How Seagrass Meadows Influence Nutrients and Microalgae in Coral Reef Ecosystems

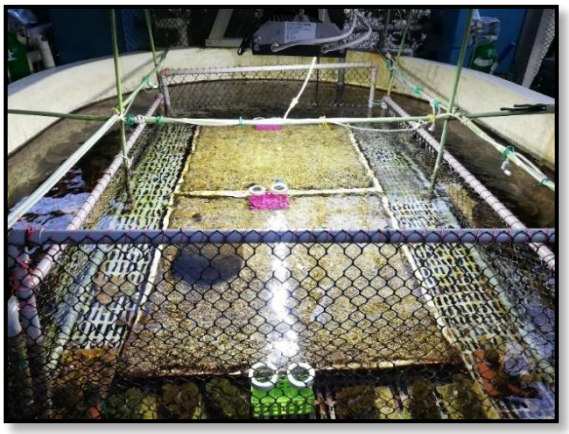
Article by: Hewa Pathirannahelage Athri Thathsarani Weerakoon

Supervisor / Corresponding Author: Prof. Kwee Siong Tew

Published research: Thathsarani Weerakoon, H. P. A., Liu, P.-J., & Tew, K. S. (2025). Effects of seagrass meadow on nutrient and microalgal responses in coral reef mesocosms. *Terrestrial, Atmospheric and Oceanic Sciences*, *36*(1), 32. https://doi.org/10.1007/s44195-025-00115-8

Seagrass meadows and coral reefs are closely connected coastal ecosystems that play important roles in maintaining marine biodiversity and ecosystem functioning. Although seagrasses are widely recognized for supporting fisheries, stabilizing sediments, and storing carbon, their influence on microalgal communities in nearby coral reef environments remains poorly understood.

In our recent study, *"Effects of seagrass meadow on nutrient and microalgal responses in coral reef mesocosms"*, we investigated how seagrass meadows affect nutrient dynamics and microalgal communities under controlled coral reef mesocosm conditions over a six-week experimental period.



Control mesocosm

Seagrass mesocosm

Our results showed that the presence of seagrass significantly increased sediment accumulation within the mesocosms. This enhanced sediment trapping was associated with higher concentrations of silicate and nitrite in the surrounding water. Silicate is an important nutrient for

many microscopic algae, particularly diatoms, which are key primary producers in marine food webs. Higher chlorophyll-a concentrations in benthic microalgae were observed in the seagrass mesocosms, indicating enhanced microalgal productivity in seagrass-associated systems.

DNA-based community analysis further revealed clear differences in benthic microalgal composition between seagrass and non-seagrass environments. Diatoms such as *Nitzschia* became more abundant in the seagrass mesocosms, suggesting that seagrass habitats may promote the growth of diatoms, a key group of benthic microalgae in coastal ecosystems.

We also detected a greater abundance of several benthic dinoflagellate genera historically associated with toxin production, including *Prorocentrum*, *Alexandrium*, and *Cochlodinium*, within the seagrass mesocosms. Although these potentially harmful groups represented only a small portion of the total community (less than 7%), their increased presence suggests that nutrient-rich seagrass environments may create favorable conditions for certain opportunistic microalgae.

In addition, the abundance of free-living *Symbiodinium* (microscopic algae closely associated with coral symbiosis) increased in seagrass systems. Previous studies suggest that nutrient enrichment can influence coral–algal relationships and potentially affect coral health under environmental stress conditions.

This study highlights the complex ecological interactions between seagrass meadows and coral reef ecosystems. While seagrass provides many important ecological benefits, changes in nutrient dynamics may also influence microscopic algal communities in unexpected ways. Understanding these interactions is increasingly important as coastal ecosystems continue to face pressures from climate change, nutrient pollution, and habitat degradation.

Our findings contribute to a better understanding of the functioning and ecological connectivity of coastal ecosystems and provide valuable information for future marine conservation and seagrass restoration efforts.