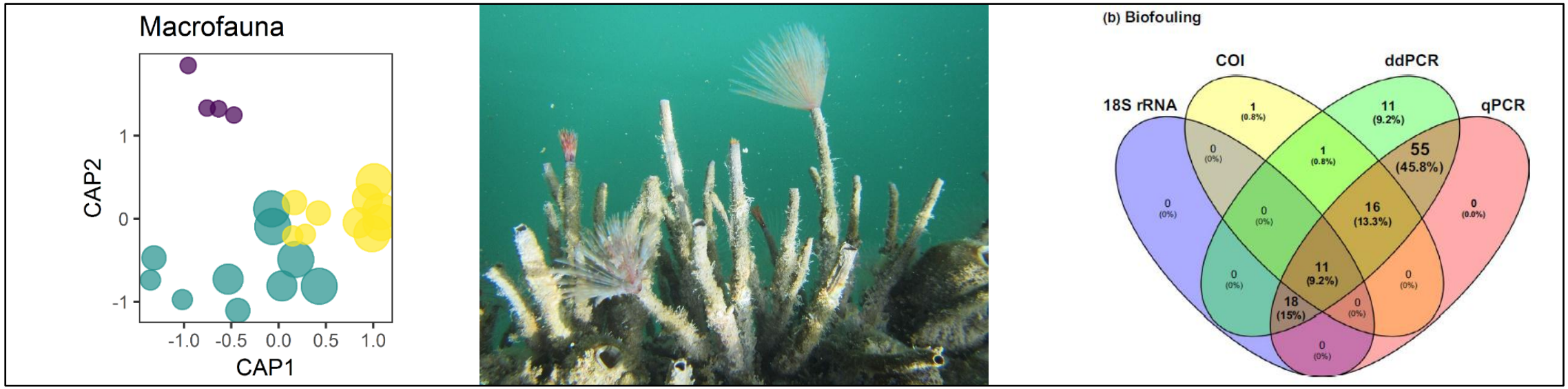
SCIENCE UPDATE – RESEARCH RELEVANT TO BIOSECURITY IN THE TOP OF THE SOUTH REGION

Oliver Floerl (Cawthron Institute), TOSMBP Management Committee



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SABELLA SPALLANZANII
IMPACTS, BIOLOGY AND NOVEL DETECTION TOOLS

1. Experiments to determine ecological impact of fanworms in soft sediments
2. Reproductive biology of *Sabella*
3. Optimisation of eDNA based surveillance tools


Image: J. Atalah

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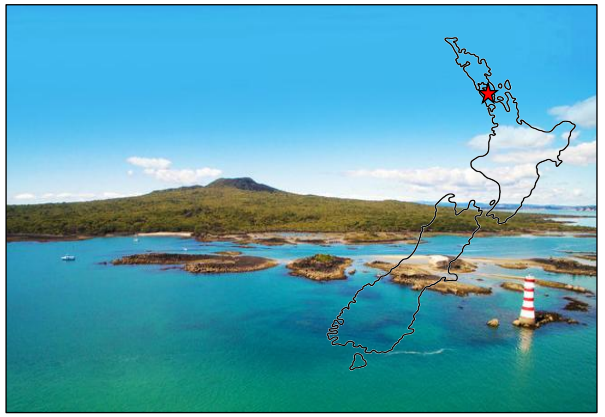
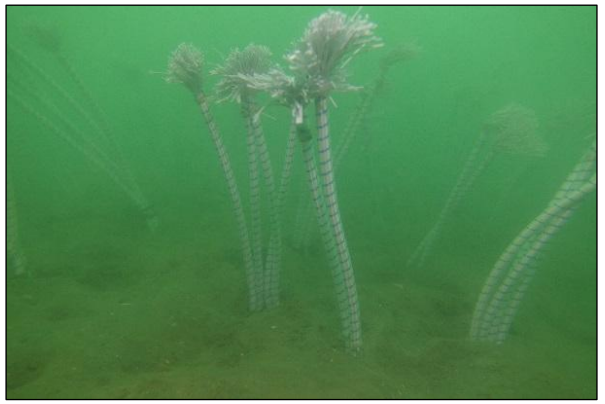
1. How does *Sabella spallanzanii* modify the functioning of soft sediment communities?

- 2016 – 18, Rangitoto Channel
- Transplants – worms and mimics
- Density gradients (0-50 per m^2)
- 6 months

Examined impacts on:

- Soft-sediment fauna (macro/micro)
- Community respiration
- Denitrification
- Primary productivity





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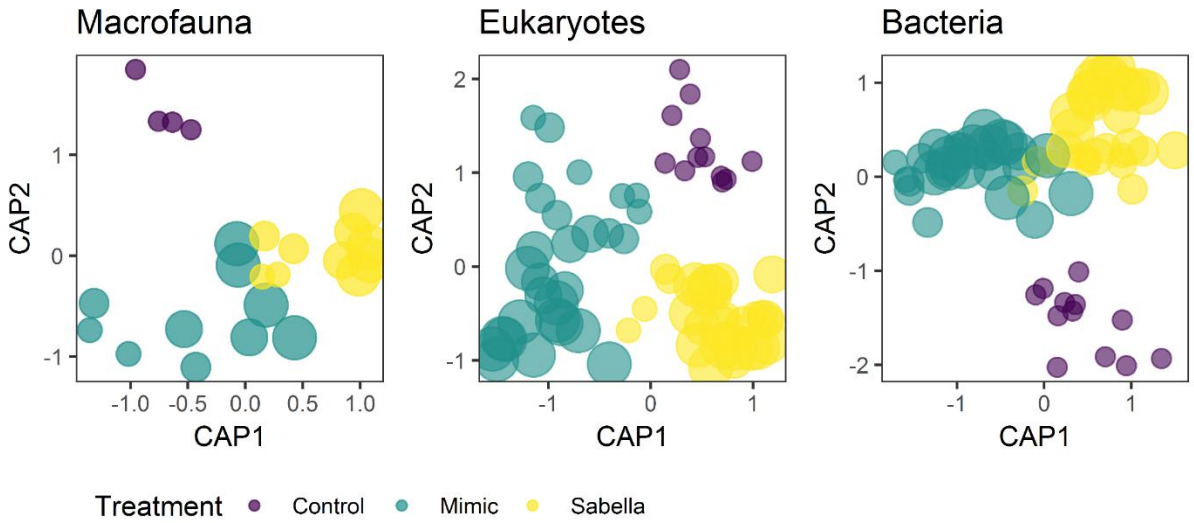
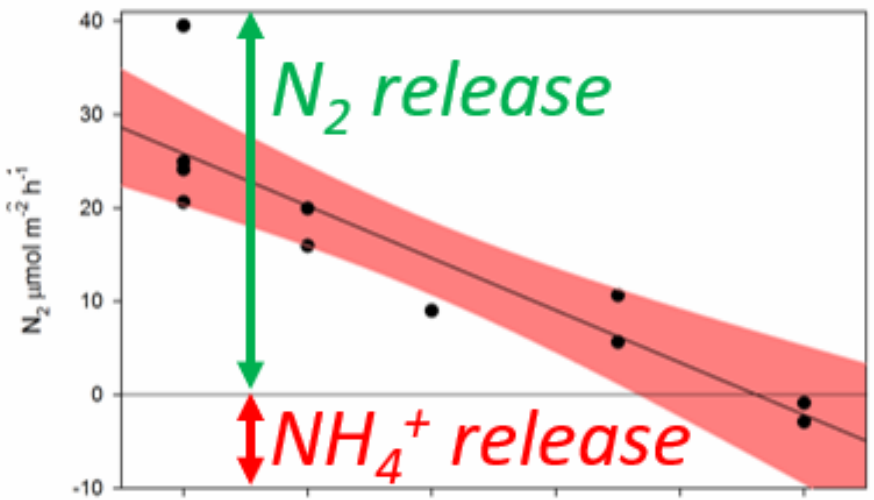
1. How does *Sabella spallanzanii* modify the functioning of soft sediment communities?

- No impacts on sediment biodiversity
- But shifts in the composition of sediment communities
- Increased community metabolism and reduced denitrification
- Worms change structure of above-sediment physical habitat





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1. How does *Sabella spallanzanii* modify the functioning of soft sediment communities?

Quantified impacts on ecosystem services

↓

Decision-making for investment in eradication / management

↖ **Spatial spread models**

↗ **Economic valuation of ecosystem services**

Impact research leads

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2. PhD project: *Sabella spallanzanii* in the context of mussel farms in the Coromandel

Project aims

- Reproductive cycle and output
- Seasonal presence of larvae around mussel farms
- Larval development and settlement preferences
- Potential for regeneration after fragmentation

THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

Sarah Brand
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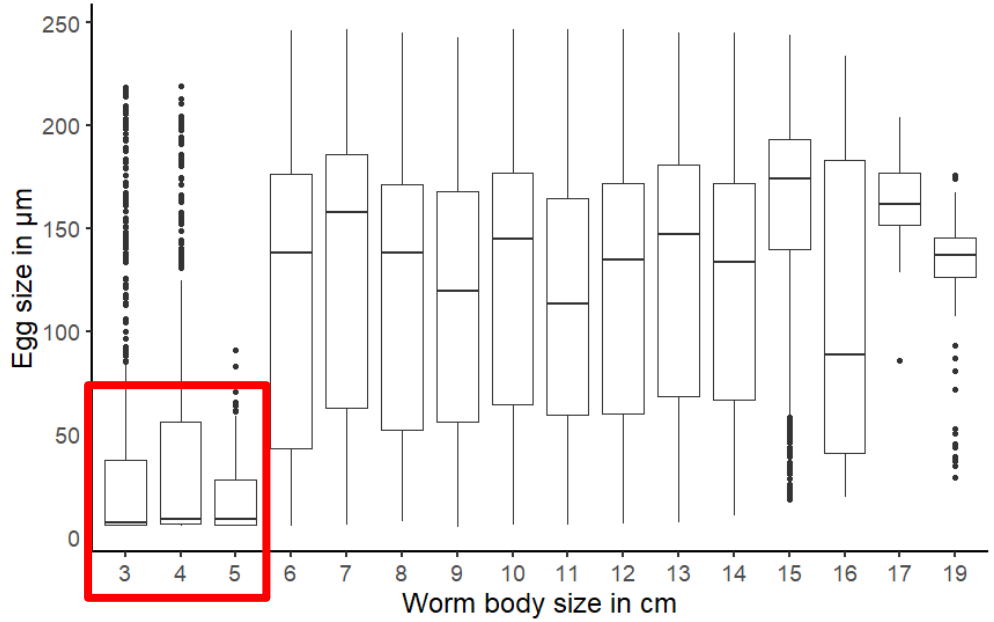
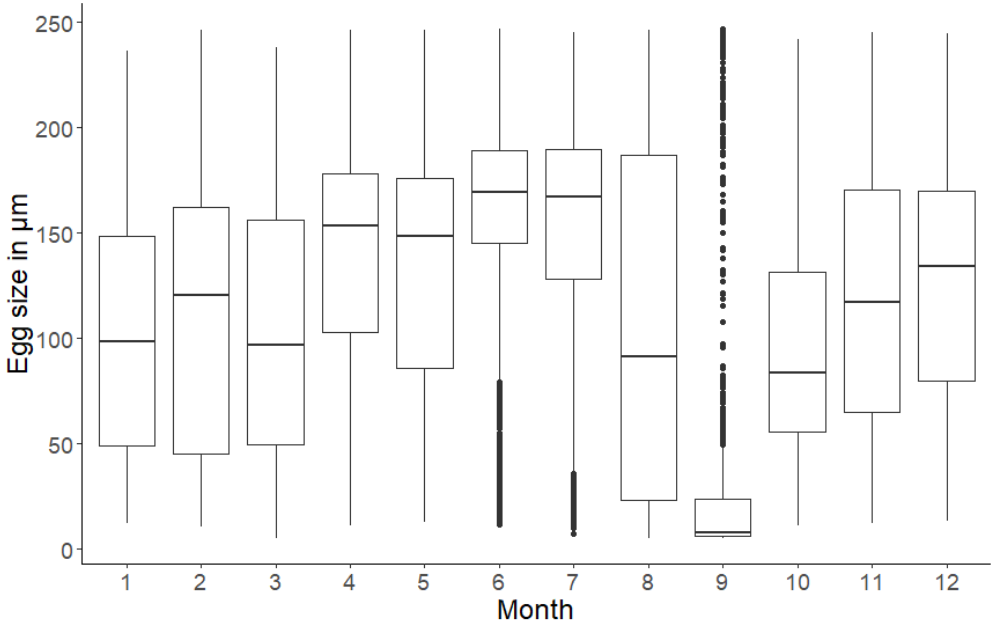
Reproductive cycle and output

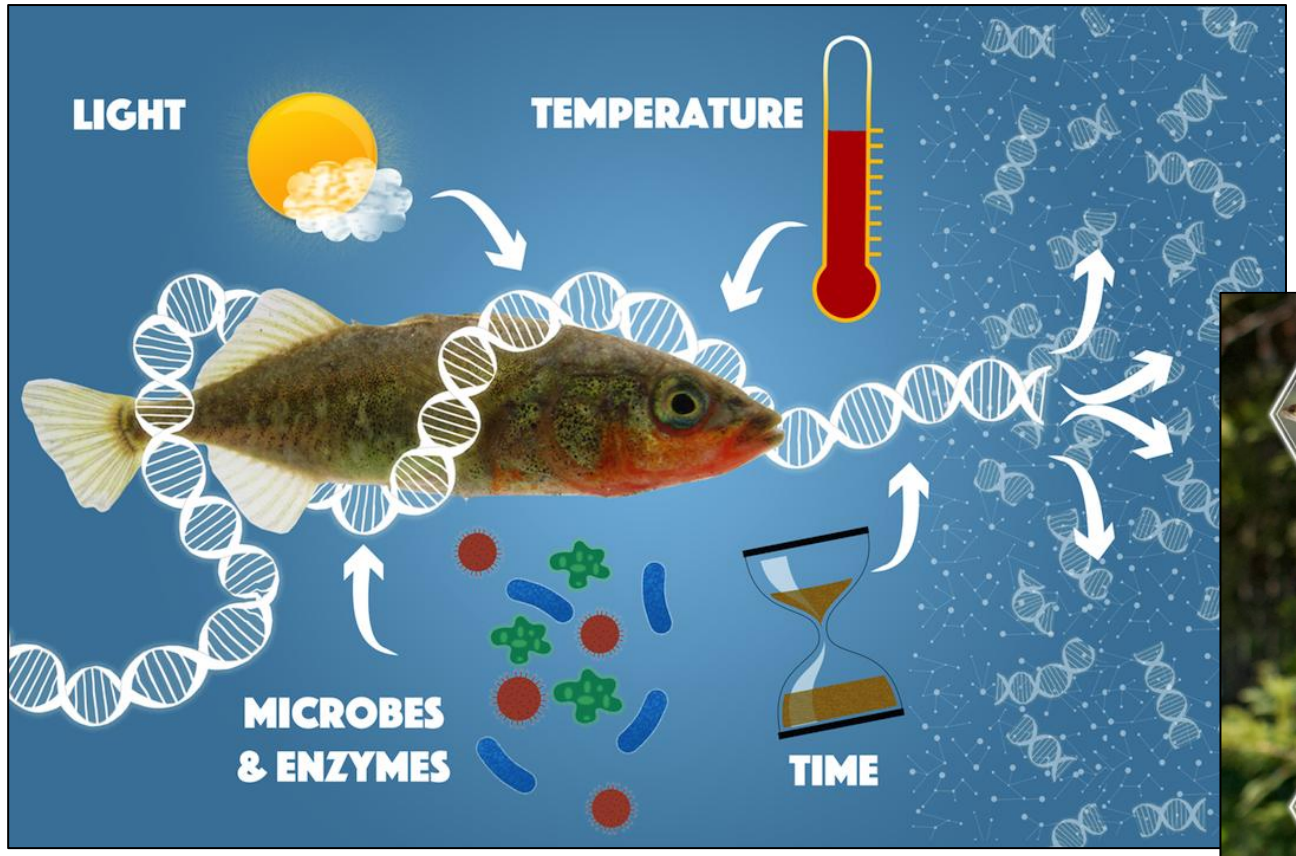
- 1,200 worms sampled over 1y
- Worms <5cm (<10cm tube length) generally not reproductively mature
- Sex ratio of 1:1 not confirmed



- Wide range of egg sizes produced each month
- Continuous egg production and gametogenesis, *potentially* enabling spawning events year-round
- Evidence for a spawning event in Aug/Sept



3. Environmental DNA approaches to finding Sabella (and others)



eDNA sample

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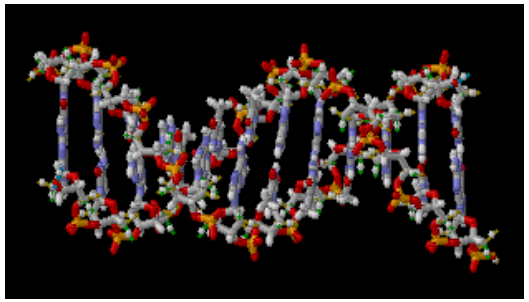
Marine biosecurity applications

Target species detection

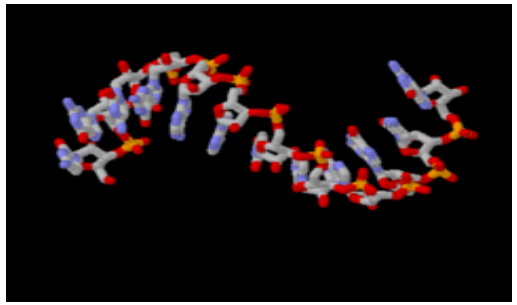
- Species-specific assays
- qPCR, ddPCR
- One-to-few known target taxa
- High specificity



DNA (Deoxyribonucleic acid)

Biodiversity screening

- Community-wide inventories
- HTS metabarcoding
- Multiple taxa, incidental detections
- Validation of positive detections is recommended



RNA (Ribonucleic acid)

Targeted detection surveys to:

- Verify the results of traditional surveillance over various spatial scales
- Assess large-scale pest occupancy (distribution)
- Optimise surveillance designs and management programmes
- Verify eradication success over a constrained area (in prog.)

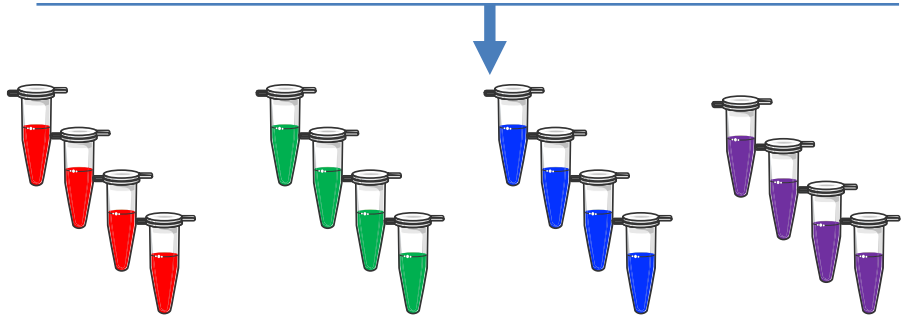
Image: J. Atalah

Image: J. Atalah

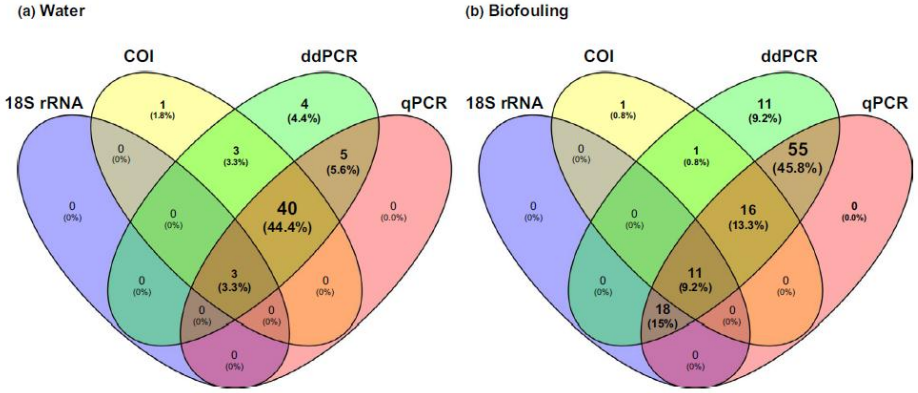
Method development/optimisation

Sampling methods/matrices: filtered water samples vs settlement plates vs sediment

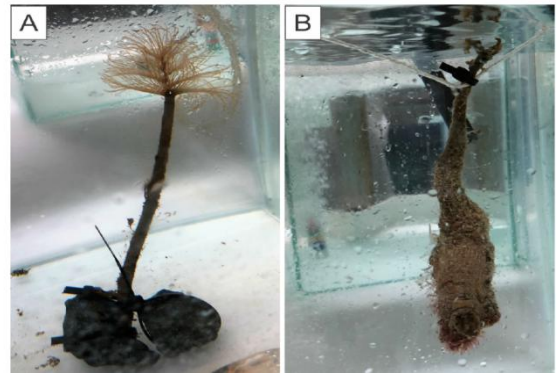
International validation and standardization of pipelines



Analytical platforms: qPCR vs ddPCR vs metabarcoding



eDNA and eRNA fate in water: Experimental study of shedding and decay rates

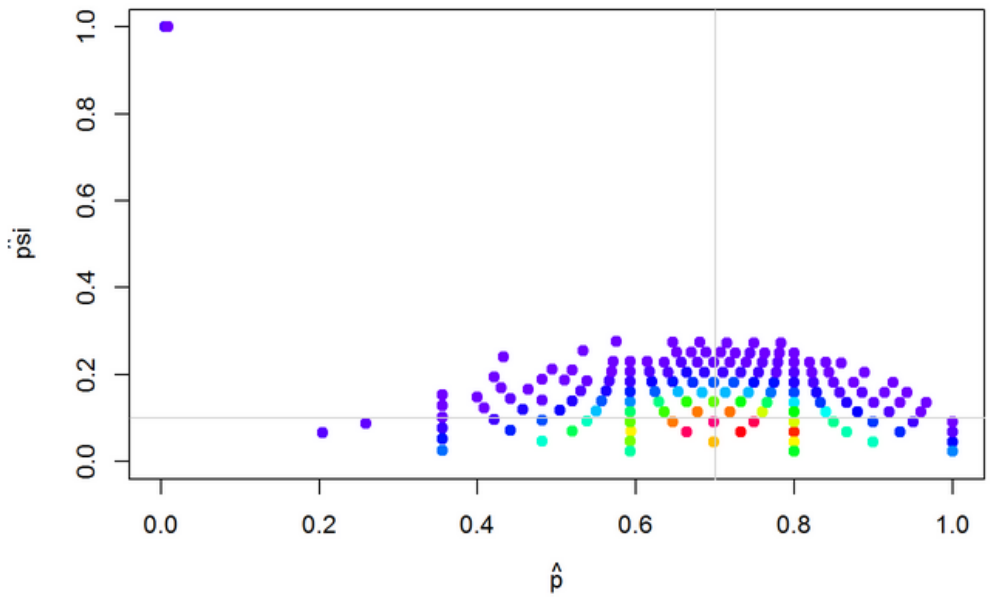


Coupling eDNA signals with probabilistic models to:

- Estimate occupancy of the species (accounting for potentially imperfect detection)
- Estimate probability of detection for particular method/ sampling approach
- Design fit-for-purpose surveys - optimised detection probabilities for a given sampling effort
- Informed interpretation of non-detections

In development: coupling eDNA with hydrodynamic models and novel sampling methods

	qPCR	ddPCR	COI	18S rRNA
Water				
ψ (SE)			0.74 (0.1)	
θ (SE)			0.91 (0.02)	
p (SE)	0.93 (0.02)	1.0	0.57 (0.05)	0.27 (0.05)
Biofouling				
ψ (SE)			1.0	
θ (SE)			0.91 (0.02)	
p (SE)	0.87 (0.03)	1.0	0.40 (0.04)	0.16 (0.03)



FOR MORE INFORMATION….

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