Scotian Pride 2011

Proceedings of the Oyster Development Workshop
January 26, 2011, Halifax, Nova Scotia

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1.0 Acknowledgments

The Aquaculture Association of Nova Scotia (AANS) would like to thank Fernando Salazar, Peter Warris and René Lavoie for providing suggestions on guest speakers, and Thomas Landry and Denise Méthé for their input and guidance. Thank you also to the oyster industry for providing direction on the relevant topics and interests within the sector. A special thanks to all guest speakers who engaged the audience in lively discussions. Without yours and the participant's enthusiasm, the discussion panel would not have been as constructive for providing the industry with future direction.

Thank you to the Aquaculture Collaborative Research and Development Program (ACRDP) and the National Research Council – Industrial Research Assistant Program (IRAP) for seeing value in this initiative and for their financial support. Without your contributions, the Oyster Development Workshop would not have been possible.

Danielle Goodfellow, Workshop organizer, AANS

2.0 Introduction

The concept for an Oyster Development Workshop was based on the fact that oyster production in the Maritime Provinces of Canada is insufficient to meet market demand. Furthermore, there are many viable oyster growing areas available for shellfish aquaculture, and there is an increased need for employment opportunities in rural areas.

The Aquaculture Association of Nova Scotia (AANS) received funding from the Aquaculture Collaborative Research and Development Program *(*ACRDP*)* of Fisheries and Oceans Canada and the Industrial Research Assistance Program (IRAP) of the National Research Council to host a one-day workshop; which took place on January 26, 2011, at the Marriott Harbourfront Hotel in Halifax, Nova Scotia.

The main objective of the workshop was to identify areas of concern where the industry must focus its efforts to improve the oyster sector. The content of the presentations discussed current research and development. The program included eleven guest speakers from Prince Edward Island, New Brunswick and Nova Scotia who made presentations grouped under three panel themes: business development, culturing techniques and technologies, and oyster health.

Several factors affecting oyster development potential were identified and discussed. These include innovative technologies, marketing strategies, and regulatory road blocks and concerns impeding oyster culture production.

This document provides a summary of each guest speaker's presentation, followed by questions and answers relevant to the presentation. Some presentations will be available on the AANS web site at www.aansonline.ca

After the presentations, a panel discussion was held. The points raised by participants and paraphrased responses appear in the panel discussion section (3.4). During the group discussion 13 priorities were indentified; they are listed under priorities (3.5). A list of participants and biographies of guest speakers are available in the Appendices.

3.0 Presentations, Questions and Answer Period

3.1 Panel 1: Business development.

Moderators: Danielle Goodfellow and Bruce Hancock

3.1.1 Johnny Flynn: Marketing products – How to be successful

The oyster industry in Prince Edward Island produces six million pounds of oysters per year with a farm gate value of $5.1 million. The fishery comprises 1070 licensed fishers, of which 750 are active. The fishery is responsible for approximately 70% of the landings. The aquaculture sector is made of 477 lease holders who control 760 lease sites representing 6,481 acres. Approximately 250 lease holders are active and 75 utilize off-bottom technology.

Colville Bay Oyster Company is a family-owned business that has been growing top quality oysters in Souris, PEI, since 1995. It is important to "know your lease"; site selection is the key to a successful operation. Colville Bay has characteristics that make it a near ideal lease for rack and bag, surface, and bottom culturing of oysters. The tides in the bay expose the growing tables; this prevents fouling and allows access for inspection twice a month (on the new and full moon). There is a constriction in the river which creates a natural flupsy effect, making the water run faster over the lease. The bottom of the bay is a mixture of sand and silt which creates a "goldie locks" effect, not too hard and not too soft, which is important for good shell shape. A bar outside the sites acts like a barrier reef, breaking waves before they come ashore. In the spring the sand bars ground icebergs, which luckily do not come inside the bay; if they did, they would rest on the finishing beds, damage the bottom and cause oyster mortality. Over time, the company learned about the environmental characteristics and appreciates them.

The company owes its success to several factors. Its simple and hands-on operation allows ample opportunity for observation of the oyster and the environment. The company also encourages site visits by students, chefs, shuckers, buyers and oyster lovers. Consumers want to know how and where their food is grown. The more people talk about a product, the better. Word of mouth is the most effective and cheapest method of advertising. Another simple marketing tool is to "create a demand for product that will exceed supply". At present, demand for Colville Bay oysters exceeds supply, which is an excellent marketing position to be in. Colville Bay oysters are shipped with consistent quality and shape; when they reach their destination, they are ready to be served.

In 2001, Colville Bay Oyster Company invested in a federally licensed plant that allowed the company to pack and ship oysters out of province. The first shipments went to OysterBoy in Toronto, Ontario. For a while, oysters were shipped to the United States; this was stopped due to exchange rates. Currently, the company's products are shipped within Canada. The largest markets are Toronto, Ontario and Quebec City, Quebec, with smaller markets in Winnipeg, Manitoba and Calgary, Alberta.

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Question and Answers

Q: Do you receive an increased value for handling your oysters with care?
A: Ensuring they are uniform in size and clean builds up a reliable reputation with customers. Over time, this justifies why growers can receive a higher value for their product

Q: What is the best technique to use and how comfortable are you with the cost/benefits?
A: The best oyster growing technique depends on the site and the environmental conditions. The Colville Bay Oyster Company uses a combination of fabricated gear and the Oyster Gro System; the costs and benefits have not been calculated precisely.

3.1.2 Rhéal Savoie: The OysterGro System business model – successfully meeting market demands

The OysterGro System was developed out of necessity. Oyster farming has been around for a long time on the east coast of New Brunswick, but unfortunately the people involved could at best supplement their income. Over the years, different methods were introduced in an effort to make oyster farming a viable business. Though some progress had been made with different types of oyster rearing methods, there was still problems to be addressed. To build a profitable business, oyster growers needed a system that could:

- Reduce labour costs,
- Significantly increase oyster growth rate and produce a high quality product,
- Significantly reduce the mortality rate,
- Control secondary spat,
- Be user friendly for overwintering, and
- Be strong, durable, and virtually maintenance free for a decade or longer.

With the oyster growers leading the way, and with the participation of the Province of New Brunswick, the Atlantic Canada Opportunities Agency (ACOA), the Department of Fisheries and Ocean (DFO) and Bouctouche Bay Industries Ltd, the OysterGro System was developed. Financial and technical support from various government departments played a key role in developing the System and supporting the growers during the initial phase of the project. The System has proven itself over the last ten years. Hundred of oyster growers big and small are now using it across North America, but mostly in Atlantic Canada.

The OysterGro System offers the following advantages and features:

- It reduces the labour costs significantly at just about every stage of production,
- It allows control of secondary spat and fowling by flipping the cages when needed,
- For overwintering, growers can simply remove caps at each end of the float and let the cage sink to the sea bed,
- Harvesting is quick and efficient; growers simply remove the vexar bags containing marketable oysters ,
- Growth is excellent because oysters are held near the surface, where the water is warm and food is plentiful,
- Oysters are well protected, whether near the surface or on the seabed, resulting in low mortality, and
- After ten years of use, the OysterGro System has proven itself efficient and durable.

The OysterGro System has benefited oyster growers and the rural communities where oyster farming has been introduced. The oyster industry, which is still in its early stage of development has created hundreds of direct and indirect jobs in sectors like: transportation, boat building, welding shops and the retail industry.

In conclusion, Bouctouche Bay Industries believes that the oyster industry in Atlantic Canada is on route to becoming a key economic engine for many rural communities.

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Questions and Answers

Q: Is there much push back from shore property owners and other users of the water?
A: When Government funding is involved in aquaculture projects, it is not uncommon to get residents petitioning against it for various reasons. Over time the OysterGro System created jobs in the local area, and residents (including cottage owners) became more receptive to the project. Politicians did support the project to a certain degree, which was helpful

Q: Would your system work in the Bras D'Or Lakes?
A: The Oyster Gro System works well in deeper water, with at least 6 ft of water at low tide; otherwise it can be caught in ice during the winter months, and damaged. The system may well work in the Bras d'Or Lakes if water depth and other environmental conditions are suitable.

3.1.3 Paul Budreski – Aspects of the shellfish industry – that must be dealt with to become a two billion dollar industry in ten years

The shellfish industry contributes $37.5 M to the economies of the Maritime Provinces at present. The provincial breakdown (2010) is as follows: New Brunswick: $4.1 M; Prince Edward Island: $28 M and Nova Scotia: $5.4 M. It has been postulated that the industry could contribute much more.

The Dutch have been culturing shellfish for centuries. Their industry produces $90 M worth of shellfish from 459 km of coastline using only bottom culture. Together, the Maritime Provinces have over 12,400 km of coastline, which is over 27 times the usable space in the Netherlands.

If Atlantic Canada was to emulate the productivity of the Dutch, an industry worth$1.8 Billion could be created by growing mussels, oysters, clams and scallops (bay and sea), thus creating jobs are in rural areas.

Oysters have the best potential to increase the industry; Atlantic Canada oysters have a unique taste compared to oysters from the United States. Several world events are reducing oyster supply; for example, the oil spill in the Gulf of Mexico has affected many growers; one harvester reported that his production was down by 180,000 oysters a day. In France, 40-80% of the oyster stocks have been wiped out by disease; 130,000 tonnes of production dropped by 50,000 tonnes, creating a shortage of approximately half a billion oysters in the market place.

Several constraints prevent Atlantic Canada from expanding its oyster industry. One is a lack of capital. Millions of dollars of investment are needed. Government support is important, but it cannot be the only source of funding/support. Investors need to recognize the potential in the industry and believe the story.

Obsolete and inappropriate policies and regulations are a constraint. Regulations for the aquaculture industry were written years ago. They were often based on fishery conservation objectives and impose unnecessary burdens and cost on aquaculture. For instance, oyster growers cannot harvest and sell undersized oysters from their lease. Since oysters on a lease are owned by oyster farmers, they should be able to harvest and sell their oysters at any size for which there is a market. Oyster farmers should not face restrictions that do not apply to chicken, cattle and pig farmers. This policy has to change.

Water contamination is another problem. Pollution has been holding growers back because large areas have been included in closures for 20 to 30 years even though the sources of contamination like the steel industry have disappeared. It is true that some municipalities still lack sewage treatment facilities, but this problem is being fixed gradually. It is essential that the size of contaminated areas be reduced when pollution sources are being remediated.

Finally, policy changes are required to encourage commercial fishermen who are seasonally employed to participate in the aquaculture industry. Other states and countries such as Virginia

and Turkey encourage communities to get back into aquaculture. Turkey's aquaculture industry has grown by 10 fold in recent years, creating employment for people and taxes for the state.

We need to be more enthusiastic and aggressive while selling oysters. Let's present Atlantic Canada's oysters as "Nature's Viagra – No Prescription required".

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Questions and Answers

Q: Where are the markets and who is going to buy?
A: The market to sell oysters exists within Canada and overseas. The problem is that growers cannot meet the current market demand. Many times growers find that their products are already pre-ordered; for example, one grower has a customer who would like to pre-order 20,000 oysters per year, but that quantity cannot be met. Atlantic Canada has the potential to grow enough oysters to satisfy the market demand.

Comment from the floor: In the Bras d'Or Lakes, it is not possible for growers to expand their operations because of MSX. They need a seed supply that would be resistant to MSX.

3.1.4 Lorne Penny and Florence Albert: Oyster Fisheries - Regulations & Policies

The lack of a federal aquaculture act and regulations causes problems for both aquaculture operators and other stakeholders. Aquaculture, as an emerging industry, must compete for legitimacy with established marine and aquatic sectors such as the capture fishery and marine transportation.

Responsibilities for regulations affecting aquaculture are distributed among numerous federal departments and agencies, and those regulations were often designed with activities other than aquaculture in mind.

The interests of the aquaculture industry, which have been strongly supported by the federal government, need to be established not just in policy but also in law. At the same time, the responsibilities of aquaculture operators must be set out clearly so that there are specific standards to which they will be held accountable. DFO has several key areas of responsibility affecting aquaculture:

- Patrol shellfish harvesting/ growing areas,
- Issue licenses, prescribe harvesting locations/ times and establish minimum harvest sizes for resource management purposes,
- Issue Variation Orders and Prohibition Orders, and
- Ensure compliance with the Canadian Shellfish Sanitation Program (CSSP).

Federal regulations and policies governing oyster fishing were drafted before Aquaculture was a significant activity. Regional policies have been developed in the absence of regulations to facilitate aquaculture interests:
Maritime and Gulf Regions:

- National Policy on Access to wild aquatic resources as it applies to aquaculture,
- Molluscan Spat Collection Operational Policy,
- National Code on Introductions and Transfers of aquatic organisms,
- Cocktail Oyster Policy, and
- CSSP – Management of Contaminated Fisheries Regulations.
- Draft - Maintenance activities for farmed oysters (Gulf Region Management Guidelines)

A draft Maintenance Activities for Farmed Oysters Guidelines has been developed from a pilot project in PEI. Once approved, these guidelines will allow aquaculturists to conduct maintenance activities off-lease for closed or open status oyster leases. Maintenance activities such as: add or remove buoys, lines and anchors; clean, sort, grade oysters; modify density of cultured oysters; add or remove culture apparatus such as floating bags or shell bags, rake the bottom to remove plants before seeding, de-silt bottom, rotate position of culture gear, glue oysters to strings, etc.

The Cocktail Oyster Policy was a pilot project in New Brunswick during 1993/1994 and it became a policy in 1996 for both Maritimes and Gulf Regions.

- Cocktail oysters are 65 to 75mm in size.
- Variation Orders are a Management tool to vary size and season on specific leases.
- The policy applies to aquaculturists (holder of a license and surveyed shellfish lease) not holding commercial oyster licenses in order to protect commercial fishery.
- All cocktail oysters must be processed in provincially licensed and registered plants or federally registered plants if exported outside the province of origin.
- Oysters shipped to market must be in tagged containers while en route to buyers. A record of product and amount must accompany all shipments.
- Aquaculturists participating in the program must grow their own oysters from spat or seed that is either collected on the lease site or, can purchased from an identified seed/ spat supplier.

General procedures include:

- Application submitted,
- Provinces must recommend approval of applications, and
- Source of seed, name of processing facility, list of staff, copy of harvesting and shipping labels and tamper-proof packaging, example of record-keeping method and accounting procedure.

Spat collection: on-site/lease collection does not require an authorization. The policy also provides the aquaculture industry with access to wild stocks in a manner that is consistent with the department's sustainable management of those stocks (the National Policy on Access to Wild Aquatic Resources as it applies to oyster aquaculture was introduced in 2004). Regional Molluscan Spat Collection Operational Policies are designed to complement and be consistent with the National Policy on Access to Wild Aquatic Resources as it applies to Aquaculture. Molluscan shellfish growers have predictable, equitable and timely access to molluscan spat. The

policy defines, among other things; terms and conditions, eligibility and application review/licensing process. Individual or corporate lease-holders, Aboriginal communities, fishers' groups interested in sea ranching projects, scallop, oyster, mussel and coastal clam fishers are eligible to apply for spat collection licenses. Out-of-province spat collection applications will be accepted if the applicant holds an aquaculture lease in the province where the spat collection is to occur.

The National Code on Introductions and Transfers of Aquatic Organisms sets in place a mechanism (Introductions and Transfers Committees) for assessing proposals to move aquatic organisms from one water body to another. It also provides all jurisdictions with a consistent process (the Risk Assessment procedure) for assessing the potential impacts of intentional introductions and transfers of aquatic organisms. The Code applies to all aquatic organisms (called fish hereafter) in fresh water and marine habitats. These include finfish, molluscs, crustaceans, echinoderms, and other invertebrates, aquatic plants, both attached to the bottom and floating, and other aquatic animals as defined in the Fisheries Act. It applies to all activities in which live aquatic organisms are introduced or transferred into fish bearing waters, or fish rearing facilities such as aquaculture, commercial and recreational fishing including; biological control programs e.g. control of aquatic vegetation.

CSSP: The Canadian Food Inspection Agency (CFIA), DFO and Environment Canada (EC) are directly involved in the sanitary control of the shellfish industry. DFO is responsible for the enforcement of closure regulations and enacting the opening and closing of shellfish areas under the authority of the *Fisheries Act* and *Regulations*.

Regulatory Outlook: Regulators/departments must operate effectively under the current multi-jurisdictional system to promote competitiveness of the various Industry sectors in the production of high-quality products. Overall the goal is to design and implement a regulatory framework/system that encourages Aquaculture and Resource sustainability.

Eastern Nova Scotia (ENS) initiatives – Aqua Ed Site East Bay promotes the opportunity for students to experience the aquatic environment (Bras d'Or Lakes) and conduct personal and class studies to test hypotheses in the field. The Aqua Garden project is a partnership with First Nations and other stakeholders to encourage interest and participation from cottage owners in the monitoring of aquatic species such as oysters.

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Questions and Answers

Q: How do you determine what the large size is for oysters?
A: This is an industry driven approach to marketing. The size for a large oyster is determined by the growers themselves. This means that the sizes of what is sold as "large oysters" can vary between growers within and across the Maritime Provinces.

Q: We all seem to agree that the regulations were written a long time ago and urgently need revising to adapt them to the reality of the aquaculture industry, will they be updated?
A: It is true that the regulations were written many years ago, and they do have to be revised. DFO (Gulf Region) is in the process of reviewing the guidelines. This process is complex and takes time.

Q: If a grower collects wild spat to grow it and sell as seed to other growers, how do you permit this in the Gulf Region?
A: In the Gulf Region, it is now rare that growers collect wild spat to grow it to sell it as seed to other growers. Most growers collect the seed available on their leased sites.

3.1.5 Chuck McKenna – Licenses, leases and conditions in Nova Scotia - Aquaculture Policy & Licensing

The total oyster production in Nova Scotia for 2009 was 159,000 kg, with a market value of $676,000. The Province has 160 leased sites. Not all issued leases report production. There has been a steady decline in production of oysters from the year 2000. Much of this decline can be attributed to MSX in Cape Breton.

In aquaculture, careful site selection is often the key to future success. To help potential growers, the Nova Scotia Department of Fisheries and Aquaculture (NSDFA) recently published a Roadmap for Aquaculture Investment that specifies the ideal bio-physical growing parameters for several marine species and where in Nova Scotia such conditions prevail.

A Canada - Nova Scotia Memorandum of Understanding (MOU) on Aquaculture Development outlines the respective areas of responsibility when it comes to aquaculture. The MOU specifies that the federal and provincial governments will cooperate on environmental monitoring, environmental effects monitoring, R&D priority setting, and information and data sharing.

The federal government is responsible for scientific research, providing input on applications, conducting Canadian Environmental Assessments (CEAAs), National and regional fish diseases, and compiling and publishing a National report on aquaculture.

The Province is responsible for applied development, licensing and leasing, site inspection and compliance, fish health Management, and collecting production data. In addition, Nova Scotia has the *Fisheries and Coastal Resources Act* (and regulations) which further describes the provincial role in aquaculture.

The Atlantic Provinces have created an Atlantic MOU that describes their intention to collaborate on developing aquaculture throughout the region.

The Aquaculture Division of NSDFA has an Aquaculture Director overseeing three areas (Staff lead or Manager noted) Fish Health (Dr. Roland Cusack), Development/Environmental Monitoring (Dr. Toby Balch) and Policy/Licensing & Leasing (Chuck McKenna).

The Fisheries and Coastal Resources Act applies to commercial aquaculture, not to laboratory or research environments. The plants or animals being cultivated on an aquaculture lease are the private property of the leaseholder. Licenses and leases are issued for an initial ten-year period, and are renewable for additional five year periods. An aquaculture lease in Nova Scotia provides the lease holder with exclusive use of the water column and sub-aquatic land. The Act allows for assignments, amendments and cancellations. All licenses and leases come with a list of attached conditions. Annual production reports are mandatory. If more than one application is received for a particular location, the Minister selects the one that is in the best interest of the province.

The application process is quite extensive; it can be time consuming and costly. Bottom culture tends to be less involved than off bottom, suspended or floating culture methods. Applications for restricted areas can take longer. Larger sites may need more review than smaller ones etc. Applicants can help themselves by carefully choosing an area most likely to be profitable, environmentally friendly and socially acceptable.

Applicants must send an application form, a development plan and the appropriate fees to NSDFA. Upon receiving an application staff initiates a technical review to determine whether the application merits going further. If so, the department shares the information with the Office of Aboriginal Affairs for an assessment. The Office of Aboriginal Affairs advises NSDFA if formal First Nations consultations may be required. The application is then circulated to a number of federal/provincial agencies and initiatives, including First Nations if advised to do so. The applicant is told what baseline information and analysis is required.

If the application involves off-bottom, suspended or floating culture methods, the Environmental Affairs section of Transport Canada will typically trigger a CEAA review under the *Navigable Waters Protection Act*. Consultations with First Nations may be involved. If the review concludes that off-bottom culture is possible at the site, Transport Canada will issue an authorization for a navigable impediment. Once the CEAA is triggered, the Department will conduct its public engagement through a public meeting or open house.

The Aquaculture Division of NSDFA chairs a group of key regulatory agencies that meet as needed (approximately quarterly) to discuss files and keep them moving. Applicants have the opportunity to attend these meetings to interact in person with regulators. Ultimately, the Aquaculture staff makes a recommendation and the Minister approves or rejects the application.

The Regulatory Working Group consists of members of NSDFA's Aquaculture Division fish health and Development and Licensing sections. It also includes staff from DFO – Regional Aquaculture Coordinating Office and Habitat Branch and staff from Transport Canada – Navigable Waters Protection Program and Environmental Affairs.

A number of issues can affect the application process; for example MSX in Cape Breton and the status of the water (e.g. open, restricted, prohibited, presence of eel grass, suspended or bottom culture, degree of opposition from traditional fishery or the public etc.). Aquaculturists who want to sell cocktail oysters must give up their oyster fishing licenses.

Applicants can experience significant delays if they are not in good standing with the department or submit incomplete applications. Weak research, planning and public engagement cause requests for more information from the review agencies. Applicants slow the process considerably when they do not get back to the department or other agencies when required. At times, applications can stall when applicants lack resources to provide baseline information for marine locations.

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Questions and Answers

Q: Once your lease application is submitted, is there a lead responsible for checking on the progress?
A: Once you submit an application for a lease, the supervisor of licensing is responsible for keeping track of the application. Service standards have been developed by the department. These show that the department can process an application for a suspended culture application within six months. However, before a decision about an application can be made we need to await reviews by federal agencies.

Q: Is there a cancellation policy?
A: Sites in Nova Scotia can be cancelled for non-compliance, outstanding fees or non-utilization. If a site is not active, it should not be assumed that another operator cannot apply for that site. If you have a particular inactive site in mind, you should contact the Department.

Q: Does a CEAA approval carry through when a leased site changes hands?
A: If a grower takes over a lease and the site has been previously been through a CEAA, another CEAA should not be required. However, if the gear configuration “works” on any site changes dramatically then the NWPP authorization may need to be reviewed to reflect this change. When considering the changes, the NWPP division of Transport Canada may trigger a new CEAA if they believe the change warrants such an action. It is important to note that NWPP authorizations need to be renewed every few years. If not renewed as prescribed, another CEAA could be triggered whenever a renewal is attempted.

3.2 Panel 2: Culturing techniques and Technologies.

Moderators: Danielle Goodfellow and Bruce Hancock

3.2.1 Kim Gill: A Comparison of Oyster Culture Techniques in PEI

Oysters are cultured in Prince Edward Island (PEI) using both bottom and off-bottom techniques. Although the majority of oysters are grown on the bottom, over the past few years there has been an increase in the amount of off-bottom oyster culture sites in PEI. The majority of oyster producers have been using either floating bags or the OysterGro System to grow oyster's off-bottom. However, other techniques are also being used, such as French tables and submerged aluminum rack and bags. Recently, the SEAPA oyster basket technology has been tested for use in PEI.

In an effort to determine the performance of oysters grown in off-bottom technologies, trials have been developed to follow oyster production in several areas in PEI. To date, the focus has mainly been on oysters grown in floating bags and the OysterGro System.

A 2007 trial looked at how these units, as well as submerged rack and bags, could be used to control fouling by four invasive tunicate species. It was found that turning the floating units every two weeks to provide air exposure was successful at controlling fouling, without any significant effects on the oysters. It was more difficult to control tunicate fouling on oysters held in the submerged rack and bags. A treatment using either a one minute immersion in a solution of 4% hydrated lime followed by five minutes air exposure or a vinegar (5% acetic acid) spray was applied. The treatment application required a hydraulic lift for treatment of the clubbed tunicate and vase tunicate fouling. An immersion in hydrated lime was successful at controlling the clubbed and vase tunicates. Efforts to control the colonial tunicates gave inconclusive results.

In 2010, an oyster monitoring trial was initiated to follow oyster production in floating bags and the OysterGro System at 13 sites in PEI. The intent is to follow the oysters through to market and obtain growth and mortality data over several years. Preliminary results from the 13 sites showed a large variation in oyster growth, depending on where the oysters were grown. There was also a difference in the amount of fouling between areas.

In 2010, an oyster producer purchased and set up SEAPA oyster baskets as a method of growing oysters. The baskets are developed in Australia and have been used globally for sub-tidal and intertidal oyster farming. The grower had one line set up for two months. In that time, the grower was satisfied with the performance of the baskets and will be putting in a further set of lines in the spring of 2011.

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Questions and Answers

Q: How long does it take to turn around from bottom culture to off bottom culture?
A: In Prince Edward Island, a change from bottom culture to off bottom culture can take between two to three years; it depends on the lease and the grower (some have faster turn-around to approval, some have slower).

Q: What do you do with the SEAPA baskets in the winter?
A: Growers who use SEAPA baskets used gray totes for over wintering oysters. The oysters were removed from the baskets and put in the totes for the winter, and will then be put back into the baskets in the spring. This requires manual labour during the fall and spring.

Q: Is the difference in growth due to biological factors?
A: The size in oysters varied between 8 to 13mm. It was not certain if this was the result of biological factors.

Q: Was there any fouling on oysters in the floating bags?
A: Fouling has been found on the floating bags, but not on the oysters themselves.

3.2.2 André Mallet: Developing Strategies to Reduce the Impact of the Boring Sponge (Cliona celata)

The boring sponge *Cliona celata* poses an ongoing threat to the quality of Eastern oysters cultured in Baie St-Simon, Shippagan, New Brunswick, Canada. Diving surveys suggested that the distribution of the sponge within the bay is controlled by the occurrence of low salinity runoff in the spring. Apparently C. *celata* can function efficiently in areas with salinities as low as 20 ‰, and can withstand exposure to 15‰ for brief periods, but prevailing salinities below 1 0-15‰ are lethal (Hartman 1958, Hopkins 1962). Although grown off-bottom for most of the year, 25-30% of cultured oysters also develop severe sponge infections, leading to the culling of otherwise commercial oysters.

The purpose of this study was to investigate the process by which cultured oysters become infected, assess the growth rate of the sponge and develop mitigating strategies. Sequential deployment of non-infected shells revealed that mid-June to mid-July was the critical period for infection. Over 80% of the shells deployed during this period showed at least one, and often multiple singular infections upon examination in October. However, no evidence of sponge infection was detected during the winter months when experimental oyster shells were deployed in bags lying on the bottom. Histological sectioning of severely-infected wild oysters revealed the presence of developing gametes in early June, mature eggs and sperm from mid-June to mid-July and empty follicles in late July. Larvae were never successfully identified in plankton tows, but the sequential deployment and retrieval of experimental shells corroborated that June/ July was the peak infection period. By the end of October, single infections measured approximately 0.1 cm^2 with evidence of shell bio-erosion and papillae development. Monitoring of sponge growth in 70-90 mm shells indicated that a 5 cm^2 infection will grow at a rate of approximately 15 cm^2 per year, rapidly occupying the 30 cm^2 shell of a marketable oyster (64 mm shell length).

Comparison of various treatment strategies indicated that a six min brine dip was completely effective at eliminating the boring sponge without harming the oysters. Brine dipping every second year, after the main sponge recruitment event in June/ July, should be sufficient to control the development of this shell parasite in cultured oysters. A commercial unit which provides a means to automatically dip into a brine solution 12 floating oyster bags with floats for six minutes was shown to be very effective in a commercial situation.

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Citation to manuscript: Strategies to reduce the impact of the boring sponge *Cliona celata* on cultured Eastern oyster *Crassostrea virginica***.** 2010. Journal of Shellfish Research 29: 905-915.

Questions and Answers

Q: If salinity is a potential controlling factor, have you tried to treat the oysters in freshwater?
A: We have not tried to treat sponges with fresh water. It might work.

Q: Did you try any treatments with heat?
A: No.

Q: Why does the boring sponge seem to start borrowing at the end of the oyster?
A: We do not know why boring sponges seem to start at one end of the oyster and gradually infect the whole oyster. Boring sponges can affect any shell, including scallop shells.

Q: Would it not make more sense to dip the oysters before they are placed in the bag?
A: Oysters are graded every two years. They are dipped and then placed into the floating bags.

3.3 Panel 3 – Oyster Health Updates

Moderators: Danielle Goodfellow and Bruce Hancock

3.3.1 Dr Roland Cusack: Oyster health review in Nova Scotia

Cusack, RR, G. Spearman**, A. Bagnall*, C. Huntington*, N. Gagne****

The Nova Scotia Department of Fisheries and Aquaculture along with collaborators have been monitoring oyster health in Nova Scotia for the past eight years. Collaborators include oyster farmers, Fisheries and Oceans Canada, Atlantic Veterinary College, NS Department of Agriculture, New Brunswick Department of Agriculture and Aquaculture and others.

Two main issues have dominated oyster health during this time. The first was multinucleated sphere unknown (MSX) first detected by DFO in 2002. Secondly, Malpeque disease, detected in the Bras d'Or Lakes in 2007.

Surveillance work has revealed the presence of MSX widespread throughout the Bras d'Or Lakes including Whycocomagh Bay, St. Andrews Channel, East Bay, Denys Basin, and Chapel Island. Outside the Lake MSX has been detected in Aspy Bay, MacDonalds Pond and St. Anns Bay. Infected oysters in St. Anns Bay were removed from the affected aquaculture site. Surveillance activity by DFO in St. Anns has since failed to detect MSX in wild oyster populations.

The waters of the Gulf of St. Lawrence and SW Nova Scotia contain the regions other main oyster growing areas. Despite extensive testing MSX has not yet been detected in these areas.

In experimental work carried out in an MSX infected area of the Bras d'Or Lakes, a 64% rate of mortality was recorded over a 3 month period between August and October.

Malpeque disease has also been detected in the Bras d'Or Lakes and Aspy Bay. This disease has been responsible for significant mortalities in the affected populations. Although Malpeque disease is known to exist in oyster populations' through-out the Maritime waters, the finding in the Bras d'Or Lakes in 2007 was the first detection in that body of water. Oysters in the Gulf of St Lawrence are considered resistant to the disease and no reports of significant mortalities from Malpeque disease have been made from that region for over three decades.

The cause of Malpeque disease is not known. Attempts to identify a pathogen were made using a differential display technique. In this experiment "infected" and "non-infected" oysters were compared using random amplification by polymerase chain reaction (PCR) of partial DNA/RNA sequences of tissue extracts. No specific bands were differentiated between control and infected animals. Therefore, a causative agent was not identified.

Infections of MSX and Malpeque continue to be a challenge to aquaculture development in Nova Scotia. MSX remains a significant threat to cultured and wild populations outside the infected area.

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Questions and Answers

Q: Is there a MSX resistant oyster?
A: According to current research, MSX-resistant oysters do not exist yet.

Q: Could you bring seed not affected by the Malpeque disease into the Bras D'Or Lakes?
A: That is debatable. Seed not affected by Malpeque may come from areas where other diseases exist; imported seed could bring them to the Bras d'Or Lakes.

Q: Is there any other way to detect MSX without sampling?
A: This is the most affective and definitive way of determining the presence of MSX.

Q: Are there management protocols in place to reduce the risk of transferring the disease?
A: Education is the most important tool to reduce the risk of transferring diseases within and between sites. There are no legal transfers permitted by DFO from diseased areas due to known risks.

3.3.2 Mary Stephenson: Fisheries & Oceans MSX oyster survey and research

The Shellfish Health Unit (SHU) has a dedicated disease surveillance program to monitor the health of American oysters in the Maritimes. In 2002, MSX disease was detected within the Bras d'Or Lakes during a routine investigation of a mortality event. The sampling effort that followed formed the basis of science advice provided to the Federal and Provincial governments, industry and oyster resource stakeholders. A disease management approach aimed at preventing the spread of MSX established the Bras d'Or Lakes as an MSX positive zone, a buffer zone surrounding the outer coast of Cape Breton, and identified an area of increased surveillance along the Gulf Shore of Nova Scotia.

No transfers of oysters from the MSX positive zone have been permitted since 2002. During 2003 to2007, MSX was subsequently detected and confirmed in three bays outside of the Lakes; Aspy Bay, St. Ann's Harbour and Mira Bay. Therefore, the MSX positive zone increased to include Bras d'Or Lakes and the Atlantic Coast of Cape Breton. No expansion of the MSX positive zone has occurred since 2007.

In 2010, there was renewed concern about the Gulf Shore of NS due to imports of oysters from this area into PEI for processing. To address these concerns, the SHU increased sampling efforts along that coastline and collected 60 oysters from three sites between the NB border and the Canso Causeway, with two more along the Western Shore of Cape Breton. All five samples were negative for MSX using molecular tests.

Site selections for 2011 will be made following discussions with federal and provincial governments and industry representatives to review activities and identify areas of concern. It is expected that the Gulf Shore of NS will continue to be an area of increased surveillance.

Research and surveillance within the Bras d'Or Lakes provides information on the development and seasonal dynamics of MSX. DFO created three oyster sanctuaries within the Lakes to contribute to ecosystem health, determine the viability of areas with different levels of MSX infection and provide a platform for scientific research. The two smaller sanctuaries within the heavily infected St. Patrick's Channel, experienced high mortalities with no oysters remaining at the close of the trials. In the larger North Denys Basin sanctuary, MSX disease prevalence was lower but the detection of Malpeque Disease at the site has complicated disease management in the area.

The SHU provides ongoing science advice in support of MSX disease controls. These controls are applied by DFO Fisheries and Aquaculture Management through Conditions of License, Oyster Harvest Protocols for harvesters and processors, and the Introduction and Transfers Committees.

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Question and Answer

Q: Do the harvest protocols cover the wild fishery?
A: The harvest protocols do cover the wild fishery as well as aquaculture.

Q: When are samples taken for areas that are of concern?
A: If there are areas of concern for MSX or Malpeque disease, they are typically sampled during June.

3.3.3 Tammy Rose-Quinn: The role of Introductions and Transfers Committees in disease management as it is related to oysters (within Nova Scotia and beyond)

Section 55 of Canada's Fishery (General) Regulations (F(G)Rs), requires that anyone transferring live fish or shellfish into a rearing facility (including research) or releasing live fish into fish habitat, must have a license. Section 56 of the F(G)Rs establishes the terms and conditions under which the license may be issued:

- The release or transfer of the fish would be in keeping with the proper management and control of fisheries,
- The fish do not have any disease or disease agent that may be harmful to the protection and conservation of fish, and
- The release or transfer of fish will not have an adverse effect on the stock size of fish or their genetic characteristics, in-keeping with the proper management and control of fisheries.

In an effort to establish an objective decision-making framework regarding the intentional introductions and transfers of live aquatic organisms[1], the federal, provincial and territorial governments approved the National Code on Introductions and Transfers of Aquatic Organisms (The National Code) in 2003. The National Code applies to all aquatic organisms in fresh water and marine habitats and provides all jurisdictions with a consistent process for assessing the potential impacts of intentional introductions and transfers of aquatic organisms.

The Nova Scotia Introductions and Transfers Committee (NSITC), which is comprised of representation by both DFO and NSDFA, oversee all introductions and transfers activities within the province of Nova Scotia. The main focus of the committee is to ensure that introductions or transfers of native and non-native aquatic organisms do not result in the introduction of pathogens and parasites, which can cause genetic changes in native aquatic organisms or may have unforeseen ecological impacts. All decisions made by the NSITC are guided by the National Code.

In keeping with DFO's responsibilities to minimize disease during transfers, decisions by the NSITC are guided by the Fish Health Protection Regulations (FHPR) of the *Fisheries Act*. The FHPRs apply to all fish species belonging to the family Salmonidae and are designed to minimize the risk of the spread of infectious diseases through inspection of wild and cultured fish stocks and to control the movement of infected fish into Canada and between provinces. Requests to import salmonids into Canada or between provinces must be accompanied by an Import Permit. Although this is not issued by the NSITC, it is critical to the decision making process.

As for non-salmonids, DFO is limited by the absence of regulations such as the FHPRs specifically related to non-salmonids. Therefore, DFO conducts histology and PCR in an effort to detect and identify pathogens or parasites of concern.

[1] Aquatic organisms includes all organisms: finfish, molluscs, crustaceans, echinoderms, and other invertebrates and their life stages defined as "Fish" in the Fisheries Act, as well as marine and fresh water plants (National Code, 2003).

All requests for movements of all aquatic organisms must be accompanied by up to date fish health information. Expert advice on the fish health, along with genetics and ecological impacts are provided to the Chair of the NSITC by its members such that informed decisions regarding risk can be made. Licenses are issued in accordance with the advice provided by the experts on the NSITC. It is an offense to transfer any live fish to any fish rearing facility or to release live fish into any habitat without a license issued by DFO.

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Questions and Answers

Q: What is the penalty for transferring shellfish without a permit?
A: Transferring shellfish without a permit for a first time offender could be as high as $100,000.

3.3.4 Dr Jeff Davidson: Environmental factors affecting oyster health

Pathogens are ultimately the cause of infectious diseases. However, the presence of the infectious agent, whether it be a parasite, bacteria or virus, does not in itself, necessarily result in the expression of the disease or disease outbreak. In the outbreak of MSX in the Bras d'Or Lakes in Cape Breton, Nova Scotia restorative measures are not focusing on the MSX organism itself, but rather on 1) the environmental factors that allow or prevent the disease from occurring, and 2) breeding an oyster that has increased tolerance to the effects of MSX.

In the Maritimes, except for the Bras d'Or Lakes, the vast majority of oyster mortality is not due to infectious disease. Estimates of yearly oyster mortality range from 4 - 20% in 'disease free' areas. Two factors account for these deaths: 1) the environment in which the oysters are grown, and 2) the ability of the oysters to survive and thrive in those conditions (physiologic fitness - genetics). Oyster farmers in the Maritimes strive to provide their crop with the best conditions for survival and growth. However, they can't select seed best suited to the conditions in which they are grown. By and large, the spat is selected on size; however, this doesn't always translate to the oyster's ability to survive and thrive in the growing conditions it will encounter.

For many growers, survival and productivity does not seem to be an issue. However, in other food animal production systems such as chickens, cows and more recently shrimp, the domestication of the animals for their specific purpose, whether it be producing 10 times more milk than a calf requires, producing one egg a day or decreasing the production cycle in shrimp, the dividends have been huge.

The oyster aquaculture industry can also benefit from this domestication. A breeding (brood stock) program would allow the industry to select the traits in an oyster that could increase productivity and profits; traits such as increased growth rate, uniform growth, tolerance to disease, and adaption to the conditions in which they are grown. This is not a small task; it requires hatchery produced seed and the will from industry to invest in an oyster breeding program. However, it is not unique in shellfish aquaculture; the Mollusc Broodstock Program in

Oregon has been established for many years supplying superior oysters to the Pacific oyster industry on the west coast. In New Zealand, a study estimated that acquiring spat was approximately 5 % of the total production cost in the mussel industry. They are in the process of producing hatchery based spat and a domestication program. The domestication of the oyster in the Maritimes can provide benefits that will help ensure its sustainability and growth.

Dr. Jeff Davidson
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Questions and Answers

Q: What was the length of the study?
A: The study was conducted over an eight-year period. The samples were collected in the last week of November and the last week of April. Food levels were measured using a water quality meter.

Q: How many generations would we need to breed oysters to get "better survivors"?
A: That is difficult to answer, one question to resolve is what makes an oyster survive well?

3.4 Panel discussion

Q: Why do you think the industry could be worth two billion in ten years?
A: Two billion dollars in ten years is just a starting number derived from the habitat available in the Maritime Provinces and production levels achieved elsewhere. The oyster sector must work together to improve the industry.

Q: What is the difference between the general and individual license?
A: General licences have to be renewed annually whereas individual licences depend on individual situations. For example, if a grower is looking to transfer product from Prince Edward Island to New Brunswick, an Introduction and Transfer (INTA) licence would be required. This process would also vary if the proposed site to transfer product from has tunicates.

Q: How can you facilitate the transfer of seed into the Bras D'Or Lakes in order for the industry to grow?
A: DFO will allow transfers within pre-authorised areas of the Bras d'Or Lakes in order to help the oyster industry. DFO is very cautious where seeds originate from a MSX-positive area, as MSX is the biggest concern. Sampling programs provide DFO Management with the necessary information to make decisions about transfers.

Q: How fast can you get the results back from sampling?
A: Post-mortem results take between two to three weeks. The results from summer 2010's sampling program will not be available until April 2011.

Q: Does public perception play a part in the success of the industry?

A: Public perception is extremely important for a successful industry. We need more young people interested in aquaculture. At present, many young people leave rural areas because they perceive that there are no jobs there.

Q: Is it an issue that not every site has a processing plant?
A: In Prince Edward Island, many growers have their own processing plants. This is how they can control the quality and presentation of their oyster shipments, tailor their products to the needs of their clients, and obtain fair value for the capital and hard work invested in producing their oysters.

Q: Is business planning a priority?
A: Definitely. This is an industry where growers must have the knowledge to be involved in every aspect of oyster production

Comment from the floor: It is difficult to get operating capital from government. We want to see how big businesses would point industry in the right direction. In the 1970's, there was an investment in the tree business in Brazil, because it was obvious to investors that there was a growth potential. The oyster industry needs investors who see enough value in the industry to put money in it as a strategic investment.

Comment from the floor: European investors with knowledge of the oyster business look at the production cycle and regulations that the Maritime Provinces have to operate under. Investors like the growing habitat, the quality of Maritime oysters, and the prices. However, investors do not see how money can be made with our production cycle and the present administrative and regulation burden; they shake their head and move on to invest elsewhere.

3.5 Priorities

The priorities in the following list were raised during the panel discussion and from comments made during the day by workshop participants:

- Access to capital,
- Current regulations and lease tenure in relation to grow out cycle need to improve to attract investors,
- Business and management planning need refining,

- Regulations must be written down and available,
- Reform regulations to make them grower friendly (e.g. transfer and process on site),
- Access to leases, need quicker responses (e.g. shorter approval time frame),

- Technology to shorten the production cycle,
- Domestication (agriculture as a model),
- Understanding seed mortalities (when/ which season),

- Education, knowledge transfer to younger generations and public in general,
- Human resources, recruit young people to industry,

- Water quality, and

- Disease management protocols.

4.0 Conclusion

The 2011 Oyster Development Workshop attracted 75 participants from industry, governments, and academia. The workshop was focused on Research and Development, and priorities for the industry. Existing and prospective growers, technology developers and providers, and experts from government and academia shared knowledge and experiences with a common objective to develop the untapped oyster culture potential of the Maritime Provinces, and to supply demand for high quality oysters in the market place. Participants identified issues, road blocks to development, and priority areas for the guidance of investors and government officials.

In the weeks and months ahead, the AANS intends to consult further with prospective and existing oyster producers to discuss and rank industry priorities. It may be desirable to develop packages of needed regulation and policy changes for submission to federal and provincial authorities.

Appendix A: List of participants

Name of Participant	Organization
Industry Representatives	
1. Rheal Savoie	Bouctouche Bay Industries Ltd.
2. Johnny Flynn	Colville Bay Oyster Co.
3. Fernando Salazar	Atlantic Policy Congress of First Nation Chiefs Secretariat
4. Dean MacEachern	Rodneys Oyster Depot
5. Gordan Neal	Aqualife
6. Stephan MacIntosh	Industry
7. Nolan D'Eon	Eel Lake Oyster Farm
8. Colton D'Eon	iGrow Oysters
9. Nick D'Eon	iGrow Oysters
10. Darlene Meade	AquaPrime Mussel Ranch
11. Paul Firminger	Little Shemogue Oyster Company
12. Darrell MacLeod	Cape North Mussel Ltd.
13. Kevin Johnson	Chapel Island First Nation
14. Sandra Basque-Johnson	Chapel Island / Potlotek
15. Anita Basque	Apaqtukewaq Fisheries, Chapel Island
16. Brian Blanchard	Scotian Halibut Ltd.
17. Peter Darnell	Indian Point Marine Farms Ltd.
18. Harold Montgomery	5M Aqua Farms Ltd.
19. Charles Purdy	Bay Enterprises
20. Brian Fortune	Bill & Stanley Oyster Company Ltd.
21. Dr André Mallet	L'Etang Ruisseau Bar Ltd. / Mallet Research
22. Paula Curry	Cooke Aquaculture Ltd.
23. Jeff Nickerson	Cooke Aquaculture Ltd.
24. Rodney O'Neil	Cooke Aquaculture Ltd.
25. Peter Warris	Prince Edward Island Aquaculture Alliance
26. Jarred Gun-MacQuinn	Prince Edward Island Aquaculture Alliance
27. Darrell Green	Newfoundland Aquaculture Industry Alliance
28. Bruce Hancock	Aquaculture Association of Nova Scotian
29. Danielle Goodfellow	Aquaculture Association of Nova Scotian
Academia	
30. Rod Beresford	Cape Breton University
31. Dr. Jeff Davidson	Atlantic Veterinary College, University of PEI
32. Dwaine Dakin	Nova Scotia Agricultural College
33. Dr. Cathy Enright	Nova Scotia Agricultural College
34. Kevin Henderson	Nova Scotia Agricultural College
Federal Government	
35. Jim Frost	Department of Fisheries & Oceans, Maritimes Region
36. Lorne Penny	Department of Fisheries & Oceans, Maritimes Region
37. Stephanie Rose	Department of Fisheries & Oceans, Maritimes Region
38. Tammy Rose-Quinn	Department of Fisheries & Oceans, Maritimes Region

39. Chantal Coomber	Department of Fisheries & Oceans, Gulf Region
40. Mary Stephenson	Department of Fisheries & Oceans, Gulf Region
41. Alan Dwyer	Department of Fisheries & Oceans, Gulf Region
42. Michelle Maillet	Department of Fisheries & Oceans, Gulf Region
43. Angeline LeBlanc	Department of Fisheries & Oceans, Gulf Region
44. Florence Albert	Department of Fisheries & Oceans, Gulf Region
45. Ellen Kerr	Department of Fisheries & Oceans, Gulf Region
46. Thomas Landry	Department of Fisheries & Oceans, Gulf Region
47. Marie-Line Cournoyer	Department of Fisheries & Oceans, Gulf Region
48. Andy Woyewoda	National Research Council – Industry Research Assistant Program
49. Dr Neil Ross	National Research Council – Industry Research Assistant Program
50. Karen White	Canadian Food Inspection Agency
51. Brenda Bradford	Atlantic Canadian Opportunity Agency
Provincial Government	
52. Mr. Jim Boudreau, MLA	Ministerial Assistant, Nova Scotia Department of Fisheries & Aquaculture
53. Marshall Giles	Nova Scotia Department of Fisheries & Aquaculture
54. Eugene Samson	Nova Scotia Department of Fisheries & Aquaculture
55. Lewis Clancy	Nova Scotia Department of Fisheries & Aquaculture
56. Chuck McKenna	Nova Scotia Department of Fisheries & Aquaculture
57. Charlotte Underwood	Nova Scotia Department of Fisheries & Aquaculture
58. Dr. Roland Cusack	Nova Scotia Department of Fisheries & Aquaculture
59. Adam Ogilvie	Nova Scotia Department of Fisheries & Aquaculture
60. Dr. Toby Balch	Nova Scotia Department of Fisheries & Aquaculture
61. Kim Gill	Prince Edward Island Fisheries Aquaculture & Rural Development
Industry Companies/Other	
62. Trudy Spooner	Lura Consulting
63. Sean Kavanagh	Aon Risk Services
64. David Boyle	Maritime Micro Biologicals Ltd.
65. Jesse Fortune	Formutech Inc.
66. Christy Bourque	Mitchell McConnell Insurance
67. Joe Mersereau	
68. Kent Ferguson	Go Deep International Inc.
69. Lise Marshe	AirSept Co.
70. Peter Skyes	Aquatic Health Sciences
71. Zack Whynot	TriNav Fisheries
72. Jenny Gouthro	Hoskin Scientific Ltd.
73. Dr. René Lavoie	Shellfish biologist (Retired)

Appendix B: Guest speaker biographies

Back row, from left to right: Paul Budreski, Dr André Mallet, Chuck McKenna, Johnny Flynn, Dr Jeff Davidson. Front row, from left to right: Mary Stephenson, Kim Gill, Tammy Rose-Quinn, Danielle Goodfellow (Workshop organizer), Florence Albert, Dr. Roland Cusack, Lorne Penny. (Missing from the picture: Rhéal Savoie)

Johnny Flynn, "*Marketing products – how to be successful*"

Mr. Flynn works as a lobster fisherman in the spring and manages an oyster farm in Colville Bay, Prince Edward Island. Colville Bay Oyster Company is a family run business and has been operating for over 15 years. In addition to his work, he sits on the Executive Committee for the Island Oyster Growers group. Colville Bay is well known for its oysters. Mr. Flynn has done a remarkable job at marketing his oysters based on word of mouth through chefs, restaurants and tourists and treating his costumers with respect. His products are available in restaurants across Canada.

Rheal Savoie, "*The OysterGro system business model – successfully meeting market demands*"

Mr. Savoie graduated from the University of Moncton with a Bachelor's in Social Sciences. He has been working in the economic development for over 21 years. In 1995, he bought an existing business in the commercial fishing industry, which has since expanded. Mr. Savoie was a key participant in developing the OysterGro System, which is now marketed to oyster companies globally. The Oyster Gro System is a successful business model, primarily because various stakeholders were involved in its development (government, universities, associations etc.) and developed communities support in this initiative. Having the key stakeholders involved it its development, the OysterGro System was easily marketed because research backed up its functionality. Oyster farmers often revamped technical gear to make it work more efficiently on their site. Sometimes, their ideas vastly changed the original equipment, leading them to consider marketing the system as their own product. Mr. Savoie has been involved in the process, which had its trials and tribulations but ultimately lead to a successful story

Paul Budreski, "*Aspects of the shellfish industry – that must be dealt with to become a two billion dollar industry in ten years*"

Mr. Budreski is the owner and manager of AquaDelights Seafoods Ltd., which was established in 1993. His focus has been on oysters, mussels, quahogs and bay scallops. In addition to being a full-time aquaculture farmer, he is also a professional accountant (CGA 1978) and has been a business professor at Mount Saint Vincent and Dalhousie University. He is actively involved in his community and is known for being a strong advocate on improving the oyster industry in Atlantic Canada. Mr. Budreski spoke on the shellfish industry and how we can make it a two billion dollar industry.

Lorne Penny (Florence Albert), "*DFO Maritimes & Gulf Regions, Oyster Fisheries - Regulations and Policies*"

Mr. Penny has worked with Fisheries & Oceans Canada (DFO) in various management regions across the country after graduating from Cape Breton University. Lorne has spent over 16 years as a Fishery Officer in the Western and Eastern Arctic regions and in the Southwest Nova Scotia and Eastern Nova Scotia areas. In 2002, Lorne changed his career direction towards program management within DFO and has coordinated the CSSP program for Eastern Nova Scotia for the last eight years. Mr. Penny is currently acting Chief of Resource Management for the Eastern Nova Scotia Area, Maritimes Region. In cooperation with Florence Albert of DFO Gulf region, he made a presentation about DFO's regulations and policies for both the Maritimes and Gulf Regions.

Chuck McKenna, "*Provincial licenses, leases and conditions in Nova Scotia*"

Mr. McKenna started with the Nova Scotia Department of Fisheries and Aquaculture (NSDFA) in 1990 and worked for several years on harbour infrastructure design, technology transfer projects and trade development. During that time, he was involved in a number of aquaculture technology initiatives, including initial investigations on New Zealand long line/ cotton sock equipment.

He left the department in 2000 and worked as a public engagement specialist and policy analyst with Voluntary Planning – a provincial Board that conducted province-wide consultations. During this time he managed task forces on a Fiscal Review of the Province, Off Road Vehicles, Non-Resident Land Ownership and a Heritage Strategy for Nova Scotia.

In 2008, he returned to NSDFA as the Aquaculture Division's Manager of Policy and Licensing. Mr. McKenna oversees a licensing process that includes new applications, a renewal process, amendments, fees and enforcement. In his policy role, he has helped to draft an aquaculture strategy and actively participates in the department's public confidence initiatives.

Kim Gill, "*Comparison of Oyster Culturing Techniques in Prince Edward Island*"

Ms. Gill graduated from the Atlantic Veterinary College in PEI with a Masters Degree. Her research focused on tunicate mitigation on mussel farms. She has been working with the Department of Fisheries and Agriculture Rural Development for four years as a shellfish biologist. Ms. Gill has lead several research projects on tunicate mitigation on mussel and oyster aquaculture operations. More recently, she worked to develop a monitoring program for off-bottom oyster aquaculture.

Dr André Mallet, "*Controlling boring sponges*"

Dr. Mallet is president of L'Etang Ruisseau Bar Limited in Shippagan, New Brunswick, a family-owned shellfish business that has been in operation for over 30 years. This company is involved in the hatchery seed production, growing, and selling of the Eastern oysters, bay scallops and quahogs. The company is continually investing into R&D activities as a means of improving product quality and production efficiencies. Dr. Mallet's consulting company, Mallet Research Services (Dartmouth, Nova Scotia) had a research paper recently accepted in the Journal of Shellfish Research. He presented the results from this research with details on the life cycle of the boring sponge as well an effective method for eradicating this pest in bag-cultured Eastern oysters. Dr. Mallet is a leader in aquaculture research questions, including methods to mitigate the impact of sponges and other pests.

Dr. Roland Cusack, "*Oyster Health Review in Nova Scotia*"

Contributors: Cusack RR, G. Spearman, A. Bagnall, C. Huntington, C., N. Gagné

Dr. Cusack did his first aquaculture project in 1980, studying the use of thermal effluents for aquaculture at the Lingan Power Plant. He graduated with an Honours Biology Degree in 1983, from St. Francis Xavier University. This was followed by a Masters Degree in fish parasitology from Dalhousie University. Dr. Cusack undertook several fish disease contracts between 1985 and 1987, including work on a parasite survey of Nova Scotia fish farms and work on sea lice. He completed a Doctor of Veterinary Medicine in 1991 and joined the Nova Scotia Department of Fisheries and Aquaculture as the Provincial Fish Health Veterinarian. He provided an oyster health overview with respects to diseases present in Nova Scotia, such as MSX and the Malpeque disease.

Mary Stephenson, "*Fisheries & Oceans MSX oyster survey and research*"

Ms. Stephenson, B. Sc., is the Head of the Shellfish Health Unit – SHU at DFO Gulf Region, Moncton, NB. She started her career with shellfish at DFO's Research Station in Western PEI providing lab and field support on various projects including the domoic acid outbreak in the late 1980's. Mary transferred to Moncton in 1990 to work in the newly established Shellfish Health Unit collecting baseline information on shellfish diseases and investigating concerns such as unusual mortalities and poor growth. In 2002, the SHU investigated the original reports of oyster mortalities within the Bras d'Or Lakes, confirmed *Haplosporidium nelsoni* - MSX disease as the causative agent, and led the disease investigation that ensued. The SHU established a dedicated oyster survey within the Maritimes to provide scientific advice considered by DFO and the Provincial governments for management of the oyster resource and by the Introductions and Transfers Committees as part of their risk assessments. Also, as the DFO shellfish disease reference laboratory, the SHU provides training for the monitoring of shellfish diseases, development of quality assurance/quality control for disease detection, and validation of emerging diagnostic techniques.

Tammy Rose-Quinn, "*The role of Introductions and Transfers Committes in disease management as it related to oysters (within Nova Scotia and beyond)*"

Mrs. Rose-Quinn has been working in the aquaculture industry for 13 years and hopes to continue for at least another 13 years. Her first experience with aquaculture came from being enrolled in the Aquaculture Diploma Program (in 1996-1997) at Holland College (Ellerslie, PEI). She attended the college for one year and continued her education at the University of Prince Edward Island where she completed her Bachelor of Science Degree. During her four year stay in PEI, she had the opportunity and pleasure of working as a student with shellfish growers in the Malpeque Bay and Enmore areas. In addition, during her free time at University, she volunteered at the Atlantic Veterinary College participating in a shellfish research project related to *Haemic neoplasia* in Soft shell clams.

After leaving PEI, she attended the Nova Scotia Community College, Centre of Geographic Sciences (COGS) where she obtained her Advanced Diploma in Marine Geomatics. She finished school in 2002 and began working almost immediately with the DFO Habitat Management Program as an Aquaculture Assessment Technician; she reviewed aquaculture site proposals in NS and NB. In 2005, she began working on aquaculture projects again as a Habitat Assessment Biologist conducting environmental assessments for proposed aquaculture sites. In 2008, she shifted her focus and career path and started in her current position as Senior Advisor with the Aquaculture Management Office which deals with the aquaculture file from a broader departmental management perspective.

Dr. Jeff Davidson, "*Environmental Factors Affecting Oyster Health*"

He has a worldwide reputation for expertise in shellfish and shrimp health management. He works as a professor in the Department of Health Management, Atlantic Veterinary College at the University of Prince Edward Island and is the recipient of the Pfizer Award for Research Excellence for 2009. His areas of specialties include: health and production medicine of shellfish and shrimp, eco health and aquaculture invasive species. Dr. Davidson's research team focuses on outbreak investigations and the causes of diseases such as MSX. Dr. Davidson discussed environmental factors and their effect on oyster mortality.