NSERC Canadian Integrated Multi-Trophic Aquaculture Network

Réseau canadien d'aquaculture multitrophique intégrée du CRSNG

CIMTAN Snippets

The **Canadian Wildlife Federation** (CWF) had its Annual General Meeting in Saint John, New Brunswick, on June 25-26, 2015. **Thierry Chopin** was one of two guest speakers and gave a presentation entitled "**An environmentally, economically and societally responsible aquanomic approach to farming the sea: Integrated Multi-Trophic Aquaculture (IMTA)**". This led to quite a lot of discussion, which led to Thierry Chopin attending lunch with members afterward. It was interested to see members of the CWF, who are generally opposed to aquaculture development, becoming interested in IMTA, which for them represents an interesting evolution in aquaculture practices that they could support.

James Wilson and Thierry Chopin during a meeting of the International Scientific Advisory Board of the Institut Universitaire Européen de la Mer (IUEM), in Brest, France, in April 2015.

James Wilson (Economics professor at the University of Québec in Rimouski) presented a paper entitled "**Changing rules, the evolution of property rights, and industrial organization: a case study from Canadian aquaculture**", co-authored with **Thierry Chopin**, at the conference "Property Rights in a Marine Context. Issues and Evolution" held in Brest, France, on July 2-3, 2015.

The presentation gave a brief history of the New Brunswick Bay of Fundy salmon aquaculture industry and the discussion focused on the rules of site attribution and regulation of production, with their likely impacts on the industrial organization of the sector over time. A look at this history of the sector suggests that whoever is eligible for new aquaculture development programs may have an impact on the costs of sector development, as well as the rapidity of changes in the industry structure. Policy changes that Canadian law-makers and public managers might consider for making the industry more competitive were also discussed along with the trade-offs that these changes may engender.

The authors benefitted greatly from interesting discussions with Pamela Parker (Atlantic Canada Fish Farmers Association), Peter Cashin and Andrew Sullivan (New Brunswick Department of Agriculture, Aquaculture and Fisheries) and Robert Sweeney (Sweeney International Marine Corp.).

The paper will be published in the Proceedings of the conference and another paper is also anticipated in an interdisciplinary journal.

On July 21, 2015, **Thierry Chopin** and **Adrian Hamer** (from CIMTAN), and **Michael Szemerda** (from Cooke Aquaculture Inc.) met with **Yvon Chiasson** (Executive Director) and 5 other regulators of the New Brunswick Department of Agriculture, Aquaculture and Fisheries to discuss how to transform regulatory barriers to innovation into a flexible and enabling framework allowing the development of IMTA. This was an extremely productive and cordial meeting in which a number of regulatory barriers

experienced by the IMTA academic and industry developers were openly discussed and pragmatic solutions were sought.

It was reiterated that there is no moratorium on IMTA development in New Brunswick.

Recognizing that we are in the presence of different types of nutrients (small particulate organic nutrients, large particulate organic nutrients and dissolved inorganic nutrients), different spatial and temporal strategies need to be developed for their bioremediation, which means that the infrastructures for the co-cultivated species of an IMTA system should be placed accordingly. There will be a need for regulatory changes instead of regulatory hurdles and there is a need for enabling and flexible regulations for the development of innovative aquaculture practices such as IMTA. In particular, the cultivation structures for seaweeds, the inorganic extractive component of marine IMTA systems, should not necessarily have to be confined to the leased area of an existing fish aquaculture site and we will have to think of dissolved inorganic nutrient sequestration at the bay management area (BMA) scale. Consequently, it is time to consider "seaweed only" sites, of course, integrated within the BMAs.

How can we reconcile different species with different production cycles (salmon with a 2 year rotation, mussels with a 1.5 year rotation, scallops with a 3 year rotation, sea-urchins and sea-cucumbers with a 3.5 year rotation and seaweeds with a 1 year rotation), 3 BMAs in the Bay of Fundy and 3 year licenses (because of the BMAs, not because of the production cycles)? Synchronizing crop rotation and fallowing, while considering the specifics of each species cycle, will not be a simple task (the limit of 2 licenses per site will have to be removed to allow that flexibility).

It will be important to harmonize regulations across Canada, while recognizing provincial specificities. In British Columbia, a site can be amended for several species at once and the licenses are for 6 years for finfish and 10 years for shellfish; in New Brunswick, amendments are one species at a time and licenses are for 3 years. The rationale for these differences is far from obvious and both provincial and federal harmonization is needed, with all agencies involved. The process for water classification needs to be significantly improved in terms of protocols and delegation for sampling.

As seaweed products are being developed, there is a need for seaweed regulations, which are almost absent at present. Now is the time to do it in a proactive manner, calmly around the table, so that these regulations are well thought-out, instead of rushed at the last minute, and implemented in a timely manner so as to not introduce delays in commercialization.

Ecosystem services provided by the extractive components of IMTA (seaweeds and invertebrates) will have to be recognized, accounted for and used as financial incentive tools (nutrient trading credits) to move towards responsible practices. At a time when we see several provinces starting to elaborate carbon policies, it will be important to extend the debate to other nutrients, such as nitrogen and phosphorus, the sequestration of which is also important in the marine and freshwater environments.

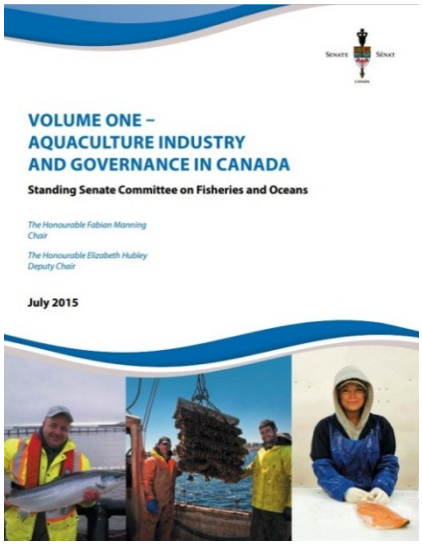
The same approach we have taken with marine IMTA (MIMTA) will have to be taken with freshwater IMTA (FIMTA, or aquaponics). In fact, the new equation could be FIMTA + MIMTA = ETPIMTA (Egg to Plate IMTA)! Going all the way with IMTA could also be an interesting marketing strategy.

"Transforming regulatory barriers to innovation into a flexible and enabling framework allowing the development of IMTA" will be the theme of a national workshop CIMTAN will organize in 2016. At a

time when the idea of an Aquaculture Act seems to be gathering momentum in Canada, it will be important that this Act presents a holistic and flexible approach so that it does not fall into the same monospecific faults as the present Fisheries Act, but instead opens the door to the development of innovative practices, like IMTA and others we presently cannot even imagine, that should not encounter hurdles because they were not thought of at the time the document was written.

The **Standing Senate Committee on Fisheries and Oceans** released its report (three volumes) on the **regulation of aquaculture, current challenges and future prospects for the industry in Canada** in July 2015, after several months of fact-finding missions and consultations across Canada (see *CIMTAN Snippets* V5N7 of December 2014), and videoconferences with representatives in Norway and Scotland.

These documents are available in English at:
http://www.parl.gc.ca/Content/SEN/Committee/412/pofo/rep/rep12jul15-e.htm
and in French at:
http://www.parl.gc.ca/Content/SEN/Committee/412/pofo/rep/rep12jul15-f.htm.

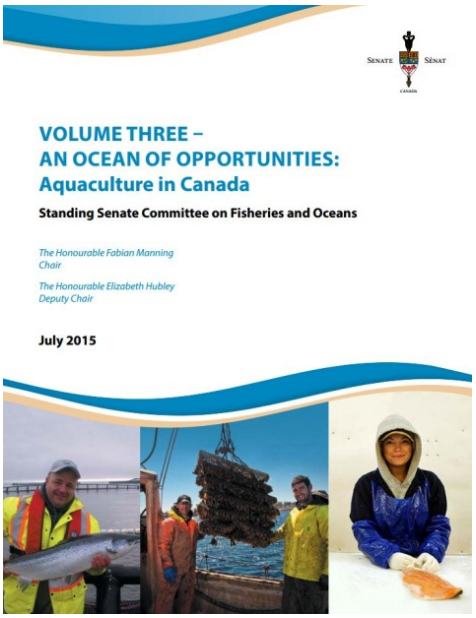


It is interesting to note how IMTA has gained respectability in these three documents. In Volume 1 (Aquaculture Industry and Governance in Canada), IMTA is mentioned on 7 pages out of 60. It is part of the list of acronyms (p. vii). Pages 6 and 7 mention IMTA on Vancouver Island; p. 15 mentions IMTA in the Bay of Fundy. Page 20 is illustrated with a picture taken during the visit of the Crow Island IMTA site in New Brunswick. On p. 59, one can read "Finally, the Committee learned that there is potential for diversification and innovation in the aquaculture industry in Canada, more particularly in British Columbia and New Brunswick, through the development of IMTA." In the concluding remarks (p. 60), the Committee notes that "today, the industry is characterized by a dominant finfish sector (particularly salmon), a strong shellfish sector (particularly mussels and oysters), and an emerging aquatic plant sector (particularly seaweed), mostly associated with the recent development of IMTA."

In Volume 2 (Aquaculture Industry and Governance in Norway and Scotland), IMTA is mentioned on 5 pages out of 37. It is part of the list of acronyms (p. vii). Page 21 mentions IMTA development in Scotland. On p. 31, a SWOT analysis for aquaculture in Scotland indicates that "IMTA could expand opportunities for mussel production". On p. 32, one can read "Canada also has more experience with respect to commercial land-based closed containment systems and IMTA than the two other countries." On p. 36, under the section "Social Licence", the report notes that "in Scotland, the government is supporting the use of "greener" methods of production, such as cleaner-fish and IMTA, while developing a community benefit charter that will explain and promote the benefits generated by aquaculture at the local level."

In Volume 3 (An Ocean of Opportunities - Aquaculture in Canada), IMTA is mentioned on 8 pages out of 76. It is part of the list of acronyms (p. vii). On p. 3 and 31, IMTA is cited as one of several non-chemical technologies to manage sea-lice. IMTA is part of the definition of aquaculture on p. 10 and

in the glossary (p. 59): "Aquaculture: the cultivation and harvesting of aquatic organisms - finfish, shellfish, molluscs and aquatic plants - in the marine environment, freshwater environment (in lakes and ponds) or in tanks on land. Monoculture refers to the cultivation of a single crop or species, while polyculture or IMTA refers to the rearing of two or more complementary species in the same grow-out site." On p. 12, the Committee indicates having visited two IMTA operations. On p. 14, one can read "the Committee further believes that new opportunities for growth should be encouraged in the areas of land-based, closed-containment aquaculture, the monoculture of aquatic plants, and IMTA, given Canada's comparative advantage in these sectors." On p. 16, the Committee indicates that "Furthermore, there is interest in developing seaweed aquaculture and IMTA in several provinces (British Columbia, New Brunswick, Nova Scotia, and Québec) and suitable locations should also be identified to accommodate these sectors. The Committee believes that work must continue to determine the areas that are most suitable for aquaculture growth in the marine and freshwater environments (for finfish, shellfish, and aquatic plants, as well as for IMTA)."



In Volume 3, the Committee also unambiguously supports the enactment of a federal Aquaculture Act (p. 20-24): "Accordingly, we believe that it is imperative that new federal aquaculture legislation be enacted" followed by a series of reasons justifying its support for a federal Aquaculture Act. It is the view of the Committee that "the Act must legitimize the aquaculture industry and acknowledge its important economic contributions to various regions of the country, including several Aboriginal communities."

It is with great sadness that we report the tragic death of **Alexandre Alter Wainberg**, murdered at his aquaculture farm on July 30, 2015.

Alexandre was born on August 11, 1960, in Rio de Janeiro, Brazil. He received a BSc in marine biology from the Universidade Federal do Rio de Janeiro in 1986. He graduated with a MSc in aquatic bioecology from the Universidade Federal do Rio Grande do Norte in 1998.

In 1993, Alexandre created **Primar**, an aquaculture company, in **Tibau do Sul**, in the state of Rio Grande do Norte, 1.5 hours south of Natal. Alexandre was considered a pioneer, a beacon in his country, and was internationally recognized for his unique shrimp and oyster farming techniques and the organic certification he obtained in 2003, when the company became **Primar Aquicultura Orgânica** (www.primarorganica.com.br).

Thierry Chopin had the great pleasure of meeting Alexandre at an FAO workshop on "Building an Ecosystem Approach to Aquaculture (EAA): Initial Steps for Guidelines", in Palma de Mallorca, Baleares Islands, Spain, in May 2007. Alexandre, with his smile, gentle mannerism, big heart, enlightening common-sense comments and in-depth scientific and traditional knowledge, could not leave anybody indifferent. Thierry and Alexandre remained in contact over the years, but it was only in August 2014 that Thierry had an opportunity to visit Alexandre's intriguing integrated multi-trophic aquaculture (IMTA) farm, which was always evolving based on Alexandre's long-term dream and his admirable dedication and tenacity. Primar Aquicultura Orgânica is developing IMTA with **organic shrimps** (*Litopenaeus vannamei*), **oysters** (*Crassostrea gazar*), **seaweeds** (*Gracilaria dominguensis* and *Hypnea* sp.) and **seahorses** (*Hippocampus reidi*) in earthen estuarine ponds over 40 hectares.

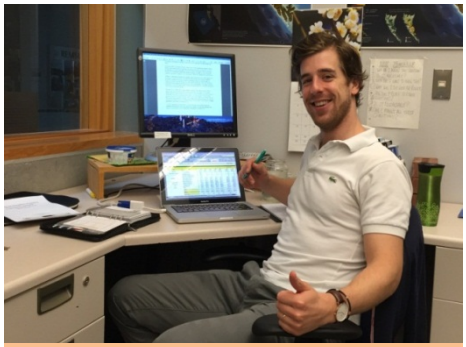
The shrimps are organically certified and produced for the Brazilian market. They are not fed artificial diets, the ponds are managed without aeration systems and are filled and emptied with controlled regimes, and the mangrove and other vegetations have been preserved, contrary to other operations. No chemicals, pesticides , GMOs, antibiotics or hormones are used on Alexandre's farm. Alexandre always said that his management practices reduced stress for the animals, provided a healthy growing environment, reduced the occurrence of diseases and improved survival rates. Because of the absence of artificial feeds, shrimps do not need to be "deveined", which also saves on processing costs. And, of course, they are nicely firm and delicious, as Thierry confirmed last year!

To be able to fully control the oyster cultivation process, Alexandre started to operate his own oyster hatchery last year. Thierry had the privilege of tasting these oysters, with a few drops of very tasty Brazilian lemon or of a very fragant olive oil: they were simply delicious! To add a special touch, they were served on an oyster plateau and lemon pressing tool from France: the grande classe in this very warm house on the farm property, displaying many souvenirs of the trips (always educational) Alexandre had taken around the world.

Seaweed cultivation and seahorse aquaculture were ongoing projects with **Eliane Marinho-Soriano**, of the Oceanographic Department of the Universidade Federal do Rio Grande do Norte, and **Lilia Pereira Souza Santos**, of the Oceanographic Department of the Universidade Federal de Pernambuco. Alexandre always had an insatiable and admirable appetite for developing cultivation methods for different species and innovative aquaculture systems. As an enthusiastic and persevering scholar, he always wanted his farm to be a continuous experimental site. Several master and doctoral students conducted their research on his farm.

Alexandre mentioned regularly that Thierry was his IMTA inspiration, but for Thierry, Alexandre was his inspiration, by being a living example of the values and benefits of IMTA and for tirelessly living his dreams for over 22 years. Alexandre will be dearly missed, as one of these rare pioneer figures, with style, fairness, a contagious smile, his life-loving enthusiasm, curiosity-driven eyes and generous heart. He was on a brillant trajectory that has been very sadly interrupted by the fragility of life.

We would like to express our sincere condolences to Alexandre's wife, Marcia Kafensztok, a talented graphic designer, and their daughter, Bianca Wainberg, a bright student in social sciences, with a focus in anthropology, at the Universidade Federal do Rio Grande do Norte.



The models of Mark Carras are works in progress, but the work in progress is going well! (photo credit: Hossein Ayouqi).

Mark Carras was born and raised in Halifax, Nova Scotia, and received his Bachelor of Business Administration from Saint Francis Xavier University, Antigonish, Nova Scotia. He spent several years working in Vancouver, South Africa, and Botswana, before starting his Master of Resource and Environmental Management (MREM) program at Simon Fraser University (SFU). Mark's first exposure to CIMTAN and IMTA began with a phone call from his to-be supervisor, **Duncan Knowler**, in 2013. Since then, he has been using IMTA research as an opportunity to expand his knowledge of natural resource management, international development and sustainability.

Mark is currently constructing and updating existing financial projections of hypothetical IMTA operations in order to examine the potential financial impacts for private companies investing in IMTA. Mark's summer research has been focused on integrating different sources of financial information into updated and comprehensive capital budgeting models, as well as writing the first chapter of his thesis. In the autumn, he will be investigating the financial impacts of incorporating a benthic species into an IMTA operation. An important research insight for Mark has been discovering the monetary value which investors can attribute to the relative certainty/uncertainty of a given investment's regulatory framework.

Mark Carras and his supervisor, Duncan Knowler, visited the Parque Nacional Vicente Pérez Rosales after the CIMTAN/Universidad de Los Lagos conference in Puerto Montt, Chile, last December (photo credit: anonymous tourist).

In his off time, Mark can be found enjoying quiet weekends with his wife on their terrace, harvesting tomatoes and basil from their inaugural garden, playing and listening to music and spending time with friends and family. Mark finished a Graduate Certificate in Development and Sustainability from SFU in 2014, and he is looking forward to getting back into international development work and consulting after graduation.

CIMTAN member quote of the month: "It's great to see IMTA and other polyculture efforts seeing increased research and commercial interest, and I hope that the federal and provincial governments are able to develop a regulatory environment that supports sustainably-driven food production technologies such as IMTA" (*CIMTAN MREM candidate Mark Carras*).

From the Classic Joke Friday of the Ellen DeGeneres Show.