



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

FLEXING OUR MUSSELS: RESTORING NEW ZEALAND'S WILD INTERTIDAL MUSSEL REEFS

Trevyn Toone^{1,2}, Emilee Benjamin^{1,2}, Sean Handley², Jenny Hillman¹, Andrew Jeffs¹

¹University of Auckland Institute of Marine Science, ²National Institute of Water and Atmospheric Research

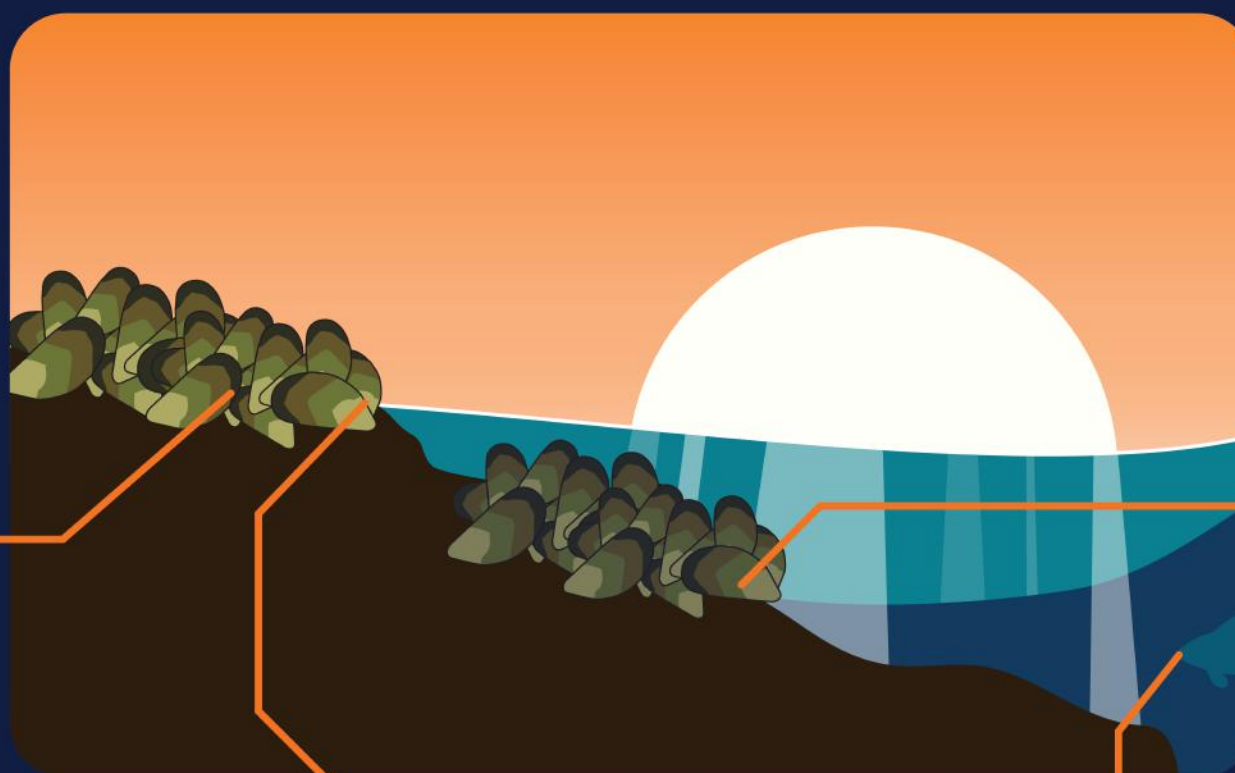


NIWA
Taihoro Nukurangi

BACKGROUND

- Shellfish like oysters and mussels can build **complex reefs** that filter water, create habitats, and stabilize the seafloor (Grabowski et al., 2012)
- Shellfish reefs have globally **severely declined** in recent history (Beck et al., 2009)
- Restoration projects attempt to address these losses with **mixed results** (Fitzsimmons et al., 2020)
- The intertidal zone, or the area exposed on low tides but covered on high tides, has seen **very low survival** in traditional restoration efforts (de Paoli et al., 2015)
- We restored mussel reefs in an area with low predator abundance and high wave protection to test **whether successful intertidal restoration is possible**

Mussels can join to form dense reefs!



METHODS

- Study took place at the **top of New Zealand's South Island**
- **5 tonnes** of adult mussels from aquaculture farms were restored to the seafloor
- Half of mussels were restored **intertidally** and half **subtidally** but they were restored at the same times, places, and from the same sources
- Mussels are monitored every three months for **survival, growth, and health**



Mussels were restored at three sites at the top of New Zealand's South Island

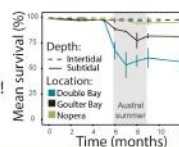
As the tide rises, it covers the restored intertidal mussels



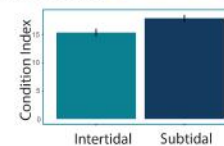
RESULTS

- After one year the subtidal mussels showed **very high survival!**
- The intertidal mussels had **high survival at one location**, but many died of **heat stress** at the other two locations
- **Subtidal mussels grew faster** than intertidal and appear to be **slightly healthier**

Almost all mortality occurred during the summer!



Condition index is a way to measure mussel health!



CONCLUSIONS

- To our knowledge this is the **first restoration of intertidal mussels at this scale with high survival**
- Intertidal restoration is possible as long as stress like predation, wave action, and heat is avoided
- While intertidal restoration is cheaper and easier, subtidal restoration may still result in healthier, larger mussels, so **managers should decide based on their goals and resources**

A successful restored intertidal mussel reef!



Subtidal mussels appear to be healthier and grow faster!



FUTURE RESEARCH

- We will continue monitoring these restored reefs to see if any **baby mussels** arrive!
- Research into different benefits from intertidal and subtidal mussels will impact future work
- Eventually, we hope to restore mussels intertidally and subtidally at a **larger scale!**

Intertidal and subtidal mussels may form different kinds of habitats!



I'd love to hear from you!

✉ ttoo112@aucklanduni.ac.nz

🐦 @trevtoone

🌐 trevyntoone.com

Reach out to me!

Or see more about the project here!



REFERENCES

Beck MW et al. (2009) Shellfish Reefs at Risk: A Global Analysis of Problems and Solutions. Arlington, VA
Fitzsimmons JA et al. (2020) Restoring shellfish reefs: Global guidelines for practitioners and scientists. Conservation Science and Practice
Grabowski JH et al. (2012) Economic valuation of ecosystem services provided by oyster reefs. BioScience 62:900-909
de Paoli et al. (2015) Processes limiting mussel bed restoration in the Wadden-Sea. Journal of Sea Research 103:42-49