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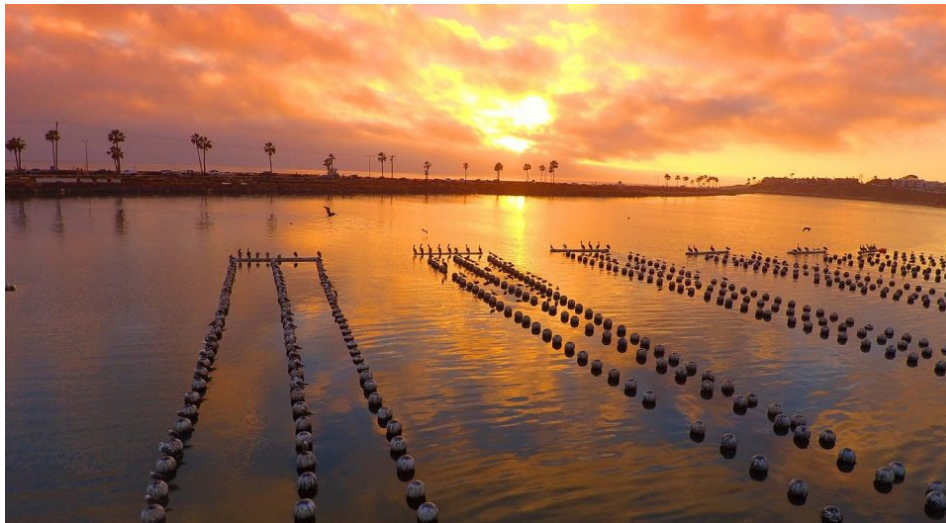
 Responsibility

As ocean acidification threatens the shellfish industry, this California oyster farm is raising oysters resistant to climate change

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By Hank Hogan

Forward-thinking Carlsbad Aquafarm also diversifies into seaweed to develop vegan products



Despite the dangers to shellfish posed by ocean acidification, Carlsbad Aquafarms in California is producing oysters resistant to climate change and diversifying into seaweed production. Photos courtesy of Carlsbad Aquafarms.

Sitting on the California coast north of San Diego, Carlsbad Aquafarm has been farming oysters and mussels since 1990. Its longevity is impressive, partly because running a successful aquaculture operation in the Golden State can be **notoriously difficult** (<https://www.globalseafood.org/advocate/two-years-after-shutdown-california-oyster-farm-remains-a-community-hot-button/>).

“There’s a lot of regulatory hurdles that California has that other states don’t have,” said Thomas Grimm, CEO. The permitting process can be challenging and lengthy, he noted.

That observation was echoed in a public commentary by Brandon Barney, co-founder of Primary Ocean. He stated in January that gaining **state regulatory agency approval** (<https://www.sfchronicle.com/bayarea/article/Companies-want-to-grow-seaweed-in-California-to-16741527.php>) for a seaweed farm took years despite the project being backed by the U.S. government. And a **2019 study** (http://chrome-extension://efaidnbnmnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.pacificresearch.org%2Fwp-content%2Fuploads%2F2019%2F04%2FEntrepreneurship1_fweb.pdf&cLen=888270&chunk=true) from the libertarian Pacific Research Institute found California ranked second to last among states in terms of its business regulatory environment.

In addition to those hurdles, California’s coastal shelf is narrower than those off the U.S. Atlantic and Gulf of Mexico coasts, meaning that prime locations to anchor a sea farm in California are closer to shore. In Southern California, those sites can be in high-traffic shipping lanes – the Port of Long Beach is one of the world’s busiest – or near offshore oil platforms.



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“In California, there are a lot of reasons why it’s difficult to do aquaculture,” Grimm concluded.

There are also unique challenges that come with oyster farming in the time of climate change: As the ocean absorbs carbon dioxide at an alarming rate, ocean acidification is transforming marine ecosystems. Shelled animals, like zooplankton, corals, clams, mussels and oysters, cannot grow their shells in the acidic water and the effects are especially severe at the juvenile stages.

But Carlsbad Aquafarm’s SoCal setting gives the company a leg up in developing oysters resistant to climate change, a result of ongoing research that could impact oyster production worldwide. And despite the obstacles, Grimm attributes his company’s success to a commitment to sustainable operations. He notes that the California Coastal Commission **voted unanimously in 2019** (<https://www.thelog.com/local/coastal-commission-supports-san-diego-area-marine-shellfish-aquaculture-operations/>) to approve a Carlsbad Aquafarm permit.



Carlsbad Aquafarms is working with University of Southern California researchers to implement a technique used in agriculture: the concept of hybrid vigor. This method involves the in-breeding of specific lines to heighten differences between groups of plants or animals, followed by the crossing of those lines with one another.

A commitment to doing things right and sustainably plays a role in the innovations Carlsbad Aquafarm is pursuing. One is the raising of oysters more tolerant to the increasing acidity of ocean water brought about by climate change. The oysters are also more resistant to disease and generally hardier than

other commercially raised shellfish.

In conjunction with University of Southern California researchers, the project is an aquaculture implementation of a technique used in agriculture: the concept of hybrid vigor. This method involves the in-breeding of specific lines to heighten differences between groups of plants or animals, followed by the crossing of those lines with one another. The crossed off-spring are then crossed again, resulting in a hybrid animal or plant more robust than any of the original starting stock. The research project is ongoing but the early results are promising, Grimm indicates.

This hybridization requires raising successive generations, with the time for each generation in the sequence determined by how long it takes to go from a newborn spat to a mature animal. Consequently, there is a premium in having oysters mature quickly.



The water flowing through the lagoon where Carlsbad Aquafarms is located is rich in the calcium carbonate oysters need to build their shells. The water is also nutrient-dense, a result of a high concentration of nearby organic farms and fresh seawater from the adjacent ocean.

“Pacific oysters most often take two to three years to mature, whereas in Carlsbad, California, it’s less than a year and sometimes as brief as nine months,” Grimm said.

That compressed timeframe arises from several factors, according to Grimm. The water flowing through the lagoon where Carlsbad Aquafarms is located is rich in the calcium carbonate oysters need to build their shells. The water is also nutrient-dense, a result of a high concentration of nearby organic farms and fresh seawater from the adjacent ocean. A third factor is a steady, temperate climate that allows the oysters to grow year-round.

The fast-growing oysters accelerate research into and the eventual production of animals that are better able to withstand a changing climate and its effects, Grimm explained.

“The shellfish that we grow, the stronger and more resilient they are, the better it is for everybody,” Grimm said.

Carlsbad Aquafarms has other innovations brewing, including a seaweed-based source for gummies that’s both vegan and kosher. The generally reddish seaweed species known as Ogo can be processed into gummies that do not come from animals, opening a door to the alternative medicines market. The company was also awarded a U.S. Department of Agriculture grant to explore feeding seaweed to cattle with the goal of disrupting their methane production.

Cows **burp out the potent greenhouse gas** (<https://www.globalseafood.org/advocate/beefing-up-seaweed-production-to-green-up-beef/>), and so eliminating methane would help mitigate climate change. Grimm pointed to other diet-change benefits: increased milk production, a higher reproductive rate and higher quality meat. The seaweed that pulls off this feat is difficult to grow, and Carlsbad Aquafarm is investigating alternatives.

These efforts, and others underway to expand operations, fit into the company’s vision of its place in the world. As Grimm said, “Our role as environmental stewards is to ensure the ecological health of the lagoon in which we work.”

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