

Growing Quality Seafood through Innovation
L'Innovation et la production de fruits de mer de qualité

Program Guide / Guide de programme

Aquaculture Canada^{om} 2008
&
AquaFair 2008



Saint John, New Brunswick, 10-14 May 2008
Ville de Saint Jean, Nouveau Brunswick, 10-14 mai 2008

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**Courtesy of the
AC'08 Student
Affairs
Committee ...**

Aquaculture Idol

...is back!



- **WHERE:** Joe Brown Student BBQ
 - O'Leary's Pub, 46 Princess St., Saint John
- **WHEN:** May 12th, 2008 at 6:00 p.m.
- **Ticket Price:** \$25 (Get them while they're still available!)

Watch and get in on the fun as AC'08 conference delegates go head to head, performing their karaoke favourites while being judged by a panel of AAC's professional musicians, for the coveted Aquaculture Idol Trophy!

SEE YOU THERE!

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Aquaculture Canada 2008 Committees / Comités

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Caroline Graham – AquaFair President / présidente de l'AquaFair 2008
Cyr Couturier - Program Chair / président du programme
Joanne Burry - Conference Coordinator / coordonnatrice de la conférence
Catriona Wong - Aquaculture Association of Canada / Association Aquacole du Canada
Susan Waddy - Aquaculture Association of Canada / Association Aquacole du Canada
Tim Jackson – National Research Council – IRAP / Le Programme d'aide à la recherche industrielle du CNRC

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Caroline Graham – AquaFair President / présidente de l'AquaFair 2008
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Debbie Martin-Robichaud – AAC President-elect / présidente élu
Bettie Arsenault – Professional Shellfish Growers Association of New Brunswick / l'Association des conchyliculteurs professionnels du N.-B.
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Jason Mullen - Awards and Student Affairs / prix et affaires étudiant(e)s
Linda Duncan – Prince Edward Island Aquaculture Alliance / L'Alliance de l'aquaculture du P.-É.
Rod Penney – Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments
Brian Muise – Aquaculture Association of Nova Scotia / Association aquacole de la Nouvelle-Écosse
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James A. Smith - New Brunswick Salmon Growers Association / l'Association des producteurs de saumons du N.-B.
Charlane Hatt - New Brunswick Department of Agriculture and Aquaculture / Département de l'agriculture et de l'aquaculture du Nouveau-Brunswick
Karen Coombs - New Brunswick Department of Agriculture and Aquaculture / Département de l'agriculture et de l'aquaculture du Nouveau-Brunswick
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Aquaculture Association of Canada / Association Aquacole du Canada

Board of Directors 2007 / 2008 Conseil d'administration

Alistair Struthers, President

Canadian Food Inspection Agency, Aquatic Animal Health Division
59 Camelot Drive, Ottawa, ON K1A 0Y9
Tel. 613-221-1465; Fax 613-221-3137; e-mail: struthersa@inspection.gc.ca

Tim DeJager, Vice President

DeJager AquaLogic, 115 Gibraltar Rock, Nanaimo, BC V9T 4M3
Tel. 250-751-0634 Email: dejagert@co3.ca

Debbie Martin-Robichaud, President Elect

DFO - Biological Station, 531 Brandy Cove Road, St. Andrews, NB E5B 2L9
Tel. 506-529-5923; Fax 506-529-5862; e-mail: Martin-RobichaudD@mar.dfo-mpo.gc.ca

Chris Pearce, Past President

Fisheries and Oceans Canada (DFO), Pacific Biological Station,
3190 Hammond Bay Road, Nanaimo, BC V9T 6N7
Tel. 250-756-3352; Fax 250-756-7053; e-mail: pearcec@pac.dfo-mpo.gc.ca

Cyr Couturier, Treasurer

Marine Institute, Memorial University, PO Box 4920, St. John's, NL A1C 5R3
Ph: 709-778-0609; Fax: 709-778-0535; e-mail: Cyr@mi.mun.ca

Joy Wade, Secretary

Fundy Aqua Services, 1619 Venlaw St., Nanaimo, BC V9S 1J8
Ph: 250-754-6884; e-mail: joy2004wade@yahoo.ca

Tillmann Benfey, Director

Department of Biology, University of New Brunswick
P.O. Box 4400, Fredericton, NB E3B 5A3
Tel 506-452-6293; Fax 506-453-3583; E-mail: benfey@unb.ca

Tim Jackson, Director

National Research Council Canada - IRAP Atlantic & Nunavut Regional Office
1411 Oxford Street, Halifax, Nova Scotia, B3H 3Z1;
Tel. 506-636-3728; Fax 506-636-3479; e-mail: Timothy.Jackson@nrc-cnrc.gc.ca

Jason Mullen, Director

Aquaculture Association of Nova Scotia, The Village at Bayers Road Starlite Gallery, 7071 Bayers Road, Suite 320, Halifax, NS B3L 2C2
Tel. 902-499-6284; Fax 902-422-6248; e-mail: jmullenaans@eastlink.ca

Ian Butts, Director

DFO - Biological Station, 531 Brandy Cove Road, St. Andrews, NB E5B 2L9
e-mail: ButtsI@mar.dfo-mpo.gc.ca

Administrative Office / Bureau administratif:

Susan Waddy, Association Office Manager / chef du bureau d'administration

Catriona Wong, Administrative Assistant / assistante administrative

Terrence Hutchinson QC, Legal Counsel / conseil juridique

Aquaculture Association of Canada, 16 Lobster Lane, St. Andrews, NB, Canada E5B 3T6
Tel 506-529-4766, Fax 506-529-4609, email /courriel: aac@mar.dfo-mpo.gc.ca, site web: www.aquacultureassociation.ca

Aquaculture Canada 2008

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- AquaFair 2008
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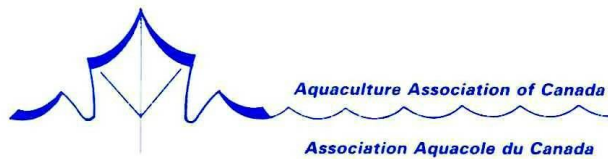
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Aquaculture Association of Canada / Association Aquacole du Canada

Welcome to delegates / Mots de bienvenue aux délégués



On behalf of the board of directors of the Aquaculture Association of Canada, it is my pleasure to welcome you to Aquaculture Canada 2008. This meeting represents a significant milestone for the Association as we celebrate our 25th anniversary, and we are pleased to celebrate this milestone meeting in Saint John, NB, near the heart of Atlantic Canadian aquaculture. Milestones are times for us to reflect on what we've accomplished, and where we wish to go. The AAC, along with the Canadian aquaculture industry, has experienced significant change over the last quarter century. The Association has been fortunate to have grown in parallel with the Canadian aquaculture industry, but we have also felt the challenges faced by the industry. As we look forward, I encourage you to share your vision. This is *your* association, and you can have a role in shaping the role that we play in the Canadian aquaculture industry.

As is customary at Aquaculture Canada meetings, we have arranged a comprehensive scientific agenda and industry trade show, along with social events and tours. The theme of this year's meeting is *Growing Quality Seafood through Innovation*, and the broad range of topics reflects both quality and innovation - two aspects that are key to the future success of the Canadian aquaculture industry.

We have also joined forces in co-hosting Aquaculture Canada 2008 with AquaFair 2008. I hope that you have the opportunity to take in this celebration of aquaculture in the heart of NB salmon farming industry, St. George, NB.

Organizing a meeting the size and calibre of Aquaculture Canada is no small task, and I would like to thank Joanne Burry (Conference Organizer), Cyr Couturier (Program Chair) and Tim Jackson (Local Organizing Committee Chair) along with their teams for the tremendous amount of work that has gone into Aquaculture Canada 2008. I would also like to gratefully acknowledge the generous support of the Province of New Brunswick, in addition to our co-hosts, the New Brunswick Salmon Growers Association and the Professional Shellfish Growers Association of New Brunswick.

As we reminisce with old friends, make new ones, and look forward to the next 25 years I hope the program is to your liking and that you are able to find something valuable to take away. I wish you an enjoyable and productive meeting.



C'est avec un grand plaisir que j'aimerais, de la part du conseil d'administration de l'Association d'Aquaculture du Canada, vous accueillir à « Aquaculture Canada 2008 ». Cette réunion représente un jalon significatif pour l'Association car nous célébrons notre 25^e anniversaire près du cœur de l'aquaculture canadienne, à Saint John au Nouveau Brunswick. C'est le temps pour nous de réfléchir à

ce que nous avons accompli et voir où nous souhaitons aller. L'AAC, autant que l'industrie d'aquaculture canadienne, a connu des changements significatifs depuis les vingt-cinq dernières années. L'association a été privilégiée d'avoir grandi en même temps que l'industrie d'aquaculture canadienne, mais nous avons dû aussi faire face aux mêmes défis que l'industrie. En regardant dans un futur rapproché, je vous invite à partager votre vision avec nous. Cette association vous appartient et vous avez rôle important dans la direction future de l'industrie d'aquaculture au Canada.

Comme il est de coutume aux réunions de l'AAC, nous avons un ordre du jour scientifique complet, un salon commercial et aussi des événements sociaux et des visites. Le thème de notre réunion est «L'Innovation et la production de fruits de mer de qualité». Plusieurs sujets porteront sur l'innovation et la qualité - deux aspects qui sont des éléments clés dans le succès de l'avenir de l'industrie d'aquaculture canadienne.

Nous avons joint nos énergies avec AquaFair 2008 pour animer « Aquaculture Canada 2008 ». J'espère que vous apprécierez cette célébration de l'aquaculture dans le coeur de l'industrie d'élevage de saumon NB, à St-George, au Nouveau Brunswick.

Organiser une réunion d'envergure tel qu'« Aquaculture Canada » n'est pas une simple tâche et j'aimerais remercier Joanne Burry (organisatrice de conférence), Cyr Couturier (président de programme) et Tim Jackson (organisateur de comité local) ainsi que leurs équipes, pour tout leur travail et efforts formidables dans la préparation de cette événement. C'est aussi avec une grande reconnaissance que j'aimerais souligner le soutien généreux de la Province de Nouveau Brunswick, ainsi que nos hôtes; l'Association des producteurs de saumons du N.-B. et l'Association des conchyliculteurs professionnels du N.-B.

En vous rappelant des souvenirs de cet événement avec de vieux camarades, faites-vous en des nouveaux et regardez en avant pour les vingt-cinq prochaines années. J'espère que le programme saura vous plaire et que vous trouverez quelque chose de valeur à remporter avec vous. Je vous souhaite d'avoir une réunion agréable et productive.

Alistair Struthers
President / président, AAC

AquaFair 2008
Welcome to delegates / Mot de bienvenue aux délégués



I am very pleased to welcome you to AquaFair 2008, being held for the first time in St. George and Saint John with the Aquaculture Association of Canada's annual meeting.

Like the Atlantic salmon industry in New Brunswick, AquaFair has undergone many changes since its inception 21 years ago. Our event has always worked closely with the industry, and the Steering Committee felt that the 2008 event should be a true celebration of our industry. It is fitting that this day of celebration be held in St. George, which is truly the heart of the salmon aquaculture industry in New Brunswick.

I would like to take this opportunity to express our sincere gratitude to all of our contributors for their continued support of AquaFair. We are proud to display the names and logos of companies from all aspects of the aquaculture industry and our surrounding communities.

We would also like to thank the Aquaculture Association of Canada for inviting us to join with Aquaculture Canada 2008, and are confident that our collaboration has resulted in an excellent slate of technical and social events that will create lasting memories for all of us.

Finally, I would like to recognize all of the AquaFair Steering Committee members for their dedication to continuing the tradition of promoting the salmon aquaculture industry in New Brunswick.

Caroline Graham
President, AquaFair 2008

**New Brunswick Salmon Growers Association /
Association des salmoniculteurs du Nouveau-Brunswick
Welcome to delegates / Mot de bienvenue aux délégués**



On behalf of the New Brunswick Salmon Growers Association, welcome to our beautiful province for this combined 2008 Aquaculture Canada and Aquafair event. We are proud to be co-hosting this event with the Professional Shellfish Growers of New Brunswick, along with the Aquaculture Association of Canada. What a great opportunity to take in the presentations and socials of AC 08, as well as the community-based events of our own Aquafair!

Established in 1987, the NBSGA continues to support and enhance the sustainability of the largest agri-food sector in the Province. We are pleased that AAC chose our region for Aquaculture Canada 2008, providing the opportunity to showcase the many initiatives and activities that take place here. The NBSGA and our members are involved in world-leading programs and projects on fish health and environmental management, integrated multitrophic aquaculture, marine species, and high-energy sites.

It is truly an exciting time for aquaculture in the region. Our products are known for exceptional health benefits and quality, and our sector is renowned for our commitment to innovation and research. This week you will also see the dedication that we have to our communities.

I hope that you will enjoy your stay with us. Please join me in thanking all of the volunteers for their hard work in organizing another successful Aquaculture Canada conference, and for combining this event with our own Aquafair.

Sincerely,

Jamey Smith
Executive Director

**Professional Shellfish Growers Association of New Brunswick /
l'Association des conchyliculteurs professionnels du N.-B.
Welcome to delegates / Mot de bienvenue aux délégués**

Association des conchyliculteurs
professionnels du Nouveau-Brunswick



New Brunswick Professional
Shellfish Growers Association



The New Brunswick Professional Shellfish Growers Association (NBPSGA) was founded in 1997 by oyster and mussel growers in order to promote the shellfish industry and to establish an organization that could act as their spokesperson.

On behalf of the NBPSGA and its members, the executive would like to welcome you all to the 25th annual meeting of the Aquaculture Association of Canada. The NBPSGA is proud that this is the second time that the annual meeting is held in New Brunswick.

We are proud to say that New Brunswick has a great deal to offer regarding shellfish production, especially with regard to the eastern oyster (*Crassostrea virginica*). Since this province is the second most important aquaculture producer in Canada, it goes without saying that shellfish production is undergoing a significant expansion on the east coast of New Brunswick due to the popularity of cocktail oysters.

This meeting is necessary in order to enable the various stakeholders (eg. students, educators, scientists, industry and government representatives) to keep up to date with recent developments in aquaculture in Canada. It is essential for stakeholders from different provinces to share knowledge on a variety of topics (commercialization, science and technology) to ensure that Canada stays competitive in the aquaculture sector.

I hope that you will benefit from your stay in Saint John, New Brunswick, and that there will be an excellent attendance at the talks and at the other activities scheduled for this event.



L'Association des conchyliculteurs professionnels du Nouveau-Brunswick (ACPNB) a été fondée en 1997 par des éleveurs d'huîtres et de moules soucieux de promouvoir l'industrie conchylicole et d'appartenir à un organisme capable d'agir comme leur porte-parole.

De la part de l'ACPNB et de ses membres, la direction vous souhaite la bienvenue, à toutes et à tous, à cette 25^e réunion annuelle de l'Association Aquacole du Canada. L'ACPNB est fière de revoir, pour une seconde fois, la tenue de cet événement au Nouveau-Brunswick.

Nous sommes fiers de pouvoir dire que le Nouveau-Brunswick a beaucoup à offrir en ce qui a trait à sa production de coquillages, particulièrement celle de l'huître américaine (*Crassostrea virginica*). Et, comme cette province se situe au 2^e rang des plus importants producteurs aquacole au Canada, il va sans dire que la conchyliculture fait actuellement l'objet d'une croissance importante sur la côte est du Nouveau-Brunswick, notamment en raison de la popularité des huîtres cocktails.

La tenue de cette rencontre est nécessaire afin de permettre à divers intervenants (i.e... étudiants, éducateurs, scientifiques, membres de l'industrie et gouvernement) de se tenir à jour au niveau des récents développements en aquaculture au Canada. Le partage des connaissances entre les intervenants des différentes provinces sur différents aspects, tels que le commerce, les sciences et la technologie), contribue à faire du Canada un pays compétiteur dans le secteur aquacole.

J'espère que votre présence à Saint-Jean au Nouveau-Brunswick, dans le cadre de cet événement vous sera bénéfique et que vous participerez en grand nombre aux conférences ainsi qu'aux activités prévues pour l'événement.

Emile Basque, President / Président

Canadian Aquaculture Industry Alliance / Alliance de l'Industrie Canadienne de l'Aquaculture
Welcome to delegates / Mot de bienvenue aux délégués



On behalf of the Canadian Aquaculture Industry Alliance, I am very pleased to welcome all delegates to Aquaculture Canada 08.

The selection of this year's conference theme, *Growing Quality Seafood Through Innovation* highlights several of our industry's strengths, showing us we have much to be proud of. Not only is Canada producing quality products that are in high demand worldwide, but innovation, diversification, and commercialization of new and improved techniques and technologies are a cornerstone of development for Canadian aquaculture.

The conference keynote address by Dr. Bruce Holeb will undoubtedly reinforce the unique nutritional importance of seafood products. Seafood has always been one of nature's healthiest foods and a strong body of nutritional science now confirms it. The Canadian aquaculture industry has much to be proud of and AC08 is a good opportunity to remind ourselves that we are not only a part of a growing industry that provides economic opportunity for rural Canadians – but we are also part of an industry that supplies high quality food products which are of critical importance to the health of consumers.

Since 1984, the annual conference of the Aquaculture Association of Canada has served as an effective forum for the exchange of the most up to date information on the business, science and technology of Canadian aquaculture. Once again, this year's conference promises to encourage a cooperative exchange of knowledge between representatives of a wide range of important stakeholder groups. By facilitating this cooperative knowledge exchange, AAC continues to play a key role in bringing forward new information that will allow this industry to maintain a leadership role as a top quality food producing industry in Canada.

CAIA congratulates AAC for another job well done and wishes everyone in attendance a productive and successful conference.

Ruth Salmon, Executive Director, Canadian Aquaculture Industry Alliance



Message from Premier Shawn Graham

As Premier of New Brunswick, it gives me great pleasure to welcome you to Aquaculture Canada 2008 and AquaFair 2008. The combination of these two important events will result in additional opportunity to highlight aquaculture in New Brunswick and in Canada.

The aquaculture industry in New Brunswick is the second largest in Canada and I am very pleased with its performance. The industry is a vital contributor to the economy of our province. The finfish sector in the Bay of Fundy and the shellfish sector on the East coast of the province create employment and wealth in rural coastal communities. As such, government has made aquaculture an integral part of our self-sufficiency agenda, identifying it as one of the sectors whose growth will contribute to achieving a self-sufficient province by 2026.

New Brunswick is not only the hub for aquaculture production in Atlantic Canada. The companies that have developed in support of primary production, including hatcheries, feed and equipment manufacturing, transport, and research and training institutions, support operations and growth of aquaculture in neighbouring jurisdictions as well. The success of the industry and its support industries is a testament that New Brunswick is a good place to be in business.

In New Brunswick, we are creating the conditions for companies in the aquaculture industry to be innovative and successful. Innovation is key to ensuring that this vital industry continues to be an important component of our provincial economy and in creating a self-sufficient future for all New Brunswickers.

I hope that you will find the time to experience the spectacular nature, lively culture and legendary hospitality of our unique part of the country. Enjoy the conference and fair, as well as your stay in New Brunswick.



Shawn Graham
Premier / Premier ministre

Message du Premier ministre Shawn Graham

À titre de premier ministre du Nouveau-Brunswick, j'ai le plaisir de vous souhaiter la bienvenue à Aquaculture Canada 2008 ainsi qu'au salon AquaFair 2008. Grâce à la tenue simultanée de ces deux événements majeurs, nous aurons davantage de possibilités de mettre en valeur l'aquaculture du Nouveau-Brunswick et du Canada.

L'industrie aquacole du Nouveau-Brunswick est la deuxième en importance au Canada et je suis très satisfait de son rendement. Elle contribue énormément à l'économie de la province. La pisciculture dans la baie de Fundy et la conchyliculture sur la côte Est de la province créent de l'emploi et des richesses dans les collectivités côtières rurales. Pour cette raison, le gouvernement a fait de l'aquaculture une composante importante de son plan d'action sur l'autosuffisance, la désignant comme l'un des secteurs dont la croissance nous aidera à devenir une province autosuffisante d'ici 2026.

Le Nouveau-Brunswick n'est pas que le pivot de la production aquacole dans les provinces de l'Atlantique. En effet, les entreprises qui s'y sont développées en faveur de la production primaire, notamment les écloséries, les fabricants d'équipement et de nourriture et les entreprises de transport, ainsi que les établissements de recherche et de formation, appuient également les activités et la croissance de l'aquaculture dans les provinces voisines. Le succès de l'aquaculture et de ses industries complémentaires est la preuve que le Nouveau-Brunswick est un endroit propice pour être en affaires.

Au Nouveau-Brunswick, nous créons les conditions nécessaires pour aider les entreprises aquacoles à être innovatrices et prospères. L'innovation est la solution pour que cette industrie essentielle continue d'être une partie intégrante de l'économie de la province et assure aux gens du Nouveau-Brunswick un avenir sous le signe de l'autosuffisance.

J'espère que vous aurez le temps de découvrir les richesses naturelles spectaculaires, la culture dynamique et l'hospitalité légendaire de notre coin de pays. Profitez bien de la conférence et du salon, ainsi que de votre séjour au Nouveau-Brunswick..

Be Innovative... and sustainable

On behalf of the Department of Agriculture and Aquaculture, it is my pleasure to welcome you to AquaFair 2008 and to the 25th anniversary meeting of the Aquaculture Association of Canada.

Aquaculture is a significant component of the food industry in New Brunswick and we are privileged to host these two events simultaneously, giving more opportunity to network and learn from colleagues across Canada.

The theme of this year's conference "Growing Quality Seafood Through Innovation" is very appropriate. Our aquaculture industry has incorporated principles of innovation and science in its production methods while enhancing competitiveness and maintaining environmental sustainability.

In New Brunswick, innovation is found throughout the spectrum; at the farm level and in the various support industries. A variety of innovative production techniques are being developed in the province; from integrated multi-trophic aquaculture to the latest in off-shore engineering technology and oyster suspension-rearing systems. In addition, New Brunswick is at the forefront of alternate species development with cod, halibut, sturgeon and bay scallops all being grown at pre-commercial scale.

The Department of Agriculture and Aquaculture remains committed to working with industry to address challenges and to provide an enabling environment to promote the continued growth of aquaculture in New Brunswick.

I hope your stay in New Brunswick is memorable and that the conference results in increased collaboration between partners in aquaculture development across Canada.



Être innovateur... et durable

Au nom du ministère provincial de l'Agriculture et de l'Aquaculture, je suis très heureux de vous accueillir à AquaFair 2008 ainsi qu'à la 25e réunion de l'Association aquacole du Canada.

L'aquaculture est une composante importante de l'industrie alimentaire du Nouveau-Brunswick et nous sommes privilégiés d'être l'hôte de ces deux activités de façon simultanée, ce qui donnera encore plus d'occasions de faire du réseautage et d'échanger avec nos collègues de partout au Canada.

Le thème de la conférence, « L'innovation et la production de fruits de mer de qualité », est très approprié. Nos entreprises aquacoles ont incorporé les principes de l'innovation et de la science dans leurs méthodes de production, ce qui les classe parmi les plus efficaces au monde, tout en accroissant leur compétitivité de même que la durabilité de l'environnement.

Au Nouveau-Brunswick, l'innovation est présente tant au niveau de l'entreprise que dans le secteur des services généraux. La mise au point de diverses techniques de production innovatrices est en cours; elles varient de l'aquaculture multi-trophique intégrée aux plus récents systèmes de technologie industrielle en mer et d'ostréiculture en suspension. Le Nouveau-Brunswick est également un chef de file dans le développement de nouvelles espèces dont la morue, le flétan, l'esturgeon et le pétoncle de baie, qui sont actuellement au stade précommercial.

Le ministère de l'Agriculture et de l'Aquaculture a toujours à cœur de collaborer avec l'industrie pour traiter les divers enjeux et offrir un milieu favorable à la promotion d'une croissance régulière de l'aquaculture grâce à l'innovation au Nouveau-Brunswick.

J'espère que votre séjour au Nouveau-Brunswick sera mémorable et que la conférence permettra d'améliorer la collaboration entre les partenaires engagés dans le développement de l'aquaculture au Canada.

Hon. / L'hon. Ronald Ouellette
Minister / Ministre
Department of Agriculture and Aquaculture / Ministère de l'Agriculture et de l'Aquaculture



**Message from His Worship
Mayor Norm McFarlane**

Welcome to Saint John!

It is with great pleasure that I extend a warm welcome to all delegates of the Aquaculture Canada 2008 and Atlantic AquaFair 2008, being held May 11-14, 2008 in our city.

I am pleased to have you in our city and I am certain that you will enjoy our hospitality.

Saint John Is Where It All Begins!

Home of the world-renowned Reversing Falls, Saint John has recently experienced dramatic revitalization. Impressive evidence of this transformation exists throughout the City, but nowhere more than in our core area. First-class accommodations, dining, shopping, and recreational opportunities are linked by a climate-controlled pedway system, the "Inside Connection", ensuring comfort and convenience.

Saint John effectively combines historic attractions such as the Old City Market and the New Brunswick Museum with more modern facilities which include the Saint John Campus of the University of New Brunswick, Market Square, the Canada Games Aquatic Centre, and Harbour Station.

Experience our wonderful city and all that it has to offer, visit our attractions, enjoy our dining and shopping, meet our people. There is a lot to see and do in Saint John. I hope that everyone enjoys their experience. We are delighted to have you. Enjoy your stay in Saint John.

Yours sincerely,

A handwritten signature in black ink that reads "Norm McFarlane".

Norm McFarlane
MAYOR





**A MESSAGE FROM CANADA'S
MINISTER OF FISHERIES AND
OCEANS**

On behalf of the Government of Canada, it is my pleasure to welcome you to Saint John for *Aquaculture Canada 2008*, the 25th annual meeting of the Aquaculture Association of Canada (AAC). In addition to that impressive milestone, this year's event is doubly special as the AAC has partnered with the New Brunswick Salmon Growers' Association to offer complementing technical sessions, tours and social events as part of *AquaFair 2008*.

As Minister of Fisheries and Oceans, I am quite proud that Budget 2008 committed \$22 million over the next two years to aquaculture development. Along with our successful existing programs, this funding will help the aquaculture industry reach its fullest potential. Through product certification, a more streamlined regulatory process, and strategic investment to spur innovation, we will build a vibrant industry that can compete and succeed on the world stage for years to come.

Science will drive our success. By developing policy based on solid research, we will strengthen environmental performance and develop Canadian products that are second to none in terms of safety and quality. We will improve economic performance by catalyzing increased industry investment in innovation. *Aquaculture Canada* is a perfect venue to bridge industry and research while creating opportunities for the long-term prosperity of this industry.

I believe in Canadian aquaculture. It is breathing new life into coastal and rural communities whose economic prospects were once more limited. Together, government, industry and science can build a thriving, responsible and sustainable aquaculture sector of which all Canadians can be proud.

I wish you a productive and pleasant stay in Saint John.

*The Honourable Loyola Hearn, P.C., M.P.
Minister of Fisheries and Oceans*



**MESSAGE DU MINISTRE DES PÊCHES
ET DES OCÉANS DU CANADA**

Au nom du gouvernement du Canada, je vous souhaite la bienvenue à Saint John à l'occasion d'*Aquaculture Canada 2008*, la 25^e réunion annuelle de l'Association aquacole du Canada (AAC). Cette manifestation a d'autant plus d'importance cette année qu'AAC a formé un partenariat avec la New Brunswick Salmon Growers' Association en vue de la tenue de séances techniques, de visites et d'activités sociales complémentaires dans le cadre d'*AquaFair 2008*.

En tant que ministre des Pêches et des Océans, je suis très heureux que le Budget 2008 prévoit un investissement de 22 millions de dollars sur deux ans pour le développement de l'aquaculture. En plus de contribuer au succès des programmes existants, ce financement aidera l'industrie de l'aquaculture à atteindre son plein potentiel. Grâce à l'homologation de produits, à un processus réglementaire simplifié et à des placements stratégiques visant à favoriser l'innovation, nous développerons une industrie dynamique capable de faire face à la concurrence et de réussir sur la scène mondiale.

Nous comptons sur la science pour obtenir le succès escompté. En élaborant des politiques fondées sur des recherches approfondies, nous renforcerons notre performance environnementale et développerons des produits canadiens incomparables en termes de sûreté et de qualité. Nous améliorerons le rendement économique en encourageant l'industrie à investir davantage dans l'innovation. *Aquaculture Canada* est l'occasion privilégiée d'opérer un rapprochement entre l'industrie et la recherche tout en créant des occasions susceptibles de contribuer à la prospérité à long terme du secteur.

Je crois en l'aquaculture canadienne; elle apporte un nouveau souffle aux collectivités côtières et rurales dont les perspectives économiques ont déjà été moins réjouissantes. Ensemble, le gouvernement, l'industrie et les scientifiques peuvent contribuer au développement d'une aquaculture prospère, responsable et durable qui sera source de fierté pour tous les Canadiens.

Je vous souhaite une réunion productive et un agréable séjour à Saint John.

*L'honorable Loyola Hearn, C.P., député
Ministre des Pêches et des Océans*



A MESSAGE FROM PAUL ZED, MEMBER OF PARLIAMENT FOR SAINT JOHN, NB

As the Member of Parliament for Saint John, it is a pleasure to welcome you to our community to participate in Aquaculture Canada 2008 & AquaFair 2008. I would also like to take this opportunity to congratulate the Aquaculture Association of Canada on its 25th anniversary meeting.

I am pleased that our city of Saint John, situated on the beautiful Bay of Fundy is the host city for Aquaculture Canada 2008 & AquaFair 2008. This year's theme "*Growing Quality Seafood through Innovation*" reflects the advancements and successes shared by business, science and technology in the heart of Atlantic Canada's salmon farming industry.

I would like to thank the organizers for their dedicated efforts to ensure the success of this event. I hope that you will find time to experience our warm hospitality and enjoy the beauty and historical significance of Saint John and its surrounding area.

Paul Zed
MP for Saint John



UN MESSAGE DE PAUL ZED, DEPUTE DE SAINT JOHN, AU NOUVEAU-BRUNSWICK

En tant que député de Saint John, j'ai le plaisir de vous accueillir dans notre région et je salue votre participation à Aquaculture Canada 2008 et au festival AquaFair 2008. Je saisis également l'occasion pour féliciter l'association Aquacole du Canada pour sa 25^e assemblée annuelle.

Je suis heureux que notre ville, Saint John, située dans la merveilleuse baie de Fundy, accueille les activités d'Aquaculture Canada 2008 et du festival AquaFair 2008. Le thème de cette année, « l'innovation dans la production de fruits de mer de qualité », reflète le progrès et le succès du commerce, de la science et de la technologie que vit l'industrie salmonicole dans la région atlantique.

Je remercie les organisateurs pour les efforts particuliers qu'ils ont faits pour garantir le succès de cette activité. J'espère que vous aurez le temps de profiter de notre chaleureuse hospitalité et de la beauté des sites historiques de Saint John et des environs.

Paul Zed
Député de Saint John

**Aquaculture Association of Canada – Lifetime Achievement Award /
Association Aquacole du Canada - Prix honorifique pour contributions**

**Wednesday, May 14, mercredi 14 mai, 2008 11:00 – 11:45
AM**

Room/Salon: Ballroom AB, Delta Brunswick Hotel

Chair: Alistair Struthers



Yves Bastien retired from the Federal Public Service in April 2007 after a 30 year career in the provincial and federal public services, and 24 years in aquaculture.

He started his aquaculture career with the Québec Department of Agriculture Fisheries and Food. Over a 13 year period he occupied 3 aquaculture positions: Aquaculture Industrial Development Officer, Coordinator for technical assistance to fisheries and aquaculture, and Mariculture Coordinator. His main function during this period was to organize and deliver extension services and technology transfer activities to the shellfish farming sector.

He was then seconded to the private sector, where as Director General, he designed, established and managed a semi-private mariculture investment fund called SODIM (Société de développement de l'industrie Maricole).

In 1999 he became Canada's first Commissioner for Aquaculture Development, a position that he held until 2004. Reporting to the Minister of Fisheries and Oceans, he was tasked with championing the development of aquaculture in Canada, particularly within the federal government. Key achievements included the creation of the Program for Sustainable Aquaculture (\$75 M over 5 years), a funding program to foster partnership and cooperation within the aquaculture industry, and 3 major reports with recommendations to the government of Canada: (1) *Legislative and Regulatory Review of Aquaculture in Canada*, (2) *Achieving the Vision*, and (3) *Recommendations for Change*.

At the end of his mandate as Commissioner he was offered the opportunity to implement his recommendations within the federal government and accepted the position of Executive Director, Aquaculture Management with DFO. During this period he managed DFO's policy and regulatory responsibilities regarding aquaculture. He was co-chair of the Aquaculture Task Group (ATG) of the Canadian Council of Fisheries and Aquaculture Ministers (CCFAM), played a key role in the creation of the National Aquatic Animal Health Program (NAAHP) and laid the groundwork for the federal investment announced in the last budget.

During his career he was a member of several organizations including Aquanet, the Canadian Aquaculture Industry Alliance, the World Aquaculture Society, Advisory Board of the Atlantic Veterinary College and the Aquaculture Association of Canada (of which he was twice elected President). In 2004 he received the Herb Dhaliwal Sustainable Aquaculture Award.

Yves Bastien a pris sa retraite du gouvernement fédéral en avril 2007 après 30 années de carrière au sein de la fonction publique provinciale et fédérale et 24 années en aquaculture.

Il a débuté sa carrière en aquaculture au Ministère de l'agriculture, des pêcheries et de l'alimentation du Québec où il a occupé 3 positions sur une période de 13 ans : Agent de développement industriel en

aquaculture, Coordonnateur à l'aide technique aux pêches et à l'aquaculture et Coordonnateur à la mariculture. Durant cette période, sa principale fonction consistait à organiser et à livrer des services d'aide technique et de transfert de technologie au secteur de la conchyliculture.

Il a ensuite été prêté au secteur privé où, à titre de Directeur général, il a conçu, mis en place et géré un fonds semi privé d'investissement en mariculture nommé SODIM (Société de développement de l'industrie maricole).

On lui a ensuite offert de devenir le premier Commissaire canadien au développement de l'aquaculture, une position qu'il a occupé de 1999 à 2004. Se rapportant au ministre des pêches et des océans, il devait se faire le champion du développement de l'aquaculture au Canada, particulièrement au sein du gouvernement fédéral. Entre autres réalisations, il a joué un rôle clé dans la création du Programme pour l'aquaculture durable (\$ 75 M sur 5 ans), il a conçu et géré un programme d'aide financière au partenariat et à la coopération au sein de l'industrie aquicole et a publié 3 rapports contenant des recommandations au gouvernement fédéral : (1) Revue légale et réglementaire de l'aquaculture au Canada (2) Concrétiser la vision (3) Recommandations pour un changement.

À la fin de son mandat de Commissaire, on lui a offert de mettre en œuvre ses recommandations au sein du gouvernement et il a accepté la position de Directeur exécutif de la gestion de l'aquaculture au MPO. Au cours de cette période, il a géré les responsabilités du MPO en matière de politiques et de réglementation en aquaculture. Il a été co-président du Groupe de travail en aquaculture (GTA) du Conseil canadien des ministres des pêches et de l'aquaculture (CCMPA), a joué un rôle clé dans la création du Programme national sur la santé des animaux aquatiques (PNSAA) et a préparé le terrain pour l'investissement fédéral annoncé lors du dernier budget.

Au cours de sa carrière, il a été membre de nombreuses organisations incluant Aquanet, l'Alliance de l'industrie canadienne de l'aquaculture, la World Aquaculture Society, le Conseil consultatif du Collège vétérinaire de l'Atlantique et l'Association Aquacole du Canada, organisation pour laquelle il a été élu président à 2 reprises. En 2004 il a reçu le prix d'aquaculture durable Herb Dhaliwal.

Registration and Information / Inscription et informations

Registration / Inscription

Registration is located on the Mezzanine Floor in the Coat Check and operates daily as follows:

L'inscription est dans le Mezzanine. Les heures d'opération sont:

- Sunday May 11th – dimanche 11 mai: 1PM - 6 PM
- Monday May 12th – lundi 12 mai: 7:30 AM - 5 PM
- Tuesday May 13th – mardi 13 mai: 8:00 AM - 5 PM
- Wednesday May 14th – mercredi 14 mai: 8:00AM - 12:00PM

All function tickets must be obtained from the registration desk.

Vous devez obtenir les billets pour banquets, barbecue et AGA au bureau d'inscription.

Entrance to Sessions / Accès aux sessions

Entry to a session and trade show will not be permitted without your Aquaculture Canada 08 name tag.

Vous devez porter votre carte d'inscription pour avoir accès aux salles de conférence et d'exposants.

Trade Show Exhibits / Salon commercial

A list of exhibitors is included in the program guide. Please show your support by patronising the exhibit area during the Health Breaks.

La liste des exposants se trouve dans le programme. SVP veuillez visiter le salon commercial pendant les pauses-café.

Set-Up / Montage

Set-up will take place on Sunday May 11th, beginning at 3:00PM and ending at 6:00 PM. Montage des kiosques doit se faire entre 15:00 et 18:00 Dimanche le 11 mai.

Take-Down / Démantèlement

Take-down will take place immediately following the end of the show, on Tuesday May 13th, 4:00 PM and booths must be totally removed by 7:00 PM.

Démantèlement des kiosques commencera dès la fin de l'expo mardi le 13 mai, 16:00 et les kiosques doivent être complètement démanteller par 19:00.

Program Notes for Speakers and Posters / Notes pour conférenciers et présentations d'affiches

Posters – Mezzanine Floor - Set-up time is Sunday May 11 from 4:00-6:00 PM.

Presenters are asked to be available at their poster during the Poster Session on Tuesday May 13 from 2:00-4:00 PM as well as during morning and afternoon breaks. Posters should be taken down by 6 PM on Tuesday 13 May.

Affiches – niveau Mezzanine - Montage dimanche le 11 mai entre 16:00 et 18:00. Les présentateurs sont priés de se présenter dans le salon pour la session des affiches mardi 13 mai entre 14:00 et 16:00, et aussi durant les pauses-café. Les affiches doivent être enlever au délais le plus tard à 18:00 mardi le 13 mai.

Speakers – Oral presenters are asked to meet their session chair and AV personnel no less than 15 minutes prior to the start of the session. Should changes occur in the program, these will be announced at the beginning of each session and posted in the foyer next to each session room. Speakers are asked to submit their presentations to the Registration Desk no later than 5 PM the day before they are to be given to allow for mounting on laptops.

Conférenciers – Ceux qui font des présentations orales doivent rencontrer le modérateur de la session et le personnel qui s'occupe du service audiovisuel au moins 15 minutes avant le début de la session. Si il y des changements dans le programme, ils seront annoncés au début de la session et montés près de la salle au début de la journée. Les conférenciers sont priés de soumettre leurs présentations avant 17:00 le jour avant d'être présenter pour qu'on les installe sur les ordinateurs.

Media Room / Salle de média

The Canterbury 1 Room is available for media related activities.
Le salon Canterbury 1 sera disponible pour les médias.

Job Board / Annonces d'emploi et résumés

Notice boards are available for posting résumés and job notices near the registration desk. Il y aura des tableaux disponibles pour les annonces près de l'inscription.

Refreshment Breaks / Pauses-santé

For your convenience, refreshment breaks will take place in the Trade Show Exhibitor area.

Les pauses-santé auront lieu dans le salon commercial.

Refreshment breaks are / Pauses-santé:

Monday May 12th / lundi 12 mai: 10 - 10:30 AM; 3:30 - 4 PM

Tuesday May 13th / mardi 13 mai: 10 - 10:30 AM; 3:40 - 4 PM

Wednesday May 14th / mercredi 14 mai: 10:40 - 11:00 AM

Student Affairs and Events / Affaires étudiant(e)s

Student Awards – The AAC is pleased to have sponsored travel for over 11 students to attend the conference. 26 students will compete for Best Oral and Best Poster presentations.

Prix étudiant(e)s – L'AAC est fière d'avoir commanditer plus de 11 étudiant(e)s avec des bourses de voyage pour participer à la conférence. 26 présentations par étudiant(e)s seront faites pendant la conférence.

Joe Brown Student Endowment BBQ – The proceeds from the activities at the Joe Brown Student BBQ on Monday May 12th go towards the AAC Student Endowment Fund to support student scholarships and travel to Aquaculture Canada meetings. Students are especially encouraged to attend and participate in the evening's events.

Barbecue Joe Brown pour le fond de support étudiant - Les profits des activités au barbecue aquacole lundi le 12 mai sont placés dans un fond de support en forme de bourses pour les étudiant(e)s. On encourage les étudiant(e)s de participer au barbecue.

AAC AGM and Luncheon / AGA de l'AAC et lunch d'affaires

This will take place in the Trinity Royal Room, 12:15- 1:30 PM, Tuesday May 13th. All AAC members are encouraged to attend. Luncheon tickets are available at the Registration desk.

L'AGA de l'AAC se tiendra dans la salle Trinity Royal de 12:15-13:30, mardi le 13 mai. Les membres de l'AAC sont bienvenus de participer. Les billets pour le lunch d'affaires sont disponibles au bureau d'inscription.

Social Functions / Événements Sociaux

We will once again be having a number of exciting social events featuring exceptional Canadian aquaculture products.

Il nous fait plaisir de vous offrir des événements sociaux mettant en oeuvre nos produits canadiens aquacoles de qualité exceptionnelle.

Presidents' Reception / Réception des présidents

Sunday May 11th, New Brunswick Museum, 6:30-9:30 PM. Cash bar.

Dimanche 11 mai, Musée du Nouveau-Brunswick, 18:30- 21:30. Bar payant.

Joe Brown BBQ for Student Endowment / Barbecue aquacole Joe Brown pour fond des étudiant(e)s

Monday May 12th, O'Learys Pub. 6:00-11:00PM. Tickets required in advance.

Lundi 12 mai, O'Learys Pub. 18:00-23:00. Billets requis.

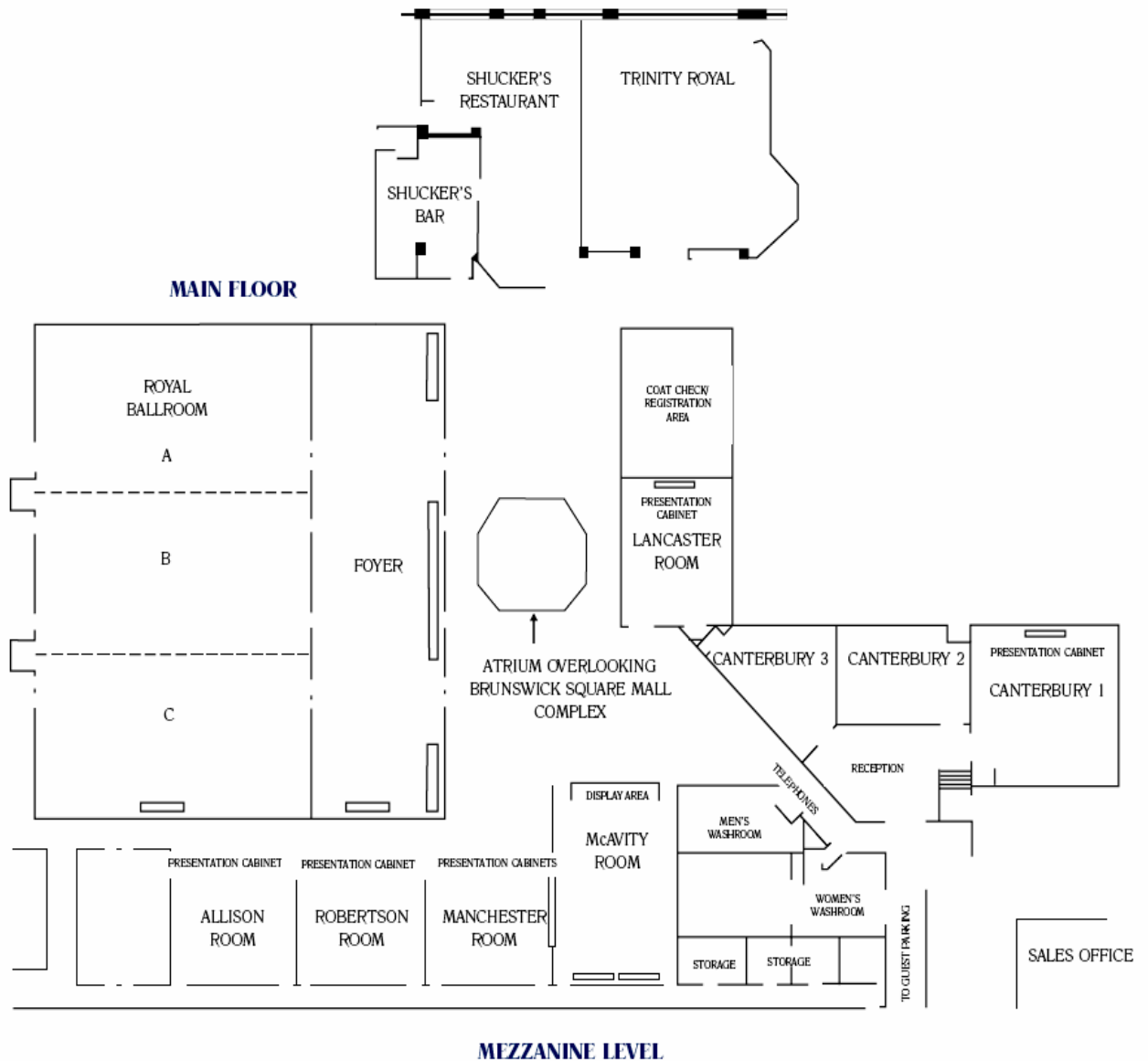
Banquet – Ballroom ABC, Delta Brunswick / Ballroom ABC, Delta Brunswick

Tuesday May 13th. Tickets required in advance (from Registration desk). Pre-dinner reception to be hosted by Genome Atlantic, 6:00PM, 7:30 PM dinner and exceptional entertainment.

Mardi 13 mai. Billets requis à l'avance (du bureau d'inscription). Réception 18 :00 par Génome Atlantique, dîner 19 :30 et un spectacle très spécial.

Session Rooms / Salles de conférences

Delta Brunswick Floor Plan



Program Outline / Sommaire du programme

DAY 1- SUNDAY, MAY 11

JOUR 1 – DIMANCHE, 11 MAI

| | |
|--------------------|---|
| 08:00-14:00 | Aquaculture Golf Tournament / tournoi de golf - Rockwood Park |
| 13:00-18:00 | Registration Open / Inscription ouvert |
| 10:00-18:00 | Trade Show Exhibitor Move-in / montage du salon commercial Atlantic Ballroom & Mezzanine |
| 16:00-18:00 | Poster Set Up / montage des affiches – Mezzanine |
| 18:30-21:30 | Presidents' Reception / Réception des présidents New Brunswick Museum / Musée du Nouveau-Brunswick |

DAY 2 – MONDAY, MAY 12

JOUR 2 – LUNDI, 12 MAI

| | |
|--------------------|---|
| 07:30-17:00 | Registration Open / Inscription ouvert |
| 10:00-16:00 | Trade Show / Salon commercial - Mezzanine & Ballroom Foyer |
| 10:00-16:00 | Poster Session / Affiches – Mezzanine |
| 8:15-18:00 | Opening Session, Keynote Speaker, Technical Sessions / Allocutions d'ouverture, session plénière, sessions techniques |
| 12:30-13:50 | IPSFAD AGM Luncheon (members only) / AGA IPSFAD (membres seulement) |
| 18:00-23:00 | Joe Brown BBQ in Support of AAC Students & Aquaculture Idol Contest / Barbecue Joe Brown & Concours Aquaculture Idol - O'Leary's Pub |

DAY 3 – TUESDAY, MAY 13

JOUR 3 – MARDI, 13 MAI

| | |
|---------------------|--|
| 08:00-17:00 | Registration Open / Inscription ouvert |
| 10:00-16:00 | Trade Show / Salon commercial - Mezzanine & Ballroom Foyer |
| 10:00-16:30 | Poster Session / Affiches – Mezzanine Speakers in attendance 14:00- 16:30 / Auteurs présents 14 :00-16 :00 |
| 9:00-16:00 | Plenary Speaker, Technical Sessions / Session plénière, sessions techniques |
| 12:15 -13:40 | AAC AGM Luncheon (members only) / AGA et diner d'affaires AAC (membres seulement) |
| 18:00-19:30 | Genome Atlantic Reception / Réception Génome Atlantique |
| 19:30-23:00 | Gala Dinner with InterAction Children's Theatre Group and Tradition / Gala avec groupe de théâtre InterAction Children's Group et groupe musicale Tradition AquaFair Aquaculturist of the Year Award / Présentation du prix de l'aquaculteur de l'année |

DAY 4 – WEDNESDAY, MAY 14

JOUR 4 – MERCREDI, 14 MAI

| | |
|----------------------|--|
| 08:00-12:00 | Registration Open / Inscription ouvert |
| 9:00-11:00 | Technical Sessions / Session techniques |
| 11:00-11:45 | Lifetime Achievement Award / Prix honorifique de l'AAC - Ballroom AB |
| 11:45 | Student Awards / Prix étudiants - Ballroom AB |
| 12:30 – 20:00 | Finfish Aquaculture Tour / Visite de site salmonicole |
| 13:00 | Oyster & Mussel Farm tours / Visite de sites conchylicoles (until 16:00 15 May) |

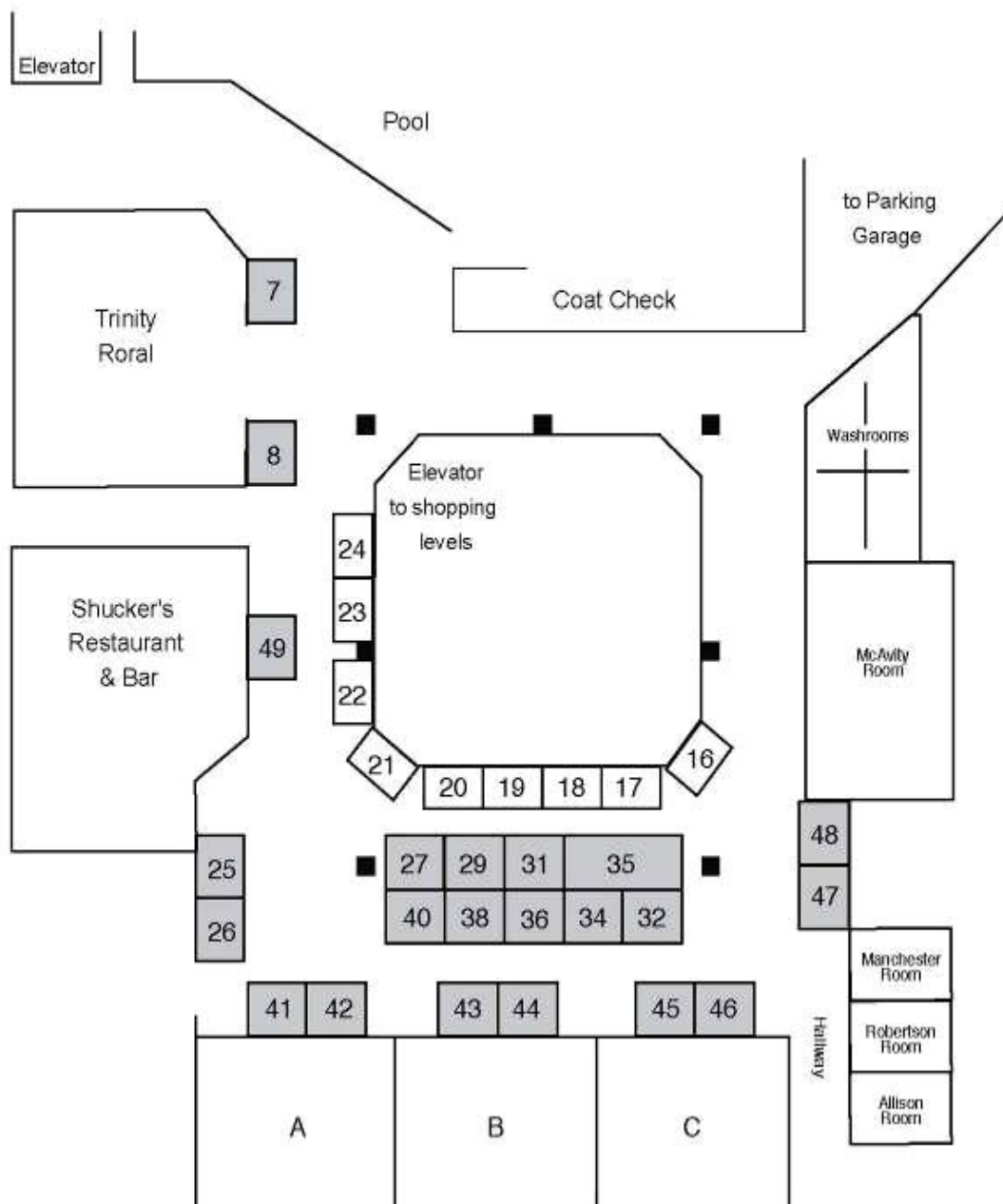
Trade Show and Poster Map / Salon Commercial et Affiches

Floor plan for illustration purposes only.

5' x 10' Booths



10' x 8' Booths



Trade Show Exhibitors and Booth Numbers / Exposants au salon commercial et emplacement

| Company | Booth # |
|---|----------------|
| AKVA group North America | 17 |
| Aquaculture Association of Canada | 18 |
| Atlantech Companies | 42 |
| Bouctouche Bay Industries Ltd | 46 |
| Canadian Farm Insurance Services Inc | 41 |
| Dura-Tech Industrial & Marine Ltd | 19 |
| EWOS Canada Ltd | 45 |
| Fisheries & Oceans Canada | 29 |
| GMG Fish Services Ltd a Division of Cooke Aquaculture Inc | 35 |
| Go Deep International | 49 |
| Hoskin Scientific Ltd | 27 |
| Hydraulic Systems Ltd | 20 |
| Inve Aquaculture Inc | 40 |
| Inventive Marine Products Ltd | 44 |
| National Research Council - IRAP ATL & NU | 36 |
| New Brunswick Professional Shellfish Growers Association (ACPNB/NBPSGA) | 16 |
| Norampac Moncton (a division of Cascades Canada) | 23 |
| Northeast Equipment Ltd | 21 |
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Speakers Outline & Abbreviated Titles / Résumés des présentations
MONDAY, MAY 12, Morning **LUNDI 12 MAI, matin**

| | | | |
|---------------|---|---|---|
| 7:30 | Registration open (until 5:00pm) | | |
| 8:15 | Opening Session Ballroom AB A. Struthers, President, AAC C. Graham, President, Aquafair 2008 J. Smith, Executive Director, NBSGA E. Basque, President, PSGANB Hon. Shawn Graham, Premier NB Hon. Ron Ouellette, Minister, NB Agriculture & Aquaculture Hon. Rick Doucet, Minister, NB Fisheries R. Salmon, Executive Director, CAIA Hon. L. Hearn, Minister, DFO (to confirm) | | |
| 9:15 | Conference Keynote - Ballroom AB Dr. Bruce Holub "Fish/seafood containing DHA/EPA omega-3 fatty acids for human health & prevention/management of cardiovascular & other diseases" | | |
| 10:00 | HEALTH BREAK, TRADESHOW and POSTERS (Ballroom Foyer and Mezzanine) | | |
| | Ballroom AB | Ballroom C | McAvity |
| | Food Safety, Quality & Nutritional Benefits | Shellfish Culture (contributed) | Advances in Broodstock Development & Management (contributed) |
| 10:30 | Schwartz Reel in healthy - seafood - sorting through the benefits versus risk | Belvin Development and evaluation of mussel seed quality standards | Trippel Overview of the Atlantic cod genome project |
| 10:50 | | Ouellette Interactions between the rock crab fishery & mussel aquaculture productivity in PEI | Garber Genetic variation of cultured Atlantic cod (<i>Gadus morhua</i>) in New Brunswick & Newfoundland |
| 11:10 | Lall Dietary changes to improve the nutritional quality of farmed fish for human health | Vickerson Effects of brine, lime & acetic acid treatments & transport on mussel seed | Fordham Hormone-induced ovulation and spermiation in Atlantic cod (<i>Gadus morhua</i>) |
| 11:30 | Friesen Quality of farmed salmon in Atlantic Canada | Joyce BC shellfish industry: risk management practices & perceptions in product monitoring & traceability | Butts Artificial fertilization strategies for winter flounder & Atlantic cod |
| 11:50 | Rose IFQC - farmed seafood certification | Myrand Effects of current velocity, turbulence, substratum, & size on dispersal of <i>Mya arenaria</i> | Dupont Cyr Wolffish broodstock management: photoperiod a powerful tool for productivity |
| 12:10 | Panel Discussion | Dias Hybridization of mussel (<i>Mytilus</i>) species in Scotland | Ritchie Development of a broodstock based DNA traceability program |
| 12 :30 | LUNCH – IPSFAD AGM Luncheon, Trinity Royal Room (members only) / ON OWN | | |

MONDAY, MAY 12, Afternoon**LUNDI 12 MAI, après-midi**

| | Ballroom AB | Ballroom C | McAvity |
|--------------|---|---|---|
| | International Workshop on Sturgeon Culture | Environmental Interactions of Shellfish & Finfish Aquaculture (contributed) | Aquaculture Research, Regulatory & Policy (contributed) |
| 13:50 | Williot Peculiarities in sturgeon aquaculture as illustrated by some husbandry-related issues | Chang Characterization of benthic sulfide levels at salmon farms in southwest New Brunswick | Dupuis Replacement class screening reports for suspended & off-bottom system culture sites in NB |
| 14:10 | | Page Testing DEPOMOD for predicting benthic impacts of salmon farming in southwest New Brunswick | Parker Pacific Salmon Forum - building trust & collaboration |
| 14:30 | 14:20 - Chebanov Early sexing and staging of farmed and wild sturgeon juveniles by using ultrasound | Robichaud Influence of mussel aquaculture & an associated invasive ascidian on macroinvertebrates | O'Riordan Pacific Salmon Forum - modeling to assess sea lice abundance & distribution |
| 14:50 | Wei Sustainable sturgeon aquaculture in China | Heath Acoustic assessment of the impacts of suspended shellfish culture in British Columbia | DeJager Information finding you over the web in near real time: AquaPort.ca |
| 15:10 | | Pearce Do intertidal geoduck clam aquaculture & harvest significantly impact the local benthic environment? | Whelan Aquaculture Collaborative Research and Development Program (ACRDP): history & future |
| 15:30 | HEALTH BREAK, TRADESHOW and POSTERS (Ballroom Foyer and Mezzanine) | | |
| | Advances in Sturgeon Culture (continued) | Environmental Interactions of Shellfish (contributed) | R & D Network - Driving Industry Research |
| 16:00 | Ceapa Sturgeon aquaculture development – a business insight | Fréchette Hierarchical structure of bivalve culture systems and optimal stocking density | Graham – Opening remarks Dalton – SLICE project summary Warris – PEI R & D priorities Green – Update on R & D in NL Boucher – IPSFAD update MacCallum – Everything we want to do is illegal – BC shellfish industry Penton – Looking forward: BCSFA research strategy Burke – Research at PSGANB Discussion – Collaboration between researchers & industry |
| 16:20 | Archibald Influence of PurGRO2® Oxygen Infusion System on growth of shortnose sturgeon | Lachance-Bernard Self-thinning in blue mussel populations reared in suspension culture | |
| 16:40 | Panel Discussion | Liutkus Seston dynamics: Effects of salmon farm effluent on biodeposit dynamics of mussels | |
| | | | |

TUESDAY, MAY 13, Morning**MARDI 13 MAI, matin**

| | | | |
|--------------|---|---|---|
| 8:00 | Registration open (until 5:00pm) | | |
| 9:00 | Plenary I - Ballroom AB Dr. James Anderson "International seafood trade and the emerging dominance of aquaculture" | | |
| 10:00 | HEALTH BREAK, TRADESHOW and POSTERS (Ballroom Foyer and Mezzanine) | | |
| | Ballroom AB | Ballroom C | McAvity |
| | Aquaculture Marketing: Canadian & International Perspectives | Inter-Provincial Partnership for Sustainable Freshwater Aquaculture: the Way Forward | Regional Aquatic Animal Health & Biosecurity |
| 10:30 | Shuve North American fresh mussel market study | Vandenberg IPSFAD's third action plan implementation status | Beattie Biosecurity avoidance from egg to market |
| 10:50 | Salmon Fresh salmon market study | Vandenberg Feed goes green: new diet development in Canada | Hammell Fish health decisions in Atlantic Canada supported by epidemiology |
| 11:10 | Gollin Perceptions of Canadian aquaculture by US seafood opinion leaders | Nabi Positioning Canada's trout industry: the competitiveness approach | Hawkins Biosecurity practices in Cooke Aquaculture |
| 11:30 | Gomes Marketing and branding in the Canadian agrifood market | Redmayne U.S. market opportunity assessment: freshwater trout | Byrne Research & diagnostic work on aquatic pathogens supported by high-level containment lab |
| 11:50 | Discussion Panel | Stechey Canadian experimental aqua-farm feasibility study: results & next steps | O'Brien Biosecurity practices in Newfoundland aquaculture |
| 12:10 | Panel Discussion | Panel Discussion | Panel Discussion |
| 12:15 | LUNCH –AAC AGM Luncheon, Trinity Royal Room (members only, tickets required)/ ON OWN | | |

TUESDAY, MAY 13 Afternoon**MARDI 13 MAI, après-midi**

| | Ballroom AB | Ballroom C | McAvity |
|---------------|--|--|---|
| | Advances in Marine Finfish Culture (contributed) | Integrated Multi-Trophic Aquaculture (contributed) | Fish Health (contributed) |
| 13:40 | LeFrançois Spotted wolffish cultivation: on the brink of commercialization? | Reid Modelling nutrient recovery in open-water, Integrated Multi-Trophic Aquaculture (IMTA) systems | Frenette In quest of a sensitive and specific PCR assay to diagnose Loma morhua in Atlantic cod |
| 14:00 | Forward Development of probiotics for use in marine finfish larviculture | Robinson Economic significance of aquaculture research: insights gained on cost-benefit ratios from IMTA research | Barker Preliminary studies on the role of sea lice as a vector of bacterial pathogens |
| 14 :20 | Bélanger Influence of weaning time on growth & survival of winter flounder juveniles | Hannah Suitability of the California sea cucumber in Integrated Multi-Trophic Aquaculture | Ritchie Virulence and resistance responses from infection of Atlantic salmon to various ISAV isolates |
| 14 :40 | Avery Blastomere asymmetry & hatching success in Atlantic cod | Blair The use of biochemicals in cultured blue mussels as spatial & temporal tracers in IMTA & monoculture systems | Beaudin Antibacterial capacity of probiotic candidates against Vibrio in marine bivalve larvae |
| 15 :00 | Forsythe Development of high value aquaculture for New Zealand | Chopin The world's largest maricultured biomass is seaweeds. IMTA is an opportunity to address this imbalance | MacKinnon Vaccine best practices throughout the production cycle |
| 15 :20 | Symonds Broodstock developments in kingfish, groper and abalone in New Zealand | Cross Intensive SEA-System design: an opportunity for innovation | |
| 15 :40 | POSTER SESSION and HEALTH BREAK | | |

WEDNESDAY, MAY 14, Morning**MERCREDI 14 MAI, matin**

| | Ballroom AB | Ballroom C | McAvity |
|--------|---|---|---|
| | Finfish Nutrition & Physiology (contributed) | Aquaculture Waste Management / Miscellaneous (contributed papers) | NSERC - Industry Strategic Programs Session |
| 9 :00 | Hori Divergent cortisol stress responsiveness of Atlantic cod (<i>Gadus morhua</i>) | Conroy Phosphorus leaching during the hydrolysis of fish waste solids | Chair: Ruth Salmon, CAIA |
| 9 :20 | Wijekoon Effect of diet & temperature on muscle lipid & fatty acid composition in steelhead trout (<i>Oncorhynchus mykiss</i>) | Fraser Anaerobic digestion of aquaculture waste solids | |
| 9 :40 | Deslauriers Replacement of fish oil in Atlantic salmon diets by poultry oil | Reda The sudden propagation of harmful algae <i>Didymosphenia geminata</i> | |
| 10 :00 | Diouf Preservation of lipid content in microalgae concentrates from ultrafiltration process | Hedayatifar Quality changes of cold-smoked rainbow trout during storage | |
| 10 :20 | MacPherson Transferring Arctic charr to seawater: problems and potential | | |
| 10 :40 | HEALTH BREAK | | |
| 11 :00 | AAC LIFETIME ACHIEVEMENT AWARD AND PRESENTATION – BALLROOM AB | | |
| 11 :45 | STUDENT AWARDS AND CLOSING – BALLROOM AB | | |

Opening & Welcome / Allocution d'ouverture et de bienvenue

Monday May 12, 2008 – lundi mai 12, 2008

8:15 - 9:15 AM

Room/Salon: Ballroom AB

Chair: Alistair Struthers (President, Aquaculture Association of Canada)

A. Struthers, President, AAC

C. Graham, President, AquaFair 2008

J. Smith, Executive Director, NBSGA

E. Basque, President, PSGANB

Hon. Shawn Graham, Premier NB

Hon. Ron Ouellette, Minister, NB Agriculture & Aquaculture

Hon. Rick Doucette, Minister, NB Fisheries

R. Salmon, Executive Director, CAIA / AICA

Hon. L. Hearn, Minister, DFO (to confirm)

Conference Keynote Presentation / Session Plénière

Monday May 12, 2008 - lundi 12 mai, 2008

9:15 - 10:00 AM

Room/Salon: Ballroom AB

Chair: Alistair Struthers (President, Aquaculture Association of Canada)



Dr. Bruce Holub

Fish/seafood containing DHA/EPA omega-3 fatty acids for human health and the prevention/management of cardiovascular and other diseases

Dr. Bruce Holub is University Professor Emeritus, Department of Human Health & Nutritional Sciences at the University of Guelph. He has served as President, Nutrition Society of Canada and Chair, Nutrition Task Force (Heart & Stroke Foundation of Ontario). He has authored over 200 papers in scientific journals (medical, nutrition, other) in addition to various book chapters and conference proceedings. His research program is focused on dietary omega-3 fatty acids (DHA plus EPA) from fish/fish oils, plant oils, and resulting nutraceuticals plus functional foods for human health (throughout the human life cycle) and the prevention/management of cardiovascular disease and other chronic disorders.

As well, he has been active in the evaluation of nutraceuticals and agri-foods for improving human health, disease prevention and management, and their potential for considerable cost-savings to the healthcare system. He has also been studying the composition and health risks associated with foods containing 'trans' fatty acids. Dr. Holub also maintains active collaborative research with clinical groups at various Canadian medical schools, the Mayo Clinic in the United States, Japan, Greenland, Turkey, and the agri-food sectors.

Prof. Holub also serves as Scientific Director for the DHA/EPA Omega-3 Institute and a freely-accessible website that provides current evidence-based health and research information on DHA/EPA from fish/seafood at www.dhaomega3.org.

Food Safety, Quality, and Nutritional Benefits

Monday May 12, 2008 - lundi 12 mai, 2008

10:30 AM – 12:30 PM

Room/Salon: Ballroom AB

Chair: Santosh Lall

Keynote - Rosie Schwartz, RD



Reel in healthy seafood - sorting through the benefits versus risk

Rosie Schwartz, author of the best-selling book, *The Enlightened Eater's™ Whole Foods Guide: Harvest the Power of Phyto Foods* (Viking Canada), is a Toronto-based consulting dietitian-nutritionist and a licensed member of College of Dietitians of Ontario. Translating the science of nutrition into healthy and delicious fare has been her focus, both in her private nutrition counselling practice and her extensive work with the media.

She is a columnist for a number of magazines including *Homemaker's*, *Diabetes Dialogue*, a magazine of the Canadian Diabetes Association and *CARP News 50Plus*. She recently won her second National Mature Media Award for her ongoing food and nutrition column in *50Plus*. Her columns have also appeared in other publications such as *National Post*, the *Ottawa Citizen*, *Montreal Gazette*, *Chatelaine*, *Today's Parent* and *Arthritis News*. Other articles have appeared in other publications such as the *Globe and Mail*, the *Medical Post* and *Family Circle*. As a regular contributor to television and radio, she appeared as a weekly nutrition commentator on *CBC Morning* for three years. Other appearances have been on programs such as *Canada AM*, *Marketplace*, *Venture*, *Balance TV* and the *Heart and Stroke Health Show* in addition to local talk shows across the country. Schwartz is also often interviewed for her perspective on nutrition on national news programs.

In addition, she is a media spokesperson and a consulting dietitian for the Heart and Stroke Foundation. As well, she has conducted workshops on nutrition for audiences on both on land at sea at venues such as the Pamela Wallin Cultural Weekends, the Department of Fisheries and Oceans Canada as well as on board cruise ships sailing in the Mediterranean.

Plenary Session / Session plénière

Tuesday, May 13, 2008 - mardi 13 mai 2008

9:00 AM – 10:00 PM

Room/Salon: Ballroom AB

Chair: Cyr Couturier

Keynote: Dr. James L. Anderson

**Professor & Chair, Dept. of Environmental & Natural Resource
Economics, University of Rhode Island**



International seafood trade and the emerging dominance of aquaculture

There are only two fundamental sources for increasing seafood supply: 1) better management and utilization of wild fish stocks and 2) aquaculture. However, nearly all significant growth in global seafood harvest and international trade will come from aquaculture.

The potential for growth and improved efficiency in the aquaculture sector has a long way to go. Aquaculture will benefit from: biotechnology, better disease management, improved nutrition and feed development, consolidation and better organization, improved farm management and marketing. As aquaculture expands, uncertainty in quantity and price will likely decline relative to that found in the wild fishery sector.

Aquaculture will play an increasing role in the global seafood economy. Technological change will continue to make aquaculture more competitive, resulting in increased international trade, improved marketing/distribution systems, more efficient resource utilization, additional value-added seafood products and new promotional campaigns.

Given these changes, what is the potential role of generic marketing? Under what conditions is it likely to be successful? What can be learned from previous generic marketing and promotion campaigns? What does an aquaculture sector need to have a successful program?

Biography

James Anderson is involved with numerous research projects related to fisheries and aquaculture management, seafood markets and international trade. Recent work has focused on analysis of international salmon, tuna and shrimp markets, seafood futures and evaluating how aquaculture development and rights-based fisheries management is changing the global seafood sector. In 2003, his book entitled *The International Seafood Trade* was published. In 2007, he co-authored *The Great Salmon Run: Competition between Wild and Farmed Salmon* with Gunnar Knapp and Cathy Roheim. He is the Editor of *Marine Resource Economics* the leading international journal in the field. He has served on three National Research Council committees related to aquaculture. He earned his Ph.D. in Agricultural and Resource Economics from the University of California at Davis.

Sessions and Abstracts – Aquaculture Canada^{OM} 2008

Food Safety, Quality, & Nutritional Benefits

Monday, May 12, 2008, - lundi 12 mai 2008

10:30 AM - 12:30 PM

Location: Ballroom AB

Chair: Santosh Lall

10:30 Schwartz

Reel in healthy seafood - sorting through the benefits versus risk

11:10 Lall

Dietary changes to improve the nutritional quality of farmed fish for better human health

11:30 Friesen

Quality of Farmed Salmon in Atlantic Canada

11:50 Rose

IFQC – farmed seafood certification (no abstract)

12:10 Panel Discussion

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award.

Dietary changes to improve the nutritional quality of farmed fish for better human health

Santosh P. Lall, National Research Council, Institute for Marine BioSciences, Halifax, Nova Scotia, B3H 3Z1

Limitations in the availability of marine by-products and some restrictions placed by government agencies on the inclusion of certain terrestrial animal products in fish feeds has resulted in an urgent need to search for alternative plant products. At the same time, rapid development of the biofuel industry has resulted in higher costs for grains and oilseeds which are reflected in higher fish feed costs. Several plant-derived ingredients and single cell proteins such as yeasts, bacteria and microalgae seem to offer the most promising sources of feedstuffs for salmonid feeds. Despite these constraints, changing technologies, ingredients, formulations and nutritional strategies to replace fish meal and oil in salmonid diets continue to provide high nutritional quality salmon and trout for human consumption. Marine fish oils (MFO) have traditionally been used in salmon and marine fish diets to provide essential fatty acids (mainly n-3 highly unsaturated fatty acids) and energy. The current level of MFO being used globally by the expanding aquaculture industry has led to increased concern about the overexploitation of these resources. Recent research on rainbow trout, brown trout, Atlantic salmon, turbot and halibut has shown that it is possible to replace the major proportion of MFO with vegetable oils (VO) and maintain optimum growth and feed utilization over the major part of their lifecycle. Finishing diets based on MFO can then be used to tailor the desired level of eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) for human nutrition. To date, any significant effects of either partial or full replacement of vegetable oils (canola, rapeseed and flaxseed oils) on flesh and sensory quality of fish have not been observed.

Farmed salmonids and marine fish are an excellent source of B vitamins including niacin (functioning of the digestive system, skin, and nerves), vitamin B₁₂ (maintenance of the nervous system, fatty acid synthesis and energy production), vitamin D (bone formation) and vitamin A (vision, immune function). These fish also contribute appreciable amounts of dietary calcium, heme iron, zinc and other nutrients, which are often marginal in human diets. Fish is one of the best sources of dietary selenium and iodine. The presentation will briefly review the current state of knowledge on lipid and nutrient composition and organoleptic properties of farmed fish as well as potential nutritional strategies that can increase the nutritional value of farmed fish for better human health.

Lowering flesh organic contaminants in farmed Atlantic salmon while concurrently maintaining levels of EPA and DHA through dietary modifications

E. Friesen*¹, D. Higgs², M. Ikonomou³, S. Balfry², B. Skura¹, G. Deacon⁴, J. Mann⁵, Cory Dubetz³, K.P. Ang⁶ and A. Oterhals⁷

¹ Faculty of Land and Food Systems, Food, Nutrition and Health, University of British Columbia, 6650 N.W. Marine Drive, Vancouver, British Columbia, V6T 1Z4

² Department of Fisheries and Oceans/University of British Columbia, Centre for Aquaculture and Environmental Research, 4160 Marine Drive, West Vancouver, British Columbia, V7V 1N6.

³ Department of Fisheries and Oceans, Institute of Ocean Sciences, 9860 West Saanich Rd. Sidney, British Columbia, V8L 4B2.

⁴ Skretting Canada Ltd. 1350 East Kent Ave. Vancouver, British Columbia, V5X 2Y2

⁵ Ewos Canada Ltd. 7721-132nd Street, Surrey, British Columbia, V2W 4M8

⁶ Stolt Sea Farm Inc., 1761 Redwood Street, Campbell River, V9W 3K7, Canada.

⁷ Norwegian Institute of Fisheries and Aquaculture Research, Kjerreidviken 16, N-5141 Fylingsdalen, Norway

In 2004, a paper was published in Science that revealed that farmed Atlantic salmon have higher level of persistent organic pollutants (POPs) than wild Pacific salmon. Although the levels fell below standards set by government health regulatory agencies and were not of concern, the two major aquaculture feed companies in British Columbia (BC) Canada increased their usage of plant and animal protein and lipids. Consequently, an on-farm field study conducted in 2005 revealed that BC farmed Atlantic salmon now

have flesh POP levels in the same range as wild pacific salmon, while having higher flesh levels of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

The on-farm field study was complimented with a laboratory feeding trial that examined the effects of alternative lipid sources (flaxseed oil, poultry fat, crude super de-gummed canola oil), activated carbon treatment anchovy oil and protein sources (canola concentrate meal, soy concentrate meal and poultry by-product meal) on flesh POP concentrations and fatty acid composition. Triplicate groups of Atlantic salmon (mean initial wt 84g) were fed one of 7 dietary treatments for 24 weeks, followed by a 12-week finishing period with fish oil based diets. At the end of phase 1, fillet fatty acid compositions were found to reflect those of the dietary treatments, and the levels of EPA and DHA were almost completely restored by the end of phase 2. Levels of polychlorinated dibenzo dioxins/furans and polychlorinated biphenyls were significantly lowered after phase 1 and did not return as quickly as EPA and DHA in phase 2. Flesh levels of polybrominated biphenyl ethers were influenced by both ingredient composition and pelleting of the diets.

Shellfish Culture – Contributed Papers

Monday, May 12, 2008, - lundi 12 mai 2008

10:30 AM - 12:30 PM

Location: Ballroom C

Chair: Bruno Myrand

10:30 S. Belvin

Development and evaluation of mussel seed quality standards.

10:50 M. Ouellette

Interactions between the rock crab (*Cancer irroratus*) fishery and mussel aquaculture productivity in Prince Edward Island: an overview

11:10 A. Vickerson

The effects of brine, lime and acetic acid antifouling treatments and transport conditions on the short and long term performances of mussel seed (*Mytilus* spp.)

11:30 A. Joyce

Health of the British Columbia Shellfish Industry: An assessment of risk management practices and stakeholder risk perceptions in the monitoring of contaminants and tracking of product

11:50 Myrand

Effects of current velocity, turbulence, substratum, & size on dispersal of *Mya arenaria*.

12:10 P.J. Dias

Survey of mussel (*Mytilus*) species in Scotland.

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award.

Development and evaluation of mussel seed quality standards

S. Belvin^{*1}, R. Tremblay², F. Pernet³, N. Leblanc⁴ and T. Landry⁵,

¹ Institut des Science de la Mer et Centre Aquacole Marin de Grande-Rivière, 6 rue du Parc, Grande-Rivière, Qc, G0C 1V0

² Institut des Science de la Mer, 310 allée des Ursulines, Rimouski, Qc, G5L 3A1

³ Coastal Zones Research Institute Inc., 232B avenue de l'Église, Shippagan, NB, E8A 1J2

⁴ Coastal Zones Research Institute Inc., 232B avenue de l'Église, Shippagan, NB, E8A 1J2

⁵ Department of Fisheries and Oceans, Science Branch, Maritimes Region, Gulf Fisheries Center, P.O. Box 5030, Moncton, NB E1C 9B6.

With the increasing number of grow-out sites and the development of husbandry practices, the mussel aquaculture industry has become an important element in the economy of PEI and NB. The growth of the existing industry depends mainly on the improvement of husbandry practices. In mussel farming, seeds supply is crucial since it relies only on natural spat collection. A study has shown that the cultured stocks are self-sufficient from a quantitative standpoint. However, it has been demonstrated that there is a relationship between heterozygosity and physiological fitness of the mussel. The degree of heterozygosity is a good indicator for the performance of a stock and can be linked to mortality events during high environmental stress conditions. The goal of this study was to develop and assess seed quality criteria based on physiological and pathological health with the following objectives 1) Determine the biochemical/genetic profile in relation to physiological performance of mussels (*M. edulis*), 2) develop practical evaluation methods to assess physiological fitness at the individual and population level 3) assess and monitor pathological health and productivity of various mussel seed stocks from NB and PEI in relation to their physiological health. The first step was to compare performance of each stock and same laboratory conditions at 12 and 25°C. Performance was estimated by metabolic measures, lipid class dynamic, heterozygosity and survival to stressful even. Results showed that all the stocks had deficiencies in heterozygosity and mussels from Tracadie Bay may be more able to adapt to changing water temperature.

Interactions between the rock crab (*Cancer irroratus*) fishery and mussel aquaculture productivity in Prince Edward Island: an overview

M. Ouellette*, J.-F. Mallet, A. LeBlanc and L. Comeau.

Fisheries and Oceans Canada, Gulf Fisheries Centre, Moncton, NB, Canada, E1C 9B6.

The rock crab directed fishery has evolved in the southern Gulf of St. Lawrence, over the past twenty years, with landings up to 4,044 mt in 2004. Concurrently, the mussel aquaculture industry has expanded considerably in Prince Edward Island, with landings up to 17,576 mt for that same year. Overlaps between these two activities can now be observed in several bays and estuaries. For a number of years, concerns have been raised by mussel growers as to possible impacts of the rock crab fishery within the cultivated areas on their industry.

The main objective of this project is to examine whether there is a change in the abundance and structure of the rock crab populations on and under mussel lines during and following the directed fishery. The assertion that rock crabs are beneficial to mussel culture productivity will also be evaluated. The results obtained could set a working base to improve the rock crab fishery management measures and thus ensuring that both industries can realize their full potential. They are both viewed as important activities in sustaining the economic viability of coastal communities. This scientific investigation will thus contribute in applying coastal integrated management of human activities.

The effects of brine, lime and acetic acid antifouling treatments and transport conditions on the short and long term performances of mussel seed (*Mytilus* spp.)

A. Vickerson^{*1}, C. Couturier¹ and C. McKenzie²

¹ School of Fisheries, Marine Institute of Memorial University, St. John's, NL A1C 5R3

² Fisheries and Oceans Canada, Northwest Atlantic Fisheries Centre, St. John's, NL A1C 5X1

Transferring mussel seed from collection sites to grow-out sites can subject seed to unique and multiplicative stressors (e.g. long transport times, treatments for mitigating the spread of invasive species) that could compromise their health and subsequent performance. Batches of mussel seed (30-40mm length) were stored on ice or at ambient air temperature (4°C, 100% humidity) and subjected to the following antifouling treatments, either before (30-s seawater rinse or no rinse), or after a 24-h simulated storage/transport period: 300 ppt brine, 4% lime, or 4% acetic acid (30-s. dip). Short term health of seed was assessed via the Neutral Red Assay and attachment via byssal threads 24-hrs post treatment. Seed stored at ambient air temperature and treated with lime or brine had Neutral Red Retention (NRR) times that were significantly lower than the control (ANOVA, $p < 0.05$), indicating greater levels of stress. Seed treated with acetic acid and not rinsed had NRR times and attachment post-24-hrs that were significantly lower than the control. The findings show that the stress level of mussel seed treated with brine or lime can best be mitigated by storing seed on ice during transport and seed treated with acetic acid should be rinsed post-treatment.

Health of the British Columbia Shellfish Industry: An assessment of risk management practices and stakeholder risk perceptions in the monitoring of contaminants and tracking of product

A. Joyce¹

¹ Institute of Resources, Environment and Sustainability, Aquatic Ecosystem Research Laboratories, 2206 East Mall, University of British Columbia, Vancouver, BC V6T 1Z3

The ability to communicate risk-related information to the public plays an important role in determining public confidence in the aquaculture industry. Stigmatization of the aquaculture industry, such as observed in response to campaigns against farmed salmon, may reduce purchases of specific products which consumers believe pose unacceptable health or environmental risks. In the event of a risk incident, such as occurred in the late 1980s with domoic acid in PEI mussels, the loss of confidence in the risk management practices of an industry may also lead to amplification of risk and industry stigmatization. There is strong evidence that management strategies can be devised to reduce stigma effects, and to minimize amplification effects in the event of an incident. Risk perceptions are socially constructed, and managers and policy makers with a good understanding of how public risk perceptions are constructed are more likely to succeed in devising effective environmental monitoring protocols, and are more likely to be able to reduce damage to an industry in the aftermath of a health-related incident.

We present the results of fifty-six interviews conducted with stakeholders in the British Columbia shellfish industry regarding their perceptions of the health and environmental risks associated with shellfish production. We examine risk management protocols for both wild and cultured fisheries relative to their effectiveness in tracking point and non-point source contaminants. Our results find a strong disconnect between current risk management protocols and public perceptions of the risks of shellfish production and consumption. Our results, however, are consistent with psychometric work on risk perception which shows that particular characteristics of risk - such as whether the consequences of risk are uncertain or unknown, whether exposure is voluntary, or outcomes are reversible - play a more important role in determining public risk responses than expert assessments. Our findings also point to the fact that risk communication is influenced by a variety of socio-political factors, including public trust in risk management protocols, and credibility in the agencies administering them.

Effects of current velocity, turbulence, type of substratum and clam size on dispersal of *Mya arenaria*

REDJAH, I¹, R. TREMBLAY¹, B. MYRAND*², F. OLIVIER³, F. PERNET⁴, U. NEUMEIER¹ and L. CHEVARIE^{1,2}

¹ ISMER-UQAR – 310 Allée des Ursulines, Rimouski, Qc, Canada, G5L 3A1

² MAPAQ - CeMIM – 107-125, chemin du Parc, Cap-aux-Meules, Qc, G4T 1B3

³ MNHN – 17, Avenue George V, BP 70134, 35801 Dinard, France

⁴ IRZC – 232B, Ave de l'Église, Shippagan, NB, Canada, E8S 1J2

Mya arenaria lives into soft substrates in the tidal zone. It may bury as deep as 1.5 times its shell length. Small clams are, thus, buried near the surface and prone to passive dispersal. The purpose of this study was to measure in a laboratory flume the effects of currents, substratum and clam size on dispersal. First, laminar currents with increasing velocities (0 to 0.60 m s⁻¹) were applied upon three different substrates (medium- and large-grain sand and mud) in which were clams from one of three different size classes (10, 15 and 20 mm). Secondly, we looked at the effects of turbulent currents on the erosion of medium-grain sand and clams. Turbulent energy was created with a home-made device acting on the laminar currents. Nearly 95% of buried clams (all substrates and lengths together) resisted to erosion from laminar currents up to 0.60 m s⁻¹ but only 10% resisted to weak turbulent currents of 10.1 J m⁻³. Fall is probably a critical period for dispersal of small seeded clams. Indeed the protective nets placed on the newly seeded plots must be removed in fall. From that time, the small clams are no longer protected against dispersal through the erosion caused by turbulence.

Survey of mussel (*Mytilus*) species in Scotland

P. Joana Dias^{1,2*}, Stuart Piertney², Ian Davies¹ and Michael Snow¹

¹Fisheries Research Services Marine Laboratory, 375 Victoria Road, Aberdeen AB11 9DB, Scotland

²School of Biological Sciences, University of Aberdeen AB24 2TZ, Scotland

j.dias@marlab.ac.uk

Recent discovery of *M. galloprovincialis* and *M. trossulus*, together with *M. edulis* and all 3 hybrids in cultivation in some Scottish sea lochs has led to investigation of the species present in wild mussel populations around Scotland. Samples of 30 mussels were taken at 44 sites and ~5 mg pieces of tissue from each mussel in each sample were bulked. A qPCR method for species identification was developed to detect *M. edulis*, *M. galloprovincialis* and *M. trossulus* alleles in bulked samples. *M. edulis* alleles were identified in samples from all sites. *M. galloprovincialis* alleles were found together with *M. edulis* (and hybrids) extensively in northern parts of the west and east coasts of Scotland. *M. trossulus* (or its hybrids) was found in samples from some shores and marinas in the Argyll and Clyde areas (south west Scotland). Simultaneous positive identification of the three species alleles occurred at 3 sites. *M. trossulus* is generally not the preferred species for aquaculture. Improved information on its distribution in cultivation is essential to the development of possible management strategies for the Scottish shellfish industry.

Advances in Broodstock Development & Management

Monday, May 12, 2008 - lundi 12 mai 2008

10:30 PM – 12:50 PM

Location: McAvity Room

Chair: Debbie Martin-Robichaud

10:30 E. Trippel

Overview of the Atlantic Cod Genomics and Broodstock Development Project (CGP)

10:50 A. Garber

Genetic variation of cultured Atlantic cod (*Gadus morhua*) families reared in New Brunswick and Newfoundland

11:10 S. Fordham

Hormone-induced ovulation and spermiation in Atlantic cod (*Gadus morhua*)

11:30 I.A.E. Butts

Artificial Fertilization Strategies for Winter Flounder (*Pseudopleuronectes americanus*) and Atlantic Cod (*Gadus morhua*): Effects of Sperm Density, Sperm-Egg Contact Time, and the Duration of Gamete Receptivity

11:50 B.A. Dupont Cyr

Wolffish (*Anarhichas minor* & *A. Lupus*) broodstock management: photoperiod a powerfull tool for productivity

12:10 R.J. Ritchie

Development of a broodstock based DNA traceability program

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Overview of the Atlantic Cod Genomics and Broodstock Development Project (CGP)

Bowman S^{1,2}, Trippel EA^{*3}, Gamperl AK⁴, Johnson SC¹, Rise ML⁴, Robinson A⁵, Culver K⁶, Garber A⁷, Borza T¹, Hubert S¹, Tosh J⁵, Lush L⁸, Neil S³, Afonso L¹, Hori T⁴, Rise M⁴, Were K⁷, Nardi G⁹, Moir J¹⁰, Powell F¹¹, Walsh A¹⁰, Symonds J¹².

1 Dalhousie University, Halifax, Nova Scotia, Canada

2 The Atlantic Genome Centre, Halifax, Nova Scotia, Canada

3 Fisheries and Oceans Canada, St. Andrews Biological Station, St. Andrews, New Brunswick, Canada

4 Ocean Sciences Centre, Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, Canada

5 University of Guelph, Guelph, Ontario, Canada

6 University of New Brunswick, New Brunswick, Canada

7 Huntsman Marine Science Centre, St. Andrews, Canada

8 Fisheries and Oceans Canada, White Hills, St. Johns, Newfoundland and Labrador, Canada

9 GreatBay Aquaculture, Portsmouth, New Hampshire, U.S.A.

10 Newfoundland Cod Broodstock Company, St. John's, Newfoundland and Labrador, Canada

11 Cooke Aquaculture, Blacks Harbour, New Brunswick, Canada

12 NIWA Bream Bay Aquaculture Park, Ruakaka, New Zealand

The objective of the CGP is to develop a breeding program and a set of fundamental genomics tools which will be used to supply the developing Atlantic cod aquaculture industry in Canada with improved broodstock. The first three major spawning seasons have been completed in Newfoundland and New Brunswick / New Hampshire. By June 2007, 226 families were available for evaluation towards selection of elite broodstock. Evaluations include assessment of family performance related to growth, survival and the overall health. The project also includes ongoing studies of the stress and immune responses in cod as well as studies that examine responses to acute and chronic thermal challenges. Considerable variation among families in growth, tolerance to elevated temperatures and stress has been observed. Preliminary heritability estimates for growth are high suggesting that the breeding programs will be successful at selecting fish for improved performance. In addition the CGP has dramatically improved the availability of genomic resources for this species. Within the first 18 months of project inception, 96% of publicly available DNA sequence information for cod was contributed by the CGP. To date, more than 180,000 sequences have been processed and more than 100,000 sequences have been submitted to GenBank.

Genetic variation of cultured Atlantic cod (*Gadus morhua*) families reared in New Brunswick and Newfoundland

A. Garber^{*1,2}, J. Tosh³, E. Trippel², A. Robinson³, M. Rise⁴, S. Fordham¹, T. Harrold⁴ and J. Symonds⁵

¹Huntsman Marine Science Centre, 1 Lower Campus Road, St. Andrews, NB E5B 2L7

²Fisheries and Oceans Canada, Biological Station, St. Andrews, NB E5B 2L9

³Centre for Genetic Improvement of Livestock, University of Guelph, Guelph, ON N1G 2W1

⁴Ocean Sciences Centre, Memorial University of Newfoundland, St. John's, NL A1C 5S7

⁵National Institute of Water and Atmospheric Research Ltd., Bream Bay Aquaculture Park, Ruakaka, New Zealand 0151

The Atlantic cod genomics and broodstock development project (CGP, www.codgene.ca) was initiated to assist the aquaculture industry by developing tools to identify cod with important commercial traits. Two regional family-based selective breeding programs were created in New Brunswick/New Hampshire (progeny reared in NB) and Newfoundland & Labrador (NL). Individual cod assessments are occurring at ~6 months of age and two times during sea cage growout (~1.5 and ~2.5 years of age). Individual data have been collected from the initial sea cage assessment. These data include measures of body weight and length for individuals from 49 families in two sea cages in NB ($n = 7909$) and 14 families in one sea cage in NL ($n = 1571$). Additionally body, carcass, liver, and gonad weights, along with stage of sexual maturation based

on gonadal visual assessment, were collected on a subset of the progeny ($n = 1259$, NB; $n = 579$, NL). Analysis of these data has revealed significant differences between families for each attribute. Heritability of each trait was estimated along with genetic and environmental correlations among the traits. Results are encouraging as they demonstrate the possibility for improvement of important commercial production traits in the developing cod aquaculture industry.

Hormone-induced ovulation and spermiation in Atlantic cod (*Gadus morhua*)

S. Fordham^{*1}, A. Garber^{1,2}, J. Symonds³, E. Trippel² and D. Berlinsky⁴

¹Huntsman Marine Science Centre, 1 Lower Campus Road, St. Andrews, NB E5B 2L7

²Fisheries and Oceans Canada, Biological Station, St. Andrews, NB E5B 2L9

³National Institute of Water and Atmospheric Research Ltd., Bream Bay Aquaculture Park, Ruakaka, New Zealand 0151

⁴University of New Hampshire, Durham, NH 03824

The efficacy of hormones to synchronize manual spawning in Atlantic cod (*Gadus morhua*) was assessed as part of the Atlantic cod genomics and broodstock development project (www.codgene.ca). Wild-caught female cod (October 2006; $n = 25$ Georges Bank, 10 Cape Sable) were administered an intramuscular implant or injection of salmon gonadotropin releasing hormone analogue (sGnRHa, Ovaplant; Syndel), luteinizing releasing hormone analogue (LHRHa pellet or liquid), human chorionic gonadotropin (hCG), or saline (control). Hormones were also used to induce spermiation in non-running males ($n=16$ Georges Bank). Ovarian biopsy was used to determine the stage of oocyte maturation prior to hormone administration during the natural spawning season (January 2007). The time interval to ovulation was dependant on the degree of oocyte development and treatment, but decreased with use of implants (sGnRHa and LHRHa) compared to injection (hCG, LHRHa and saline controls). Implantation of males resulted in increased milt quantities and spermatocrit compared to males injected with hormone or saline and was similar to or greater than naturally spermiating males.

Artificial Fertilization Strategies for Winter Flounder (*Pseudopleuronectes americanus*) and Atlantic Cod (*Gadus morhua*): Effects of Sperm Density, Sperm-Egg Contact Time, and the Duration of Gamete Receptivity

L.A.E. Butts^{*1,2}, P. Roustaian¹, M.K. Litvak¹, and E.A. Trippel²

¹Department of Biology and Centre for Coastal Studies and Aquaculture, University of New Brunswick, Ganong Hall, P.O. Box 5050, Saint John, New Brunswick, E2L 4L5, Canada

²Fisheries and Oceans Canada, St. Andrews Biological Station, 531 Brandy Cove Road, St. Andrews, New Brunswick, E5B 2L9, Canada

Artificial fertilization has been routinely used to generate embryos of winter flounder and Atlantic cod. Despite the ubiquitous use of this technique there has been no concentrated effort made to assess the effects of sperm density and gamete contact time on fertilization success (FS) for these species. The present study was conducted to assess the effects of sperm density, gamete contact time, and the duration of gamete receptivity on FS. Parental effects were also examined. The optimal sperm to egg ratio (34×10^3 to 1) for winter flounder gave a fertilization rate of 81%. After release in seawater flounder sperm were viable for 60s; while eggs were still viable for 30 min. Cod sperm density and gamete contact time had a significant effect on FS. Below a sperm to egg ratio of 1×10^5 to 1 FS significantly decreased. At lower sperm to egg ratios (1×10^3 - 1×10^4) maximum fertilization occurred after 30 min gamete contact. Both maternal and paternal variance components had a significant effect on FS for cod and flounder. This information has important implications for optimizing family production in breeding programs, and for conserving sperm from superior pedigree in genome banks.

Wolffish (*Anarhichas minor* & *A. Lupus*) broodstock management: photoperiod a powerful tool for productivity

Bernard-Antonin Dupont Cyr^{*1}, Nathalie R. Le François^{2,3}, Robert L. Roy⁴ and Helge Tveiten⁵

¹ Département de Sciences Animales, Université Laval, Québec, QC, Canada.

² Département de biologie, Université du Québec à Rimouski, Rimouski, QC, Canada. ²Nathalie_Le-Francois@uqar.ca

³ Centre Aquacole Marin de Grande-Rivière, Ministère de l'agriculture des pêcheries et de l'alimentation du Québec (MAPAQ), Grande-Rivière, QC, Canada.

⁴ Pêches et Océans Canada, Institut Maurice-Lamontagne Institute, Mont-Joli, QC, Canada.

⁵ Fiskeriforskning, Muninbakken, Breivika, Tromsø, Norway

Wolffish have been selected as a promising species for cold-water aquaculture in eastern Canada. However, a major constraint to the emergence of a new aquaculture species is a year-round supply of high-quality juveniles, a limitation that may be partly resolved by increasing the production of larvae and juveniles. Photoperiod plays an important role in the timing of gonadal maturation in several fish species, including wolffish. The objectives of this study are to compress the reproduction cycle of wolffish by photoperiod manipulation and to quantify the effects of photoperiod manipulation on gamete quality, fish growth and appetite. Each month, sexual maturation of wolffish was monthly monitored through oocyte diameter measurement by ultrasound (females only) and blood samples for analysis of the sexual steroids (11 ketotestosterone & 17- β -oestradiol). After 2-yr, male fishes under the accelerated photoperiod showed a three months shift in maturation compared to fishes under natural photoperiod. We also noted atresia in some of the female fish. Our data suggest that compression of fish reproduction cycle takes a long acclimation period. Further measurement of vitellogenin (yolk precursor protein) should help us understand atresia.

Development of a broodstock based DNA traceability program

R J Ritchie¹ and J.A.K.Elliott²,

¹ Research & Productivity Council (RPC), 921 College Hill Rd., Fredericton, N.B. E3B 6Z9

² Cooke Aquaculture Inc, Oak Bay Hatchery.

In increasingly competitive national and global markets, many companies are developing in-house traceability systems for their product in order to differentiate themselves in the global market. These initiatives generally incorporate developing national standards, but in many cases to go beyond what might be required so as to provide a greater level of traceability and accountability, aimed at generating greater public trust and preference for specific firms. Like leaders in other industries, Cooke Aquaculture, is well aware of the potential and importance of traceability to their operations. Establishment of the traceability system in Cooke Aquaculture's operation will not only allow them to meet regulatory requirements and provide then with fine-grained data regarding the effectiveness of husbandry practices, but it will also benefit the larger Atlantic Canadian industry through the supply of fully traceable eggs, fry and smolts for sale to existing others in the industry, all with the benefit of complete life-history tracing. We will describe our plans for establishment of a DNA-based traceability and will discuss advances in breeding (broodstock development), DNA marker panels and bioinformatics underpinning this fish traceability system.

International Workshop on Sturgeon Culture

Monday, May 12, 2008 - lundi 12 mai 2008

2:00 PM – 3:30 PM

Location: Ballroom AB

Chair: Cornell Ceapa

14:00 P. Williot

Peculiarities in sturgeon aquaculture as illustrated by some husbandry-related issues

14:30 M.S. Chebanov

Early sexing and staging of farmed and wild sturgeon juveniles by using ultrasound technique

15:00 Q. Wei

Sustainable sturgeon aquaculture in China: problems, strategy and potential effects on the natural populations & aquaculture of sturgeons

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Peculiarities in sturgeon aquaculture as illustrated by some husbandry-related issues

P. Williot

Senior consultant, PhD, HDR Bordeaux University I, 4 rue du Pas de Madame 33980 Audenge, France

Sturgeon aquaculture has been developing for stocking, and further for meat and caviar production as wild populations have been declining. Sturgeon are mostly long-life, late puberty, and non-yearly oogenesis fish. Some results, innovations, and potential improvements are given with regard to reproduction (ovarian cycles, selection of best spawners prior to hormonal injection, fertilization rates), larval rearing (survival rates post weaning, weaning consequences), growth period (intra & inter individuals variability, rearing conditions) and broodstock development (sex determinism, genetics, self-functioning). Some present particularities are pointed and potential relationships are suggested.

Early sexing and staging of farmed and wild sturgeon juveniles by using ultrasound technique

Chebanov M.S.

South Branch Federal Center of Selection and Genetics for Aquaculture,
59 Gimnasitsheskaya St., Krasnodar, 350000, Russia, Tel./Fax: +7-861-262 25 59;
E-mail: Chebanov@sturg.kuban.ru

Ultrasonography technique proved to be promising for sturgeon farmed broodstock formation. A portable ultrasound scanner supplied by 5-9 MHz linear transducers may be used for this purposes. Examined were more than 40 thousand of ultrasound images of 8 sturgeon species and few hybrids live individuals:

Features of used equipment, testing procedure, optimal season, age and size of examined individuals of different sturgeon species under different conditions, diagnostic peculiarities of males and females at different maturity stages were analyzed. The following diagnostic markers being indicated:

1. germinal tissue localization in gonad;
2. lack (presence) of gonad tunic;
3. surface and margins of gonad character;
4. echogenicity of genitive tissue revealed in different brightness of images;
5. heterogeneity (homogeneity) of gonad tissue structure;
6. relative distance from the genital pore and shape of the caudal margin of gonad.

Sexing and staging possibility was determined by the following parameters of the examined fishes: age, size, feeding regime, CF, season of the experiments, prior holding regime. The testing procedure did not exceed 10 s. per a single fish.

Use of PC with an ultrasound scanner enabled optimization of broodstock sex structure in the Russian Living Gene Bank and efficiency increase of commercial sturgeon culture.

Sustainable sturgeon aquaculture in China: problems, strategy and potential effects on the natural populations & aquaculture of sturgeons

Qiwei Wei¹ and Rong Li²

¹Yangtze River Fisheries Research Institute, Chinese Academy of Fisheries Science
No.41 Jiangnan Road, Shashi District, Jingzhou City, Hubei 434000, P.R. China

²Ocean University of China, No. 5, Yushan Road, Qingdao 266003, P.R. China

Continuing to be the largest in the world since 2000, the production of cultured sturgeons in China was 17400 MT in 2006. There has been the first batch of export of farmed sturgeon caviar in China since 2006.

However, there are restrictive factors to the sustainable sturgeon aquaculture, including in insufficient domestic supply of seedlings, potential threat of genetic pollution to endemic sturgeons, self water-pollution of aquaculture, a small domestic market and limited amount of export.

In order to develop a sustainable sturgeon farming industry in China, some key measures should be taken:

1) to implement a regulation restricting minimum size of sturgeon in market; 2) to develop a labeling system for the sturgeon farming, trading and restocking to manage all process on sturgeons; 3) to do risk evaluations in potential genetic pollution of endemic sturgeons; 4) to regularize the hybridization and larvae sales and to produce enough seedlings by registering and managing all stock farms. A sustainable sturgeon aquaculture in China will reduce the pressure on stocks of sturgeons in the Amur River and enhance endangered sturgeons in Yangtze River. With further development of aquaculture, farmed sturgeon products will find its way to export. Then it will also reduce the pressure on the globe natural populations of sturgeons.

Environmental Interactions of Shellfish and Finfish Aquaculture - Contributed Papers

Monday, May 12, 2008, - lundi 12 mai 2008
1:50 PM - 3:30 PM

Location: Ballroom C

Chair: Eddy Kennedy

13:50 B. Chang

Characterization of benthic sulfide levels at salmon farms in the southwest New Brunswick area of the Bay of Fundy

14:10 F.H. Page

Testing the DEPOMOD model for predicting benthic impacts of salmon farming in the southwest New Brunswick area of the Bay of Fundy

14:30 L. Robichaud

Influence of suspended mussel aquaculture and an associated invasive ascidian on macroinvertebrate communities

14:50 W.A. Heath

Acoustic seabed classification of Baynes Sound, British Columbia, and the assessment of impacts on the benthic environment from suspended bivalve aquaculture

15:10 C. Pearce

Do intertidal geoduck clam (*Panopea abrupta*) aquaculture and harvest significantly impact the local benthic environment?

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Characterization of benthic sulfide levels at salmon farms in the southwest New Brunswick area of the Bay of Fundy

Page, F.H.¹, Losier, R.L.¹, McCurdy, E.P.¹, Chang, B.D.^{1*}, MacKeigan, K.¹, Szemerda, M.²

¹ Fisheries and Oceans Canada, Biological Station, St. Andrews, NB E5B 2L9

² Cooke Aquaculture Inc., St. George, NB E5C 3H8

This project focuses on the spatial characterization of sediment sulfide levels at selected salmon farms in the southwestern New Brunswick area of the Bay of Fundy, as part of an ACRDP project aimed at testing the DEPOMOD model for predicting benthic impacts of salmon farms. Sediment grab samples were taken from several locations in and around selected salmon farms. The results were used to map the spatial distribution of sulfide levels at the farms. The statistical properties of these sampling efforts will be presented.

Testing the DEPOMOD model for predicting benthic impacts of salmon farming in the southwest New Brunswick area of the Bay of Fundy

Page, F.H.^{*1}, Losier, R.L.¹, Chang, B.D.¹, McCurdy, E.P.¹, Szemerda, M.²

¹ Fisheries and Oceans Canada, Biological Station, St. Andrews, NB E5B 2L9

² Cooke Aquaculture Inc., St. George, NB E5C 3H8

This ACRDP project focuses on gaining experience with the application of the DEPOMOD particle tracking and deposition model to salmon farming in the southwestern New Brunswick area of the Bay of Fundy. This report is a follow-up to a mid-project report presented at Aquaculture Canada 2006. Current meter data was gathered from several moorings at a farm site. Feeding data was obtained from the farm operator. The DEPOMOD model was run for different water current scenarios, for comparison with the actual field data on benthic sulfide levels. The presentation will give a summary of results to date.

Influence of suspended mussel aquaculture and an associated invasive ascidian on macroinvertebrate communities

Lisa Robichaud^{* 1,2}, Christopher W. McKindsey^{1,2*}, Philippe Archambault¹, Gaston Desrosiers¹

¹ Institut des Sciences de la Mer, Université du Québec à Rimouski, 310 allée des Ursulines, PO Box 3300, Rimouski (QC) G5L 3A1, Canada

² Fisheries and Oceans Canada, Institut Maurice-Lamontagne, 850 route de la mer, PO Box 1000, Mont-Joli (QC) G5H 3Z4, Canada

The influence of mussel aquaculture on classic descriptors of benthic community structure (e.g. abundance, diversity) is well known, but the influence of this activity on benthic productivity has not been studied, despite its importance for understanding ecosystem dynamics and for fisheries management. As well, the macroinvertebrates living in association with bivalves in culture have generally been excluded from studies on the environmental effects of bivalve aquaculture. As suspended bivalve aquaculture creates new macroinvertebrate habitat in the water column, this study tests the hypothesis that mussel aquaculture increases overall macroinvertebrate productivity when both sediment and mussel sock invertebrates are considered. Further, the presence of the invasive ascidian *Styela clava* was expected to increase this effect, by adding additional structure to mussel socks. Macroinvertebrates in the sediment and on mussel socks were thus sampled in 8 bays on Prince Edward Island, eastern Canada: 3 invaded by *S. clava* and 5 where *S. clava* was absent. When sediment and mussel sock macroinvertebrates were combined to determine overall macroinvertebrate abundance, biomass and productivity inside mussel leases, these measures were greater inside mussel leases than in areas outside. The presence of *S. clava* did not change this trend.

Acoustic seabed classification of Baynes Sound, British Columbia, and the assessment of impacts on the benthic environment from suspended bivalve aquaculture

W. A. Heath*¹ S. Carroll² R. Devos² and B. Provan²

¹Aquaculture Development Branch, BC Ministry of Agriculture and Lands, 2500 Cliffe Avenue, Courtenay, BC V9N 5M6

²Environmental Technology Program, Camosun College, 3100 Foul Bay Rd, Victoria, BC V8P 5J2

To establish an inventory of benthic sedimentary habitats and to assess potential benthic impacts of suspended culture shellfish farms, an acoustic seabed survey was conducted in Baynes Sound, BC. Following the 50 kHz acoustic survey by Quester Tangent QTC VIEW4, groundtruthing by benthic grabs and ROV underwater video recording were carried out to attribute geophysical characteristics to the acoustic classification scheme. Further grab sampling and underwater video were collected at shellfish farm and reference sites as part of the impact assessment. Nine acoustic classes were identified; however, geophysical characteristics cannot be definitively attributed to all of these acoustic classes without further sampling. Some differences between conditions at shellfish farms and reference sites were noted, mainly due to introduction of shell debris to the benthic environment. Further studies are needed to improve resolution for practical application of acoustic survey techniques for monitoring shellfish farms.

Do intertidal geoduck clam (*Panopea abrupta*) aquaculture and harvest significantly impact the local benthic environment?

C.M. Pearce*

Pacific Biological Station, Fisheries and Oceans Canada, Nanaimo, BC V9T 6N7

The geoduck clam is the largest burrowing clam in the world and adults of this species live a metre or more below the sediment surface. In order to extract these clams, harvesters use high-pressure water hoses to liquefy the surrounding sediment. High density culture of clams and/or harvesting to a depth of a metre or more could have profound effects on the local benthic environment, but little research has examined this issue. We seeded a small-scale (3 x 20 m) intertidal plot with juvenile clams at a commercial density and harvested them a year later using industry standard techniques. We took sediment samples within the harvest zone and at varying distances from the area of impact (5, 10, 25, 50 m) at various time points (ranging from a month prior to seed out-planting through to 12 months post-harvest). We examined various sediment qualities (grain size, percent organics, total organic carbon, total nitrogen, sulphide concentration, and redox) as well as infaunal diversity and numbers. Preliminary results show that many of the measured variables were not significantly affected by either the culture or harvesting processes. Significant effects of harvest (*e.g.* sediment grain size) were generally short-lived and near field.

Aquaculture Research, Regulatory & Policy – Contributed Papers

Monday, May 12, 2008 - lundi 12 mai 2008

1:50 PM - 3:30 PM

Location: McAvity Room

Chair: Jay Parsons

13:50 J. Dupuis

Replacement Class Screening Reports for Suspended and Off-Bottom Oyster Culture Sites in Eastern New Brunswick.

14:10 P. Parker

Building a Collaborative Research Program.

14:30 J. O'Riordan

Development of a Comprehensive Analytical Framework.

14:50 T. DeJager

Information finding you over the web in near real time: AquaPort.ca

15:10 C.L. Whelan

Aquaculture Collaborative Research and Development Program (ACRDP): History and Future Initiatives.

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Replacement Class Screening Reports for Suspended and Off-Bottom Oyster Culture Sites in Eastern New Brunswick

Transport Canada¹ presenter Julie Dupuis*

¹Transport Canada, Environmental Affairs, P.O. Box 42, Moncton, N.B. Canada E1C 8K6

Any “work” built or placed in any navigable waterway in Canada requires a *Navigable Waters Protection Act* (NWP) authorization. These works typically include growing structures used on aquaculture sites. It is necessary to conduct an environmental assessment (EA) for works that require an authorization because NWP is included on the *Law List Regulations* of the *Canadian Environmental Assessment Act* (the Act). Previously, each application for works placed on aquaculture sites was subject to a separate EA. In order to facilitate the assessment of the important number of applications for suspended and off-bottom oyster culture sites in eastern New Brunswick, Transport Canada, in collaboration with the Department of Fisheries and Oceans (DFO), and the New Brunswick Department of Agriculture and Aquaculture (NBDAA), has developed a Replacement Class Screening Report (RCSR). The RCSR consists of a single report that defines the class of projects and describes the associated environmental effects, design standards, and mitigation measures. It includes a conclusion of the significance of the environmental effects of all projects assessed by the RCSR. No project-specific information or further EA is required for projects in the class, provided that the design standards and mitigation measures described in the RCSR are implemented.

Building a Collaborative Research Program

Pamela Parker*¹ and Jon O’Riordan

¹BC Pacific Salmon Forum, L – 427 Fitzwilliam Street, Nanaimo, BC V9P 9C1

Building trust and collaboration among scientists is not always a straight road but can be beneficial to strengthen support for research results that will improve information and understanding by general public regarding the environmental and economic effects of salmon aquaculture in British Columbia

In this presentation the BC Pacific Salmon Forum will review the steps they have taken over the past three years to establish collaborative research program on wild/farmed salmon interaction with a focus on sea lice in the Broughton Archipelago of British Columbia. The Forum believes that this process could serve as a template for other collaborative research agendas.

Development of a Comprehensive Analytical Framework

Jon O’Riordan* and Pamela Parker

¹BC Pacific Salmon Forum, L – 427 Fitzwilliam Street, Nanaimo, BC V9P 9C1

Currently there are several mathematical models being used to assess salmon lice abundance and distribution to forecast long-term impacts of lice on wild fish. However, the predictions that result from these models are often inconsistent with each other leading to confusion in the public about the results of such research

As more is learned about the complexity of sea lice and effects of various environmental factors such as salinity, temperature and water currents, it is becoming apparent that a more robust analytical framework is necessary to incorporate these complex factors into a predictive model.

This presentation will provide an overview of the collaborative process being used by the BC Pacific Salmon Forum to develop an analytical model that will incorporate the biological and environmental factors relating to sea lice in the Broughton Archipelago of British Columbia - a model that will be

designed to evaluate and integrate a range of the research data emerging from an extensive two-year, collaborative research program.

Information finding you over the web in near real time: AquaPort.ca

Tim DeJager¹

¹ Consulting CEO, AquaPort.ca, Malaspina University-College, 900 Fifth Street, Nanaimo, BC, V9R 5S5

Aquaport.ca is working for the Canadian aquaculture industry on ways to close the gap between what you need to know and what is out there – critical information on technology, markets, business management, production, scientific research, and regulation. With exponentially increasing availability of information, there is a growing need for easy to use tools that bring you the most relevant and useful information – free of junk and unwanted information. And this can be accomplished without you having to search and scan the hundreds of websites where those nuggets of information might be found. Essentially relevant information is *finding you* rather than you having to hunt down the information. And it is happening in near real time in many cases – information posted can be in the hands of those who need it almost instantly. Demonstrations of various web tools will be included in the presentation.

Aquaculture Collaborative Research and Development Program (ACRDP): History and Future Initiatives

Christie L. Whelan*¹ and G. Jay Parsons¹

¹ Fisheries and Oceans Canada, Aquaculture Science, 200 Kent Street, Ottawa, Ontario, K1A 0E6, Canada

The purpose of the Aquaculture Collaborative Research and Development Program (ACRDP) 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 has been in operation since 2001 and 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). Since the beginning of the program (2001-2008), over 230 projects have been approved and funded. There are three main research and development objectives to the program: 127 projects focusing on the best performance in fish production have been funded, 48 projects optimal fish health and 55 projects on industry environmental performance. In total, over \$56 million in research has been conducted through the ACRDP. This includes \$25.7 million in ACRDP funds, \$12.7 million from industry contributions, \$12.8 million in other DFO funding and \$5.0 million in contributions from other project partners. Research priorities, communications initiatives, improved technology transfer and future plans for the program discussed at a recent national ACRDP stakeholders meeting in Ottawa will be presented.

Advances in Sturgeon Culture (continued)

Monday, May 12, 2008 - lundi 12 mai 2008

4:00 PM - 5:30 PM

Location: Ballroom AB

Chair: Tim Jackson

16:00 C. Ceapa

Sturgeon Aquaculture Development – A Business Insight.

16:20 A. Archibald

Influence of the inVentures Technologies' PurGRO2® Oxygen Infusion System on Growth of Cultured Shortnose Sturgeon (*Acipinser brevirostrum* LeSeur).

16:40 Panel Discussion

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Sturgeon Aquaculture Development – A Business Insight

C. Ceapa

Acadian Sturgeon and Caviar Inc, 214 King Street East, Saint John, NB, E2L 1H3, Canada

Although sturgeon were known for a long time as a valuable seafood resource, only during the last 10-15 years, when the wild stocks become severely depleted, they were given a real consideration as an alternative species for aquaculture. The main aspects that constrained the sturgeon aquaculture development were their challenging life history characteristics (late first time sexual maturation, multi-annual ovarian cycles), but also some geo-political (concentration of over 90% of the supply in a monopoly type exploitation system in the Caspian Sea) and business related issues (very long production cycles, weak markets). Many of those restraints were or will be overridden in the future through innovation and new business strategies. In this paper we are going to discuss some of the new business related aspects of sturgeon aquaculture development. Production systems (extensive, recirculation, inland, cages), stocking strategies (single and multi-age, multi-species culture), markets development and forecasts, development of secondary products and product mix strategies (caviar / meat) will be presented in an attempt to promote the sturgeon aquaculture development as a sustainable alternative to wild captures.

Influence of the inVentures Technologies' PurGRO2® Oxygen Infusion System on Growth of Cultured Shortnose Sturgeon (*Acipinser brevirostrum* LeSeur)

W.E. Hogans¹ A. Danielle Breau² Aaron Archibald^{*3}

1. Huntsman Marine Science Centre St. Andrews, New Brunswick E5B 1C8 Canada

2. Supreme Sturgeon and Caviar 181 Mealy Road Pennfield, New Brunswick E5H 2M1 Canada

3. inVentures Technologies incorporated 670 Wilsey Road Fredericton, New Brunswick E3B 7K4 Canada

An experiment to determine the impacts of a high oxygen (220-250% saturation)/ low nitrogen environment, created by the inVentures PurGRO2® oxygen infusion system, on the growth rate of juvenile Shortnose sturgeon

(*Acipinser brevirostrum*) was completed over a 5 month period in the summer and fall of 2007. The experiment utilized 2 tanks, one control and one test (PurGRO2® environment) containing fish of identical initial average size. The control tank environment was characterized by much lower oxygen levels (85-110% saturation) and higher nitrogen values and was maintained based on the standard, commercial culture systems used for Shortnose sturgeon. Water quality parameters in both the control and test tanks were nearly identical during the study period. Shortnose sturgeon in the PurGRO2® environment grew significantly faster and to a larger end weight (19.8% greater) than those fish held in the control tank. Sturgeon in the PurGRO2® system also converted the food ration to fish weight at a much higher rate (34% more food in total converted to biomass) than the control group. The PurGRO2® environment caused the test fish to exhibit much more active and prolonged feeding activity than was characteristic of the sturgeon in the control tank.

Environmental Interactions of Shellfish – Contributed Papers

Monday, May 12, 2008 - lundi 12 mai 2008

4:00 PM – 5:30 PM

Location: Ballroom C

Chair: Réjean Tremblay

16:00 M. Fréchette

Hierarchical structure of bivalve culture systems and optimal stocking density

16:20 M. Lachance-Bernard

Self-thinning in blue mussel populations reared in suspension culture

16:40 M. Liutkus

Seston dynamics: effects of salmon farm effluent on biodeposit dynamics of various size classes of mussels (*Mytilus spp.*)

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Hierarchical structure of bivalve culture systems and optimal stocking density

M. Fréchette

Ministère des Pêches et des Océans, Institut Maurice-Lamontagne, C.P. 1000, 850 route de la Mer, Mont-Joli, QC, Canada G5H 3Z4

The structure of bivalve culture systems is hierarchical. Each hierarchical level may spatially structure the environment, resources and yield. Ultimately, however, phytoplankton depletion is generated at the scale of individual culture units. Therefore at least two scales should be considered in carrying capacity studies, that of individual culture units, and that of whole basins. Density-dependence at the scale of individual culture units is studied in stocking experiments. At the scale of whole basins, it is studied using mathematical models of carrying capacity. In all cases I am aware of it is assumed that both scales do not interact. I test this assumption in simple simulations. The model assumes that growth is regulated by food availability at both scales and that all scales are completely nested. It is assumed that there is no mortality and that initial stocking density may be used as a proxy for production costs (as in Fréchette et al. 2005. *Aquaculture* 246:209-225). I find an exponential-like decrease in optimal stocking density on individual culture units as basin-scale stocking increases. Therefore there is need to develop strategies to link carrying capacities at unit-scale and basin-scale levels. I present a model to test for hierarchical effects in field situations.

Self-thinning in blue mussel populations reared in suspension culture

M. Lachance-Bernard*^{1,2}, J.H. Himmelman¹, M. Fréchette²

¹ Université Laval, Département de Biologie, Québec, G1K 7P4.

² Ministère des Pêches et des Océans, Institut Maurice-Lamontagne, 850 Route de la Mer, Mont-Joli, Québec, CP. 1000, G5H 3Z4.

Part-time mussel farming might be an interesting way for fishers to diversify their activities. This can be achieved by letting grow mussels on spat collectors, thereby bypassing spat sleeving. However, this implies that population density may be either too low to allow profitability or too high, with intraspecific competition being exacerbated. Here we present an account of population dynamics on mussel spat collectors focusing on self-thinning because it sets an upper limit to yield. Our study was done at two farms in Baie de Cascapédia, Quebec, using four replicate collector longlines which were sampled haphazardly from October 2003 through July 2007. On each occasion, 30.5-cm lengths were taken from triplicate collectors sampled at two depths. In addition to biomass and population density, we monitored size structure, length-mass relationships of individual mussels, multilayering of mussels, proportions of bare substrate, depth of the mussel lines and water temperature. Analysis indicated that biomass and population density were inversely correlated. Self-thinning curves varied between the two farms, longlines and depth. The fact that mussel populations followed self-thinning dynamics indicates that the upper limit to collector production had been reached. This implies that further increases in profitability may be reached only through improving culture technique.

Seston Dynamics: Effects of salmon farm effluent on biodeposit dynamics of various size classes of mussels (*Mytilus spp.*)

Liutkus, M.*^{1,2}, Robinson, S.², MacDonald, B.¹, Reid, G.K.^{1,2} and Martin, J.²

¹University of New Brunswick, Centre for Coastal Studies & Aquaculture, Centre for Environmental & Molecular Algal Research, P.O. Box 5050, Saint John, NB, E2L 4L5, Canada.

²Department of Fisheries & Oceans, St. Andrews Biological Station, 531 Brandy Cove Road, St. Andrews, NB, E5B 2L9, Canada.

Integrated Multi-Trophic Aquaculture (IMTA) promotes sustainability by co-culturing extractive species with upper-trophic fed species (fin-fish); thereby providing additional harvestable commodities that also act as biofilters. An IMTA site in the Bay of Fundy, Canada, is making the transition from a pilot project to a

commercial scale. Increasing the culture scale of extractive organic species such as blue mussels (*Mytilus edulis*) may alter local benthic dynamics. Bivalves filter out particles and either; conglomerate and egested as pseudofaeces or intestinal faeces or; digest and biodeposit them. Different diets generate different mussel biodeposits potentially affecting deposition dynamics. Preliminary findings have shown that mussels produce biodeposits with distinct compositional and density characteristics as a function of diet fed. Differences are minimal within small mussel sizes (average mussel lengths 25mm), but become more significant as mussel lengths increase (50mm to 75mm). Regardless of their diet, small mussels will produce biodeposits that can disperse over a greater area than produced by larger mussels. In contrast, larger mussels produce biodeposits that may settle near field. Implications of the biodeposit dynamics and the scale of loading on the net nutrient recovery of blue mussels at IMTA sites are discussed.

Industry-Led Research & Development

Monday, May 12, 2008 - lundi 12 mai 2008

4:00 PM – 6:15 PM

Location: McAvity Room

Chair: Caroline Graham

16:00 **Welcome and Introduction**
Session Moderators

16:10-17:30 **TECHNICAL PRESENTATIONS**

Overview of SLICE Project
Kathy Dalton, NB DAA

R&D to Address PEI Aquaculture Industry Priorities
Peter Warris, PEIAA

**Update on Ongoing and Upcoming R&D Projects in
Newfoundland and Labrador**
Darrell Green, NAIA

TBD
Eric Boucher, IPSFAD

**Everything We Want to Do is Illegal. Anarchy in the
Shellfish Farming Industry**
Dave McCallum, BCSGA

**Looking Forward: British Columbia Salmon Farmers
Association Research Strategy**
Norm Penton, BCSFA

**Research Activities at the Professional Shellfish
Growers Association of New Brunswick**
Kevin Burke, PSGNB

17:30-17:45 **Facilitated Discussion on Increasing Collaboration
Between Industry and Researchers**
Industry Association RDCs

SLICE Update: 2006-2008

Kathy Dalton, NBDAA

SLICE is a registered product in all major aquaculture producing countries throughout the world, with the exception of the USA and Canada. Registration of SLICE in Canada and the US has been ongoing for several years and it not likely to be registered here for at least another 3 years. SLICE is available for producers under the Emergency Drug Release (EDR) program in Canada.

Other jurisdictions worldwide have set the minimum residue limit for SLICE at 100 ppb with a withdrawal time of 0 days (Norway/Chile) to 2 days (UK). The USA has not established a minimum residue level (MRL) for SLICE but has placed a 60 day withdrawal time under their INAD policy (equivalent to Canada's EDR). The Veterinary Drug Directorate (VDD) had set the new MRL for SLICE at 42 ppb with an associated withdrawal time of 68 days. Both Health Canada and CFIA are prepared to look at the data provided from this multi-year study and use it in their deliberations on reviewing the withdrawal period and minimum residue level.

This presentation will give an overview of results found to date (from 2006-2007) and expected results from the in-tank study being performed at the Atlantic Veterinary College (2008-2009).

This project is of great importance to the salmon industry as a whole as Health Canada will not make any changes to current 68 day withdrawal period without having field data collected and supporting data from a controlled in-tank study.

Aquaculture Marketing: Canadian & International Perspectives

Tuesday, May 13, 2008

10:30 AM - 12:30 PM

Location: Ballroom AB

Chair: Ruth Salmon

10:30 H. Shuve

Marketing Fresh Mussels in North America: Consumer Attitudes and Preferences

10:50 R. Salmon

Fresh Salmon Market Study.

11:10 G. Gollin

Perceptions of Canadian Aquaculture by US Seafood Opinion Leaders.

11:30 L. Gomes

Marketing and Branding in the Canadian Agri-Food Market

11:50 Panel Discussion

Marketing Fresh Mussels in North America: Consumer Attitudes and Preferences

¹ North American Fresh Mussel Market Study, Newfoundland Aquaculture Industry Association
H. Shuve*¹

² Marketing Mussels from Integrated Multi-Trophic Aquaculture (IMTA)
H. Shuve*¹, E. Caines², J. Lamontagne³, N. Ridler², S. Robinson⁴, T. Chopin², M. Sawhney², M. Szemerda³, R. Marvin³, F. Powell³, G.K. Reid^{2,4}, S. Boyne-Travis⁵, and J. Sewuster⁶.

¹Ipsos-Reid, 133 Prince William Street, Saint John, NB, E2L 2B5, Canada

²University of New Brunswick, Centre for Coastal Studies & Aquaculture, Centre for Environmental & Molecular Algal Research, P.O. Box 5050, Saint John, NB, E2L 4L5, Canada

³Cooke Aquaculture Inc., 874 Main Street, Blacks Harbour, NB, E5H 1E6, Canada

⁴Department of Fisheries & Oceans, 531 Brandy Cove Road, St. Andrews, NB, E5B 2L9, Canada

⁵Canadian Food Inspection Agency, 99 Mount Pleasant Road, St. George, NB, E5C 3S9, Canada

⁶Acadian Seaplants Limited, 30 Brown Avenue, Dartmouth, NS, B3B 1X8, Canada

This presentation blends the results of two recent consumer studies conducted by Ipsos Reid, both which address fresh mussel marketing opportunities in North America.

The **North American Fresh Mussel Market Study**¹ was a two-part investigation designed to explore the fresh mussel consumer market and gain the insight required to guide development of a generic promotional campaign to grow the fresh mussel industry in key urban markets in Canada and the United States to the benefit of all producers. Twenty-two focus group sessions and 1,750 online surveys with fresh mussel consumers were conducted in ten major urban markets across North America exploring attitudes and behaviours of those who eat fresh mussels in and/or out of the home, identifying opportunities to increase the frequency of consumption of fresh mussels.

The second study included in this presentation is **Marketing Mussels from Integrated Multi-Trophic Aquaculture (IMTA): a survey of consumer attitudes and preferences**². Integrated multi-trophic aquaculture (IMTA) is a farming practice in which the by-products from one species become nutritional inputs for another: fed aquaculture (fish) is combined with inorganic extractive (seaweed) and organic extractive (shellfish) aquaculture to create balanced systems for environmental sustainability, economic diversification and social acceptability. Ecological benefits of IMTA have the potential to enhance the marketing of the cultivated species because of improved consumer perceptions towards more efficient, profitable and environmentally-friendly aquaculture systems. Approximately six hundred seafood consumers in the New York region were asked about their attitudes towards IMTA and any preferences for mussels grown in an IMTA system compared with monoculture mussels. They also indicated whether IMTA mussels could obtain a price premium as a differentiated product.

Marketing and Branding in the Canadian Agri-Food Market

Liz Gomes

Agriculture and Agri-Food Canada, Cross-Sectoral Food Industry Affairs Division

A key theme of the original Agricultural Policy Framework (APF) was the development of a Canada Brand to raise the profile of Canadian primary and processed food, seafood and beverage products in exports markets. While there are domestic branding programs currently operating in several provinces including Foodland Ontario, Buy BC and Taste of Nova Scotia, there is no national branding program, nor is there national data on consumer attitudes towards Canadian foods.

To fill this knowledge gap and contribute to this discussion, the Consumer Analysis Section of Agriculture and Agri-Food Canada commissioned several studies designed to provide new information about Canadian consumer perceptions, attitudes, and purchasing behaviours with respect to domestic primary and processed agri food, seafood, and beverage products. These studies included a literature review of existing research,

quantitative online survey, set qualitative focus groups, and a synthesis report to pull together the information gathered in the preceding phases. This research could be beneficial to maintaining and growing the domestic market for Canadian products.

Inter-Provincial Partnership for Sustainable Freshwater Aquaculture: The Way Forward

Tuesday, May 13, 2008 - mardi 13 mai 2008

10:30 AM - 12:30 PM

Location: Ballroom C

Chair: Éric Gilbert

10:30 G. Vandenberg

IPSFAD's third action plan implementation status

10:50 G. Vandenberg

Feed goes green: new diet development in Canada

11:10 R. Nabi

Positioning Canada's Trout Industry: The Competitiveness Approach

11:30 P. Redmayne

U.S. Market Opportunity Assessment: Freshwater Trout

11:50 D. Stechey

The Canadian Model Aqua-Farm Initiative – From Concept to Reality

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

The Canadian Model Aqua-Farm Initiative – From Concept to Reality

Stechey¹, Daniel,* and Eric Gilbert²

¹ Canadian Aquaculture Systems Inc., 1076 Tillison Avenue, Cobourg, ON K9A 5N4 Email: stechey@cogeco.ca

² Aquaculture Management Directorate, Fisheries & Oceans Canada, 200 Kent Street, Ottawa, ON K1A 0E6 Email: gilberte@dfo-mpo.gc.ca

‘Farmers’ often develop agri-business ventures by observing other operations, acquiring a basic understanding of operational and investment requirements, and then constructing their own facility. Throughout Canada, however, there is no standard aquaculture model to emulate. Moreover, existing aquaculture ventures are decidedly variable in design and performance and thus there are few fundamental benchmarks for productivity or efficiency. The intent of the Canadian Model Aqua-Farm (CMAF) initiative, a core component of the Inter-Provincial Partnership for Sustainable Freshwater Aquaculture Development’s (IPSFAD) 3rd Industry Action Plan, is to standardize the basic production, economic, environmental and regulatory aspects of commercial aquaculture in a design that is efficient, effective and sustainable. Based on an intensive, recirculating Burrows raceway design, the CMAF is a modular 100-tonne rainbow trout production unit sized to fit within a conventional agricultural barn. To launch a second wave of growth in freshwater aquaculture, the CMAF will need to generate producer, investor and regulator confidence in the technology; therefore, a comprehensive performance management system to monitor and assess all inputs and outputs (e.g. fry, feed, water, energy, solid and soluble wastes, harvestable product, etc.) will be a fundamental component of the first model farm projects. The participation of pertinent regulatory authorities in the performance management program will help to bring a ‘smart’ approach to the sector.

Positioning Canada’s Trout Industry: The Competitiveness Approach

Rashed Nabi¹

¹ Aquaculture Management Directorate, Fisheries and Oceans Canada, 200 Kent Street, Ottawa, ON K1A 0E6

Canada's abundant freshwater resource base offers significant scope for the growth of the trout industry. However, the performance of the industry has not been impressive. Using the competitive advantage framework, this paper aims to identify the factors that potentially hinder the production and growth of the industry. The paper focuses on internal and external factors that interact with each other to create a competitive advantage required for sustained industry growth. Factors such as regulations represent a constraint, but lack of new product development also contributes to the lack of competitiveness. Horizontal clusters, among other things, are necessary to enhance the ability of the industry to respond to the changing pattern of consumer demand.

Regional Aquatic Animal Health & Biosecurity

Tuesday, May 13, 2008 - mardi 13 mai 2008

10:30 AM - 12:30 PM

Location: McAvity Room

Chair: Alistair Struthers

10:30 M. Beattie

Biosecurity & risk avoidance from egg to market

10:50 L. Hammell

Fish Health & Biosecurity Decisions in Atlantic Canada Supported by Epidemiology

11:10 L. Hawkins

Biosecurity practices in Cooke Aquaculture

11:30 P. Byrne

Research and Diagnostic work involving Aquatic Animal Pathogens is supported by a High-Level Biocontainment Laboratory operated by DFO, in Charlottetown, PEI

11:50 N. O'Brien

Biosecurity practices in Newfoundland aquaculture

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Bio-security and Risk Avoidance From Egg to Market

Michael J Beattie DVM MRCVS

Bio-security / Bio-safety is not a flavour of the month. Risk avoidance is proportionally associated with the bio-safety level utilized by the company. One must compare bio-security techniques and methodologies employed by the agriculture sector, then pick and choose those that best fit the aquaculture model. This presentation will explore the high risk areas within the production chain and examine the links with terrestrial farming practices. We will also look at both sides of the coin; “my farm is disease free and I want to keep it that way”, and “my farm has a disease and I do not want it to spread to adjacent farms”.

Fish Health & Biosecurity Decisions in Atlantic Canada Supported by Epidemiology

Larry Hammell¹

¹ AVC Centre for Aquatic Health Sciences, Atlantic Veterinary College, University of PEI, 550 University Ave, Charlottetown, PE C1A 4P3

Fish health policy decisions, at the farm and industry levels, are made with the goal of minimizing the impact of selected diseases on the productivity of the industry. These decisions are based on the evidence available while epidemiology research applied to these questions advances the quality and quantity of evidence needed to support or improve the original decision. Epidemiology research has focused on ISA over the past decade and has included risk factors leading to outbreaks, evaluations of diagnostic tests used in surveillance, background levels of virus genotypes in apparently healthy fish, and clinical trials for management methods. This same approach is currently being applied to other health issues facing the industry. Atlantic Canada has highly respected fish health resources both to make decisions and to improve those decisions through sound epidemiologic investigations.

Research and Diagnostic work involving Aquatic Animal Pathogens is supported by a High-Level Biocontainment Laboratory operated by DFO, in Charlottetown, PEI

Philip Byrne*¹ and Anne-Margaret MacKinnon²

Fisheries & Oceans Canada | Pêches et Océans Canada

¹CAAPBL, Charlottetown, PEI, C1A 5T1; ²Gulf Fisheries Centre, Moncton, NB, E1C 9B6

The Charlottetown Aquatic Animal Pathogen & Biocontainment Laboratory (CAAPBL) is located in Prince Edward Island, Canada. Fisheries and Oceans Canada operates CAAPBL which provides specialized biocontainment for R&D involving aquatic animals and aquatic animal pathogens. The containment stringency in CAAPBL is the highest available in Canada for aquatic animals and includes the autoclaving of all laboratory waste (disposable clothing plastics, small amounts of animal tissue, *etc.*) and waste water (from animal holding, sinks, floor drains, *etc.*). There is on-site incineration for animal carcasses and other organic waste. Biocontainment rooms and HVAC are built to Canadian level 3 specifications and include pressure tested rooms & ventilation, and HEPA filtration of all exhaust air. Activities at CAAPBL support Canada's National Aquatic Animal Health Program (NAAHP) and currently include several viral finfish challenges (to support risk assessment, genomic and diagnostic test development projects) and test development and validation of an exotic shellfish pathogen. Collaborators include the Lobster Science Centre (Atlantic Veterinary College) and the Fish Pathology Laboratory (Ontario Veterinary College). Additional project and collaborative activities continue to be developed in support of R&D needs developed by the NAAHP client (CFIA).

Biosecurity in NL Aquaculture

N. O'Brien *¹ and D. Whelan ¹

¹Newfoundland and Labrador Department of Fisheries and Aquaculture, St. John's, NL, A1B 4J6

Biosecurity is the management of risks from non-indigenous species and the environment. It includes practices, policies, or procedures used on the farm to reduce stress of the animals and reduce spread of pathogens should they be introduced. It is comprised of preventative medicine, surveillance, adequate diagnosis, containment of outbreaks and eradication, quarantine, and the controlled traffic of personnel, vehicles and equipment. In addition, biosecurity responsibilities include audit and enforcement of legislation, providing sanitary assurances to trading partners. Biosecurity is a shared responsibility, in that each individual in the process of animal production plays a different but critical role in the implementation of an overall program. Any failure in the chain of process will undercut the overall effort to establish and maintain biosecurity.

Advances in Marine Finfish Culture – Contributed Papers

Tuesday, May 13, 2008 - mardi 13 mai 2008

1:40 PM – 3:30 PM

Location: Ballroom AB

Chair: Kurt Gamperl

13:40 N.R. LeFrançois

Spotted wolffish cultivation in Québec: on the brink of commercialization? A clear and proactive approach to getting there.

14:00 B.S. Forward

Development of probiotics for use in marine finfish larviculture

14:20 M. Bélanger

Influence of the weaning time on growth and survival of winter flounder juveniles (*Pseudopleuronectes americanus*).

14:40 T. Avery

The influence of blastomere asymmetry pattern on embryonic development and hatching success in Atlantic cod, *Gadus morhua*

15:00 J.A. Forsythe

Developing High Value Aquaculture for New Zealand

15:20 J. Symonds

Advances in broodstock development in kingfish, groper and abalone in New Zealand

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Spotted wolffish cultivation in Québec: on the brink of commercialization? A clear and proactive approach to getting there

N.R. Le François¹⁻²

¹Université du Québec à Rimouski, Département de Biologie, Chimie et Géographie, Rimouski, QC G5L 3A1 Nathalie_Le-Francois@uqar.ca

²Centre Aquacole Marin, Direction de l'Innovation et des Technologies, Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, Grande-Rivière, QC G0C 1V0

This presentation outlines the current and future R&D activities on the spotted wolffish, a new marine fish species, setting the stage for larger scale operations. Research efforts in Quebec on the critical stages of wolffish cultivation have been successful. Studies on fertilization, incubation and first-feeding have provided predictable and reproducible results. A domestic brood-stock (mature F1 individuals born in captivity in 2002-03), and raised under two photoperiodic regimes, is now available. However, some challenges to wolffish cultivation still remain. Mainly, brood-stock nutrition and genetics to improve the survival and quality of eggs and juveniles. To this day, Quebec R&D efforts have highlighted the potential of spotted wolffish for commercialization. The next development should consist of large-scale grow-out trials, based on the best available grow-up technology and practices, involving wolffish juveniles from several families, ultimately leading to a start-up farm project.

Development of probiotics for use in marine finfish larviculture

Benjamin S. Forward^{1*}, Baijing Ji¹, Rémy Haché², Fabrice Pernet² and Rachael Ritchie¹.

¹ The New Brunswick Research & Productivity Council (RPC), 921 College Hill Road, Fredericton NB, E3B 6Z9

² Coastal Zone Research Institute Inc., 232-B avenue de l'Église, Shippagan NB, E8S 1J2

The larviculture of alternative finfish species such as cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*) has often been plagued by very low survival rates (3-5%) attributable to opportunistic bacterial infections caused by pathogens such as *Vibrio sp.* As the use of antibiotics can be expensive and lead to the development of drug resistant pathogens, we have sought to identify naturally occurring probiotic bacteria for use in treating early mortality problems. A high throughput screening platform designed to select probiotic candidates from a collection of ~1500 marine bacteria has identified over 50 unique strains from a variety of marine sources. Testing of strains in Phase I trials with cod show up to 93%-110% better survival in treated versus untreated controls and an ability to protect larvae challenged with *Vibrio Anguillarum*. Trials with one particular strain, L68, have shown that treated larvae have 48%-65% greater survival in Phase I trials with cod and 40%-140% better survival in Phase II trials with haddock. These results suggest the use of probiotics is a promising and viable solution for reducing larval mortality in the culture of alternative marine species.

Influence of the weaning time on growth and survival of winter flounder juveniles (*Pseudopleuronectes americanus*)

M. Bélanger^{1*}, Y. Lambert², M. K. Litvak³, C. Audet¹

¹ Institut des sciences de la mer de Rimouski, Université du Québec à Rimouski, C.P. 3300, Rimouski (Québec), Canada, G5L 3A1

² Institut Maurice-Lamontagne, Pêches et Océans Canada, C.P. 1000, Mont-Joli (Québec), Canada, G5H 3Z4

³ Department of Biology, University of New Brunswick, P.O. Box 5050, St. John (New-Brunswick), Canada, E2L 4L5

Winter flounder (Pleuronectidae) has been identified as a promising species for aquaculture in Eastern Canada. Reproduction and larval rearing in captivity are mastered. However, juvenile rearing is critical because high mortality rates occur in the month following settlement. This burst in mortality has been attributed to nutritional deficiencies. Rotifers, artemia and artificial diets are currently used to produce juvenile winter flounder. However, live prey, such as rotifers (*Brachionus plicatilis*), that are required for early life stages feeding represent additional costs and production efforts. Weaning corresponds to a complete end of live prey feeding for artificial diet feeding. Past observations indicate that juveniles weaned later after settlement had a better survival. Four different weaning times were tested for this experiment, at settlement, one month, two months and three months after settlement. Results show that survival increases with a later weaning. However, weaning time does not influence growth, pigmentation and fin erosion.

The influence of blastomere asymmetry pattern on embryonic development and hatching success in Atlantic cod, *Gadus morhua*

T. Avery*¹, T. Hollinger¹, S. Killen²

¹ Department of Biology, Acadia University, Wolfville, NS, Canada, B4P 2R6

² Institut des Sciences de l'Evolution de Montpellier, Station Méditerranéenne de l'Environnement Littoral, 1 Quai de La Daurade, F-34200 Sète, France

A reliable method for assessing the viability of fertilized embryos early in development would be beneficial for the aquaculture industry where batches with a high probability of low hatching success or poor larval quality could be discarded before costly resources are devoted to their culture. During the last decade, the observation of cellular morphology during embryogenesis has received attention as a potential early indicator of embryo quality. However, most often abnormally cleaving eggs are assessed together when noticeable differences in cleavage patterns are generally present. We separated six batches of Atlantic cod eggs into normal and abnormal cleavage patterns and reared them individually in a temperature-controlled room and recorded mortality rate each day until hatch, hatching success, and larval quality (based on qualitative assessments). Seven abnormal cleavage patterns were readily distinguishable. Moderate variability in egg mortality was observed across all groups and batches with no significant differences found when comparing each abnormal cleavage pattern, or all abnormal data combined, with normal eggs. Larval deformities were low in all groups, often lower in abnormally cleaving eggs, and hatching success was consistent within batches.

Developing High Value Aquaculture for New Zealand

J. A. Forsythe¹

¹ National Institute of Water and Atmospheric Research (Ltd.), Box 147, Ruakaka, New Zealand, 0151

Since 1998, the National Institute of Water and Atmospheric Research (NIWA) has conducted a series of long term research and development initiatives to develop high value marine aquaculture for New Zealand. Major species include rock lobster (*Jasus* spp), kina (*Evechinus chloroticus*), shortfinned eel (*Anguilla australis*), paua (*Haliotis iris*), yellowtail kingfish (*Seriola lalandi lalandi*) and hapuku (*Polyprion oxygeneios*).

This work focuses on technologies which advance the environmental, economic and social sustainability of production and include:

- Reproductive biology and husbandry requirements of target species
- Nutrition requirements and practical diet formulation
- Broodstock development and selective breeding
- Near-field impacts of finfish farming, mitigation and compliance
- Aquatic health management (diagnostic tools to novel therapies)

Product quality attribute identification, management, verification and manipulation

Our point of difference from many research groups is our role to develop the knowledge, establish sufficient juvenile production to support early adopters and ultimately transfer technology to industry.

This paper reviews recent achievements and challenges in bringing new, high-value species into production.

Integrated Multitrophic Aquaculture – Contributed Papers

Tuesday, May 13, 2008 - mardi 13 mai 2008

1:40 PM – 3:40 PM

Location: Ballroom C

Chair: Chris Pearce

13:40 G.K. Reid

Modelling nutrient recovery in open-water, Integrated Multi-Trophic Aquaculture (IMTA) systems

14:00 S.M.C. Robinson

Economic Significance of Aquaculture Research: Some Insights Gained on the Benefit-Cost Ratios from the Integrated Multi-Trophic Aquaculture (IMTA) Research Program.

14:20 L.C. Hannah

Suitability of the California Sea Cucumber (*Parastichopus californicus*) in Integrated Multi-Trophic Aquaculture.

14:40 T. Blair

The use of biochemicals in cultured blue mussels as spatial and temporal tracers in IMTA and monoculture systems.

15:00 T. Chopin

Did you know that the world's largest maricultured biomass (45.9%) is seaweeds? Maybe not, because 99.7% is produced in Asia, but Integrated Multi-Trophic Aquaculture (IMTA) is an opportunity to address this imbalance.

15:20 S. Cross

Did you know that the world's largest maricultured biomass (45.9%) is seaweeds? Maybe not, because 99.7% is produced in Asia, but Integrated Multi-Trophic Aquaculture (IMTA) is an opportunity to address this imbalance.

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Modelling nutrient recovery in open-water, Integrated Multi-Trophic Aquaculture (IMTA) systems

G.K. Reid^{*1,2}, S.M.C. Robinson², T. Chopin¹, T. Lander^{1,2}, M. Liutkus^{1,2}, F. Salazar², J. Mullen^{1,2}, R. Smith², T. Blair², M. Sawhney¹, B. MacDonald¹, L. Burridge², F. Page², N. Ridler¹, J. Sewuster³, M. Szemerda⁴, R. Marvin⁴, F. Powell⁴ and S. Boyne-Travis⁵

¹University of New Brunswick, Centre for Coastal Studies & Aquaculture, Centre for Environmental & Molecular Algal Research, P.O. Box 5050, Saint John, NB, E2L 4L5, Canada, ReidGK@mar.dfo-mpo.gc.ca

²Department of Fisheries & Oceans, 531 Brandy Cove Road, St. Andrews, NB, E5B 2L9, Canada

³Acadian Seaplants Limited, 30 Brown Avenue, Dartmouth, NS, B3B 1X8, Canada

⁴Cooke Aquaculture Inc., 874 Main Street, Black's Harbour, NB, E5H 1E6 Canada

⁵Canadian Food Inspection Agency, 99 Mount Pleasant Road, St. George, NB, E5C 3S9, Canada

An open-water IMTA project in the Bay of Fundy, Canada, is successfully making the transition from pilot project to the commercial scale production of co-cultured species (e.g. kelps, blue mussels) at Atlantic salmon sites. One measure of IMTA sustainability is nutrient recovery in the form of harvestable biomass. The proportion of augmented growth in co-cultured species attributed to the fed trophic level (i.e. salmon) can be empirically derived. However, system-wide nutrient recovery potential of open-water IMTA systems cannot be fully validated until co-cultured species are grown at biomasses complementary to that of fed species, and this has yet to occur. In the interim, such a system can be modelled to determine appropriate culture scales and niche exploitation required to optimize nutrient recovery. A model presently under development, partitions an IMTA system into a nutrient loading module for the fed species and three extractive functional groups; the inorganic extractive species, and the organic extractive filter and deposit feeders. A 'mass balance' nutritional approach, estimates the fractional nutrient load from the fed trophic level, which is supplied to various distributions of biomass, percent 'nutrient capture' and trophic transfer efficiencies of the extractive functional groups. Monte Carlo simulations are run for potential culture scenarios, thereby providing insight into management and development considerations.

Economic Significance of Aquaculture Research: Some Insights Gained on the Benefit-Cost Ratios from the Integrated Multi-Trophic Aquaculture (IMTA) Research Program.

S.M.C. Robinson^{1,3*}, C.A. Robinson², G. Reid^{1,3}, T. Blair¹, T. Chopin³, T.R. Lander³, B. MacDonald³, K. Haya¹, L. Burridge¹, F. Page¹, N. Ridler³, S. Boyne-Travis⁴, J. Sewuster⁵, F. Powell⁶ and R. Marvin⁶

¹Dept. of Fisheries & Oceans, 531 Brandy Cove Road, St. Andrews, NB E5B 2L9, Canada, robinsonsm@mar.dfo-mpo.gc.ca

²Public Health Agency of Canada, 130 Colonnade Rd, A.L. 6501H, Ottawa, Ontario, K1A 0K9

³University of New Brunswick, Centre for Coastal Studies & Aquaculture, Centre for Environmental & Molecular Algal Research, P.O. Box 5050, Saint John, NB E2L 4L5, Canada

⁴Canadian Food Inspection Agency, 61 Wallace Cove Road, Blacks Harbour, NB E5H 1G9, Canada

⁵Acadian Seaplants Limited, 30 Brown Avenue, Dartmouth, NS B3B 1X8, Canada

⁶Cooke Aquaculture Inc., 14 Magaguadavic Drive, St. George, NB E5C 3H8, Canada

IMTA is a rapidly evolving food production system that involves the combination of fed and extractive forms of aquaculture with the ultimate objective to form a customized biological system where the net output of the aquaculture production is reduced to a level where, ideally, there is no discernable negative impact on the surrounding ecosystem. Biologically, the IMTA concept has been making significant advances in its adoption by the aquaculture industry in Canada from both the organic extractive component (e.g. invertebrates) and the inorganic component (e.g. seaweeds). The value of this research can be assessed with the potential economic development that will result from this work, either directly or indirectly. This presentation will show the benefit-cost ratios associated with the IMTA research to-date. In addition, we will show that Lancastrian economic theory can also apply to some of the indirect impacts of this aquaculture research and speculate on some of them potential benefits that may accrue from this approach.

Suitability of the California Sea Cucumber (*Parastichopus californicus*) in Integrated Multi-Trophic Aquaculture

L.C. Hannah^{1*}, C.M. Pearce¹, S.F. Cross²

¹ Pacific Biological Station, Fisheries and Oceans Canada, Nanaimo, BC, Canada, V9T 6N7

² University of Victoria, Department of Geography, Victoria, BC, Canada, V8W 3P5

Integrated multi-trophic aquaculture (IMTA) can provide an environmentally responsible, yet still profitable, approach to aquaculture production. In the particular IMTA system developed in BC, several invertebrate species will be used to consume different fractions of fish farm waste, reducing the impact on the environment and providing additional harvestable crops. This study quantifies the consumption of the heavy fraction of sablefish waste by the California sea cucumber (*Parastichopus californicus*). Laboratory experiments determined the effect of sea cucumber size and temperature (4, 8, 12, 16°C) on feeding and assimilation rates of cucumbers fed sablefish faeces. While there was high variability among individuals, feeding rate increased with experimental temperature until 12°C, then decreased at 16°C. Small sea cucumbers fed at a significantly higher rate (per unit body weight) than larger individuals. Our results will be included in calculations to determine the biomass of sea cucumbers needed to process the heavy fraction of sablefish waste produced in the IMTA system over the course of a year. The next phase of this project will be field based at the experimental IMTA farm site and will assess the effect of varying densities of sea cucumbers on their growth and survival.

The use of biochemicals in cultured blue mussels as spatial and temporal tracers in IMTA and monoculture systems

T. Blair^{*1}, T. Lander^{1,2}, S. Robinson¹, L. Burrige¹, M. Lyons¹ and S. Leadbeater¹

¹ St Andrews Biological Station, Fisheries and Oceans Canada, St Andrews, NB E5B 2L9

² University of New Brunswick, Saint John Campus, PO Box 5050, Saint John, NB E2L 4L5

Biochemicals have frequently been used as indicators of nutrient source in various organisms. A controlled lab experiment demonstrated a correlation between diet, i.e. salmon feed or algal paste, and the biochemical composition (stable isotopes and fatty acids) of blue mussel tissues. In a field setting, external factors such as background plankton levels, local hydrography and seasonality will also influence the levels of biochemicals. A field study to examine the effects of these factors, in addition to the nutrients from nearby salmon cages, on the biochemical composition of cultured blue mussels is currently being conducted. In May 2006, we deployed polar circle mussel rafts at two salmon sites and one reference site located in Passamaquoddy Bay, and commenced monthly sampling to monitor the spatial and temporal variations in biochemical composition (fatty acids, lipids, SI, carbon/hydrogen/nitrogen and glycogen) of the mussels. To examine variability within each raft (edge and depth effects), our initial sample examined mussels in a 3D matrix from each raft. Initial results of the data collected will be presented. This information could be useful in supporting models illustrating nutrient flow in an IMTA system.

Did you know that the world's largest maricultured biomass (45.9%) is seaweeds? Maybe not, because 99.7% is produced in Asia, but Integrated Multi-Trophic Aquaculture (IMTA) is an opportunity to address this imbalance

T. Chopin^{*1}, M. Sawhney¹, R. Shea¹, E. Campbell¹, E. Belyea¹, S. Bastarache¹, W. Armstrong¹, J. Sewuster², R. Ugarte², P. Watson², T. Wilcox², M. Szemerda³, R. Marvin³, F. Powell³, G.K. Reid^{1,4}, S.M.C. Robinson⁴, N. Ridler¹, F. Page⁴, K. Haya⁴, L. Burrige⁴, and S. Boyne-Travis⁵

¹ University of New Brunswick, Centre for Coastal Studies & Aquaculture, Centre for Environmental & Molecular Algal Research, P.O. Box 5050, Saint John, NB, E2L 4L5, Canada, tchopin@unbsj.ca

² Acadian Seaplants Limited, 30 Brown Avenue, Dartmouth, NS, B3B 1X8, Canada

³ Cooke Aquaculture Inc., 874 Main Street, Blacks Harbour, NB, E5H 1E6, Canada

⁴ Department of Fisheries & Oceans, 531 Brandy Cove Road, St. Andrews, NB, E5B 2L9, Canada

⁵Canadian Food Inspection Agency, 99 Mount Pleasant Road, St. George, NB, E5C 3S9, Canada

Seaweeds represent 45.9% of the tonnage and 24.2% of the value of the world mariculture production. The seaweed aquaculture production (92% of the world seaweed supply) is estimated at 11.2 million tonnes and US\$5.7 billion, with 99.7% of the production and value being provided by Asian countries. One may be inclined to think that, on the world scale, the two types of aquaculture, fed and extractive, balance each other out environmentally, as 45.9% of the mariculture production is provided by seaweeds, 43.0% by molluscs, 8.9% by finfish, 1.8% by crustaceans and 0.4% by other aquatic animals. However, because of predominantly monoculture practices, economics and social habits, these different types of aquaculture production are often geographically separate, and, consequently, rarely balance each other out environmentally on the local or regional scale. Integrated Multi-Trophic Aquaculture (IMTA) can help bring a balanced ecosystem approach to aquaculture development by combining the cultivation of fed species (fish or shrimps) with inorganic extractive species (seaweeds) and organic extractive species (filter or deposit feeding invertebrates) in many regions of the world. The western world animal-dominated aquaculture has to recognize and take advantage of the environmental, economic and societal services and benefits of value-added extractive crops. In particular, we have an opportunity to reposition the value and roles seaweeds have in coastal ecosystems.

Intensive SEA-System Design: An Opportunity for Innovation

Stephen F. Cross

Coastal Aquaculture Research & Training Network, University of Victoria

3800 Finnerty Rd., Victoria, British Columbia, Canada, V8P 1A1

As recognition of the Integrated Multi-Trophic Aquaculture (IMTA), or Sustainable Ecological (SEA), system as a commercially viable approach to aquatic agrifood production grows, industry faces a variety of challenges (and innovation opportunities) in designing new, and/or in modifying existing monoculture systems, in order to accommodate multiple species co-production. While commercial-scale success of IMTA in New Brunswick is based on modification of an *extensive* model of finfish production (polar circle grid array), the use of a comparatively *intensive* netcage system in coastal British Columbia (steel, square cages) has necessitated design and engineering that is resulting in a novel approach for SEA-System production. This talk will discuss this pilot-scale development in coastal British Columbia, providing our vision of Sustainable Ecological Aquaculture (SEA-Systems) using Sustainable Energy Alternatives (SEA-Power).

Fish Health – Contributed Papers

Tuesday, May 13, 2008 - mardi 13 mai 2008

2:00 PM - 3:20 PM

Location: McAvity Room

Chair: Joy Wade

13:40 A.P. Frenette

In quest of a sensitive and specific PCR assay to diagnosis *Loma morhua* in Atlantic cod (*Gadus morhua*).

14:00 D.E. Barker

Little bugs with smaller bugs: preliminary studies on the role of sea lice as a vector of bacterial pathogens.

14:20 R.J. Ritchie

Virulence and resistance responses from infection of Atlantic Salmon with various ISAV isolates.

14:40 M.L. Beaudin

Evaluation of antibacterial capacity of probiotic candidates against major *Vibrio* pathogens in marine bivalve larvae: Preliminary results

15:00 A.M. MacKinnon

The Necessity of Vaccination Best Practice Standards Throughout the Production Cycle

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

In quest of a sensitive and specific PCR assay to diagnosis *Loma morhua* in Atlantic cod (*Gadus morhua*)

Aaron P. Frenette^{*1}, Michael S. Duffy², and Michael D. B. Burt²

Infectious disease agents are an imminent threat poised to disrupt the production level of any developing aquaculture industry. Infection of caged Atlantic cod (*Gadus morhua*) with the protozoan parasite, *Loma morhua*, has impeded the full potential of the cod aquaculture industry in Atlantic Canada. The pathogen has adverse effects on both fish survival and condition upon grow-out. Very little is known about the route of transmission or about other organisms that might be involved in the epidemiology of infections. The Internal Transcribed Spacer (ITS) of *L. morhua* ribosomal DNA (rDNA) was sequenced to identify a region that would facilitate development of a sensitive and species-specific diagnostic assay (PCR). Sequence alignments with related species, and assay using *L. salmonae* DNA, confirmed the specificity of this PCR assay for *L. morhua*. Sensitivity of diagnosis was 100% using parasite material from 14 fish from two aquaculture cage sites. The sensitive and specific nature of the PCR assay will be employed in the assessment of prophylactic measures to defend against disease outbreaks and for the detection of the parasite in live fish. This contemporary diagnostic assay will aid in elucidating the life cycle, in studies on the epidemiology of infections, and in the assessment of efficacy of therapeutics to limit *L. morhua* infections in cod.

Little bugs with smaller bugs: preliminary studies on the role of sea lice as a vector of bacterial pathogens

Duane E. Barker^{1*}, Laura M. Braden¹, Maria P. Coombs² & Brad Boyce³

¹Fisheries & Aquaculture Department, Malaspina University-College, Nanaimo, British Columbia, Canada, V9R 5S5

² Animal Health Branch, Ministry of Agriculture & Lands, Courtenay, B.C., Canada, V9N 5M6

³Marine Harvest Canada, Campbell River, B.C., Canada, V9W 8C9

The ability of a parasite to carry and transmit other parasites or pathogens, thus serving as a disease vector, is fascinating. Parasite vector-pathogen associations (e.g., malaria from mosquitoes), have been well described from humans and domestic animals but have rarely been examined within an aquatic ecosystem. Farmed fish provide a unique host system to study because they represent an artificial aggregation of hosts; however, farmed fish can be treated, thus interrupting the cyclical development of parasite and pathogen. Farmed salmon in B.C. provide an almost ideal system to examine because of the abundance of wild and farmed salmon and the potential for reciprocal pathogen exchange. The potential role of sea lice in a vector-pathogen association affecting salmon has not been explored, despite an obvious need. We will present the preliminary results of our proposed long-term study on this association, including the first isolation of *Tenacibaculum maritimum* (= *Flexibacter maritimus*), *Pseudomonas fluorescens* and *Vibrio* sp. from sea lice, *Lepeophtheirus salmonis*, parasitizing farmed Atlantic salmon in B.C. Using standard screening protocols, we have repeatedly isolated three pathogenic species from external (58-100%) and internal (12.5-100%) samples of motile sea lice collected from healthy farmed Atlantic salmon. These preliminary results are intriguing and certainly justify a comprehensive, long-term study to explore and describe this relationship. We plan to identify transmission risk from sea lice vectors as defined within a spatiotemporal context. In other words, where (geographically) and when (seasonally), could sea lice carry important salmon pathogens?

Virulence and resistance responses from infection of Atlantic Salmon with various ISAV isolates

R J Ritchie^{*1}, J T McDonald^{*2}, B Glebe³, W Young-Lai³, E Johnsen¹ & N Gagné⁴.
(* co-presented)

¹Research & Productivity Council (RPC), 921 College Hill Rd., Fredericton, N.B. E3B 6Z9 Canada

²Department of Economics University of New Brunswick, Fredericton, NB Canada

³Department of Fisheries and Oceans, Biological Station, St. Andrews, NB E5B 2L9 Canada

⁴Department of Fisheries and Oceans, Aquaculture and Environmental Sciences, Moncton N.B. E1C 9B6 Canada

A large number of genetically distinct ISAV isolates which appear to be of variable virulence have been identified in the Bay of Fundy. However it has been difficult to elucidate a clear association between these genetically distinct isolates and variations in virulence seen in the field. This has stymied the establishment of proactive management decisions regarding infected fish, and ISAV infections, regardless of type, must be treated as one. Field data of ISAV infections is difficult to collect and comparison between infections is difficult owing to a wide range of confounding factors including time of year, fish stock, cage site location, mitigating factors and stressors. An important tool in determining the relationship between molecular differences and virulence comes from analysis of quarantine studies. The goal of this study was to compare the virulence, by co-habitation and intra-peritoneal injection, of four regionally common and recent ISAV isolates in a controlled environment. We found significant differences in mortality between ISAV molecular isolates, and present data showing that survival of ISAV infection confers significant resistance to re-infection with a different ISA isolate. These findings, if borne out in field studies, will significantly alter the way ISAV infections are managed in the Bay of Fundy and elsewhere.

Evaluation of antibacterial capacity of probiotic candidates against major *Vibrio* pathogens in marine bivalve larvae: Preliminary results

M.L. Beaudin^{*1}, R. Tremblay¹, P. Miner² and J.L. Nicolas²

1. Institut des Sciences de la Mer, Université du Québec à Rimouski, Rimouski, QC, Canada, G5L 3A1

2. DRV/A, Laboratoire de Physiologie des mollusques, IFREMER Centre de Brest, Plouzané, France 29280

The expansion of bivalve hatchery is often limited by the weak health condition of larvae. Survival is extremely variable in larval production and mortality is frequently associated with bacterial contamination, mainly by species of *Vibrios*. Now with the limited use of antibiotics in hatchery, it is essential to find other ways to prevent larvae mortality. Probiotic seems to be the most conceivable solution to fight *Vibrio* such as *Vibrio pectenicidae*, known as the main cause of Great scallop (*Pecten maximus*) larval death. The purpose of this study was to realise a pre-selection of probiotics candidates susceptible to increase survival rate of larvae in bivalve hatchery. Inhibitory effects of six different marine bacteria were tested on four main Great scallop (*Pecten maximus*) and Pacific oyster (*Crassostrea gigas*) pathogens (*Vibrio pectenicidae*, *Vibrio splendidus*-like, *Vibrio coralliilyticus* and *Vibrio aestuarianus*). Two of the potential probiotics, *Roseobacter gallaeciensis* and *Pseudoalteromonas sp.*, stood out from the others and have shown more interesting results. The toxicity of *Pseudoalteromonas* has also been tested on *Pecten maximus* larvae.

The Necessity of Vaccination Best Practice Standards Throughout the Production Cycle

Allison M. MacKinnon* and R. Peach

37 McCarville Street, Charlottetown, PE, C1E2A7, allison.mackinnon@novartis.com

It is often assumed that vaccines will perform the same under a variety of conditions, environmental factors and methods of administrations. Sometimes we take liberties with label instructions, assuming that minor violations will not have serious consequences. After several years and billions of vaccinated salmon around the world, we are learning that to insure the benefits of maximum protection with minimum risk of side effects, the health status of the animal at time of vaccination, quality of application, pre-check and follow-up can be almost as important as the vaccine itself. Although we understand a deal more about the risk factors involved in affecting vaccine performance, we are a long way we are still gathering information

with each vaccination season to help quantify the major risk factors involved in the vaccination process. This information is critical so that the farmer can make the best decisions in maximizing the benefits of vaccines in their business. It is with this in mind that Novartis has developed their SECURE program in order to monitor vaccine application and use under a variety of hatchery conditions around the world, and set a baseline of standards for the application and monitoring; 2) build a comprehensive database of vaccine application under a variety of conditions around the world; and 3) continually analyze the data collected and report it back to the farmer for the best and most effective method of use on that specific farm.

Finfish Nutrition & Physiology – Contributed Papers

Wednesday, May 14, 2008 – mercredi, 14 mai 2008

9:00 AM - 10:40 AM

Location: Ballroom AB

Chair: Nathalie LeFrançois

09:00 T.S.F. Hori

Divergent Cortisol Stress Responsiveness of Atlantic Cod (*Gadus Morhua*)

09:20 M.P.A. Wijekoon

Effect of diet and temperature on muscle lipid and fatty acid composition in steelhead trout (*Oncorhynchus mykiss*)

09:40 D. Deslauriers

Replacement of fish oil in Atlantic salmon diets by poultry oil

10:00 D. Diouf

Preservation of lipid content in microalgae concentrates from ultrafiltration process

10:20 M.J. MacPherson

Transferring Arctic charr to seawater: problems and potential

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Divergent Cortisol Stress Responsiveness of Atlantic Cod (*Gadus Morhua*)

Tiago S. F. Hori^{1*}, Stewart C. Johnson², A. K. Gamperl¹, Luis O. B. Afonso².

¹Ocean Sciences Center, Memorial University of Newfoundland, St John's, NL, A1C 5S7, Canada.

²The Atlantic Genome Center, Genome Atlantic, 1411 Oxford Street, Halifax, NS, B3H 3Z1, Canada.

The magnitude of the cortisol response to stress shows significant intra-specific variation, and is defined as a divergent response. In this study, we investigated the divergent cortisol response in ten families of cod by subjecting them to a handling stress (30 sec out of water) over 5 consecutive months, and determining for each family the proportion of high (HR) and low (LR) cortisol responders, and their growth and survival. The proportion of HR and LR fish among the families varied from 70 to 10%. At the end of the experiment, the body mass of families with a high proportion of LR (345 g) was significantly greater than in families with a high proportion of HR (220 g). Survival was higher in predominantly LR as compared to predominantly HR families (90 vs 70%, respectively). We showed that free-cortisol (FC) levels and the percentage of FC was higher in HR than in LR fish (an important point given that only FC interacts with target-cells), and that status as a LR or HR was maintained when the fish were subjected to a subsequent acute temperature stress. These results suggest that low cortisol responsiveness may be a desirable trait to select for in broodstock development programs.

Effect of diet and temperature on muscle lipid and fatty acid composition in steelhead trout (*Oncorhynchus mykiss*)

Manju P.A. Wijekoon^{*1}, Atef A. H. Mansour², Daryl Whelan³, Kaushik Nag⁴, Chris C. Parrish¹

¹Ocean sciences Centre, Memorial University of Newfoundland, St Johns, NL A1C5S7

²Department of Fisheries and Oceans, St Johns, NL A1C5X1

³Department of Fisheries and Aquaculture, St Johns, NL A1B4J6

⁴Memorial University of Newfoundland, St Johns, NL A1C5S7

The fluctuating water temperature in the Bay d'Espoir aquaculture sites can be stressful for the caged trout, compromising the growth survival and flesh quality. Dietary lipids play a crucial role in fish growth; overcome environmental stresses and improving the flesh quality. This study was conducted to examine the effect of temperature fluctuations on muscle lipid and fatty acid composition in adult trout fed with 3 different commercial diets commonly used by the aquaculture farmers. The lipid portion of the 3 diets (High – Polyunsaturated fatty acids: H-PUFA; medium; M-PUFA; low; L-PUFA) differ based on the origin, with the lipid of H-PUFA and M-PUFA primarily originating from marine or terrestrial lipids respectively, while the lipid of L-PUFA consists of marine, terrestrial and vegetable oils. The temperature was gradually raised from 13.5°C to 18.5°C, and then dropped back to 13.5°C, and the fish were sampled about 10 days after each increment. Different lipid variables were compared between fish fed the three diets, including PUFA and MUFA fatty acids, DHA:EPA ratios, saturated: unsaturated fatty acid ratios, cholesterol levels and cholesterol to phospholipids ratios. Preliminary results indicate fatty acid composition respond to dietary manipulation. These findings have implications for fish health and nutritive value for the consumers.

Replacement of fish oil in Atlantic salmon diets by poultry oil

D. Deslauriers^{*1}, K. Rideout²

¹ Advance diploma in sustainable aquaculture, Marine Institute of Memorial University of Newfoundland, P.O. Box 4920, St. John's, NL A1C 5R3

² School of Fisheries, Marine Institute of Memorial University of Newfoundland, P.O. Box 4920, St. John's, NL A1C 5R3

The aim of the present study was to determine the impacts of replacing up to 40 % of total marine oil with poultry oil in Atlantic salmon (*Salmo salar*) diets. Growth, feed conversion ratios and digestibility as well as flesh and faeces proximate analysis were evaluated. The experimental design consisted of four treatments with triplicate groups of 20 fish each. The diets were fed twice daily to apparent satiation to 32.1 g fish during 54 days at 9 °C. Final weight, specific growth rate and condition factor were all independent of diet. Hepato-somatic and viscero-somatic indexes as well as fillet yield of fish from the four treatments did not show any significant differences. Flesh proximate analysis showed a significant difference ($P < 0.05$) in moisture for the 20% inclusion of poultry oil diet. Digestibility of protein and lipid decreased in the 10% diet compared to the control. The results suggest that marine oil can be replaced up to 40% with poultry oil without compromising growth performances.

Preservation of lipid content in microalgae concentrates from ultrafiltration process

Diadié Diouf^{*1}, Réjean Tremblay¹, Réal Fournier¹ and F. Pernet²

1. Institut des Sciences de la Mer, Université du Québec à Rimouski, Rimouski, QC, Canada, G5L 3A1

2. Laboratoire Environnement Ressources en Languedoc-Roussillon, Pôle "Mer et Lagunes",
Cedex Sète, IFREMER Sète, France 34203

In this study cultured microalgae from Eustigmatophyceae (*Nannochloropsis sp.*), Prymnesiophyceae (*Pavlova sp.* and *Isocrysis sp.*) and a cocktail of these three species was used to produce concentrate which stability in time was assessed by monitoring the lipid content during a eight week storage at 2°C. Survey was performed using two preservatives (ascorbic and citric acids).

Experiment was conducted at the aquatic station of the marine science institute of the University of Quebec in Rimouski. Microalgae were cultured in 260 liter photobioreactor using a continuous artificial light. After harvesting, they are concentrated by a serie of ultrafiltration and dispatched in four polyethylene flasks (two with preservatives and two controls) and stored at 2°C. Sampling was conducted each week and lipid analysis performed at the marine science institute.

Results show a good preservation of lipid classes mainly TAG and AMPL for *Nannochloropsis sp.* Values of FFA and PL slightly increased at the end of the storage duration. Very high level of preservation rates were also obtained for essential fatty acids, like EPA (~90%), AA (86%) and total fatty acids.

The biochemical composition of the two Prymnesiophytes *Pavlova sp.* and *Isocrysis sp.* has increased in TAG and PL. For *Isocrysis sp.*, TAG increased by two fold and PL five times. AMPL content of *Isocrysis sp.* showed an increase of 4.35% whereas that of *Pavlova sp.* decreased with a preservation of only 38%. At the same time the preservation rate of AMPL for the control was as low as 13%.

Concerning the concentrate of the cocktail, good preservation rate were obtained up to day 42. Beyond this limit, lipid content decreased compared to that of the control.

Transferring Arctic charr to seawater: problems and potential

M.J. MacPherson^{*}, J. Duston, T. Astatkie¹

Dept. Plant and Animal Sciences and ¹Dept Engineering, Nova Scotia Agricultural College, PO Box 550,
Truro, NS, B2N 5E3

Economic viability of Arctic charr farming would be greatly improved if grow-out could be completed in sea-cages in full seawater. Attempts to date have failed due to the limited salinity tolerance of the Fraser River stock. The present study investigated some of the parameters needed to enable Arctic charr to grow well in 30 ppt salinity. Salinity challenge tests conducted from March through June revealed poor smolt development compared to Atlantic salmon, irrespective of temperature of either freshwater or seawater (4 vs. 9 °C). Other experiments showed Arctic charr (>200 g) can easily tolerate direct transfer to 20 ppt, then be acclimated up to 30 ppt. Direct transfer to 30 ppt in June completely stunted growth, even among fish >500 g, although mortality was low. Despite the high incidence of sexual maturation (>70 %) in autumn, mortality among maturing fish was less than 11 %. However, the growth potential of immature fish is encouraging, as they attained market size (>1 kg) after only six months in seawater.

Aquaculture Waste Management & Miscellaneous– Contributed Papers

Wednesday, May 14, 2008 – mercredi, 14 mai 2008

9:00 AM - 10:30 AM

Location: Ballroom C

Chairs: Michel Couturier

09:00 J. Conroy

Phosphorus leaching during the hydrolysis of fish waste solids

09:20 S. Fraser

Anaerobic Digestion of Aquaculture Waste Solids

09:40 M. Reda

Comments on the sudden propagation of The Harmful algae *Didymosphenia geminate*

10:00 M. Hedayatifar

The quality changes of cold-smoked rainbow trout during storing (*Oncorhynchus mykiss*)

Underline denotes presenter is a student eligible for Best Student Oral Presentation Award

Phosphorus leaching during the hydrolysis of fish waste solids

J Conroy*, M.F. Couturier

Recirculating Aquaculture Research Group, Department of Chemical Engineering, University of New Brunswick, P.O. Box 4400, Fredericton, NB, E3B 5A3, Canada, Tel.: (506)455-4690, Fax: (506)453-3591, Email: cout@unb.ca

The removal of suspended solids from the effluent of aquaculture facilities is a recognized strategy for reducing BOD and phosphorus emissions. The effectiveness of this strategy is reduced however when the captured solids remain in contact with the effluent water and hydrolysis is allowed to occur. Hydrolysis is the enzyme catalyzed conversion of organic solids into soluble compounds under anaerobic conditions. In order to determine how phosphorus goes into solution, the hydrolysis of fish waste solids - collected from a salmon smolt hatchery - was investigated at room temperature. Dissolved oxygen, pH and dissolved phosphorus were measured over several days. It was found that as the DO concentration decreased, the pH also dropped due to the production of volatile fatty acids. The concentration of dissolved phosphorus increased with decreasing pH, especially once the pH dropped below 6.5. Within the range of solids concentrations tested (0.5 wt.% - 9.02 wt.%), solids content had little effect on dissolved phosphorus concentration. As with the phosphorus, the dissolved calcium concentration increased with decreasing pH with a sharp increase at a pH of 6.5. This process was found to be reversible. Solids which had undergone hydrolysis were filtered and the pH of the filtrate was increased by the addition of sodium hydroxide. The concentration of dissolved calcium and phosphorus decreased with increasing pH, and there was a visible precipitate formed at pH 6.5 and above. This precipitate was analyzed using x-ray diffraction and was found

to contain the minerals apatite ($\text{Ca}_5(\text{PO}_4)_3(\text{OH})$), bobierrite ($\text{Mg}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$), and hannayite $\text{Mg}_3(\text{NH}_4)_2\text{H}_4(\text{PO}_4)_4 \cdot 8\text{H}_2\text{O}$.

Anaerobic Digestion of Aquaculture Waste Solids

S. Fraser*, M.F. Couturier, J. Conroy and K.S. Singh¹, Adrian Desbarats²

¹ Recirculating Aquaculture Research Group, Department of Chemical Engineering, University of New Brunswick, P.O. Box 4400, Fredericton, NB, E3B 5A3, Canada, Tel.: (506)455-4690, Fax: (506)453-3591, Email: cout@unb.ca

² Atlantech Companies, 89 Hillstrom Avenue, Charlottetown, PEI, C1E 8C3, Canada

A pilot-scale anaerobic digester (0.21 m³) was used to treat fish waste from a land-based recirculating aquaculture farm producing salmon smolts. The digester was operated continuously at 31°C for over one year at volatile solids (VS) loadings ranging from 0.2 to 2 kg VS/m³/day and hydraulic retention times between 30 and 70 days. The content of the digester was kept well mixed by a recirculation pump whereas the gas pressure in the reactor was maintained below 37 kPa using a pressure-reducing valve. The gas production rate was calculated from the rate of pressure rise in the reactor and by measuring the effluent flowrate using a wet-test meter. Waste solids were transferred to the digester from a feed tank once per day using a constant displacement pump. Although the average residence time of the solids was less than four days in the feed tank, this was sufficient for the feed tank to act as a hydrolysis reactor where a significant amount of volatile fatty acids were generated. In this manner, the acidogenesis step occurred in the feed tank at a low pH (5.5 - 6.5) whereas the methanogenesis step occurred in the anaerobic reactor at a high pH (7.6 - 8.0). The unusually high pH in the anaerobic reactor was due to the high nitrogen content of the waste solids (3 - 10 wt.%) which got converted to ammonia in the reactor (2,000 - 3,000 mg/L). Small amounts of hydrochloric acid had to be periodically added to the feed and digester to keep the pH below 8 and thereby prevent undissociated ammonia concentrations from reaching toxic levels. As a result of the high ammonia levels, the alkalinity in the reactor was also high (8,000-10,000 mg/L). The high pH had however the beneficial effect of inducing the precipitation of dissolved phosphorus and thereby reducing

its concentration from 100 - 400 mg/L in the feed tank to 30 mg/L in the digester effluent. Over 75% of the total COD fed to the reactor was consistently converted to methane and carbon dioxide, yielding an effluent gas with a CH₄ content between 55 and 63 vol%. Anaerobic digestion is an attractive strategy for the management of aquaculture waste because it stabilizes the solids prior to land application by converting organic matter into valuable biogas.

Comments on the sudden propagation of The Harmful algae *Didymosphenia geminata*

M. Reda

Independent Technical Consultant , CanadElectrochem ,Research & Development ,Hamilton, Ontario L8R 1R6, Canada, pulp555@gmail.com

The Harmful algae *Didymosphenia geminata* is propagating all over the world. Scientists remain puzzled about the timing of its sudden bumper-crop blooming. Why is this happening now? *Didymosphenia geminata* is a diatom, which is a type of single-celled algae unique for their silica (SiO₂) cell walls. The nuisance build-up is not the cell itself, but their massive production of extracellular stalks. Extracellular polymeric substances (EPS) that form the stalks are made primarily of polysaccharides. Within the masses of extracellular stalks and cells, concentrations of dissolved oxygen are supersaturated with respect to the atmosphere (Larned et al. 2006). The objective of this publication is to explain how *D. geminata* attains its remarkable biomass. Thus the purpose is investigation of the processes within the mat matrix (the stalks) which will lead to addressing the biological paradox of how *D. geminata* produces excessive biomass in low nutrient streams and rivers, over short periods of time. This should help resolve the paradox.

The quality changes of cold smoked rainbow trout during storing (*Oncorhynchus mykiss*)

MASOUD HEDAYATIFARD^{*1}, SARA K. KHAZAEI², FARZANEH SHAKERZADEH², ZOHREH JAMALI³

¹ Fisheries Department, College of Agriculture, Islamic Azad University, Ghaemshahr branch, Po Box: 163, Iran

² BSc, Young Researchers Club, Islamic Azad University, Ghaemshahr, Iran.

³ MSc, Environment and Fisheries Department, College of Agriculture and Young Researchers Club, Islamic Azad University, Ghaemshahr, Iran.

* Author for correspondence, e- mail: persiafish@gmail.com, Tel.: 0098. 123 2240672; Fax: 0098. 123 2240090

It has been known the smoking will increase the shelf-life of fish. In addition, storage and preservation of seafood are one of the most important technical goals in the food sciences and technology. The shelf-life of smoked fish is affected by temperature of smoking, phenol compounds, salt content, biochemical compounds of fish and kind of packaging. In the present investigation, the shelf-life of cold smoked rainbow trout (*Oncorhynchus mykiss*) has studied and biochemical factors such as moisture, protein, lipid, ash, Total Volatile Nitrogen (TVN), Peroxide value (POV) and pH were determined at fresh and smoked stages and also, during storage. The results showed that TVN and POV has changed and increased during cold storage at 4°C. The bacteria community changed according to TVN and reached to an amount of 1700 cfu/g from the 1300 cfu/g, during cold storing. There are proteolytic and psychrophilic bacteria in the cold smoked trout while are not any fungi at the samples. These results were subjected as test of tukey, with a SPSS software and analysis of variance (ANOVA) which were significant at a level of 95 % (p<0.05). The results showed that also, the trout fillets were preserved by cold smoking and storing at the chilled temperatures.

Poster Session / Session affiches
Tuesday, 13 May, 2008 – mardi, 13 mai 2008

2:00 – 4:00 PM

Room/salon: Mezzanine Floor

Underline denotes presenter is a student eligible for Best Student Poster Presentation Award

The thermal tolerance of Atlantic cod (*Gadus morhua* L.) juveniles held under normoxic and moderately hypoxic conditions.

J.A. Bailey¹, C.D. Busby¹, J. Tosh², L. Murphy¹ & A.K. Gamperl¹

Growth and Gonadal Development of Triploid versus Diploid Atlantic Cod

Nathaniel Feindel^{*1}, Tillman Benfey², Edward Trippel³, Steve Neil⁴

Bivalve transfers: how to improve the risk assessment and the risk management of their ecological risk due to associated non-indigenous marine species?

S. Gauthier-Clerc^{*1} and C. McKindsey²

Identification of the causal agent of Malpeque disease in oysters

Mark Laflamme^{1,2}, Mélanie Robichaud-Haché¹, Roland Cusack³, Brian Muise⁴, Nellie Gagné^{1,2}

Study of the impacts of oxygen concentration on survival and growth of juveniles spotted wolffish (*Anarhichas minor*).

F. Larouche^{*1}, N.R. Le François¹⁻², S.G. Lamarre³ and D. Chabot⁴

Effect of digestible protein to digestible energy (DP/DE) ratio on growth performance, feed efficiency and ammonia output of juvenile shortnose sturgeon (*Acipenser brevirostrum*)

S. Leadbeater^{*1, 3}, S.P. Lall², J.D. Kieffer¹ and M.K. Litvak¹.

Immune response of Atlantic salmon (*Salmo salar*) to infection by the Infectious Salmon Anemia Virus (ISAV)

Francis LeBlanc^{*1}, Mark LaFlamme², Nellie Gagné²

Investigation on temporal effects of spawning season, maternal and paternal differences on reproductive success in Atlantic cod (*Gadus morhua*) broodstock

Lush L.^{*1}, Hamoutene D.¹, Drover D., and Walsh A.²

Evaluation of Yellow Seed Canola Meal as Partial Replacement for Fish Meal in Practical Diets for Rainbow Trout Fingerlings.

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diets at 25% inclusion rate produced performance equal to a fishmeal diet by rainbow trout fingerlings.

It doesn't matter if you're black or white: Malpigmentation changes and impact on growth of cage-cultured Atlantic Halibut (*Hippoglossus hippoglossus*)

J. Power^{*1,2}, T. Benfey¹, D. Martin-Robichaud²

Current validation plan for Infectious salmon anemia virus (ISAV)

Mélanie Robichaud-Haché^{*1}, Crystal Collette¹, Lisa Léger¹, Nellie Gagné^{1,2} and Charles Caraguel³

Development of novel recombinant vaccine models against infectious salmon anemia virus (ISAV)

Mélanie Roy^{*1,2}, Mark Laflamme^{1,2}, Kira Salenius³, Nathalie C. Simard³, Mélanie Robichaud-Haché¹, Gilles A. Robichaud² et Nellie Gagné^{1,2}

Dietary protein hydrolysates and trypsin inhibitor effects on the digestive capacities and performance of newly-hatched wolffish

A. Savoie^{*1}, N.R. Le François¹, S.G. Lamarre², P.U. Blier³ and C. Cahu⁴

Genetic variability of different American oyster (*Crassostrea virginica*) populations of Atlantic Canada assessed by microsatellite markers

P. St-Onge^{*1,2}, B. Vercaemer, J.-M. Sévigny¹, R. Tremblay² and F. Pernet⁴

Effect of rearing density on growth and stress level of juvenile spotted wolffish (*Anarhichas minor* Olafsen)

S. Tremblay-Bourgeois^{*1}, N. R. Le François¹, R. L. Roy², T. Benfey³ and A. K. Imsland⁴

Poster Abstracts – Aquaculture Canada^{OM} 2008

The thermal tolerance of Atlantic cod (*Gadus morhua* L.) juveniles held under normoxic and moderately hypoxic conditions.

J.A. Bailey¹, C.D. Busby¹, J. Tosh², L. Murphy¹ & A.K. Gamperl¹

¹Ocean Sciences Centre, Memorial University of Newfoundland, St. John's, NL. A1C 5S7.

²Centre for Genetic Improvement of Livestock, University of Guelph, Guelph, ON. N1G 2W1.

Understanding the thermal limits of cod is crucial as sea-cage locations in Atlantic Canada and Europe can experience high and fluctuating summer temperatures. To this end, the tolerance of 14 cod families to acute ($\sim 2^{\circ}\text{C} \cdot \text{h}^{-1}$) and chronic (1°C every 4 days) temperature increases was measured under both normoxia and moderate hypoxia (75% O_2 saturation). The latter examined as reduced water oxygen levels are often observed with increased temperature or stocking densities. Cod challenged with an acute temperature increase had a CTM (Critical Thermal Maximum) of $22.5 \pm 0.7^{\circ}\text{C}$ (mean \pm s.d.), and exposure to hypoxia only decreased their CTM slightly (to $21.8 \pm 0.7^{\circ}\text{C}$). In the chronic challenge, the normoxic CTM was $21.9 \pm 1.0^{\circ}\text{C}$, a value 0.6°C lower than that measured acutely. However, hypoxia had no effect on the cod's chronic CTM or its temperature-food consumption (F_C) relationship; F_C decreasing by $\sim 50\%$ from $17\text{--}18^{\circ}\text{C}$, and ceasing altogether by 20°C . Large differences in family means for acute CTM (up to 1.8°C) were observed, but reduced fish numbers precluded family analysis in the chronic temperature challenge. This data suggests that thermal tolerance may be heritable, and thus could be selected for in a breeding program.

Growth and Gonadal Development of Triploid versus Diploid Atlantic Cod

Nathaniel Feindel^{*1}, Tillman Benfey², Edward Trippel³, Steve Neil⁴

^{1,3,4}St. Andrews Biological Station, 431 Brandy Cove Road, St. Andrews, New Brunswick, Canada. E5B 2L9

²University of New Brunswick, Department of Biology, P.O. Box 4400 Fredericton, N.B. Canada E3B 5A3

Atlantic cod (*Gadus morhua*) is a prime candidate for aquaculture due to the collapse of the wild stocks, low supply and a large market demand. Pre-harvest sexual maturation of cod is one of the main problems for commercializing the mariculture of this species. We are using triploid populations as a way to examine the suppression/inhibition of maturation in cod. Pressure treatment of 5 min at 58,600 kPa (8500 psi), applied at 30 min post-fertilization to eggs held at 6°C , resulted in a 100% success rate of triploidy induction. Based on preliminary results, no mature triploid females were observed, and only 12.5% of triploid males were mature (at 26 months of growth). Approaching spawning season and during the regular spawning season, triploid females had oocytes which were previtellogenic or ripening. Triploid males were ripening upon the approach of the spawning season and spawning during the regular spawning season. Data collection, histological examination of the gonads along with growth data is still being collected and will be analyzed at a future date. This research is funded by DFO's Aquaculture Research and Development Program, in partnership with Cooke Aquaculture Inc.

Bivalve transfers: how to improve the risk assessment and the risk management of their ecological risk due to associated non-indigenous marine species?

S. Gauthier-Clerc^{*1} and C. McKindsey²

¹Institut des Sciences de la Mer de Rimouski, Rimouski, QC G5L 3A1

²Institut Maurice Lamontagne, Fisheries and Oceans Canada, Mont-Joli, QC G5H 3Z4

In eastern Canada, the sustainability of bivalve farming industry relies on transfer of spat or small seed between growing areas. Inter-regional marine farming activities are recognised as one of the human-mediated pathways for the spread of non-indigenous marine species (NIMS). Potential spread of toxic algae or alien invasive species (*codium fragile*, tunicates, green crab) transferred with bivalve between growing areas is of great concern in Maritimes as well as in Québec or Newfoundland. Nevertheless, the ecological risk assessment framework of the National Code on introductions and transfers of aquatic organisms should prevent such ecological risk during bivalve transfer. However, an effective risk management of spread of NIMS during transfer, may require appropriate mitigation protocols as well as a voluntary code of practice by mussel farming industry. Moreover, management plans to ensure that no spat, mussels equipment or organisms known to be harbouring harmful, toxic or nuisance organisms are transferred to mussel farm could come at cost to growers. It is important, therefore, that the risks posed by other vectors are acknowledged, and comparable management measures implemented for them. We will identify on our poster major issues to improve the risk assessment and the risk management of the spread of NIMS potentially transferred with bivalve.

Identification of the causal agent of Malpeque disease in oysters

Mark Laflamme^{1,2}, Mélanie Robichaud-Haché¹ Roland Cusack³, Brian Muise⁴, Nellie Gagné^{1,2}

1. Department of Fisheries and Oceans, Gulf region, Moncton, Nouveau-Brunswick (Canada)

2. Département de chimie et biochimie, Université de Moncton, Nouveau-Brunswick (Canada)

3. Nova Scotia Department of Agriculture and Fisheries

4. Aquaculture Association of Nova Scotia

Oyster aquaculture is an important industry with a long history in Atlantic Canada. In 2005, nearly 5 000 tonnes of cultured American oysters were produced in Atlantic Canada at a value of more than \$8 million. The oyster industry has been plagued on several occasions, however, by a highly infectious malady named Malpeque disease. Initially, the disease appeared in 1915 in Malpeque Bay, PEI, and new epizootics in the 1950's and 60's greatly affected the industry, with losses of up to 90% of affected stocks. Despite these occurrences, and many attempts to visually or histologically identify the causative agent of Malpeque disease, no pathogen has ever been found. We propose to use a differential display PCR system to compare total genetic material from healthy and infected mussels. By identifying DNA sequences present in the infected samples but absent in the healthy samples, we hope to gain insight into the nature of the pathogen, which may be of viral, protistan or other origin.

Study of the impacts of oxygen concentration on survival and growth of juveniles spotted wolffish (*Anarhichas minor*).

F. Larouche^{*1}, N.R. Le François¹⁻², S.G. Lamarre³ and D. Chabot⁴

¹Département de biologie, Université du Québec à Rimouski, Rimouski, QC, G5L 3A1 Nathalie_Le-Francois@uqar.ca

²Centre aquacole marin de Grande-Rivière, Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, Grande-Rivière, QC, G0C 1V0

³Memorial University of Newfoundland, St-John's, NL

⁴Institut Maurice Lamontagne, Ministère des Pêches et Océans, Mont-Joli, QC G5H 3Z4

In Quebec, efforts have been applied for the establishment of a profitable spotted wolffish (*Anarhichas minor*) production. However, more production data and verifications are necessary before initiating the commercial phase. Land-based facilities will likely be the preferred rearing technology on Québec's territory. Production in large raceway units and at fairly high rearing densities (> 200 Kg/m³) is currently the most efficient rearing system used in Norwegian commercial facilities. Exposure to high variation in oxygen level being one of the main factor affecting fish growth its occurrence during on-growing operations (after feeding, maintenance operations and accidental shut-downs) and its impact on fish performance and compensation mechanisms and physiological adjustments should be more fully characterized. Our research will concentrate on the effect of dissolved oxygen (DO) on the growth, stress

level and oxidative metabolism of juvenile spotted wolffish exposed to normoxic, hypoxic and hyperoxic conditions.

Effect of digestible protein to digestible energy (DP/DE) ratio on growth performance, feed efficiency and ammonia output of juvenile shortnose sturgeon (*Acipenser brevirostrum*)

S. Leadbeater^{*1,3}, S.P. Lall², J.D. Kieffer¹ and M.K. Litvak¹.

¹Department of Biology, University of New Brunswick Saint John. Saint John, NB, Canada, E2L 4L5.

²Institute for Marine Biosciences, National Research Council of Canada, Halifax, NS, Canada, B3H 3Z1.

³Department of Fisheries and Oceans Canada, Saint Andrews Biological station. 531 Brandy Cove Road, St. Andrews, N.B. E5B 2L9 (email: LeadbeaterS@mar.dfo-mpo.gc.ca)

Triplicate groups of juvenile shortnose sturgeon (*Acipenser brevirostrum*) initial weight 35.3 ± 0.4 g (mean \pm sem) were fed practical diets containing digestible protein/digestible energy (DP/DE) ratios of 18.3, 19.5, 20.3, 21.3, 22.7 and 25.6 g DP MJ DE⁻¹ for 12 weeks. Whole-body energy ($p = 0.047$) and lipid content ($p = 0.02$) of the fish was significantly higher for the 19.5 g DP MJ DE⁻¹ diets, while diets containing 21.3, 22.7 and 25.6 g DP MJ DE⁻¹ resulted in fish with lower energy and lipid content. Lipid content of the diet was the influential factor for both parameters ($p = 0.02$ and $p = 0.005$ respectively). ADC (%) values for energy dropped with respect to increasing DP/DE ratio ($p = 0.0002$). Lipid digestibility was significantly lower for the 18.3 and 20.3 g DP MJ DE⁻¹ diets ($p = 0.001$). Ammonia output rate was significantly impacted by DP/DE ratio with rates increasing with DP/DE ratio ($p = 0.006$), dietary lipid level was the influential factor ($p = 0.002$). Polynomial regression analysis estimated the optimal DP/DE ratio to be 20.75 g DP MJ DE⁻¹ ($R^2 = 0.52$). Results from this work suggest a 40% protein and 20-21 g DP MJ DE⁻¹ diet would be suitable for shortnose sturgeon.

Immune response of Atlantic salmon (*Salmo salar*) to infection by the Infectious Salmon Anemia Virus (ISAV)

Francis LeBlanc^{*1}, Mark LaFlamme², Nellie Gagné²

¹Department of Biology, Université de Moncton, Moncton, NB E1A 3E9

²Gulf Fisheries Center, Fisheries and Oceans Canada, Moncton NB E1C 9B6

Infectious diseases among fish present an important economic burden for aquaculture and fisheries industries. Little is known about these diseases or the causative pathogens. For example, the Infectious Salmon Anemia Virus (ISAV) is known to infect farmed Atlantic salmon (*Salmo salar*), and results in millions of dollars of lost revenue to salmon farmers. Although much is known about the viral infection and transmission process, very little is known about the host response upon infection by ISAV. Modern molecular biology tools, such as DNA microarray, are increasingly employed to examine differentially regulated molecular pathways following viral infection, and to identify molecular biomarkers indicative of the infection process. Thus this project aims at identifying genes that are differentially expressed in Atlantic salmon following an infection by ISAV. DNA microarrays will be used to compare gene expression of ISAV infected and healthy Atlantic salmon. A time trial experimental set up using 6h, 24h, 3d, 7d, 14d as time points will be used, enabling us to characterize and put together an expression pattern representative of an infection with ISAV as it progresses in time. Finally, the biomarkers identified will serve as ground for the development and testing of current and new vaccine. Partial results to date are presented.

Investigation on temporal effects of spawning season, maternal and paternal differences on reproductive success in Atlantic cod (*Gadus morhua*) broodstock

Lush L.^{*1}, Hamoutene D.¹, Drover D., and Walsh A.²

¹DFO, Science Branch, PO Box 5667, A1C 5X1 St John's, NL.

²Sapphire Sea Farms, Bay Bulls, NL.

The understanding of parameters affecting egg quality and larval survival is of utmost importance for healthy broodstock development and efficient husbandry practices. The effect of three predictors (month of spawning, maternal and paternal differences) has been studied on early cleavage pattern parameters (blastomere symmetry, uniformity, adhesion, margin and number normality), egg diameters, as well as fertilization percentages and hatching rates by using decision tree analysis (DTA) on 3 years of data. DTA showed that females were the dominant predictor determining differences in cleavage parameters, fertilization success and hatch rate. Time of spawning did not seem to impact reproductive success and egg quality. Similarly to previous authors, we found strong correlation between cleavage parameters and reproductive success with the exception of egg diameters suggesting further research on the meaningfulness of this criterion. Our results highlight the importance of properly selecting healthy and productive females in the constitution of a broodstock and that time of spawning, as previously suspected, is of lesser importance in ensuring high rates of fertilization and larval hatch.

Evaluation of Yellow Seed Canola Meal as Partial Replacement for Fish Meal in Practical Diets for Rainbow Trout Fingerlings.

P.F. MacIsaac, and D.M. Anderson

Aquaculture Centre, Department of Plant and Animal Sciences, Nova Scotia Agricultural College, PO Box 550, Truro, NS, B2N 5E3

Yellow seed canola meal generally exhibit lower fibre levels than brown seed canola meal thus leading potentially to a higher digestible energy content and a higher inclusion rate in practical diets. Six hundred rainbow trout, initial weight 3.6 ± 0.2 g, were stocked in 40L tanks with flowing water ($14.5 \pm 0.2^\circ\text{C}$). Three times daily the fish were fed to satiation with experimental diets for 12 weeks. The experimental diets included a fish meal control diet (FM) and replacement of fish meal with inclusion of yellow seed at 15% (15YM), 20% (20YM), and 25% (25YM) or brown seed: 20% (20BM) canola meal. Following 12 weeks on test, mean weight gain was greater ($P \leq 0.05$) for fish fed the FM (75.2 ± 2.5 g) and 25YM (75.2 ± 2.5 g) than fish fed 20BM (62.0 ± 2.5 g). SGR was greater ($P \leq 0.05$) for fish fed FM ($2.87 \pm 0.04\%$ day⁻¹) and 25YM ($2.84 \pm 0.04\%$ day⁻¹) than for fish fed the 20BM diet ($2.65 \pm 0.04\%$ day⁻¹). FCR was also better ($P \leq 0.05$) for fish fed FM (0.99 ± 0.03) and 25YM (0.99 ± 0.03) compared to fish fed 20BM (1.18 ± 0.03). The fish fed the other diets were intermediate. PER was lower ($P \leq 0.05$) for the fish fed 20BM (1.87 ± 0.05) compared to fish fed all other diets. Inclusion of yellow seed canola meal in practical diets at 25% inclusion rate produced performance equal to a fishmeal diet by rainbow trout fingerlings.

It doesn't matter if you're black or white: Malpigmentation changes and impact on growth of cage-cultured Atlantic Halibut (*Hippoglossus hippoglossus*)

J. Power^{*1,2}, T. Benfey¹, D. Martin-Robichaud²

¹Dept. of Biology, University of New Brunswick, Box 4400, Fredericton, NB, E3B 5A3

²DFO St. Andrews Biological Station, 531 Brandy Cove Rd., St. Andrews, NB, E5B 2L9

Lack of pigmentation on the upper surface of halibut is an abnormality which is of concern for growers. Although there is some understanding of its cause (diet and handling, for example), little is known about how it affects growth or changes over time. Such information would be helpful to growers concerned about juveniles displaying the abnormality. This study tracked the growth and changes in pigmentation of 48 individually tagged malpigmented cage-cultured Atlantic halibut over two years, from May 2006 to November 2007. Normally pigmented fish served as controls. Fish sizes were measured and digital photographs taken biannually. Using Image Pro Plus, the total area of malpigmentation was calculated for each fish and changes in percent malpigmentation calculated. Results indicate that malpigmentation decreases with time, independent of growth rate, and has no significant impact on growth. Degree of malpigmentation change depended on the time of year tracked, with larger decreases in malpigmentation coverage occurring during summer months than winter months. Conclusions drawn on these results, useful to halibut growers, will be discussed.

Current validation plan for Infectious salmon anemia virus (ISAV)

Mélanie Robichaud-Haché^{*1}, Crystal Collette¹, Lisa Léger¹, Nellie Gagné^{1, 2} and Charles Caraguel³

¹ Department of Fisheries and Oceans, Gulf region, Moncton, Nouveau-Brunswick, Canada. E1C 9B6.

² Département de chimie et biochimie, Campus de Moncton, Université de Moncton, Nouveau-Brunswick, Canada. E1A 3E9.

³ Health Management Department & Centre for Aquatic Health Sciences, Atlantic Veterinary College / University of Prince Edward Island, Charlottetown, Prince Edward Island. C1A 4P3.

Fisheries and Oceans Canada (DFO) and the Canadian Food Inspection Agency (CFIA) received in Spring 2005, 59\$ million investment over five years to put in place the National Aquatic Animal Health Program (NAAHP). For the development of this project, it was important to put in place methods for assessing and validating diagnostic tests within the regulatory framework of NAAHP in Canada. During the last months, our laboratory has worked on the validation plan for ISAV in salmon kidney tissues using a no gold standard model. The method used gave us information on the sensitivity and specificity and the repeatability and reproducibility of the different tests. Samples used for validation were from 3 different prevalence groups (low, moderate and high). A subset of 100 samples were homogenized and divided into 3 aliquots to be submitted to each lab involved (DFO, lab B, lab C) for repeatability and reproducibility. Statistics using latent class models were calculated to estimate the true status of samples and the characteristics of the assays. Partial results from the validation are presented.

Development of novel recombinant vaccine models against infectious salmon anemia virus (ISAV)

Mélanie Roy^{*1,2}, Mark Laflamme^{1,2}, Kira Salenius³, Nathalie C. Simard³, Mélanie Robichaud-Haché¹, Gilles A. Robichaud² et Nellie Gagné^{1, 2}

¹ Department of Fisheries and Oceans, Gulf region, Moncton, Nouveau-Brunswick, Canada. E1C 9B6.

² Département de chimie et biochimie, Campus de Moncton, Université de Moncton, Nouveau-Brunswick, Canada. E1A 3E9.

³ Novartis Animal Health Canada, Inc., Aqua Health Business Unit, Victoria, PE, Canada, C0A 2G0

Infectious salmon anemia virus (ISAV) is an important viral pathogen which has caused mass mortalities of salmonid fish in aquaculture. It has remained a recurrent problem on Canada's east coast and on the northern east coast of the USA, since the initial epizootics of 1996. A commercial heat-inactivated virus vaccine is available; however, with the current management of ISAV requiring depopulation at first signs of the disease, this vaccine may not get wide acceptance as it does not provide total protection from the disease. We propose a novel approach, where recombinant ISAV proteins will be produced *in vitro*, and combined to salmon heat shock proteins (HSP) *in vivo*. We believe this approach shows great promise as it has been demonstrated that HSPs naturally bind many peptides and proteins, and that recombinant peptides bound to HSPs produce much stronger antigens than the recombinant peptides alone. Partial results obtained to date are presented.

Dietary protein hydrolysates and trypsin inhibitor effects on the digestive capacities and performance of newly-hatched wolffish

A. Savoie^{*1}, N.R. Le François¹, S.G. Lamarre², P.U. Blier³ and C. Cahu⁴

¹ Université du Québec à Rimouski / Centre Aquacole Marin, Rimouski, QC G5L 3A1

² Memorial University of Newfoundland, St. John's, NL A1C 5S7

³ Laboratoire de Biologie Évolutive, Université du Québec à Rimouski, QC G5L 3A1

⁴ Unité Mixte INRA IFREMER de Nutrition des Poissons, B.P. 70, 29280 Plouzané, FRANCE

Spotted wolffish is an aquaculture species extremely well suited for cultivation under cold northern climates. Despite larval robustness, this species displays highly variable survival at first-feeding (40-80%). We propose to investigate the use of protein hydrolysates (pre-digested proteins (PH) to improve survival

and growth at first-feeding. To determine if protein digestion (via trypsin) is a growth limiting agent, we also added a trypsin inhibitor (Soy Bean Trypsin Inhibitor, SBTI) in some of the diets. Four different diets were evaluated as shown in table 1.

The survival rates and final weights obtained at the end of the experimental period are reported in Figure 1. As expected, the inclusion of the trypsin inhibitor yielded the lowest survival rate ($44.7 \pm 10.9\%$) compared to the control diet (67.3 ± 3.5). Inclusion of protein hydrolysates with or without SBTI had a positive impact on survival rate (82.7 ± 5.7 and $84.7 \pm 5.9\%$ respectively). Enhanced palatability of the diet and therefore a stimulation to initiate first-feeding could be responsible. Trypsin inhibitor was detrimental only when PH was not present in the diet, indicating that PH favour assimilation despite trypsin inactivation.

Surprisingly, the only diet that enhanced significantly growth compared to control diet is HI. This might be linked to an easier assimilation of peptides or to a concurrent overcompensation of trypsin secretion due to the presence of the protease inhibitor (Sveier et al. 2001)

Genetic variability of different American oyster (*Crassostrea virginica*) populations of Atlantic Canada assessed by microsatellite markers

P. St-Onge^{*1,2}, B. Vercaemer, J.-M. Sévigny¹, R. Tremblay² and F. Pernet⁴

¹Department of Fisheries and Oceans, Maurice-Lamontagne Institute, 850 Route de la Mer, Mont-Joli, QC, Canada G5L 3A1

²ISMER, Université du Québec à Rimouski, 310 Allée des Ursulines, Rimouski, QC, Canada G5H 3Z4

³Department of Fisheries and Oceans, Bedford Institute of Oceanography, 1 Challenger Drive, P.O. Box 1006, Dartmouth, NS, Canada B2Y 4A2

⁴Laboratoire Environnement-Ressources du Languedoc-Roussillon, IFREMER, BP 171 - Boulevard Jean Monnet, 34203 Sète – France

Several studies have shown that bivalve characteristics such as growth, survival and morphology can be inheritable. This underlines the potential for developing selection programs that would enhance spat quality of commercial bivalve farms. However, very little information exists on whether or not American oysters (*Crassostrea virginica*) originating from different aquaculture sites possess distinct genetic signatures. Recently, highly variable microsatellite markers were developed for bivalve species of particular interest to the aquaculture industry, including the American oyster. Spat originating from several oysterculture sites around Atlantic Canada was collected between 2003 and 2005 and grown into floating bags for one year. Genetic characteristics of individuals from each site were determined with the use of different microsatellite loci. Data show interesting results pertaining to population structure that might be relevant to species management and to the improvement of breeding programs.

Effect of rearing density on growth and stress level of juvenile spotted wolffish (*Anarhichas minor* Olafsen)

S. Tremblay-Bourgeois^{*1}, N. R. Le François¹, R. L. Roy², T. Benfey³ and A. K. Imsland⁴

¹Université du Québec à Rimouski, Rimouski, QC, Canada G5L 3A1

²Fisheries & Oceans Canada, Institut Maurice-Lamontagne, Mont-Joli, QC, Canada G5H 3Z4

³University of New-Brunswick, Fredericton, NB, Canada E3B 5A3

⁴University of Bergen, Postbox 7803, 5020 Bergen, Norway

Determining the optimal rearing density of fish is important to maximise the productivity of aquaculture operations. We describe some initial findings from a density trial with juvenile (50-100g) spotted wolffish (*Anarhichas minor* Olafsen), a promising candidate for cold-water aquaculture. Initial rearing densities of 10, 20 and 40 kg·m⁻² were used to compare growth and stress level. We allowed density to increase as the fish grew in one series of tanks while in another series of tanks density was periodically readjusted to the initial value. Fish were measured and sampled for plasma cortisol, osmolality and ions concentration (Na⁺ and Cl⁻) at the start of the experiment (time 0) and at days 15, 30, 59 and 120. Preliminary findings show

that increases in weight and length are similar at 10 and 20 kg·m⁻². Some detrimental effects on growth are seen at 40 kg·m⁻² but these need to be evaluated in light of food ingestion data since condition factor is lower at this density. At this stage of the project, growth results suggest that optimal rearing density of spotted wolfish of this size is around 30 kg·m⁻² (~ 215 kg·m⁻³).

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