

03 DEC 2009: **REPORT**

In Search of New Waters, Fish Farming Moves Offshore

As wild fish stocks continue to dwindle, aquaculture is becoming an increasingly important source of protein worldwide. Now, a growing number of entrepreneurs are raising fish in large pens in the open ocean, hoping to avoid the many environmental problems of coastal fish farms.

BY JOHN MCQUAID

Seven miles off Panama's Caribbean coast, businessman Brian O'Hanlon is conducting an entrepreneurial-ecological experiment. Since 2007 he has been running a fish farming operation, husbanding cobia in six enormous, pyramidal underwater pens. Cobia, a tropical finfish, is a solitary predator, a popular quarry for sport fishermen but not a target for commercial fishing. It's also known for its tasty, tender white meat, which is high in healthful Omega-3 fatty acids. Cobia are not often found on restaurant menus or at fish counters, and O'Hanlon believes that if he can create a reliable supply of farmed cobia, his company, Open Blue Sea Farms, will be able to sell it at a premium.

Fish have been raised in pens and cages for centuries. But until recently, aquaculture was rarely attempted in deep offshore waters. Employing teams of divers to feed and monitor the fish and keep up the enclosures is expensive. Continuous pounding by waves damages equipment and fish escape.

But over the past decade the technology has steadily improved. And now, as they did in the 19th century American West, ranchers are staking claims on the last open range on Earth — the oceans. For better or worse, this is probably the future of seafood, and offshore fish farmers contend that by raising fish far from the coast in deeper waters, they will avoid the environmental problems — including pollution of inshore waters — that have plagued near-shore aquaculture operations.

It's been clear since the mid-1990s — when the UN Food and Agriculture Organization (FAO) says the global fish catch peaked at about 95 million metric tons a year — that something must be done to address the world's insatiable hunger for seafood. The Earth's population continues to grow, and food consumption is expanding at an even faster rate. Where will the protein come from to feed all those people?

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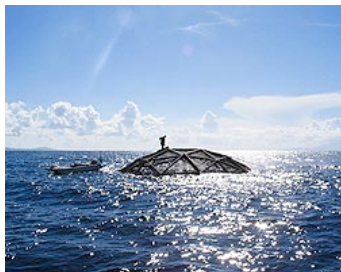
Available solutions won't solve this problem. Better fisheries management would help, but that isn't about to happen on a global scale. And industrialized animal production, with its huge carbon footprint, won't do the job in a warming world.

Then there's aquaculture. Just as hunting-and-gathering gave way to farming 10,000 years ago, many scientists think fish farming will inevitably displace men plying fishing grounds with traps and trawls. World aquaculture production has grown at the rapid clip of 7 percent a year since 1950, according to the FAO, rising from near zero to 52 million tons in 2006 (the last year for which detailed statistics are available). Farmed finfish and shellfish now account for 47 percent of all seafood consumption.

At the moment, offshore fish farming is a fledgling technology representing a tiny fraction of global aquaculture. (Statistics typically distinguish only between freshwater and marine aquaculture, not location or technique, so there are no hard numbers on offshore fish farming.) OceanSpar, a company that manufactures aquaculture cages for offshore use, has sold them to fish farms in Canada, Mexico, Venezuela, Portugal, Spain, South Korea, Japan, and the United States. In the U.S., where 20 percent of aquaculture production is done in salt water, only a small number of truly offshore operations exist, a mix of experimental, academic, and business ventures that include farms in Hawaii, a University of New Hampshire test site, and a soon-to-start pilot project off the San Diego coast that will farm striped bass.

Right now, though, aquaculture is no cure-all for the world's food problems, primarily because the rapid expansion of fish farming has brought environmental disaster to many coastal zones.

Most aquaculture operations are located inshore or in sheltered areas just offshore. This makes economic sense: It's both cheaper and easier to run a fish farm in a pond or an inlet, say, than something miles out to sea. But pollutants and waste easily concentrate in relatively calm, still water and



Open Blue Sea Farms

Since 2007 Open Blue Sea Farms has raised cobia in six enormous, pyramidal underwater pens, or "aquapods," off the Panama coast.

hurt the dense, complex webs of life that inhabit shorelines. As a result, fish farms have fouled coastal zones with waste and antibiotics. Farmed fish that slip out of their enclosures can harm wild populations by breeding with, eating, or displacing them. Disease can run rampant, spread by large numbers of fish penned in close quarters. Salmon farms — including operations in Chile,

Canada and Scotland — have been plagued with sea lice, a parasite that has spread to wild populations. In Peru, China, Thailand, Vietnam, and elsewhere, shrimp farms have polluted vast coastal areas and destroyed mangrove swamps.

But offshore operations have several crucial advantages that make them a potentially promising long-term solution to the "fish gap." Cages located miles offshore in deep water have a lighter ecological footprint because the ocean environment is so vast and the water — driven by wind, waves, and currents — is constantly moving.

"With the amount of water flowing through in an hour and the amount of waste from our fish," said O'Hanlon, the cobia farmer, "the dilution is so massive you cannot detect the waste downstream. The current is so brisk you never see the same effects as you do inshore. We are over 200 feet

deep. It's a sandy muddy bottom, there's no coral reefs. We are purposely going to a type of environment that has a carrying capacity for what we are doing."

Only a handful of scientific studies have been conducted on offshore fish farming, but they've been positive. One series of analyses cited by the U.S. Government Accountability Office showed that a fish farm off the Hawaiian coast had some effects on water quality, but that they fell within allowable federal limits.

The example of the lone, tiny fish farm surrounded by miles of open water is not an ideal indicator, though. O'Hanlon and other fish farmers say that to be profitable they'll need to scale up.

"It's an industry that will achieve better economics as it scales," says Neil Sims, the co-founder and CEO of Kona Blue Farms, an offshore operation in Hawaii that farms a local species of yellowtail it calls Kona kampachi. "We need to grow this industry. Larger pens are going to be more efficient than smaller ones. Better technology, more automation is going to be better than using manpower. We need to locate closer to the market or find ways to get product to market more inexpensively."

Indeed, if deep-sea fish farming is to have any impact on the seafood marketplace, not to mention global food supplies, it will have to get much, much bigger. That prospect alarms environmental groups that have spent years fighting poorly managed industrial fish farms.

Chile, for example, used to be the world's number two producer of farmed salmon, after Norway. But Chilean salmon production has plunged by more than half over the past two years due to an epidemic of infectious salmon anemia.

If deep-sea fish farming is to have an impact, it will have to get much bigger.

Scientists blame the disaster on several aspects of Chilean salmon farms: The practice of packing as many fish as possible into enclosures puts physical stress on the fish and facilitated the spread of disease, and the industry's rapid expansion with minimal oversight meant many farms were badly managed and unable to contain the epidemic.

"Infectious salmon anemia is a consequence of scaling up of the industry, not having a precautionary plan that assures you don't overcapitalize and overdevelop," says George Leonard, who directs the Ocean Conservancy's aquaculture program.

Alex Muñoz Wilson, Oceana's vice president for South America, who is based in Santiago, Chile, offers a more vivid description of the disease's impact: "It was like a plague from the Bible."

Whether offshore or inshore, Muñoz says, large-scale aquaculture operations will be tempted to crowd fish as a cost-saving measure. Moving offshore also wouldn't solve the problems of fish escapes or the overuse of antibiotics, which can lower disease resistance in fish populations, though it's possible that the vast spaces of the open ocean will mitigate those effects.

Perhaps the largest unresolved question involves the mathematics of protein consumption. The big finfish favored by farmers must eat a lot of smaller fish to reach a marketable size — in some cases, four to seven pounds of small fish for every pound of prime finfish. So as fish farming

expands, so does the demand for those fish down the food chain, increasing the risk of overfishing and population collapses. For this reason many scientists believe the future of aquaculture depends on using fish that eat algae and vegetation such as tilapia and catfish.

O'Hanlon says he's working on this problem with his cobia, raising the percentage of vegetation in the fish meal they're fed. After more than two years of setup in Panama, he's now preparing to harvest his first cobia in the next few weeks, approximately 250 tons from six pens, grown over a 16-month cycle. In 2011, he plans to quadruple the output, on the way to a still-elusive profitability goal of 2,000 tons a year. He plans to sell the cobia mostly to high-end fish markets and restaurants in the U.S.

Ultimately, the viability of operations like O'Hanlon's, and the question of whether offshore aquaculture harms or harmonizes with an ocean environment, hinge on careful management. But that won't happen on a large scale without an external structure of laws, rules, scientific assessments, and careful government oversight. And none of those things exist right now.

Instead, fish farmers must contend with a bewildering array of authorities and jurisdictions. In the U.S., state waters go to three miles offshore (except for Florida, Texas and Puerto Rico, which claim a nine-mile limit).

The federal government has territorial authority out to 12 miles, plus economic and more limited legal rights out to 200 miles, a zone known as the Exclusive Economic Zone (EEZ).

Many fishing industry organizations oppose offshore aquaculture, fearing competition and pollution.

The agencies that have a hand in aquaculture include the National Oceanic and Atmospheric Administration (fisheries), the Army Corps of Engineers (navigation), the Environmental Protection Agency (water quality), and the Food and Drug Administration (food safety).

"There is no regulatory framework in place — if you were to submit an application for an aquaculture site in the EEZ, it's possible it would never be looked at by anyone," says Richard Langan, the director of the University of New Hampshire's Atlantic Marine Aquaculture Center, which has been experimenting with offshore techniques at test sites off the Atlantic coast for more than a decade.

Last summer, NOAA's National Marine Fisheries Service approved a plan that would open the Gulf of Mexico's offshore waters to aquaculture. NOAA lawyers and policy planners are devising regulations for that, but the one — and only — thing that fish farmers, environmentalists, and government officials agree on is that the United States and other countries need to come up with truly national plans.

An obvious solution is to put a single agency — possibly NOAA, the lead agency on ocean policy — in charge. The U.S. Commission on Ocean Policy and Pew Oceans Commission, which both recommended major reforms in recent years, both favored this idea.

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But it all depends on the contentious, unpredictable politics of fisheries. Such a change requires a new law from Congress. There's no bill yet (Leonard says some members are drafting one), and when one is introduced, it won't

back from the brink.

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necessarily be easy to pass.

Many fishing industry organizations oppose offshore aquaculture, fearing possible competition, pollution, and navigation hazards. Food and Water Watch, a Washington-based environmental group, opposes any expansion of offshore fish farming because of the potential threat to the

ocean environment. Other groups want significant restrictions that offshore fish farmers would oppose. Until there's a national policy, most offshore aquaculture will take place in state waters, where authority is divided between states and federal agencies.

For the time being, some entrepreneurs are moving to countries with lower costs, less red tape — and less environmental oversight. O'Hanlon says he transferred his operations from U.S. waters off Puerto Rico to Panama in part because of bureaucratic frustration. Sims, of Kona Blue, is planning a new aquaculture project off the Mexican coast after the Hawaii state government wouldn't give him a permit to expand his existing operations.

"There's a lot of emotion and knee-jerk sentiment against the idea of farming fish, and I don't get it," Sims says. "...We have to hope the overwhelming logic of moving toward sustainable mariculture will hold sway, but I'm not sure it's happening fast enough, because a lot of entrepreneurship and investment is flowing overseas."

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Aquaculture can have much lower environmental impacts than terrestrial agriculture. This being said, off shore aquaculture is not necessarily the solution. The tremendous amounts of "waste" from open ocean aquaculture are in fact nutrients. Properly managed multi-tropic aquaculture recovers these nutrients as food. An offshore fish farm may pass pollution standards, but a properly run aquaculture facility will reap a harvest of fish, shellfish and edible seaweeds. The issue of economies of scale are likewise a red herring.

The better option is smaller distributed aquaculture facilities that support local communities and do not over tax the local environment. I and my company are working on fielding a mobile seafood processing unit that will go from town to town much as grape crushers travel wine country to assist local producers/facilities in bringing economies of scale to widely distributed and more ecologically friendly facilities. Great article on a tough issue- we need to look at terrestrial protein production as an historical and cultural model, though.

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Posted by [Andrea Angera](#) on 03 Dec 2009

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