



NSERC Canadian Integrated  
Multi-Trophic Aquaculture Network

Réseau canadien d'aquaculture  
multitrophique intégrée du CRSNG

**CIMTAN** *Snippets*

# HAPPY NEW YEAR 2017



Christmas ornament by Kathy Chopin

**Peace, health, love, friendship and happiness  
from CIMTAN to you and yours**



### Seaweeds at Magellan Aqua Farms Inc. for the second year.

Two species of kelps, *Saccharina latissima* and *Alaria esculenta*, were transferred from the hatchery at the **University of New Brunswick in Saint John** to the aquaculture site of **Magellan Aqua Farms Inc.** in Passamaquoddy Bay, Bay of Fundy, on November 15, 2016.

All the work was completed in one day, by the very competent and complementary team of **Steven Backman** (owner), **Thierry Chopin**, **Caroline Longtin** and **Adrian Hamer**, and very cooperative weather for the time of year.

This season, the optimal growth depth for this site will be tested. Different methods of post-harvesting processing will also be tested next May-June, with different product developments in mind.



Since May 2015, **Thierry Chopin** has been involved in the development of the **Seaweed Standard** of the **Marine Stewardship Council (MSC)** and the **Aquaculture Stewardship Council (ACS)**. With **Alejandro Buschmann**, from Chile, he is one of two international seaweed experts advising the MSC and the ACS at different stages leading to a complete standard, which will be publicly available during the second half of 2017. The collaboration started with a meeting in London in May 2015, after some preparational consulting work. This was followed by a period of public consultation in March-April 2016, targeted workshops and testing of the standard with a few case studies in different countries and with different seaweed species.

Thierry Chopin participated, as a facilitator, with **Suzanne Keshavarz** and **Patricia Bianchi** of the MSC, in the workshop held in Bali, Indonesia, in November 2016. This intensive meeting, with 28 participants from 7 countries (Indonesia, The Philippines, The Republic of Korea, Japan, Canada, France and the UK), allowed for a review of the 5 principles (sustainable wild populations,



environmental impacts, effective management, social responsibility, community relations and interaction) and 33 performance indicators of the proposed standard. Very constructive comments were provided by the participants, which will help refine the next iteration of the standard.



Thierry Chopin, then, participated in a meeting in London, in December 2016, with the **MSC-ASC**



**Seaweed Standard Committee** to exchange information and recommend directions and decisions. More case studies will be conducted in early 2017, followed by a second period of public consultation in March-April 2017. This rigorous process should allow for the public release of a robust standard in the second half of 2017.

Thierry Chopin was interviewed on **Radio-Canada** to explain what this standard will be, how it will impact the aquaculture (96%) and the harvest of wild populations (4%) of seaweeds in different parts of the world, including Canada, and how it should increase the sustainability and responsibility of the global seaweed sector.

*Listen to the radio interview:*

[http://ici.radio-canada.ca/emissions/l\\_heure\\_de\\_pointe\\_acadie/2015-2016/chronique.asp?idChronique=424848](http://ici.radio-canada.ca/emissions/l_heure_de_pointe_acadie/2015-2016/chronique.asp?idChronique=424848)

*Read the article "Une certification pour les algues en 2017" by Amélie Gosselin:*

<http://ici.radio-canada.ca/nouvelle/1006978/une-certification-pour-les-algues-en-2017-acadie>



**Thierry Chopin** was an invited speaker at the **Fishermen's Forum 2016**, held at St. Francis Xavier University in Antigonish, Nova Scotia, on November 21-22, 2016. For the fifth year, the **Gulf Aquarium and Marine Station Cooperative of Chéticamp** organized a forum to promote communication between fishermen, scientists, professional associations, industry, government representatives, aboriginal communities, non-governmental organizations and others concerned with the sustainability of the marine environment and its resources.

This two-day workshop was attended by 88 participants, representing over 40 organizations from the Canadian Maritime Provinces and the State of Maine. It was an interesting mix of invited speakers, panels and break-out discussion groups to facilitate exchanges and bring diverse perspectives to the table to respond to targeted questions.

This year, six themes were selected:

- Looking forward: lobster and crab fisheries
- Fishermen science
- The bait challenge
- Groundfish
- Changes and opportunities in aquaculture
- Sustaining coastal communities.



Thierry Chopin gave his presentation entitled "**Integrated Multi-Trophic Aquaculture (IMTA) and its applicability to Nova Scotia**" as part of the fifth theme on Day 2. At a time when there is a renewed interest in seaweed aquaculture in Nova Scotia, it was important to bring the possibilities of alternatives to monoculture and the benefits of the ecosystem services provided by IMTA to the attention of the participants.



CIMTAN student **Stacy Murray** defended, brilliantly, her MSc thesis entitled "Freshwater Integrated Multi-Trophic Aquaculture (FIMTA): developing aquaponics for cold temperate salmon, *Salmo salar*, hatchery systems and investigating the use of IMTA kelp biochar as a plant substrate" on November 23, 2016.



From all of us in the Chopin Lab: congratulations Stacy on a job well done! It was a pleasure working with you.

**Abstract:**

Freshwater integrated multi-trophic aquaculture (FIMTA) integrates animal aquaculture with plant culture where wastes produced by fish are either converted by microbes then consumed by plants or directly consumed by plants. An experimental system tested 13 plant species and measured nutrient removal from sludge effluent collected from a commercial salmon hatchery using two techniques: the floating raft and the media-filled bed. Biochar, a stable form of carbon, was produced by the pyrolysis of IMTA-grown kelps and was tested as a substrate in both techniques. After rinsing, the biochar was suitable for seedling production and in the floating raft technique; however, it was unsuccessful in the media-filled beds presumably due to its high water retention. The development of FIMTA for salmon hatcheries will aid in the completion of IMTA from "egg to plate", which can be useful for branding purposes, product diversification, waste reduction, water reuse and improved societal acceptance. Importantly, reducing phosphorus levels in effluents can prevent eutrophication and help farmers meet water quality guidelines.



The following paper by **Andrea Sterling** (University of Victoria), **Stephen Cross** (University of Victoria, SEA Vision Group Inc.), and **Chris Pearce** (Fisheries and Oceans Canada - Nanaimo Pacific Station) was recently published in the journal *Aquaculture*: **Co-culturing green sea urchins (*Strongylocentrotus droebachiensis*) with mussels (*Mytilus* spp.) to control biofouling at an integrated multi-trophic aquaculture site. *Aquaculture* 464: 253-261.**

This paper examined the use of sea urchins (*Strongylocentrotus droebachiensis*) to mitigate biofouling in mussel (*Mytilus* spp.) aquaculture and the effect of sea urchin density on biofouling coverage and mussel/sea urchin growth. Treatments containing sea urchins showed significantly less fouling than a control treatment without sea urchins. Sea urchin density had no significant effect on mussel growth. While fouling was significantly reduced in the presence of sea urchins compared to the control treatment with no sea urchins, it was not completely eliminated since they



were only able to access the inside surface of the nets. Sea urchin somatic and gonad growth declined with increasing stocking density, but there was no significant difference in mussel growth at the different sea urchin stocking densities. Mussels and sea urchins can be successfully co-cultured with no food input, but there may be a trade-off between the effectiveness of biofouling control and sea urchin growth.

The following paper is one of the 5 most highly cited papers published in *Marine Environmental Research* during 2014, 2015 and up until June 2016:

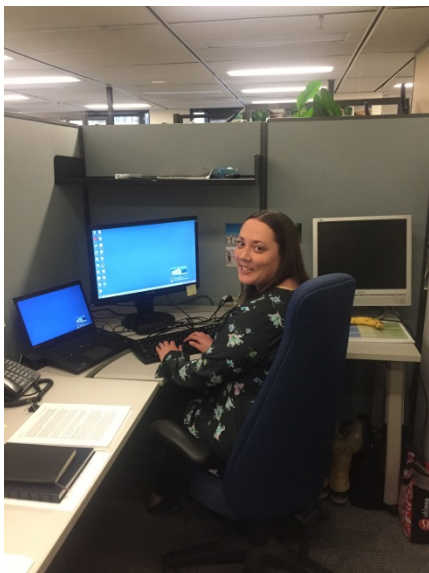
Liu, F., Pang, S.J., Chopin, T., Gao, S., Shan, T., Zhao, X., and Li, J., 2013 - Understanding the recurrent large-scale green tide in the Yellow Sea: temporal and spatial correlations between multiple geographical, aquacultural and biological factors. *Marine Environmental Research* 83: 38-47.



#### Concluding paragraph:

“Consequently, we re-emphasize the need for early management actions in the sequence of events leading to the recurrent and massive green tides in the Yellow Sea. For a truly integrated management of the coastal zone, reduction in nutrient inputs and control of the effluents of the coastal animal aquaculture pond systems are needed in the land-based operations. If the green tides are to be managed and, hopefully, reduced or eliminated, their development needs to be stopped at the sources on land, not at intermediate steps on the radial intertidal mudflat when it is already too late for preventing their massive blooming.”

#### CIMTAN postdoctoral fellow goes to Ottawa.



Caroline Longtin in her cubicle office at Fisheries and Oceans Canada in Ottawa (photo credit: Corinne Pomerleau).

**Caroline Longtin** joined CIMTAN in September 2014 after finishing her PhD in Biology at the University of New Brunswick in Fredericton, where she worked on kelp ecology and taxonomy with **Gary Saunders**. She spent 2 years as a postdoctoral fellow with **Thierry Chopin**, at the University of New Brunswick in Saint John, working on the cultivation of the red seaweed, *Palmaria palmata*, as a complementary IMTA species and trying to identify a sex-linked molecular marker to distinguish between immature males and tetrasporophytes, which are morphologically indistinguishable.

As a member of CIMTAN she was able to work with stakeholders and collaborate on research projects, which gave her valuable transferable experience to transition to a job with Fisheries and Oceans Canada (DFO). She applied to DFO in the fall of 2016 and was offered a position as a Science Advisor in Ottawa with the Environment and Biodiversity Science Branch. After much paper work, she began her new position in November 2016.

She has switched gears from aquaculture and is currently working on a file related to the impacts of vessel noise on marine mammals. It has been a big change going from primary



producers (seaweeds) to marine mammals, but she says that it keeps her on her toes! She gets to coordinate with researchers in the different regions and different departments within the Federal Government, such as Transport Canada and Environment and Climate Change Canada.

“It is interesting to see and be an instrumental part of the behind the scenes work that goes into government science” says Caroline. “In my role, I am responsible for gathering the best scientific research to pass along to the policy makers to help the government make more informed policy decisions”.

**Former CIMTAN member quote of the month:** “I am happy that I was able to keep an open mind about exploring a different career path, because I really enjoy the fact that I am helping to shape policy decisions in Canada and making a meaningful contribution to protect our oceans” (former CIMTAN postdoctoral fellow Caroline Longtin).

As the **Canadian Integrated Multi-Trophic Aquaculture Network (CIMTAN)** is coming to an end, after being in existence since 2010, and this is the **last issue of CIMTAN Snippets**, we thought we would conclude by summarizing **CIMTAN in a few numbers**, which testify to the accomplishments and vitality of the network, which successfully attained its goals.

Network Dissemination									
	Year 1 03/2009- 02-2010 (12 months)	Year 2 03/2010- 12/2011 (22 months)	Year 3 01/2012- 12/2012 (12 months)	Year 4 01/2013- 12/2013 (12 months)	Year 5 01/2014- 12/2014 (12 months)	Year 6 01/2015- 12/2015 (12 months)	Year 7 01/2016- 09/2016 (9 months)	Post Network 10/2016- ???? (????)	All CIMTAN publications
Papers in refereed journals	2	11	9	18	7	8	11	9	<b>75</b>
Papers in refereed conference proceedings	1	5	9	2	-	6	-	14	<b>37</b>
Books/book chapters/monographs	2	2	3	1	-	1	2	10	<b>21</b>
Non-refereed publications	-	7	6	4	2	3	3	3	<b>28</b>
Abstracts or posters	25	55	52	66	66	53	37	4	<b>358</b>
Special series or books edited	-	1	-	-	-	-	-	2	<b>3</b>
Technical reports	-	-	1	1	1	1	1	-	<b>5</b>
CIMTAN <i>Snippets</i>	1 (4 p.)	7 (23 p.)	6 (31 p.)	6 (66 p.)	7 (87 p.)	7 (50 p.)	4 (51p.)	2 (19 p.)	<b>40</b>
YouTube videos	-	7	3	-	2	1	2	-	<b>15</b>
HQP theses	0	4	5	5	4	3	4	10	<b>35</b>
<b>Total</b>	<b>31</b>	<b>99</b>	<b>94</b>	<b>103</b>	<b>89</b>	<b>83</b>	<b>64</b>	<b>54</b>	<b>617</b>



The total output of CIMTAN is an impressive number of publications: **617**. A large proportion was contributed by our **Highly Qualified Personnel (HQP)**, whose training was a **very high priority** for CIMTAN. The initial and ambitious target of training 114 HQP, over the entire life of the Network, was exceeded, as **137 HQP (120%)** were trained: 76 undergraduate/summer students; 23 MSc, 4 MASc, 5 MRM and 3 MA graduate students; 6 PhD students; 7 postdoctoral fellows; 12 technicians; and 1 research scientist. Our CIMTAN HQP have either pursued higher academic degrees or found jobs in a variety of sectors, where they are appreciated for their interdisciplinary training and approach to problem solving: positions at academic institutions, federal departments and their counterparts at the provincial level (Fisheries and Oceans Canada, Environment and Climate Change Canada, Treasury Board of Canada, Canadian Food Inspection Agency, Canada Environmental Assessment Agency, Natural Resources Canada), provincial laboratories, aquaculture and feed companies, engineering companies, consulting companies, renewable and power networks, financial companies, non-governmental organizations, museums and municipal authorities.

CIMTAN was always interested in disseminating and translating its scientific research, results and perspectives. The deliberate choice to use a diverse array of documents and media platforms (scientific papers, conference proceedings, book chapters, reports, professional magazines articles, newspapers/radio/TV interviews and documentaries, public school activities, Google Scholar, ResearchGate, LinkedIn, YouTube videos, CIMTAN *Snippets* newsletter, Wikipedia, etc.) has enabled the network to reach varied targeted fields and audiences in Canada and beyond, and to spread the IMTA message widely with researchers, federal and provincial agencies, industry, professional associations, coastal and rural communities, First Nations, national and international environmental non-governmental organizations (NGOs), and the general and school public.

More than 1150 contacts were made with the media (magazine articles, newspapers/radio/TV interviews and documentaries), with interviews, or citations, in 232 media in the following 42 countries: **Argentina, Australia, Austria, Belgium, Brazil, Canada** (Globe and Mail, Montréal Gazette, Ottawa Citizen, Calgary Herald, Vancouver Sun, Maclean's Magazine, Canadian Geographic, CBC Radio, CBC Quirks & Quarks, Radio Canada, Radio Canada International, CBC Television, CBC The Suzuki Diaries/The Nature of Things, Télévision de la Société Radio Canada, CTV, TVA), **Chile, China** (China Central TV-CCTV News), **Colombia, Costa Rica, Cuba, Denmark, Dominican Republic, France** (Le Monde, Ouest France, Radio France, France Bleu Breizh Izel, TV5 Monde, Tébéo TV - Télévision Bretagne Ouest), **Germany, Greece, Guam, Honduras, India, Ireland, Israel** (Teva Hadvarim - The Nature of Things), **Italy, Japan** (Television Nippon 2, The Japan Times), **Kuwait, Malaysia, Mexico, New Zealand, Norway, Oman, Papua New Guinea, Peru, Puerto Rico, Singapore, Spain, Switzerland** (Télévision Suisse Romande), **Taiwan, The Netherlands** (Radio Netherlands Worldwide), **The Philippines, The Republic of Korea** (Seoul Broadcasting System, Korean TV), **United Kingdom** (Thomson Reuters Foundation News, The Daily Mail, The National, The Times), **USA** (Yale Environment 360, The Scientist, US News & World Report, The Chronicle of Higher Education, The Christian Science Monitor, National Geographic, Frontiers in Ecology & the Environment, BioScience, The New York Times, Washington Post, San Francisco Chronicle, Los Angeles Times, The Huffington Post, USA Today, Reuters, Time Magazine, Fortune Magazine, National Public Radio (NPR) and 104 affiliated radio stations, ABC News, NBC News, CBS News, PBS), and **Venezuela**.

Two media were very successful at reaching audiences beyond those associated with the traditional scientific dissemination tools: the network newsletter, **CIMTAN Snippets**, and 15 videos posted on **YouTube**. **Thierry Chopin** edited 40 issues of CIMTAN Snippets over 6 years, totaling 331 pages of information about the activities of the network, sent to 842 subscribers.





YouTube has been a very efficient dissemination platform for the IMTA concept and the principles it is based on. On December 31, 2016, the Integrated Multi-Trophic Aquaculture YouTube channel (<https://www.youtube.com/user/imtacanada/videos>) reached 85,334 views with 15 videos.

The top videos at the "IMTA box office" are **Seaweeds - A part of everyday life** (33,833 views; 40%) and **Filter Feeders** (29,748 views; 35%).

The videos have been watched in 197 countries (32% viewing in the USA and 19% in Canada).

In terms of demographics, our audience is made of 59% males and 41% females; 32% are between 25-34 years old, 24% between 18-24 years old, and 11% between 45 and 54 years young.

The top playback locations are YouTube watch pages (85%), embedded players on other websites (9%), mobile devices (5%) and others (1%).



Photo and art naïf by Kathy Chopin

THE END