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DURHAM, N.H. -- Winter flounder – sold in markets as flounder or lemon sole – in the Gulf of Maine went into serious decline in the 1980s, taking with it a major commercial and recreational fishery. Despite stringent fishing regulations, it's estimated that it could take more than a decade for winter flounder to regain its once-robust place in New England coastal waters.

Now, researchers at the University of New Hampshire are setting the winter flounder (Pseudopleuronectes americanus) fishery on the fast track to recovery. New research indicates that winter flounder is a good candidate for stock enhancement, in which juvenile fish hatched from wild brood stock are raised in captivity and released into the wild.

"We're studying winter flounder because we think they are an excellent local candidate for stock enhancement," says Elizabeth Fairchild, a post-doctoral researcher in zoology at the University of New Hampshire who has worked with professor of zoology W. Huntting Howell on winter flounder stock enhancement for a decade. "We know how to raise them, and we've learned how to release them in a way that maximizes their survival."

Raising the juvenile flounder is, in many ways, the easy part. The process begins in what Fairchild calls the "honeymoon tank" in UNH's Coastal Marine Laboratory in New Castle. Commercial fishermen provide the wild brood stock; Fairchild and colleagues expertly gauge their readiness for releasing sperm and eggs then give the males and females their privacy: "We let the fish spawn on their own," she says, noting that stock enhancement is most effective when the raised fish are as similar as possible to the wild fish they'll ultimately breed with.

The work gets tricky – and makes for fascinating research -- when the juveniles reach the size of a potato chip and are ready to join their wild brethren in the shallow coastal waters where winter flounder naturally spawn. "Hatchery-bred fish are different than wild fish," says Fairchild. They haven't been exposed to predators, for instance; nor have they had to forage for food. "For stock enhancement to work, the raised fish must be as fit as the wild fish." Much of her research turns on the challenge of making the cultured fish more wild.

In a study published in the "Journal of Fish Biology," Fairchild examined several factors that she hypothesized made hatchery flounder more vulnerable to predators: the amount of time it took them to conceal themselves by changing skin color and pattern and burying themselves in sediment, the rate at which gulls preyed on white versus dark-colored flounder on sediment, and the fish's behavioral reactions to predators. Her findings led her to test the effectiveness of acclimatization cages, marine halfway houses that give hatchery-raised fish a protected introduction to the wild blue sea.

Fairchild's current studies build on explorations of optimal release strategies. Earlier this month, she released 1,000 one-year-old juveniles in the Hampton-Seabrook Estuary several months ahead of their usual summertime launch; she's hoping that earlier release will mitigate the juvenile flounders' vulnerability to green crabs, which are less prevalent in the spring than the summertime. Unlike in previous releases, when divers submerged crab-proof acclimatization cages of flounder into 20 feet of water prior to release, Fairchild and a team of researchers released the flounder directly into the Hampton River. "The cages were like snack cages for the green crabs," says Fairchild, noting that the predators clustered around the cages hungrily awaiting the juveniles' release. "It was like ringing the dinner bell."

Fairchild tags the juveniles so she can track their survival over time. She's also starting to explore pre-release conditioning for hatchery-raised fish, to see if they can be "trained" to have the same reactions to predators and predation as the wild flounder. And she's starting to explore the hatchery-raised flounders' impact on the wild population. "We want to be sure we're not displacing or otherwise harming the wild fish," she says.

"Targeted at the restoration of commercial and recreational fish and shellfish, enhancement is becoming a very important tool in NOAA's fishery management tool box," says Michael Rubino, aquaculture program manager for the National Oceanographic and Atmospheric Administration (NOAA).

Fairchild's work is part of SCORE, the Science Consortium for Ocean Replenishment, which is a national research group dedicated to developing scientifically-based marine stock enhancement technology. SCORE is funded through NOAA and is part of UNH's Atlantic Marine Aquaculture Center, a center for aquaculture research and technology development. For more information, go to www.amac.unh.edu/stock_enhancement/stock_about.html or http://zoology.unh.edu/faculty/howell/grad/efairchild/fairchild.html.

Photos are available to download here. Credit: Beth Potier, UNH Media Relations.

http://unh.edu/news/img/efrelease.jpg

Caption: Elizabeth Fairchild, post-doctoral researcher at the University of New Hampshire, releases hatchery-bred juvenile winter flounder into the Hampton River as part of a stock enhancement effort.

http://unh.edu/news/img/bucketofish.jpg

Caption: One-year-old winter flounder, bred at the University of New Hampshire's Coastal Marine Laboratory, await their release into the Hampton River.