OYSTERS AS A MODEL ORGANISM FOR SETTLEMENT OF REEF-BUILDING ORGANISMS IN RESPONSE TO COMPLEX SENSORY LANDSCAPES OF CHEMICAL, TACTILE, AND SOUND CUES

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Substrate colonization by planktonic larvae is a complex process. As larvae near the end of their pelagic period, they rely on environmental cues to evaluate habitat quality for permanent settlement. Most invertebrate species with a larval phase depend on settlement cues to identify ideal environments. These cues are highly species specific, can have various origins, and influence larvae at different spatial scales. Understanding larvae responses to these cues, especially when multiple cues interact, not only advances fundamental knowledge of larval settlement strategies but also provides critical insights for habitat restoration, aquaculture, and antifouling efforts.

Through a series of controlled laboratory experiments, we investigated known or predicted settlement cues of the Pacific oyster (*Magallana gigas*).

In the first set of experiments, we examined how larvae modify optimization strategies in response to multiple and conflicting cues (e.g., from conspecifics or predators). Our findings suggest that larval settlement under conflicting cues depends on the cue origin (waterborne vs. substrate-bound). Notably, larvae can ignore predator cues when faced with preferred substrates but not when exposed to waterborne conspecific cues.

In a second experiment, we explored the influence of marine soundscapes on larval settlement, using sounds associated with oyster reefs and anthropogenic noises from marine vessels. Our results indicate an increased settlement response to sounds from healthy reefs. We propose that acoustic diversity is crucial for larval settlement, emphasizing not just an increase in decibel level but also the acoustic complexity of different sounds.

A third experiment investigated how changes in surface microtopography and the resulting biofilm alterations affect larval settlement patterns.While these experiments contribute to our understanding of larval settlement, a significant gap remains in conceptual frameworks that explain observed patterns. Developing such frameworks is essential for generating new hypotheses and advancing this field of research.