IMPACTS OF URCHIN DIVERSITY ON ALGAL ABUNDANCE IN THE GALÁPAGOS ISLANDS

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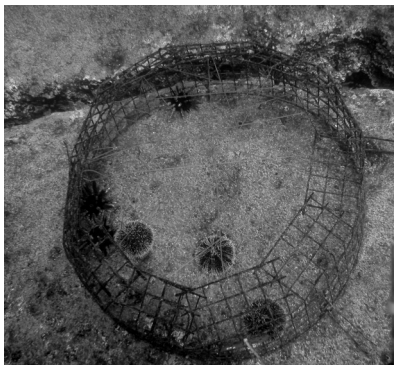

Experimental cage showing a 2-species treatment (*Eucidaris galapaguensis* and *Tripneustes depressus*).

Major advances in understanding how biodiversity influences ecosystem functioning have been made in terrestrial plant and aquatic microbial communities but the impact of biodiversity on ecosystem processes in marine systems is less well known. Additionally, it is widely recognized that hydrodynamic forces have pervasive effects in benthic communities, however their effect on biodiversity - ecosystem functioning relationships are largely untested. Here, we examined the effects of sea urchin diversity on algal abundance (percent cover) in variable flow conditions in the Galápagos Islands. We chose the following urchin species *Eucidaris galapaguensis*, *Lytechinus semituberculatus*, and *Tripneustes depressus*, because they represent the most common urchins in the Galápagos archipelago and they usually co-occur in the same habitats. The experiment consisted of manipulating in cages the number and species combinations of sea urchins, by creating 3 levels of species richness (1, 2 and 3 species). Density was held constant at 6 individuals per cage, and the 2-level treatments contained all three possible species combinations. The experiment ran for one month at 7-10 m depth at Caamaño Islet, a wave-exposed site in the central archipelago.

To assess general flow regimes close to the bottom, we used an ADCP recorder and flow blocks. Additionally, attachment strengths of the sea urchin species were measured to investigate the hypothesis that grazer diversity effects on algal abundance were related to the ability of different urchin species to forage in high flows. We found that horizontal velocities ranged from 1 to 97.8 cm s^{-1}, and that the grazing by urchins responded idiosyncratically to that range of flow. The effects of urchin species differed not only in how fast they responded but also in the type and hence the extent of their grazing on the cover of benthic algae and epifaunal invertebrates. Our preliminary analysis suggests species identity grazing effects that it is explained by the high attachment strength of *Tripneustes*, which allows it to forage when the other species are restricted by high flow. These results have implications for conservation and management, as they suggest that physical environmental factors have the potential to change the nature of relationships between biodiversity and ecosystem functioning that is usually generalized across time and space.