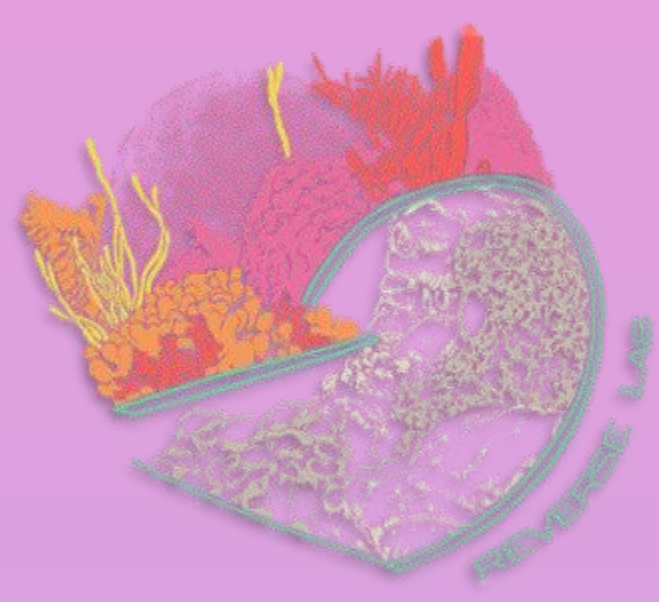




Ecological roles of the two largest herbivorous invertebrates on Caribbean coral reefs

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Introduction

Over the past several decades coral reefs across the Caribbean have undergone severe degradation in response to the ongoing climate crisis. Ocean warming, acidification, and increasing storm intensity are globally impacting coral reefs in conjunction with local stressors such as sedimentation, coral disease and coral bleaching. Turf algae and long sediment-laden algal turf (LSAT) have become major benthic space holders on coral reefs, even where herbivorous fish are abundant negatively impacting coral recruitment. As a result, we are investigating the role of invertebrate grazers in reef restoration to enhance favorable benthic conditions that support coral survival.

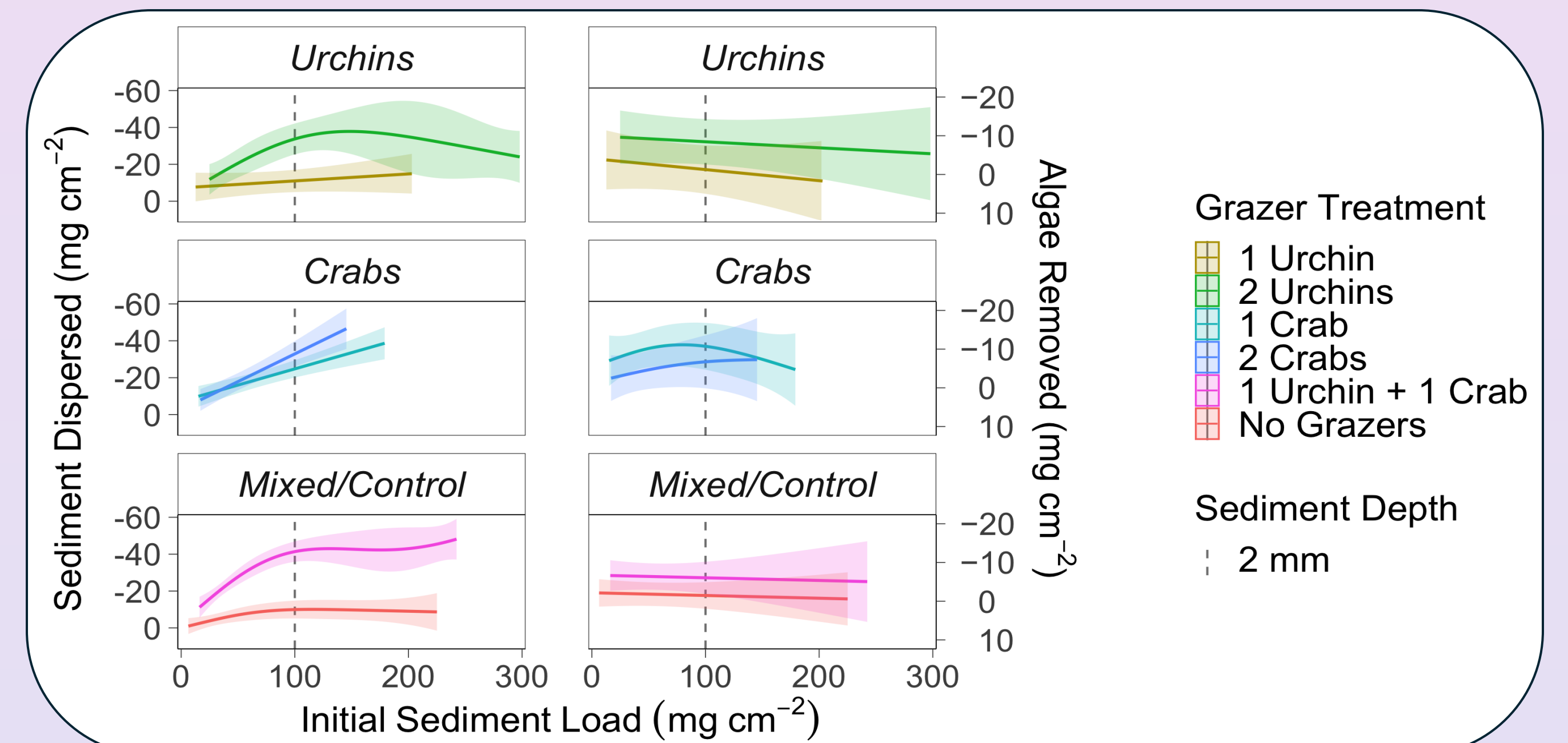
Methods

Using aquaria-based experiments, we tested the ability of *M. spinosissimus* and *D. antillarum* to reduce common turf algae assemblages and associated sediments on experimental tiles.

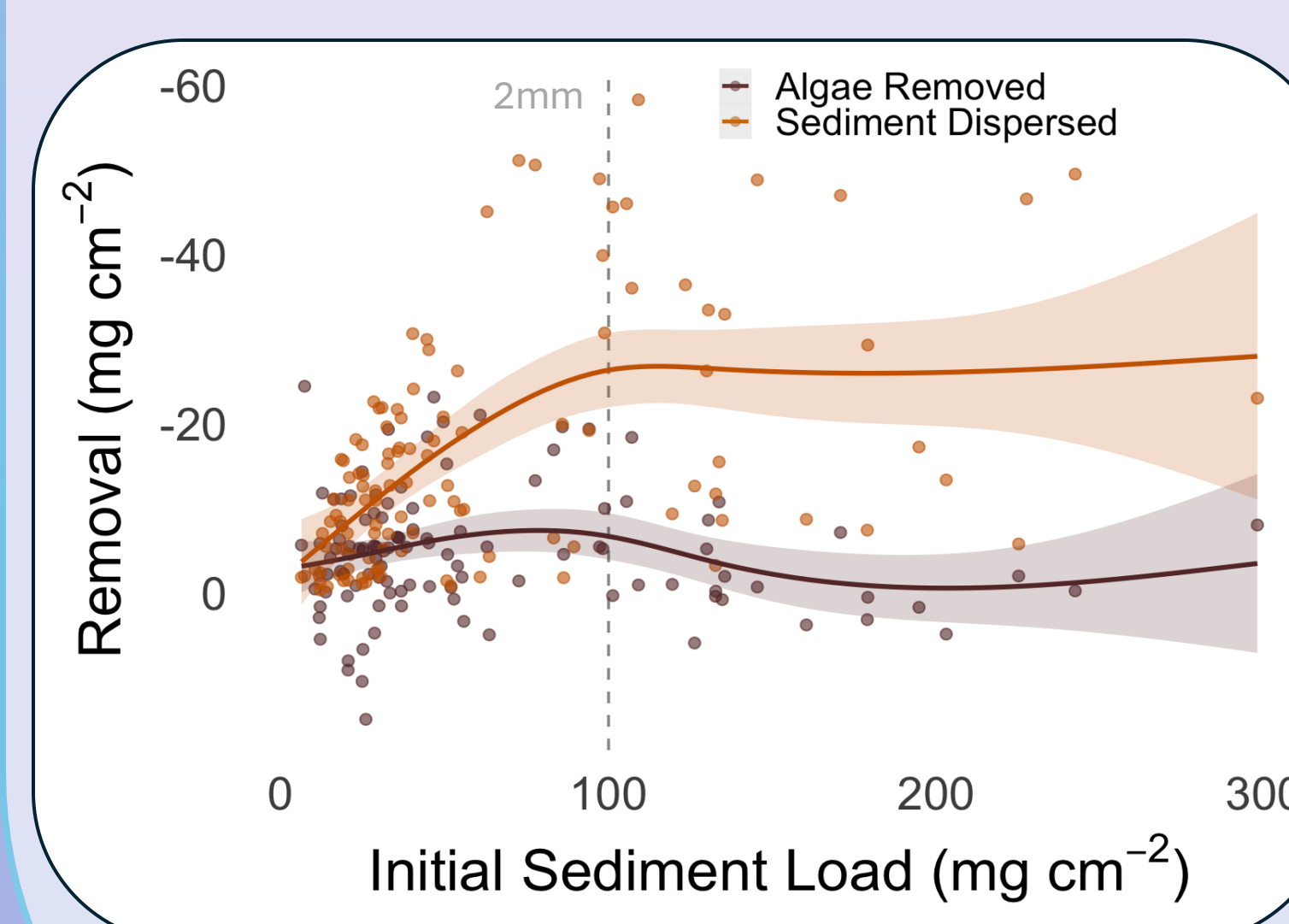
Grazer treatments consisted of five different grazer assemblages plus control groups: (1) 1 *D. antillarum*, (2) 2 *D. antillarum*, (3) 1 *M. spinosissimus*, (4) 2 *M. spinosissimus*, (5) 1 *D. antillarum* + 1 *M. spinosissimus*. Tiles from two experimental runs were then used for coral settlement assays of *Diploria labyrinthiformis* and *Acropora palmata* larvae to determine if grazers indirectly influenced settlement.

Results

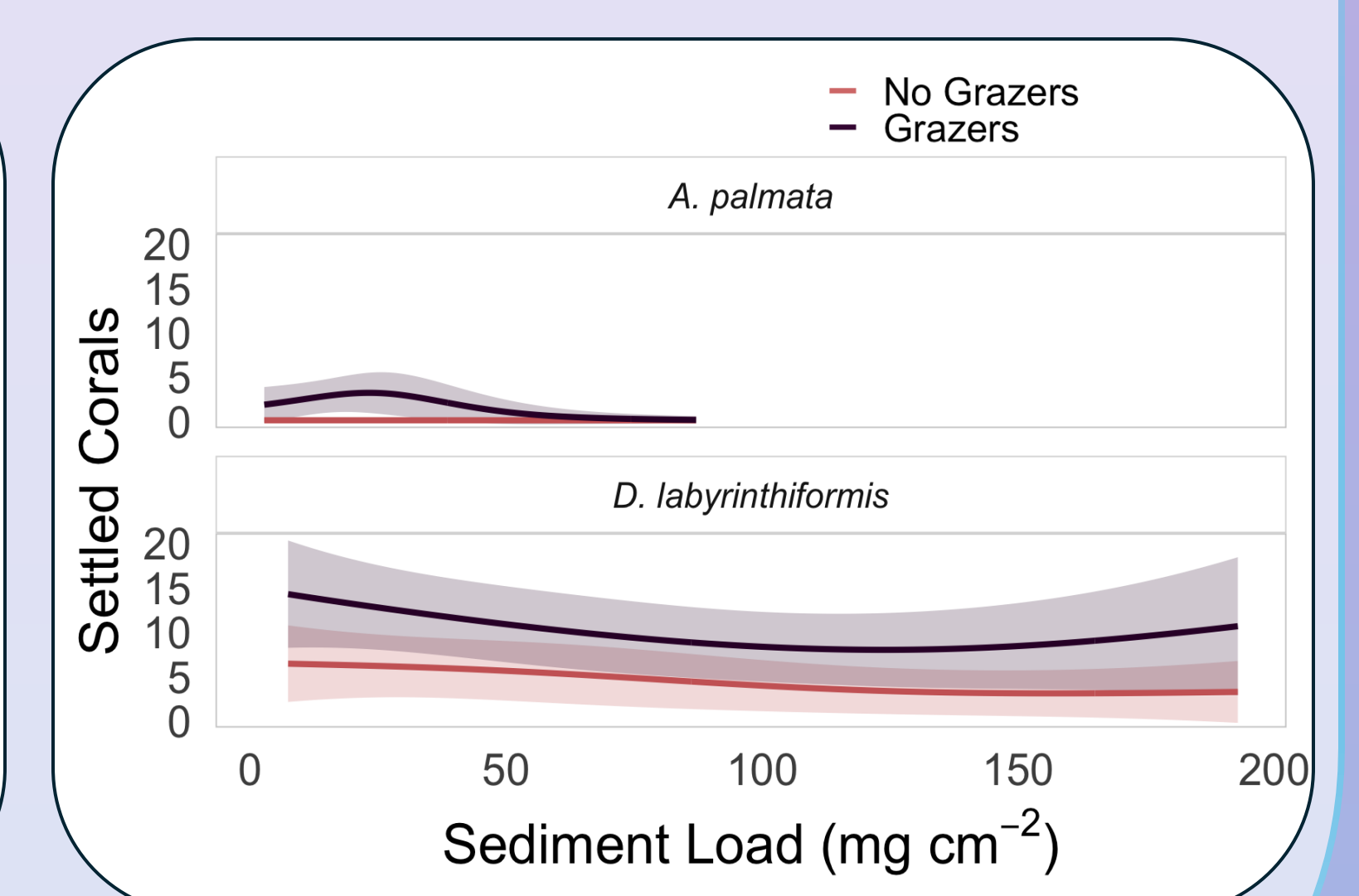
Algae Removal and Sediment Dispersal



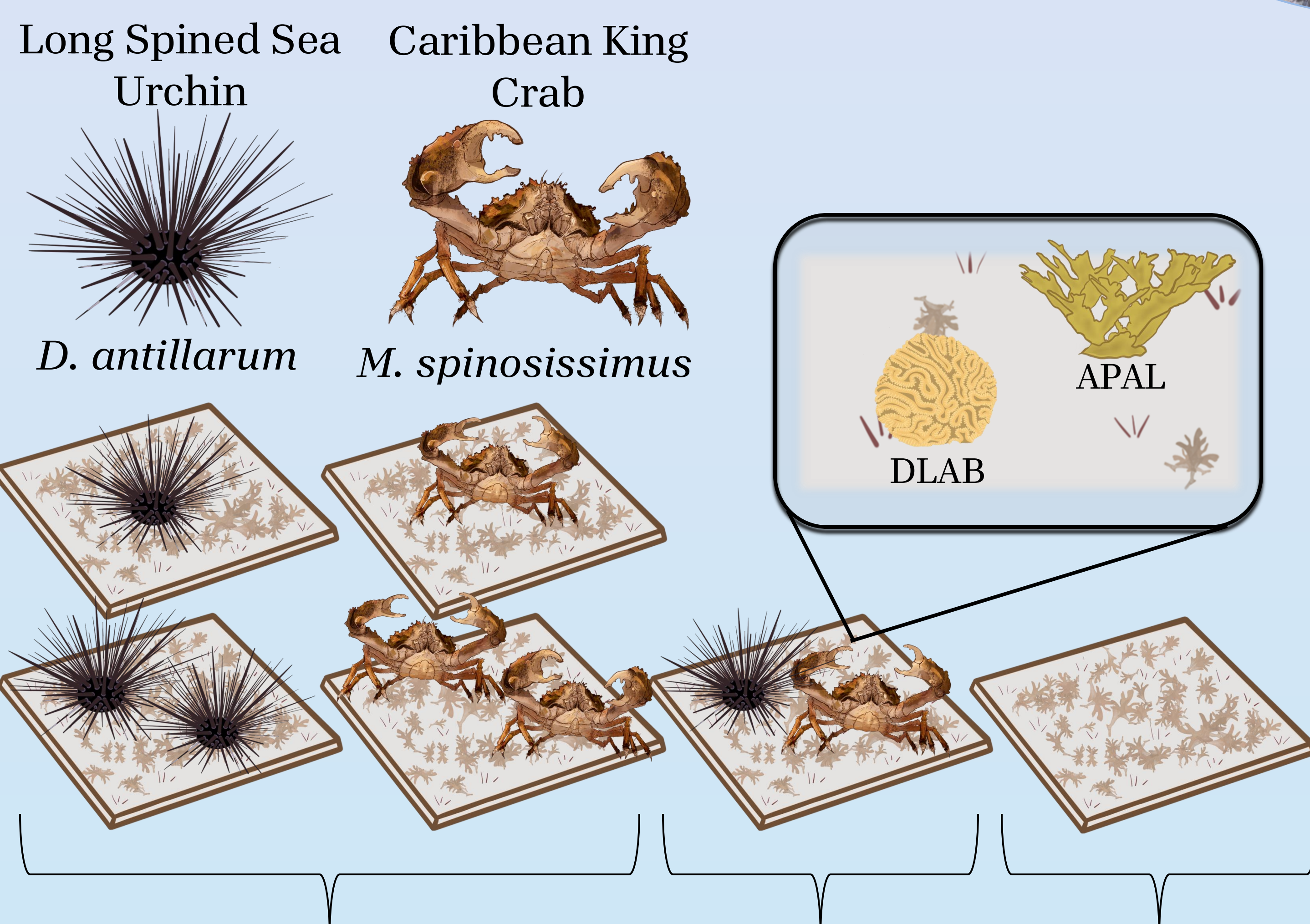
Overall Response Trends



Coral Settlement



Experimental Design

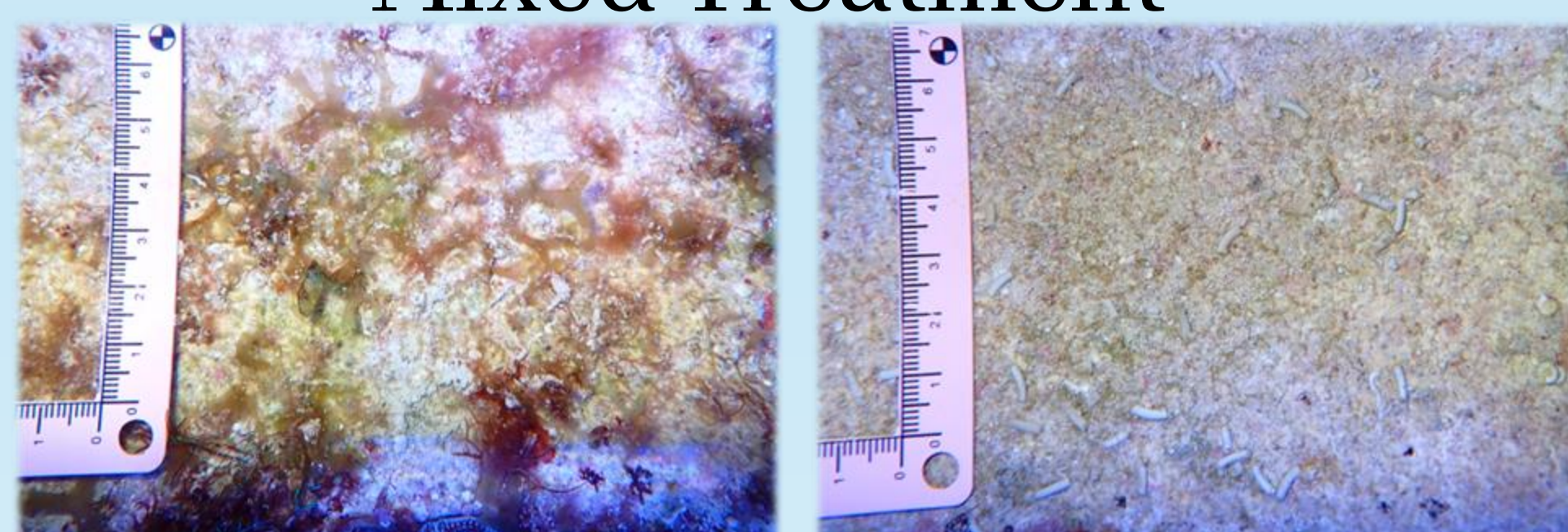


Independent Effects

Interactive Effects

Control

Mixed Treatment



Initial

Final

Conclusion

- Sediment dispersal and algae removal plateaued once sediment loads reached ~2 mm in depth suggesting that greater sediment loads impacted foraging efficiency
- On average, tiles with grazers dispersed 2.5 times more sediment than tiles with no grazers and tiles with mixed species treatments had the greatest impact on sediment (4 x; -30 mg cm⁻²)
- Initial sediment load was the dominant driver of sediment dispersal, explaining ~45% of dispersal overall
- 1 Crab and 2 Urchin treatments removed the most algae (-9 mg cm⁻²; 6% per day), reducing up to 4 times more algae than other treatments
- Sediment load decreased coral recruitment particularly for *Diploria labyrinthiformis* and tiles that were previously manipulated by grazers more than doubled settlement

Future Research

Future research will include macroinvertebrate feeding and behavioral assays to evaluate diet preferences and sediment-removal efficiency across sediment types and loads. These experiments, with the addition of density surveys will clarify how species impact current benthic communities on coral reefs.



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