

Fisheries Extension Enhancement

HATCHERIES AND AQUACULTURE

Theme Scope: This theme is limited to interactions of hatcheries and aquaculture with the wild fisheries with emphasis on aquaculture as it relates to rehabilitating and managing (supplementing) healthy, harvestable wild fisheries. It does not include direct efforts to promote aquaculture or increase effectiveness of aquaculture operations except as relates to the 'wild' or 'put-grow-and-take' fisheries. Impacts of aquaculture operations on wild fisheries via potential water quality impacts are included here as are potential disease vectors. Indirect impacts of aquaculture via potential introductions of non-native species are considered separately in the Invasive Species theme.

Regional Issues Addressed by this Theme

One of Sea Grant's challenges is to develop and promote environmentally-acceptable and economically viable aquaculture techniques, especially for northern climates.

Aquaculture can provide fish for food, stocking, bait, ornamental use, or feeder fish. Aquaculture



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options in each of these market supply streams can reduce dependence on wild harvested populations.

Hatchery-based stocking programs offer opportunities for rebuilding or restoring depleted fish stocks including both native and endangered species as well as non-native species used for biological control. Many of the large predatory sport fish, which are the mainstay of the \$4 billion Great Lakes recreational fishery, are supported by hatchery stocking—including both efforts to restore native lake trout and coaster brook trout as well as stocking of non-native salmonids such as Chinook and coho.

Aquaculture can also have negative environmental impacts. New technologies need to be developed to improve treatment of aquaculture effluent and potentially associated diseases and invasive species. There is also a need to assess the environmental impacts of organisms currently being cultured (against the event of escapes) as well as those that may be developed through genetic engineering.

Current Great Lakes Sea Grant Network Activities

Genetic Guidelines for Fisheries Management

Fish are the product of their genes, the environment and of the interaction between the two. Often managers have concentrated on



manipulating the environmental aspects of fisheries without regard to the genetic makeup of fish stocks. To contribute to the Great Lakes Fishery Leadership Institute and to provide information to resource management agencies, two versions (an abridged and an unabridged version) of *Genetic Guidelines for Fisheries Management* was produced. The guidelines booklet and manual are divided into three parts. Part I identifies how management activities affect the genetics of fish stocks. Genetic terms and principles are defined in Part II, and Part III describes the tools used to gather genetic data and their application to fisheries management and research.

The Impact of Fish Eating Birds on Aquaculture

Minnesota Sea Grant produced an outreach publication, *Minnesota Fish Producers Report on Losses to Birds*, based on Sea Grant-funded research. They surveyed 54 fish farmers in Minnesota to correlate information on bird-related fish losses with the distribution and abundance of cormorants, pelicans, and herons. The researchers discovered that cormorants cause the most problems for fish producers. It appears that a large part of the problem is with migrating cormorants, since the bulk of fish-farming country in Minnesota lies along a major migratory flyway. Eighty-seven percent of fish producers experienced losses from fish-eating birds, with 41% defining their losses as severe.

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The report is aiding the U.S. Fish and Wildlife Service, Minnesota DNR, and fish producers in Minnesota as they consider options for cormorant control in the state.

WATERS 2004-2006: Wisconsin's Aquaculture Technology, Education and Research Services

The WATERS project provides generalized outreach, specialized workshops and hands-on training on recirculating aquaculture systems and other intensive aquaculture technology. This project will produce an aquaculture curriculum for Wisconsin students and provide pre-service as well as in-service instruction for vocational agriculture teachers.

Developing New Technologies and Examining New Potential Impacts

A Wisconsin Sea Grant supported research project examines environmental conditions and endocrine factors that affect the growth rates of yellow perch in order to develop methods that can speed the growth of this popular food fish in aquaculture. Another project examines genotypic diversity and potential antibiotic resistance reservoirs associated with aquaculture. These researchers are investigating the occurrence of tetracycline antibiotics in waters and sediments associated with aquaculture facilities. The project examines whether antibiotic use in aquaculture creates reservoirs of resistant microorganisms in the environment.

An Ohio Sea Grant funded researcher is working on developing new fish vaccine technology to combat BKD (Bacterial Kidney Disease) in trout. BKD is a major disease of fresh-water and marine salmonids resulting in substantial mortality and a prime candidate for the development of an effective vaccine treatment.

Integration with National Goals

The Aquaculture and Hatcheries Theme supports National Sea Grant goals in the areas of Fisheries, Aquaculture, and Biotechnology.

Fisheries extension enhancements within this theme will support national efforts to develop

the scientific, technological information, and expertise needed to propagate and successfully culture fish with commercial and/or recreational value while addressing social and environmental constraints of nearshore areas.

Priorities for Regional Action

Foster environmentally sound practices:

- Develop improved, environmentally-sensitive methodologies and technologies to treat aquaculture effluent cost-effectively while meeting effluent water quality standards
- Develop environmental risk assessment approaches for fish, including genetic strains.

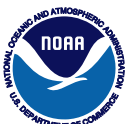
Develop new technologies:

- Develop aquaculture techniques for species that are currently harvested from the wild or which are at or beyond sustainable production levels
- Identify, detect and control disease and parasites to maintain fish health in aquaculture systems and beyond
- Improve the growth and controlled reproduction of cultured fish by developing biotechnological approaches.

Additional Information

Genetic Guidelines for Fisheries Management (abridged)

www.glerl.noaa.gov/seagrant/GLFLI/Notebook/Curriculum/Projects/GeneticGuidelines.pdf



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