Investigating chemical settlement cues and their interactions for Pacific oysters (Magallana gigas) using video analysis

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Coastal environments are subject to intense anthropogenic pressure worldwide. Many species occurring in this habitat, including reef-building bivalves, have relevant ecosystem functions and provide socio-economically ecosystem services such as coastal protection and improving ecological resilience. While some species struggle to survive in anthropogenic habitats and populations are diminishing, others thrive, become abundant or even invasive in areas where they did not previously occur. Such species include many bivalves, one of those being the Pacific oyster (*Magallana gigas*) which colonized large parts of western Europe during the 20th century.

Many factors contribute to the successful colonization of new substrate by bivalves. A key factor is settlement preference. Understanding how ecological cues influence larvae settlement will help potential restoration efforts as well as broaden ecological understanding of the species.

This research focuses on how the interaction of multiple ecological cues steer behaviours of pacific oyster (*Magallana gigas*) larvae during settlement. The influences of both olfactory chemical cues, and physical substrate properties are studied here for a more robust view of settlement in the natural environment. This experimental research project seeks to answer questions such as:
-   Will preference of settlement substrate change in the presence of chemical cues?
-   Do predator cues result in a delay in settlement time and does an increase in cue strength affect this response?
-   How does the presence of both predator and conspecific cues change settlement behavior?

In the first phase of this project, an experimental setup has been developed in which settlement and behavior of the pediveliger stage larvae is measured using video recording and automated image analysis. Videos of larvae are taken using multiple Raspberry pi HQ cameras and computers, and particle tracking software is used to analyze settlement time and larvae behaviors prior to settling. This technique for assessing larvae settlement improves time-consuming manual settlement assessments enabling complex experimental setups that can investigate multiple settlement cues and their interactions.

Keywords: Larvae settlement; Settlement cues; Bivalves; Coastal systems; Pacific Oyster; Video analysis