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First Known Sightings of the Withering Syndrome Bacterium Discovered North of San Francisco

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Summary

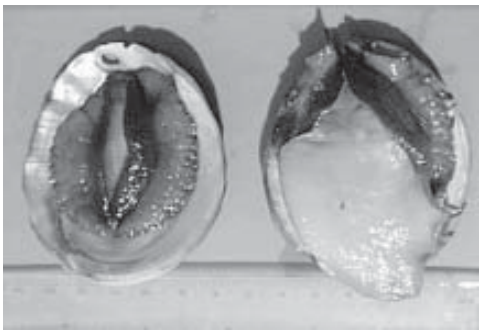
Populations of California's seven native abalone species have been reduced not only by overharvesting but also by disease. One of the most lethal diseases is a waterborne bacterial infection that causes what is known as withering syndrome. Withering syndrome obstructs the production of digestive enzymes. To prevent immediate starvation, abalone catabolize, or destroy, their own foot muscle, causing their body to atrophy or wither, hence the name. The consequence of the disease can be extreme: black abalone populations in Central California were reduced by as much as 99 percent by withering syndrome in the mid-1980s.

Up until recently, the withering syndrome bacterium *Candidatus Xenohaliotis californiensis* was believed to be confined to warmer ocean waters south of San Francisco. A survey of abalone beds, conducted by fish pathologist Dr. Carolyn Friedman, however, has revealed that the bacterium has spread to two isolated locations in colder northern waters. Her work suggests that human activity—aquaculture practices or abalone "outplantings"—may have contributed to the spread of the bacterium.

The Project

Dr. Friedman and colleagues collected red and black abalone specimens from 13 sites in Northern and Central California between December 1998 and October 2000.

Analyses of tissue samples revealed that the withering syndrome bacterium was present at two sites north of San Francisco: Crescent City near the Oregon border and Van Damme State Park in Mendocino County. Although none of the abalone from these two sites showed signs of withering syndrome, there are concerns that the infected abalone, by dispersing the bacterium via their feces, increase the potential for an outbreak later.



The abalone specimen on the left has withering disease. Note the severe atrophy—or withering—of its foot muscle. The specimen on the right is healthy. Photo: California Department of Fish and Game.

Both Crescent City and Van Damme State Park received abalone "outplantings," in which abalone seed bred in captivity were transferred to the ocean. Crescent City is also located near an aquaculture farm that imported abalone from farms now known to have had infected abalone.

Impacts

Withering disease not only threatens wild stocks but also farm-raised abalone, which may be reared in cages in the ocean or in land-based tanks that circulate ocean water through them.

California has 12 abalone farms, with the bulk of production coming from four farms. The state's cultured abalone crop has an estimated value of $4 million to $5 million a year.

Dr. Friedman is currently involved in developing antibiotic therapies for

At any given time, The Abalone Farm, Inc. in Cayucos, California, may have about 2 million abalone growing in concrete tanks along the coast. The company is working with scientists to develop oral antibiotic therapies for treating withering syndrome. Photo: Ray Fields, The Abalone Farm, Inc.

farm-raised abalone. She is also working with industry to develop ways of administering antibiotics orally in abalone feed. Another goal is to understand how environmental stresses, such as a lack of food or warmer than normal water temperatures, may trigger withering syndrome in abalone that already harbor the withering syndrome bacterium.

Cooperating Organizations

Abalone International, Inc.
California Aquaculture Association
California Department of Fish and Game

Publication

Finley, C.A., F. Wendell, and C.S. Friedman. 2002. Geographic distribution of *Candidatus xenohaliotis californiensis* in northern California abalone. *J. Shellfish Res.* In press.

Trainee and Thesis

Finley, Carl, M.S. in Aquaculture and Fisheries, Bodega Marine Laboratory, University of California, Davis, May 2001, "Life History of an Exotic Sabellid, *Terebrasabella Heterouncinata*."

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