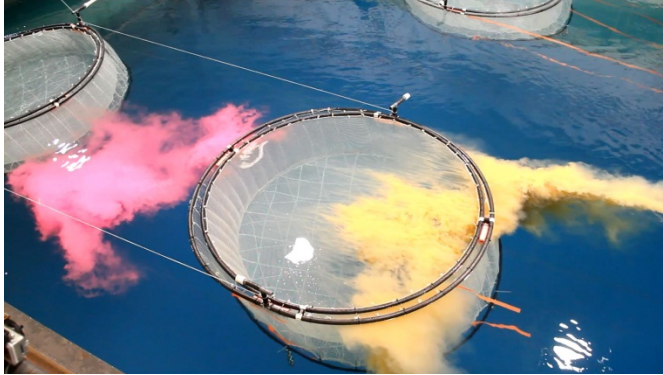




CIMTAN releases its 14th video on its YouTube channel (imtacanada).



This latest addition recounts the adventures of a group of 8 CIMTAN west and east coast graduate students, led by **Gregor Reid** (CIMTAN modeller) and **Jordana Van Geest** (CIMTAN postdoctoral fellow), during a workshop studying the effects of a 1:15 scale model fish-cage array on the near field, down-current water flow and the implications for nutrient delivery in open-water integrated multi-trophic aquaculture systems.

The workshop took place at the world renowned Flume Tank facility of the Marine Institute at Memorial University of Newfoundland, in St. John's, Newfoundland. It was supported by the Strategic Network Enhancement Initiative (SNEI) of the Natural Sciences and Engineering Research Council of Canada (NSERC) to CIMTAN.

Thanks to **Justin Del Bel Belluz** (CIMTAN MSc student at the University of Victoria, under the supervision of **Maycira Costa**) for producing and editing this wonderful, instructive and fun video of a very successful workshop at several, and important, levels for our CIMTAN highly qualified personnel (HQP in NSERC jargones!).

Watch the video: <http://youtu.be/snXt4qCLx6w>



Angela Fortune and Stacy Murray receiving their awards from Rich Moccia, Chair of the AAC Student Award Committee (photo credit: Thierry Chopin).

Two CIMTAN students, **Angela Fortune** (supervised by **Chris Pearce**) and **Stacy Murray** (supervised by **Thierry Chopin**), came back from the **Annual Conference of the Aquaculture Association of Canada**, in Nanaimo, British Columbia, with **2 of the 4 student awards** given in 2015.

Angela received the Best Poster Award for her very interesting poster entitled "Optimizing benthic extraction of nutrients within an integrated multi-trophic

aquaculture (IMTA) system using the California sea cucumber, *Parastichopus californicus*".

Stacy received one of the two Aquaculture Association of Canada Scholarships, valued at \$1,000.00 each.

Congratulations, Angela and Stacy!



A happy CIMTAN Scientific Director with the two CIMTAN awardees (photo credit: Allie Byrne).



The sixth edition of the biannual **Canadian Aquaculture R&D Review** is out!



This publication provides information about aquaculture research and development projects from all across Canada. It contains over 200 project descriptions detailing an impressive range of aquaculture research topics, disciplines and species. Projects deal with marine and freshwater species, along with a variety of issues ranging from fish health to production, husbandry technology, nutrition, genomics, environmental interactions and more.

CIMTAN has its own 11 page section (p. 62-72) out of 121 p.

Links to the Review:

http://www.dfo-mpo.gc.ca/science/environmental-environnement/aquaculture/rd2015/DFO_Review-eng.pdf

http://www.dfo-mpo.gc.ca/science/environmental-environnement/aquaculture/rd2015/DFO_Review-fra.pdf

Thierry Chopin attended the 83rd Conference of the **Association Canadienne-Française pour l'Avancement des Sciences (ACFAS)**, in Rimouski, Québec, in May.



A special session "**Légumes de mer et aliments santé: les grandes algues marines de l'Atlantique Nord comme source d'innovation**" ("Sea-vegetables and healthy food: the marine macroalgae of the North Atlantic Ocean as innovation sources") was organized by **Lucie Beaulieu** (Institut sur la Nutrition et les Aliments Fonctionnels (INAF) at the Université Laval) and **Éric Tamigneaux** (Cégep de la Gaspésie et des Îles (CGI) - Merinov).

The session covered seaweed harvesting and aquaculture, strategies to sustainably secure the resource, and the validation of its potential as food and ingredients for health products and their benefits. Thierry Chopin gave a presentation entitled "L'aquaculture des algues en systèmes multi-trophiques intégrés (AMTI), services écosystémiques rendus et valorisation par une approche de bioraffinerie séquentielle intégrée (BRSI)" ("Seaweed aquaculture in integrated multi-trophic aquaculture (IMTA) systems, ecosystem services provided, and adding value by an integrated sequential biorefinery (ISBR) approach").



CIMTAN held its sixth Annual Meeting, June 3-6, in Nanaimo, British Columbia.



On June 3, 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 June 4, to review the recommendations and assess the progress of the Network. The Network continues to be in good shape, scientifically and financially. Our funding agency, the Natural Sciences and Engineering Research Council of Canada (NSERC), has given us a no cost extension until September 2016 (plus four months to wrap up everything by the end of January 2017).

The 27 CIMTAN scientists have already exceeded their ambitious Highly Qualified Personnel (HQP) training goals. HQPs are undergraduate/summer students, Master and PhD students, postdoctoral fellows, technicians and research scientists. As set out in 2009, the plan was to train 114 HQPs over the full duration of the Network; we have already trained 127 of them and will have a few more before the Network is over. This is an impressive commitment (111%) by CIMTAN investigators and our HQPs, reflecting the very high priority given by CIMTAN to this training aspect of its mission (43.1% of the NSERC support for the Network).

It was interesting to note that, as in previous annual meetings, a significant number of the members of both the Scientific and Steering Committees also attended the Annual General Meeting (AGM), on June 5-6, which attests to their keen interest in the progress made by the Network. The AGM was attended by 40 people (21 of them being HQPs). During the AGM, representatives of the 16 projects made 21 presentations, 18 of them given by HQPs.

At the end of the first day of the AGM, the whole group was invited to take a short ferry ride across Nanaimo Harbour to Newcastle Island. After a little Frisbee and a soccer game to build up appetites, some beautiful and delectable seafood hors-d'oeuvres were served by Open Water Catering. Before starting the meal, a wonderful jazz trio from the Wellington Secondary School Jazz Academy put everybody in a nice, relaxing swinging mood. They came highly recommended by our "local guy", Chris Pearce, and were a delight during the whole meal. One of the entrée choices could only satisfy the mouth buds of CIMTAN members: local clams and mussels, local galloping goose sausages, and local fried kelps in a buttery white wine and garlic reduction with garlic bread... mmhhmmmm! We arrange for one extra late ferry service, so nobody would be stranded on the island overnight, and every one arrived back in Nanaimo safely.

The remaining year of CIMTAN will be key for synthesizing and summarizing the environmental, economic and societal results acquired by the different projects of the Network and, then, disseminating them to various audiences in a cohesive and coherent manner. CIMTAN has been asked to address and sort out a lot of issues: environmental efficiency, economic efficiency, societal efficiency, aquaculture industry adoption efficiency, and the efficiency in regulation and governance evolution and implementation... a lot after a few years of existence! One should not forget that agriculture is still not perfect after a few millennia; so, it would also be appropriate to consider that IMTA is a concept and practice in progress, which cannot be perfected in less than two decades.



A major rethinking is needed regarding the functioning of an “aquaculture farm”. It does not work only within the limits of a few buoys on the water (or GPS coordinates on a map), but should be managed within a bay management area (BMA) approach, according to the movement of the different elements to consider:

- Large particulate organic nutrients: management within the site.
- Small particulate organic nutrients: management within the site or around its immediate vicinity.
- Dissolved inorganic nutrients: management at the BMA scale.
- Disease vectors and parasites: management at the BMA scale.

Developing different spatial and temporal strategies means that the infrastructures for the co-cultivated species of an IMTA system will have to be placed accordingly. It also means that there is a



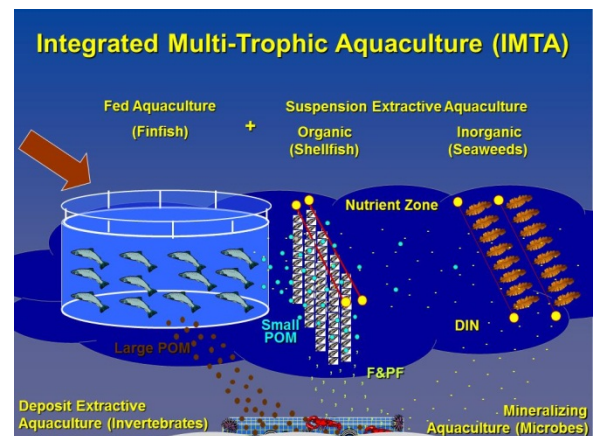


pressing need to address a number of regulatory impediments. Regulations should not be hurdles to progress but should allow flexibility enabling experimental work and commercial development of innovative practices, such as IMTA.



CIMTAN is understanding, more and more, the roles and functions of the deposit feeder and microbial mineralizing components. However, if we want the nutrient cycling to continue, we cannot look only at the cascading aspect of organic nutrient transformation, we have to be sure that some “water” is still “sent back” to the top of the cascade. Some serious bio-engineering is needed for the system to continue to operate. Receptors are needed for the inorganics generated by bioturbation and decomposition. That is where the western world animal-biased aquaculture sector has to realize that there is no escape from the

photosynthetic world! Only photosynthetic organisms (macroalgae, microalgae, seagrasses and plants adapted to aquatic environments in the context of aquaculture) provide a fundamental ecosystem service: the ability to use solar energy to metabolize these accumulated reprocessed inorganics back to organic molecules so that the cycle of life can continue to operate. So, who will be invited to the “party” to eat the substantial inorganic “cake” (maybe more a “smoothie!”): nuisance opportunistic species (green, red or brown tides, for example) or commercially opportune species we will learn to cultivate (some species of seaweeds, for example)?



Society should change its perception on nutrients, which are, unfortunately, increasingly equated to wastes. In moderation (*i.e.* within the assimilative capacity of the ecosystem), nutrients are a valuable resource we could take advantage of, if we start to understand how to use them in a beneficial manner. It's all about recycling! It's OK in your hotel room, your office, your garden, your farm on land... why is it, then, not OK in your farm in the aquatic environment? Ecosystem services provided by the nutrient extractive components of IMTA should, then, be recognized, accounted for and used as financial incentive tools (nutrient trading credits, for example) to move toward responsible aquanomic practices.

To fully demonstrate the validity of the IMTA concept, we will need to integrate the economic and societal aspects to the environmental ones.

- The economic benefits derived from the biomitigative effects of IMTA will have to be considered. We have already demonstrated (Martinez-Espiñeira *et al.* 2015; see CIMTAN Snippets Vol. 6, No. 1 of February 2015), through a contingent behaviour analysis, that a lower bound for current salmon consumers in Canada can be estimated at about CAD\$280 million/year (with less restrictive assumptions yielded about CAD\$1.5 billion/year). Through a contingent valuation analysis, a new study (Martinez-Espiñeira *et al.* in press) is estimating that the benefits accruing to households not purchasing salmon habitually would range between CAD\$43 million/year and CAD\$65 million/year. More economic analyses are coming from CIMTAN Domain 3 (**Duncan Knowler** and his HQPs).



- The intangible societal benefits of IMTA will also have to be considered. Through previous attitudinal survey studies, we have shown that IMTA can help the aquaculture sector gain consumer trust and societal and political license to operate. If that does not always convert into instant hard cash, this should not be brushed aside rapidly or in a condescending manner. More social analyses are coming from CIMTAN Domain 3 (**Mark Flaherty** and his HQPs), and, in particular, regarding the interest in IMTA by First Nations.

Finally, if CIMTAN has mostly focused on the marine side of IMTA (MIMTA), one project, over the last two years, has focused on developing the freshwater side of IMTA (FIMTA, also called aquaponics).

The new equation is: FIMTA + MIMTA = ETPIMTA
(ETP meaning Egg To Plate, of course... IMTA all the way!)





Stacy Murray showing off her recent FIMTA harvest of mint and nasturtium grown for six weeks using salmon hatchery effluents (photo credit: Thierry Chopin).

Stacy Murray has had an ongoing interest in aquaculture since graduating from the New Brunswick Community College aquaculture technician program in 2004. This led to her working (and living) in a hatchery for a short period of time and later (2009) completing her BSc in marine biology at the University of New Brunswick in Saint John. Her involvement with CIMTAN began in 2013, after responding to an ad looking for an individual interested in completing a MSc in freshwater IMTA (FIMTA)/aquaponics with **Thierry Chopin** at the University of New Brunswick in Saint John. Being a person who not only enjoys gardening but also enjoys freshwater hatcheries seems to be a perfect fit.

Stacy's thesis work involves collecting effluent water from a local salmon hatchery and using it to grow a variety of plants (vegetables, herbs, ornamentals, medicinals, etc.) in a temperature and light controlled room to simulate hatchery conditions. The plants and effluents are measured to identify the nutrient removal capabilities of the plants and the system. Stacy is also using biochar made from IMTA kelps as a plant substrate in two different aquaponic techniques: floating rafts and media

filled beds. Preliminary results have identified that many of the selected plants grow very well; nutrient removal varies and is dependent on the quality of the effluent. Stacy presented her work at the Aquaculture Association of Canada (AAC) conferences in 2014 (St. Andrews, New Brunswick) and 2015 (Nanaimo, British Columbia), as well as at the international IMTA conference and workshop at the Universidad de Los Lagos (Puerto Montt, Chile) in 2014.

Stacy won the AAC graduate student essay contest on defining sustainable aquaculture in a Canadian context, which was part of the 30th Anniversary Awards in 2014 (published in the *Bulletin of the Aquaculture Association of Canada* 112-2: 18-20). In 2015, she was the recipient of an AAC student scholarship and an AAC travel award.

Stacy's thesis work will hopefully encourage the adoption of FIMTA by commercial salmon farmers and help them to uphold water quality guidelines by reducing the amount of nutrients, especially phosphorus, in their hatchery effluents. It should also help decrease water usage and allow product diversification by growing other sellable crops.

When not working on her thesis, Stacy enjoys gardening, fishing and painting. After graduating, she hopes to implement her work at a salmon hatchery and/or pursue teaching.

CIMTAN member quote of the month: "Working with CIMTAN has been an extraordinary experience. The travel and the networking opportunities have been something I truly value. Farm waste shouldn't be viewed as waste but can actually be a valuable resource" (*CIMTAN MSc candidate Stacy Murray*).



FIMTA garden (floating raft technique) showing lettuce, nasturtium, yarrow, chamomile, mint and pinks growing at 13-15 °C with effluents collected at a local salmon hatchery (photo credit: Stacy Murray).



What do CIMTAN and the 2015 FIFA Women's Soccer World Cup have in common?!

Well, the same person, **Thierry Chopin**, is the multi-tasking Scientific Director of CIMTAN and the Honorary Consul representing French authorities at the first game of the French team in Moncton, New Brunswick, on June 9, as this year's edition of the Cup was in Canada.

France had to roll up their sleeves to defy the wind, drizzle and England in their Group F debut, but still managed to show plenty of deftness and style. A genius strike from 20 m by Eugénie Le Sommer at the 29th minute was the difference, as France edged England 1-0 in a tightly contested, physical match.



France moved on to the quarter-finals where it was defeated by Germany in a penalty shout-out. The uneven distribution of the teams in the second stage, which saw Germany (no. 1), the USA (no. 2) and France (no. 3) in the same group, led to what some considered a premature elimination of the French team.

Nevertheless, France was able to leave with their heads held high after displaying their technicality, inspiration and great coordination, which made watching them in action most interesting and entertaining (yes, female soccer is completely under-rated). At the end of the competition, France received the Fair Play Trophy and Amandine Henry the Silver Ball Award for her work controlling the midfield and for ripping a stunning goal 35 m away from the Mexico goalkeeper.

Watch this amazing goal:

<http://screamer.deads핀.com/this-goal-amandine-henry-just-scored-for-france-is-thre-1712083602>



"Amandine Henry is from the Olympique Lyonnais. That's my team!" (Thierry Chopin)