Investigating the Limits of Native Oyster Recovery and Restoration

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BACKGROUND

Why does one native Olympia oyster restoration project succeed while a seemingly identical one fails? This project sought to answer the question by collecting recruitment, growth and survivorship statistics for oysters in Tomales Bay. Scientists also measured oyster predation by Atlantic oyster drills and are quantifying the effects of fouling organisms and "space competitors" (i.e., tunicates and sponges) on the availability of suitable oyster habitat. Findings are providing information on where and how to go about restoring oysters in California.

FINDING: SNAILS THREATEN NATIVE OYSTERS IN TOMALES BAY

Based on field data, scientists conclude that voracious alien snails are devouring California's only native oyster in Tomales Bay along Point Reyes National Seashore.

Half of the pristine coastal estuary's Olympia oysters have fallen prey to an exotic whelk snail, known as the Atlantic oyster drill, scientists report in peer-reviewed research findings.

The predator, introduced decades ago with Atlantic oysters, drills through the top of an oyster's shell, digesting the soft tissue inside.

Native red rock crabs keep the exotic snail's numbers in check in saline parts of the estuary. They, however, cannot hold the line against the invasive snail in prime oyster habitat near the bay's head, where water is much fresher. In these fresher habitats, the dominant crab species is another invasive, the European green crab, which fails miserably at oyster drill hunting.

"For Tomales Bay, this means that nearly half the habitat is inhospitable to re-establishing native oysters," says David Kimbro, a postdoctoral associate at Florida State University in Tallahassee, who was a Sea Grant trainee at UC Davis at the project's onset.

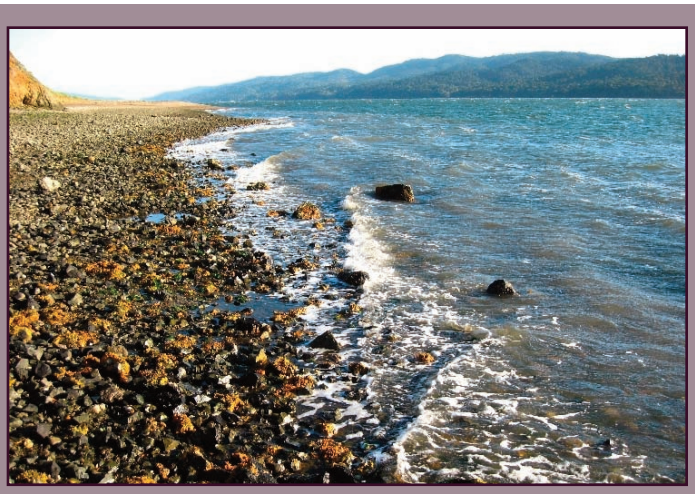
Atlantic Oyster Drill.
Andrew N. Cohen/SFEI

To avoid the predatory snails, scientists recommend rebuilding oyster beds in the estuary's center, where there is also an abundance of phytoplankton (food).

"The center of the bay receives optimal tidal currents for phytoplankton growth," explains UC Davis researcher Ted Grosholz. "Currents are strong enough to inject nutrients but not so strong they sweep away phytoplankton."

UC Davis graduate student Anna Deck has also found that "space competitors" from fouling organisms such as tunicates and barnacles are likely not affecting oyster survival rates in the bay.

There is also mounting evidence that hard substrate may not be a factor limiting native oyster recruitment, meaning that future re-establishment efforts may require captive rearing of native oysters for release in the wild.



Anna Deck/UC Davis

Tomales Bay field site.

INSIGHTS

The Atlantic oyster and its native pest, the Atlantic oyster drill, were brought to the West Coast decades ago in an attempt to culture the oysters for human consumption in places such as Tomales Bay. When that effort failed, shellfish farmers began importing and successfully culturing Japanese oysters. Although the Atlantic oysters did not do well in California waters, their pests have thrived. This project's findings underscore the ecological seriousness of non-native species to remnant wildlife areas slated for restoration.

Annaliese Hettinger/UC Davis

Oyster density surveys in Tomales Bay.

APPLICATIONS

In the past, people have placed bags of empty oyster shells on the bottom of Tomales Bay in an effort to create hard substrate for oyster recruitment. This project provides a partial explanation as to why these efforts have largely failed: The limiting factor to oyster recovery is likely not bottom substrate but the presence or absence of invasive predators and/or the availability of food.

PUBLICATIONS

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Olympia oysters on a recruitment collector in Tomales Bay.

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