

Predatory Impacts of the Invasive Portunid Crab, *Charybdis japonica*, in New Zealand: Implication for Functional Change, Risk Assessment and Ecosystem Goods and Services

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RHAVA

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ICAIS Conference: 22–26th October 2017, Fort Lauderdale, Florida

Today's Talk

- Charybdis japonica
- (Underestimating?) risk / threat
- Impacts on benthic community structure and ecosystem functioning
- Links to ecosystem services
- (Improving?) risk assessments





Charybdis japonica

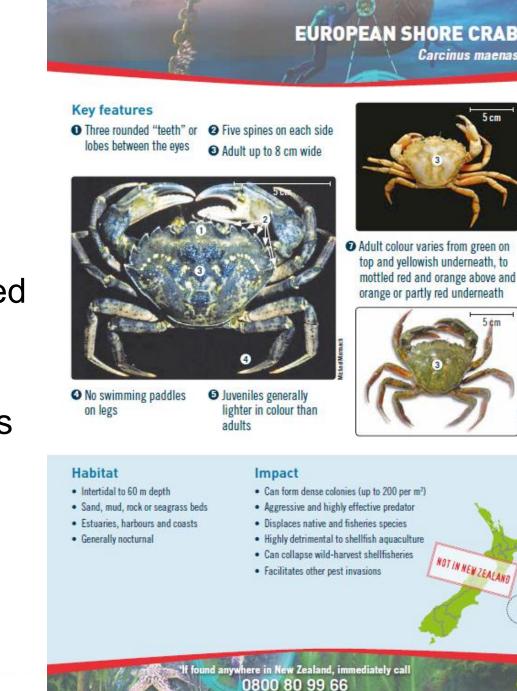
- Asian Paddle crab native to waters around Japan and Malaysia.
- Arrived in NZ in 2000 in Waitemata Harbour.
- New Zealand has low species richness of native crabs.
- Large and aggressive
- CW 3.5" to 4", 170 g or 6 oz





Identifying Risks

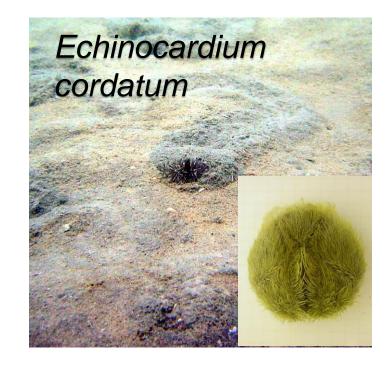
- A strong management response in the case of *Charybdis* was lacking.
- Despite some similarity to Carcinus maenas - which is on NZ's "Least wanted list".
- 37% of new arrivals in Australasian waters have no prior history of invasion¹.
- Linking traits of known invaders with impacts may help calibrate potential impacts of unknown species.



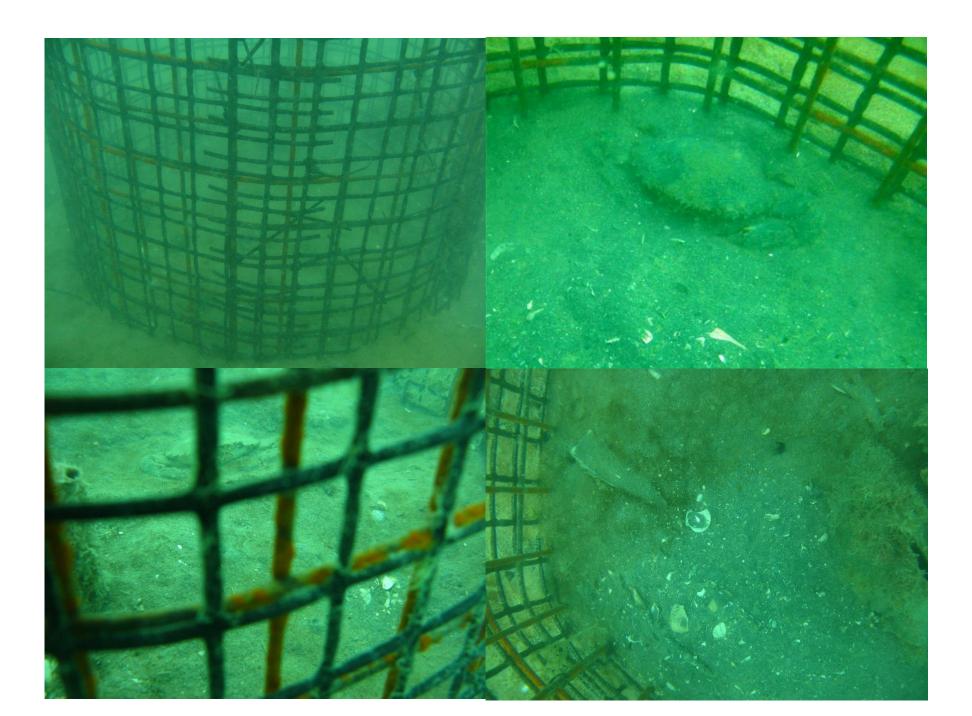
¹ Hewitt et al. (2010)

Impacts of Charybdis japonica in New Zealand

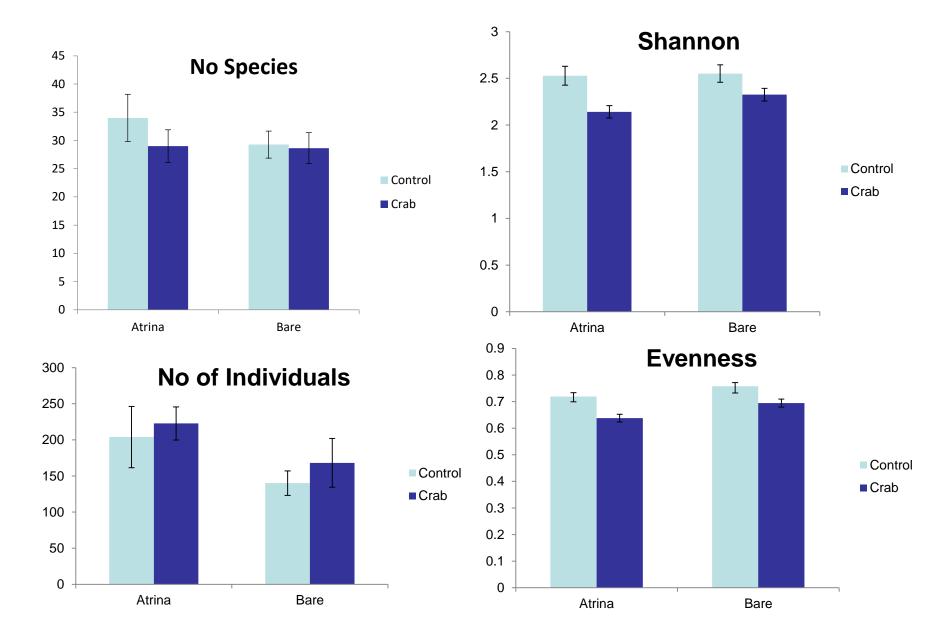
- Impacts cannot be fully assessed from crabs caught in baited cages, from laboratory experiments or from studies in other localities.
- Controlled introduction of crabs to enclosed patches of habitat (Caging) *in situ* allows:
 - 1. Quantification of natural prey availability
 - 2. Control over crab feeding area / duration
 - 3. Assessment of prey choices made by crabs
 - 4. Interactions with functionally important native species
- Intertidal and subtidal

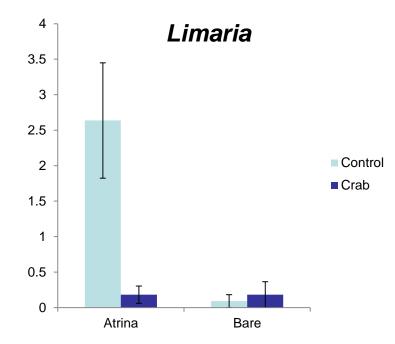


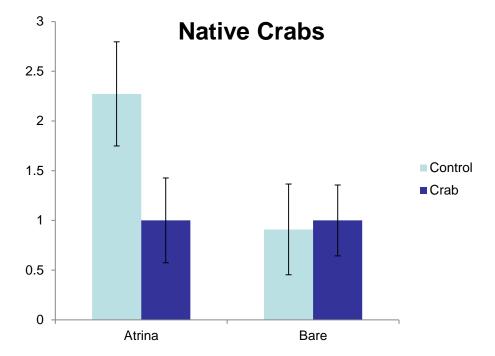


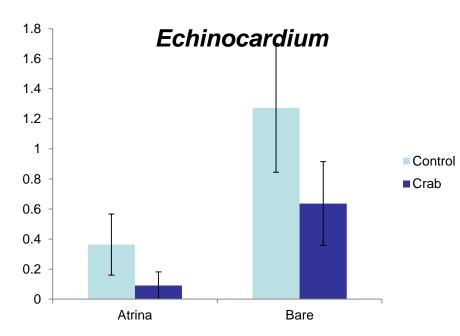


Impacts on benthic macrofauna

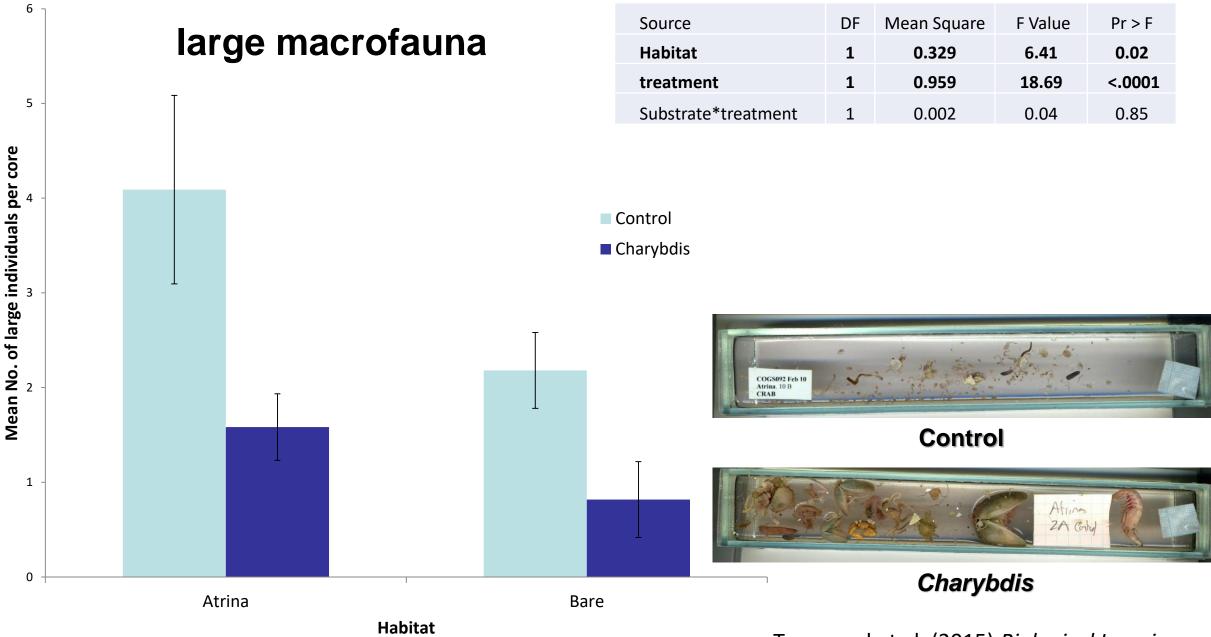




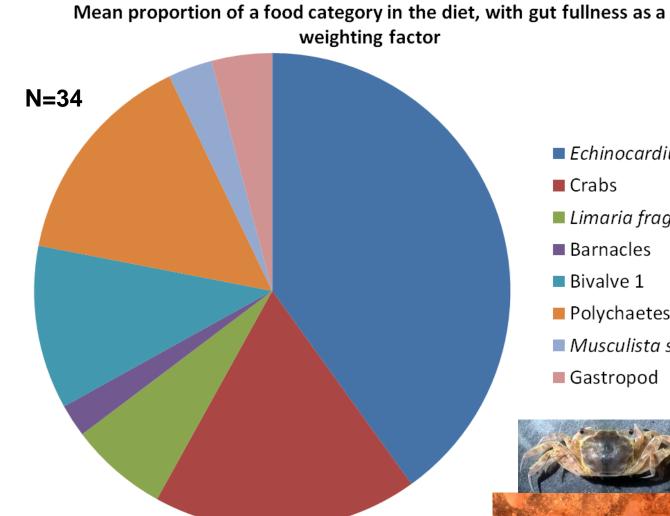


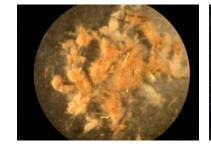






Townsend et al. (2015) Biological Invasions

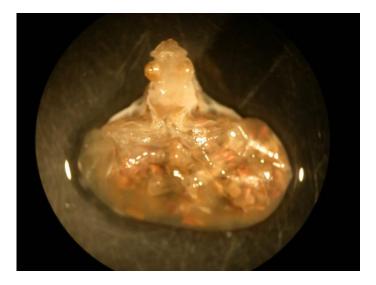




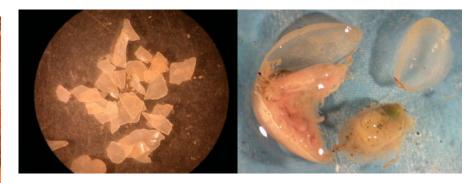


- Echinocardium cordatum
- Crabs
- Limaria fragilis
- Barnacles
- Bivalve 1
- Polychaetes
- Musculista senhousia
- Gastropod









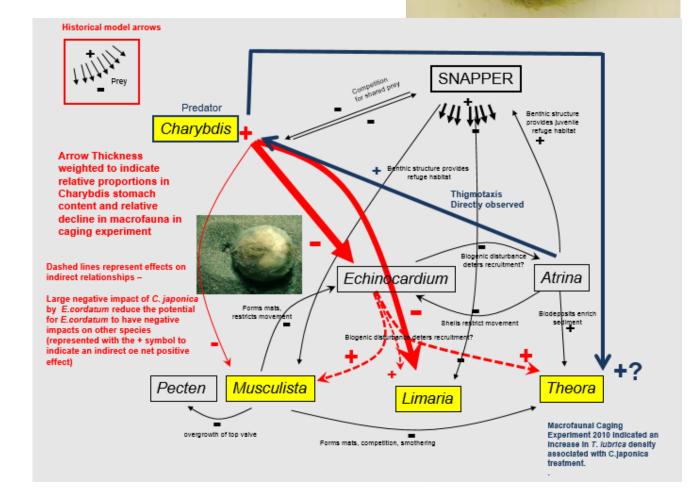
Linking functions to ecosystem services

- Nutrient regulation
- Sediment retention & turnover
- Waste treatment, processing and storage

Lohrer et al. (2004) Nature.

• Resilience and resistance to invasion.

Lohrer et al. (2008) Biogenic disturbance determines invasion success... *Ecology*.



April 2017

Wedge shell

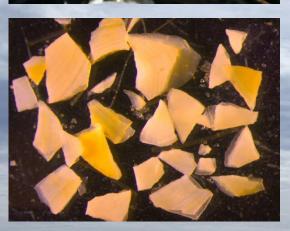
Macomona liliana





NZ Cockle

Austrovenus stutchburyi

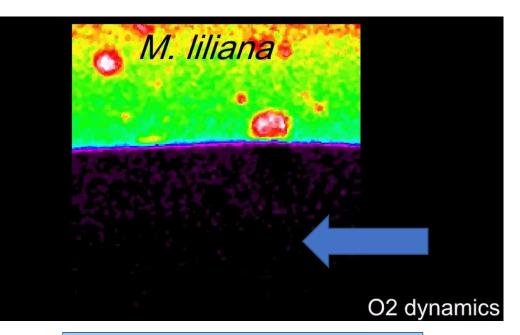


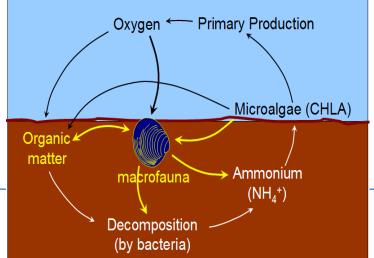






Ecosystem Functions and Services







enhancing the benefits of New Zealand's natural resources



Ficopomatus enigmaticus – Australian tubeworm





- AIS is an additional stress in already multiple and cumulatively stressed systems.
- Sedimentation
- Nutrient enrichment



enhancing the benefits of New Zealand's natural resources

Next Steps:

- Further analysis of intertidal experiment data community structure and prey choices.
- Quantitative assessments around diet.
- Telemetry? Look at proportion of time spent in different habitat types, intertidal versus subtidal.
- Improve links between changes in EF and ES.
- Integrate findings into risk assessment work.





Prioritizing marine invasive species

- Global pool of invasive species large and 30% of recent detections have no prior history of invasion
- Linking traits of known invaders with impacts may help calibrate potential impacts of unknown species
- We ask you to assess the likely impacts of hypothetical species described by 5 traits across 3 values:

 - 2. Habit
 - 3. Toxicity
 - 4. Size
 - 5. Fecundity

- 1. Trophic level 1. Environment
 - 2. Economic
 - 3. Social

Options for participation

- www.surveymonkey.com/r/mNIS 1.
- Register your email with us 2. Leigh.Tait@niwa.co.nz

Thank you for your attention any questions?

Asian Date Mussel (*Musculista senhousia*) Mediterranean Fan worm (Sabella spallanzanii)

Australian mud snail (Nassarius burchardi)



MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

We would like to thanks:





Ministry for Primary Industries

Manatū Ahu Matua

Andrew Bell, Andy Miller, Barry Greenfield, Diederick van Kempen, Graeme Inglis, Javier Atalah, Kelly Carter, Kit Squires, Lisa McCartain, Luca Chiaroni, Mike Meredyth-Young, Naomi Parker, Oli Floerl, Sam Parkes, Sarah Hailes, Scotty Edhouse.

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