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'Almost as if they're wild' – Offshore aquaculture startup Forever Oceans is gaining confidence farming in deep water

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By Hank Hogan

Offshore aquaculture startup deploys modular fish enclosures in deep water to produce a sashimi-grade yellowtail with low environmental impacts



With patented modular fish enclosures, sensors and software, Forever Oceans uses offshore aquaculture to raise kanpachi, with bold expansion plans ahead. Photos courtesy of Forever Oceans.

Aquaculture startup Forever Oceans claims it has overcome the challenges of offshore aquaculture. Its solution consists of modular, ruggedized fish enclosures anchored by patented single-point mooring along with sensors, software and automated features situated several miles from shore and in thousands of feet of water. At this depth and distance, the enclosures drift with the currents, allowing the fish – a yellowtail species called kanpachi (*Seriola dumerili*) – to mature like their uncaged counterparts.

“Our fish are being raised almost as if they’re wild. They’re swimming in their natural conditions,” CEO Bill Bien told the *Advocate*.

After years of research and development, Forever Oceans is now raising kanpachi off the Pacific Coast of Panama. Production volume of the yellowtail sushi-grade fish has grown tenfold since the farm started operation in August 2022, with the company on track to meet a reported goal of 2,500 metric tons harvested over 12 months. The company is selling product in North America and Europe with plans for other farms near Brazil and Indonesia to supply Asia and other markets.

The anchorage point for all of Forever Oceans’ farm enclosures will be at depths of at least 100 meters and as much as 1,000 meters, with the distance to shore depending on the local seafloor profile. Along with its modular enclosures and anchoring hardware, Forever Oceans also deploys sensors and AI (artificial intelligence) software. The sensors monitor the fish and their environment while the software uses this information to adjust feed so that it is only what is needed, thereby avoiding waste that costs money and contributes to negative environmental impacts. The software and sensors also check the enclosures’ biomass, alerting operators when the fish should be harvested, and otherwise automate operations.



(<http://www.expalsa.com/>).

The control software works in combination with the mooring hardware in other ways. The duo, for instance, can move the enclosures to different depths below the waves, making the enclosures capable of riding out all but the strongest hurricanes without suffering damage.



"These fish are basically all athletes," said Forever Oceans CEO Bill Bien. "They're in natural currents, rather than in a sheltered bay. As a result, they're very muscled. They have great marbling, great taste, firm texture, while also having very rich omega-3s because of what we feed them."

Farming in deep waters brings benefits, according to Bien. The fish, for instance, swim in natural currents, which pays dividends in terms of the final product.

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The company has provided about 5,000 samples of its product at industry trade shows thus far. More than 100 restaurants have signed up to sell the product.

The resulting feedback, Bien stated, is that the ocean-raised product is delicious and just as good in taste and quality as salmon and tuna. Other comments are that the ocean-raised fish really pops in the mouth because of the richness of the omega-3 and other fats. Chefs, Bien relayed, characterize

kanpachi as versatile enough to appear as a center of the plate dish as well as sushi and sashimi.

Farming in deeper water and in enclosures that move also brings environmental benefits, noted Jason Heckathorn, chief sustainability officer. He founded Forever Oceans in 2014, a spin-off from Lockheed Martin.

An aquatic ecosystem exists in layers, he explained, with problems arising when there is an imbalance between the layers. Operating in deeper waters, in enclosures that move, and in currents that flow like rivers transform the effluent from farmed fish from a pollutant into a fertilizer for the seafloor and the ecology near it.

Forever Oceans worked with consultants to determine the proper carrying capacity of its farm modules. As a result, the fish are healthier and grow faster while eliminating issues that would arise from having too many fish in too small a space.

"Think of what we've done as rebalancing the ecosystem," Heckathorn said.



Chefs who buy kanpachi say it "really pops in the mouth because of the richness of the omega-3 and other fats" and is versatile enough to appear as a center of the plate dish as well as sushi and sashimi.

A **study by The Nature Conservancy** (<https://www.globalseafood.org/advocate/tnc-evaluation-confirms-offshore-aquaculture-companys-low-carbon-footprint/>), found that the Forever Oceans approach leads to an estimated 4.26 kilograms of carbon dioxide equivalent emission per kilogram of fish, about 20 percent less than that for salmon production. What's more, operations will not significantly impact the ocean environment, according to the report.

Forever Oceans is currently concentrating on building out its farm network and expanding its market reach, Bien said, noting there will continue to be wild-caught fish and shallow water or even land-based aquaculture, and that there's room for all products in the seafood market. Offshore aquaculture

production that is cost competitive has a place in this picture because it helps meet a pressing need, he stressed.

"The world needs more protein. But it needs to be grown in a more sustainable way," he said. "We've created that way. I think there's a large opportunity in front of us."

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