Marine fish enhancement and aquaculture research

Problem Statement

Wild harvesting of seafood currently meets or exceeds sustainable levels and many stocks are well below levels that can be rebuilt in a timely manner. Aquaculture is the only way to increase production of seafood and may be an important tool for rebuilding severely depressed stocks. However, a number scientific and technical obstacles must be overcome before aquaculture of most marine fish species is viable.

Critical factors

- Many commercially- and recreationally-important Pacific marine fish stocks are seriously depleted, yet demand for these fish is increasing.
- Seafood is the third largest component of the U.S. trade deficit after oil and automobiles.
- The experimental use of artificially-propagated juveniles to rebuild depleted marine fish stocks has shown promise and is an active area of research worldwide.
- The National Marine Fisheries Service (NMFS) has targeted several marine fish species for commercial aquaculture development. This new industry could potentially provide thousands of resource-friendly jobs in economically-depressed areas and increase the supply of domestically-produced seafood.
- Research is needed on critical biological and environmental factors that affect fish reproduction, development, growth, nutrition, and survival in order to develop aquaculture systems for most marine species.


Pacific halibut broodstock

Status of research

The Northwest Fisheries Science Center (NWFSC) is conducting research to develop laboratory aquaculture techniques for targeted marine species. This research includes studies in aquacultural engineering, fish physiology, nutrition, pathology, and developmental biology. Once the NWFSC develops successful laboratory aquaculture techniques, it will start developing techniques for large-scale culturing of fish species to market and it will begin experimental releases of marked juveniles to determine their potential for accelerating stock rebuilding.

Initial studies focus on 1) establishing captive broodstocks of marine species to provide offspring for research, 2) determining appropriate conditions for using hormonal and environmental manipulation to stimulate and synchronize spawning, 3) developing egg incubation, larval culture, and juvenile rearing technologies, 4) developing environmentally-sound aquaculture techniques, feed and health-management practices for rearing juveniles to maturity and spawning, 5) developing rearing technologies that are both cost-effective and environmentally friendly, and 6) investigating the genetic and ecological effects of released fish on wild populations.

Since 1998, two species (lingcod and brown rockfish) have been raised from spawning to the juvenile stage. NWFSC scientists can now raise enough lingcod to examine the potential for restocking depleted populations. In addition, captive Pacific halibut and sablefish broodstocks have been established and spawned. Broodstocks of Puget Sound groundfish species that the NMFS is considering for listing under the Endangered Species Act are being established as well.

Future considerations

The NWFSC will continue to 1) establish and maintain captive broodstocks for future research, 2) raise sablefish, rockfish, and halibut broodstocks under photoperiods that have been shifted to provide offspring out of season (doubling the amount of research that can be done on critical larval stages), 3) develop sustainable low-pollution feeds and transfer diet formulations and manufacturing methods to the private sector for commercialization, 4) train state biologists, tribal members and entrepreneurs in large-scale rearing technologies, 5) disseminate information through scientific publications, presentations and facility tours, and 6) conduct stock-enhancement and market-oriented aquaculture trials in cooperation with state and tribal fisheries agencies.

Marine fish enhancement and aquaculture research (continued)

Key Players
Resource Enhancement & Utilization Technology (REUT) Division, NWFSC
Institute of Marine Research, Bergen, Norway
University of Bergen, Norway
U.S. Fish & Wildlife Service (Bozeman Fish Technology Center)
Oregon State University
University of Washington
University of Idaho
Washington State Department of Fish & Wildlife
Washington State University
International Pacific Halibut Commission
Makah Tribe
Northwest Indian College

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