UNIVERSITY of GUELPH

CHANGING LIVES
IMPROVING LIFE

AQUACULTURE

Animal Production Systems Research Program

[At the Alma Aquaculture Research Station] quarantine units allow for the controlled importation of non-domestic stocks and exotic species of fish in support of new business opportunities for Ontario's aquaculture industry.

Photo credit: Alma Aquaculture Research Station

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Our Researchers

Over 25 expert researchers from the University of Guelph, its research facilities and affiliated institutions provide research support for commercial aquaculture producers. Research expertise includes nutrition and feeding management, ecosystem impacts and mitigation, health management, and genetic improvement.

Our Facilities

The Alma Aquaculture Research Station (AARS) was established in 1987 by the University of Guelph, the Ontario Ministry of Agriculture and Food and the Ontario Ministry of Natural Resources. The 20 hectare site near Guelph consists of 10 buildings and facilities with 365 fish tanks, ranging in size from 100 litres to 70,000 litres that support research on all life stages. The facilities include incubation and early rearing, quarantine and recirculation units, photoperiod control rooms and waste-water treatment. The station has access to a ground water supply of 6,680 litres per minute at a constant 8.5°C.

Our Stock

Rainbow trout, Arctic char and Nile tilapia are the primary species raised. The AARS is also licenced to rear Atlantic salmon, brook trout and yellow perch. In addition, quarantine units allow for the controlled importation of non-domestic stocks and exotic species of fish in support of new business opportunities for Ontario's aquaculture industry.

Our Research Program

Our researchers collaborate with government and industry to develop leading edge solutions to priority issues. Examples of research projects are listed below.

Nutrition and Feeding Management

Researchers provide the aquaculture industry with recommendations to enhance feed formulations and feeding strategies that promote fish growth, maximize product yield and quality, improve feed cost efficiencies and reduce environmental impacts.

Consumers value the red or pink colour of salmon and trout fillets which is due mainly to astaxanthin, a carotenoid pigment, found within muscle fibres. Salmon and trout cannot synthesize this pigment so it must part of their diet. Researchers are developing techniques to reduce the amount of yellow carotenoids in corn gluten meal, a widely-used ingredient in feed that appears to have a negative effect on the desired pink colour. Results of this study will help in the formulation of cost effective fish diets that ensure the desired flesh colour consumers prefer and support the economic sustainability of rainbow trout aquaculture.

Current studies are also looking at modifying feeding rates to determine the effects on fish growth and product quality, with a goal to improve practical feeding guidelines for producers.

Ecosystem Impacts and Mitigation

Environmental sustainability is necessary for the success of the aquaculture industry. The physical characteristics of feed and fecal waste in trout aquaculture provide important information for wastewater treatment. University research results have been used by the Department of Fisheries and Oceans (DFO) to assess the applicability of DEPOMOD, a mathematical model used to predict the environmental impact of caged fish farms. Ongoing research will contribute to more environmentally sound management practices for both land-based and open-water farming.

Photo credit: Alma Aquaculture Research Station

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Using genetic analysis, our researchers are working with an industry partner to develop a pedigreed rainbow trout broodstock with superior growth and production traits.

Ultraviolet irradiation (UV) is commonly used to disinfect wastewater from recirculation aquaculture systems (RAS). However, the bacterium that causes bacterial cold water disease (BCWD) is not killed at the recommended UV doses used in aquaculture. Researchers found that using membrane filtration (MF) appears to decrease the risk of BCWD and improve water quality.

Bacteria and algae in RAS produce organic chemicals which cause undesirable flavours and odours in farm raised fish. An innovative sampling approach, in vivo solid phase microextraction (SPME), to monitor for the presence of organic chemicals has promise for field applications. This fast, simple technique will have a significant impact on the aquaculture industry by enabling producers to manage RAS quality.

Exposure to bisphenol A (BPA), an industrial chemical used to make certain plastics has been linked to health problems in mammals. Our researchers are studying the effects of BPA accumulation in fish eggs and subsequent changes in fish growth and reproduction to develop risk assessment tools that can be used to predict long term impacts of chemical exposure. This information will be useful to government and industry for monitoring the impact of common chemicals found in the aquatic environment.

Health Management

Bacterial and viral diseases cause health and welfare concerns in fish and are costly for the aquaculture industry. Bacterial cold water disease (BCWD), spring viremia of carp virus (SVCV) and viral hemorrhagic septicemia virus (VHSV) are a few of the infectious diseases our researchers are studying in order to generate improved management options for producers.

BCWD is the most important infectious disease for rainbow trout aquaculture in Ontario. Our researchers have found that the antibiotic florfenicol is equally effective for treatment of BCWD as erythromycin which is only available as an emergency drug.

SVCV is an internationally reportable disease that has recently been found in carp in Hamilton Harbour. Our researchers are determining how widespread this disease currently is in Ontario. The susceptibility of Ontario baitfish is also being studied as these fish are commonly moved and may be a source of spread of SVCV.

VHSV was first found in the Great Lakes in 2005. Researchers have since been studying the impact of VHSV on walleye and other Great Lakes fish species. Research continues to generate information to help develop prevention and/or treatment strategies for these and other diseases.

Genetic Improvement

Genetic research is a starting point for developing practical management options for the aquaculture industry. Determining the location and influence of different genes on important traits can lead to improved breeding programs, management techniques, and treatment options to produce a superior quality product for consumers. Researchers have identified genes in the salmonid family of fish that influence maturation and spawn timing. Application of these results to breeding programs will help producers select fish with superior growth characteristics, nutrient utilization and a high degree of spawning time variability.

Using genetic analysis, our researchers are working with an industry partner to develop a pedigreed rainbow trout broodstock with superior growth and production traits. This innovative project for Canadian freshwater aquaculture will reduce producers' reliance for eggs imported from the United States and supply a superior product for marketing.

Advances in DNA technology allow researchers to use single nucleotide polymorphisms (SNPs, or "snips") as biological markers to locate genes that are associated with disease. An example is research into the associations between SNPs in Atlantic salmon and resistance to sea lice, a parasite that can cause significant health issues. Preliminary results suggest that future breeding programs could include marker-assisted selection for developing Atlantic salmon that are more resistant to sea lice. This will increase fish health and welfare, and reduce production losses.

Broodstock can be exposed to a number of stressors including those associated with routine maintenance and spawning procedures. Ongoing research is examining the effects of maternal stress on eggs and the development of embryos from these eggs. Determining if early exposure to stress will permanently affect growth and reproductive health of adult fish could lead to changes in aquaculture practices to improve fish health and maximize productivity.

For additional information on current research projects:
www.aps.uoguelph.ca/aquacentre/aars/research.html

Contact Us

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Agri-Food and Rural Link

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