

**Ontario Aquaculture
Research and Services Coordinating
Committee**

**2005 Strategic Report
(For the Period 2005 – 2009)**

**Presented to the Ontario Animal Research and Services
Committee**

January, 2005

Introduction

The Ontario Animal Research and Services Committee (OARSC) is one of nine sub-committees reporting to the Ontario Agricultural Services Coordinating Committee. The OARSC has been mandated to lead a strategic priority setting process to provide recommendations to the Ontario Ministry of Agriculture and Food and Rural Affairs (OMAFRA) regarding animal research in Ontario. OMAFRA uses the recommendations to:

- Direct the development of the animal research program funded through the OMAFRA/University of Guelph Agreement.
- Establish priorities for OMAFRA funded competitive research programs such as the New Directions Research Program, the Food Safety Research Program, Life Sciences and Agri-food Innovation Fund and the Alternative Renewable Fuels Research and Development Fund.

OMAFRA has an active role in communicating these strategic priorities through:

- Submission of an annual report to the Canada Committee on Animals and the Canadian Agri-food Research Council (CARC).
- Forwarding the report to the University of Guelph and to other organizations as recommended by the OARSC.
- Posting a summary of the report on OMAFRA's website.

Executive Summary

The main issues facing the industry continue to arise from the confused regulatory framework surrounding aquaculture in Ontario. Direction and hope for improvement in that area may come from the federal level, where the Department of Fisheries and Oceans has formally recognized support for Aquaculture through the formation of the Aquaculture Management Directorate. Part of the new Directorate's goal involves working with provincial governments to improve the regulatory framework for aquaculture. Key personnel in the Directorate have an excellent perception of the problems inherent in achieving their goals. This report has adopted the term "social licence" used by Mark Burgham, Director of Public Engagement and Government Relations for the Directorate. Gaining and maintaining the "social licence" of the public is essential to aquaculture's development and economic success. Building widespread public acceptance enables removal of barriers to growth. For Ontario fish farmers, the "social licence" is one of the key issues to be addressed over the next four years.

OMAF supported research for Aquaculture

DUNCAN, IJ	26188	01-MAY-04/30-APR-06	Development Of Behavioral / Physiological Indices To Assess Welfare Of Farmed Fish
LEATHERLAND, JF	26267	01-JAN-05/30-MAR-07	Evaluation of growth-specific molecular markers in juvenile rainbow trout.
LUMSDEN, JS	26190	01-MAY-04/30-APR-06	Antibiotic resistance of Flavobacterium psychrophilum strains
LUMSDEN, JS	26292	01-APR-05/30-MAR-07	Fish welfare and acute phase proteins in rainbow trout (<i>Oncorhynchus mykiss</i>).
MACINNES, J	26190	01-MAY-04/30-APR-06	Antibiotic resistance of Flavobacterium psychrophilum strains
MCMILLAN, I	25980	01-MAY-03/30-APR-07	Maximizing genetic improvement of salmonids for Ontario aquaculture
MOCCIA, RD	25567	01-MAY-97/30-APR-04	Aquaculture Extension Program
MOCCIA, RD	26053	01-MAY-03/30-APR-05	Waste signaturing: evaluating utility of stable isotope ratios for identification of effluent
MOCCIA, RD	26188	01-MAY-04/30-APR-06	Development Of Behavioral / Physiological Indices To Assess Welfare Of Farmed Fish
MOCCIA, RD	26189	01-MAY-04/30-APR-06	Hypolimnetic and Benthic Impact Modeling of Cage Aquaculture in the Great Lakes
MOCCIA, RD	26295	01-MAY-05/30-APR-07	Performance characteristics of the Ontario Aquaculture Industry.
MOCCIA, RD	26308	01-MAY-05/30-APR-07	Predictive Models and Enhanced Decision Support Systems for Aquaculture.
STEVENSON, RM	26287	01-MAY-05/30-APR-06	Genetic analysis of Ontario isolates of fish-pathogenic flavobacteria

In addition to the research addressing the listed recommendations, OMAF continued to support ongoing, longer term work on genetics and breeding of rainbow trout.

Major trends and/or issues facing the Ontario Aquaculture industry over the next 4 years

1) Regulatory Framework

At the provincial level, there has been no progress in addressing the confusing and unevenly applied assortment of regulations being applied to aquaculture. In the northern part of the province, the newly formed Northern Ontario Aquaculture Association (NOAA) has enjoyed improved dealings with some personnel from the Ontario Ministry of Natural Resources, potentially enabling progress for cage culture operations in future. The Ontario Ministry of the Environment is restructuring regulations governing water taking permits, and a real risk exists that land-based fish farms may be further constrained as a result.

Federally, the Department of Fisheries and Oceans has further formalized recognition and support for aquaculture through the establishment of an Aquaculture Management Directorate. As part of its agenda the Directorate hopes to work with provincial agencies

to improve the regulatory framework for aquaculture. Clearly, this could have significant benefits for Ontario fish farmers.

2) Economic Viability

Improvements in management regimens, health maintenance, nutrition, and genetics have kept commercial scale fish farms profitable in spite of rising input costs, competition from imports, and increasing costs due to growing regulatory burdens. As with all food production, maintaining a reasonable level of profitability will be a constant challenge for Ontario farmers who are held to higher standards, particularly in the areas of food safety and the environment, than many producers of imports.

3) Environmental Issues

The controversy over the environmental impacts of aquaculture continues. It is becoming clear that objective science is not sufficient to silence industry critics. Increasingly, the challenge will be to prevent regulatory agencies from responding to persistent, ideologically motivated groups and organizations rather than the facts surrounding an issue. Public relations and politics will supersede reality regarding the environment to an even greater extent in future, and failure to recognize this and respond appropriately will have negative consequences for fish farmers and other commercial livestock producers.

4) Social Licence

Maintaining the ongoing ability to operate in Ontario will require enhancing the generally favourable public perception that the industry currently enjoys. Even aquaculture critics concede that much, if not all, of our seafood will eventually be farmed. Part of the challenge to today's fish farmers comes from environmental idealists insisting on the development of an industry with zero environmental impact, a concept that cannot realistically be applied to commercial scale food production of any sort. Broadly based public acceptance of aquaculture can constitute the political force that is required to offset the influence of unreasonably zealous environmental activists on regulatory agencies. Building on the increasing media and public awareness of the health benefits of consuming fish is essential in gaining solid, widespread acceptance for aquaculture. This can provide the basis to counter industry opponents who have started to exploit food safety fears in their campaigns against the farming of fish.

2005 –2009 Strategic Research Recommendations

A research recommendation describes an area of research that is of sufficient scope to encompass a number of research projects or a large multidisciplinary project and is linked to a desired outcome. Recommendations should be listed that will further the industry by addressing the identified gaps and barriers and move the industry towards realizing the stated vision.

SUMMARY OF RESEARCH RECOMMENDATIONS (Listed in order of Priority - #1 being of greatest importance)

Priority Order	Title of Recommendation
1	Environmental Impact Research
2	Nutrition and Bioenergetics Research
3	Health management and Disease Research
4	Genetics and Breeding Research
5	Welfare of Farmed Fish
6	Food Products and Processing Technology Research
7	Economic Analyses and Industry Profiling
8	
9	
10	

RECOMMENDATION DETAIL

RECOMMENDATION # 1

Title: Environmental Impact Research

Background: In Ontario, current guidelines governing water quality impacts from aquaculture operations do not address mass loading of nutrients discharged from a production facility in relation to the assimilative capacity of receiving waters. Given the variability existing both in types of production facilities (inland, cage, recirculation) and their receiving waters (cold, warm, streams, lakes), use of the mass nutrient loading approach to regulate fish farming appears to be the optimal method for protection of the environment while allowing for orderly development of aquaculture. For inland operations, such an approach would end the discrimination currently inherent in the regulation of point source nutrient inputs on watersheds, while much greater non-point source inputs are overlooked. For cage farms, regulation through nutrient loading would offer operational flexibility and the opportunity to progress towards a management model involving site rotation, which would benefit both the environment and production. The need to move forward with an improved regulatory approach is especially urgent for the cage sector, the segment of the industry with the most growth potential. Governments

must, however, recognize that the cost of developing such a regulatory approach is well beyond the resources of the industry at its present size. The decision to undertake the necessary research involved would require an acknowledgement by all government agencies that the development of a successful aquaculture sector is desirable and beneficial for Ontario.

Objectives: Investigate various approaches to quantify environmental impacts of fish farming activities specifically to develop techniques to estimate the impacts on assimilative capacity of various receiving water systems. Assimilative capacity assessments should take into account expected regenerative capabilities of sites, where applicable, using data from actual investigations of decommissioned facilities.

Outcomes: Addresses the regulatory barriers holding back the industry, and aids in gaining social licence.

Referral Organizations: Ontario Ministry of the Environment, Ontario Ministry of Natural Resources, Environment Canada, Fisheries and Oceans Canada

RECOMMENDATION # 2

Title: Nutrition and Bioenergetics Research

Background: Feed costs in aquaculture constitute up to 60% of the unit cost of production for raising carnivorous fishes of the salmonid family. Therefore this is the variable that holds the most promise for significantly improving profitability of large, commercial scale rainbow trout farms in Ontario. Lower feed costs per unit of production would raise the relative significance of transportation costs, thus providing a competitive advantage over imports. Additionally, diet reformulation provides an opportunity to reduce nutrient outputs and alleviate environmental concerns.

Objectives: Investigate alternative protein sources for salmonid feeds to reduce dependency on expensive fish and soybean meals. Simultaneously, waste production implications of alternate protein sources must be taken into account, considering the potential to decrease phosphorus and nitrogen outputs while avoiding the creation of new problems.

Outcomes: Addresses economic viability and environmental issues.

Referral Organizations: Ontario Ministry of Natural Resources, Fisheries and Oceans Canada

RECOMMENDATION # 3

Title: Health Management and Disease Research

Background: More effective control and detection of economically significant diseases are essential to lowering costs of production. Public awareness of the use of antibiotics and other therapeutants in livestock production is increasing and fish farmers need to demonstrate the safety of their disease management practices to end consumers. The lack of registered therapeutants is a problem for the industry that may not be readily overcome due to the small market potential that aquaculture presently offers for a therapeutant relative to the large expense involved in obtaining registration approvals. This necessitates the exploration of alternate means of disease treatment and prevention.

Objectives: Determine the pathobiology and effective management of diseases which are of economic significance to fish farming in Ontario, including newly emerging diseases in species which may become commercially important to the industry, as well as the common gill and skin diseases of salmonids. Investigate the efficacy of commonly utilized chemo-therapeutants, the biological dynamics of these compounds in the environment, and their persistence and clearing rates from fish when used prior to harvest. Determine whether alternatives to chemo-therapeutant treatment, such as vaccines and modifications in husbandry practices, may represent more effective means of disease control. Develop new detection and epidemiological techniques for on farm use.

Outcomes: Addresses economic viability and social licence, as the public becomes increasingly aware of farmed animal health maintenance and disease treatment.

Referral Organizations: Fisheries and Oceans Canada, Environment Canada, National Research Council Canada, Ontario Ministry of Natural Resources

RECOMMENDATION # 4

Title: Genetics and Breeding Research

Background: Ontario rainbow trout strains may have a number of superior characteristics with respect to growth, body conformation, and disease resistance relative to imported strains. However, we still know very little about the genetic make-up and potential for improvement of performance of our rainbow trout stocks. Undesired sexual maturation in production fish is one of the industry's key problems and frequently impacts producer profitability.

Objectives: Determine genetic variability, specific parameters, and gene-environment interactions affecting growth performance, disease resistance, and maturation characteristics in Ontario rainbow trout, with the aim of improving those stocks.

Outcomes: Addresses economic viability.

Referral Organizations: Fisheries and Oceans Canada

RECOMMENDATION # 5

Title: Welfare of Farmed Fish

Background: Objective methods of measuring animal response are needed for evaluation of the effect that current and alternative husbandry practices have on behaviour and stress in aquatic animals. This information will allow fish farmers to develop and adopt optimum culture practices and respond effectively to ethical concerns regarding the holding and husbandry of fish.

Objectives: Develop objective methods for assessing the general welfare of farmed fish through quantitative evaluation of their physiological responses to various management practices. Establish husbandry protocols that maximize the health and welfare of farmed fish without sacrificing production performance or profitability for the farm operation.

Outcomes: Addresses an area that will become increasingly important for aquaculture's social licence.

Referral Organizations: Ontario Ministry of Natural Resources

RECOMMENDATION # 6

Title: Food Products and Processing Technology Research

Background: Ontario aquaculture does not offer the variety or refinement of retail products that other red and white meat industries have. Final product forms have been dictated as much by processing machinery availability as by consumer or market preferences. As the industry grows, product diversification will be required to appeal to a broader consumer base.

Objectives: Develop and refine advanced processing and packaging techniques to add value, assure food safety and quality, and extend shelf life in order to increase the marketability of trout products. Utilize consumer testing and sensory evaluation studies to improve our understanding of consumer preferences.

Outcomes: Addresses economic viability.

RECOMMENDATION # 7

Title: Economic Analyses and Industry Profiling

Background: Production management, forecasting, and planning all require a sound database of factual information about past and current industry status. This enables the identification of management factors contributing to profitability, providing the opportunity to enhance them.

Objectives: Maintain an accurate and updated database of the provincial industry allowing for economic analyses of industry performance and comparison with other sectors, from a provincial, national, and international perspective.

Outcomes: Addresses economic viability.