

# Creating Opportunities for Bull Kelp Aquaculture

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*I undertook a PhD on this topic with the Blue Economy CRC because seaweed aquaculture is an emerging sector in Australia and New Zealand and I wanted to be at the forefront of that research, especially because we are dealing with taonga (treasure) species for Māori. With this project, I am aiming to bring together indigenous knowledge and practice with western science protocols in hopes to further progress those key relationships*

*Following my PhD, I wish to be involved in a sector where I can further progress my love for the ocean to aid in climate change and intensive farming mitigation, while also ensuring inclusivity with indigenous communities*

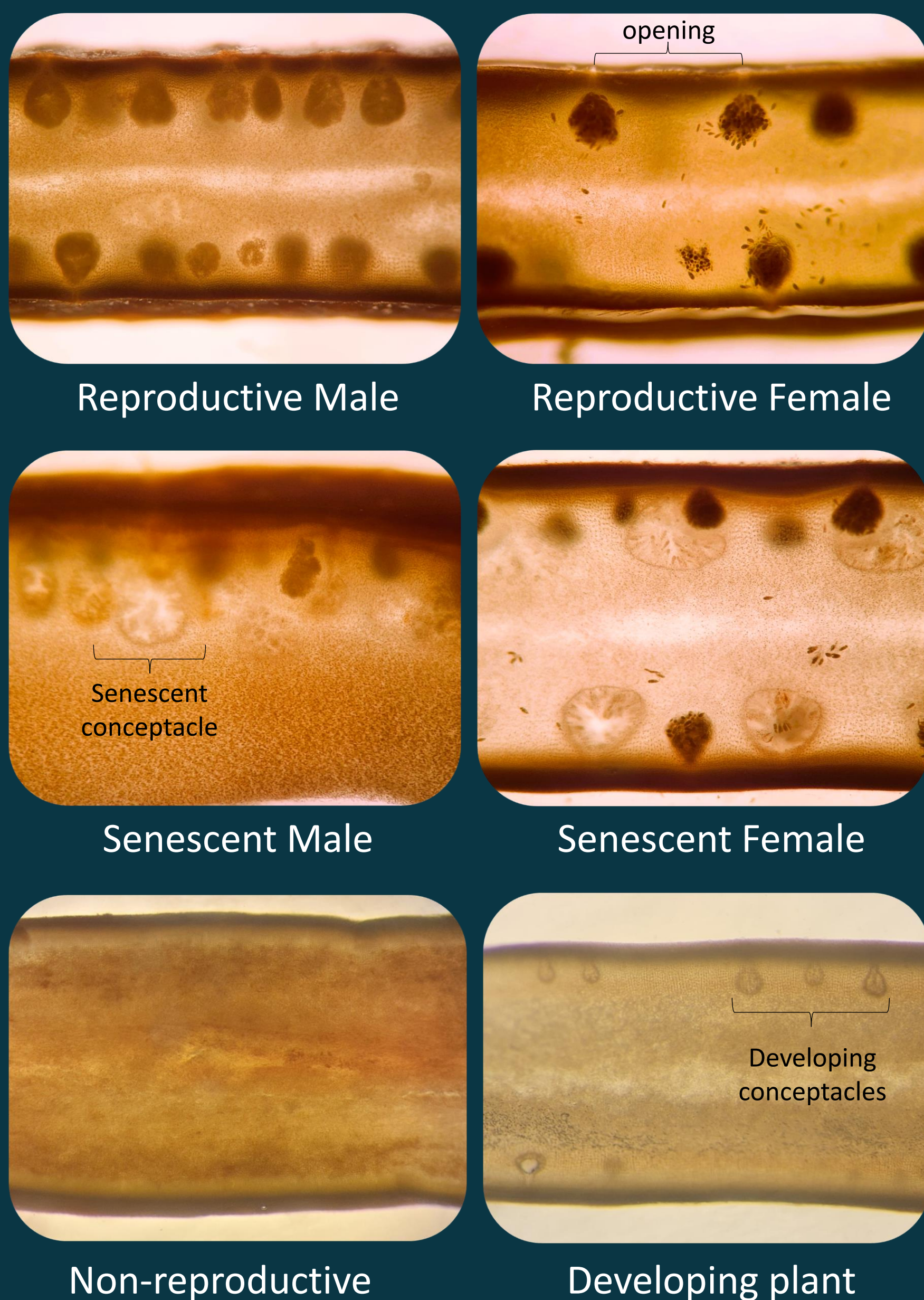


## Background

Bull Kelp, or *Durvillaea* spp., are large brown seaweeds found in New Zealand, Australia, South America, and the Subantarctic Islands<sup>1,2</sup>. These kelp species inhabit rocky reefs in New Zealand, with the NZ endemic, *Durvillaea poha* being recognized as genetically distinct in 2012<sup>2,3</sup>. Bull kelp play vital roles in coastal ecosystems, while their high alginate levels, used in foods, pharmaceuticals and cosmetics, provide resilience in wave-exposed environments<sup>2,3</sup>. The existing *Durvillaea* industry on King Island, Australia, for both alginate and for plant and soil treatments, relies on beach-cast stock<sup>4</sup>. Developing a new *Durvillaea* aquaculture industry in NZ and AUS faces challenges due to limited knowledge of key biological aspects.

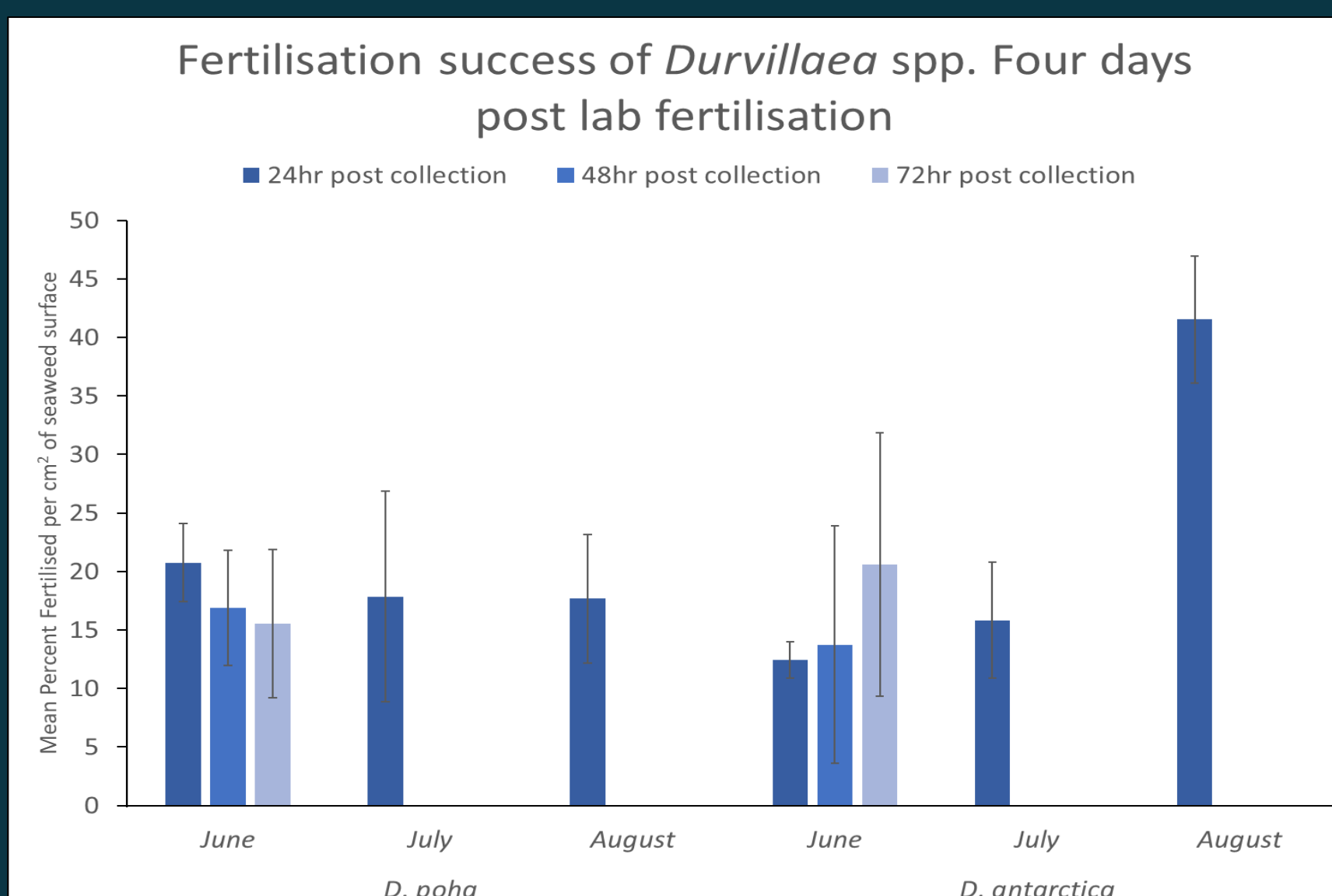
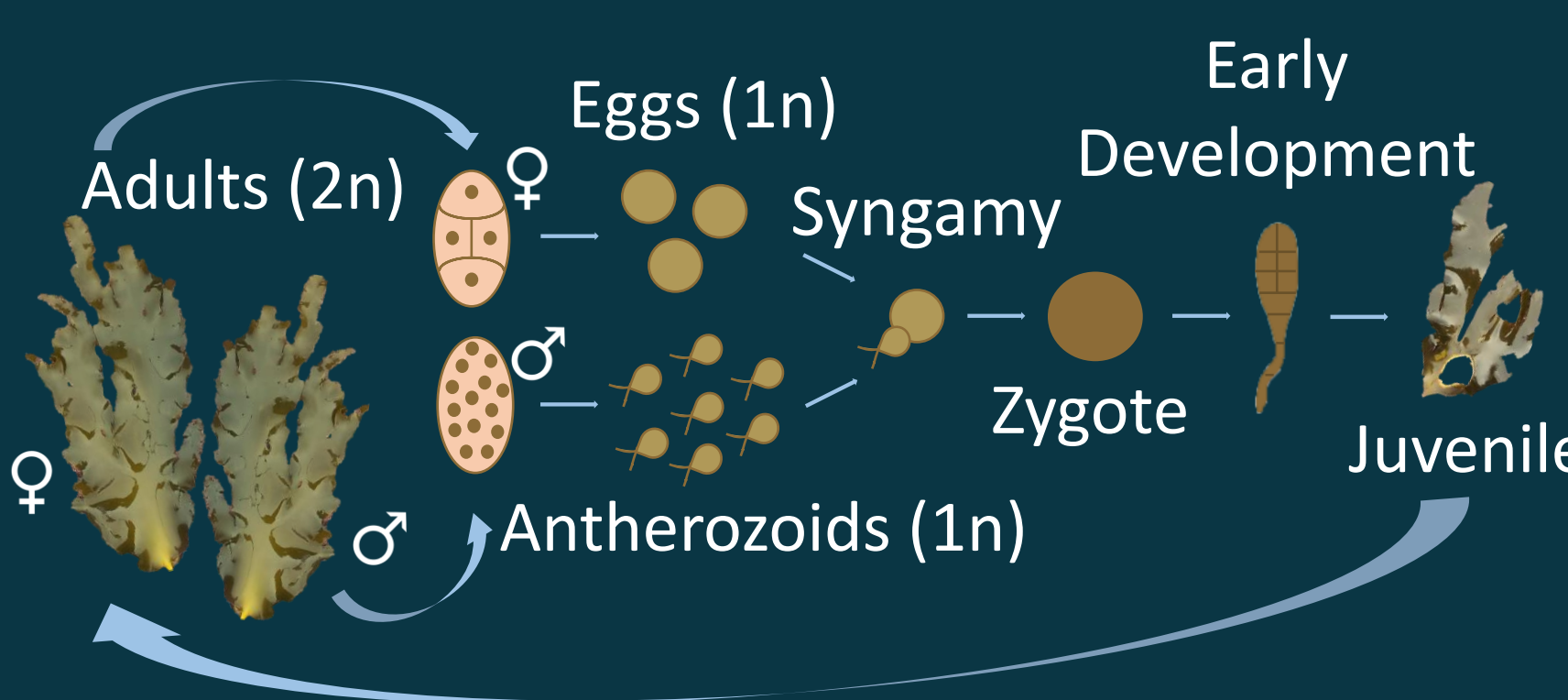
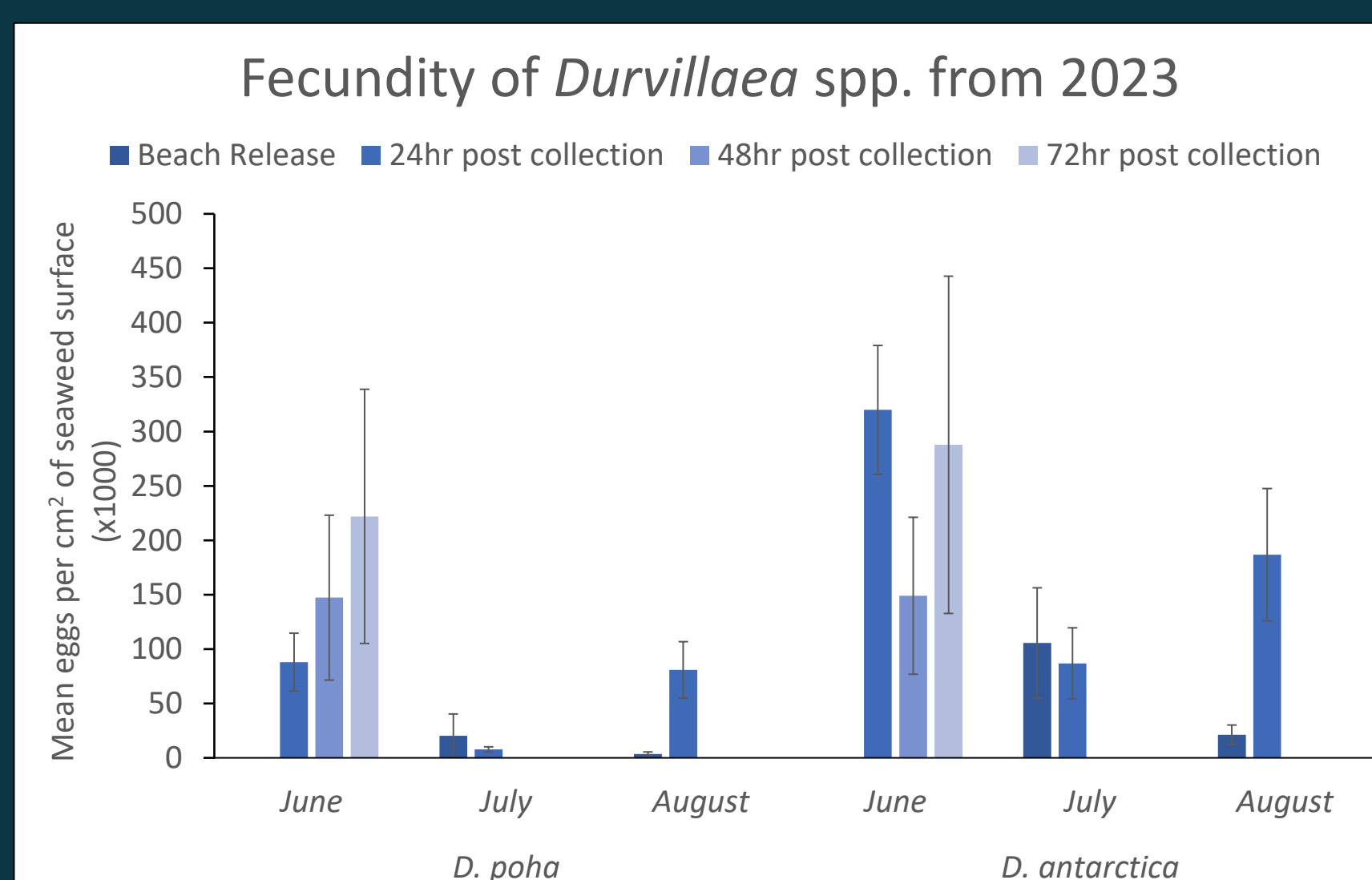
The blue economy's future lies in integrated multi-trophic systems for enhanced efficiency, waste reduction, and ecosystem services like bio-remediation. This project could significantly benefit New Zealand and Australia's offshore seaweed aquaculture by utilizing endemic species, appealing to residents and businesses.

## Histology



A total of 6,225 conceptacles from *Durvillaea antarctica* and *D. poha* (both male and female) were examined from May 2022 to April 2023. Results showed that early development starts in late March to early April, with peak maturity from May to August. Gametes are spent during this period, and senescence occurs from September to February

## Reproduction



## Alginate

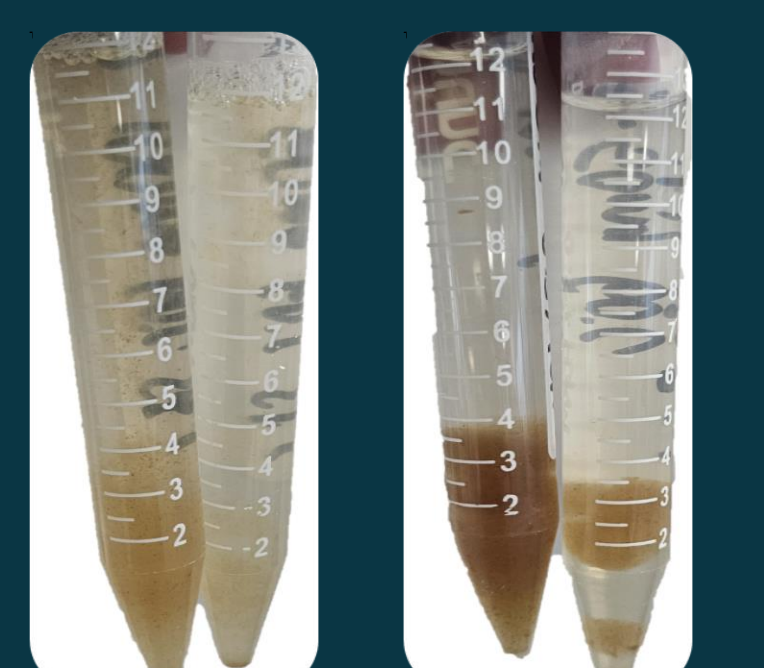
Alginate content in *Durvillaea* spp. from New Zealand and Australia has been recorded at 30%-55% dry weight, which competes with other commonly cultivated species<sup>5</sup>

Typical extraction methods include a form of acid pre-treatment, an alkaline extraction in water, then a precipitation/purification regime and drying<sup>6</sup>



We tested pre-treatments of ETOH, formalin, and no treatment for the tissue and found that an overnight treatment in 0.5% formaldehyde was most effective at stripping the pigments

Then the alkaline extractions at 60°C with shaking vs. non-shaking, with shaking at 60°C showing to macerate and combine the tissue better in the alkaline solution



Shaking Non-shaking

Initially, we did not alter the pH of our alkaline solution ( $\text{Na}_2\text{CO}_3$ ) before the addition of our precipitant ( $\text{CaCl}_2$ ), so we were precipitating alginate and  $\text{CaCO}_3$  simultaneously. Subsequent testing revealed lowering the pH to ~6 resolved this issue, but further testing will be required to ensure the accuracy of this method

## References

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