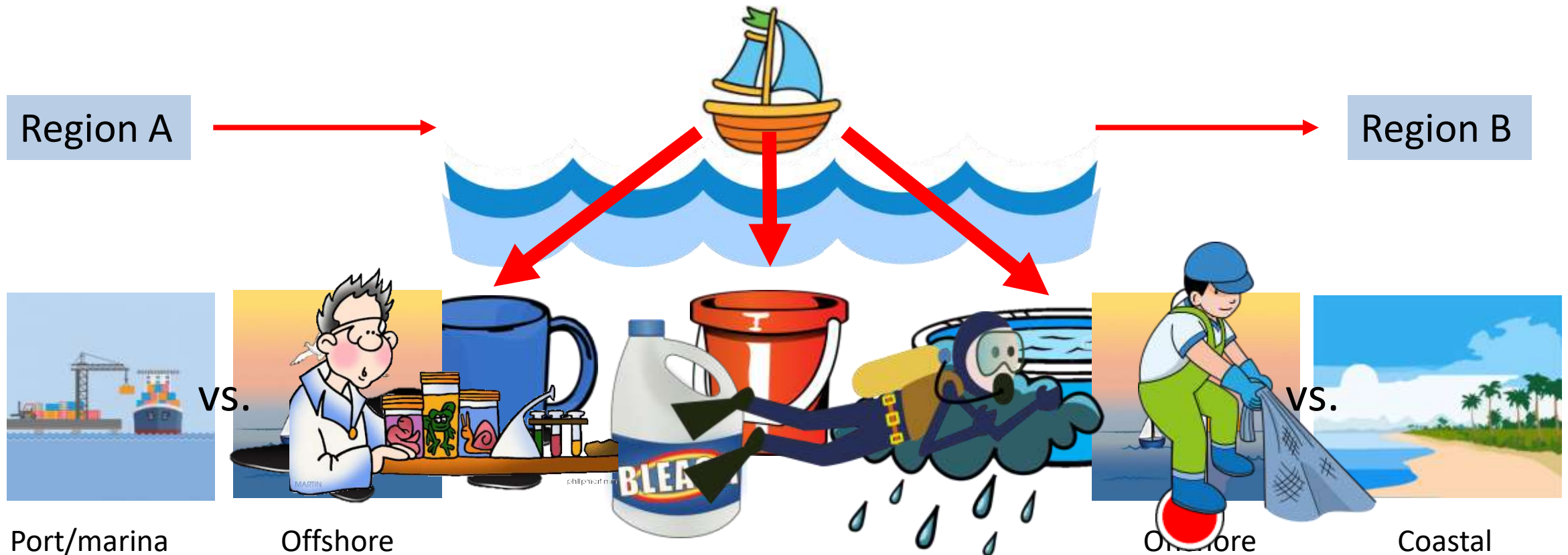
How do vessel systems and operator behaviours affect risk?

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

- Questionnaire-based survey of 110 vessel operators

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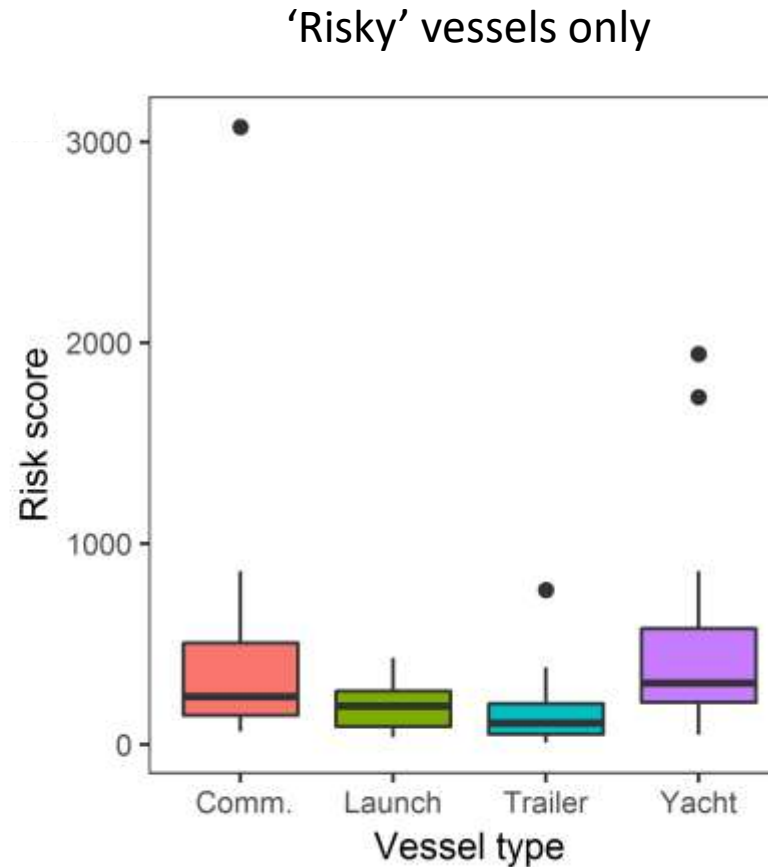
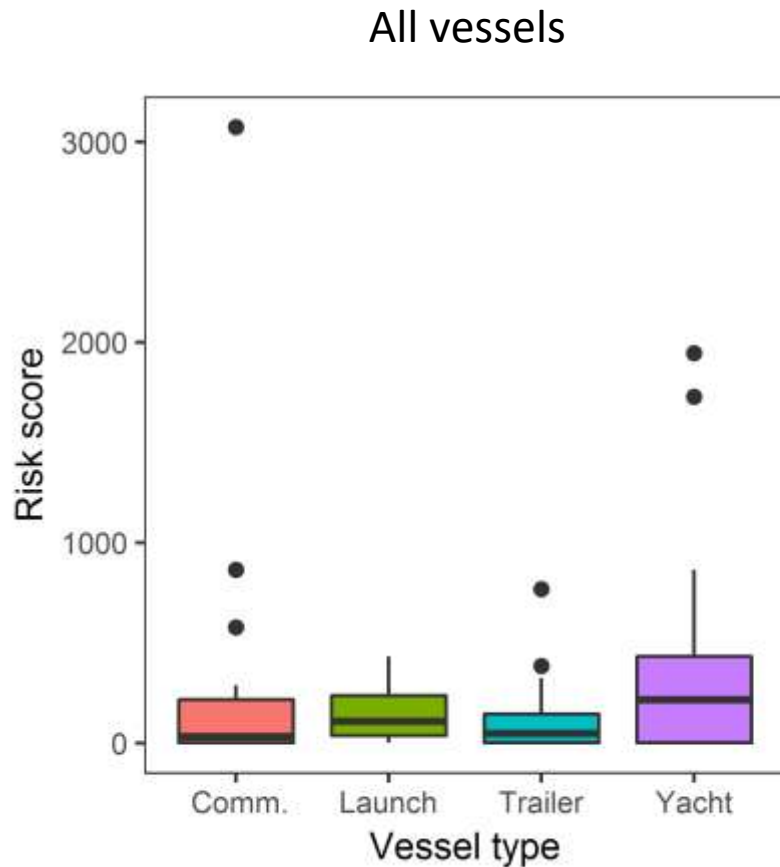- Identification of 'risky' vessel types

or

?

How do vessel systems and operator behaviours affect risk?

All vessels — 'Risky' vessels only

- 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)

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How far are propagules being transported?
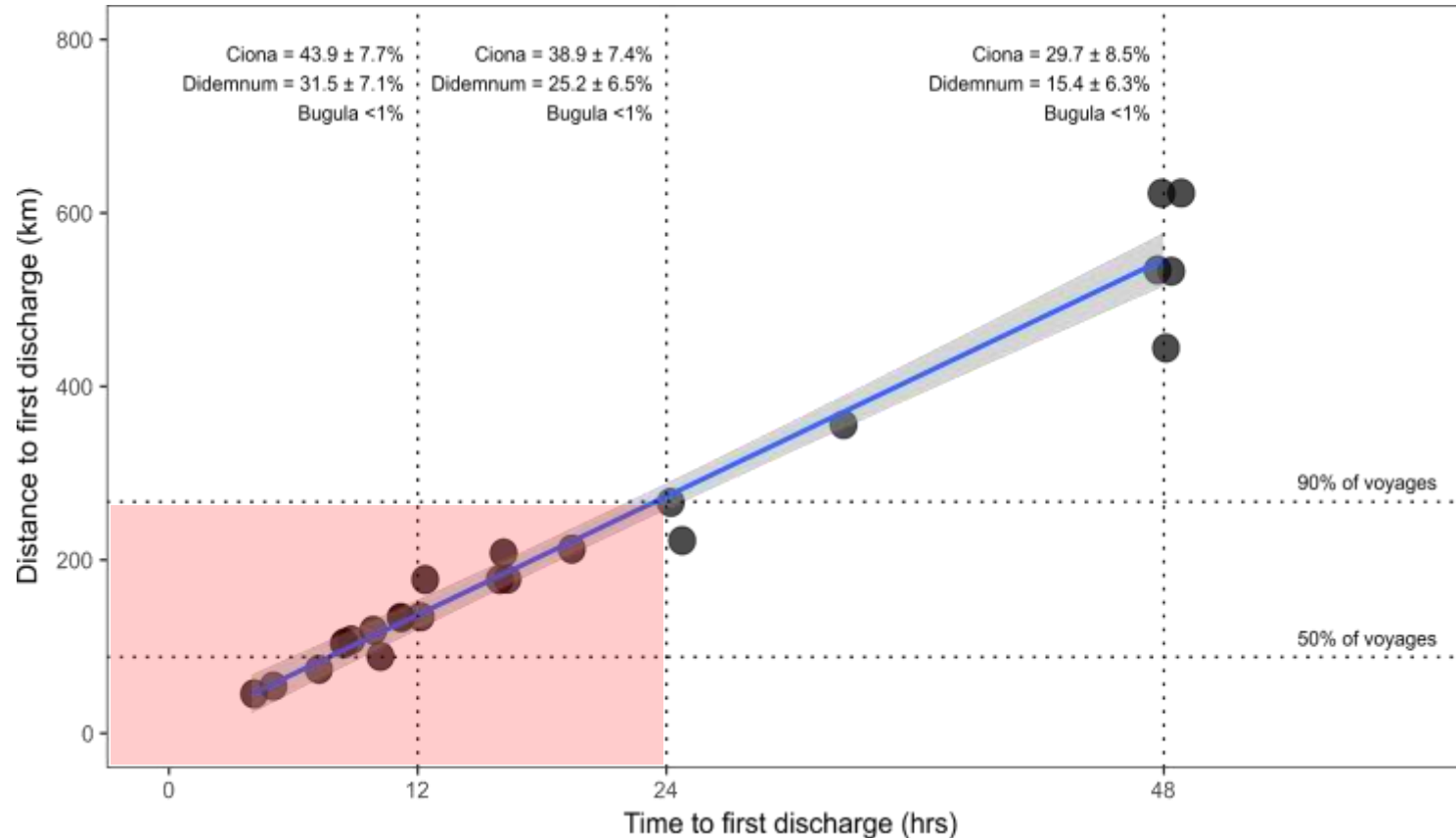
- Geographical scale of risk investigated for **yachts** only (n = 24)

- 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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