

## Canadian Research: Integrated Multi-Trophic Aquaculture

Over the past 15 years, fisheries landings have declined from a high of around 1.6 million metric tonnes (MT) to approximately 1 million MT. During the same period, the consumption of fish and seafood in Canada has increased by more than 10%, and production by the Canadian aquaculture industry has steadily increased from 36,000 MT to about 150,000 MT in 2005. To meet current demands and an anticipated increase of 40% for fish and seafood in North America by 2010, the aquaculture industry will need to expand and remain competitive through a variety of innovative processes and techniques.



Increasing domestic aquaculture not only provides the potential for increased revenue, but has the added benefit of revitalizing coastal areas that have been adversely impacted by the decline of natural fisheries, and improving biosecurity. In response to the need for domestically cultured seafood, the government of Canada established in 1999 a network of Centres of Excellence focused on aquaculture research and development (AquaNet). The idea behind AquaNet was to develop a network of researchers in both universities and government that worked in conjunction with industry and non-governmental organizations to tackle industry-specific aquaculture issues. While many of the projects focused upon finfish and socioeconomic issues, a fair number of projects have been funded that examine shellfish related issues. These projects covered topics such as selective breeding, disease, toxins, nutrition, management and integrated multi-trophic aquaculture (IMTA; for more information, visit [www.aquanet.ca](http://www.aquanet.ca)). AquaNet finished its funding cycle in 2006, but has set the framework for continuing research. One of these projects examines the concurrent culture of salmon, mussels and kelps in an IMTA setting in Atlantic Canada.

Salmon aquaculture is a significant business in Atlantic Canada, employing thousands of workers and is the economic backbone of many coastal communities. There are concerns that finfish culture using open feeding systems introduce large amounts of wastes in the form of uneaten food, feces and excretory products which may contribute to localized eutrophication. There is a renewed interest in IMTA, which is based on an age-old, common sense, recycling and farming practice that uses by-products

(wastes) from one species as inputs for another. Fed aquaculture (fish or shrimp) is combined with inorganic extractive (seaweed) and organic extractive (shellfish) aquaculture to create balanced systems for environmental sustainability (biomitigation), economic stability (product diversification and risk reduction) and social acceptability (better management practices). Since 2001, one project in the Bay of Fundy has been using this approach, incorporating the blue mussel (*Mytilus edulis*) and kelps (*Saccharina latissima* and *Alaria esculenta*) into existing salmon (*Salmo salar*) aquaculture systems. The research is funded by federal and provincial governments and private companies and being undertaken by scientists, students and technicians from the Department of Fisheries and Oceans (DFO) in St. Andrews and the University of New Brunswick (UNB) in Saint John in close collaboration with regulatory agencies (CFIA) and industrial partners (Cooke Aquaculture Inc. and Acadian Seaplants Limited).

Co-leaders of the project, Drs. Shawn Robinson (DFO) and Thierry Chopin (UNB), are both very optimistic about this type of research and the potential economic benefits and future opportunities for Canada's aquaculture industry. The results so far are very promising and have shown increased growth rates of kelps (46%) and mussels (50%) cultured in proximity to fish farms, indicating that the excess high-energy fish food is being utilized by the two extractive species. The introduction of any new culturing techniques to existing aquaculture farms must overcome several regulatory and safety hurdles. None of the therapeutants used in salmon aquaculture have been detected in kelps and mussels collected from the IMTA sites, and levels of heavy metals, arsenic, PCBs and pesticides have always been below regulatory limits. Phytoplankton blooms of *Alexandrium fundyense* were present at the sites annually, from May to September, and resulted in PSP toxin concentrations in mussel tissues that exceeded the regulatory limit for short periods of time (late May to early July). However, using proper management and monitoring regimes, IMTA mussels can be safely harvested as seafood for human consumption.



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Preliminary data from a bio-economic model show that the addition of seaweed and mussel culture to salmon farming is profitable and helps reduce risks. The project is currently scaling-up experimental systems and working on an appropriate food safety regulatory and policy framework for the development of commercial scale IMTA operations. While much of this research is still in the experimental stage there are current plans to evaluate the addition of other species to the IMTA model. This could include species such as sea urchins, sea cucumbers, marine worms and additional seaweeds that may feed on other excess material from the farm, which would further enhance the local ecosystem and provide valuable cash crops. Other opportunities may include the rearing of some species with biochemical/bioactive properties useful for new forms of industrially important compounds. Site selection for the best compromise between site characteristics, species selection, and market demands will be key to optimizing IMTA.

**Lisa Milke & Bruce MacDonald**

**NSA Newsletter Reporters**

(Photos by Manav Sawhney)

## The Blue Crab... Continued from page 5.

**The Blue Crab** will take its place beside the only other comprehensive 'species volume' covering crustaceans, **The American Lobster** (Jan Factor, Ed., Academic Press 1995). One special note is that this book probably constitutes some of the last writings of Gene Cronin, Austin Williams, and C.K. Govind, giants in their respective disciplines, and I'm sure they would be delighted with the final product!

**The Blue Crab** should have a place on the bookshelves of all marine libraries, fisheries managers' offices, researchers, teachers and students.

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## Report on the Interstate Shellfish Sanitation Conference

The biennial Interstate Shellfish Sanitation Conference (ISSC), which took place from August 11 to 17 in Albuquerque, New Mexico, resulted in the passage of several proposals that directly affect US and West Coast oyster production, including issues associated with illnesses in recent years caused by *Vibrio parahaemolyticus* (*V.p.*). The ISSC's new *Vibrio*-control plan passed unanimously after numerous revisions were developed and agreed upon by a contingent of industry and FDA representatives. The new proposed plan, which will become part of the Model Ordinance and be mandatory, will go into affect by next year if FDA concurs with the proposal (as is expected). The plan provides an approach to shellfish safety rules that is relatively unusual under the National Shellfish Sanitation Program, calling for each state to conduct its own risk assessment to determine the potential for *V.p.* illnesses, and then to develop controls customized for each growing region. The flexibility afforded each state was recognized as critical to controlling illnesses, given the vast fluctuations in environmental conditions that exist from one growing area to another, and the evolving research and scientific methods used in monitoring and testing for *V.p.* For example, Washington State, which leads the US with the highest number of documented *V.p.* illnesses, is currently operating under an emergency *V.p.* rule that is set to expire in September. The Washington Department of Health anticipates holding meetings with growers over the next few months after data on illnesses due to *V.p.* and control measures taken over the last few years are analyzed. Departmental

staff recognize that there are critical distinctions that will need to be made between the growing areas, and will be asking growers to help develop a new rule that better addresses these differences.

A national issue that generated a controversial proposal (carrying over from the 2005 conference) allows states to require permits or licenses for non-commercial shellfish producers. States with significant numbers of "oyster gardeners," found primarily in New England and the mid-Atlantic, pushed this proposal forward. ISSC representatives suggested the need for greater authority to regulate non-commercial activities which sometimes results in non-commercial shellfish showing up in the commercial stream. This change in the Model Ordinance is a significant departure from the ISSC which is charged with regulating commercial shellfish only.

The Import Assessment Committee considered issues related to more effective ways of addressing concerns associated with shellfish imported from countries without a memorandum of understanding (MOU), but no proposals were presented for deliberations. Recommendations coming out of the committee included more standard utilization of a new testing method to determine raw from cooked product, and the development of a form to facilitate the collection and sharing of information on possible misbranded non-MOU shellfish.

**Robin Downey**

**Pacific Shellfish Growers Association**