NOAA AND MARINE AQUACULTURE: A LONG HISTORY, A PROMISING FUTURE

BY DAVID A. BROWN

We've heard it for years: "Fish is good for your brain." Well, some of the top brains at NOAA Fisheries are committed to ensuring that American consumers have plenty of cerebral fuel.

But here's the dilemma: Americans love their seafood, but Mother Nature can only provide so much. Ideally, effective resource management will help ensure thriving populations of wild fish stocks. But the law of supply and demand compels us to seek supplemental options.

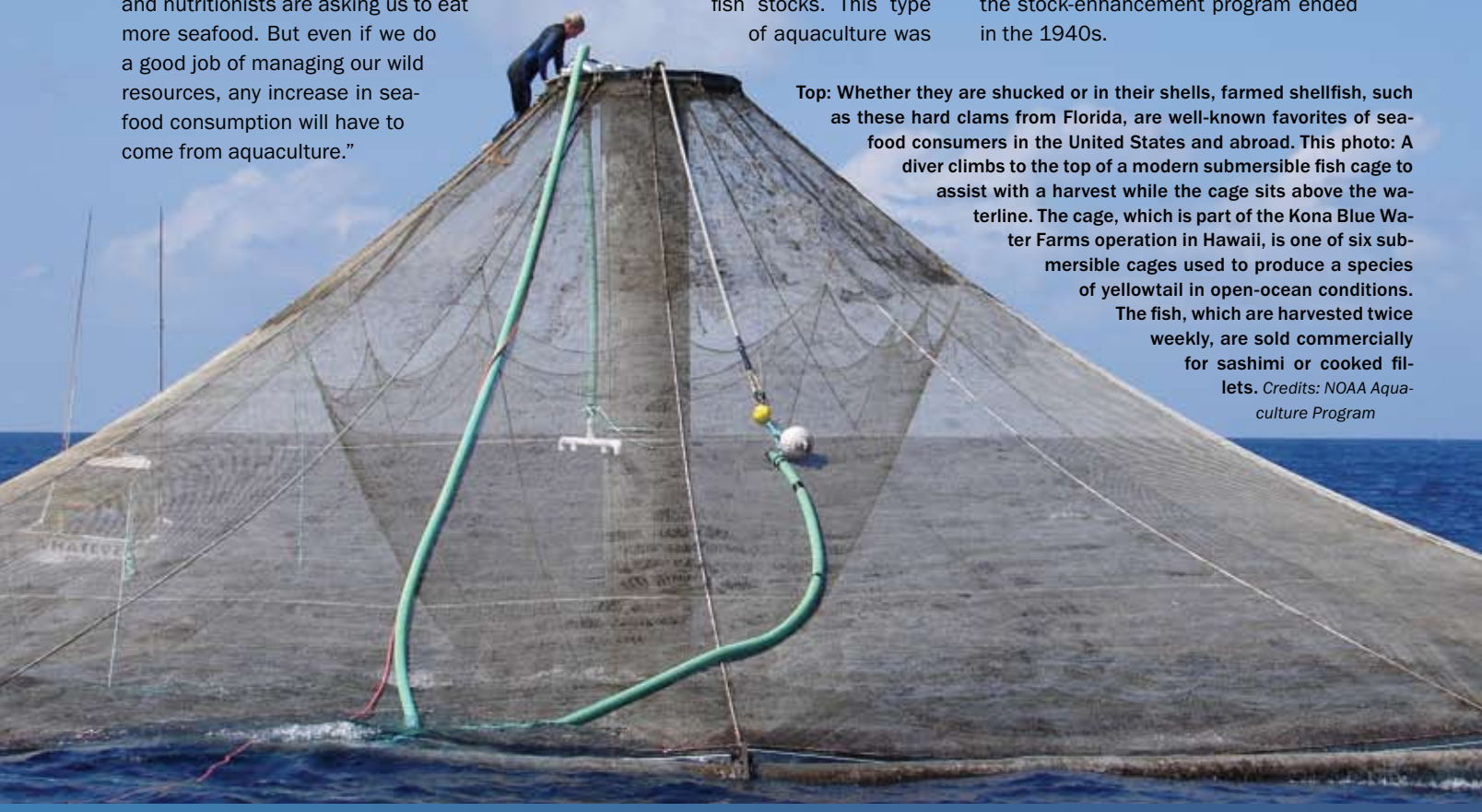
One of the answers is aquaculture, or seafood farming, and NOAA envisions a bright future for American fish farming.

Michael Rubino manages NOAA's Aquaculture Program. He said, "Doctors and nutritionists are asking us to eat more seafood. But even if we do a good job of managing our wild resources, any increase in seafood consumption will have to come from aquaculture."

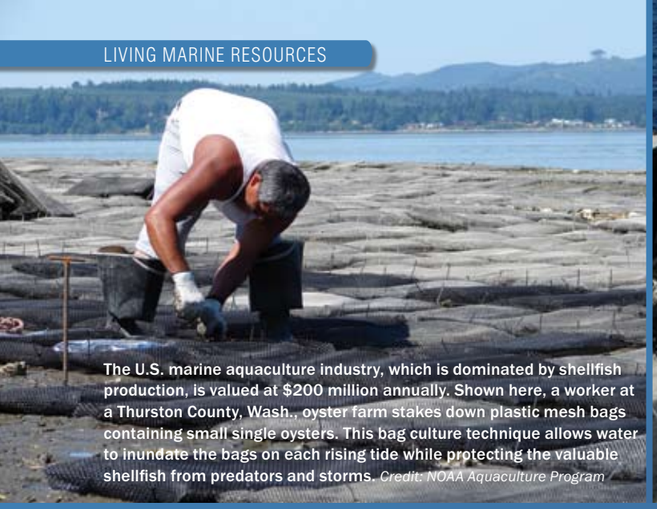
Currently, almost 70 percent of the seafood Americans consume is imported, and foreign aquaculture accounts for at least 40 percent of those imports. NOAA's plan: Reduce dependency on foreign seafood and bolster domestic production.

Similar to agriculture, this type of food production includes the breeding, rearing, and harvesting of freshwater and marine plants and animals in all types of water environments, including ponds, rivers, lakes, and oceans. Aquaculture also takes place on land, in human-created environments.

Modern U.S. aquaculture traces its roots to 1871, when Spencer Fullerton Baird, as head of the newly formed United States Commission of Fish and Fisheries, advised Congress of his belief that fish culture could alleviate declining wild fish stocks. This type of aquaculture was dubbed "stock enhancement." Governmental support enabled Baird's ideas to be put into motion through research projects and shore-based marine fish hatcheries. These facilities produced and released young fish to the wild, but the stock-enhancement program ended in the 1940s.

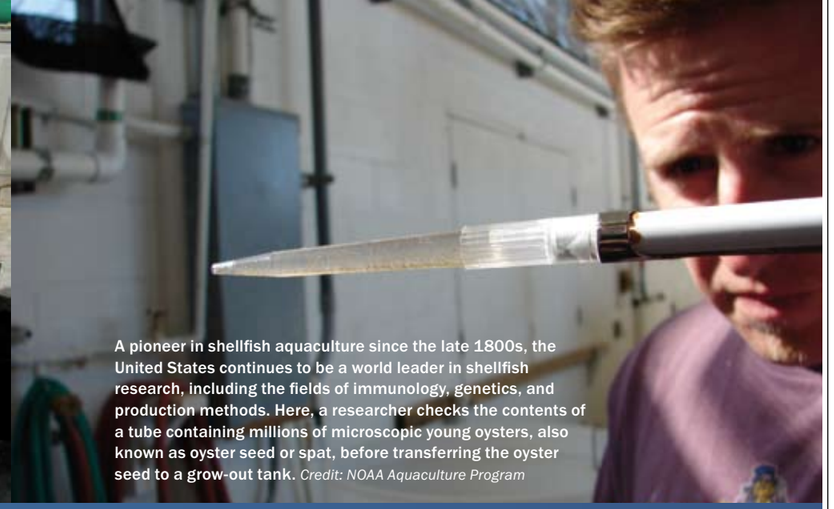


Top: Whether they are shucked or in their shells, farmed shellfish, such as these hard clams from Florida, are well-known favorites of seafood consumers in the United States and abroad. This photo: A diver climbs to the top of a modern submersible fish cage to assist with a harvest while the cage sits above the waterline. The cage, which is part of the Kona Blue Water Farms operation in Hawaii, is one of six submersible cages used to produce a species of yellowtail in open-ocean conditions. The fish, which are harvested twice weekly, are sold commercially for sashimi or cooked fillets. *Credits: NOAA Aquaculture Program*



The U.S. marine aquaculture industry, which is dominated by shellfish production, is valued at $200 million annually. Shown here, a worker at a Thurston County, Wash., oyster farm stakes down plastic mesh bags containing small single oysters. This bag culture technique allows water to inundate the bags on each rising tide while protecting the valuable shellfish from predators and storms. *Credit: NOAA Aquaculture Program*

Fish harvested from an offshore cage in Hawaii are seen on a dewatering table. *Credit: NOAA Central Library Photo Collection*



A pioneer in shellfish aquaculture since the late 1800s, the United States continues to be a world leader in shellfish research, including the fields of immunology, genetics, and production methods. Here, a researcher checks the contents of a tube containing millions of microscopic young oysters, also known as oyster seed or spat, before transferring the oyster seed to a grow-out tank. *Credit: NOAA Aquaculture Program*

The post-World War II era saw a shift toward aquatic farming. Federal laboratories conducted landmark culture research with mollusks (at Milford, Conn.), salmonids (Manchester, Wash.), and marine shrimp (Galveston, Texas). In the late 1960s, NOAA's research and development work on salmon provided the basis for the development of aquaculture industries in the United States as well as Chile, Norway, and the United Kingdom. Much of this work has been instrumental in the development of culture operations for shellfish, shrimp, and salmon throughout the world. Although these efforts were successful, federal research support dwindled during the 1980s, and further research and development were left to the private sector.

In the 1990s, rising consumer demand for seafood, declining market share of domestic wild-caught fish, and increasing levels of seafood imports led to renewed interest in the potential of marine and freshwater aquaculture in the United States.

Presently, freshwater aquaculture, mostly farm-raised catfish and trout, dominates the $1 billion-a-year U.S. aquaculture industry. And, while salmon farms have long been a fixture in the Pacific Northwest and Maine, shellfish farming accounts for the majority of United States marine aquaculture production. Leading the way are oysters, mussels, and clams, which are high in food value, plus these filter feeders benefit their environments by cleaning the surrounding water.

Other promising aquaculture species include cod (New England); cobia, red drum, pompano, and red snapper (Caribbean and Gulf of Mexico); yellowtail (California); sablefish/black cod (Pacific Northwest); and moi and amberjack (Hawaii). Sea urchins and abalone are also viable options. The possibilities are many, and Rubino lauds the diversity.

"NOAA is working across a broad spectrum," he said. "If we're to produce more seafood in the United States, we will need onshore, coastal, and offshore technologies for finfish, shellfish, plants, and algae. We'll need it all."

Just like agriculture is very diverse with its pork, beef, and chicken industries, aquaculture is also very broad in scope. And that scope is extending farther into the ocean. Increasingly, the United States aquaculture industry is casting its glance to the distant waters within the Exclusive Economic Zone (EEZ – 3-200 miles offshore), an area of about 3.4 million square miles.

"The United States has invested a lot in offshore aquaculture research," said former NOAA Aquaculture Manager Conrad Mahnken, now retired. "One reason is that there's a lot of space out there and it's unhindered, unlike inshore environments. Another reason is that much of the inshore waters has become polluted. In aquaculture, you need good, clean, clear water, and that's what you get offshore."

Although there are currently no fish farms in federal offshore waters, there are several in state, territorial, and foreign waters. Demonstration projects and businesses in Hawaii, New Hampshire, and Puerto Rico exhibit the range of options for aquaculture techniques in a variety of conditions. For example, open-ocean operations range from mussel farming, where the succulent shellfish grow on ropes linked in a grid to submersible cages for finfish equipped with automatic feeders, underwater cameras, and sensors that monitor feeding and fish behavior.

One of the key factors needed for offshore aquaculture to flourish is a definitive set of rules. While the Magnuson-Stevens Act extended federal jurisdiction into the EEZ, the text was written primarily for wild fisheries. The National Offshore Aquaculture Act, submitted to Congress in June 2005, would provide the Secretary of Commerce with the necessary authority to establish and implement a regulatory system for offshore aquaculture.

Linda Chaves, NOAA Fisheries' Senior Advisor for Seafood Industry Issues, said such clarity should provide important assurances for offshore facilities. "You want to make sure that if you have a site offshore, you own the cage system or pen, and the fish in it."

Aquaculture, Rubino said, is not just about commercial fish production. There's also much potential for habitat restoration (i.e., replenishing marsh grass and shellfish beds), and stock enhancement to replenish wild fish stocks important to both commercial and recreational industries.

Regardless of the objective, aquaculture offers unquestionable economic benefit to local communities. From growing red snapper, white sea bass, snook, or abalone to planting sea grass beds and cultivating oyster colonies, aquaculture means jobs.

And they're not just seasonal positions, as in the case of some wild fish processing plants, which scale back to skeleton crews between runs. With proper planning, labor needs can be spread across the calendar. Permanent populations mean burgeoning economic development, and that means even more jobs and greater benefit for areas in need of economic stimulus.

Rubino said that inviting more commercial fishermen to embrace aquaculture would provide a base of skilled workers with an existing affinity for marine operations. Aquaculture can fill in the gaps between commercial fishing seasons and provide fishermen with dependable employment. Moreover, cultured fishing can relieve pressure on wild stocks.

"We have to stop thinking about fisheries and aquaculture as diametrically opposed," Rubino said. "Aquaculture is supplying additional opportunities in a growing market. The wild stocks are limited, so aquaculture is another way to use existing infrastructure – boats, docks, and processing plants."

Similarly, the challenge of feeding cultured fish may create opportunities for the nation's agricultural industry. Clearly, the amount of various feed sources needed for cultured stocks will increase as global aquaculture grows. To help avoid supply limitations, NOAA is supporting research into alternative fish foods produced by domestic farmers, including soybeans, barley, rice, and other crops.

Chaves said that NOAA's aquaculture vision encompasses more than U.S. dietary needs. "We're not looking at aquaculture only for domestic use. There's going to be seafood demand all over the world, so we might as well take the opportunity to meet some of that demand as well."

To usher the process forward, NOAA awarded $3.6 million in competitive grants to 11 sustainable marine aquaculture demonstration and research projects in September 2006. Made possible by the National Marine Aquaculture Initiative (NMAI), the funding supports projects to assess the commercial potential of marine aquaculture, stock enhancement feasibility, and environmental impacts. Other projects will research aquatic animal nutrition and health issues.

As U.S. aquaculture continues to develop, Rubino said it's important for the role of NOAA Fisheries to remain clear and steadfast. "Our job is to enable aquaculture by providing a regulatory framework that allows it to happen in a businesslike manner.

"We have a responsibility to the public trust to provide an environment in which aquaculture can thrive, while also maintaining the safeguards for protecting wild stocks and the environment, and balancing all this for multiple uses. And I think that can happen.

"There are many challenges, but it's also a great opportunity."

NOAA Aquaculture Program — www.aquaculture.noaa.gov
Aquaculture Information Center — www.lib.noaa.gov/docaqua/frontpage.htm