

UTILIZATION OF LOW ALTITUDE REMOTE SENSING TECHNIQUES FOR CORAL BLEACHING ASSESSMENTS

Abstract:

The utilization of small-unmanned aerial systems (sUAS) as a cheap, effective complement to other assessment tools is imminent in the field of coral reef ecology. Here, we describe the current status of sUAS in the field of coastal monitoring, and introduce the utilization of low-altitude sUAS assessments for coral reef research using proof-of-concept results and completed work describing the distribution of coral bleaching across several patch reefs in Kāneʻohe Bay, Hawaii. Overlapping sub-centimeter reef imagery collected during the 2015 coral bleaching event was used to construct complete high-resolution reef images of four Kāneʻohe Bay patch reefs located in “coastal” and “oceanic” flow regimes. The spatial distributions of bleached and paled corals were assessed in relation to exposure to coastal stressors (sedimentation rates, salinity and phosphate concentrations). Results support the notion that phosphate, an important inorganic nutrient, differs significantly between “coastal” and “oceanic” reefs. Mean phosphate concentrations and salinities are both significantly correlated to unhealthy (bleached and paled) coral cover. When assessing the environmental conditions in close temporal proximity to image collection, only salinity has a strong negative correlation with the cover of unhealthy coral. Paled, bleached, and healthy coral on all four reefs were significantly spatially clumped, although bleached corals had the largest mean distances between affected colonies. This project has provided valuable insight into the relationships between Kāneʻohe Bay patch reefs and coastal stressors at previously unexplored spatial scales, and demonstrates the effective use of sUAS surveys in the field of coral reef science.