

R/F-43PD: 11.1.1998–10.30.2000

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

Carolyn Friedman

University of Washington

### Summary

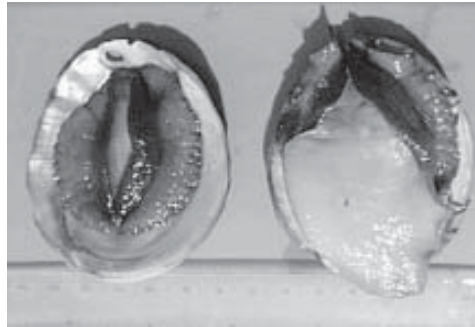
Populations of California's seven native abalone species have been reduced not only by overharvesting but also by disease. One of the most lethal diseases is a waterborne bacterial infection that causes what is known as withering syndrome. Withering syndrome obstructs the production of digestive enzymes. 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 Xenohalictis 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



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.

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.

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*."

### For more information:

Dr. Carolyn Friedman  
Aquatic & Fishery Sciences  
University of Washington  
Tel.: (206) 543-9519  
Email: carolynf@u.washington.edu

**PUB. NO. CSG-F-02-001**

**JANUARY 2002**

*California Sea Grant is a statewide, multiuniversity program of marine research, education, and outreach activities, administered by the University of California. Sea Grant-sponsored research contributes to the growing body of knowledge about our coastal and ocean resources and, consequently, to the solution of many marine-related problems facing our society. Through its Marine Extension Program, Sea Grant transfers information and technology developed in research efforts to a wide community of interested parties and actual users of marine information and technology, not only in California but throughout the nation. Sea Grant also supports a broad range of educational programs so that our coastal and ocean resources can be understood and used judiciously by this and future generations.*

*The national network of Sea Grant programs is a unique partnership of public and private sectors, combining research, education, and technology transfer for public service and dedicated to meeting the changing environmental and economic needs in our coastal, ocean, and Great Lakes regions.*

*This work is sponsored in part by a grant from the National Sea Grant College Program, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, under grant number NA06RG0142, Project number A/P-1. The views expressed herein are those of the author and do not necessarily reflect the views of NOAA or any of its sub-agencies. The U.S. Government is authorized to reproduce and distribute for governmental purposes.*



CALIFORNIA SEA GRANT COLLEGE PROGRAM

Russell A. Moll, Director • Dolores M. Wesson, Deputy Director • Paul Olin, Interim Associate Director for Extension  
• Marsha Gear, Communications Coordinator

University of California, San Diego, 9500 Gilman Drive, La Jolla, CA 92093-0232  
Phone:(858) 534-4440 Fax: (858) 453-2948 Web site: <http://www-csgc.ucsd.edu>