Think Tank: Hatching crab

Future funding, cannibalistic juveniles plague king crab researchers

By Lauren Kramer
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Ten years from now, the king crab that consumers pluck off one of the many buffet lines on the Las Vegas strip may have its roots to a lab in Alaska. That is, if current research by Alaska Sea Grant on raising the spidery crabs is able to proceed.

During the king crab industry's heyday in the 1980s, fisheries off the coast of Alaska and the Aleutian Islands produced up to 200 million pounds of king crab. Those days are long gone, as the harvests now are closer to 20 million pounds, the majority from Bristol Bay, according to Forrest Bowers, a fisheries biologist with the Alaska Department of Fish & Game.

"In the Aleutian Islands, the golden king crab fishery is harvesting about 6 million pounds of king crab, but the Pribilof Island harvests are not doing well," he says.

"One of the problems is that we don't know why the crab stock is depressed. It could be environmental conditions, predator-prey relationships or habitat conditions that have changed. It's difficult to rebuild the stock without knowing what factors are causing the depression of king crab."

Alaska Sea Grant researchers are determined to get answers, and four years ago, started studying how to hatch and raise large numbers of larval king crab. In November 2009 they received red and blue adult king crab broodstock for another year of research.

The goal of the research is to determine if hatchery enhancement will help rebuild depleted blue and red king crab stocks in areas such as the waters around the Pribilof Islands and Kodiak Island, respectively, neither of which has had king crab fisheries for many years.

"It could be that those areas of Alaska are recruitment-limited, that they're not getting enough new baby crabs. If that was the case, then hatchery enhancement could offer a solution," says Ben Daly, a research biologist with Alaska Sea Grant. "By introducing juvenile crabs we could jump-start the population again and make it stable for the long term."

Daly is part of a research team that includes university and federal scientists and researchers at the Alutiiq Pride Shellfish Hatchery in Seward. Together they are conducting studies as part of the Alaska King Crab Research, Rehabilitation and Biology (AKCRRAB) program, which was created in 2006. AKCRRAB is an Alaska Sea Grant partnership among regional fishermen's groups, coastal communities, the National Marine Fisheries Service, the Alutiiq Pride Shellfish Hatchery, Chugach Regional Resources Commission and the University of Alaska Fairbanks School of Fisheries and Ocean Sciences.

Red king crab populations declined around Kodiak Island in the 1970s, at a time when ocean temperatures warmed slightly and the ecosystem dynamic shifted. "One theory is that this climate change may have caused the decline in crab stock," Daly says. "But there was a peak in commercial fishing at that time, too, so we don't know if [the decline] was due to overfishing."

Funding for the research is one challenge that Daly's team is navigating. An 18-month grant of $200,000 will dry up
"We're in search mode to try to extend funding to pay for our tanks, utilities and experimental floor space," he says.

In the three years of research, the egg-bearing blue and red king crabs were supplied by fishermen from Kodiak Island, Bristol Bay, north of the Alaska Peninsula, the Pribilof Islands and from St. Matthew Island in the Bering Sea.

In the first year, Daly's team faced several technological and biological hurdles as they learned about the four larval stages of a crab's life. "They're very sensitive to temperature fluctuations and diet, and we had to fine tune those parameters in the lab," he says.

For example, we learned that warming the temperature was good for the crabs, as it helped reduce filamentous bacteria growing on their shells. The bacteria limit the larval crabs' ability to breathe and feed. In warmer water the crabs grow faster, shed their bacteria-covered shell faster and can stay on top of the bacteria problem, which helped them survive."

The first year of the research was 2007, when 1,000 juveniles were cultured. In 2008, that number jumped to 37,000 and in 2009, researchers were able to culture 100,000 juveniles.

"We shipped some to other laboratories in Kodiak, Juneau [Alaska] and Newport, Ore., where other researchers were experimenting with habitat preference and predation," Daly says. "But the juveniles are highly cannibalistic, so today we're only left with about 100."

The juvenile stage is the one in which the crabs would be released into the wild, should a hatchery restocking program take off. Daly and his team hope to do small-scale experiments in the field to see how hatchery-cultured crabs behave in the wild.

"Can they avoid predation and compete with wild crabs?" he wonders. "When we understand these issues, larger releases could come into play, but the first hurdle will be to get permits to do these things, which will be a slow process. We're starting dialogue with the appropriate agencies in Alaska right now, but it may take as long as five or six years before we're able to do any large-scale releases."

At the end of the day, Daly and his team are hoping to determine if stock enhancement can be used to bolster depressed stocks of king crab. "It may boost the natural stocks to such a degree that fishing could be reopened in areas presently closed to fishing," he says. "But that's highly speculative, as we're in the very early stages of research right now."

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