Opening Remarks of the President of the International Seaweed Association, Professor Thierry Chopin (Canada)

The 20th International Seaweed Symposium: getting out of our phycological ivory tower to be much more societally relevant

Hola amigas y amigos! Bienvenido in Ensenada al Symposium International de Algas Marinas! Dear friends and colleagues, let me first carry out my official duties as the President of the International Seaweed Association (ISA) and declare the 20th International Seaweed Symposium (ISS) opened.

Secondly, I would like to thank Dr. José Zertuche-González (Chair), the Local Organizing Committee (LOC), the sponsors and the numerous volunteers for what promises to be a wonderful 20th ISS this week in Ensenada. The organization is solid, the venue beautiful and the Mexican hospitality up to its reputation!

Despite the economic situation, the H1N1 scare, a certain localized instability due to drug wars in Mexico (always sensationalized by the media, but not present around Ensenada), and some visa problems, we are here. Maybe not in number, but certainly in quality: 405 participants (including 46 students) from 40 countries, 4 plenary lectures, 57 presentations distributed among 14 mini-symposia, 100 presentations in 18 contributed paper sessions, and 109 posters in 2 sessions.

On Wednesday, the 4 mid-symposium excursions will take us to different places according to our tastes: gray whale watching cruise, visit to La Bufadora (The Blowhole), the wine route and a seaweed collection trip. We also have 18 accompanying persons for whom Laura Zertuche has put together a wonderful program of Mexican cooking, a visit to the Ensenada Art Centre and a tour of the Ojos Negros Valley (cheese and wine tasting), to give them a flavour of the Mexican culture, gastronomy and enology around Ensenada.

On Sunday, the International Seaweed Association Council (ISAC) had its triennial face to face meeting. The ISA governing body conducts its business electronically in-between ISSs to be sure that we meet again every three years, each time in very interesting and varied places. Two elected members of the ISAC have their mandate expiring with this ISS, Drs. Juan Correa and Alan Critchley, while Dr. Eurico C. Oliveira, our dedicated appointed Secretary for the last 18 years, has decided it is time to retire. At the end of this ISS, I will become the new Secretary; I will try to fill Eurico's shoes and they are very big! To all three, we express our gratitude for their commitment to the ISA. Two new members have joined the ISAC: Drs. Alejandro Buschmann and Shaojun Pang. To both we extend our welcome and forewarn you to be ready to roll up your sleeves! At the end of this Symposium, Dr. Iain Neish will become the new President for 2010–2013, while Dr. José Zertuche-González has been elected Vice-President for that period and will become President in 2013–2016.

This year, besides the University of British Colombia awards for the best 3 student oral presentations, the Universidad Autónoma de Baja California will give 3 awards for the best 3 student posters, as a posthumous homage to Dr. Raul Aguilar-Rosas, Mexican phycologist and member of the LOC, who recently left us. A special committee of judges chaired by Dr. Daniel Robledo is in charge of the evaluation process. The winners will receive certificates along with their cheques at the closing ceremony.

We should also observe a moment of silence for Dr. Ivka Maria Munda who passed away last November in her eighty second year. This elegant and grande Dame of Phycology attended almost all ISSs and was still active until her last days. She was well known for her significant contribution to the flora and littoral ecology of the Adriatic Sea and Iceland.

Now, I would like to talk about a subject close to my heart: the seaweed industry sector is alive and in full mutation. But are people outside the phycological community aware of that, especially in the western world? Phycocolloids (carrageenans, agars and alginates) had their glory days from the 1960's to the 1990's; the ISSs and the history of the ISA are very much linked to the phycocolloids. However, this has changed: at this ISS, there are no oral presentations and only 4 posters on phycocolloids. So, how do we continue to make sure that society sees the relevance of our discipline and seaweeds in everyday life? Sea-vegetables for direct human consumption, phycocolloids, ingredients, phycosupplements, fine and bulk chemicals, agrichemicals, fertilizers, biostimulants, animal feeds, pharmaceuticals, cosmetics, cosmeceuticals, nutraceuticals, functional foods, antioxidants, biooils, botanicals, pigments, colorants, aromatics, bioactive compounds, antiviral agents, biofuels, biodiesels, biogases, bioalcohols, biomaterials, biomitigative services as one of the extractive components of Integrated Multi-Trophic Aquaculture (IMTA), nutrients trading credits (NTC)… and I am sure I am forgetting other applications!

In many languages, large benthic marine algae do not have the bad connotation they have in English (the weeds of the sea!): algues marines in French, algas marinas in Spanish, Meeres Algen in German, 海藻 (haizao, or the colorful/beautiful plants of the sea) in Chinese, rumput laut (the grasses of the sea) in Indonesian, etc. We know that, but does the rest of the

world know that? So, the message has to go out, beyond the phycological community, beyond the scientific community, and we have to talk to regulators, decision makers and politicians!

Paradoxically, seaweed aquaculture represents 46% of the total world mariculture (aquaculture in the marine environment), while fish aquaculture, of which we hear so much, represents only 9%. The problem is that 99.8% of the 15.8 million tons of cultivated seaweeds (worth US$7.4 billion) come from China, Indonesia, the Philippines, Korea and Japan, hence the ignorance in the western world (Chopin and Sawhney 2009, FAO 2010, Chopin 2011).

In 2007, a month before attending the 19th ISS in Kobe, Japan, I attended the Aquaculture 2007 Conference of the World Aquaculture Society in San Antonio, Texas, USA. Going through the book of 1198 abstracts, I realized that:

- 66.3% of the abstracts were dedicated to fish (8.9% of the 2004 world mariculture production),
- 15.9% to mollusks (43.0% of the 2004 world mariculture production),
- 14.2% to crustaceans (1.8% of the 2004 world mariculture production),
- 1.6% to other aquatic animals (0.4% of the 2004 world mariculture production), and
- by regrouping abstracts on microalgae (0.8%), freshwater plants (0.6%), and seaweeds (0.6%), I was, painfully, able to reach a combined 2.0% for all these organisms, whereas seaweeds represented 45.9% of the world mariculture production in 2004 and 46.2% in 2006!

Next week, after attending the 20th ISS in Ensenada, I will attend the Aquaculture 2010 Conference of the World Aquaculture Society in San Diego, California, USA. I have already looked at the book of 1211 abstracts:

- 59.7% of the abstracts will be dedicated to fish,
- 20.7% to mollusks,
- 12.2% to crustaceans,
- 2.8% to other aquatic animals, and
- by regrouping abstracts on microalgae (1.4%), freshwater plants (1.0%), and seaweeds (2.2%), I reached a combined 4.6% for all these organisms. This more than doubling is mostly due to abstracts on IMTA and biofuels.

At the closing ceremony of the ISS in Kobe, I mentioned that, to make us relevant to society in many everyday activities and global issues, we needed to get out of the phycological ivory tower and "preach" at other meetings to educate people who do not know much about seaweeds because of our deeply zoologically-biased education system. I invited you to attend at least one non-phycological conference to disseminate our message of relevance and stop "preaching" to the "converted". Obviously, much remains to be done.

We have a huge educational role to play, to help bring a balanced ecosystem approach to aquaculture development, and to "convert" the animal-dominated aquaculture world to make it recognize that it needs to take advantage of the biomitigative services of seaweeds for their extractive functions. The biomitigative services of seaweeds are often not recognized by the rest of the aquaculture world and society in general. I should clarify that I will talk about biomitigative services instead of ecosystem services, so as to not chagrin some economic purists, who argue that the term should be reserved to the non-market services of nature provided to humans, who are the only ones who can assign a monetary value to them. I can, however, see that that distinction is less and less observed and that the two terms are frequently interchanged. Moreover, if we accept that humans are part of the ecosystem, and not a particular species on a particular pedestal, and that market-valued cultivated species can render similar services to those of their conspecific natural equivalents, then the semantic problem is solved.

If we estimate an average composition for seaweeds of around 0.35% nitrogen (N), 0.04% phosphorus (P) and 3% carbon (C), and nutrient trading credits (NTC) which should be around US$10–30 kg^{-1}, US$4 kg^{-1} and US$30 t^{-1} for N, P and C, respectively (Chopin et al. 2010), the biomitigative services of cultivated seaweeds are worth at least US$592.5 million to U$$1.698 billion, hence as much as 23% of their present commercial value. Of course, to that should also be added the biomitigative services of natural beds of seaweeds, but their total biomass being difficult to estimate accurately, it will be difficult to arrive to their monetary value.

During the last few years there has been a renewed interest in the mariculture of seaweeds and their uses, something that should make phycologists and ecologists rejoice, as this group of organisms has been misunderstood, unappreciated and underused over the centuries. As the experts on these organisms, let's not miss the opportunity for finally developing marine agronomy, a concept promoted by Dr. Max Doty in the 1970's and clearly delineated in the Proceedings of the 9th ISS more than 30 years ago (Doty 1979). It is essential for the vitality of our discipline and for the future of our students.

We also have to make sure that seaweeds figure prominently in the present debates about energy generation and biofuel production. We now have an opportunity to reposition the roles, applications and values seaweeds have in coastal ecosystems, in the economy and in our society. However, how can it be done appropriately and responsibly, without "promising the moon", which will not necessarily be attained, thereby risking another "purgatory period" in between each

energy crisis?! Seaweeds (and algae in general) made the news in the 1970–80s. They are back; but, if we are not careful to distance ourselves from charlatanistic claims, which abound in the media and even in certain scientific circles, we could be in a situation of not developing a sustained public interest and use of these organisms. We could then enter another phase of denial until the next fad cycle (2030–40s?), which is not productive for the acquisition of still much needed scientific knowledge. While everyone wants the seaweed sector to develop, some biotechnological issues and societal constraints, particularly in the western world, should be recognized and a long-term responsible and gradual implementation strategy adopted.

We also have to stay away from claims of solving world hunger, converting everybody into frequent direct "seaweedivores", 100% biomitigation (which, in fact, is not necessarily the goal), renewing energy at unbelievable rates that defy the equations governing photosynthesis, all within the next five years with the almighty, miraculous seaweeds and microalgae! If there is no shortage of interesting ideas working at the small demonstration scale, problems generally appear when scaling up is contemplated and people start to realize what the consequences will be and, especially, the realistic, or unrealistic, deployment footprints required to implement these experimental ideas to commercial market scales, which should make sense from environmental, economic and production perspectives, and also have an acceptable societal impact.

It will be up to us to bring aquaculture to a new ERA of ecosystem responsible aquaculture and make green energy scalable. As we gather to contemplate sophisticated solutions to complicated problems, we should not lose sight that sometimes the biggest ideas are the simplest and that the new "big" can be small!

Thank you very much and enjoy your week in Ensenada!

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