



IMTA reaches a new level of recognition: it is now cited in the well-known and respected textbook – **Elements of Ecology**, by T.M. Smith, R.L. Smith and I. Waters. In chapter 26, dedicated to population growth and sustainability, it receives a half page (p. 586) of attention and is illustrated by a picture of one of the IMTA sites of our industry partner Cooke Aquaculture Inc. in the Bay of Fundy.

Paul Greenberg, the author of the book **“Four Fish: the Future of the Last Wild Food”**, which dedicated several pages to IMTA, wrote an article (**“How mussel farming could help to clean fouled waters”**) in *Yale Environment 360*. In this article, he talks about the experiment of growing mussels for bioremediation, conducted in the Bronx River, in New York Harbour. IMTA and seaweeds are also mentioned as a strategy for a more complete remediation of the range of nutrients and pollutants. Of course, growing organisms in this environment will require a strategy to identify the possible applications for the harvested products and an Integrated Sequential BioRefinery (ISBR) approach would be recommended.



Read the article:

http://e360.yale.edu/feature/how_mussel_farming_could_help_to_clean_fouled_waters/2648/

For more on the Integrated Sequential BioRefinery (ISBR) approach, read:

<http://www.unbsj.ca/sase/biology/chopinlab/articles/files/2011.07.ChopinetalGAA.pdf>



Award winning science correspondent at National Public Radio (NPR) in Washington, DC, **Richard Harris**, visited one of the IMTA sites of Cooke Aquaculture Inc. and interviewed **Thierry Chopin** (CIMTAN-UNB) and **Lennie Totten** (Cooke Aquaculture Inc.) on May 21. The story went on air on June 6 on *All Things Considered*, an NPR national program retransmitted through the entire NPR syndicated network, as well as on the NPR food blog *The Salt – What’s on your Plate* (rebroadcasted on at least 94 radio stations and blogs).

Listen to the radio interview and read the blog:

<http://www.npr.org/blogs/thesalt/2013/06/06/188431577/how-to-clean-up-fish-farms-and-raise-more-seafood-at-the-same-time>



All Things Considered is a NPR radio newsmagazine that delivers in-depth reporting and transforms the way listeners understand current events and view the world. The program presents breaking news mixed with compelling analysis, insightful commentaries, interviews, and special - sometimes quirky - features.

Richard Harris was presented the prestigious *2013 Presidential Citation for Science and Society Award* on June 25. This award of the [American Geophysical Union \(AGU\)](#) celebrates leaders whose work and vision have advanced the understanding, and heightened the public awareness, of the value of earth and space science to society and helped shape policies. "Scientific and societal advancements go hand in hand, and neither can be accomplished without the passion and innovation of talented people who are willing to reach out to new partners and audiences," said AGU President Carol Finn. "Many of the greatest challenges we face today to our health, security, and environment can only be addressed when our personal and policy decisions are informed by science. Through his leadership, commitment, and enthusiasm, Richard Harris has demonstrated the crucial role science can play in protecting public health and safety, connecting humans to their environment and promoting economic growth."



©NPR by Steve Barrett

A potential benefit of IMTA may be that filter-feeding shellfish could act as biological agents in the control of parasitic sea lice at salmon farms as part of a multifaceted approach. An important first step towards confirming this potential commercial benefit was to evaluate whether or not various filter-feeding shellfish species could consume sea lice larvae under controlled laboratory conditions. **Two CIMTAN/DFO (ACRDP) funded papers have been published recently on this particular subject.**

(1) **Janis Webb**, an MSc student with CIMTAN working at the Pacific Biological Station in Nanaimo, recently had her graduate research published in *Aquaculture*.

Webb J.L., Vandenbor J., Pirie B., Robinson S.M.C., Cross S.F., Jones S.R.M. and Pearce C.M., 2013 - Effects of temperature, diet, and bivalve size on the ingestion of sea lice (*Lepeophtheirus salmonis*) larvae by various filter-feeding shellfish. *Aquaculture* 406-407: 9-17.

Janis tested four species of filter-feeders (basket cockles, blue/gallo mussels, Pacific oysters and Pacific scallops) for their ability to consume sea lice larvae in the laboratory. She found that all four species were capable of ingesting the larvae and that neither temperature nor the presence/absence of phytoplankton had any significant effect on the proportion of individuals consumed. Larger oysters and scallops consumed a significantly greater proportion of larvae than smaller individuals.

(2) Other research conducted at the St. Andrews Biological Station has focused on the ability of filter-feeding Atlantic sea scallops and blue mussels to consume the copepodid stages of *L. salmonis* in the laboratory under both static and flowing water conditions, with variable copepodid densities, and with the aid of a light attractant. This work was published in the *Journal of Fish Diseases* as part of the collection of papers from the international workshop on sea lice held in Bergen, Norway, in the spring of 2012.

Bartsch A., Robinson S.M.C., Liutkus M., Ang K.P., Webb J. and Pearce C.M., 2013 - Filtration of sea louse, *Lepeophtheirus salmonis*, copepodids by the blue mussel, *Mytilus edulis*, and the Atlantic sea scallop,



Placopecten magellanicus, under different flow, light and copepodid-density regimes. *Journal of Fish Diseases* 36: 361-370.

Blue mussels consumed similar proportions of copepodids at low and high larval densities, suggesting that they were not saturated at the concentrations examined. Mussels were capable of consuming copepodids under both static and flowing water conditions and ingested more larvae when a light attractant was present. Sea scallops were also found to be capable of ingesting lice copepodids, consuming a similar number of larvae as an equivalent total wet weight of mussels.

Both of these studies have shown that various filter-feeding shellfish have the ability to consume sea lice larvae under controlled laboratory conditions. Field trials are currently underway at a commercial salmon farm on the west coast of Canada to determine whether commercial-scale densities of Pacific oysters can significantly affect planktonic sea lice numbers and/or the concentration of adult lice on the fish.

Read the papers: for copyright reasons, these papers cannot be posted here, but you can contact Chris Pearce (chris.pearce@dfo-mpo.gc.ca) for the first paper, and Shawn Robinson (shawn.robinson@dfo-mpo.gc.ca) for the second paper, and they will send you a copy for individual use.

Estimates of seaweed nutrient sequestration ability in open-water, Integrated Multi-Trophic Aquaculture (IMTA) required to “balance” nutrients from fish cages have typically assigned a specific nutrient load for a specific fish biomass. The resultant culture area and densities of seaweeds required for full equivalent nutrient sequestration may have meaning only to experienced aquaculturists. Consequently, Gregor Reid and co-authors are proposing a novel ratio model, which determines the weight ratio of harvested seaweeds required to sequester an equivalent weight of soluble inorganic nutrients loaded per unit growth of fish. This work was recently published in *Aquaculture*.

Reid G.K., Chopin T., Robinson S.M.C., Azevedo P., Quinton M. and Belyea E., 2013 - Weight ratios of the kelps, *Alaria esculenta* and *Saccharina latissima*, required to sequester dissolved inorganic nutrients and supply oxygen for Atlantic salmon, *Salmo salar*, in Integrated Multi-Trophic Aquaculture systems. *Aquaculture* 408-409: 34-46.

Soluble inorganic nutrient excretion from Atlantic salmon, *Salmo salar*, was estimated using a semi-stochastic nutritional mass balance approach. Oxygen demand was estimated using respiratory quotients. Nutrient contents of the IMTA kelps, *Alaria esculenta* and *Saccharina latissima*, were measured at harvest times, and net oxygen production was estimated using the photosynthetic equation. To quantify uncertainty, input parameters were assigned theoretical distributions (based on empirical or literature data) and the model was run using a stratified sampling approach (Latin Hypercube) over multiple iterations, to generate distributions of weight ratios for the various nutrients. A mathematical simulation of nutrient loading from a salmon farm over a full production cycle was estimated using mean loading values per unit growth, with monthly growth estimated by a thermal growth coefficient (TGC). The mean ratios of *A. esculenta* weight required to sequester nutrients excreted per unit weight of *S. salar* production were 6.7(±1.5):1 for nitrogen, 4.8(±3.0):1 for phosphorus, and 5.8(±1.4):1 for carbon. Oxygen could be supplied at a weight ratio of 4.1(±1.0):1. The mean ratios of *S. latissima* were 12.9(±2.7):1 for nitrogen, 10.5(±6.2):1 for phosphorus, and 10.2(±2.2):1 for carbon. Oxygen could be supplied at a weight ratio of 7.2(±1.5):1. *A. esculenta* appears to have almost twice the nutrient sequestration capacity per wet weight than *S. latissima*. However, culture densities of *S. latissima* are 1.5 times greater than those for *A. esculenta* and when spatially weighted this difference is reduced to 1–1.5 times.

Numbers of rafts for both kelp species required for full nutrient sequestration from a commercial scale salmon farm exceed the number of rafts which can be practically deployed within a typical site lease area. However, not all inorganic nutrients from cultured fish will be available to IMTA seaweeds, nor should



100% nutrient sequestration need be the only successful endpoint in such systems. These aspects should be considered when assessing the net value of kelps in open-water IMTA systems.

Read the paper: for copyright reasons, this paper cannot be posted here, but you can contact Gregor Reid (gregor.reid@dfm-mpo.gc.ca) and he will send you a copy for individual use.

Hamid Khoda Bakhsh and Thierry Chopin, involved in the new CIMTAN project on Freshwater IMTA (FIMTA), published the previous research of the first author while he was in Malaysia.

Khoda Bakhsh H. and Chopin T., 2013 - Water quality and nutrient aspects in recirculating aquaponic production of the freshwater prawn, *Macrobrachium rosenbergii*, and the lettuce, *Lactuca sativa*. *International Journal of Recirculating Aquaculture* 12: 13-34.

The purpose of this study was to investigate the effects of different nutrients and their ability to improve the production of *Macrobrachium rosenbergii* and *Lactuca sativa* in a prototype recirculating aquaponic (RA) system. Experimental units were set with different range of supplemented organic and inorganic (complex minerals) nutrients to carry out the study. The results indicated that desirable growth of *M. rosenbergii* might be possible in RA systems when supplied sufficient levels of macro-micro nutrients. Analyses of nutrients in the prawn culture tanks demonstrated that ammonia and nitrate concentrations were critical elements in maintaining proper water quality during culture period. Five day biological oxygen demand (BOD5) increased significantly with the increase loading of organic supplement in the rearing tanks. A significant linear relationship of chlorophyll *a* and N:P ratio was observed among the treatments. The combination of complex minerals and organic chicken manure (CM15) displayed a higher N:P ratio, maximal total yield and did not show adverse effects on NH₃ concentrations and other important water quality parameters.

Read the paper: for copyright reasons, this paper cannot be posted here, but you can contact Hamid Khoda Bakhsh (hamidk.bakhsh@unb.ca) and he will send you a copy for individual use.



The *Canadian Aquaculture R&D Review 2013* is out! As part of the *Aquaculture Association of Canada Special Publication 23* - edited by D.J. Martell, J. Duhaime and G.J. Parsons - a **full section**, from p. 48 to 55, is dedicated to **CIMTAN** and the description of its **16 projects**.

Read the section:

<http://www.unbsj.ca/sase/biology/chopinlab/articles/files/Canadian%20Aquaculture%20R&D%20Review%202013%20CIMTAN%20English.pdf>



Fisheries and Oceans Canada has just released two YouTube videos related to IMTA:

(1) Aquaculture Research: Integrated Multi-Trophic Aquaculture (IMTA) - Deposit Feeders

English version: <http://www.youtube.com/watch?v=U5AYTCMP0r4>

French version: <http://www.youtube.com/watch?v=0I8iluX90qY>

(2) Aquaculture Research: Alternate Control Methods for Managing Sea Lice

English version: <http://www.youtube.com/watch?v=ImmP80dc5DI>

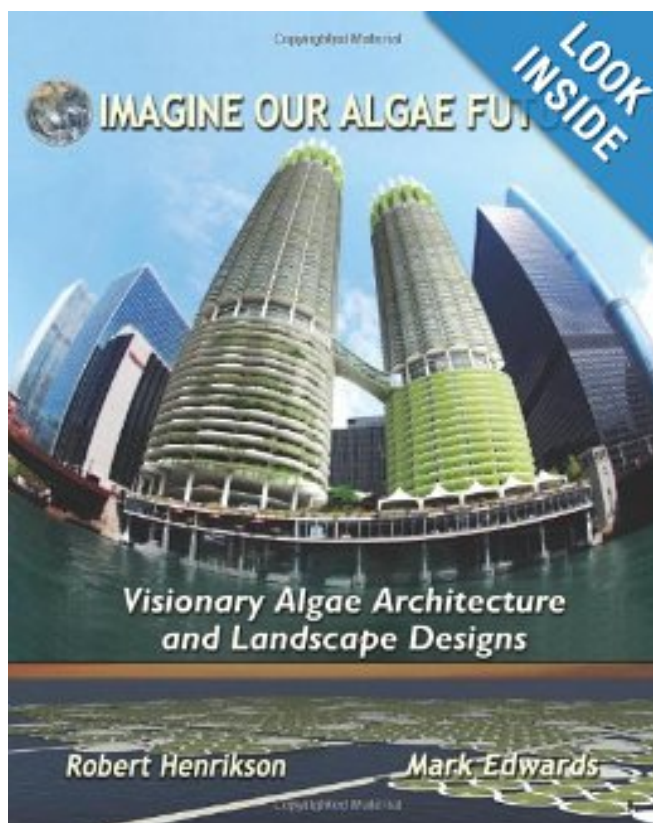
French version: <http://www.youtube.com/watch?v=xo41JtsWEms>

Thierry Chopin provided the text for the section on “Seaweed and marine algae industry - Harvesting and processing macroalgae” in the book *Imagine our Algae Future - Visionary Algae Architecture and Landscape Designs* by R. Henrikson and M. Edwards.

The book can be purchased on Amazon.com:

<http://www.amazon.com/Imagine-Our-Algae-Future-Architecture/dp/1475128185>

This book offers a peek into our future: how will growing algae change the world and improve our lives? Imagine our future living in cities where buildings are covered with photosynthetic skins and vertical gardens, collecting the sun's energy and producing food and energy for urban citizens. Imagine greening desert coastlines and producing food for millions of people. Imagine algae systems that recycle polluting wastes into high value animal food, fuel and biofertilizers. This book reviews algae production, products and potential today and showcases some of the amazing visions of our future from the International Algae Competition. Our future with algae offers rich and diverse opportunities that will impact every aspect of our lives. International Algae Competition is a global challenge to design our future with algae food and energy systems. As a participatory design game, Algae Competition invited global citizens from around the world to design their own future with the foods they eat, systems that grow algae, landscapes and cityscapes they dream of living in. 140 participants responded, representing 40 countries, and they submitted some amazing designs, projects and food ideas. Growing algae offers a future beyond scarcity toward sustainability and abundance.





"Broccoli, kale, seaweeds, mustard greens. They're all phenomenal super foods and wonderful for you".

Bobby Deen, host of Cooking Channel's *Not My Mama's Meals*

CIMTAN held its fourth Annual Meeting, May 14-17, in Vancouver, British Columbia.

On May 14, the Scientific Committee had its annual face-to-face meeting to review the progress of the 16 CIMTAN projects distributed among its 3 domains and make recommendations to the Steering Committee. The latter also met face-to-face, on May 17, to review the recommendations and assess the progress of the Network as it enters its post mid-term review period. Being just after the midway point of the Network, CIMTAN scientists have already trained 90 (79 %) of the 114 HQPs planned for the full duration of the Network and all the projects are progressing on target.

It was interesting to note that a significant number of the members of both the Scientific and Steering Committees also attended the Annual General Meeting (AGM), on May 15-16, which attests to their keen interest in the progress made by the Network.

The AGM was attended by 47 people [23 of them being HQPs (Highly Qualified Personnel), *i.e.* Master and PhD students, postdoctoral fellows and technicians]. During the AGM, representatives of the 16 projects made 22 presentations, 18 of them given by CIMTAN HQPs. The 16 projects are described in the *Canadian Aquaculture R&D Review 2013*, which has just been published (see above).

At the end of the first day of the AGM, Shane Nason, Intellectual Property Manager at the University of New Brunswick and member of the CIMTAN Scientific Committee, gave a presentation entitled "Intellectual property considerations for CIMTAN". Then, the whole group moved to the revolving Vistas 360 Restaurant of the Renaissance Vancouver Hotel Harbourside for the CIMTAN Annual Reception and Dinner.

At the end of the second day of the AGM, Rich Moccia, Associate Vice-President Research at the University of Guelph and Chair of the CIMTAN Steering Committee, gave a presentation entitled "A pig's tale! Lessons from the Abyss on managing novel IP that's ahead of its time", in which he covered the scientific and societal saga of the Enviro Pig at the University of Guelph and what could be learned for the benefit of CIMTAN. Then, Gregor Reid offered a seminar to the CIMTAN HQPs on "Technical and organizational imperatives for timely thesis completion: how to handle the document and your data", which was very well appreciated, along with the delicious chicken wings!



NSERC Canadian Integrated
Multi-Trophic Aquaculture Network

Réseau canadien d'aquaculture
multitrophique intégrée du CRSNG

CIMTAN *Snippets*







The 2nd Annual Atlantic BioRefinery Conference entitled “Fields, Forests & Oceans: Growing New Markets” was held in Charlottetown, Prince Edward Island, May 29-31. This conference focused on the **how, when and why of turning Atlantic Canada’s forestry, agriculture and aquaculture biomass resources into high value-added products for the global market.** Business professionals, growers, fish processors,



foresters, government officials and academics attended this event to hear from a wide array of regional and national experts talking about their field experience and addressing the key challenges of innovation, business management and commercialization of our regional bioresources. The opportunity to engage industry and researchers on a one-to-one manner was made available through two Business to Business (B2B) sessions to maximize the networking connections. The Lobster on the Wharf dinner only reinforced them in a warm ambiance.

Thierry Chopin was an invited speaker and gave a presentation entitled “**An aquanomic approach**

seaweed cultivation and applications: Integrated Multi-Trophic Aquaculture (IMTA) and Integrated Sequential BioRefineries (ISBR)”.

The world-renowned phycologist Max Doty talked about “marine agronomy” in the 1970’s and defined it in the Proceedings of the 9th International Seaweed Symposium more than 30 years ago, in 1979. However, the greener approach to the Blue Revolution, the Turquoise Revolution, is not only targeting practices in the marine environment, but also in the freshwater environment, and in open-water as well as in closed containment operations. Instead of talking about agronomy (in Greek, “the laws of the [land] fields”) in marine or freshwater environments, it may now be time to give a proper name to this discipline and talk about aquanomy (“the laws of the aquatic fields”), especially if we want to responsibly produce large amounts of seaweeds as crops.



When freshwater IMTA and Aquaponics people meet to discuss their convergent approach.

Having the 2013 Aquaculture Canada annual conference in Guelph, Ontario, June 2-5, was an excellent opportunity to be less “salty” and have two communities finally meet.

On one side, we have been working on the development of IMTA at sea over the last 12 years (salmon/seaweeds/invertebrates). However, if salmon spend between 1.5 to 2 years in seawater pens, it is only after they have spent between 9 and 18 months in land-based, closed-containment, freshwater hatcheries. Consequently, it makes sense to now venture into developing IMTA in the freshwater/hatchery context so that IMTA practices can be developed from the egg to the plate. This would help in marketing differentiation and certification for obtaining premium prices.

On the other side, the Aquaponics people are developing systems that are not to be confused with Hydroponics or Recirculating Aquaculture Systems (RAS). They are realizing that Aquaponics is also about multi-trophic food production systems, not merely a juxtaposition of animal aquaculture and plant



hydroponic cultivation. There is a significant microbial digestion link for the systems to stabilize into a fully mature state. Microorganisms also form associations with plants enabling them to absorb nutrients more efficiently and protecting them from diseases (“probiotic horticulture”).

The two communities share the same IMTA concept and vision of its environmental, economic and societal potentials and developments for improved aquaculture and agriculture practices (including using extractive species, which not only behave as biofilters recapturing expensive nutrients released by fish and therefore not needed to be added in the form of fertilizers, but also 1) become additional crops of commercial value, 2) extend water recirculating leading to both more efficient water usage/saving and reduced discharge to the environment, and 3) decrease costs associated with nutrient removal in hatcheries). The full day FIMTA/Aquaponics session at the conference, followed by a two day Advanced Aquaponics Workshop (June 6-7), organized by NOA Fisheries, allowed for much discussion, networking and plans for future collaboration.

During the session, Thierry Chopin and Hamid Khoda Bakhsh (CIMTAN - UNB) explained how they are looking at introducing FIMTA in the operations of the salmon hatcheries of industry partner Cooke Aquaculture Inc. Kathy Brewer-Dalton presented, on behalf of Troy Lyons, the view regulators of the province of New Brunswick have on the role and benefits of FIMTA: an additional method to further treat effluents as the regulatory system moves toward a new performance based standard. Nick Savidov (Alberta Department of Agriculture and Rural Development) gave an exhaustive review of Aquaponics and its evolution (presently working on 5th generation systems) and commercialization challenges. John Derksen gave an overview of 10 years of Aquaponics development and innovation at the Lethbridge College. Grant Vanderberg presented the collaborative work, with colleagues at Laval and McGill universities, on the observation that fish effluents reduce the growth of two greenhouse tomato pathogens. Charles Shultz started his presentation with the knowledge he gained from working on the University of the Virgin Islands system, with the grandfather of Aquaponics, Dr. James Rakocy, for over 14 years; he then discussed the factors to consider for successful adaptations to cold temperate climates.



The session closed with a roundtable to summarize the challenges ahead for the development of Aquaponics in Canada:

- How to change the image of FIMTA/Aquaponics from backyard operations into new large scale commercial operations.
- How to make FIMTA/Aquaponics work in our cold temperate climate. Appropriate site selection, greenhouse design, lighting and temperature control will be very important.



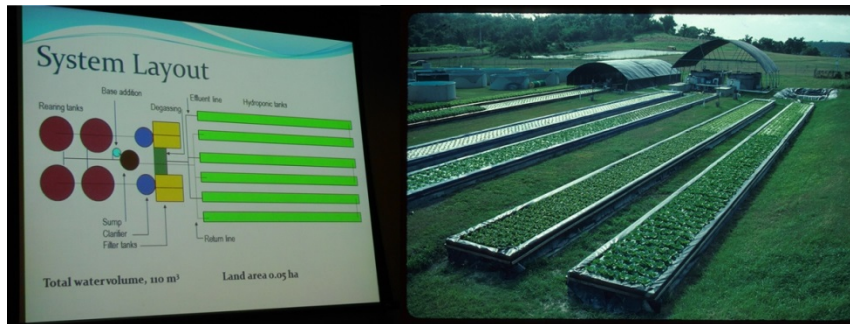
- The selection of appropriate fish and plant species will also be very important, not only from a biological angle, but also economically.
- Educating growers, regulators and the public on the advantages and benefits of FIMTA/Aquaponics will be key. Microbes are needed and high biological activity is a good sign of a balanced system.
- Regulations and biosafety policies will need significant changes, based on the evidence accumulated over the last decades, with respect to how to operate these systems sustainably for the production of safe food.

The two day workshop, organized by Tamar and Jason Oziel from NOA Fisheries, took place at the University of Guelph and gathered 42 participants from diverse horizons: couples looking at a career change and at growing their own food; high school teachers looking at practical ways to get their students interested in original science projects; hydroponic farmers intending to use fish as a nutrient source; fish farmers intending to use plants to treat their effluents; city officials interested in permitting integrated urban aquaculture/agriculture; and university students and researchers. They came from 9 provinces of Canada, the Bahamas, New York State and Saudi Arabia.

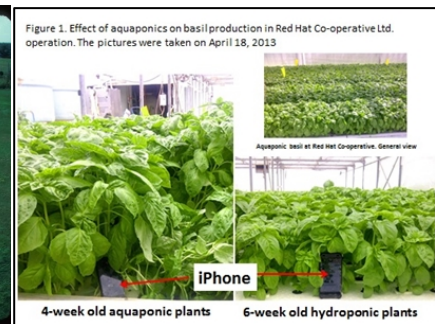
Charles Shultz and Nick Savidov went over the concepts, designs and guidelines (*e.g.* water quality) of Aquaponics operations in greater detail. Nick emphasized the need for understanding agro-ecology, plant physiology, microbiology and food safety. Steve Naylor described the strategy for sustainable aquaculture development in Ontario and the regulatory requirements for foods of plant origin. Donald Bailey explained, by Skype from the Virgin Islands, how to prepare an appropriate Aquaponics business plan and management strategy. Charles Shultz described the cultivation of tilapia from breeding to harvest, while Shawn Coyle (Kentucky State University) described the cultivation of freshwater prawn and largemouth bass, as well as low cost RAS systems.



At the end of the workshop, participants were divided into groups for a hands-on initiation into seed germination, water testing, tilapia sexing and plant harvesting for specific markets. It became clear that to succeed in FIMTA/Aquaponics, one needs a wet thumb, a green thumb and a microbial finger in between to make the link. It is also crucial to clearly identify your market before growing anything.



The University of the Virgin Islands Aquaponics system: a reference for many in the business
(photo credit: Charles Shultz).



Comparison of basil production. On the left, 4-week old aquaponic plants; on the right, 6-week old hydroponic plants. An iPhone was used to provide a scale (photo credit: Nick Savidov).

The 4th Algae Technology Platform Americas took place at the Arizona Biltmore Hotel in Phoenix, Arizona, June 26-28. The conference was attended by approximately 40 people representing producers, product formulators, business developers, marketers, investors, engineers, processors, regulators and R&D academics. It was split into two parts. Day 1 was "Investor Day", during which investors could meet developers. In the second part of the afternoon, the participants visited the Arizona Center for Algae Technology and Innovation (AzCATI) on the Mesa Campus of the Arizona State University. AzCATI is a member of the ATP³ network of regional Algae Testbeds Public-Private Partnership, funded through a \$15 million grant from the US Department of Energy. Days 2 and 3 were the "4th Practical Smart Short Course" on algae growing, harvesting, downstream processing and marketing for value-added applications. **Thierry Chopin** was an invited speaker and gave a modified version of his presentation entitled "**An aquanomic approach to seaweed cultivation and applications: Integrated Multi-Trophic Aquaculture (IMTA) and Integrated Sequential BioRefineries (ISBR)**". After a rapid "Seaweeds 101" smart/crash/fast review, he developed the idea that we should rejoice at seeing a renewed interest in the mariculture of seaweeds and their use. However, how we can reposition the value and roles seaweeds have in coastal ecosystems, and demonstrate how relevant they can be in many of our everyday activities and in solving global issues, without "promising the moon" and risking another 40 year "purgatory period" in between each energy crisis, is a difficult balance to find. One of the solutions is to combine IMTA and ISBR. BioRefineries have often been interpreted as a series of intermediate steps until the ultimate products, biofuels, are finally produced. For Thierry Chopin, BioRefineries are tools of product diversification, as our attitudes and business models will need to evolve from the one species/one process/one product approach. It is becoming abundantly clear (and it is interesting to see some companies finally admitting) that after a few years of hype and generous subsidies, the market may not presently be ready for the production of low-value commodity energy from biofuels, but for a range of bio-based, high-value compounds, as people start to realize that some co-products of an ISBR platform could, in fact, be the real drivers for generating more immediate revenues. So, the question could really be which are the co-products of the others: the bio-based, high-valued molecules or the low-valued commodity energy carrying molecules?

The IMTA program in Eastern Canada is already developing an ISBR strategy for its IMTA products – seaweeds for ecosystem services, seaweeds for human consumption, seaweeds as partial substitution in fish feed, seaweeds in cosmetics (Exsymtal®), WiseSource™ salmon – and we are looking at developing freshwater IMTA (FIMTA) for salmon hatcheries and biogas production for energy at a realistic regional scale. In a few words: if you are going to produce a biomass providing ecosystem services, you may as well make it a crop with diversified value-added applications.

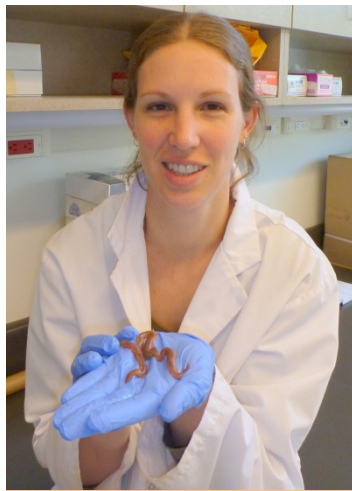




The conference took place at the most interesting Arizona Biltmore Hotel, the "Jewel of the Desert" opened in 1929. All the presidents of the USA, since Herbert Hoover in 1932, have stayed there. Clark Gable played golf there, the Tequila Sunrise was created there, Marilyn Monroe was seen around the pool area, Martha Raye played chess on a large chessboard around the Cowboy house, Ronald and Nancy Reagan had their honeymoon there, and John McCain gave his concession speech on the hotel's lawn on Election Night in November 2008.

The architecture of the buildings, designed by Albert Chase McArthur and Frank Lloyd Wright, is most distinctive. Staying at this hotel was quite a treat, only affordable because it was off season in Arizona. The temperature reached 116 °F (47 °C) on June 28, and it was supposed to reach 120 °F (49 °C) on June 29, with a humidity of 8-10%... the only places to be were in an air-conditioned conference room or in a pool (the property has 6 of them).

To know more about the 4th Algae Technology Platform Americas:
<http://www.smartshortcourses.com/algae4/>



Jordana Van Geest and her test animals, the polychaete worms *Nereis virens* (photo credit: Eric Gross).

Dr. Jordana Van Geest is a postdoctoral fellow co-supervised by Dr. Les Burridge from Fisheries and Oceans Canada in Saint Andrews, New Brunswick, and Dr. Karen Kidd from the University of New Brunswick in Saint John. Her research examines the toxicity of pesticides used to control sea lice in aquaculture on non-target organisms that may be exposed once the pesticides are released into the environment after treatment of a fish pen. Non-target organisms include natural populations (*e.g.* zooplankton, benthic crustaceans such as lobster, shrimps and amphipods) or in the case of IMTA, extractive species held in close proximity to the cages. Jordana's CIMTAN project looks at the toxicity of the pesticide AlphaMax[®], which contains the pyrethroid pesticide deltamethrin as the active ingredient, on the polychaete worm *Nereis virens*, a potential extractive species for IMTA. In laboratory tests with worms, affects observed included burrowing avoidance or emergence from sediments spiked with pesticides and impacted worm condition (body damage, hindered mobility). This research provides information needed

to assess the potential risks to worms if they are to be included at an IMTA site where treatment with sea lice pesticides occurs.

First CIMTAN member quote of the month: "What I really enjoy about CIMTAN is the opportunity at the annual general meeting to hear and learn about the diverse and interdisciplinary work going on, whether it is related to biology, hydrodynamic modelling, engineering or social science." (*Jordana Van Geest, CIMTAN postdoctoral fellow*).



Worms exposed to the sea lice pesticide AlphaMax[®] in spiked sediments in laboratory tests showed signs of burrowing avoidance or emergence on sediment surface (top right) and impacted condition including damage to body sections (bottom right) (photo credit: Jordana Van Geest).



Kathryn Tebbutt is an MA student in the Department of Geography at the University of Victoria, on Vancouver Island. She was born and raised on the west coast, spending the past nine summers working at remote fishing lodges while earning a BA from the University of British Columbia's Geography Department. During the summers spent on the water, she developed a love for all things coastal: the environment, the people, and First Nation's culture. She received the opportunity to join CIMTAN working with Dr. Mark Flaherty and Dr. Stephen Cross on the socio-economic implications of IMTA and First Nations.



Kathryn Tebbutt participating in the annual Wuikinuxv Fisheries Hatchery Program to preserve the Wannock River Chinook salmon. Each year, some of the local stewards in Oweekeno Village, on the central coast of British Columbia, fish 40 females and 40 males and send the eggs and sperm to the nearby hatchery to preserve the run for future generations (photo credit: Oweekeno community).

During field work last fall, Katie spent time in several remote communities to conduct interviews, including Oweekeno Village on the central coast, and Skidegate and Massett in Haida Gwaii. Within a

week, she experienced a 7.7 earthquake and evacuation, two gale force storms with power outages, and a missed flight due to high winds! Despite the excitement, the communities were very welcoming and she had the opportunity to attend two potlatches, a totem pole unveiling, a totem pole raising, and even had the chance to get out on the water to



Kathryn Tebbutt attended the "Open Ocean Pole" raising ceremony in Sandspit, on Haida Gwaii. This was the first pole to be raised on Moresby Island in over 200 years (photo credit: Kathryn Tebbutt).

help with the Wuikinuxv Fisheries Hatchery Program (see pictures). Experiences of a lifetime! During the month and a half away, Katie interviewed several people involved with marine and economic planning in their communities. The conversations were directed toward generating a greater understanding of coastal First Nations opinions on aquaculture, especially on the major issues and concerns with the industry, and whether there is interest and awareness of IMTA systems. This research recognizes the importance of First Nations in British Columbia's aquaculture industry and will help to assess potential opportunities for communities and for industry on British Columbia's central and north coast.



Kathryn Tebbutt and one of the massive Chinook salmon from the Wannock River, one of only two rivers in British Columbia where salmon live beyond 3-4 years. This one was probably around 25 kg, but some have been known to reach more than 36 kg. Kathryn spent two days helping in the program, creating relationships with the people and giving back to the community (photo credit: Oweekeno community).

Second CIMTAN member quote of the month: "My involvement in CIMTAN gave me the opportunity to spend time in First Nations communities, experience local life and culture, meet amazing people, and establish relationships that I hope will last for years to come. It was more than I could have hoped for." (*Kathryn Tebbutt, CIMTAN MA candidate*).