

Keeping endangered abalone alive, 1 fertilized egg at a time

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Kristin Aquilino holds an endangered white abalone at the Bodega Marine Laboratory in Bodega Bay, California, on Wednesday, March 2, 2016.

Connor Radnovich/The Chronicle

With the fate of the entire species on the line, a female abalone named 306 got together with two male abalones in Bodega Bay the other day.

It wasn't love, not exactly, but it was as close to love as a white abalone gets.

"I'm the matchmaker," said Kristin Aquilino, the scientist in charge, as she poured part of a test tube full of abalone sperm into a plastic pitcher containing Abalone 306's eggs. "This is Match.com for white abalone."

Aquilino was doing her matchmaking in a refrigerated chamber deep inside the Bodega Marine Laboratory, the spot entrusted with yanking the endangered white abalone back from the brink of extinction. The species once thrived in the waters off Southern California, but it made the mistake of being too delicious. In the 1970s and '80s, it was nearly wiped out by hungry divers in wetsuits with crowbars.

Fifteen years ago, the white abalone was put on the federal endangered species list — the first marine invertebrate to earn that distinction. For the past five years, the scientists in the Bodega Bay lab — a branch of UC Davis — have been collecting, coddling, pampering and spawning a handful of the surviving white abalone. About 2,000 remain in the wild, down from an estimated several million in the mid-20th century.



Kristin Aquilino (left) and Shelby Kawana rinse out a bucket with clean water during the artificial fertilization process of endangered white abalone at the Bodega Marine Laboratory in Bodega Bay, California, on Wednesday, March 2, 2016. Connor Radnovich/The Chronicle

No touching

The spawning this year took place at high noon Wednesday. Abalones reproduce every March by releasing eggs and sperm into the water and then hoping for the best. There is no shell-to-shell contact, under the rules, although the males and females are advised to be only a few feet from one another for the process to work.

In the laboratory version of abalone love, about 20 mature animals — half of them female and half male — waited in individual buckets under the careful eye of scientists, who had poured just a smidgen of hydrogen peroxide, which tricks the abalone into thinking it is time to get romantic.

It worked, to the delight of the humans, who scribbled furiously in their notepads whenever a male abalone turned the water in his bucket milky white with billions of sperm or a female turned the water in her bucket green with millions of eggs.

The precious fluids were collected and turned over to Aquilino, who performed the critical next step using the seasoned judgment of any matchmaker. She had to decide how much of the sperm-infused water to pour into the egg-infused water. Pour too much or too little, and the chemistry — so critical when males and females get together — could be compromised.

For this crucial moment, she eyeballed it, basing her pouring on the density and color of the fluids, knowledge she has gleaned from years of fraternizing with abalone.



Kristin Aquilino fertilizes a mixture of abalone sperm and eggs during the artificial fertilization process of endangered white abalone at the Bodega Marine Laboratory in Bodega Bay, California, on Wednesday, March 2, 2016. Connor Radnovich/The Chronicle

Good eye

Other scientists rushed samples to microscopes in the next room, to see if Aquilino had guessed right. She had. Each egg under the scope had five to 15 sperm attached to it — just the right ratio to ensure successful breeding.

“It’s an honor to be doing this work,” said Aquilino, who has run the abalone project for five years. “I believe we have an obligation to restore white abalone. We are responsible for their current condition — we simply harvested so many of them from the ocean that there are too few left to reproduce successfully. We thought we could never deplete white abalone. Now we know better.”

On the wall of the lab were posted the official rules for abalone courtship, in case the scientists were to forget.

“Keeping track of male parentage is important. ... Get the correct egg-to-sperm ratio. ... Gently stir eggs and sperm for 1.5 to 2 minutes.”

Despite their best efforts, even the abalone guardians can goof. Abalone 364 was believed to be a male and was waiting in his bucket for his turn to release sperm when the water in the bucket turned green, not white. Abalone 364 was a she, not a he.

“Whoops,” said one of Aquilino’s assistants, staring into the bucket. The “M” label was crossed out on Abalone 364’s bucket with a black marker and changed to an “F,” demonstrating that humans are not the only species that change gender designation.

Into the wild

The fertilized white abalone eggs will be kept in special tanks, fed microscopic algae, then transferred into long white trays full of kelp, which is as tasty to an abalone as an abalone is to the rest of the world.

In coming years, scientists hope to take thousands of laboratory-bred white abalone back to the underwater coves off Southern California, as for some unfathomable reason white abalones prefer the Los Angeles environs to Northern California. In a trial run, the scientists have already been introducing laboratory-bred red abalone, which are not endangered, to the wild. A white abalone and a red abalone are similar in all ways that matter to a hungry human, although the abalone know the difference and the species do not interbreed.

The location of the Southern California abalone coves is top secret, to prevent the wetsuit crowd from finding out. "Point Conception to the Mexican border" is all the information that can be pried from the lips of the abalone guardians.

"White abalones are the condors of the marine world," said lab director Gary Cherr. "We want to give them a chance."

Inside the 10-by-10-foot chamber in Bodega Bay where lies the fate of the species, their young human guardians work with passion in their hearts and pipettes in their right hands and "Team White Abalone" T-shirts on their backs.

"As a species, we're very good at consuming," said researcher Jenny Hofmeister. "It's difficult for us to see past the moment. It's something we have to learn to do better."

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