

Mapping Spatial-Temporal Changes in Restored Coral Reefs using Multiple Mapping Technologies

Jennifer A. Dijkstra¹, Christopher Parrish², Glenna Dyson¹, Selina Lambert², Erich Bartels³, Ian Combs³

¹Center for Coastal and Ocean Mapping, University of New Hampshire, USA

²School of Civil & Construction Engineering, Oregon State University, USA

³Elizabeth Moore International Center for Coral Reef Research & Restoration, Mote Marine Laboratory, USA

In the Anthropocene, coastal ecosystems have experienced greater transformations than any other marine region, primarily due to their proximity to land-based sources of disturbance. Because of their economic and ecological importance, multiple agencies around the globe are focused on restoring coral reefs using various mechanisms, including coral outplanting. However, monitoring the long-term success of coral outplants is a time-intensive task as divers measure each coral individually. This method also complicates the evaluation of the relative health of a reef at spatial-temporal scales that are relevant for management purposes. Consequently, it is becoming increasingly important to evaluate multiple mapping technologies for effective, cost-efficient monitoring across a range of spatial and temporal scales. Since 2021, we have acquired annual datasets of six coral reef sites in the Florida Keys, USA using uncrewed aircraft systems (UAS), multibeam echosounders (MBES), and diver collected underwater imagery. The datasets collected from the different platforms are enabling multiple comparisons between both different years and different combinations of data sets. We discuss how we use and integrate the datasets to assess and map changes in corals and fishes in the restored reefs. Analysis of the data is providing insight into the changes occurring at the six reefs included in this study, as well as helping to inform recommendations for how to efficiently and cost-effectively monitor coral reef restoration sites across a range of spatial and temporal scales using various mapping technologies.