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# CLIMATE CHANGE SESSIONS INCREASINGLY PROMINENT AT AQUACULTURE MEETINGS

GREGOR K. REID AND TIMOTHY JACKSON

Climate change and aquaculture issues are becoming increasingly prominent at recent aquaculture organization meetings. This past June, the World Aquaculture Society (WAS) and the Aquaculture Association of Canada (AAC) co-hosted a Special Symposium on Climate Change and Aquaculture at Aquaculture Canada 2014. Less than a week later, the session Climate Change Ready-Management Strategies for the Future was held at World Aquaculture 2014 in Adelaide. These sessions provided some excellent and at times sobering presentations. For those who did not attend and wish to stay abreast, some session highlights are detailed below.

## SPECIAL SYMPOSIUM ON CLIMATE CHANGE AT AQUACULTURE CANADA 2014

Aquaculture Canada 2014 was held in the seaside town of St. Andrews, New Brunswick, the first week of June. The symposium plenary speaker, Dr. Keith Brander, was a lead author on Working Reports for the Intergovernmental Panel on Climate Change (IPCC), and consequently awarded a share of the Nobel Peace Prize for the 4th report in 2007. In his talk, Dr. Brander reviewed the latest IPCC working report (that became available in October 2013) and contextualized the findings for aquaculture and fisheries. He discussed such influences as extreme weather events, disease spread, rising seas and effects on growth rates. Brander stated

that preparation for and adaptation to climate change needs to be considered at all time-scales, from short-term forecasting to long-term strategic planning by industry. In the follow-up discussion Brander emphasized the following message: climate change is happening now, it is manmade, and it is bad, but there is something we can do about it.

Gregor Reid discussed the need to revisit temperature effects on aquaculture in light of pending climate change. If temperature alone is considered, a Thermal Growth Coefficient model suggests Atlantic salmon in Atlantic Canada will reach market size two months quicker with an average temperature increase of 1 C. However, Reid says that this is not realistic, with many confounding temperature effects, ranging from reproductive to disease influences, and these effects will occur in consort. There are likely too many unknowns to assume reliable growth prediction under increasing temperatures.

The recent workshop Climate Change and Aquaculture in Atlantic Canada, hosted by The Prince Edward Island (PEI) Aquaculture Alliance in partnership with the University of PEI Climate Change Lab, was summarized by Peter Warris. The workshop, held in March 2014, included presentations from industry, academia and government on climatic changes in Atlantic Canada, potential impacts on aquaculture (shellfish health, invasive

(CONTINUED ON PAGE 10)

species, etc.) and the infrastructure adaptations necessary to accommodate anticipated impacts. Further to the UPEI Climate Change Lab workshop summarized by Warris, the Institute's Director, Adam Fenech, also presented some of the Lab's recent research, including Atlantic regional maps detailing anticipated changes in temperature and precipitation based on the most recent science. Improvements in model projections of future scenarios in Atlantic Canada were presented. Fenech later emphasized in group discussion that the Australian advance warning model, which provides up to months-in-advance warning of extreme water temperatures for fish farmers (referred to earlier by Brander) is viable in that region due to their ocean-driven climate, but this is not the case in Atlantic Canada.

Presentations by Lara Cooper and Ronald Pelot highlighted some of the Canadian federal government climate change research initiatives. Cooper reviewed the climate change research priorities for Fisheries and Oceans Canada, identified through the Aquatic Climate Change Adaptation Services Program and described ongoing aquaculture research projects. Pelot introduced projects from the Marine Environmental Observation, Prediction and Response Network of Centres of Excellence. The network consists of Canadian engineers and natural and social scientists aiming to reduce vulnerability to marine hazards and emergencies.

Sarah Stewart-Clark and Scott Applebaum presented research on the genetic implications of environmental stressors on oysters. Stewart-Clark and colleagues applied transcriptomic analysis to study the eastern oyster, identifying stress mediated gene expression and novel stress biomarkers, with the research identifying substantial potential for climate change to suppress oyster immune systems. Applebaum presented ongoing research to determine if Pacific oyster populations had enough adaptive resilience to climate change as a means to guide the selection of genotypes best suited for aquaculture in future conditions.

The presentation portion of the symposium closed with a 'double-header' by Helen Gurney-Smith. Her first presentation described how mass mortality events of mussels prompted the use of functional genomics to assess environmental and anthropogenic factors and whether these tools could assess vulnerability to climate change. Her second presentation explained the serious problems of ocean acidification in the Pacific Northwest, the likely cause of cultured shellfish mortalities, industry response, and ended with a 'call to action' for aquaculture stakeholders to engage in science and policy directly.

## CLIMATE CHANGE READY-MANAGEMENT STRATEGIES FOR THE FUTURE: WORLD AQUACULTURE 2014

Some fascinating and timely work on seasonal forecasting developments in Australia was presented by session co-chair, Alistair Hobday. The largely ocean-driven weather systems in this region and application of advanced modeling techniques can now enable up to several months warning and prediction of the likelihood of extreme ocean conditions for fish farmers.

Phimphakan Lebel reported on the perceptions of climate risk by river-based cage fish farmers in northern Thailand. The farmers needed no convincing of climate change realities, as 87 percent of those surveyed believed their operations were already experiencing these effects!

Some interesting advancements were presented on methods for monitoring environmental stressors, such as extreme water quality events. Andrea Morash presented developments of a small heart-rate biosensor that can attach to abalone, alerting farmers to stressed shellfish. The sound of a recorded oyster heart-beat was the lead-in to Ros Harvey's presentation on the development of a sensor network for shellfish farmers. Real-time spatial data is recorded, analyzed and can be communicated through user-friendly platforms such as smartphones, thereby enabling shellfish farmers to make informed and timely management decisions.

Perhaps the most thought-provoking presentation of the session was by Diego Platas, who reported the outcome of three major 2010 storm events in tilapia producing areas of Mexico. Flooding and structural damage reduced the annual tilapia production by 80 percent due to the devastation of 1200 uninsured farms. The pre-2010 production level has yet to return. Despite the gut-wrenching losses, these disasters prompted producers to organize, assess damages, document lessons learned and engage government to move forward. If such storm events are expected to increase in intensity and possibly frequency in many aquaculture regions, the Mexican experience should serve as a caution.

## THE CLIMATE CHANGE MESSAGE

Aquaculture producers and stakeholders presently have more than enough challenges, let alone having to address the realities of climate change. However, the pending scope of these effects on seafood production are too important to ignore. Climate change and aquaculture sessions are wisely becoming regular themes at aquaculture meetings. Co-hosting speakers and collaboration on climate change communication between affiliated associations such as WAS and the AAC is encouraging. Making such information accessible and available to aquaculture stakeholders is a big step to prepare for the future.

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## Notes

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