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Caribbean Coral Reef Ecological Restoration to Previous Magnificence

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Abstract

Oftentimes, tenacious algae have taken over once magnificent coral reefs. According to a recent study, seaweed can be reduced and corals can recover when the density of herbivorous spider crabs is raised above normal levels.

Keywords: Ecology; Caribbean Coral reefs; Ecosystem

Introduction

The Caribbean's coral reefs are breathtakingly gorgeous, but evolution never dealt them a good hand1. Caribbean reefs were unable to make up for the loss caused by disease on two of its primary reef-building corals because they had a far less species diversity than their counterparts in the Pacific and Indian Oceans (Figure 1A). The most significant sea urchin in the area, Diadema antillarum, was practically exterminated in 1983 as these corals began to deteriorate [1, 2].

Methods

Many factors contribute to the increase of macroalgae on many Caribbean reefs4, but the underlying causes are a strengthening of the processes that drive algae and a loss of corals' ability to compete. In the Caribbean, macroalgae grow incredibly quickly, so when the natural controls on their abundance are weakened, they are prepared to react quickly1. Hence, macroalgae can develop when the ecosystem is nutrient-poor or when disease or overfishing reduces herbivore eating and disturbance rates5. At the same time, illness, frequent hurricanes, and the onset of widespread coral bleaching after 19986 have all had an effect on coral populations. Due to illness and poor recruitment, many of the larger, more competitive corals have disappeared, making way for new assemblages of small, weedy corals that are poor competitors [3, 4].

Even worse, once established, interaction feedbacks between corals and algae are expected to strengthen the stability of the algal state [5].

There hasn't been much success in controlling the coral-algal phase transition. Seaweed in shallow reefs could not be manually removed because they quickly recovered. As more fish feeding on outer reefs, macroalgae quantity declines, sometimes resulting in pronounced changes in reef status across marine reserve boundaries [6, 7]. While fish grazing appears to be able to lessen the severity of algal phase shifts, it is not apparent if a fish population rebound can stop a significant phase shift. Although certain species of parrotfish consume macroalgae14, they appear to graze mostly on cyanobacteria in algal turfs and endolithic bacteria [8].

Conclusion

One of the most remarkable examples of an experimental reversal of established phase shifts can be found in the work by Spadaro and Butler3. The density of juvenile corals on reefs with crab enhancement was four times higher after two years, indicating that phase shift reductions may in fact help coral regeneration, as has been shown in other marine reserves [9, 10].

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Conflict of Interest

None.

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