

Native Oyster Restoration in San Francisco Bay Ecosystem Enhancement and Conservation of Native Species

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ABSTRACT

The native oyster *Ostrea conchaphila* was historically abundant in the San Francisco Bay-Delta Estuary where it supported harvesting by Native Americans and early European settlers as well as early mariculture operations. A combination of factors such as over harvesting, burial by mining sediment, predation by non-native species, and pollution from unregulated urban growth severely impacted oyster populations in the bay.

Renewed interest in local native oysters was stimulated by successful restoration of oysters in Chesapeake Bay and elsewhere promoted by the NOAA Community Based Restoration Program. A resurgence of oyster populations would provide habitat for many associated species and food for several native species of fishes and birds. Moreover, oysters filter large volumes of water during feeding and respiration offering potential benefits to water quality and invasive species deterrence. Anecdotal evidence for their presence led to informal surveys of their distribution and an initial effort to determine if planktonic larval oysters would recruit onto appropriate habitat (oyster shells). Results showed that oysters were widely distributed, although sparse, in intertidal and subtidal habitats. Planktonic larvae were widespread and readily recruited onto strings of oyster shells suspended in the water and monitored by volunteers. This supported the hypothesis that native oyster populations could be enhanced and restored by providing additional shell substrate for settlement. Once a critical mass was developed it was thought that the oysters would be able to persist and expand their own oyster shell reefs.

An experiment by the Tiburon Audubon Center using palettes of shells in the Richardson Bay Bird Sanctuary successfully demonstrated that shell habitat placed in the bay would be colonized by native oysters.

PROGRESS

Other oyster restoration projects modeled after the Tiburon Audubon project are now underway, but questions remain about the best way to proceed beyond the experimental strings or bags of shells that have been used up to now to provide settlement habitat for the widespread planktonic larvae.

Research (Harris 2004) has shown that existing populations of oysters in San Francisco Bay are negatively correlated with presence of oyster drills (non-native predatory snails) and inversely correlated with sediment size (rocky shores have more oysters than silty ones). Native oysters are more abundant in the northern, more estuarine, part of the bay than in the southern, more marine(?) part where there are already large expanses of shells without native oysters on them.

Other potential limiting/enhancing factors are areas with increased retention of larvae, such as marinas, areas adjacent to eelgrass beds where water clarity and other synergistic effects may be present, and areas with high phytoplankton productivity where food for the oysters would presumably be more abundant. These factors are being investigated by the ongoing volunteer-based restoration project at the Tiburon Audubon Center.

The Tiburon Audubon Center Native Oyster Project has received support from the NOAA Restoration Center, The Tiburon Peninsula Foundation, The Rocky Fund, and The Institute for Fisheries Resources.

Reference: Harris, H. E. 2004. Distribution and limiting factors of *Ostrea conchaphila* in San Francisco Bay. M.A. Thesis. San Francisco State University. 65pp.



Oyster shells are stacked on palettes to provide substrate for larval recruitment. These experimental units are placed in different depths and locations to test hypotheses about physical limiting factors to successful restoration.



Audubon Society volunteers monitor the success of the project by counting and measuring the new native oysters on the experimental oyster shell reefs.



Non-native predators such as this green crab (*Carcinus maenas*) threaten the recovery of native oysters.



Dense colonies of oysters benefit fish and birds and add habitat diversity to the saltmarsh-subtidal interface.



The thornback (*Platyrrhinoideis triseriata*), extremely rare in SF Bay, was collected during monitoring of the oyster reefs.

Native oysters attached to the shells placed near Tiburon Audubon Center in Richardson Bay and grew rapidly. This one at right was nearly 25mm (1 inch) long after 3 months.



The scoter, the scaup, and oyster catchers are some of the birds that eat oysters.



Saltmarshes and mudflats adjoin oyster habitats



Subtidal eelgrass (*Zostera marina*)