

CONTRA COSTA TIMES

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Clams may be causing Delta species decline

By Mike Taugher
CONTRA COSTA TIMES

An invasive clam that has dramatically altered the food web in Suisun Bay is emerging as a leading suspect in a sweeping ecological crash just upstream in the Delta.

Scientists racing to figure out what is going on in the West Coast's largest estuary say the clam is the basis for one of the most promising theories to emerge since it was confirmed nine months ago that numerous fish and other organisms are in rapid decline.

The one-inch clam is believed to have arrived during the 1980s in ship ballast water from Asia. It was thought to be mostly confined to the brackish water downstream of the Delta, but new information suggests it might have spread upstream, a migration that could have been aided, ironically, by water management changes meant to help Delta fish.

If the theory proves correct, it could have major implications for the future of the Delta and its ability to provide water to 23 million Californians.

The timing and amount of water deliveries could be affected. And biologists could face difficult decisions over whether to protect migrating salmon or resident fish.

"It's going to be disturbing to a lot of people, so it's going to be scrutinized very heavily, which is a good thing," said Greg Gartrell, assistant manager of the Contra Costa Water District, an agency that deduced clams might be causing the problem at about the same time scientists were independently arriving at the same possibility. "There's something for everybody to dislike about this."

Every expert interviewed for this story cautioned that more research is needed to understand the role of the clam as it relates to the Delta crisis. Some said that even if the clam theory proves correct, it is unlikely to fully explain all of the ongoing population crashes in the Delta's open waters.

Voracious filter-feeder

But preliminary evidence that the clam might have spread upstream is troubling because the clam is a voracious filter-feeder. In Suisun Bay, for example, it is blamed for severely depressing the amount of phytoplankton -- the basis of aquatic food web. In places, it dominates the bay floor.

"It's one of the first things that makes sense to me," said Ted Sommer, an ecologist at the California Department of Water Resources. "I have a hard time believing that it's not going to be a major focus (of scientific investigation) next year."

Scientists early this year confirmed that the Delta's open-water ecosystem is rapidly deteriorating and could be on the verge of collapse.

After decades of gradual decline, the populations of major fish species took a sudden turn for the worse beginning about three years ago.

Populations of Delta smelt and young striped bass last year fell to their lowest levels ever. Threadfin shad and longfin smelt also declined. And a key food source for all of those fish, tiny zooplankton called copepods, is disappearing.

Scientists in January established that the downturn could not be explained by weather patterns or any other easily identifiable cause.

Biologists earlier this year were hopeful that favorable weather patterns would stall the declines or even temporarily reverse them.

But that did not happen. Fish surveys so far this year show the problems are continuing.

Scientists have said for months that the crisis is likely due to toxins, invasive species, water management or a combination of factors within those categories.

They continue to caution that culprits besides the clam are likely at play.

Bruce Herbold, a biologist at the U.S. Environmental Protection Agency, called the clam hypothesis "a nice smoking gun (in a) room full of smoking guns."

"There's no end of causes for concern," Herbold said.

Among the possible factors contributing to the Delta's decline:

- A blue-green algae called *Microcystis* that releases toxins. Relatively little is known about it, but *Microcystis* appears to be more prolific in the Delta, especially this year.
- New pesticides. Scientists are interested in the increased use of a new class of pesticides that is especially toxic to fish. Those pesticides, called pyrethroids, are being used more often as a substitute for recently banned pesticides. But pyrethroids tend to quickly get into sediment, raising questions about whether they remain in the water long enough to have a widespread impact on the Delta's aquatic organisms.
- Copper. Copper-based pesticides are being used to control aquatic weeds that create problems for boaters and to control algae in runoff from rice farms in the Sacramento Valley. Delta fish are also more sensitive to copper poisoning than previously thought, according to new scientific tests, Herbold said. But, like pyrethroids, copper in the Delta might not enter the food chain readily enough to have a widespread impact.
- Water operations. Changes in how and when water is released from reservoirs and pumped out of the Delta for San Joaquin Valley farms and Southern California cities has, in recent years, resulted in water moving more quickly through the Delta. Scientists want to know if phytoplankton has enough time in the Delta to develop enough to sustain the food web.

Scientists work on problem

Scientists have been racing the clock to try to explain what has gone wrong. In November, they plan a public workshop to discuss the results of this year's \$2 million "triage" effort that was designed to eliminate some possibilities and develop a work plan to investigate specific possibilities next year.

The rapid pace of the scientific investigation is based partly on the gravity of the crisis and partly on the need to get funding for next year.

"The stakes are high, and we have to face the reality of the budgeting cycle," said Sommer, the state water agency ecologist.

The tiny clam is known as the "overbite" clam because its top and bottom shells are different sizes. They can blanket an area -- more than 2,000 clams per square meter is typical -- and in Suisun Marsh biologists have found up to 48,000 clams per square meter.

New information showing that the overbite clam might have moved farther upstream has yet to be verified. And scientists have yet to determine the size or age of clams they have found. If it turns out the clams are all immature, it is unlikely that they have had much effect on the ecosystem.

But if the clam has indeed moved upstream in significant numbers, it would be a worrisome sign.

Overbite clams can filter prodigious amounts of water -- stripping it of microscopic algae and other organisms that fish eat. In Suisun Bay, they are capable of filtering the entire water column above them in a day. In the shallows, they can filter the water above them up to 13 times in a day.

The clams are changing ecology of Suisun Bay

They have depressed the amount of phytoplankton -- microscopic plants at the base of the aquatic food web -- and are dramatically altering the ecology of Suisun Bay. They also consume larvae of zooplankton that are food sources for Delta fish.

The Contra Costa Water District suspects there could be a connection between the Delta's ecosystem crisis and degradation of the Delta's water quality in recent years.

The water district, which has complained for years that changes in the operation of upstream dams and giant Delta pumps have increased the amount of salt in the Delta, says it would make sense that the clams have moved upstream.

Specifically, the Concord-based water district says shifts in the timing of water deliveries meant to protect migrating salmon and spawning smelt have increased the amount of water pumped in the fall, which in turn has brought more sea salt up from the San Francisco Bay.

In wet years and in moderate years, the water in the fall at one western Delta site has been twice as salty since 1993, when the delivery shifts were put in place. At another western Delta site, the salinity is up fourfold, according to figures compiled by the water district.

If it turns out to be true that increased salinity from those changes allowed the clam to invade the Delta, and that the clam is undermining the Delta food web, solutions will be difficult to find.

Will the shifts in water deliveries have to be reversed, and will that renew problems for salmon and smelt? Or will the users of water from the Delta or the rivers that feed it be forced to give up water to improve water quality in the Delta?

"There's not an easy solution to this, except better water quality," said Gartrell of Contra Costa's water agency.

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