Maximising the benefits of kelp restoration for fish in Port Phillip Bay

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Image: John Turnbull

Scott Ling

Paul Carnell/Nearman

John Turnbull

Kelp restoration

- Transplanting most successful method
- Expensive
- Reduce density?

What do fish need?

Mates + breeding conditions

Ability to reach the new habitat

Food

Appropriate settlement cues

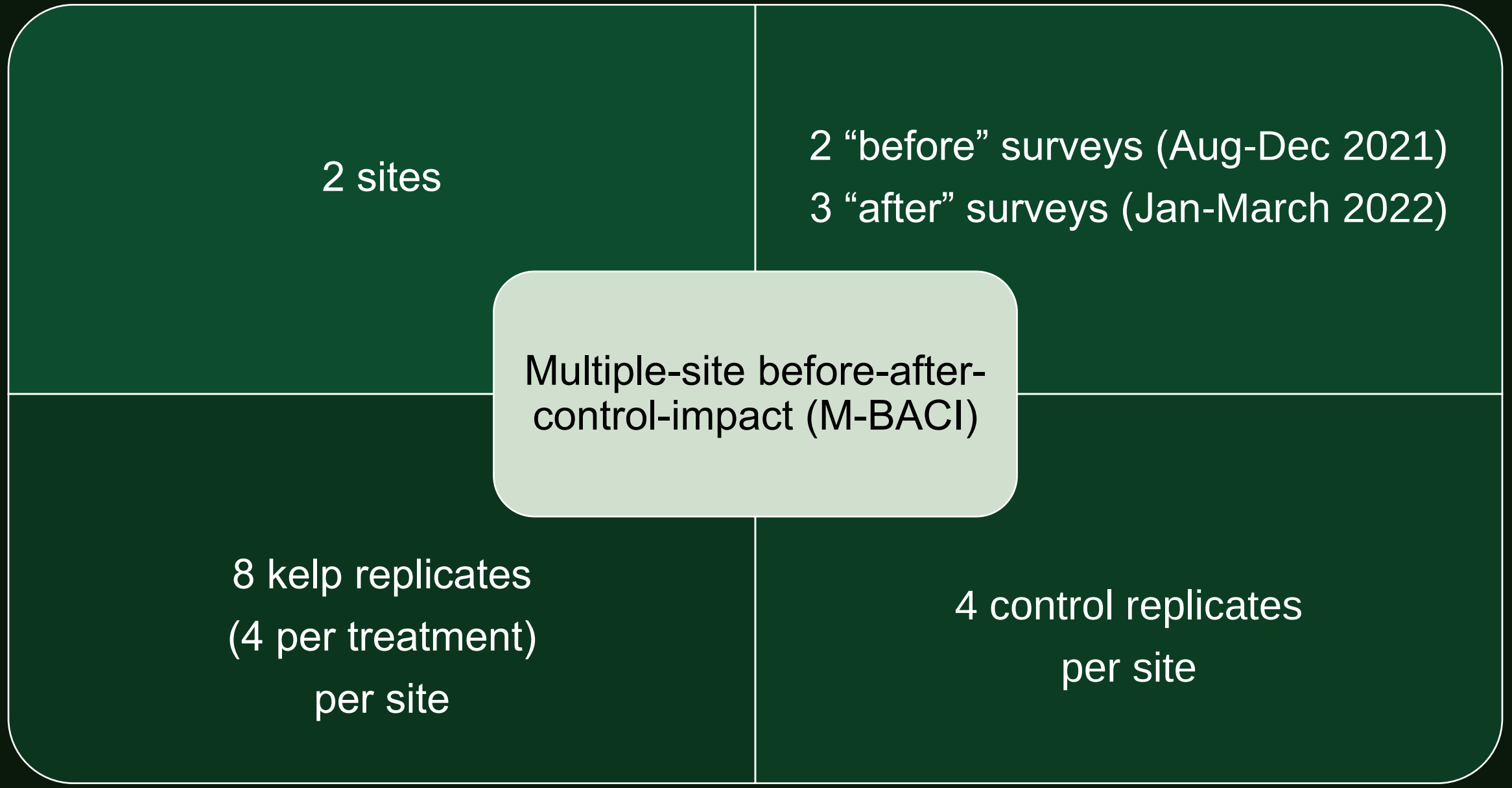
Shelter

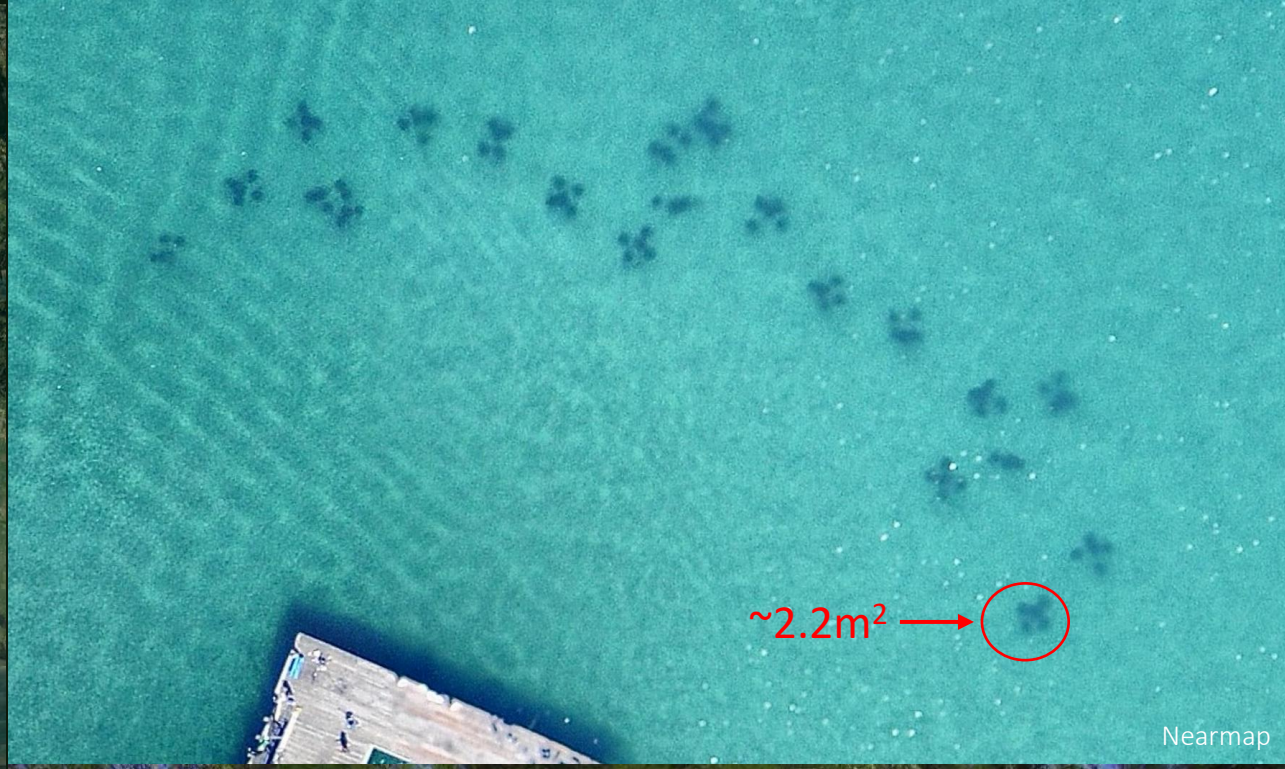
Knowledge gaps:

- Only a handful of studies on transplanting density
  - (in particular see Shelamoff et al. 2020)
- Local ecological context is important

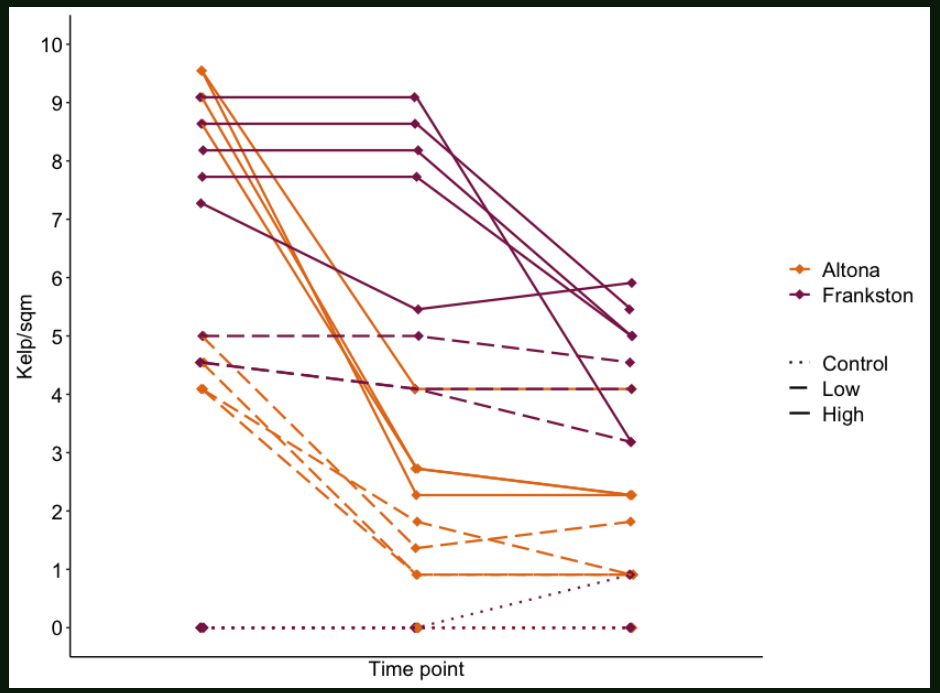
→ We need to understand whether the density of restored kelp matters for fish in Port Phillip Bay.

Aim:
investigate fish community responses to different densities of transplanted kelp


2 sites
2 “before” surveys (Aug-Dec 2021)
3 “after” surveys (Jan-March 2022)
Multiple-site before-after-control-impact (M-BACI)
8 kelp replicates
(4 per treatment)
per site
4 control replicates
per site



Sites – “reef ball” reefs in Port Phillip Bay



Treatments

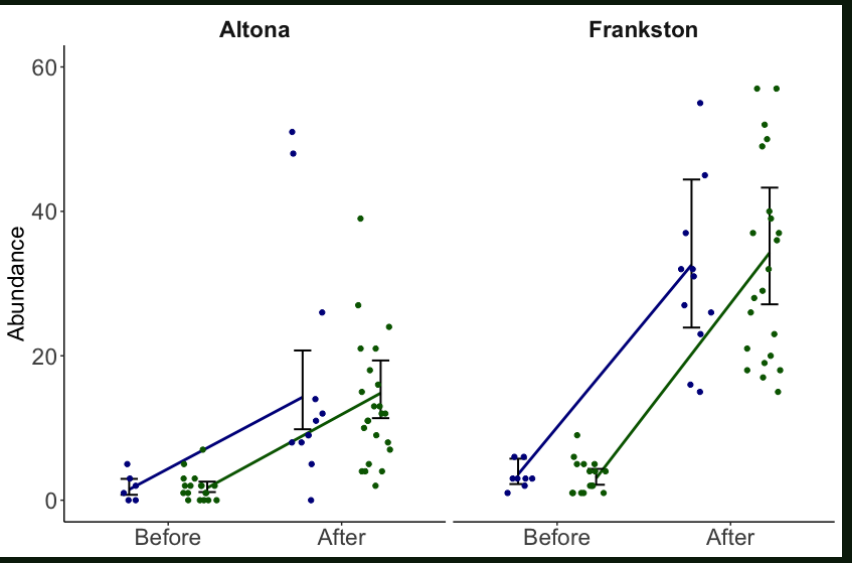
- Original: 0, 5 and 10 kelp/m^2
  - Resembling variability in natural reefs nearest to sites
- Kelp died off over time
  - Uneven across treatments
  - Worse at Altona
  - Densities by final survey: 1-6/m^2

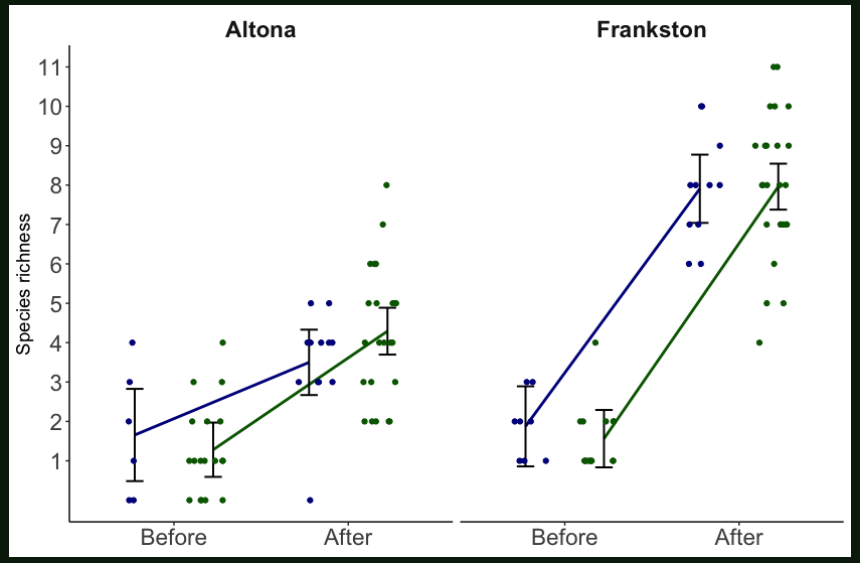
Responses of interest

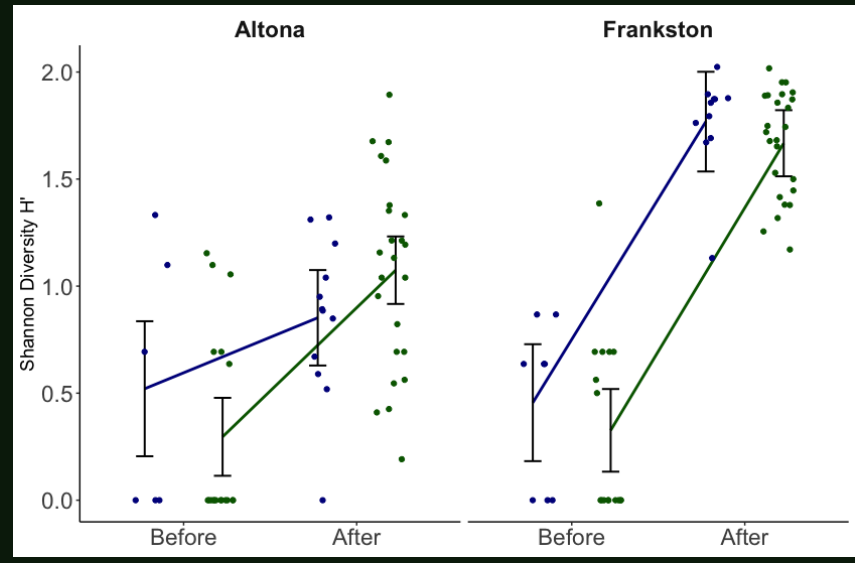
- Abundance
- Species richness
- Shannon-Wiener diversity
- Community composition

What did I find?

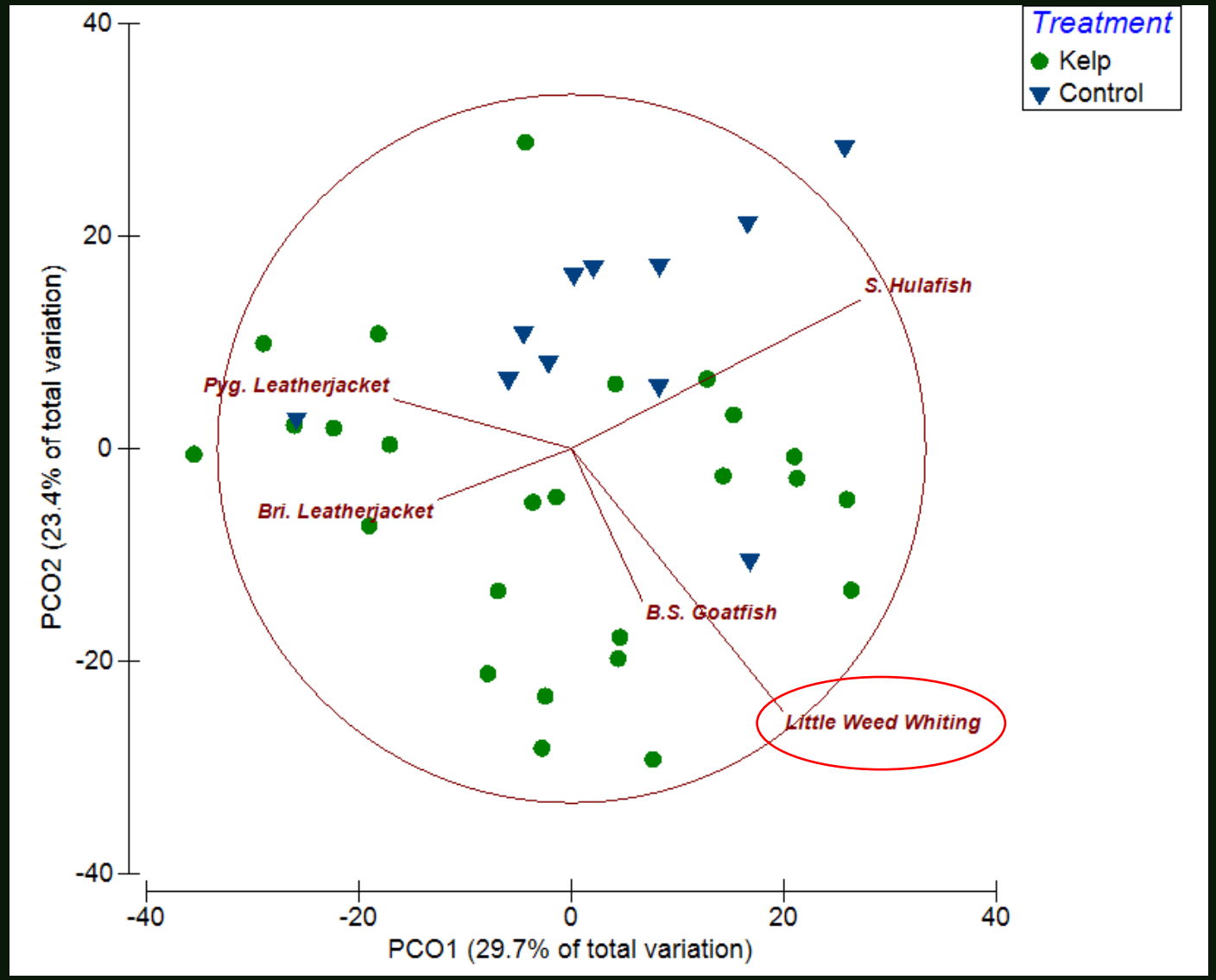
Zilch, zip, nada!







- Significant effect on community composition at Frankston (p=0.02), driven by 5 species
- BUT only one species (*Neoodax balteatus,* Little Weed Whiting) was more abundant in kelp (p<0.001)



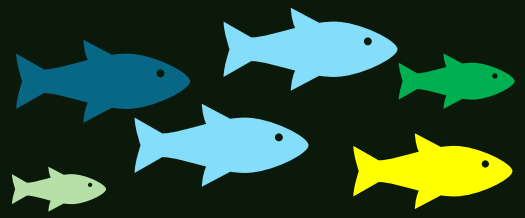
But kelp should have improved habitat – what happened?

John Turnbull

Frankston

2.9km

Further from city, lower turbidity



Mean ~6, Median 5

Closest natural *Ecklonia* reef

Water quality

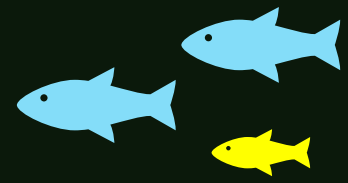
Species pool

Kelp density

Altona

5.6km

Closer to shipping channel, high turbidity



Mean ~3.5, Median 2.5

Poor quality original habitat → species too generalist?

Julian Finn

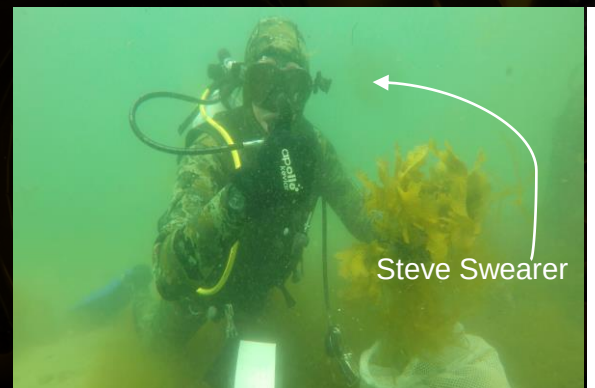
- Weak settlement cues
  - Olfactory
  - Visual
- Accurate settlement cues?
  - Not enough shelter, food
- (Too) good settlement cues?
  - i.e. ecological trap

Matt Testoni

- Adding kelp ≠ automatically better habitat
- Species pool, location and pre-restoration habitat quality will influence success (including for the kelp)

→ Low-density kelp restoration is unlikely to have a positive effect on fish in Port Phillip Bay.

Acknowledgements



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Matt Testoni