CURRA Symposium - Summary of session "Aquaculture benefits and challenges"

In the last few decades marine ecosystems worldwide have been heavily impacted by accelerating rates of natural and anthropogenic disturbances. The collapse of the cod fishery in Newfoundland and Labrador (NL) provides a prime example of the pervasive effects that overfishing has had on the economy and social fabric of an entire region. The session entitled "Aquaculture benefits and challenges", organized and chaired by Patrick Gagnon [Assistant Professor, Department of Ocean Sciences [DOS], Memorial University of Newfoundland], brought together stakeholders, managers, and researchers in federal and provincial governments, academia, and industry to discuss the role that aquaculture plays in the socio-economic growth of rural NL. How do government, industry, and academia work together to make aquaculture work for the province? What new moneys has the industry of aquaculture injected to this province in the last decade and how is it expected to grow in the next? How does aquaculture affect marine habitats? What are some of the main factors that challenge sustainable aquaculture? These questions, among others, were addressed through eight presentations by Brian Meaney (Assistant Deputy Minister for Aquaculture, Department of Fisheries and Aquaculture [DFA] of Newfoundland and Labrador), Cyr Couturier (Research Scientist and Chair Aquaculture Programs School of Fisheries, Marine Institute [MI], Memorial University of Newfoundland [MUN]), Danny Boyce (Facilities and Business Manager, Dr. Joe Brown Aquatic Research Building [JBARB], Department of Ocean Sciences, MUN), Gehan Mabrouk (Head of Aquaculture, Biotechnology and Aquatic Animal Health Research Section, Science Branch, Department of Fisheries and Oceans [DFO] Canada, NL), Miranda Pryor (Executive Director of the Newfoundland Aquaculture Industry Association [NAIA]), Patrick Gagnon, Jennifer Caines (Science and Project Manager, Northern Harvest Sea Farms [NHSF], NL), and Sheena Young (Program Director, Fundy North Fishermen's Association [FNFA], NB).

Global aquaculture production has increased rapidly since the early 1990s, providing a vital complement to stable or plummeting capture fisheries and an ever growing demand for aquatic animal proteins. With an estimated value of $120M in 2011, aquaculture production centered on Atlantic salmon, trout, char, and mussels has steadily increased in NL since the early 2000s, providing direct and indirect employment to up to 2000 persons (2011) yearly in rural and coastal communities of the province. DFA recognizes three main challenges for aquaculture in NL: 1) global market pressure [e.g., price fluctuations and international competition], 2) sustainability [e.g., environmental and aquatic animal health management], and 3) workforce recruitment and retention. DFO, which is one of 17 federal departments and agencies involved in aquaculture development and regulatory oversight in Canada, helps addressing part of these issues by spearheading collaborative research with the industry and academia under the umbrella of its Ecosystem-Based Aquaculture Management and Precautionary Approach framework. Research at DFO for the NL region includes aspects of reproduction between wild and farmed salmon, interactions between commercial fisheries (American lobster and snow crab) and finfish aquaculture, and approaches to monitoring of benthos at finfish cage culture sites, with the overarching goal of achieving sustainable aquaculture.

Research in aquaculture within MUN's marine sciences areas of focus at the DOS, MI, and JBARB, has moved from small-scale projects such as mussel seed collection, scallop hatchery, and mussel and salmon growout trials during the 1960s-1980s, to cod broodstock development, genetic impacts of escapees, and applied R&D on mussel, oyster, salmon, scallops, trout, and char in the 2000s. The creation of NAIA, a not-for-profit association of provincial

growers and processors, and strategic aquaculture development plan by the end of the 1990s catalyzed the growth of aquaculture in NL, focusing research at the MI and JBARB in specific areas benefiting the industry. With over 125 licensed sites across the province, mussel, salmon, and cod farming in NL are currently some of the most socio-economically viable productions enabled by joint efforts between the academia, NAIA, DFA, and DFO.

The aquaculture industry in NL, which supports more than a dozen coastal communities, is vulnerable to some factors that are difficult to predict and control. The coffin box (bryozoan) and green crab are two of a few notorious aquatic invasive species (AIS) introduced to shallow inshore habitats in NL in the last decade. Recent research in the DOS shows these two species can adversely affect populations of indigenous species with existing (mussel) or potential (kelp) aquaculture value. Predicting how these and other AIS will affect aquaculture production is difficult, partly due to complex life cycles allowing long-range dispersal and the need for more research to understand interactions with the environment within introduced ranges. As seen in New Brunswick through work conducted by the FNFA, integrating Local Ecological Knowledge (LEK) into studies of interactions between aquaculture and commercial fisheries has the potential to better inform aquaculture practices in NL. NHSF, a family operated business with Atlantic salmon farming operations in New Brunswick and NL and providing employment to over 250 people, is a prime example of successful aquaculture development through investment in research, respect of the environment, and cooperation with local fish harvesters.

Several consensuses emerged from the session. (1) Environmental and market conditions for aquaculture development in NL are favorable. (2) The emphasis of research and development (R&D) efforts for the commercially relevant production sectors of salmonids and shellfish rests on improving sustainable production by reducing interactions with the environment, ameliorating production outcomes and techniques, and developing "green" solutions to mitigate potential impacts. (3) R&D priorities for the industry are set by the industry and the communities in which they exist, and the focus should always be on sustainable rural economic development. (4) Although aquaculture in NL is growing steadily in a sustainable fashion, it should not be regarded as a panacea for dealing with collapsed fisheries. (5) Rather, aquaculture should be used as a complementary sphere of activity. There are many examples of fish harvesters who were able to continue to thrive by switching or diversifying their fishery, while becoming increasingly involved in aquaculture. (6) Both fisheries and aquaculture are sustainable natural resource-based industries contributing to NL's coastal communities and keeping its oceans traditions alive. (7) Both sectors must and do work hand in hand for the preservation of common values of stewardship, environmental protection, conservation, and community sustainability.