



Atlantic Canada Aquaculture Industry Research & Development Network

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The Atlantic Canadian Aquaculture Industry Research and Development Network is a unified voice for the Atlantic Canadian Aquaculture Industry in matters of R&D, providing leadership, coordination and communication for the direct benefit of the industry.

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By: Peter Warris, R&D Coordinator

International Invasive Sea Squirt Conference II (IISSC II)

Once again marine biologists and other researchers from all over the world gathered to explore the biology, ecology, impacts and management options of invasive tunicates. The second International Invasive Sea Squirt Conference was held at the Brudenell resort at the beginning of October. The aim of the conference was to address the continuing problems associated with invasive species of tunicates.



Gretchen Lambert, tunicate biology expert from the University of Washington, addresses participants in the taxonomic workshop at the Second International Invasive Sea Squirt Conference.

On day 1 Neil MacNair (PEI DFA) gave a presentation covering the history of invasive tunicates in PEI waters and the various projects undertaken to find solutions to the problems they cause. After this around eighty of the delegates took a guided tour around the Brudenell and Montague rivers to see the problems at first hand.

There were four sessions of presentations over the next two days, **Biology, Systematics & Biogeography, Ecology & Genetics, Impacts** and the free industry session entitled **Risk Assessment & Management**. This session focused more on the practical aspects of current research and included the following presentations:

- Incorporating the New Zealand Tunicate Treatment Technology into a tunicate management strategy for Indian Point Marine Farms (Nova Scotia, Canada)
- Management of sea squirts in New Zealand
- Hull fouling and overland transport of boats on trailers as vectors of spread of clubbed tunicate (*Styela clava*)
- The temporal and spatial development of an infestation of *Styela clava* on mussel farms in Malpeque Bay, Prince Edward Island
- Rapid nationwide surveys for *Styela clava* in New Zealand: delimitation methods and detection probabilities
- Market potential for *Styela clava*, a non-indigenous pest invading New England coastal waters
- Mussel processing plants a potential vector for invasive ascidians?
- Mitigation strategies for *Styela clava* fouling on mussel seed collectors

Aquatic Invasive Species (AIS) Awareness Campaign

As part of the PEIAA's ongoing awareness campaign I recently had the opportunity to talk to the grade 7/8 class at Mt Stewart Consolidated School about AIS and their effects. It was an absolute pleasure to present to such an eager and enquiring audience; they certainly had a lot of questions! The big hit of the talk was the live tunicates I brought along; there were a lot of yuck and ugh type comments and daring each other to pick the samples up.

I'd like to thank Mt Stewart Consolidated, Vice-Principal Jill Bury and especially the kids in the grade 7/8 class for inviting me and I hope that I have the chance for a repeat performance at any other interested schools. Also as part of this year's campaign we developed a four-page colour "flyer" about AIS; this will be mailed out, in partnership with DFO, to selected fisheries license holders in the New Year.

The Alliance will be re-applying to the Invasive Alien Species Partnership Program in 2008. In fact we hope to submit two applications, one, partnership with the other Atlantic Canada member associations of the network, to expand the campaign's success to encompass all of Atlantic Canada; and the other focusing on delivering the message to boaters here on PEI through a series of practical demonstrations and workshops.



By: Peter Sykes, R&D Coordinator, AANS

R&D activities in Nova Scotia have continued to focus on the challenges facing the shellfish industry. The AANS will be holding its annual 'Scotian Pride' conference at the end January which will highlight R&D efforts that have been ongoing in the province over the last year. We look forward to seeing you there. For updates on the conference and other news please visit our new website appearing in December www.aansonline.ca

Keeping the ducks at Bay in Mahone Bay - "A preliminary assessment of alternative sleeving materials"

Peter Darnell the owner/operator of Indian Point Marine Farms (IPMF) Mahone Bay, Nova Scotia, has been an innovative mussel producer for the last 25 years. Utilizing research efforts at both the academic and industry levels, Darnell has had many honours and post-graduate students complete their studies on his leases to their mutual benefit. IPMF uses the continuous long line system based on technology from New Zealand to grow their mussels. The continuous long line system makes mussel sleeving (socking) efficient and was important in the development of a tunicate mitigation tool affectionately known as the "Tunicator" enabling the cleaning of a complete continuous long line by picking up the line only once. The "Tunicator" project was a collaboration of the Aquaculture Association of Nova Scotia (AANS) and the Prince Edward Island Aquaculture Alliance, which utilized high pressure water jets to destroy the outer tunic of the invasive vase tunicate (*Ciona intestinalis*) thereby killing the pest. Darnell's leases provided the testing and development site for this innovative machine which was also based on New Zealand technology.

However, this time of year Darnell puts tunicates aside and focuses on another problem. Diving ducks like the white winged scoters (*Melanitta fusca*) found regularly helping themselves to newly sleeved mussels at IPMF. Last year, ducks were responsible for eating most of Darnell's fall sleeved seed. Spring sleeved seed is generally safe from predation as the ducks have migrated west for breeding, but there is a cost advantage to sleeving seed in the fall when seed is small and purchased by the pound, therefore providing more mussels per pound and in turn more mussels for the same price at harvest. However, in recent



*White winged scoters (*Melanitta fusca*) hesitantly taking flight upon the arrival of a boat at one of Indian Point Marine Farm leases in Mahone Bay. (Photo: Peter Sykes)*



years the economic advantage and convenience of fall stocking has been eaten up, literally by diving sea ducks.

Literature estimates a single adult eider duck is capable of consuming between 2.5 and 5 kg of mussels in a single day.

Mussel farms are a popular spot for sea ducks, not surprising as newly sleeved seed mussels are abundant, easily accessible and thin shelled, with a high meat yield leading to a high energy return per unit effort. Literature estimates a single adult eider duck is capable of consuming between 2.5 and 5 kg of mussels in a single day. It is clear to see that a flock of ducks can have considerable impact on a farm over a short period of time. In recent years the problem of duck predation has been exacerbated by the delay or complete lack of ice cover over the farms, which is by far the best possible barrier.



Typical 100% cotton sleeving material used at Indian Point Marine Farms. (Photo: Peter Sykes)

To help solve this problem a collaborative project involving Mallet Research Services, IPMF and the AANS with funding from the Nova Scotia Department of Fisheries and Aquaculture has been formed to test different sleeving materials and their effectiveness as a physical barrier between susceptible mussel seed and predating ducks. The qualities of a good sleeving material will provide physical protection during the fall/winter threat of ducks, but decompose in time to allow the mussels to migrate outside the sleeve to efficiently filter and grow. A second

important characteristic is that the sleeving material must completely decompose and assimilate into the ocean environment as is the case with the 100% cotton socks currently used. Alternatively if a synthetic material is used it must remain attached to the line so it can be collected and disposed of properly. Darnell and staff are very cognisant about the waste produced on the farm and have been very successful in reducing and accounting for all waste products in their operations. In the end this project will evaluate mussel condition, mortality and duck predation rates between the existing sleeving materials and will identify potential directions for the development of novel sleeving materials.

By: Darrell Green, R&D Coordinator, NAIA

Aquatic Invasive Species (AIS) Initiative

The introduction of invasive alien species into Newfoundland and Labrador waters represent a significant potential threat to the Newfoundland shellfish industry. Although economically harmful invasive species have never been found on any aquaculture site in the province experts in the field of Aquatic Invasive Species agree that the threat to Newfoundland is real and should not be ignored. Through the Government of Canada's Invasive Alien Species Partnership Program (IASPP), NAIA is able to deliver an AIS education campaign which aims to create greater awareness of issues related to the introduction and spread AIS within resource user groups in areas of the province which are at higher risk of AIS establishment. Currently plans are underway for a series of AIS presentations in communities within these high risk areas and new content is being developed for use in pamphlets and signage, with these media to be distributed in early 2008.

Another goal of the program is to encourage communication between the aquaculture industry and groups currently working on AIS within the province (DFA, DFO) through the creation of an AIS Advisory Committee. The Committee, which began in February 2007, includes representation from provincial and federal governments, the aquaculture industry and academia. The third meeting of the Committee was held in October and included discussions on management planning, shellfish processing protocols and planned IASPP activities as well as updates on monitoring programs. Dr. Bob Hooper gave committee members an introduction to the lacy bryozoan and it's expanding range in Newfoundland waters. It has not been determined whether or not this animal is alien to Newfoundland or if changing conditions have opened a window of opportunity for this species to expand it's distribution.

Seven people from Newfoundland, 5 of whom sit on the AIS Advisory Committee, attended the second International Invasive Sea Squirt Conference held in PEI in October (see PEI Provincial Update). The Newfoundland contingent included people from government (DFA, DFO), academia (MUN) and industry (NAIA). One of these participants was Derek Moulard of the Department of Fisheries and Aquaculture, government of Newfoundland and Labrador. "It was a great chance to connect with international experts in tunicate biology." Moulard said, adding "I thought that the taxonomic workshop was a real benefit, and will go a long way in helping Newfoundland develop expertise in tunicate identification."



Participants dissect tunicates during the taxonomic workshop at the Second International Invasive Sea Squirt Conference in PEI in October 2007.



In November, as part of the IASPP project, NAIA organized a Newfoundland Aquatic Invasive Species Workshop. Participants in the workshop included those from a wide range of backgrounds and interests, and included the federal government (Fisheries and Oceans, Environment Canada, Canadian Food Inspection Agency, Transport Canada), the NL provincial government (Dept. of Fisheries and Aquaculture, Dept. of Environment and Conservation), academia, (Marine Institute, Ocean Sciences Centre) and industry (Cooke Aquaculture, Sunrise Fish Farms, Norlantic Processors, Fish and Food Allied Workers, Newfoundland Transshipment). With sessions entitled The Issues, The Organisms and The Management Approach, the workshop included presentations from DFO, NAIA, MUN and Transport Canada. These talks covered a wide spectrum, comprising information on why we should be concerned about AIS, which species are of concern, how can we prevent the introduction and spread, and how we can manage areas in which AIS have been found. Thanks to Geoff Perry and Cynthia McKenzie of DFO for chairing the sessions and making presentations.

Ice Slurry project

Investment into harvesting and processing infrastructure within the Newfoundland and Labrador mussel aquaculture sector is seen as essential for growth of the industry. The procurement of ice slurry technology for mussel processing is an investment which is expected to reap rewards in terms of reduction in over-pack, increased product freshness and increased shelf life.

In 2007, with the help of the Department of Fisheries and Aquaculture (DFA), NAIA purchased an ice slurry machine for use in processing mussels to be shipped live to markets in Canada and the USA. Housed at Allen's Fisheries in Benoit's Cove, this machine will be used to process mussels from 11 farms from all over the island. The installation of the equipment has now been completed and personnel at the processing plant are going through the process of familiarizing themselves with the use of the machine. While results of trials runs on live mussels are promising, it is clear that the development of a new set of procedures is necessary for harvesting and processing

mussels when using ice slurry. These protocols will have to be in place before Allen's Fisheries is confident enough in the process to use ice slurry on shipments going to market.

Over the next few months NAIA will be partnering with the Centre for Aquaculture and Seafood Development (C-ASD) at the Marine Institute to carry out a research project which will develop protocols for using the ice slurry machine in mussel processing. This project will also evaluate the performance of the ice slurry system in terms of product quality, shelf life and reduced over-pack.

The purchase of this valuable addition to the industry's processing capacity would not have been possible without the support of Allen's Fisheries of Benoit's Cove and the Newfoundland Government through the Department of Fisheries and Aquaculture (DFA).



Mussel Seed Quality Project

While blue mussel aquaculture in Newfoundland continues to grow, projected shortfalls in seed supply over the coming years could slow the potential for expansion of the industry. To be sustainable any growth in mussel production must be mirrored by an increase in seed production. This can only happen if information on new and existing seed stocks is available to mussel growers. Through the Mussel Seed Quality Project NAIA is helping to collect information on seed stocks to ensure that the industry can maintain a consistent supply of good quality mussel seed.

This year the main focus of the project has been the examination of prospective collection sites in Bonavista Bay, as well as some of the best sites from Placentia Bay as determined from year's work. This past summer our partners in the Mussel Seed Quality Project, the Centre for Aquaculture and Seafood Development (C-ASD) at the Marine Institute, conducted larval monitoring, collected environmental data, deployed experimental spat collectors, sampled the spat which settled on these collectors, and analyzed these samples for qualities such as growth rate and number of spat collected. Samples were also provided to Memorial University for analysis of the genetic composition of spat collected on each site.

The Mussel Seed Quality Project is a NAIA initiative, in partnership with Fisheries and Oceans Canada (DFO), the Provincial Department of Fisheries and Aquaculture (DFA) and Memorial University of Newfoundland (MUN). Funding support for this project is provided by DFO's Aquaculture Collaborative Research and Development Program (ACRDP), the National Research Council – Industry Research Assistance Program (NRC-IRAP), and the Department of Fisheries and Aquaculture (DFA).

Potential New Project

Aquaculture in the Coast of Bays region of Newfoundland and Labrador has seen remarkable growth over the past few years, and the industry represents the greatest opportunity for economic development of communities in the region. Most of the expansion in the industry over the past 2 years has been within salmonid sector mainly due to companies outside of Newfoundland and Labrador investing in salmon growout sites in the area.

With our role of assisting the aquaculture industry achieve its full potential in Newfoundland and Labrador, NAIA is now considering the development of a system of real-time and archived data on marine environmental conditions in the Coast of Bays region. This system, which is currently in the conceptual stages, will help in planning new aquaculture sites and managing existing farms, and will include information on ocean temperature, salinity, currents, tides, weather and other information useful to aquaculturists and other marine resource users. For more information contact Darrell Green at NAIA.



By: Caroline Graham, R&D Coordinator, NBSGA

NBSGA Technical Session

Held December 14, 2007, the NBSGA Technical Session highlighted initiatives demonstrating the collaboration between Salmon Farmers and Atlantic salmon conservation efforts in the Bay of Fundy. Representatives from industry, research institutes, government, and conservation agencies gathered at the St. Marks Church Hall in St. George to hear presentations from leading experts in conservation and research.

Jonathon Carr, biologist with the Atlantic Salmon Federation provided an overview of the Magaguadavic River Project, which is a collaborative effort between industry and conservation groups.

Dr. Michael Beattie, Chief Aquaculture Veterinarian with NB Department of Agriculture and Aquaculture, summarized the research activities of this department, most of which are joint efforts with industry.

Dr. Rachael Ritchie, Head of Food, Fisheries and Aquaculture at RPC, provided an overview of the ACRDP Genetic Project, which examined testing of salmon for non-local strains. This project was a collaborative effort between RPC, DFO and industry.

NBSGA Executive Director Dr. Jamey Smith presented the NBSGA Code of Containment for the New Brunswick salmon aquaculture industry. This Code was developed by industry, but in partnership with Fisheries and Oceans Canada and the NB Department of Agriculture and Aquaculture.

Dr. Fred Whoriskey, VP of Research and Environment with the Atlantic Salmon

Federation, provided the audience with an animated presentation of the Ocean Tracking of Salmon.

Our luncheon speaker was Dr. John Anderson, author of *The Salmon Connection: Development of Atlantic Salmon Aquaculture in Canada*. Dr. Anderson discussed how the industry began, the current status and the challenges we face today.



Dr. Jamey Smith and Dr. John Anderson, author of "The Salmon Connection" at the NBSGA Technical Session December 14.

The NBSGA wishes to acknowledge the support of ACRDP for this technical session. Copies of the report from this session will be available at www.nbsga.com early in January. Contact Caroline (c.graham@nbsga.com) for more information.



Open Ocean Conference Tours

The New Brunswick salmon aquaculture industry opened its doors to the participants of the *Canada-US Technology Partnership in Sustainable Open Ocean Aquaculture Meeting*. Unfortunately, the weather did not permit a visit to the Cooke Aquaculture marine site, but participants were able to learn more about the activities of local net and cage manufactures (Future Net and Supplies, Aquaculture Engineering Group, and GMG). After lunch, the group traveled by coach through the heart of the salmon industry in New Brunswick, which highlighted key research initiatives.



Chris Bridger of Aquaculture Engineering Group Inc. addresses Open Ocean Conference participants on the initiatives being taken by equipment suppliers in NB in the development of offshore aquaculture.



By: David McCallum, R&D Coordinator, BC Shellfish Growers Association (BCSGA)

Report from BCSGA R&D Workshop

In conjunction with the BCSGA annual general meeting and gala dinner, the BCSGA facilitated the 2nd annual R&D Workshop on October 19th, 2007. The workshop was well-attended with over 50 delegates. While parts of the workshop focused on developments of the BC shellfish aquatic animal health program and research updates from current ACRDP funded projects, the highlight was the Growers' Forum where innovations from the farm were presented. Keith Reid recently visited Tasmania and showed some very interesting video of Oyster (*Crassostera gigas*) grow-out, harvesting, and grading high-technology. Perhaps the most eye-opening presentation came from Bill Dewey (Taylor Shellfish). Bill showed a series of videos on the development, testing, and effective use of his mechanical Clam (*Tapes philippinarum*) harvester at his farm in Puget Sound, WA. As a result of this technology, he has shown a significant reduction in harvesting (labour) costs – which has subsequently inspired an effort in the BCSGA office to work with DFO towards allowing mechanical harvesting. Tentative plans are underway to facilitate test projects on environmental assessments of mechanical harvesting in BC.

Shellfish Industry Environmental Stewardship

An early-winter storm on the morning of November 12th made it clear that the BC shellfish industry needs to establish stronger infrastructure and farming equipment that can withstand the high-winds of winter. As a result, the BCSGA is working on various initiatives and solutions, including the development of innovative deepwater raft designs, in cooperation with the Centre for Shellfish Research (CSR) and the BC Ministry of Agriculture & Lands.

Centre for Shellfish Research

Speaking of the CSR, progress is being made in the planning for the Deep Bay Field Site – a field research station and farm, located at the south end of Baynes Sound. Currently, the field station is still in the DRAFT schematic design phase, but the architect's drawings for the upland lab/teaching/culinary facility look very impressive. Development of the farm-site itself (to be implemented in early 2008), will be used as a case study for new and innovative farm design, anchoring, and husbandry practices. This facility is much anticipated and the BCSGA hopes it will provide many benefits in terms of responding to industry's R&D issues.

Other Upcoming R&D projects

An extension of the current ACRDP funded Oyster Stress project is being proposed. While the current project examined the oceanographic variables that may be the cause of significant



mortalities, a new DRAFT proposal may provide recommendations on husbandry practices to mitigate some of the mortalities. Stay tuned for more on this in the future.

Aquatic Invasive Species

The BCSGA wrapped up our 2007 Invasive Alien Species Partnership Program successfully. We completed (1) six regional educational workshops for farmers and other marine stakeholders, (2) an interpretive AIS website, and (3) a well-received interpretive brochure. With plans to apply for this funding again in the new year, we are taking a lesson from the East coast with regard to invasive tunicates and hope to continue being proactive in education and prevention before they become extremely problematic.

David McCallum - R&D Coordinator

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Funding Program Profile

Aquaculture Collaborative Research and Development Program (ACRDP) By Christie Whelan (Christie.Whelan@dfp-mpo.gc.ca)

The Aquaculture Collaborative Research and Development Program (ACRDP) was initiated in 2001 as part of the Program for Sustainable Aquaculture. The purpose of the program is to increase the level of collaborative research and development activity between the aquaculture industry and Fisheries and Oceans Canada (DFO). The industry-driven program is jointly funded by DFO and industry partners. The ACRDP funding envelope is \$4.5 million per year (subdivided regionally), and must be matched by a minimum industry contribution of 30% of the ACRDP amount requested (7.5% in-cash, 22.5% in-kind).

There are three main research and development objectives to the program: best performance in fish production, optimal fish health and industry environmental performance. The key goals of the program are to:

- Improve the competitiveness of the Canadian aquaculture industry;
- Increase collaboration between the department and industry on scientific research and development that will enhance aquaculture in Canada;
- Facilitate and accelerate the process of technology transfer and research commercialization through closer collaboration with the Canadian aquaculture industry; and
- Increase scientific capacity for essential aquaculture research and development in the aquaculture sector.

Since the beginning of the program (2001-2007), over 220 projects have been approved and funded. The funded research includes 120 projects focusing on best performance in fish production, 54 projects on environmental performance and 46 projects on optimal fish health.

In total, over \$51 million in research has been conducted through the ACRDP.

In total, over \$51 million in research has been conducted through the ACRDP. This includes \$23.2 million in ACRDP funds, \$11.6 million from industry contributions, \$11.7 million in other DFO funding and \$4.8 million in contributions from other project partners.

There are two deadlines for research project proposal submissions; December 1st and March 1st for projects to be conducted over the upcoming fiscal year. A third round of proposals may be established, no later than Sept 1st, in any particular region if funding is available. **Proposals for workshops can be submitted at any time throughout the year.** The ACRDP submission dates have recently changed and as a result the current call for proposals will remain open until January 15, 2008. After this time, the deadlines of December 1st and March 1st will be strictly enforced.



It is strongly encouraged that any aquaculture producers that are facing production, technical, environmental or fish health challenges contact their regional ACRDP coordinators or DFO research staff to discuss ideas for research and collaboration possibilities that can contribute towards a solution.

For more information on the ACRDP and the proposal submission process, please visit the website (http://www.dfo-mpo.gc.ca/science/aquaculture/acrdp-pcrda/main_e.htm) or contact your regional or national coordinators.

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Upcoming Meetings & Events



Scotian Pride 2008 – AANS Annual Conference

January 24-26,
Lord Nelson Hotel - Halifax, Nova Scotia
www.aansonline.ca
aans@eastlink.ca

Aquaculture America 2008

February 9 - 12, Lake Buena Vista, Florida USA
www.was.org

Cod Network Conference

Feb 13 - 15, Tromso, Norway
www.torsk.net/

International Boston Seafood Show

Feb 24 - 26, Boston, MA USA
<http://www.bostonseafood.com/>



Cold Harvest™ 2008

NAIA Annual Conference and Trade Show
March 11- 13, Gander, NL
www.naia.ca



Aquaculture Canada^{OM} 2008 and Atlantic AquaFair 2008

May 10 - 14, Saint John / St. George, NB
www.aquacultureassociation.ca

World Aquaculture 2008

May 19 - 23, Busan, Korea
www.was.org



BCSGA Annual R&D Workshop & AGM

October 17 - 18
<http://bcsga.ca/>



Company Profile

The N.B. Research and Productivity Council (RPC) is an independent contract R&D and technical services organization located in Fredericton, NB. RPC's complement of 100 scientists, engineers and technologists are supported by a 13,000 sq. meter facility housing world-class analytical chemistry and material-testing laboratories, extensive prototype design, manufacture and testing services and a wide variety of pilot facilities for the development and improvement of industrial and environmental processes and products.

Probiotics for Marine Larviculture.

Through an Atlantic Innovation Fund (AIF) project, RPC has developed a collection of probiotic bacteria for use in improving larval survival in marine finfish. Probiotics are beneficial bacteria that when added to the rearing tanks or feed can help improve the health of the host. Larviculture in some species of marine finfish can be plagued by very low survival rates (3-5%) during the first 20-30 days post hatch. As vaccination is not a viable option and dependence on antibiotics can lead to the development of resistant pathogens, probiotics are becoming a promising tool in overcoming this limitation in the production cycle. Thus far, the project has isolated over 50 probiotic candidates with approximately 25 of these having gone through phase one trials with cod (*Gadus morhua*) and showing very promising results. One of the most tested strains, L68, has shown that treated larvae have up to 48% to 65% greater survival in Phase I trials with cod and from 40% to 140% better survival in Phase II trials with haddock (*Melanogrammus aeglefinus*). Tests with other species are planned. RPC is currently seeking partners interested in commercializing this promising new technology. For more information readers can contact Dr. Ben Forward (ben.forward@rpc.ca).