

Aquaculture Trends and Developments

Spring 2004

As part of SeaWeb's efforts to advance responsible aquaculture worldwide, we will publish a biannual report briefly previewing some of the most important current and upcoming developments in aquaculture. If you have cutting edge research or information that you would like to share with others, please let us know.

- **New species farmed**

While much of the aquaculture production worldwide is low cost, herbivorous species grown for local consumption, the increasing trend is toward more high value carnivores. The multinational corporations that dominate industrial aquaculture production are diversifying their operations by adapting methods of farming salmon to other species of carnivorous fish. These industry initiatives, many of which enjoy the support of national and local governments presume the use of netpens in coastal or offshore waters. As with salmon farming, the shift of government and industry toward farming other carnivorous species with essentially the same technology will likely generate many of the same environmental, human health, and social problems. Current initiatives include:

Atlantic Cod

Since the late 1980s, Atlantic cod have been cultured at one time or another in commercial quantities in Canada, Iceland, and Norway. After a peak production of 645 metric tons (mt) in 1990, production fell to 167 mt in 2000. Industry sources estimate that Norwegian cod farmers may produce as much as 10,000 mt in 2004 and 400,000 mt by 2015-2020.

Barramundi

Barramundi has been farmed for more than a decade. Production grew tenfold between 1985 and 2000 and reached a peak of 23,277 mt in 1999. Thailand and Indonesia accounted for nearly half the total, followed by Malaysia, Taiwan, and Australia. In Australia, some barramundi are grown in ponds and recirculating tanks, but future development will likely be based on net pens or cages in coastal waters.

Cobia

In recent years, cobia, a popular sport fish in tropical waters around the world, have been raised in cages in Taiwan. In the United States, Sea Grant has supported research into commercializing the aquaculture of cobia. Currently, cobia obtained from a Florida hatchery are grown in cages off of both Puerto Rico and the Bahamas, and cobia is a potential species for offshore aquaculture in the Gulf of Mexico.

Halibut

Despite many years of research, Atlantic and Pacific halibut farming is still at an early stage of development, but with most of the technical problems worked out, production is set to take off. Commercial production is currently based in Norway, Canada, and Scotland, while research programs for farmed halibut are also underway in Iceland and the U.S.

Sablefish/Black cod

In recent years, several companies from British Columbia have expressed interest in farming sablefish. With the expected development of a large hatchery to provide juvenile sablefish to fish farmers, it is likely that the industry will expand rapidly.

Southern Hake

Researchers in Chile are rapidly progressing in the development of southern hake farming. R&D is expected to be completed in 2004 and industrial scale production is expected in 2005.

Tuna

Bluefin tuna farming, or fattening, has been pursued for some time off Australia and in the Mediterranean, and most recently off Mexico. It is expected that production will continue to increase and other expansion areas under consideration include California, Hawaii, and Panama. Additionally, the industry is expected to target other tuna species, including yellowfin and bigeye. Though breeding programs are being developed, tuna farming still depends on catching wild juvenile fish to fatten in large netpens.

Yellowtail Kingfish

The Australian and New Zealand governments have been encouraging farming of yellowtail kingfish in coastal netpens. Aquaculturists are interested in yellowtail kingfish because it is highly valuable and it grows very fast. Historically, kingfish farming was based on capturing wild juveniles and raising them in cages, but recent advances in yellowtail kingfish farming have involved controlled spawning and raising juveniles in hatcheries before placing them in cages or netpens.

• **Aquaculture feeds**

As environmental and human health problems with feeds for fish farming have recently been brought to light (see *What Price Farmed Fish* (www.seaweb.org/resources/sac/reports.html) and *A Global Assessment of Organic Contaminants in Farmed vs. Wild Salmon* (www.salmonstudy.org/study/)) an important trend will be the development of feeds that are less dependent on wild fisheries as well as free of contaminants. Because fish feed is a major expense in many types of aquaculture, and because of the recent highlighting of problems with some types of fish feeds, the industry has been investing more heavily in vegetable-based feeds. While more research is needed, it is likely that in the coming years a greater proportion of feeds used to farm carnivorous fish will have lower levels of fishmeal and fish oil; instead the protein and fats needed for adequate health and growth will be obtained from plant sources. Soy, the plant protein that has received the most attention to date, is an attractive alternative to fishmeal because it is highly digestible, widely available, and less expensive than other protein meals. Diets based solely on soy and other plant proteins have been tested, and in some cases used commercially with some species of fish, including omnivorous fish such as catfish, tilapia, and carp. Feeds with partial replacement of fishmeal protein with plant protein have been tested and used with carnivorous fish and shellfish such as salmon, trout, grouper, and seabass, and shrimp.

• **Offshore aquaculture in the U.S.**

As part of its marine aquaculture initiative, the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) has committed itself to developing an open ocean aquaculture industry in the U.S. Exclusive Economic Zone (EEZ), a region of federal waters from the state boundary (usually 3 miles) out to 200 nautical miles offshore. Over the past few years, NOAA has been in the process of drafting offshore aquaculture legislation and it is expected that legislation will be introduced in Congress this year. The legislation would provide streamlined permitting, long-term leases for offshore aquaculture development, and exemption from the Magnuson-Stevens Act, which will allow for foreign investment and leasing of U.S. waters.

In preparation for legislation, in 2000 NOAA began developing a Code of Conduct for responsible aquaculture in the EEZ that will provide guidance to companies considering this type of aquaculture development. Use of the Code by the aquaculture industry will be voluntary. A final draft of the Code is expected in 2004.

Questions still exist, however, regarding the potential environmental impacts from pollution, escapes, chemical inputs, and marine mammal interactions, as well as social impacts, such as conflicts with other stakeholders, displacement of fishermen, and ramifications for coastal communities as the industry becomes increasingly automated. Additionally, there are concerns about commercial exploitation of the EEZ, an area larger than the total US land mass and the country's largest public resource.

While there currently are no commercial aquaculture operations in the U.S. EEZ, public and private research has been underway to develop the technology needed for the industry to expand to open ocean areas. The areas most sought after for open ocean aquaculture development are the Northeast U.S., the Gulf of Mexico, and the waters off California.

Several Sea Grant projects have examined the potential for offshore aquaculture. In the Gulf of Mexico, a project examined its feasibility and there is ongoing commercial interest in an offshore industry, based either on free-standing moored cages or cages attached to oil platforms. A project off the coast of New Hampshire is investigating the offshore culture of mussels and several species of finfish. In addition to the research sites, commercial operations exist off Hawaii and Puerto Rico.

- **Aquaculture effluents guidelines**

In 2000, the U.S. Environmental Protection Agency's (EPA) Office of Water began an effort to reduce nutrient loadings from commercial agricultural and industrial operations nationwide. Included was the development of pollutant controls in the form of nationally applicable discharge standards for commercial and public aquaculture operations. In the proposed rule, published September 2002, the guidelines for each type of production system were described. The final rule, which is due in June, will likely include guidelines for controlling effluents from flow-through systems, recirculating systems and net pen and open water systems, but will exclude mollusc farms and pond aquaculture. For more information see: www.epa.gov/ost/guide/aquaculture/

- **Other developments**

U.S. Commission on Ocean Policy

The U.S. Commission on Ocean Policy released its preliminary report on April 20th. The report is available for review and comment by the nation's governors, interested stakeholders, and the public. Chapter 22: Setting a Course for Sustainable Marine Aquaculture is available at the following website: www.oceancommission.gov/documents/prelimreport/chapter22.pdf For more information and instructions for submitting comments see (www.oceancommission.gov). In a similar review of U.S. ocean policy, the Pew Oceans Commission in May of 2003 recommended a new national marine aquaculture policy based on sound conservation principles and standards, including a restriction of marine finfish farming until standards for ecologically sustainable practices are implemented (see: www.pewoceans.org).

Labeling

As a result of legislation passed in January 2004, seafood sold in U.S. supermarkets will be required to carry labeling to indicate from which country it originated and whether it is wild or farmed. The labeling will become mandatory this fall.

Genetically modified fish

The U.S. Food and Drug Administration (FDA) is still considering whether or not to approve commercial production of genetically modified salmon. FDA is required to consider possible environmental impacts as well as human health concerns. Several states have already passed laws prohibiting the use of genetically modified fish and it is likely that other states will follow suit in order to keep genetically modified fish out of their state waters (see www.centerforfoodsafety.org/GEFishStateActionChart.pdf).

Exotic and invasive species

Aquaculture is one of the major vectors for exotic species transfer and introduction. The transport of non-indigenous organisms to new locations for the purposes of cultivation, and the related transfer of entire assemblages of organisms attached to the cultivated species, has led to the introduction of a large number of unwanted seaweeds, fish, invertebrates, parasites, and pathogens into U.S. waters. Given the irreversible nature of aquatic invasions, prevention is the only meaningful way to address the problem in the future, yet current systems of control often fall short of providing adequate prevention. This issue will be receiving more scrutiny throughout 2004 and beyond.

Since 1998, the SeaWeb Aquaculture Clearinghouse has been raising awareness of the environmental and social issues related to aquaculture and generating involvement from all stakeholders, including the public, in order to encourage its sustainable development. We strive to maintain and promote healthy and productive coastal waters and watersheds through development of responsible aquaculture that is either integrated into the natural ecosystem or developed in closed systems, is diverse on local and regional scales, and is beneficial to local communities. To learn more about the Clearinghouse or to receive our newsletter and other resources please contact us at: Clearinghouse@SeaWeb.org or visit www.AquacultureClearinghouse.org