

ABSTRACT

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Title: Biodiversity Changes Associated with Shellfish Aquaculture Equipment in Martha's Vineyard

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Year: 2021

Multi-species ocean farming is a sustainable food production method that could aid in feeding our growing human population whilst also improving our marine environment. This emerging aquaculture technique co-cultures native macroalgae and shellfish in the northeast U.S. and has several potential benefits, including increasing local biodiversity. However, quantitative data are limited demonstrating evidence of these expected benefits. This study quantified the impact of shellfish aquaculture equipment on biodiversity at Cottage City Oysters' aquaculture sites located in Martha's Vineyard, MA from June to September 2021. Two field sites were used; a 2-acre multi-species ocean farm that co-cultivates Eastern oysters (*Crassostrea virginica*) and hard clams (*Mercenaria mercenaria*) all year-round and sugar kelp (*Saccharina latissima*) during the winter and spring (Site A), and a site with no aquaculture equipment (Site NA). In each site, two GoPro cameras recorded video footage monthly to determine any differences in biodiversity between sites. Biodiversity was determined through measuring individual abundance and species diversity using the Shannon-Weiner Diversity Index. Site A had a higher diversity index value (DIV) than Site NA for each month. As the camera needed to be tethered, a chain and buoy were installed in Site NA, which resulted in fish grazing on the macroalgal growths present on this chain. The species present in Site A were also observed grazing on the shellfish aquaculture equipment deployed in the multi-species ocean farm. Additionally, predatory species were observed hunting the grazing fish in Site A. The most common species observed were scup (*Stenotomus chrysops*), Threadfin shad (*Dorosoma petenense*) and Atlantic silversides (*Menidia menidia*). These findings suggest that the presence of the shellfish aquaculture equipment directly increases biodiversity. This indicates that the implementation of shellfish aquaculture practices, and multi-species ocean farming during the summer, benefits local ecosystems.