Awhi Mai Awhi Atu
Mussel Restoration Update Ōhiwa Harbour

Presentation to Ōhiwa Harbour Implementation Forum
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Awhi Mai Awhi Atu

Sustainable Seas Marine Researchers

- Assoc. Professor Kura Paul-Burke, Co-leader, Marine Researcher, University of Waikato
- Dr Richard Bulmer, Co-leader, Marine Ecologist, NIWA
- Joe Burke, Technical Field Leader, MUSA Environmental
- Megan Ranapia, Marine Science PhD Student, University of Waikato

Te Rōpū Kairangahau – Hapū/Iwi Research Advisors

- Wallace Aramoana, Kaumātua, Te Upokorehe
- Trevor Ransfield, Resource Management Team, Te Upokorehe
- Charlie Bluett, Customary Fisheries Manager, Te Rūnanga ō Ngāti Awa
- Tuwhakairiora O'Brien, Deputy Chair, Te Rūnanga ō Ngāti Awa

Bay of Plenty Regional Council Support

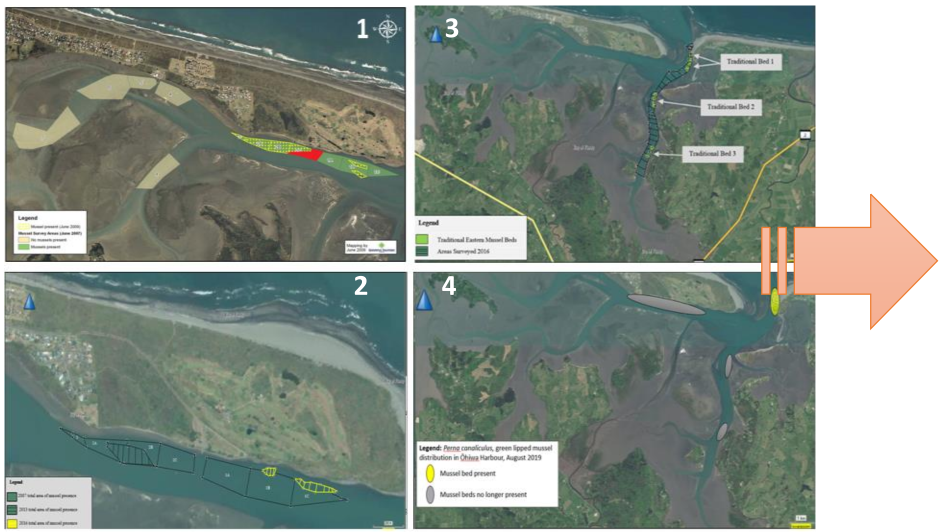
- Tim Senior, Ōhiwa Harbour Land Management Officer, Bay of Plenty Regional Council
- Dr Josie Crawshaw, Coastal Scientist, Bay of Plenty Regional Council

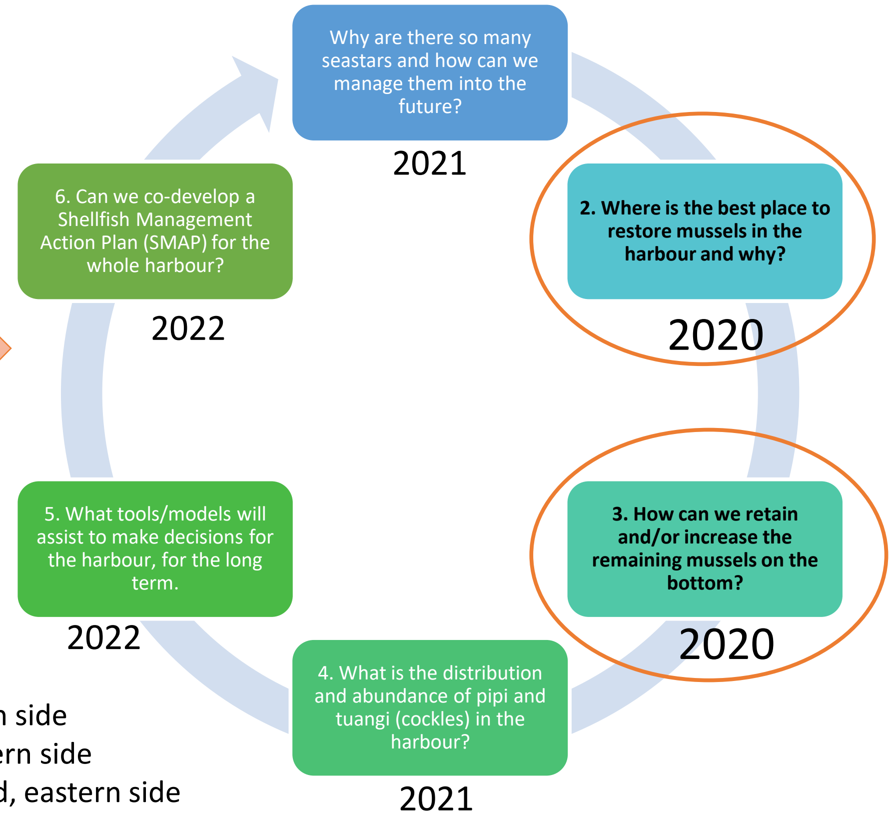
Ōhiwa Harbour Implementation Forum

- Ngāti Awa, Te Upokorehe, Te Whakatōhea, Te Waimana Kaaku, Ōpotiki District Council, Whakatāne District Council, Bay of Plenty Regional Council

Overview of Awhi Mai Awhi Atu Research Aims 2020-2023

Using mātauranga-ā-iwi & western science





Previous mussel abundance:

Map 1: 2007-2009 – estimated 112 million mussels to 16 million, western side
Map 2: 2013-2016 – estimated 2 million mussels to 485 thousand, western side
Map 3: 2016 – 2 of 3 traditional beds gone, 59 thousand in remaining bed, eastern side
Map 4: 2019 – estimated 78 thousand mussels in whole harbour

2009 – 1.2 million seastars in western mussel bed or 672 tonnes
2019 – 59 thousand eleven-armed seastars + 24 thousand cushion stars, mussel station 2
- 100,000 seastars observed in 2 hectre pipi bed, eastern side
- no seastars at entrance

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Mussel restoration update

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Seastar management

- Submitted funding application to Sustainable Seas Innovation Fund
- Investigate economic potential of bioactives and collagen products from seastars to assist management of overpopulations, for the long term
- Waste streams will be used to make lower value products
- Aim to establish zero-waste stream philosophy and low environmental impact
- Provide opportunity for taiohi (iwi youth) to participate in lab trials
- Collaboration with:

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Deploying light loggers into the harbour

Dr Richard Bulmer, NIWA

NIWA Taihoro Nukurangi

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Where are the best places to restore mussels?

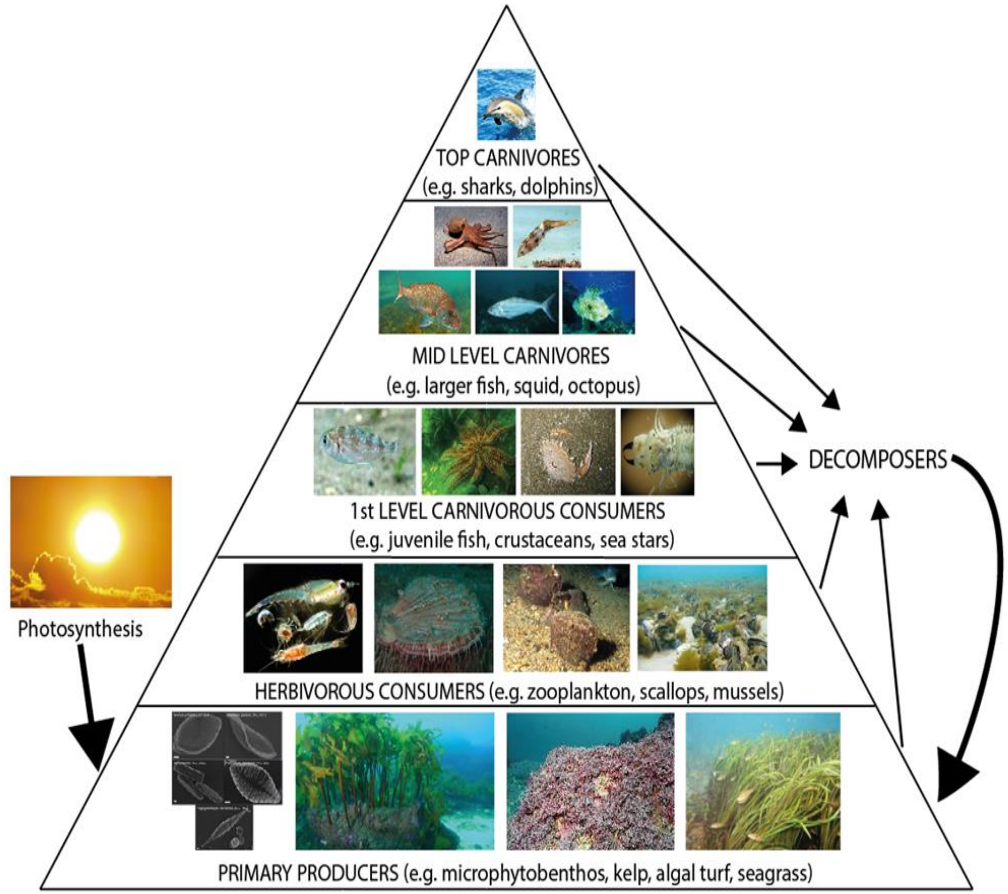
- We need good information on the environmental conditions within Ōhiwa to inform models/identify the best place to restore and retain mussels.
- Environmental information includes data on bathymetry, sediment condition, hydrodynamics, water clarity, light etc.
- One area which we don't have much information on is **how much light reaches the seafloor** and how this varies throughout the harbour.

How much light reaches the seafloor is important because:

1. Light availability impacts how much food (algae/plankton) is available to shellfish.

2. Light is used by algae and other plants, which produce oxygen and remove nutrients from the water column.

3. Light can be used to better understand how clear the water is. The worse the water clarity, the lower the seafloor light levels.



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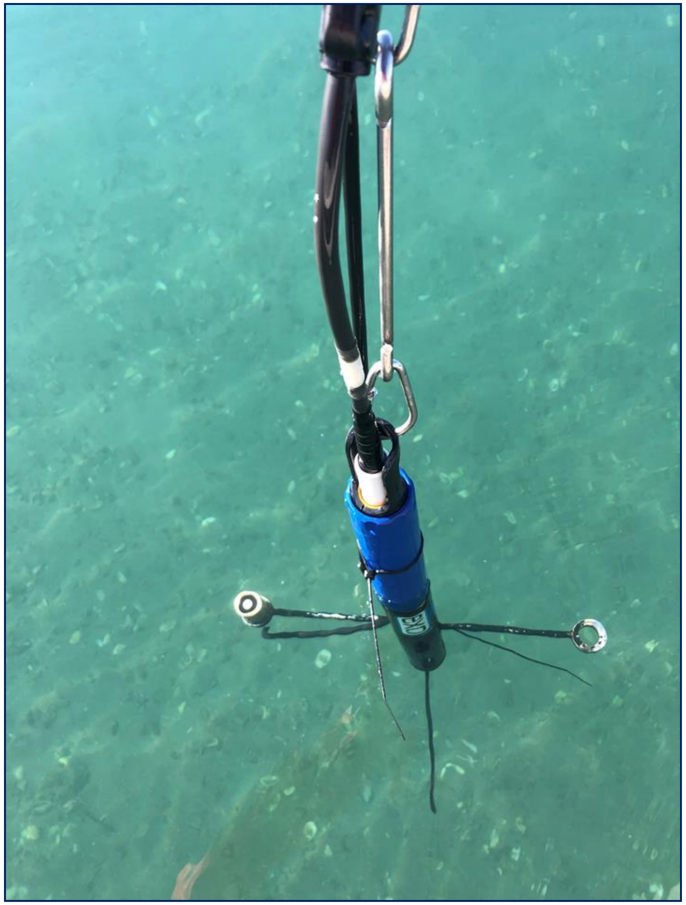
What have we been doing and why?

- Measuring light levels and water clarity throughout Ōhiwa.
- We will use this data to create a map of light availability throughout the harbour.
- This information will be used in models to help work out where the best areas might be for mussel and other shellfish restoration/recovery.



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Understanding shellfish feeding behaviour and food supply accessibility in Ōhiwa harbour

Megan Ranapia, University of Waikato

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Seston supply to traditional mussel beds in Ōhiwa Harbour

Informing future research in suitable mussel translocation sites.

Background

- Passive and active restoration strategies e.g. “recruitment and substrate limited” approach (Bramaugh & Coen, 2009)
- Understand species ecology and environmental interactions to ensure highest success of intervention.
- Tides, weather, discharge, sedimentation and primary production regulate food composition and concentrations.

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Aim: Quantify how local hydrodynamics (tides) and weather events, regulate seston supply to the traditional benthic mussel beds in Ōhiwa Harbour.

1. Establishing 'feeding dependent thresholds'.
2. Record environmental data in different weather scenarios.
3. Estimate the proportion of time mussels could be inhibited from feeding.

1. Establishing 'feeding dependent thresholds'

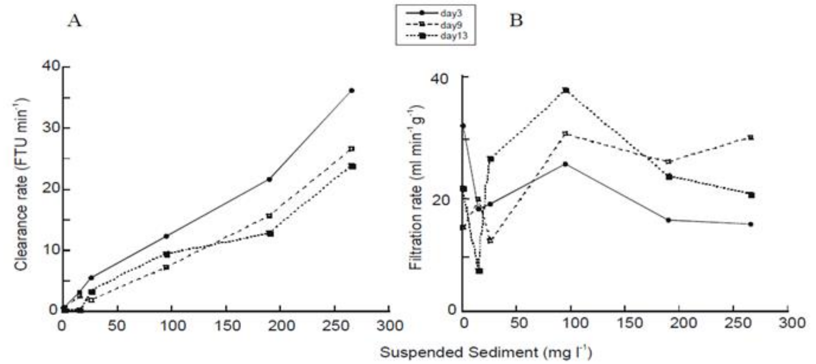

Figure 24: Clearance (A) and filtration rates (B) of the mussels observed in response to different SS levels on days 3, 9, and 13. FTU = standard unit of turbidity.

Schwartz et al, 2006

	Min.	**Max.**
Water velocity	< 0.05 m s^{-1}	> 0.30 m s^{-1}
TPM (seston) concentrations	10 mg l^{-1}	➢ 100 mg l^{-1} (> 3 d) ➢ 1000 mg l^{-1} (> 24 h)

References: Gardner 2002; Hawkins et al., 1999; Inglis et al., 2000; Ogilvie, 2000; Schwarz *et al*., 2006; Widdows et al. 2002; Wildish & Miyares, 1990.

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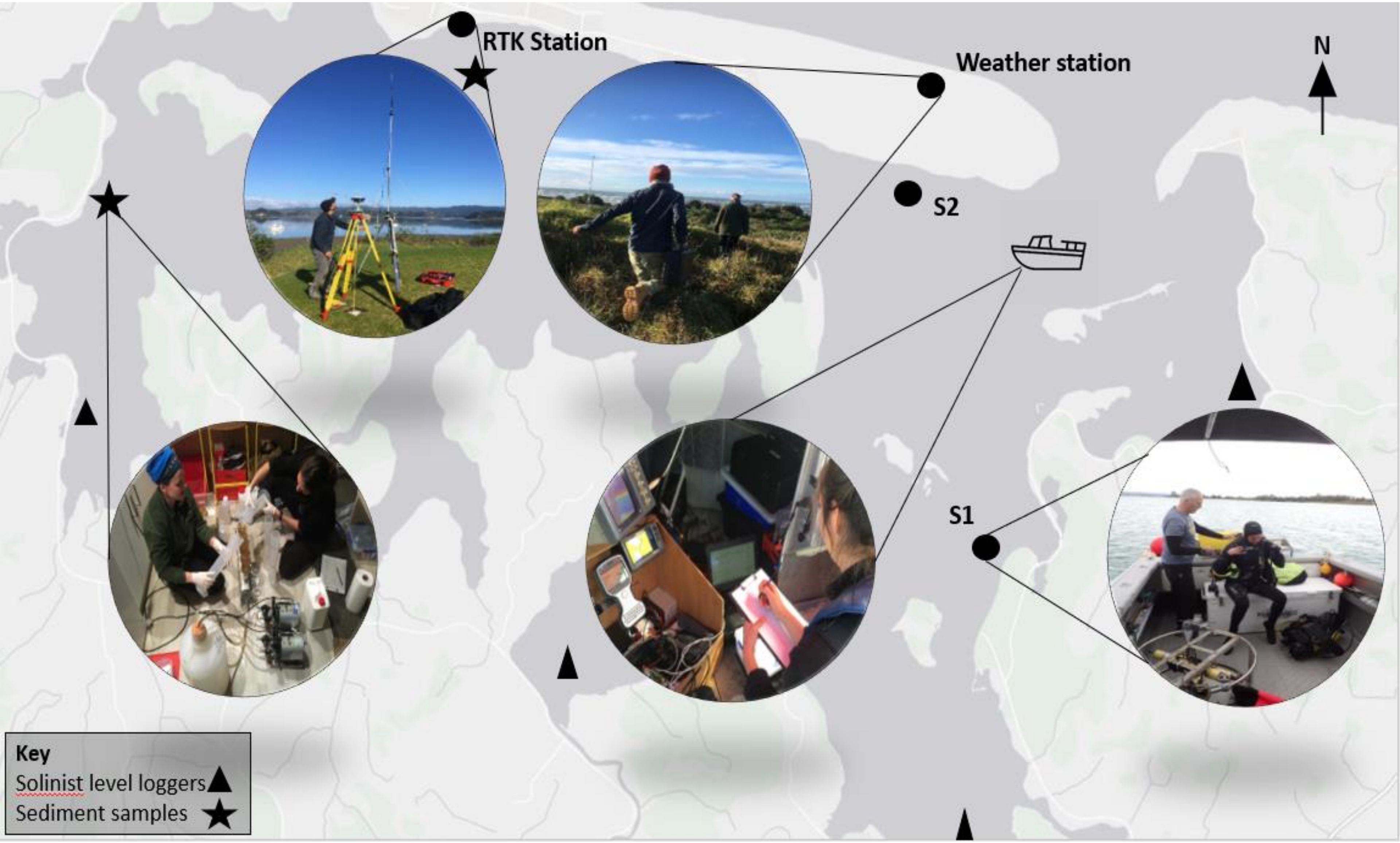
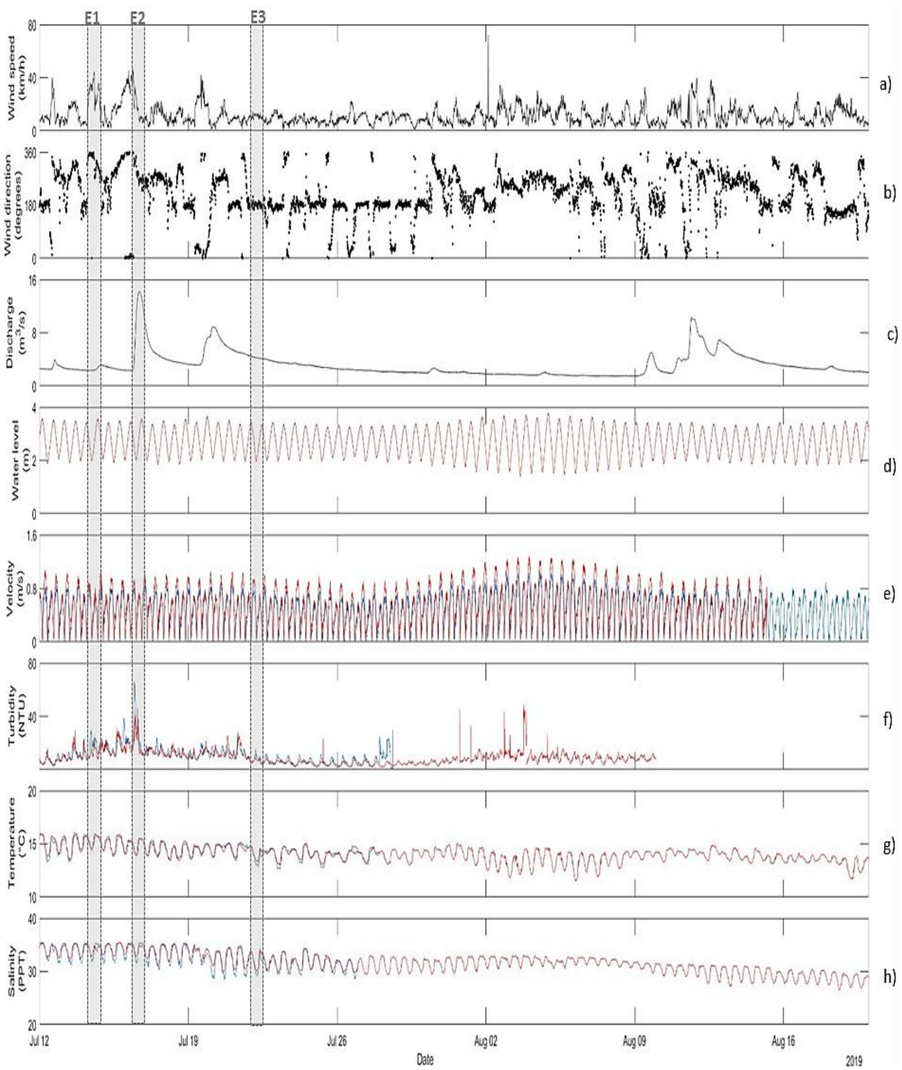
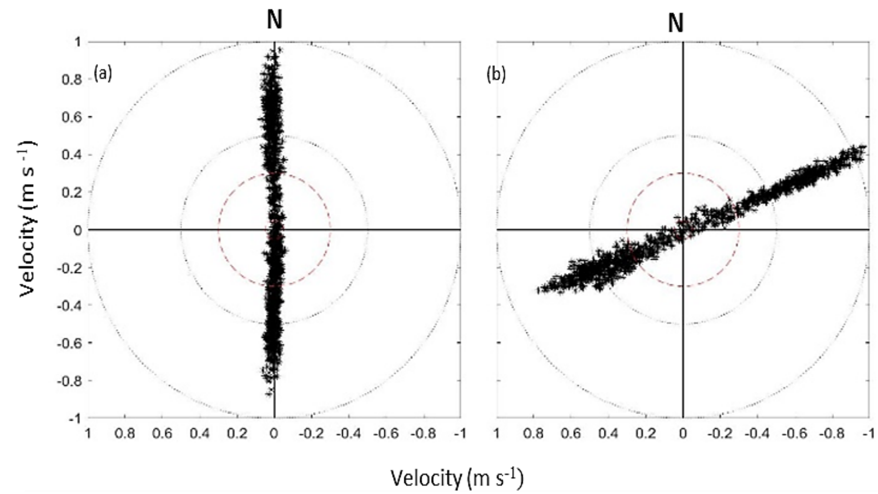
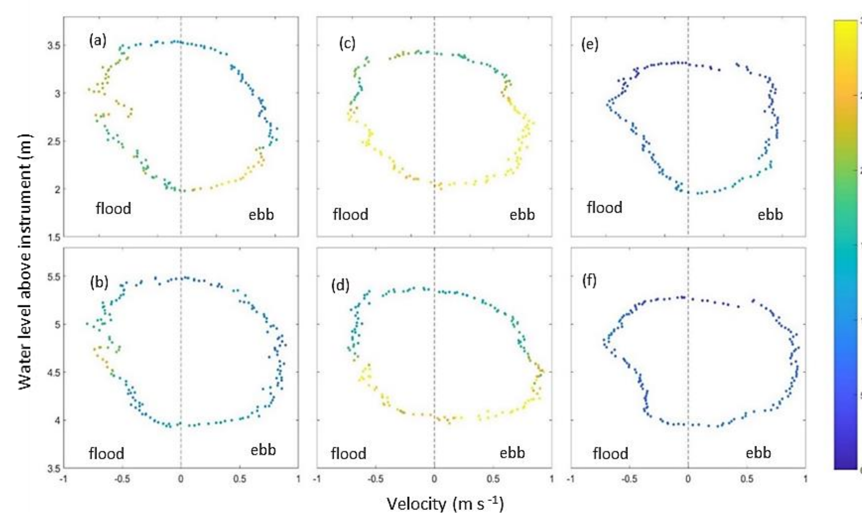
2. Measure environmental data



2. Measure environmental data cont..







3. Estimate the proportion of time mussels could be inhibited from feeding.

	Flow min. < 0.05 m s^{-1}	Flow max. > 0.30 m s^{-1}	TPM min. 10 mg l^{-1}	TPM max. 100 mg l^{-1} (>3 d)	TPM max. 1000 mg l^{-1}
S1	10 %	64 %	8 %	0 %	-
S2	2 %	79 %	12 %	0 %	-

Where to now?

- Start PhD – Determine site suitability using a Shellfish Growth Model
- Develop a 2D hydrodynamic model
- Conduct mussels feeding response trials to create parameters for the Shellfish Growth Model
- Collect environmental data (food indicators)
- Validate the models growth predictions

Thank you for your support.

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Next

- Dive surveys, identify and map current distribution and abundance of mussels and seastars on the bottom
- Wānanga to co-design this seasons taura whiri kūtai (natural resource spat lines) for deployment into the harbour
- Continue tasks 2 & 3
- Identify PhD students for Tasks 1 & 4
- Work with other funded scientists to identify how we can work together to further assist our harbour

Kia ora

Acknowledgements

UPOKOREHE
Te kotahi a Hinetahi, ka horu te moana

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MUSA ENVIRONMENTAL

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Ōpōtiki District Council
STRONG COMMUNITY STRONG FUTURE

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TE WAIMANA KAAKU

Whakatōhea Māori Trust Board

WHAKATĀNE District Council
Kia Whakatāne au i ahau

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