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SCIENTISTS STUDY CONTROL OF PREDATORY GREEN CRABS

Scientists at the University of California, Santa Barbara are studying an innovative way to control a marine pest that is wreaking havoc--economically and ecologically--on the West Coast of the U.S.

The European green crab (*Carcinus maenas*), a voracious predator that

had a devastating effect on East coast fisheries is now threatening fisheries in the northwest as it moves from California toward Puget Sound in Washington. Scientists at UCSB are investigating a way to control the pest.

Potential damage to the fishing industry on the West Coast could easily reach \$45 million annually--a conservative estimate--if the green crab migrates all the way to Puget Sound as expected, according to Armand Kuris, professor of zoology, and Kevin Lafferty, adjunct assistant professor. So far, the green crab was identified in Willapa Bay in Southern Washington on June 1.

The predator arrived in San Francisco Bay in 1990--its first appearance on the West Coast--and has moved more than 100 miles per year up the coast since then. It is moving more slowly toward the south; it has gone as far south as Monterey Bay. In Bodega Bay, north of San Francisco, the entire ecosystem was changed by the introduction of the green crab. "In Bodega Bay the mud flat invertebrates were dramatically impacted," said Lafferty.

The green crab eats Dungeness crabs, rock crabs, mussels, oysters and clams. In Northern New England the advent of green crabs has been associated with the demise of the softshell clam fishery. On the West Coast, the oyster, mussel and clam mariculture industries are threatened, as are the Dungeness and rock crab fisheries, and bait fisheries.

One of the reasons green crabs have proliferated so easily in the U.S., -Australia, Japan and South Africa, according to the researchers, is that they came from Europe without any parasites.

A parasite is exactly what is being studied, as a possible 'biocontrol,' or natural way to eliminate the green crab. A parasitic barnacle, called rhizocephalan, is the likely candidate. First, however, studies of this parasite and its safety are being carried out at the university--long before any intervention will take place. The use of biocontrol on marine pests is new, although the approach has been studied extensively in agriculture.

Mathematical models help researchers predict what will happen to a population of green crabs after the barnacle has been introduced. "We are asking, 'Can this means of biocontrol be effective?'" said Lafferty.

"We must combine fisheries models with infectious disease models," he said. "This may show us how, if and where the parasite should be introduced. It may point to a different type of parasite."

Rhizocephalans are called parasitic castrators because they block a crab's reproductive system. After rhizocephalan latches on to the crab, reproduction ceases. With the parasite, the crabs "look like crabs, act like crabs but are not crabs," says Lafferty. In fact he says that the crab is turned into a "barnacle-making robot."

In addition to working out the mathematical models, researchers are testing West Coast crabs to see which, if any, are susceptible to rhizocephalan. "Parasites tend to be fairly host-specific," said Lafferty. "This is partly because they are so integrated with the host."

Although there have been a small number of highly publicized "disaster cases" involving the use of general predators for biocontrol, Lafferty and Kuris state that scientific biocontrol has a safe and effective track record in agriculture. The

preliminary testing and modeling they are doing is aimed at determining whether the green crab could also be controlled safely and effectively.

Lafferty and Kuris emphasize the importance of a rapid response to the appearance of a pest. As they state in a 1996 article, "Biological Control of Marine Pests," published in *Ecology*, "We cannot overemphasize that, as has been long evident in the management of agricultural pests, early detection and a rapid response afford the greatest opportunity to control pest invasions."

The researchers note that the current alternative options are to either do nothing and let the damage occur, or to use massive amounts of non-specific pesticides to control the green crab.

Note to editors: A photograph of the European green crab infected by the parasite rhizocephalan is available.

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