

Bay and Estuarine Invertebrate Resources: Overview

California's bay and estuarine invertebrate resources are myriad, and when most of us think of these resources, extensive mudflats come to mind, exposed at low tides and teeming with shorebirds and skittering crabs. The chapters in this section feature the molluscan bivalves we know as clams and the caridean shrimps known collectively as the bay shrimps. The latter are the object of targeted commercial trawl fisheries in San Francisco Bay for use mostly as live bait in the sport sturgeon and striped bass fisheries, while the edible clams have traditionally been largely the domain of recreational fishermen.

In recent decades, California's bays and estuaries have been under increasing assault from the introduction of exotic species, many of which are invertebrates. Some of these like the Asian clam have significantly altered the ecology of San Francisco Bay and can be found in densities as high as several thousand per square meter. The exotic green crab and Chinese mitten crab have also adversely impacted native species and their habitats. Green crabs can outcompete juvenile Dungeness crab in mudflat habitats while the mitten crab can burrow into and weaken levees along the San Francisco Bay Delta waterways. The problems caused by such alien species are discussed in another section of this publication.

California's coastal clam resources have been under attack from numerous other sources as well - from industrial waste and municipal sewage, to habitat loss and degradation, to exotic viruses hitchhiking on imported aquaculture seed stock, to over-harvesting and poaching. Bivalve mollusks dwelling in our embayments and estuaries by the luck of the evolutionary draw just happen to occupy those habitats most likely to be near high concentrations of human populations. In this respect, they have been our "canary in the coal mine" warning us when the consequences of under-regulated industrialization and human overpopulation have exceeded the carrying capacities of our bays and estuaries. Although wastewater treatment standards have significantly reduced the concentrations of some pollutants entering California's waters in recent decades, bioaccumulation processes still result in certain bivalve populations being unsafe to eat. For example, a potentially significant resource of Manila clams exists in San Francisco Bay, but water quality problems discourage public use in many clam beds. The accelerated silting-in of Morro Bay and Bolinas Bay and the deleterious effects of septic and agricultural runoff in Tomales Bay are just a few more examples of the challenges resource managers

face in protecting our resources. Increasingly, as population pressures continue pressing on estuaries, especially near the large metropolitan areas in southern and central California, only remnant populations of harvestable bivalve mollusks will remain.

The law of unintended consequences and the complexity of human interaction within the natural world can work together in interesting and often unpredictable ways. The extirpation of the sea otter from most of California in the nineteenth century allowed populations of geoduck and pismo clams to flourish in the absence of this major predator. Under the protection of the federal endangered species act, sea otter populations have reoccupied their historical range in central California and as a consequence, have reduced geoduck and pismo clam populations in the Morro Bay and Monterey Bay regions to a point below the level of harvestable surplus.

The multiple threats of habitat destruction, pollution, exotic invasions, and the re-establishment of sea otter populations could mean the end of California's bay and estuarine resources as we have known them unless California's fishery managers, resource scientists and political leaders can work together to find timely solutions to these problems.

Peter Kalvass

California Department of Fish and Game

Bay and Estuarine Invertebrate Resources: Overview