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Smelt studies glean important insights

Scientists' research is crucial to saving fish from extinction

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Out on a sun-baked lot near the state's massive Delta water pumps sits a cluster of nondescript buildings where researchers are decoding the mysteries of a tiny fish at the center of a statewide water supply crisis.

It is here that researchers have learned how to hatch and grow Delta smelt, discovering all sorts of details about the imperiled fish along the way. They have raised and studied thousands of Delta smelt during the past 15 years since biologists first started worrying about the fate of the native fish.

Who knew, for example, that Delta smelt will not feed in clear water, preferring a more turbid environment? Or that its eggs are very sticky and tend to glue themselves to hard surfaces, like rocks, on the channel bottom?

Those little insights have taken on added meaning in recent years as Delta smelt have plunged dramatically toward extinction and could lead to changes in how the Delta is managed.

If the fish need more turbid water, for example, perhaps more could be done to rid the Delta of Egeria densa, a water weed that slows currents and allows sediment to settle to the bottom, resulting in clearer water.

Finding and protecting the eggs of a 2-inch fish in a 700-square-mile estuary, however, is more daunting.

"It's like finding a needle in a haystack. Actually, it's like finding a needle in a field," said Bradd Bridges, a fisheries biologist and researcher at the Delta smelt culture and conservation laboratory near Tracy.

But knowing some of the properties of those eggs can help biologists figure out where to protect habitat.

On a recent day in one of the buildings, researcher Lindsay Sullivan of San Francisco State University's Romberg Tiburon Center was trying to determine if Delta smelt will eat a tiny zooplankton, a copepod known as Limnoithona.

Unfortunately for Delta smelt and other small Delta fish, their preferred zooplankton food, Psuedodiaptomus forbesi, is disappearing, probably because it is being eaten by invasive clams.

Limnoithona, however, is an invasive zooplankton that is abundant in the Delta. One question for researchers is whether Delta smelt and other fish can switch their diet to eat the alternative food.

"At first it was thought the Limnoithona were too small to be eaten," Sullivan said.

"One of the reasons that's been proposed for the decline of the fish is the decline of the food," Sullivan added. "It looks from my data they can eat these small copepods."

Whether Limnoithona can sustain the fish is another question.

For visiting researchers like Sullivan and the lab's four full-time scientists, these are the best of times and the worst of times.

The good news is that with Delta smelt closer than ever to extinction, the lab is getting more funding to continue its research. It runs on a budget of about $300,000 a year, mostly from the Department of Water Resources and other agency grants.

In addition to its own work, the lab run by UC Davis gives tens of thousands of fish each year to outside laboratories so scientists can conduct research into the effects of toxic substances on the fish and the effectiveness of screens that might keep the fish alive and out of harm's way.

"A lot of the work we're doing can only be done" with lab-produced fish, said Bruce Herbold, a fisheries biologist at the U.S. Environmental Protection Agency who is among scientists researching the cause of a widespread fisheries decline in the Delta.

But the bad news for the lab is that with smelt populations crashing so severely, it is unlikely the lab will be allowed to collect spawning adult fish any time soon.
"That will cause problems," said Herbold, who is not affiliated with the laboratory.

The lab can continue to produce fish for experiments, but it runs the risk of inbreeding and promoting traits that, although favorable for fish in a hatchery, are different from wild fish.

Because the lab, which opened in 1992, has learned how to grow the fish through multiple generations, it should be able to maintain a captive population for as long as it needs to.

In fact, the skill developed at the lab to raise Delta smelt eggs to mature fish and then spawn those fish and successfully raise their eggs could become the species' last hope.

Already, there are suggestions that the laboratory could develop a formal program to retain a refuge population in case the fish disappears entirely from its natural habitat in the Delta.

"To reduce the risk of extinction, a high priority should be placed upon developing and maintaining refuge populations of Delta smelt for conservation purposes," said a March report, called the Pelagic Fish Action Plan, from the state Resources Agency.

Biologists, however, are deeply skeptical. Captive breeding might be good for producing fish for research, but it is unlikely to be of much use to restoring the population, they say.

"You end up with fish that are not able to do well in the wild. That is a dangerous tool to start using," Herbold said.

For one, it would take a heck of a lot of fish to make a difference in the sprawling Delta.

More importantly, for genetic and evolutionary reasons, captive breeding is unlikely to generate fish capable of navigating and surviving in the Delta.

"We're not strongly in favor of it unless it's absolutely necessary," said Joan Lindberg, a UC Davis researcher at the lab.
Still, Lindberg said the laboratory should be able to continue producing fish that can be used in experiments.#