479: Coral Reef Restoration Through Invasive Algae Management in Kāneʻohe Bay and the Waikīkī MLCD

Wesley Dukes, Kāneʻohe Bay Monitoring Coordinator, HCRI / DAR

Kāneʻohe Bay Treatment Areas

Kāneʻohe Bay contains some of the highest coral cover on Oʻahu and serves as a nursery ground for many native juvenile fish and invertebrates. Fast growing alien invasive algae has smothered many reefs throughout the Bay. This phase shift from healthy coral to algae dominated environment has severely degraded the reef and lead to a loss of ecosystem function. Since 2007, DLNR has carried out invasive algae control efforts in the Bay using a combination of mechanical removal (The Super Sucker) and biocontrol (sea urchins), effectively reducing invasive algae cover bay-wide, whereby currently only biocontrol is needed to keep algae levels low.

Project Summary

Invasive algae severely alter coral reef ecosystems by overgrowing reefs and eventually killing coral colonies. Removing invasive algae allows corals to regrow where partial mortality has occurred and recolonize previously occupied habitats. Removing invasive algae also creates higher rugosity on the reef providing more niches for various fish, invertebrates, and native algae species.

DAR is currently working to restore and protect reefs in Kāneʻohe Bay by removing invasive algae that are overgrowing and killing corals. A two pronged approach has been used where first divers hand remove invasive seaweed using an underwater vacuum system called the “Super Sucker” and then native collector sea urchins(*Tripneustes gratilla*) are added to graze the seaweed and keep it from growing back. This has been an extremely successful project where over 100 acres of reef have been treated and over 400,000 hatchery raised sea urchins have been outplanted. Additionally, DAR has begun a multi-year biocontrol project to restore coral reef habitat within the Waikīkī Marine Life Conservation District and adjacent areas through outplanting hatchery-raised native sea urchins to reduce the levels of invasive algae in the Waikīkī MLCD. *Tripneustes gratilla*, is capable of grazing at least five different species of invasive algae found on Hawaiʻi’s reefs (Conklin and Smith 2005, Westbrook et al. 2015) and has been successful in controlling invasive algae on coral reefs (Conklin and Smith 2005, Neilson et. al. 2017 in-review).

Using Sea Urchins to Restore Hawaii's Coral Reefs

Kāneʻohe Bay Algae Control

Current Kāneʻohe Bay treatment reefs. Reefs 9, 15, and 23 were control (non-treatment) reefs until 2019. They are now being outplanted with sea urchins.

Current Kāneʻohe Bay treatment reefs. Reefs 9, 15, and 23 were control (non-treatment) reefs until 2019. They are now being outplanted with sea urchins.

Waikīkī Marine Life Conservation District (MLCD) and Adjacent Treatment Areas

A preliminary snapshot (SNAP) assessment was performed in the restoration area to determine hotspots of invasive algae. These invasive algae hotspots will be prioritized within the Waikīkī MLCD and adjacent areas for treatment with sea urchin biocontrol.

The dominant invasive algae species in Waikīkī, *Gracilaria salicornia,* impacts reef corals by decreasing exposure to sunlight via smothering, altering water chemistry (hypoxia and acidification), increasing sedimentation surrounding corals (Martinez et al. 2012), monopolizing reef habitats and reducing reef complexity (e.g. shelter, resting areas, and surfaces for reef organisms to attach) (Conklin 2007).

The outcome of this project will be the control of 4.3 acres of invasive algae from an approximate 18 acre area of coral reef habitat in the Waikīkī MLCD and adjacent areas. This will result in the re-exposure of corals and suitable substrate for coral growth and colonization.

Waikīkī Marine Life Conservation District (MLCD) and Adjacent Treatment Areas

---