

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

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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.



An underwater photograph showing a school of fish swimming above a dense bed of brown kelp. The water is clear and blue-green. The fish are small and silvery, moving in various directions. The kelp is a thick, textured layer at the bottom of the frame.

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

2 sites

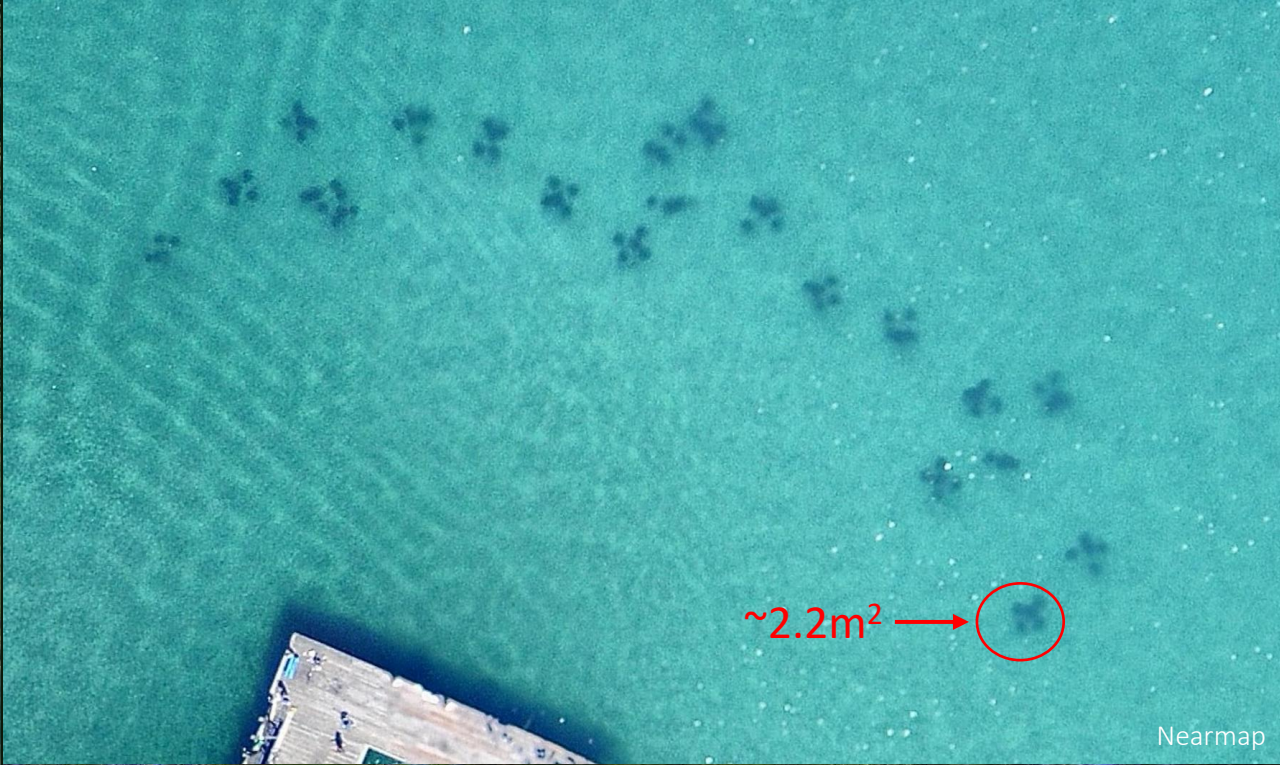
2 “before” surveys (Aug-Dec 2021)

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



Nearmap

Reef Balls Australia

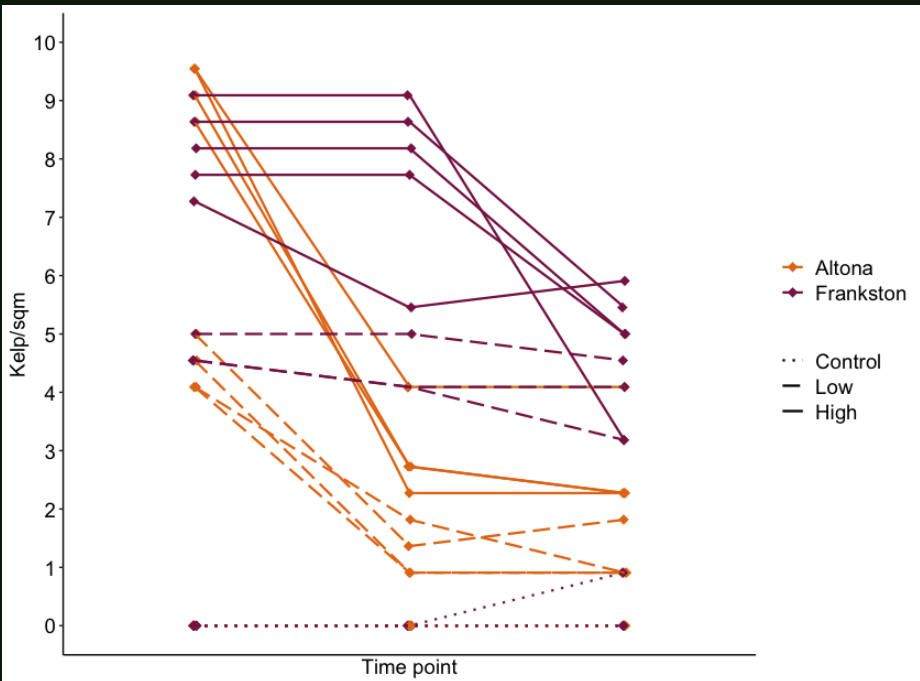
Sites – “reef ball” reefs in Port Phillip Bay





Treatments

- Original: 0, 5 and 10 kelp/m²
 - 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/m²





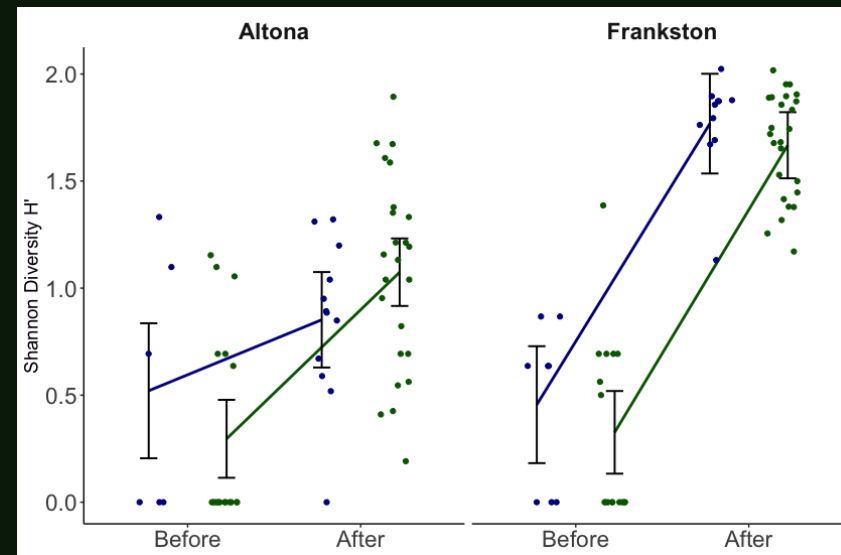
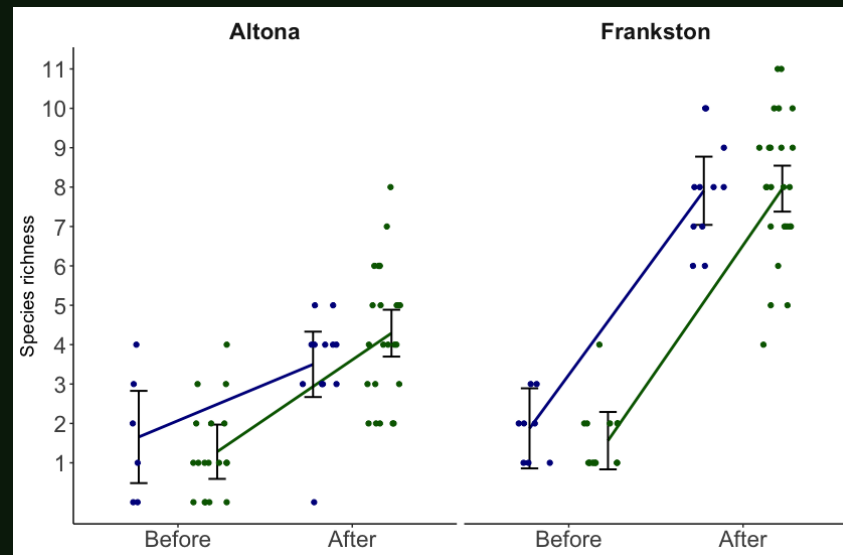
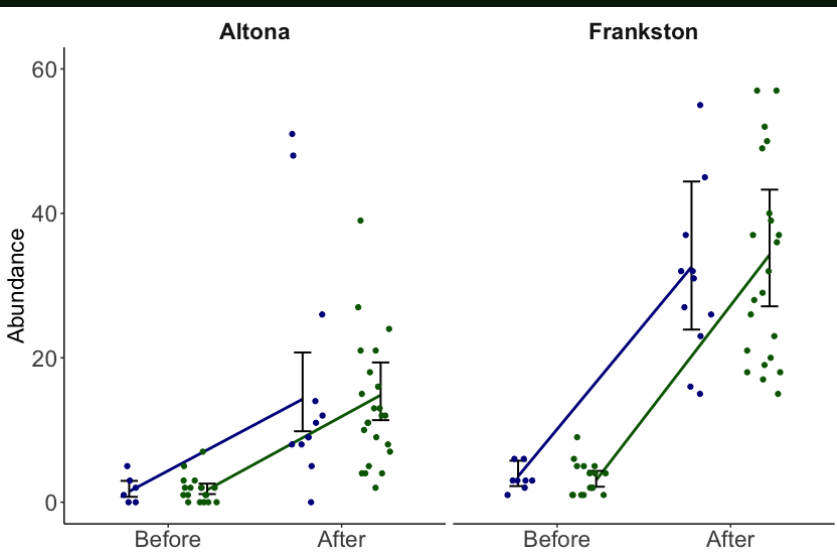
Responses of interest

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

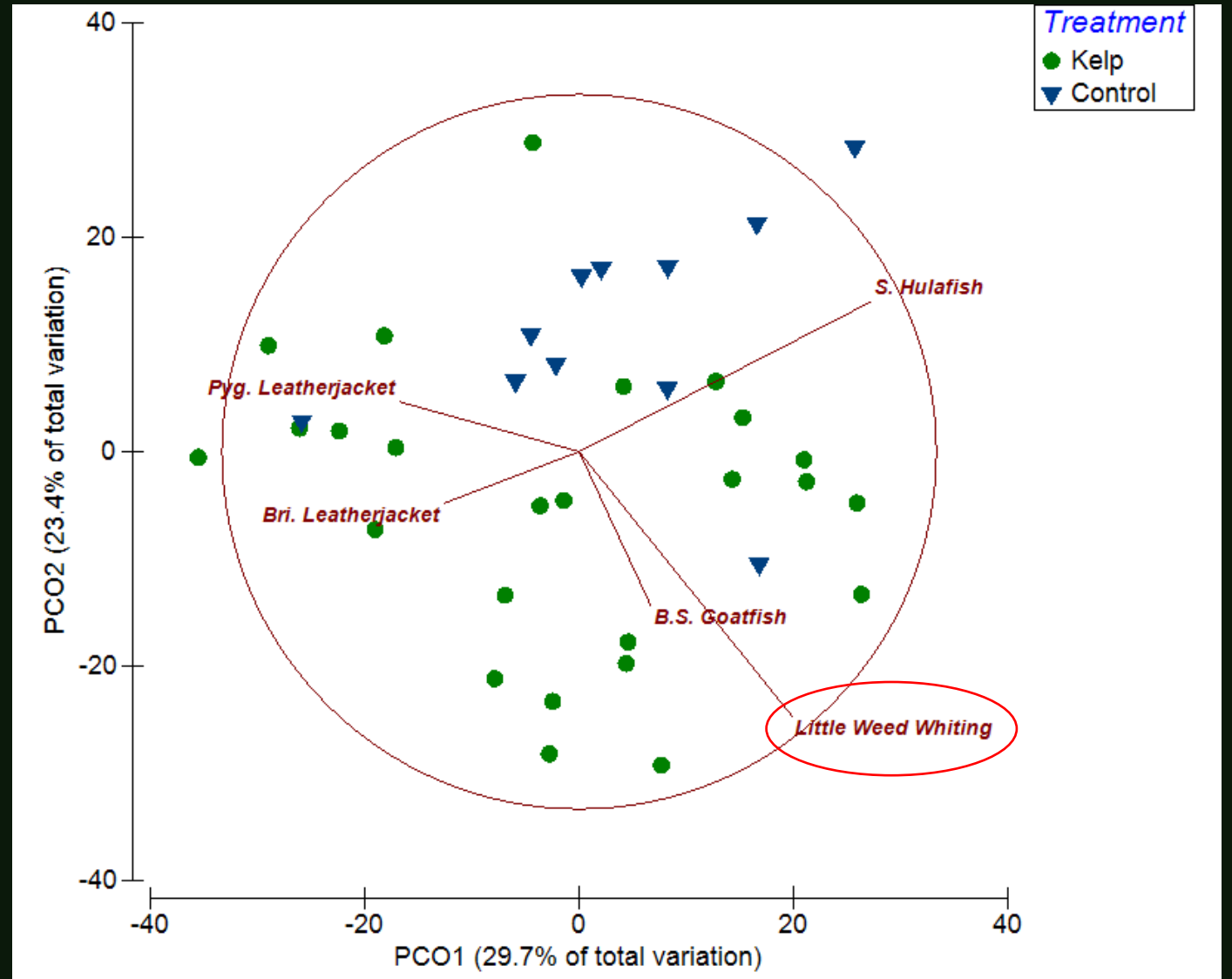
A diver is shown underwater, equipped with a large air tank and a flashlight. The diver is positioned in the upper right quadrant of the frame, with their body angled downwards. The air tank is a prominent feature, with a white and black color scheme. The diver's hands are visible, holding a flashlight that is pointed towards the bottom left. The background is a deep blue-green, suggesting an underwater environment. The overall scene is dimly lit, with the diver's equipment providing the primary light source.

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?

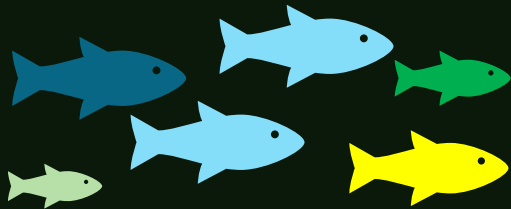


Frankston

2.9km



Further from city,
lower turbidity



Mean ~6, Median 5

Closest natural
Ecklonia reef

Water quality

Species pool

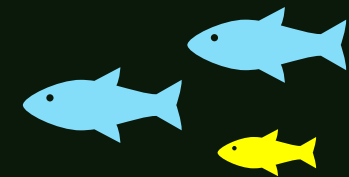
Kelp density

Altona

5.6km



Closer to shipping
channel, high
turbidity



Mean ~3.5, Median 2.5

Poor quality original habitat → species too generalist?





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

An underwater photograph of a dense kelp forest. The kelp blades are a vibrant yellow-green color, illuminated from above, creating a strong contrast with the dark, deep water. The blades are long and narrow, with some showing serrated edges. They are tangled and overlapping, creating a complex, textured appearance. The lighting is dramatic, highlighting the edges and tips of the kelp blades, while the rest of the scene fades into shadow.

What can we
learn from this?

- 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

