Abstract

The Olympia oyster, *Ostrea lurida* is the focus of many restoration projects along estuaries in the North American Pacific coast, whearas the non-indigenous Pacific oyster, *Crassostrea gigas*, makes up the vast majority of oyster aquaculture in the region. Both *O. lurida* habitat and *C. gigas* aquaculture provide filtration functions as filter feeders, my project investigated the contributions of both in four Califorina bays using a whole-habitat, *in situ* approach. I collected upstream-downstream measurements of chlorophyll α, temperature, salinity, and turbidity to estimate habitat clearance rates (HCR, L $hr^{-1}m^{-2}$). In parallel, I estimated seston total particulate matter (TPM), and organic content (OC), and examined existing data on bivalve density and biomass. Twenty-two experimental trials and four control mudflat trials were conducted from February 2018 to June 2019. Mean HCR at *O. lurida* restoration sites were 166 L hr^{-1} m^{-2} (SD = 255) at San Rafael, -464 L hr^{-1} m^{-2} (SD = 1420) at Shellmaker, and 105 L hr^{-1} m^{-2} (SD = 251) at Deanza, while the *C. gigas* aquaculture site at Morro Bay was 10.3 L hr^{-1} m^{-2} (SD = 257). HCRs were highly variable within and among sites, and not significantly different. Using random forest regression analysis, I found that temperature (23.1%) was relatively most important to HCR, followed by turbidity (20.6%), TPM (16.8%), OC (16.6%), site (15.1%), and salinity (7.8%). The contributions of all bivalve filter feeders and natural hydrodynmaics are inherently included in whole-habitat *in situ* measurements in this study. My research indicates that the field filtration performance of *O. lurida* habitat and *C. gigas* aquaculture are similar in California bays.