

# Sea-floor species health and survival to underwater 'sediment clouds'

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On behalf of the Project Team

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# Presentation outline

## Project background

- Aims

## Our work

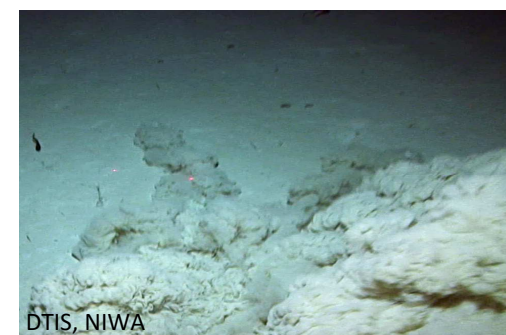
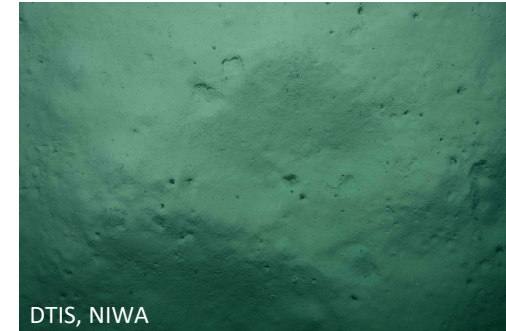
- Experimental system development
- Results

## Project conclusions and future application

## Q & A

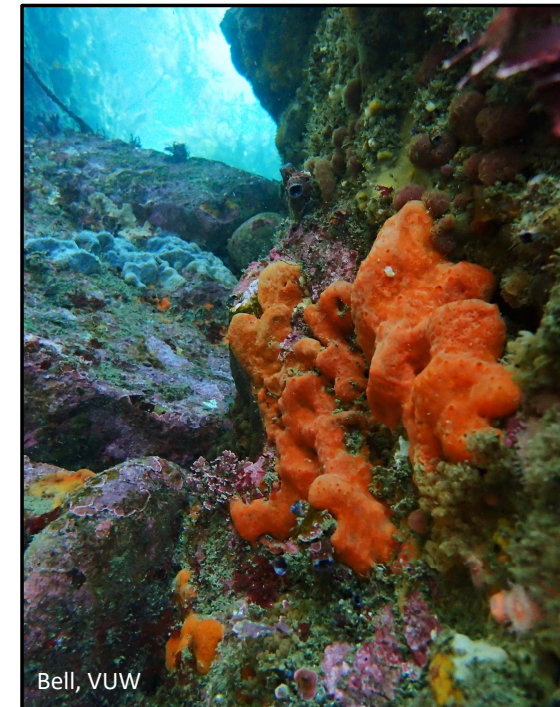
# Background

- A large proportion of the seafloor in New Zealand waters is soft sediment
- Sediments can be disturbed by storms and/or by human activities
  - e.g. seabed dredging, mining, fishing, land-based activities
- Create clouds or plumes of suspended sediments
  - potentially extend over a wide area
- Limited data and understanding of biological responses to exposure to elevated suspended sediments (cf. direct seabed disturbances)
  - especially deeper shelf and continental slope fauna



# Biological responses

- Suspended sediment can affect the abundance, diversity and structure of benthic communities
- May influence factors such as survival, larval recruitment, feeding rates and efficiency, growth
- Species, and life history stages, vary in their vulnerabilities
- Some have specific strategies to reduce sediment intake
  - cessation or reduction of respiration or pumping
  - mucous production to remove sediment
  - particle expulsion



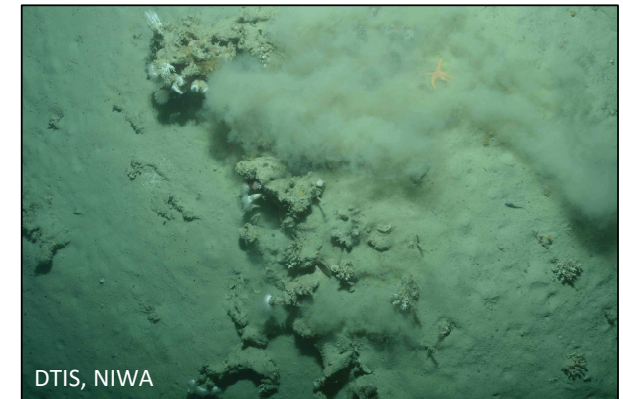
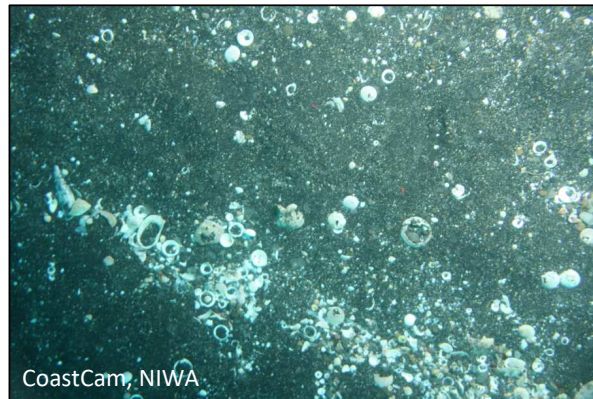
# Background (the Sustainable Seas “fit”)

- The “*Sediment tolerance and mortality thresholds of benthic habitats*” project began in 2016
- Funded through the Challenge’s Innovation Fund and part of the Dynamic Seas Programme from Phase I
- Aligned to the Sustainable Seas Challenge objective:  
*“to enhance the value of NZs marine resources while providing a healthy marine environment”*
- Improved knowledge of impacts, support for ecological risk assessments and ecosystem based models
- Extend Sustainable Seas research to deeper shelf waters



# Aims

- to help establish threshold levels of suspended sediments where impacts might become “ecologically significant”
- provide information to mitigate or manage impacts of suspended sediments



# Study focus

## Where?

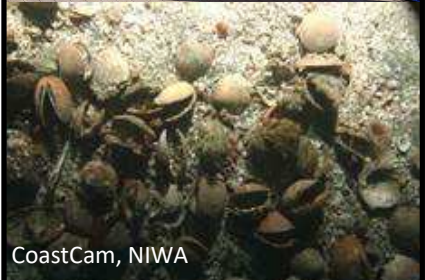
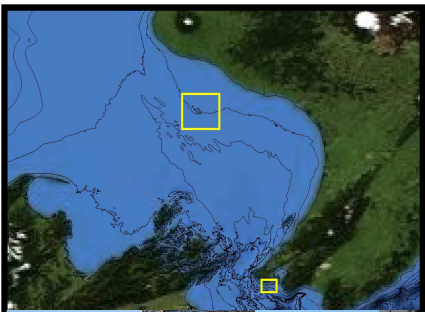
- South Taranaki Bight and Wellington
- Consistent with West Coast Stage 1 Challenge study area
- Relevance to interest at the time in offshore impacts and sediment clouds (e.g. ironsands mining)

## What?

- Common species
- Dog cockle (*Tucetona laticostata*)
- Sponge (*Crella incrustans*)

## How?

- Laboratory experiments
- Suspended sediment system

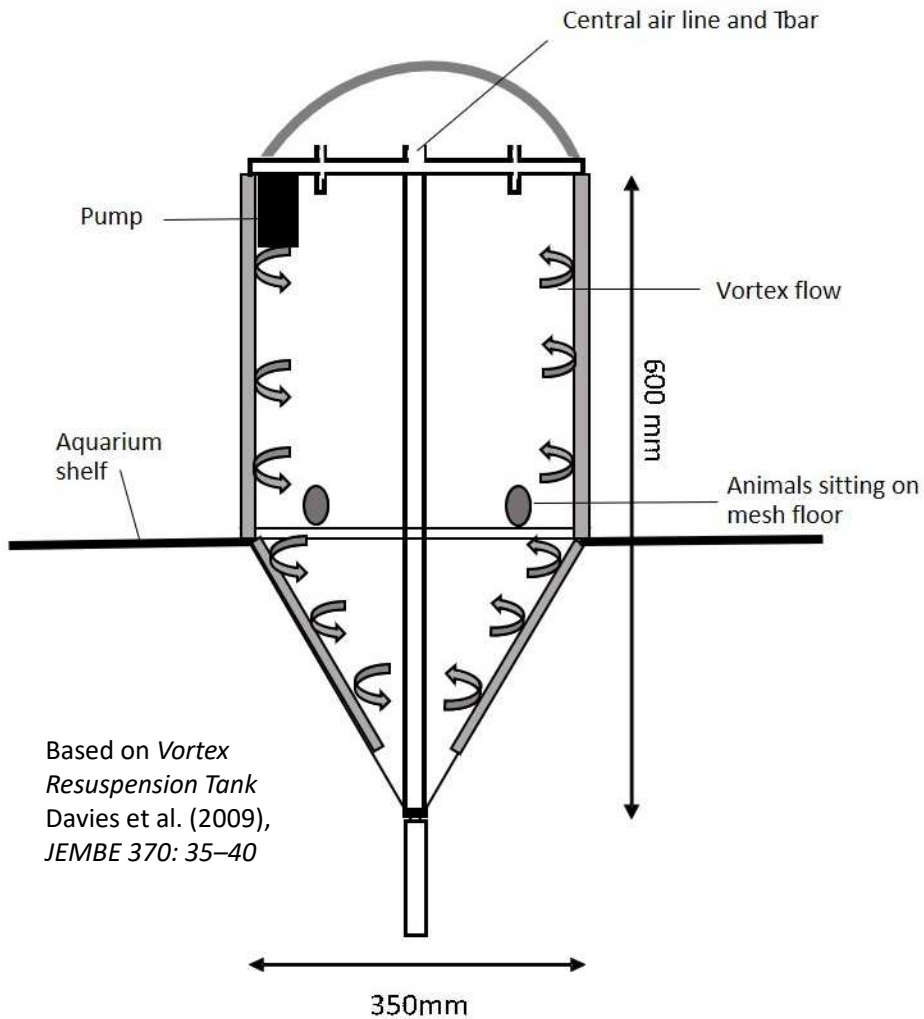


CoastCam, NIWA



Bell, VUW

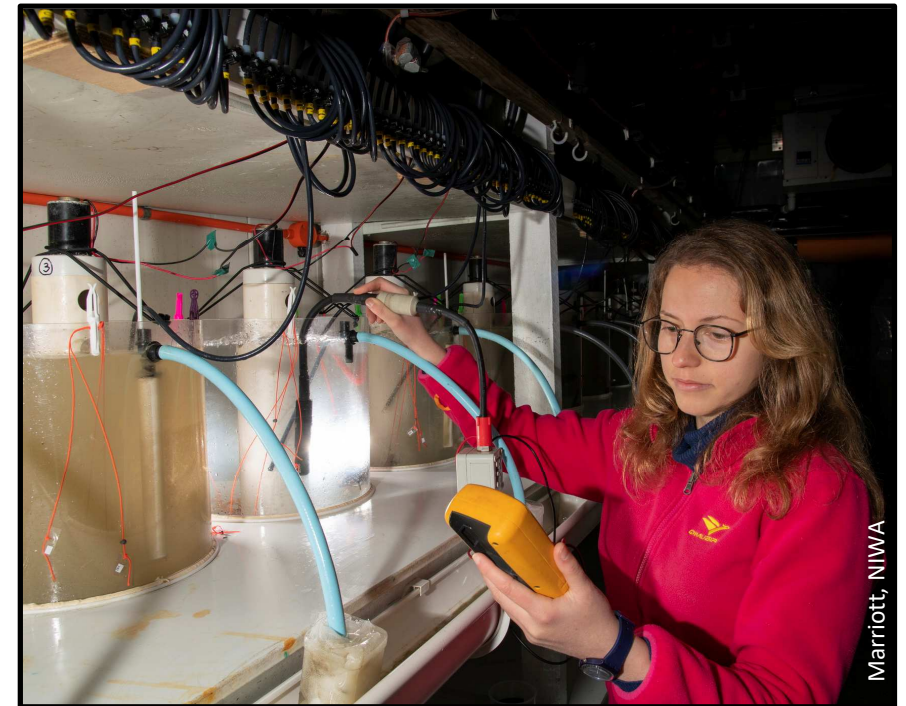
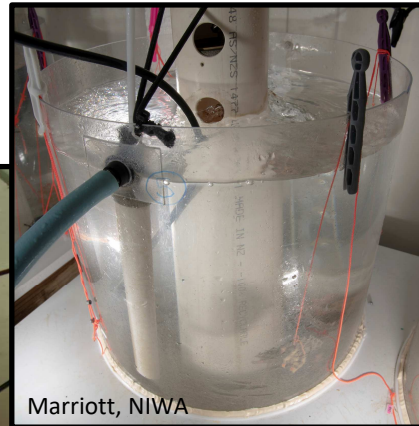
# Chamber system development





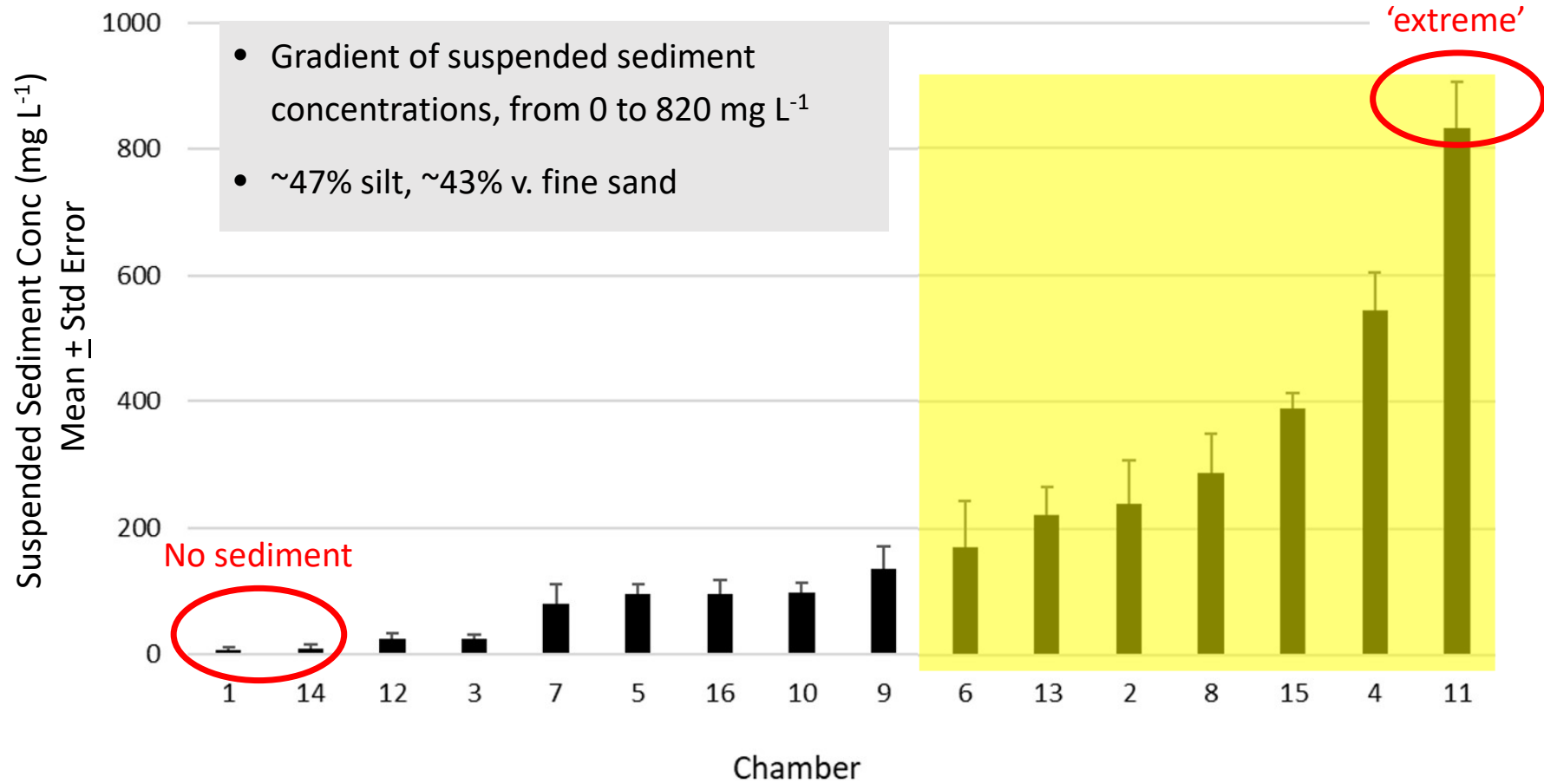
# Chamber system development

## Chambers Version 3

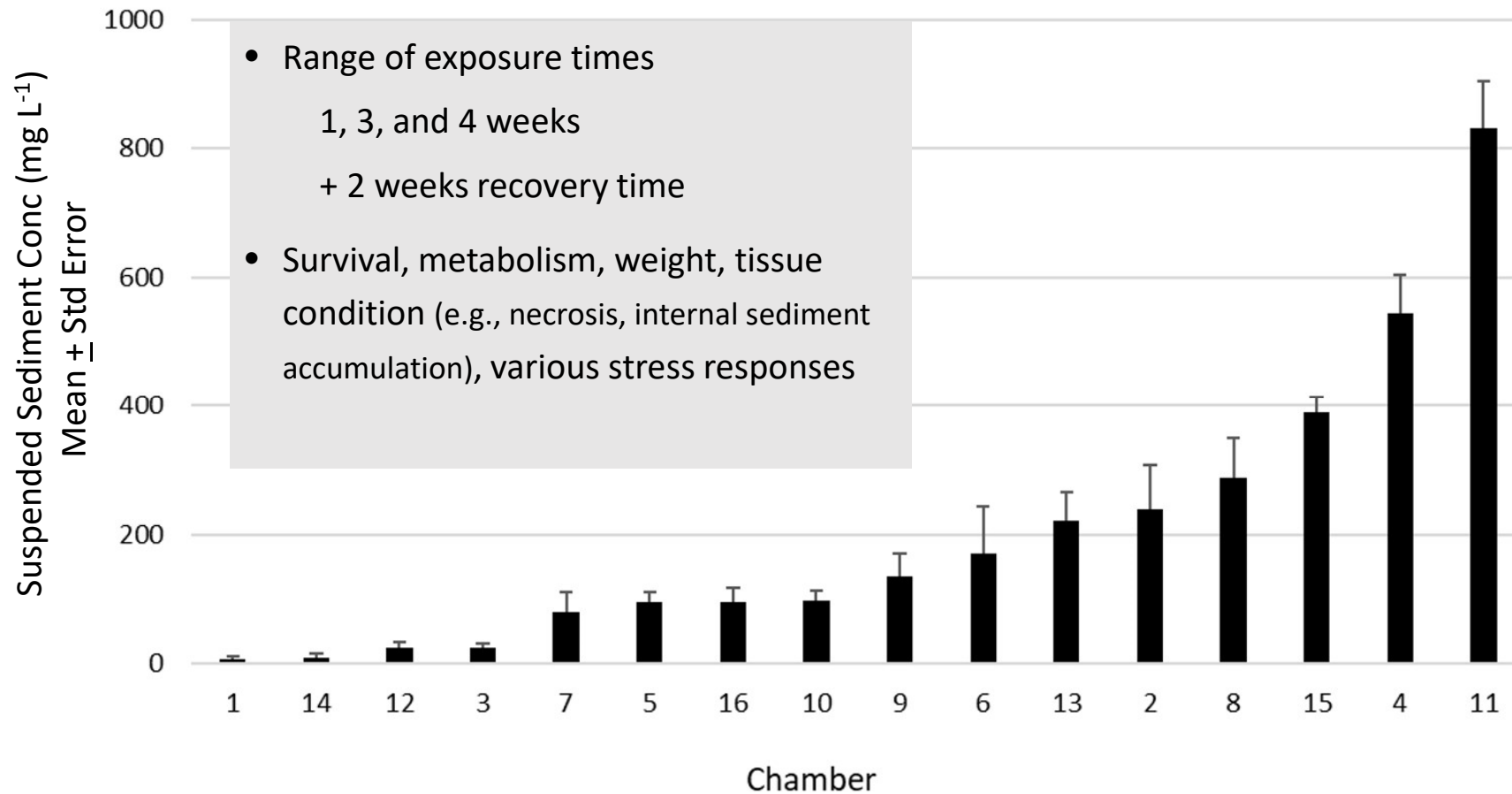


Manual checks (optical turbidity meter)

# Experimental design



# Experimental design



# Collection

*Tucetona laticostata*  
(dog cockle)



CoastCam, NIWA



Beaumont, NIWA

*RV Kaharoa*



Beaumont, NIWA



Bell, VUW

Victoria University  
of Wellington, divers

*Crella incrustans*  
(sponge)

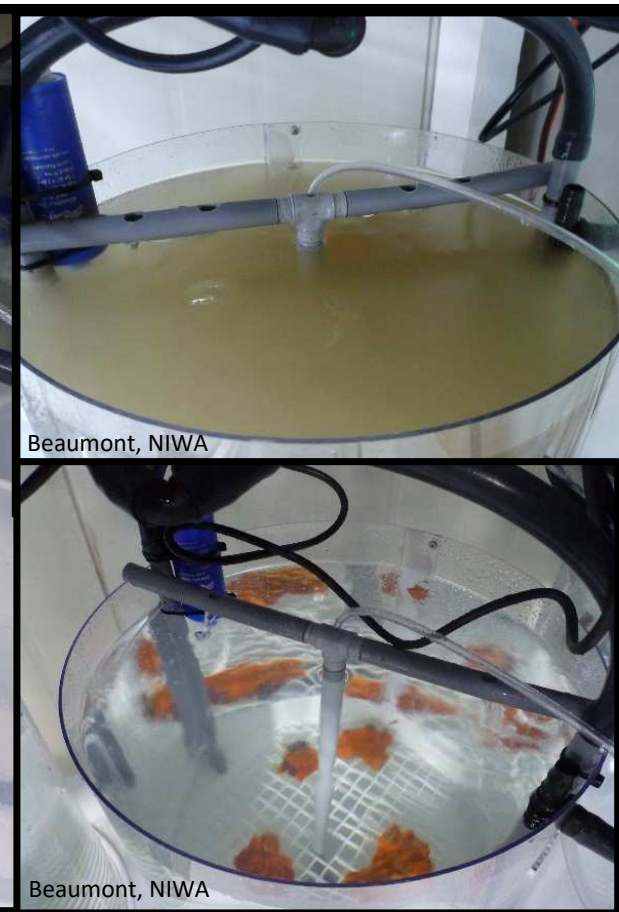
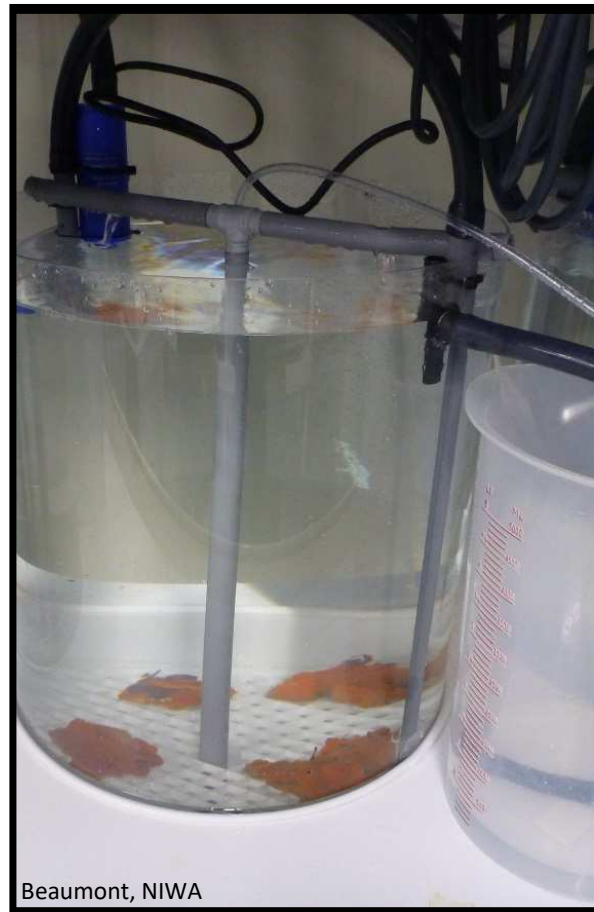


Bell, VUW

## Cockles



## Sponges



# *Tucetona laticostata*



## Cockle gills

Pre-exposure

Beaumont, NIWA

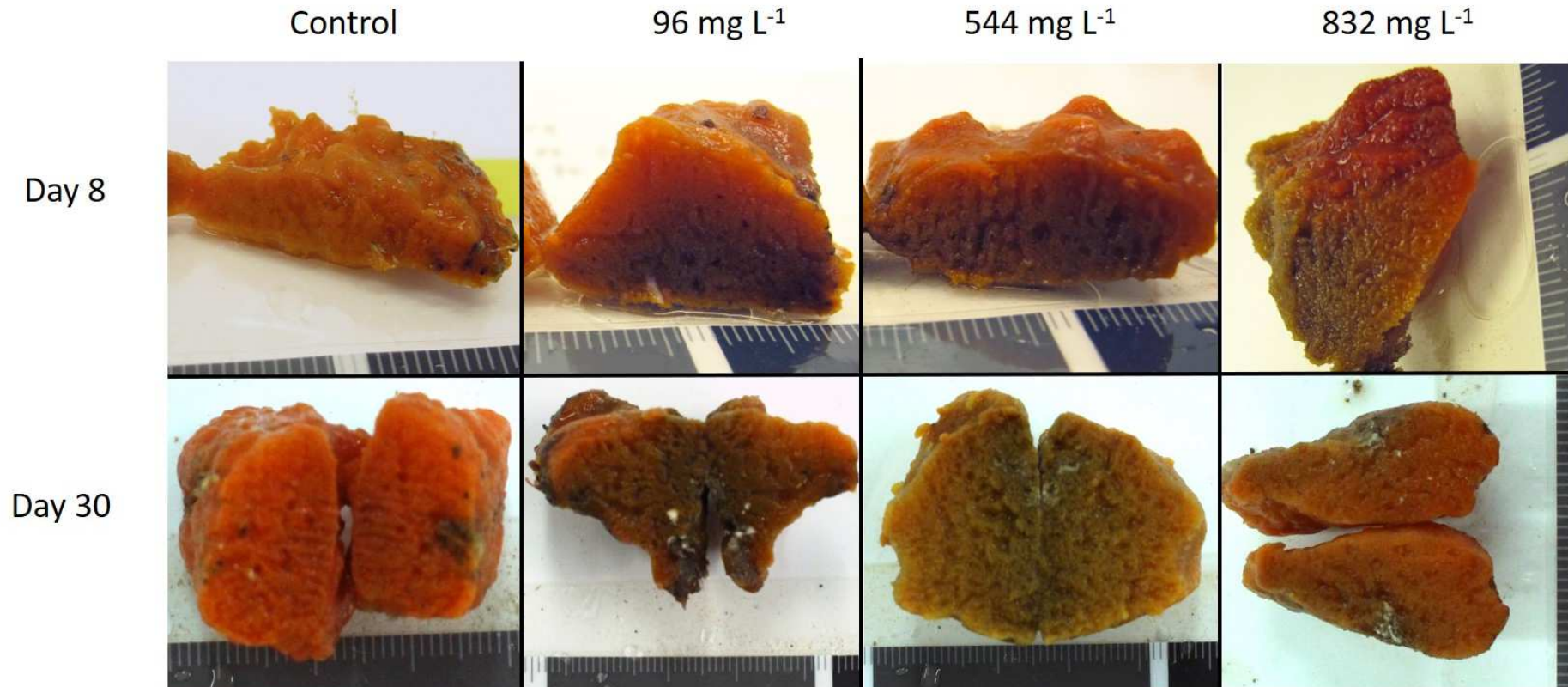
0.4 g/l (3 weeks)

Beaumont, NIWA

# *Crella incrustans*

High survival

Sediments accumulated internally



Respiration rates not significantly affected

## *Crella incrustans*

- Morphological changes
- Greater number of 'apical fistules' at higher suspended sediment concentrations (SSC)
- *Crella* tolerance to temporary (thin) sediment deposition?





# Conclusions

- Lack of strong negative effects on either *Tucetona* or *Crella*
- Both species had mechanisms to clear the sediments
- May be predisposed to 'coping', at least over the time frames and conditions investigated
- BUT, more sensitive measures, mechanisms of sediment processing, different life stages, will all enhance understanding of species responses

# Conclusions and follow-up research

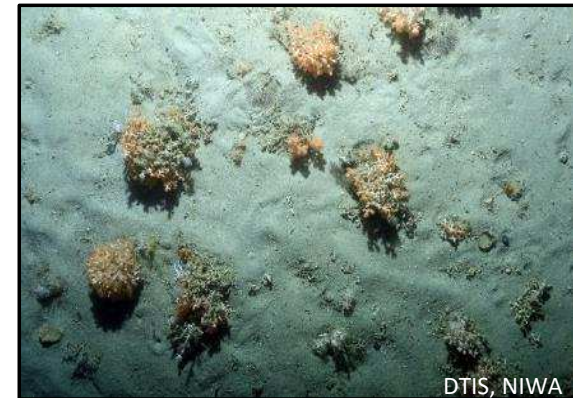
- Multiple insights into the resilience of two species
- Established effective laboratory system for maintaining sediment in suspension - not an easy task
- Developed approaches and methodology to undertake experimental work, to complement *in situ* observations and disturbance research



# Conclusions and follow-up research

Results and methodologies have informed other sedimentation research projects

- Juvenile scallops (NIWA)
  - Tolerance of juvenile scallops to suspended sediments, to inform ecosystem modelling (2020)
- Deep sea corals and sponges (NIWA, VUW)
  - ROBES (Resilience Of deep-sea Benthos to the Effects of Sedimentation) (2016-2021)
  - Chatham Rise corals (*Goniocorella dumosa*) and sponges (*Ecionemia novaezelandiae*) (2019)
  - Follow up deep-sea coral experiments, expanding response variable scope to include genetic microbiome and histology studies (2020)



# Acknowledgements

- Ko ngā moana whakauka / Sustainable Seas National Science Challenge for funding.
- *RV Kaharoa* crew and NIWA staff for dog cockle collection.
- Victoria University of Wellington's dive team for sponge collection.
- NIWA and VUW staff and students for their help with aspects of the experimental work.
- Images and photos provided by a number of NIWA and VUW staff and students

Results related to *Crella incrustans* have been published:



Academic  
publication

Cummings et al. (2020): Responses of a common New Zealand coastal sponge to elevated suspended sediments: indications of resilience. *Marine Environmental Research* 155  
[doi.org/10.1016/j.marenvres.2020.104886](https://doi.org/10.1016/j.marenvres.2020.104886)

National  
**SCIENCE**  
Challenges

SUSTAINABLE  
SEAS

Ko ngā moana  
whakauka

An underwater photograph showing a diver in the upper center, illuminated by a light. Below the diver, an American flag is planted on the seabed. The seabed is sandy and uneven, with some darker patches. The water is dark, and the overall scene is dimly lit, typical of deep-sea exploration.

Questions?