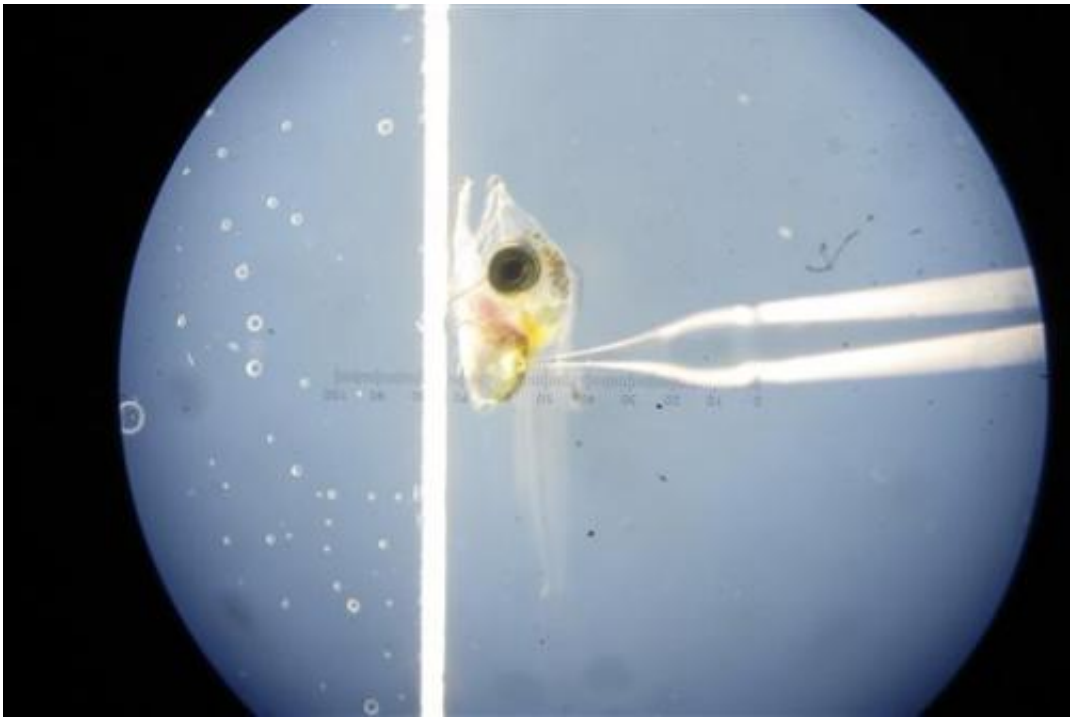
Surrogate sushi: Japan biotech for bluefin tuna

November 20 2014, by Elaine Kurtenbach



In this Wednesday, Oct. 29, 2014 photo released by Tokyo University of Marine Science and Technology, a researcher demonstrates the technique for using a minute needle to insert reproductive cells from a bluefin tuna into a mackerel fry, under a microscope, that will produce tuna when it matures. The researchers at Tokyo University of Marine Science and Technology are fine-tuning a technology to use mackerel surrogates to spawn the bluefin, a process he hopes will enable fisheries to raise the huge, torpedo-shaped fish more quickly and at lower cost than conventional aquaculture. The aim: to relieve pressure on wild fish stocks while preserving vital genetic diversity. (AP Photo/Tokyo University of Marine Science and Technology, Goro Yamazaki)

Of all the overfished fish in the seas, luscious, fatty bluefin tuna are among the most threatened. Marine scientist Goro Yamazaki, who is known in this seaside community as "Young Mr. Fish," is working to ensure the species survives.

Yamazaki is fine-tuning a technology to use mackerel surrogates to spawn the bluefin, a process he hopes will enable fisheries to raise the huge, torpedo-shaped fish more quickly and at lower cost than conventional aquaculture. The aim: to relieve pressure on wild fish stocks while preserving vital genetic diversity.

Yamazaki, 48, grew up south of Tokyo in the ancient Buddhist capital of Kamakura, fishing and swimming at nearby beaches. His inspiration hit 15 years ago while he was out at sea during graduate studies at the Tokyo University of Marine Science and Technology, and a school of bluefin tuna streaked by.

"They swam just under the boat, and they were shining metallic blue. A beautiful animal," Yamazaki said. "Before that, tuna was just an ingredient in sushi or sashimi, but that experience changed bluefin tuna into a wild animal to me."

An animal, that like so many other species, is endangered due to soaring consumption and aggressive modern harvesting methods that have transformed the bluefin, also known as "honmaguro" and "kuromaguro," from a delicacy into a commonly available, if pricey, option at any sushi bar.

This month, experts in charge of managing Atlantic bluefin met in Italy and raised the quota for catches of Atlantic bluefin tuna by 20 percent over three years. Stocks have recovered somewhat after a severe decline over the past two decades as fishermen harvested more to meet soaring demand, especially in Japan.

But virtually in tandem with that, the International Union for Conservation of Nature put Pacific bluefin tuna on its "Red List," designating it as a species threatened by extinction.

About a quarter of all tuna are consumed by the Japanese, according to the United Nations Food and Agricultural Organization. They gobble up most—between 60 percent and 80 percent—of all bluefin. Rosy, fatty "chu-toro" from the upper part of bluefin bellies, is especially prized for sushi and sashimi.

Out at his seaside lab in Tateyama, on the far northern rim of Tokyo Bay, Yamazaki and other researchers are hoping their latest attempt to get mackerel to spawn bluefin will prove a success. An earlier attempt failed due to what he thinks was a problem with the water temperature.

In this photo taken Wednesday, Oct. 29, 2014, scientist Ryosuke Yazawa uses a microscope as he demonstrates the technique for inserting bluefin tuna cells into mackerel fry that will be used as surrogates to produce tuna babies at a lab of the

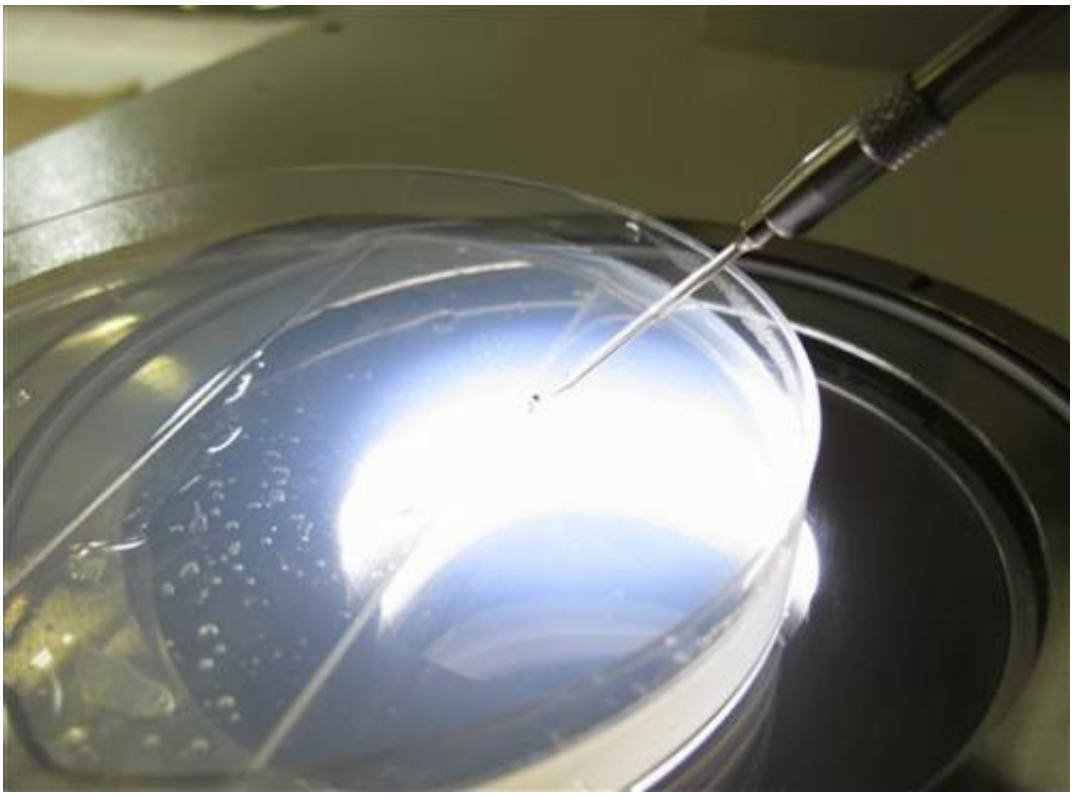
Tokyo University of Marine Science and Technology in Tateyama, southeast of Tokyo. Researchers at the lab are fine-tuning a technology to use mackerel surrogates to spawn the bluefin, a process he hopes will enable fisheries to raise the huge, torpedo-shaped fish more quickly and at lower cost than conventional aquaculture. The aim: to relieve pressure on wild fish stocks while preserving vital genetic diversity. (AP Photo/Elaine Kurtenbach)

Yamazaki's technique involves extracting reproductive stem cells from the discarded guts of tuna shipped by cold delivery from fish farms and inserting them into mackerel fry so tiny they are barely visible.

The baby fish are put in an anesthetic solution and then transferred by dropper onto a slide under the microscope. Researcher Ryosuke Yazawa deftly inserts a minute glass needle into one's body cavity to demonstrate.

Under the right conditions, the tuna stem cells migrate into the ovaries and testes of the mackerel. The team is now waiting to see if the mackerel, when mature, will spawn tuna, and if the tuna will survive. Following that, they could be released into the sea or farmed.

The research team has already succeeded in using surrogate technology to produce tiger puffer fish, the poisonous "fugu" used in sashimi and hotpot, using smaller grass puffer fish. It has produced trout spawned by salmon. Companies that import rare and tropical fish also are interested in the technology.



In this photo taken Wednesday, Oct. 29, 2014, a researcher demonstrates the technique for using a minute needle under a microscope to insert reproductive cells from a bluefin tuna into a mackerel fry, so that it will produce tuna when it matures at a lab of Tokyo University of Marine Science and Technology in Tateyama, southeast of Tokyo. The researchers are fine-tuning a technology to use mackerel surrogates to spawn the bluefin, a process he hopes will enable fisheries to raise the huge, torpedo-shaped fish more quickly and at lower cost than conventional aquaculture. The aim: to relieve pressure on wild fish stocks while preserving vital genetic diversity. (AP Photo/Elaine Kurtenbach)

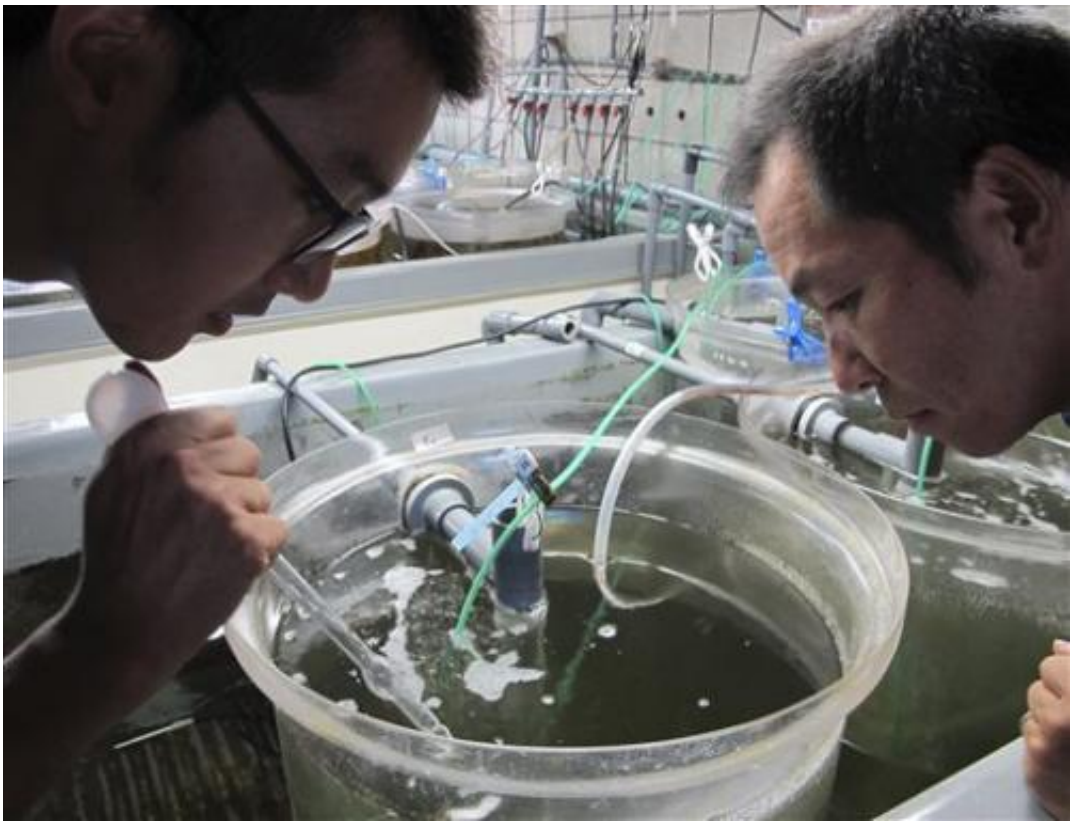
The method could help reduce pressure on wild populations, Yamazaki hopes, and also help ensure the greater genetic diversity needed to preserve various species.

Though he started out working in the field of genetic modification, Yamazaki emphasizes that his techniques involve only surrogate

reproduction, not GM.

The main "tricks," as he calls them, are using baby fish as future surrogates, because their immature immune systems will not reject the tuna cells, and relying on the natural tendency of the reproductive stem cells to mature and produce viable offspring. To simplify matters, the lab is using triploid, or sterile hybrid fish commonly bred at fish farms, that will not develop eggs or sperm of their own species.

Yamazaki expects his research to be useful for commercial purposes. Though researchers elsewhere have succeeded in breeding tuna in captivity, the process is costly and survival rates are low. Mackerel, less than a foot long when caught, are much easier to handle and keep in land-based tanks than tuna, which can grow to nearly the size of a small car and require far more food per fish. The mackerel also mature more quickly and spawn more frequently, if they are well fed and kept at the right temperature.



In this photo taken Wednesday, Oct. 29, 2014, scientist Goro Yamazaki, right, looks on as his colleague Ryosuke Yazawa collects mackerel fry that will be used as surrogates to produce tuna at a lab of the Tokyo University of Marine Science and Technology in Tateyama, southeast of Tokyo. The researchers are fine-tuning a technology to use mackerel surrogates to spawn the bluefin, a process he hopes will enable fisheries to raise the huge, torpedo-shaped fish more quickly and at lower cost than conventional aquaculture. The aim: to relieve pressure on wild fish stocks while preserving vital genetic diversity. (AP Photo/Elaine Kurtenbach)

Not all experts favor such high-tech solutions for the bluefin.

Amanda Nickson, director of global tuna conservation for The Pew Charitable Trusts, said the partial recovery of Atlantic bluefin stocks shows that enforcement of catch limits, backed by threats of trade bans,

can work.

Earlier this year, the multi-nation fisheries body that monitors most of the Pacific Ocean recommended limiting the catch of juvenile bluefin tuna to half the average level of 2002-2004. Scientists found that stocks of the species had dwindled to less than 4 percent of their original size. It also found that most fish caught were juveniles less than 3 years old, before they reach reproductive maturity.

The group set a 10-year target of rebuilding the population to 8 percent of its original size.

In this Jan. 5, 2014 file photo, people watch a bluefin tuna laid in front of a sushi restaurant near Tsukiji fish market after the year's celebratory first auction in Tokyo. The researchers at Tokyo University of Marine Science and Technology are fine-tuning a technology to use mackerel surrogates to spawn the bluefin, a process he hopes will enable fisheries to raise the huge, torpedo-shaped fish

more quickly and at lower cost than conventional aquaculture. The aim: to relieve pressure on wild fish stocks while preserving vital genetic diversity. (AP Photo/Shizuo Kambayashi, File)

"As long as you don't take too many, those populations can rebuild and rebuild fairly effectively," she said.

Perhaps so, said Yamazaki, but over the centuries, humans have repeatedly over consumed resources, sometimes past the point of no return.

"Japanese people eat tuna from all over the world. We have to do something. That is the motivation for my research."