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Chair

Mr. Rodney Weston

Standing Committee on Fisheries and Oceans

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● (1530)

[*English*]

The Chair (Mr. Rodney Weston (Saint John, CPC)): I call this meeting to order.

I'd like to thank our witnesses for taking time from their busy schedules to join us here today. I'm sure you've been briefed by the clerk in what the committee has been studying over the last little while. We certainly look forward to your comments today and to the opportunity to ask questions. I know committee members are very interested in the subject at hand.

I am assuming the clerk has informed you that we allow about ten minutes for presentations, and then we move into questions after that. There are some time constraints with respect to questions, so please do not be offended if I interrupt you at some point. It's in the interest of trying to get in as many questions as possible and to allow for fairness between members. These times were negotiated between parties beforehand, and are in the standing rules.

Having said that, who would like to start our presentations and make opening comments?

The floor is yours, Mr. Storey. Whenever you're ready, please proceed.

Mr. Andrew Storey (President and Chief Executive Officer, Open Ocean Systems Inc.): Thank you very much.

I'm Andrew Storey, president and CEO of Open Ocean Systems from Saint John, New Brunswick.

We have been asked to make this submission to your committee in order to share how our activities might impact the future direction of aquaculture development and debate in Canada in ways that were not contemplated by the Canadian Science Advisory Secretariat when the original assessment of traditional open-net pen and closed containment systems was performed.

We would also like to take this opportunity to illustrate how our activities and technology align with priority areas identified by the government as key to Canada's future ability to enhance our standard of living and competitiveness within the global community. So while our sectoral focus is actually the farming of fish in the sea, lakes, and man-made reservoirs, we are really here to talk about rural development, rural job and rural wealth creation, first nations communities engagement, innovation, innovation commercialization, productivity improvement, and increased export sales of goods, services, and technology to global markets.

That's really quite a long laundry list, but I'll only be ten minutes, I promise.

All of this is balanced with emerging ecosystem management principles that ensure the long-term ability of our abundant natural resources to sustain an additional stream of wealth for our country.

To put all of this into context, in Canada we have quite amazing natural aquatic resources. Canada has 25% of the world's coastline and 16% of its fresh water. The abundance and extremely high quality of these natural resources would suggest that we should be global leaders in aquaculture output as well as aquaculture technology. However, Canada's share of global aquaculture output hovers somewhere around 0.3%, and with our growth in output more or less stagnant over the past few years, we are falling even further behind.

The good news, though, is that the aquaculture sector, which in many ways is still in its infancy, shows no sign of moderating. Indeed, the movement towards further growth in aquaculture output is virtually unstoppable. There is still tremendous opportunity and scope for Canada to assume it rightful position in this most global of sectors, and, more importantly, to use the resources and the financial and innovation tools we possess to create significant additional wealth for the country, especially in our rural areas.

I have two other pieces of good news. First, the knowledge and understanding is now starting to catch up with this very young and promising industry, and is pointing to what is truly important and possible from an ecological and economic point of view within this sector. As well, because of this relative youth, there is really, at this point, no traditional way to farm fish. I'm a pioneer, and I'm still a pretty young guy in this industry. We are not held back in considering alternative business models for farming fish within Canada.

So far in Canada, two business models are emerging—conventional or open-net pen farming and various forms of the closed containment system—both of which have been the focus of this committee and studies by DFO. As our title suggests, we have what we consider to be a third option.

Just as a bit of background, we're based in Saint John, New Brunswick. We have been developing our innovative fish farming technology since 2006, and we're now commercializing the products. The foundation of the system we call the "iCage", which is patented fixed-volume, fixed-framework net pen architecture. I think you all should have received pictures of it.

The iCage has a number of attributes and functionalities, such as fixed growing volume, tensioned nets, submergence, rotation, and independent mooring configurations. To this operating platform we are now adding advanced sensor webs that give us a window into the growing units for high operational efficiency. When you really get to think about it, we're actually taking elements from both of the business models being considered by the committee so far while we add additional capabilities.

Currently we have iCage net pen containment systems operating successfully on commercial farms in the Bay of Fundy—farming Atlantic salmon—as well as Lake Diefenbaker in Saskatchewan. We've also grown cobia where we should all be today: at a warm-water site in Belize.

So our technology shows great promise, not only for growing fish in Canada but also for export of the technology. By April of this year, well over 300 tonnes of fish will have been grown or harvested from our generation one iCage units.

● (1535)

What does this mean for rural development in Canada? Through our development process, we realize our technology enables new approaches to unlocking more farmed seafood value from Canada's natural aquatic resources—an effort that has been constrained in the past by scale, geography, and investment. In order to have more aquaculture output, Canada needs to have more farmers farming more fish in more areas of Canada. It's a pretty simple equation.

The typical operational and investment scale required for the two business models being considered by the committee creates a significant barrier to entry for many parties, be they individuals or corporations, considering fish-farming opportunities. Scale and other constraints also limit the availability of suitable geographical locations for these types of farming operations as well. As a result, opportunities for rural development in many parts of Canada using these two models can be constrained. I'm not saying they are, but they can be.

A key focus for our company has been issues concerning small-scale fish-farming technology requirements. The iCage platform eliminates net management, reducing operational and infrastructure investment costs, which are key drivers for large scale in conventional net-pen farming. Fixed volume and tensioned nets maximizes natural water flow through the iCage, which is the largest operational cost associated with closed containment systems, requiring significant investment in pumps and energy to run them.

These are just two of the considerations that enable much smaller economic units for farming operations using the iCage. Our models show that a profitable iCage-based farm can be as small as 250 metric tonnes to 500 metric tonnes, versus the 2,500 metric tonnes to 5,000 metric tonnes considered in the other business models and in the models originally developed by DFO. Coupled with the ability to be submerged, these smaller farm site requirements open up vast new areas for fish farming in Canada that are otherwise currently unused. Consisting of just three to six individually moored units—what we call an iFarm, pardon the pun and apologies to Mr. Jobs—the footprint is very small and allows for operations in areas unsuitable for the other two business models.

Submerging the iCage helps the farmer evade numerous surface events, like storms, algae blooms, and ice cover—which occur in most of freshwater Canada—and reduces the risk and potential for escape.

This enables farming within a significant number of our freshwater lakes and reservoirs and eventually in open ocean farming on both coasts and open lake farming in our larger bodies of fresh water, such as the Great Lakes.

Ecosystem interaction of farming operations is an extremely important consideration. We need to ensure that we are using our resources as efficiently as possible and in such a way as to sustain our ability to generate wealth. This is an area where science, knowledge, and experience—much of it, by the way, generated in Canada—is starting to catch up with the growth of the sector and is pointing to ways in which the goals of ecosystem-based management can be pursued.

You're going to hear later on about IMTA, integrated multitrophic aquaculture, and closed containment systems that rely on the collection of solids for eventual dispersal as crop fertilizer for farmers' fields. It's all about nutrient cycling and staying within ecosystem boundaries.

At a recent meeting of the Standing Committee on Environment and Sustainable Development, the Canadian Environmental Assessment Agency told the Commons committee that it must screen all projects that could touch federally regulated activity, and that more than 90% of small projects have little or no environmental impact.

While we are by no means suggesting that the CEAA process be circumvented, the combination of small-scale farming operations, the ability to move and moor individual iCage units, and other attributes suggest that an iFarm can operate at the low end of the CEAA scale.

We call this "balanced ecosystem aquaculture", and we are working with government and academic scientists to establish the parameters. They're quite similar to IMTA and the fertilizer strategies that you see in the closed containment systems. Using the natural assimilative capacities of the ecosystem in which one is farming and staying within these ecological boundaries helps the farmer avoid tipping points and enables the long-term ability of an ecosystem to support small-scale farming activities.

The iCage and other tools also allow us to investigate new approaches to mitigate the impact of sea lice on salmon farming operations. A lot of good science suggests that submergence and other tools could help to mitigate infection levels. With some of our development partners, we'll be trying new materials designed to be even more resistant to damage and predator interaction than what we currently use, with the goal of minimizing the risk of fish escaping from the iCage.

We are also developing training processes and curriculums around standard operating procedures for iFarm and balanced ecosystem operations that will lead to certification of farmers and technicians.

● (1540)

Turning to the economic considerations that flow from all this, at the time of the original comparative studies that were performed by DFO and its panel our technology was at a much too early stage to be considered. However, using the same assumptions, we estimate the capital investment required for our technology package will be similar or slightly higher than traditional net-pen capital costs per metric tonne and much lower than CCS.

Our farming systems will drive operational and structural productivity improvements as we proceed along our generational release strategy, so that farmers using this system will be as efficient as or more efficient than other business models being contemplated.

Innovative technology leads to innovative financial tools, which again is a major constraint. The attributes of our systems allow us to work with partners such as Farm Credit Corporation and others in order to develop innovative financial tools such as leasing or rental of the systems. We strive to reduce the barrier to entries with not only rental and leasing programs but also working capital tools as well.

In conclusion, our technology represents a viable and valuable third option for helping to unlock the value within our aquatic resources that we all know is there. As with the smart phone and other technology revolutions that we have all experienced over these past few years, we see the same sort of evolution happening within Canada's farmed seafood industry—technology opening up new approaches to wealth creation by reducing barriers to make it accessible to a much wider variety of people over a much wider geography.

The ability to create wealth through profitable small-scale farming represents a significant opportunity. It's highly suitable to rural and first nations communities, and allows them to participate in the highly strategic, very fast-growing global farmed seafood sector in a way that is sustainable and respectful of our natural aquatic resources. With this participation comes increased knowledge jobs, more innovation, and export sales of farmed seafood, all leading to more stable and vibrant rural communities as well as increased export sales of aquaculture services and technology.

Thank you.

● (1545)

The Chair: Thank you, Mr. Storey.

Mr. Walsh.

Mr. Fraser Walsh (Chair, Board of Directors, Huntsman Marine Science Centre): First of all, on behalf of the Huntsman Marine Science Centre, I'd like to thank the committee for inviting us to present.

I'll give you a brief overview of the Huntsman Centre and I'll ask our executive director, Bill Robertson, to bring you up to speed on the projects we have in front of us and our opportunities to assist or help out on the enclosed containment of Atlantic salmon.

The Huntsman Centre is a federally incorporated, private, not-for-profit, research and science-based teaching institution located in St. Andrews, New Brunswick. It was established in 1969 by a consortium of universities, government departments, and private sector interests, including the Atlantic Salmon Federation, the federal Department of Fisheries and Oceans, New Brunswick Agriculture, Aquaculture and Fisheries, New Brunswick Department of Education, McGill University, Mount Allison University, the University of Guelph, the University of Moncton, the University of New Brunswick, the University of Toronto, and the University of Western Ontario.

Our mission is the advancement of marine sciences through collaborative research and the development of innovation, techniques, and solutions for our public and private partners. The education programs of the Huntsman Centre have trained highly qualified personnel in the marine sciences and the ocean industry sector of the Canadian economy. The school programs have engaged more than 35,000 students, and they range from elementary schools to university to post-graduate-level studies.

The Huntsman Centre has been an active steward of ocean resources by finding ways to educate Canadians about the oceans. The Huntsman Centre has welcomed more than 700,000 members of the general public to our aquarium facilities, informing visitors about Canada's east coast marine ecology and marine-based economy.

What I'd like to do now is ask Bill Robertson, our executive director, to indicate some of the projects we've had and where we are today and where we're going.

Bill.

Mr. Bill Robertson (Executive Director, Huntsman Marine Science Centre): Thank you.

Members of the standing committee, thank you again for the invitation. My name is Bill Robertson. I am the current executive director of the Huntsman Marine Science Centre.

You've just heard a little bit about our history. Specifically related to this topic, I'd like to leave you with a couple of thoughts. The net-pen aquaculture system that you're reviewing is fairly complex, partly related to the geographic distribution of the systems. It occurs in fresh water, brackish water, and in various ecological systems in salt water. It comes in a variety of shapes, sizes, and numbers, as Mr. Storey has just discussed.

We're raising a number of species. We're raising a number of strains within certain species, and we're applying a variety of management techniques to this net-pen system.

In some instances, there are issues related to environmental impacts. In this case, it may be appropriate to look at alternative methods, such as biological filtration, as will be discussed by Dr. Chopin when he addresses the IMTA system. Or it may prove useful to look at some of the new technological platforms, like the open ocean system.

It may be appropriate to recommend land-based tank culture under certain circumstances. The problem with these discussions is that this is not really a debate or review about biology. It's not really a debate or an overview about environmental science. It's a discussion about economics. It makes sense only if it makes good economic sense.

Here is something to consider: the Huntsman Centre is a unique organization, and it's in a unique location. We're in southwestern New Brunswick. If you look at a map of Canada, we're about as southwest as you can get.

In my office, when I look out the window, I look across the St. Croix River into the state of Maine, and we're right on the shores of Passamaquoddy Bay, which is one of the inner bays of the Bay of Fundy.

In addition to all the research and the training we do, we have this public aquarium focused on the Bay of Fundy. We display not only the traditional aquarium-type features of the ecology and creatures of the Bay of Fundy; we also talk about what drives the economy of the Bay of Fundy.

If you were to visit us, you would see that there is a display from Connors Brothers about the importance of the herring fishery. You would see a display on Cooke Aquaculture and the importance of salmon aquaculture in the Bay of Fundy. You would see a display on Paturel and the importance of the lobster fishery.

The point is that we attempt to demonstrate how important the economics of the fishery is to the Bay of Fundy.

Our approach to this debate would be to suggest that we create, using the Huntsman Centre facilities and expertise, a commercial-scale, land-based tank system. However, what we would propose might be different from other suggestions you've had. Our view is that this should be a full-scale demonstration project, indexed in real time against the commercial salmon farms that occur within a ten-kilometre radius from our campus.

In other words, we would use the same fish, the same number of fish, and the same types of nutrition strategies. We'd use the same technical staff to collect the data as a real-time demonstration project. In addition, we would suggest that it would work only if this were fully transparent and open to the general public, so you don't have to go hunting for the information.

In other words, this is not a one-off project, but a permanent platform for continuous improvement.

As we were discussing this idea and preparing to come before the standing committee about creating a demonstration farm, we asked a number of people what they thought of this concept. Some folks felt that our presence only legitimized the claim that there was a problem. In their view, there is no problem with open net-pen systems. Others felt that the Huntsman Centre coming here and making this kind of proposal represents the missing piece of what they've been looking for, and that we should consider having an advisory board for this demonstration farm. It would be made up of people who represent the three pillars of sustainable development: people who are socially active, people who are environmentally active, and people who have a broad-based knowledge of the economics of the fisheries and aquaculture sector.

● (1550)

Perhaps the most interesting debate was at our board of directors meeting, chaired by Mr. Walsh. The debate included the current president of the University of New Brunswick, who said that our region has a number of nodes of activity in aquaculture and we have a number of subject matter experts, but we don't have a platform that coalesces this all together in such a way that the nation can benefit from this, and by extension the aquaculture sector per se.

Right next door to the Huntsman Marine Science Centre is the Department of Fisheries and Oceans St. Andrews Biological Station, run by the science branch. Within that station are a number of individuals who are world experts in their own right, whether it's in the field of oceanography, biodiversity, or physiology. Up the street we have the New Brunswick Community College, which has had for 30 years perhaps the most comprehensive technical training program for aquaculture technicians in the country. Down the street we have the Atlantic Salmon Federation, which is the one NGO whose primary focus is the conservation of wild Atlantic salmon.

In the town next to ours, the town of St. George, we have a satellite office for the Atlantic Veterinary College. The Atlantic Veterinary College is actually based in Prince Edward Island, but it's the only vet college in Canada with an aquaculture component. The reason they have a satellite office in St. George is that it is the closest they can get to the commercial aquaculture sector. Of course we're right on the fringe of the salmon aquaculture industry.

When we take all this together, and if we could put this into a demonstration platform, indexed in real time against the commercial salmon farming ventures, we could create and find real solutions.

Therefore—and there is always a therefore—when you're sifting through all the technical information that's been presented at your committee, when you're reflecting on the expertise of the testimony that's been given, and when you're debating this file to some kind of logical conclusion, we'd like to ask you to consider the Huntsman Centre's approach.

Thank you very much.

● (1555)

The Chair: Thank you very much.

We'll move right into the question portion.

Go ahead, Ms. Davidson.

Mrs. Patricia Davidson (Sarnia—Lambton, CPC): Thanks very much, Mr. Chair.

Thanks very much to each of our presenters.

Certainly this presentation today has brought us a different perspective, as you have all stated. Certainly it's something I think we need to be examining further and we need to try to understand a little bit better.

Some of the things we've heard from other people when we've talked about the closed containment systems and the open net systems are the issues of waste and contaminants, and in particular the issue of waste building underneath the open net pens. Can you tell me, Mr. Storey, how your system would address some of those issues, or if it would?

Mr. Andrew Storey: This is related to issues around flow through the site, as well as sensor technology. The size of the waste stream is directly related to food conversion ratios, so the more you can do to reduce food conversion ratios, the lesser amount of waste you will have.

One of the things we found in some initial trials with St. Andrews Biological Station is that better flow through the cages tends to lead to a much lower residence time, so you are pushing these nutrients over a much wider area.

There is also a lot of good science from the Department of Fisheries and Oceans Freshwater Institute, as well as the St. Andrews Biological Station, relative to the actual assimilative capacity of the natural environment.

So the key is to try to site these units so that the flow is maximized, and then you're using other pieces of technology to reduce food conversion to its potential, and thereby reducing the overall amount of waste.

Mrs. Patricia Davidson: Some of the other testimony that we've heard from a lot of different areas is the importance of the agricultural industry to rural Canada, and the concerns that closed containment may move it away from rural and coastal areas that are relying so much upon this, and that it may change the very fabric of what our coastal regions look like, and the economics of that area.

Also, concerning the number of jobs that it provides in relation to what the wild fisheries provide, it's felt by a lot of people that the wild fisheries provide a lot more jobs than closed containment does.

What would your iCage system offer rural Canadians?

Mr. Andrew Storey: We're now working on a program on the east coast to turn lobster fishermen into fish farmers. We see a lot of very interesting potential there. We've also had initial discussions with first nations groups on Vancouver Island for potential projects there. And as I said, we see wonderful opportunities throughout Ontario and the rest of freshwater Canada to be able to site the small-scale farms and operate them according to the science that's coming out of the Freshwater Institute and keep the overall ecological activity that results from the fish farm. When you put a cage of fish in the water, it automatically becomes part of the ecosystem, so you've got to make sure that the ecosystem within the cage is operating within the overall ecological boundaries.

But back to our lobster fishermen, we see them with their lobster boats, and there's a lot of pressure on them these days, but we see tremendous opportunities to use that infrastructure to grow fish.

Mrs. Patricia Davidson: My riding is on Lake Huron, so I find that rather interesting. We have salmon fishing in Lake Huron now for sport fishing. Tell me how this would work in conjunction with the sport fishing that's there now and the people who are raising the fish and releasing them.

● (1600)

Mr. Andrew Storey: One of the interesting things about our technology is we're in discussion with somebody right now about that. I'm not revealing any names, but various community fisheries groups can now take advantage of this technology to raise fish potentially for restocking purposes as well as potentially for actual fish farming in further iCages. So there are lots of very interesting opportunities there.

The ability to submerge the systems has tremendous impact on ice cover and ice flow and ice movement. There is economic risk as well as risk of damage to cages and loss of fish and such.

Mrs. Patricia Davidson: One of the other things we heard from several presenters was the economics of it, the cost of the whole thing: the energy costs of closed containment, the land costs, all the issues involved with setting up the systems.

In your presentation you talked a bit about capital costs and related them to the traditional net pen. How do they compare with closed containment?

Mr. Andrew Storey: If I remember correctly, the open net-pen systems were about $2,500 per tonne, and the closed containment systems were somewhere between $9,000 and $10,000. Can anybody correct me on that? I think it was three to four times more expensive from open net-pen to closed containment, if I remember correctly. Following that model and assumptions, we estimate that the investment would be somewhere in the order of $3,000 per tonne versus the $2,500 cost of the open net-pen system.

Mrs. Patricia Davidson: Do I still have time?

The Chair: No, you don't. Thank you very much.

Mr. Donnelly.

Mr. Fin Donnelly (New Westminster—Coquitlam, NDP): Thank you, Mr. Chair, and thank you to our guests for their presentation.

I'm wondering if you could explain a bit further the difference between your system and a traditional open net-pen operation. I think an image would help. I know you referenced an image, Mr. Storey. I don't think we got that image.

Mr. Andrew Storey: I'm sorry. I've got a presentation, but it's unilingual, so I can't show it. So that's my fault.

But it looks like a beer keg with an axle running through it, and it's got the mooring system that allows it to go up and down and rotate. And that's what it looks like from the water. This is Saskatchewan. I can circulate this if you're interested.

One of the things it does is use what we call a fixed volume, which allows for better.... Oh, here comes some information.

The Chair: We can have it translated and distributed later to all members.

I'll pass it over to Mr. Donnelly so he can see the illustration at this time.

Mr. Andrew Storey: Anyway, we see that there are issues related to flow, how you moor them, site them, and submerge them and such.

Mr. Fin Donnelly: Are they fully submerged?

Mr. Andrew Storey: Yes. You can operate them on the surface as well, just like a regular cage.

Mr. Fin Donnelly: Okay. I see that does help. It seems similar, but I guess there's a twist on the scale of the operation compared to a traditional open-net form that is floated from the surface.

I don't know if this is what the demonstration project will prove, but how do these handle in storms, for instance?

Mr. Andrew Storey: In there you'll see pictures of ice hitting them, and icing up in storms, but they're really not designed to ride out a storm. The technology is such that when a storm comes along you submerge the cage, because that sort of surface air-water interface is an extremely violent place. The systems don't like it, and the fish don't like it. So the intent is that when the storms come along, you submerge the system.

● (1605)

Mr. Fin Donnelly: Some have identified that there are problems with traditional fish farming, and some, as you mentioned, say there aren't problems. Is it fair to say that you recognize that there are problems associated with fish farms?

Mr. Andrew Storey: It comes down to how they're operated, and there are a lot of good operators. I think one of the reasons that we've gone after our technology is because there are limitations with the existing net-pen systems relative to things like geography, and such. The name of our company is Open Ocean Systems, so we see ultimately moving into more open-ocean types of environments, and such.

However, as we go through the development phase we have found that the attributes have been very favourable to a number of different situations. If you look at the business models, there seems to be very good space for technology like ours to operate on a smaller scale. We can do it on a large scale as well.

Mr. Fin Donnelly: Okay. You're obviously investing in a demonstration project, and you're looking at a land-based system as well.

Mr. Andrew Storey: I'm sorry, is that for him?

Mr. Fin Donnelly: I'm going to switch to either Mr. Robertson or Mr. Walsh.

Mr. Bill Robertson: You were doing so well.

Mr. Fin Donnelly: It's the same question about investing. If you recognize there is a problem with traditional fish-farming, open-net fish farms, what is the rationale for investing in a closed system?

Mr. Bill Robertson: As I said in my remarks, the current open net-pen systems occur in a variety of geographic areas. Mr. Storey has been talking about looking at the carrying capacity of the specific environment in which you're operating. These open net-pen systems have organic loading associated with them. In some cases it's not a problem and it's difficult to demonstrate any kind of impact. In other cases, because of the ecology you're dealing with, organic loading will occur and it's possible to demonstrate a loss of biodiversity.

The answer may not necessarily be moving straight toward closed containment, but you may be able to mitigate those effects by including biological filtration. That will be described by Dr. Chopin here in this IMTA piece. This biological infiltration comes in the form of shellfish, plants, and a whole series of things, and they're very site-specific. You may have to go back and apply a different technological platform, like the one you're looking at, with a different system that forces you to think about balancing your production with the carrying capacity of the environment.

There may be circumstances where none of those things are appropriate, and moving the net-pen system to land in tanks is appropriate. I think a comment was made earlier about that. To do that you need to have the right set of circumstances, including access to power, which would mean very limited application in what's happening today with open net-pen systems.

Mr. Fin Donnelly: Thank you.

I'll maybe in my remaining time squeeze in one last question for Mr. Storey.

I'm curious about how this system would deal with diseases and parasites, such as ISAV, disease-wise, or any kind of sea lice, parasite-wise.

Mr. Andrew Storey: Again, this is where science and technology are going to help move us along.

With respect to sea lice, for instance, there is very good evidence to suggest that sea lice infestation happens in the top two or three metres of water. Sea lice have a very well-known life cycle. Again and again the science is suggesting that submerging the fish during that time can have a potential mitigating impact.

It also comes to the flow of water through the cages. The iCage has been optimized to maximize the flow of water through the cages, which keeps the oxygen flowing through the cages and takes away the metabolites. In theory—you've talked to people such as Mr. Robertson and many others—that should lead to potentially healthier fish, with maybe a little bit healthier immune systems and such, in certain situations.

● (1610)

The Chair: Thank you very much.

We'll go to Mr. Leef.

Mr. Ryan Leef (Yukon, CPC): Thank you, Mr. Chair.

I have the wonderful advantage of technology in front of me, so I have quickly gone on and looked at one of the pictures.

I'm wondering if maybe before we proceed we could ask for unanimous consent to distribute the picture you have, because I think it would be helpful for everyone who doesn't have an iPad.

The Chair: Is there unanimous consent to distribute the document in its present form?

Some hon. members: Agreed.

The Chair: Thank you.

Mr. Ryan Leef: Thank you.

My first question will be for Mr. Robertson or Mr. Walsh, whoever feels comfortable answering.

Are you aware of the Namgis project that's going on right now in British Columbia?

Mr. Bill Robertson: Yes.

Mr. Ryan Leef: Okay. Would you be able to comment on how your proposal differs from what's going on on the west coast?

Mr. Bill Robertson: I think the key difference has to do with the uniqueness of the Huntsman Centre. First of all, we are a marine biology field station. We happen to have education as part of our mandate, but we also have a public aquarium. Our view is that if we were to do one of these, it would make sense to index it, in real time, to one of the commercial salmon farms that are within a 10-kilometre radius of our operation and have it open to the general public. That is the fundamental difference.

Mr. Ryan Leef: Are you just at the discussion stage right now, or have you attempted some costing of that kind of project?

Mr. Bill Robertson: We have some very preliminary costing. Mr. Storey referred earlier to one of the models done by one of the DFO studies. When you look at the costing of that model, there's a fair amount of money involved in the various items, which we already have and could deploy as in-kind costs. Our view is that we could mitigate those costs significantly.

Mr. Ryan Leef: We've had some interesting discussion. I think you said that this is starting to become more of a discussion of economics. We've certainly heard the rural and urban discussion around it.

Being from a small northern riding up in the Yukon, I see some industry, such as trapping, for example, that goes on up there. While I appreciate your comment about it being just an economic issue, I wonder if enough of the social and cultural practices of rural Canadians are built into that formula. When I specifically think about the trapping industry, so much of their activity out on the land, regardless of the economic outcome, provides tremendous value to the community at large in terms of protecting heritage and culture and those sorts of things. I wonder how much weight is put on that in any of these projects. I could easily translate that back to Atlantic Canada and say that having people on the ocean working on the ocean contributes so much to Canadian culture and Canadian identity. If we pull everything onto the land, we lose something that's historically very valuable to us.

I certainly have made a commitment to my riding to try to preserve our past and protect it from neglect. I just wanted to hear maybe some comments on how we ensure that those things that are so valuable are given due weight, at least in a discussion that is starting to stream more towards the economics.

● (1615)

Mr. Bill Robertson: Well, you're absolutely right, and I certainly appreciate your values in terms of trying to preserve that way of life. I think what we're trying to suggest to you is that there is no one answer to the story. It's not simply a case of saying let's take all the nets out of the ocean and put all the fish in tanks. That's just not the answer. What we're suggesting is that there's sort of a paradigm of answers, depending on what the issue is and where you locate it.

However, ultimately it will be the marketplace that determines whether or not these things have longevity.

Mr. Ryan Leef: Mr. Storey, I'm just wondering if you know the stats on the escape rate for your style of iCage versus the current open net.

Mr. Andrew Storey: Pardon me?

Mr. Ryan Leef: On the escape rates, the difference between iCage and—

Mr. Andrew Storey: You're asking what the differences are?

Mr. Ryan Leef: Yes.

Mr. Andrew Storey: The difference is that we have this fixed framework, as shown here. Then we're able to utilize—you're getting the full sales pitch here—some pretty advanced netting technology. We work with our partner, DSM Dyneema, a Netherlands-based company. This material is like Kevlar. They hate it when I say that, but everybody knows what Kevlar is. We're actually working with them to make it even stronger and such.

Really, what it does is that it creates a fixed volume. In open net-pen, sometimes you get a little movement of the net; there's a lot of video we could show you. Again, it comes down to complex relationships with flow and such, but with the iCage it's basically like putting the fish in a room like this one. So again, there's a lot of oxygen flowing through, which is what they try very hard to maintain in closed contained systems and such. Also, it submerges, and we don't use copper-based anti-foulants to keep the nets clean.

Mr. Ryan Leef: Then it would be a fair assumption that the difference between the cost of the iCage and current open net systems would be at least partially offset by protecting the stock in the cage.

Mr. Andrew Storey: Absolutely. It would be.... Well, we're still in the process of developing models, but every day adds a little bit more evidence. The offset in costs comes from reduced net management costs as well as the reduced infrastructure investments required. This is why the lobstermen are of so much interest to me: because they have 90% of what we need to run a small iFarm.

The Chair: Thank you very much, Mr. Leef.

Ms. Duncan.

Ms. Kirsty Duncan (Etobicoke North, Lib.): Thank you, Mr. Chair.

Thank you to all the witnesses. This is not my usual committee, so I'm learning a tremendous amount.

I'm guessing: is it Dr. Robertson?

Mr. Bill Robertson: No, it's not.

Ms. Kirsty Duncan: Okay.

Mr. Robertson, you made an interesting comment. I'm going to pick up on what Mr. Leef was asking about. You talked about how this is an economic argument. Could you expand on where you were going with that?

Mr. Bill Robertson: The aquaculture sector produces products for an open marketplace. They have to compete in that marketplace. At the moment, they compete very well. If we arbitrarily impose other conditions through a policy that says you can no longer farm fish this way and you have to use these other systems, which increases the cost of production, that puts the entire sector at a cost disadvantage.

Sometimes it's nice to talk about how we need more filtration or we need better controls or better systems, but ultimately it will be up to the marketplace to decide whether or not that will be acceptable in terms of being able to recover your incremental costs. That's what I was trying to allude to.

Therefore, there is a range of solutions, depending on location and depending on what you're trying to solve.

Ms. Kirsty Duncan: Thank you.

Mr. Storey, in your testimony you were talking about the Standing Committee on Environment and Sustainable Development. I'm wondering if you could elaborate, because, to be perfectly honest, I'm not sure why you've made this comment regarding small projects and the fact that it's quoted that "90 per cent of small projects have little or no environmental impact". I think there are others who would argue, but I'm wondering why that comment is there.

● (1620)

Mr. Andrew Storey: There are two parts to the answer here. Part of it is, again, like smart phones—who would have guessed how we all use them today? Five or six years ago, a few people were using them, but not very many people. It represents a new way of looking at things; technology does that.

As the science emerges—again, with all of the great work Dr. Chopin does—we're seeing that with IMTA the metabolites that come from a fish farm actually grow seaweed, and they can grow mussels. They're starting to look at other things. What it's really demonstrating is that the ecology you're in has a certain assimilative capacity.

Ms. Kirsty Duncan: Sorry, you're not addressing it. Are you saying there are smaller impacts with fish farming? You're not really addressing my question.

Mr. Andrew Storey: Okay. Can you repeat your question, then?

Ms. Kirsty Duncan: Well, I'm going to turn it to Mr. Robertson first.

Mr. Robertson, can you comment? What's being implied here is that this would be a small project under the Canadian Environmental Assessment Act. I think what's being implied is that there would be little impact. Am I correct?

Mr. Andrew Storey: No, I don't think so. That's not what we're implying.

Ms. Kirsty Duncan: Could you specify that, please?

Mr. Andrew Storey: We're implying that we can exist within, as we defined it, the balanced ecosystem aquaculture approach. Well, I guess at the end of the day, maybe it doesn't have the impact, so you're right.

Ms. Kirsty Duncan: Thank you. That's what I wanted to know.

Mr. Robertson, your opinion, please, on the same question.

Mr. Bill Robertson: I think what Mr. Storey was alluding to, and what we particularly like at the Huntsman Centre about his story, is this idea of saying that each particular environment you're going to operate in has the capacity to assimilate a certain amount of organic matter. We would size the farms according to this process, as opposed to saying here's the standard pen and you put a standard number of fish in it. His approach is to look at that a little differently.

Ms. Kirsty Duncan: Are you supportive of his approach?

Mr. Bill Robertson: We like his concept, yes.

Ms. Kirsty Duncan: Okay. Thank you.

We're hearing from you that this results in greater dispersion of waste and contaminants. Yes?

Mr. Andrew Storey: Waste, yes. Again, it's really how you characterize it. I wouldn't characterize it as waste; I would characterize it as nutrients.

Ms. Kirsty Duncan: Okay, and therefore it results in reduced benthic impacts. Has this ever been quantified?

Mr. Andrew Storey: We're in the process of doing that.

Ms. Kirsty Duncan: Okay, and when might we expect those results?

Mr. Andrew Storey: They'll be ongoing. We've done our first experiments with the St. Andrews Biological Station. There will be more carried on in this coming year, and in more locations as well.

Ms. Kirsty Duncan: Okay, thank you.

Mr. Chair, how much time do I have?

The Chair: Two minutes.

Ms. Kirsty Duncan: Okay, thank you.

I believe this committee has heard that some major aquaculture-producing countries require discharge permits for open-net aquaculture operations, but Canada does not.

Mr. Andrew Storey: I'm sorry, what kinds of permits?

Ms. Kirsty Duncan: Discharge permits. Is the lack of discharge permits or is DFO's current system of benthic monitoring a barrier to further adoption of IMTA?

Mr. Andrew Storey: I don't think so, but I'm not sure I'm the one qualified to answer that one.

Ms. Kirsty Duncan: Okay. Mr. Robertson, can you comment on it?

Mr. Bill Robertson: Whether the lack of permits is a barrier to—

Ms. Kirsty Duncan: Yes, or whether DFO's current system of benthic monitoring is a barrier to the further adoption of IMTA.

Mr. Bill Robertson: That wouldn't be my point of view, no.

● (1625)

Ms. Kirsty Duncan: Could you elaborate on what your point of view would be, please?

Mr. Bill Robertson: The current system is based on some chemical testing, trying to find one that will say you have an impact if you exceed this level, or you don't have an impact if you're below this level. It's a bit crude and rudimentary, but that's the system that exists today. As I said, it's the same test, but we operate in multiple environments so we have this issue of trying to use one test to fit all of these parameters.

The IMTA system, as I understand it, is a fantastic option for mitigating some of that if your tests show you're starting to creep over into the impact side, because you're able to manage the nutrient loading through biological filtration. It's complex. It's species-specific. It's location-specific. That's what it is. But I'm not aware that it's restricted by the current environmental testing that exists in place.

The Chair: Thank you very much.

Before we conclude, I want the committee to have an appreciation for the involvement you've had in the aquaculture industry since its early introduction in New Brunswick into the Bay of Fundy. I know that Mr. Walsh has been involved for many years, also Mr. Storey.

I'm not trying to pick on Mr. Donnelly here, but your comment earlier that they're looking for new developments or innovation speaks to the admission that there's something wrong in the industry.

I want to point out that the gentlemen sitting before us today have been involved for many years with the industry. I'd also point out that this industry has been very innovative since its early introduction into the Bay of Fundy. That's where my experience comes from.

I want to ask the gentlemen whether they could highlight some of their involvement.

Mr. Storey, you talked about your company starting in 2006, but your history in the industry did not begin in 2006.

Mr. Andrew Storey: You can tell by the youth of our faces here that we're all pioneers in our own way in the industry. For a point of reference, in 1986 the company I worked with at the time put 30,000 fish in ten cages, and I was wondering, okay, what do we do now? It was very interesting.

I have a biology degree and a chemistry and math background, and I learned about the business of the seafood side of things as we came up. My company, back in 1987, actually commissioned the first study, with Dr. David Wildish, at the St. Andrews Biological Station on benthic productivity around the site.

This is part of where we're going with the iCage and smart farming systems and the things we're doing. We appreciate that when a cage of fish goes in the water it becomes part of the ecosystem. The ecosystem impacts the fish themselves, and you also have to make sure that the ecology within the cage has a low interaction, shall we say, in staying within the ecological boundaries.

At the end of the day, Mother Nature gives us all these wonderful gifts, and it's kind of corny, but it's our job, as fish farmers, as regulators, as government, to make sure we are converting the protein as efficiently, sustainably, and respectfully as we possibly can.

The Chair: Mr. Walsh.

Mr. Fraser Walsh: I started out as a canner with Connors Brothers back in 1970 and went from there to aquaculture in 1987 as the first trout farmer in New Brunswick. We started with about five cages off the wharf at one of our canneries in Deer Island, and as aquaculture evolved into being much more dominant and it started to work, we went into the feed business. This was all part of a Connors Brothers aquaculture division component, and we said to ourselves that this thing was starting to catch fire and we should start to expand it. Consequently, we set up a division within that particular company to explore our operations and build upon them.

We originally set into manufacturing moist feed to feed all of our particular fish, and then a number of individuals and independents got into the business, and we became the feed source for the rest of the industry at that point in time.

As the feed business evolved, other people got into it with dry feed and much more highly sophisticated feeds and things of that nature evolved. Then Connors Brothers said they would like that division to move forward, and we started hiring a number of candidates from around the world for the New Brunswick venture. We eventually hired Bill Robertson to run one of our new hatcheries of the day. He moved from there to become the director of our east coast operation. During that timeframe we had moved into the U.S. and set up some operations along the Maine coast. Then we took over British Columbia Packers operations on the west coast in Campbell River and around that area, and then we went to Chile and took over operations down in Chile and functioned from there.

At the end of my period there, I eventually moved from my canning background into an aquaculture component and ended up running this particular entity for six years as president of North America's largest aquaculture component in Atlantic salmon. We had operations in Chile, the east and west coasts, and in Maine. Consequently, the branded product of the day was Heritage Salmon, which you probably saw as a premium salmon product around all the major stores across Canada and deep into the U.S.

So we do have a fair amount of exposure, experience, and understanding about where the aquaculture business is and where it has to go.

I've retired from aquaculture and have gone on to become the chair of the Huntsman Marine Science Centre lab. The exercise here is to say there's been a lot of talk about closed containment in aquaculture. We're thinking that we understand what's happening here in the ocean and the waterfronts and all the bays and all the changes. We've looked at the economics, and today the economics are far outstripped in the traditional manners. But there are some issues and some faults, as obviously you people have heard over time.

The economics say it's marginal to go onshore, but no one has done it. We've all talked about it and its math on paper. To make a long story short, what we're saying is why don't we try it and measure it and put it to bed or make it work? If you have the facilities, you get to tweak a lot of this stuff. Right now there is a whole genetic program going on as to how we rid ourselves of sea lice, how we grow this particular product this fast. We were all part of that and we agree 100% with that.

If you were in tanks, all your criteria would be different. You wouldn't be out there fighting the sea lice component, because in theory it wouldn't exist. You might be able to cross your fish or develop your fish so they would grow better in confined and controlled containment. Those are the things that in this day and age we should look at and the government should think about. It isn't the final answer—at least not in our career—but it is a step that will take us through Andrew's exercise in the traditional fishery and into this particular exercise to see whether it works.

Do you buy that? We've argued for this a number of times.

● (1630)

The Chair: Mr. Robertson, do you have any comments?

Mr. Bill Robertson: Thank you. How do you top that?

I started my career as a fisheries biologist, and I worked for the Ontario government in the north channel of Lake Huron beginning with lake trout enhancement. I put in some of the first freshwater cages in the early 1980s as a cheaper alternative to building fish hatcheries to support the enhancement of lake trout and what in those days was called lake trout backcross, which was a cross between lake trout and brook trout.

I got picked off by Connors Brothers and came back to the east coast, as Fraser suggested, to help with the development of their aquaculture division, which eventually morphed into the company Heritage Salmon.

The only part I would add, which Fraser left out, was that he and I were involved in establishing the very first certified organic Atlantic salmon farm in the Americas in the late 1990s or early 2000s. That was in Chile, and it was certified through an organization called Naturland. We went through that whole process of trying to farm organically and trying to get premiums out of the marketplace.

● (1635)

The Chair: Thank you, gentlemen.

On behalf of the committee, I want to thank you all for taking the time out of your busy schedules to appear before us today. It's been informative, and we really do appreciate it.

We'll take a short break, committee members, to allow for a change of our witnesses.

Thank you.

●

(Pause)

●

● (1640)

The Chair: We will begin again.

Dr. Chopin, I'd like to thank you for taking the time today to meet with the committee. I know you were listening at the back of the room when I was explaining how committee procedures work and how we have certain time constraints for questions and answers. Anytime you'd like to proceed, the floor is yours.

Mr. Thierry Chopin (Scientific Director, Canadian Integrated Multi-Trophic Aquaculture Network, University of New Brunswick): Thank you, Mr. Chair, and good afternoon, ladies and gentlemen.

First, I would like to thank the committee for this opportunity to speak with you. My name is Thierry Chopin. I am a professor of marine biology at the University of New Brunswick in Saint John. I am also the scientific director of the Canadian Integrated Multi-Trophic Aquaculture Network.

Today I would like to talk with you about three topics. First, we should not be viewing this subject as closed containment versus open water systems. Second, we believe there is a third course: integrated multi-trophic aquaculture. Third, in preparation for today, I read the transcript of previous sessions, and I would like to respond to some statements that were made.

Why do I say it should not be closed containment versus open water systems? In fact, the salmon aquaculture industry is already a closed containment industry for approximately one year of the cycle of salmon. Then salmon grow in open water nets for a year and a half to two years. I am sure you have already heard about the issues of open water aquaculture. I would like to spend some time on closed containment systems and mention that they are not necessarily the remedy for everything.

Moving to closed containment on land does not a guarantee zero escapees. There are well-known cases of escapees from land-based operations. I know this committee is working on Asian carp. It was introduced in the seventies. Escapees started to be reported in the late eighties and nineties. Now, 2000 kilometres and 20 to 30 years later, they are at the lock system of the Great Lakes, on the point of entering the Great Lakes themselves.

The number of escapees from land-based facilities is not as well documented as it is for cage-net aquaculture. This is because land-based fish escapees are more likely to occur as a continuous trickle instead of one big event that is reported in the news. That's maybe the reason they are not making the news. I would say that nobody can guarantee you a zero-escapee facility.

Another point is that a large amount of energy is required to pump, filter, and aerate waters. A few weeks ago, Peter Tyedmers explained to you that it's a question of trade-offs. We have to be careful that we are not practising problem-shifting instead of problem-solving.

We have to talk about the acquisition of land and at what price, the designating of land for different uses, and what we want in the way of permanent infrastructure. We are not talking about fallowing or rotation techniques. That is not possible. We also need to look at greenhouse gas emissions. We must consider the carbon footprint, or maybe I should say carbon finprint.

To be economically viable, the density of fish will have to be very high. This will result in fish health issues that will have to be addressed. One thing that is missing when we are bio-engineering or over-engineering the recirculation aquaculture system is that we lose the buffer capacity of natural ecosystems and all of the important interactions between species.

Another point to consider is that moving to land for closed containment does not necessarily resolve the issue of effluents, which have to be treated. Nutrients and solid waste are poured back into the water or sent off somewhere. Often this material is trucked off the sites. This results in more cost, more energy, and a bigger footprint.

I think we have to change our attitude regarding nutrients. We have to talk about integrated metatrophic aquaculture. I like to talk about the duality of nutrients. If there are not enough, they are limiting. If there are too many, they create problems. We should not automatically consider nutrients as waste. After all, there is a good old saying, “What is waste for some is gold for others”. That is what we have to work on.

● (1645)

So the solution to nutrification is not dilution or simply land relocation; it's extraction or conversion through diversification. We have to recapture these nutrients.

What is integrated multi-trophic aquaculture? I know it's a mouthful, and maybe some will use the shorter version, which is IMTA. If it is still too complicated and you cannot remember, you can even sing it. Do you remember *YMCA*? You can do the same thing with IMTA. So now you will remember IMTA. Now it will stay in your memory. You will have this crazy guy with a French accent singing IMTA.

You were given a diagram illustrating one of the variations on IMTA. In this case it's IMTA farming with species in proximity—species that are at different trophic levels of the food web—and with complementary ecosystem functions. We want one species' uneaten feed, waste, nutrients, and by-products to be recaptured to serve as fertilizer feed and energy for the other crops. We also take advantage of synergy interactions between species.

So in this case, we combined fed aquaculture of finfish—for example, salmon—with extractive aquaculture that utilizes organic particulate nutrient, like shellfish and other components that use inorganic soluble nutrients like seaweed.

We also understand that shellfish are efficient at filtering small organic particles, but they are not efficient for the larger ones. That's why, at the bottom of this, we are now at the present time developing a fourth component: deposit feeders such as sea cucumbers, sea urchins, and sea worms. So really, IMTA is doing nothing more than mimicking natural ecosystem processes. The aim is to ecologically engineer a system for environmental sustainability, economic stability, and societal acceptability.

Really, for me, the concept of IMTA is extremely flexible. To use a music analogy, not from Frédéric Chopin but from Johann Sebastian Bach, I would say that IMTA is the overarching theme on which we can develop many variations. As a matter of fact, for me, IMTA can work in open water. It can work also in land-based operations; that's what some people sometimes call aquaponics. It can work in marine or freshwater systems and in temperate and tropical systems.

One thing that we also don't talk much about, but should, and that we should recognize and account for, is the fact that the extractive components of IMTA are providing ecosystem services. We hear a lot about carbon-trading credits, but as a matter of fact, I think in coastal environments we should talk about nutrient credits, because the extractive components of IMTA can play a significant role in the sequestration of nitrogen, phosphorous, and carbon. It's about time for us to give a value to the ecosystem services of extractive aquaculture. As a matter of fact, I think we should be able to use them as incentive tools to encourage the practitioners of mono-specific aquaculture to contemplate IMTA as a viable marine agronomy option.

Now, one thing that should be very clear is that the conversion of traditional monoculture sites into IMTA sites will not occur overnight. Changes take time; they rarely happen overnight. Because what we are really talking about here is a major philosophical change in our approach to the food production system.

We also have to understand that aquaculture companies that will embrace or are already embracing IMTA need to develop markets and distribution circuits to absorb the co-cultured biomass. If we grow a lot of IMTA biomass but we don't have an application or it cannot be sold, we will again be into problem-shifting and not problem-solving. If we don't sell this IMTA biomass, we will have to dump it somewhere else.

At the present time in southwest New Brunswick we have 96 aquaculture sites. Sixteen of them have been amended to become IMTA sites. But a site does not become an IMTA site overnight. We need to gradually equip them and to check that things are okay and that it has the proper design and all these things. As a matter of fact, out of these sixteen amended sites, only eight of them have been gradually equipped with IMTA rafts and all these things.

So for me, it is inappropriate to compare an aquaculture site in year one—when we have very few fish eating very little and we have low sulphide numbers—to the same site in the next year, because when fish are in year two, they eat much more and there are consequently higher sulphide numbers, irrespective of the site having just been equipped with some preliminary IMTA rafts or not. So for me, there we are comparing apples and oranges; therefore, concluding that IMTA doesn't work using such a comparison is totally misleading.

Change will occur. There will be progressive.... As a matter of fact, I just want to mention that there are three very interesting developments with IMTA. The first one is that because we grow the species together, we start to better understand their interaction. One very interesting thing we see is that mussels can inactivate the ISA virus. We also see that blue mussels and other shellfish can ingest early-stage sea lice. The whole idea is to develop biological control to reduce chemical treatments. That's the first aspect.

● (1650)

The second aspect is the use of IMTA seaweed. At the present time, we are working on feeding trials to do some fishmeal substitution. As you know, one of the debates is about little fish being used to grow bigger fish. Can we do substitution? People say that we have to replace animal proteins with plant proteins, and the usual things people turn to are land plant proteins. It's exactly the same problem with biofuels.

As a matter of fact, the solution is not on land, the solution is at sea. If I want more corn and more soya, I will compete. With this, the price of staple food crops will go through the roof, as we have seen with first generation biofuels. It will need more farmland, more deforestation, more irrigation, and more fertilizing. With seaweed, I don't have to cut more trees. I don't need to irrigate. My seaweed is already in the water in an IMTA setting, and I don't need to fertilize. The fish are doing it for me. So there is a lot of interest in doing some substitution with seaweed.

Finally, the last aspect is that we are now working on the land-based closed containment hatchery operation of salmon aquaculture. We are developing aquaponics. It's not seaweed this time, but other plants, such as herbs and legumes, that will be used. We are also working on that to have IMTA both in fresh water all the way to sea water, or as some people say, from the egg to the plate.

To conclude, I would say, as the previous speakers mentioned, that there is no magical solution, and there is no silver bullet. There are no universal practices. It's a combination of approaches that will allow us to enter into a new era for aquaculture. To me, this means the era is ecosystem-responsible aquaculture. It's indeed time to make the blue revolution greener, and that is why I like to talk about the turquoise revolution—blue and green combined gives you turquoise. I think that IMTA will contribute to the success of the turquoise revolution, both in open water and closed containment systems.

I thank you very much, and I would be glad to answer any of your questions.

● (1655)

The Chair: Go ahead, Mr. Hayes.

Mr. Bryan Hayes (Sault Ste. Marie, CPC): Thank you, Mr. Chair.

Mr. Chopin, it was a very nice presentation. I'm going to get to IMTA, but you made a statement earlier that I really need clarified, because it was the first time we've heard it on this committee. I believe it was the first time we heard that closed containment land-based systems still have escapees. Is this opinion, or is there some evidence that closed containment systems still have escapees?

Mr. Thierry Chopin: You have the example of the Asian carp.

Every time I visit a land-based closed containment system, it actually isn't what we think. If you look at the trough, you will always see little fish there. You need a little male and a little female and it's done.

Another thing that was very interesting last year happened at trout farms in Scotland, I think. They could not understand why some fish were missing, because they knew exactly how many fish they had put in there, and there were some missing. Then, very early in the morning, a nature photographer understood what was going on. These trout were able to jump to one of the pipes. The guy had put grids on the troughs and everything was controlled, but the trout were very smart, and were able to jump to a little pipe and then come out.

In my opinion, you can reduce escapes, but if somebody is going to guarantee you zero escapes, I don't think that's correct.

Mr. Bryan Hayes: Very good.

Can you give me an idea of some of the breakthroughs you've had in your scientific research? I think you've had some government funding that's been used for your research, so I'm curious as to the breakthroughs. That's question one.

For question two, I really need to understand the development of markets. You said that there is a market for the IMTA biomass, and that we need to develop those markets. I'm not sure I understand what exactly the IMTA biomass consists of.

My questions are on research and markets for the biomass.

Mr. Thierry Chopin: With respect to research, we started to talk about IMTA, but not under that name—we talked about integrated aquaculture—in 1995. IMTA was created in 2004. I would call 1995 to 2000 a period of preaching in the desert. We had to convince people that it could be done, because they wondered if we could grow more than one species at a site. Was that possible? Then in 2000 we started to be funded, first by AquaNet, the Centres of Excellence Network in Aquaculture, then by the ACO Atlantic Innovation Fund. The breakthrough was proving to people that yes, you could grow more than one species at a site, if you did it right.

The second aspect was that there was still a regulation that did not allow IMTA to occur legally in Canada, because in the Canadian shellfish sanitation program there was a 125-metre distance. You were not allowed to grow organisms closer than 125 metres. It was a regulation not designed to be against IMTA, but we inherited it, and it was delaying things. I was always asking where this 125 metres came from. As a matter of fact, you were not allowed to grow anything closer than 125 metres from a wharf or a discharge operation, so it had nothing to do with IMTA. Then I said, again, that 125 is a magic number and that I am sure that it's 152.3 metres. People were saying to stop these things.

Then we spent, with the help of the Canadian Food Inspection Agency, eight or nine years accumulating data on the seaweeds we grow in the IMTA system and the mussels we grow in IMTA and whether they were okay for human consumption. We accumulated eight or nine years of data, and then the CFIA said that we could proceed with proper monitoring, because we had shown that these organisms were okay for food. That was, for me, a major breakthrough.

People always ask you in research whether you have any patents. For me, I say that changing the regulations—it took us several years—was one of the most important achievements.

Now, you talk about markets. We grow salmon, and the salmon from IMTA at the present time is sold by Loblaws as WiseSource salmon. That's one example of biomass that is differentiated because of IMTA. The mussels have a much higher meat yield than the typical mussel you get on the market. We get around 56%, compared to 50% to 55%. So there is an increased yield, and we have to differentiate that.

Generally, in the western world people understand fish or shellfish. But with seaweed, people say, “What do you do with seaweed?” You do three things. First, we are using it in three restaurants. It's not a huge volume, but for me, it's for the story, which is that yes, you can do delicious things with seaweed. Second, we work on cosmetics with a European company. Third, which I think is really important, is fishmeal substitution. We are working on putting more seaweed into new feed formulations for salmon. As a matter of fact, it would be a beautiful loop in IMTA production, because again, we would reduce the use of animal protein and fish protein. At the present time, those are the three uses.

We are also thinking of bio-gas and these things.

● (1700)

Mr. Bryan Hayes: You mentioned different variations of IMTA. I was reading through the documentation. Obviously, biological filtration is what this process is about. Are you not looking at also collecting the nutrients that accumulate, even if you don't have this biological filtration, and using those nutrients elsewhere? Is that something that's being looked at as well?

Mr. Thierry Chopin: No, for us bio-filtration is bio-mitigation. Today a lot of people talk about organic accumulation. For me, there are two things: organic and dissolved nutrients. The seaweeds are a good case of dissolved nutrient bio-mitigation. We use these nutrients because seaweeds need dissolved nitrogen and dissolved phosphorus and many other dissolved compounds. We use these extra nutrients to grow seaweeds. They grow faster when they are close to the salmon cages. So there is both bio-filtration—recovery of the nutrients—and having at the same time all the crops for diversifying aquaculture production. We do the two at the same time, and it's the same with shellfish.

The Chair: Thank you very much.

Mr. Donnelly, I believe you're going to share your time with Mr. Cleary.

Mr. Fin Donnelly: Thank you, Mr. Chair.

Thank you, Mr. Chopin, for your interesting presentation.

I think what you're talking about is mainly theoretical. I'm wondering if there are some examples where this is in place, either in Canada or around the world. Are there examples in water, which I'm assuming this is mostly specific to, and are there some land-based examples where this kind of system is in existence?

● (1705)

Mr. Thierry Chopin: Yes. We are not talking so much in terms of theories: we have gone from experimental to early commercialization. That's where we are now, and we hope, over the next few years, to go to more food-scale commercial. At the present time we have eight sites that are producing IMTA products. So that's not purely experimental; it's getting serious.

The other thing to mention is that I am the editor of a new book on IMTA in the world. I don't have all the chapters yet, but IMTA projects at different stages of development exist in 40 countries at the present time. So it's not just a bit of curiosity; it's serious.

As for land-based IMTA examples, yes, they exist. The most advanced cases are in Israel and in South Africa.

Mr. Fin Donnelly: As for the eight sites in Canada, where are they?

Mr. Thierry Chopin: They are in the Bay of Fundy. There is also one IMTA site in B.C., not with salmon, but with sablefish, on the same principle as shellfish and seaweeds.

Mr. Fin Donnelly: Do you know where that is?

Mr. Thierry Chopin: Yes. It's on the west coast of Vancouver Island, in Clayoquot Sound.

Mr. Fin Donnelly: In terms of the placement of these sites, I would assume that there has to be specific criteria outlining both what makes a good site and which places would not make good sites.

Could you comment a bit more, in terms of either the east coast or the west coast, on what makes an appropriate site, and what doesn't?

Mr. Thierry Chopin: Yes. I would say for the same reasons as for fish, you need some currents. If the water is too stagnant, the particles will not go toward the shellfish and the seaweeds.

Also, the positioning is very important. There is not one design. That's where the work of people such as Fred Page, physical oceanographer at St. Andrews Biological Station, is very important in tracking the movement of the organic nutrients. That information helps to determine different placements of the mussel rafts and the seaweed rafts. So there is not one design; it has to be adapted.

Mr. Fin Donnelly: I would imagine that there are limited places on each coast, west and east, where this would work and where it wouldn't work.

I'm also curious about the scale. Is the kind of scale—the eight sites you refer to—equivalent to, say, an open net salmon operation on the west coast?

Mr. Thierry Chopin: These are aquaculture sites that were originally salmon sites. The amendment was to allow these salmon sites to grow more than one species, and to allow them to put seaweeds and mussels. They're commercial salmon sites, to which we gradually add more mussel rafts and more seaweed rafts.

But I also think we need to completely change our perspective. We try to manage at the site level too much, with imaginary boundaries that nutrients don't recognize—only humans put buoys in water. Nutrients move differently. As a matter of fact, it would be much better to have management at the bay level area instead of site management, because the nutrients affect more than one site. We have to think about commercial things, but at the level of a bay. This means that the seaweeds can be a little more downstream than the shellfish, and we could have previous salmon sites becoming seaweed sites. We have to think about more than simply restricting our area to the limit between four buoys.

Mr. Fin Donnelly: Thanks. I'll turn it over to my colleague for a final question.

Mr. Ryan Cleary (St. John's South—Mount Pearl, NDP): Thanks, Fin.

I find that your reading material is very interesting, including this statistic. You talk of how "as capture fisheries stagnate in volume, they are falling increasingly short of a growing world demand for seafood. It is anticipated that by 2030, there will be a 50-million metric tonnes to 80-million metric tonnes seafood deficit". That's very interesting.

Interesting too is that as the demand for fish increases with the world population and as wild fisheries decline, there is more of a demand for farm-grown fish. But then the problem is, what do you feed farm-grown fish? Do you feed them wild fish? What do you feed them?

I was intrigued with what you said about seaweed and how it is used in restaurants, cosmetics, and—what interests me specifically—a fishmeal substitution. Could the day come when seaweed replaces fish protein as the feed source for farmed fish?

● (1710)

Mr. Thierry Chopin: First, I would say that in Canada we have a very distorted vision of aquaculture. We think it is only fish aquaculture. I always repeat that, worldwide, the largest crop produced in aquaculture—46%—is seaweed, mostly in Asia, which is why we in the western world don't know about that. Forty-six percent of aquaculture is seaweed and 43% is shellfish. We talk a lot about fish, but fish aquaculture is only 8.9%.

In the future, aquaculture will not be only fish production; it has to be fish, shellfish, and seaweed production. People will also have to consider eating shellfish and seaweed. In Asia, it's not complicated; in the western world, it is complicated.

We are working on substituting seaweed in fishmeal. At the present time in New Brunswick, there are several strategies. There is reducing fishmeal by using trimmings discarded from fish ponds. As a matter of fact, it's still good fish protein for the fish, so the use of trimmings reduces little-fish fisheries. Then there is a percentage that can be replaced by land plant proteins. And we are working on replacing or substituting a certain percentage—I don't think 100%, but a certain percentage—with seaweed. So a few percent of seaweed plus a few percent of land plants plus trimmings—all that together—reduces the percentage.

The Chair: Thank you very much.

Go ahead, Mr. Sopuck.

Mr. Robert Sopuck (Dauphin—Swan River—Marquette, CPC): As IMTA has expanded, and you say it's in the early stages of commercialization, what environmental monitoring has been going along with that so you can quantify any environmental effects that may have been ameliorated because of your IMTA programming?

Mr. Thierry Chopin: At the beginning we spent a lot of time monitoring the mussels and the seaweed biomass to be sure that it was okay. With CFIA we monitor heavy metal, arsenic, pesticides, PCBs, and all these things. We did that and that's okay.

We can calculate how much nitrogen, phosphorous, and carbon is sequestered in shellfish and how much is sequestered in seaweed, so we have the calculation. Then we can gradually scale up.

But at the present time, I would say there is not enough information on mussel rafts and seaweed rafts to say that we have removed so many tonnes. It's coming, but we have to scale up.

Also, one thing we realize is that we have to be very careful, because it's not linear. As a matter of fact, especially with organic particles, you have organic particles from salmon feed or from salmon digestion that can go to the mussels. The mussels will eat some, will metabolize some, and will release these organic particles in a different form, which can be used by another organism and then ultimately by seaweed. So it's not linear, but a bunch of cascades. To understand all these cascades has become very complicated; I don't yet have the magic numbers.

Mr. Robert Sopuck: I can appreciate that.

In terms of the benthic environment, one of our witnesses a while ago talked about the effect of net-pen aquaculture on the benthic environment. It seems that expert opinion is such that depending on how long the net pen has been there, if the net pen is removed the benthic environment underneath the net pen will return to the original condition in three months to two years.

Just zero in for me on the use of IMTA as a way to minimize effects on the benthic environment. Are you able to fix that problem using IMTA?

● (1715)

Mr. Thierry Chopin: For the benthic, for the organics, there are two things. We started to work with shellfish. That was the suspension organic particles. The shellfish are good with small particles, but when you have bigger particles that settle faster to the bottom, that's where.... That's what we are working on now, looking at the fourth component, which is whether we can develop the aquaculture of sea cucumber, sea urchins, sea worms, because they will directly impact the bottom.

At the present time the legislation is based on sediment accumulation of sulphites, but this doesn't address monitor everything. Especially, we don't measure what is in suspension, or what is also the inorganic. I am not too sure that we should put so much emphasis on the sulphite numbers.

Another aspect is that maybe the fifth component of IMTA should be the bacterial world, because a lot of things are happening through bacterial remineralization, and if you remineralize things, they're available again to the seaweeds, as these are nutrients.

Mr. Robert Sopuck: Yes, well I'm certainly of the view that no matter what we humans do, we will change the environment. The key is to keep it within the boundaries of ecosystem sustainability. This technology shows great promise to me.

I relate this to Mr. Cleary's comments about the state of wild fish stocks. In terms of aquaculture itself, finfish aquaculture, if you look into the future do you see finfish aquaculture replacing a lot of the wild fish fisheries that are being prosecuted right now?

Mr. Thierry Chopin: No. It depends on whether you're talking locally or worldwide. Worldwide, the capture fisheries increased; now they have plateaued, and some have declined. We have an increasing human population that wants more and more seafood as a source of protein. What do we do? We have something that has reached a plateau, and we have a population that wants that, so where does the difference come from? For me, that's where aquaculture has its role. At the present time roughly 50% of seafood comes from aquaculture production. That will be on the increase. That's the worldwide perspective.

At the local perspective, I think there is still room for fisheries for certain species. For example, lobsters know where the food is. Not surprisingly, the fishermen know where to put the traps, and they are generally pretty close to the salmon sites.

Mr. Robert Sopuck: One of the benefits of aquaculture—in my view, there are two major benefits—is that it does assist with the conservation of wild fish stocks. For example, it was stated in some of the testimony earlier that there probably is no need to ever commercially fish wild Atlantic salmon stocks ever again. To a salmon fisherman like myself, that is terrific news. The second thing is there's no bycatch from aquaculture. That's another big problem with wild fisheries. So there are some significant advantages. This is why what you're doing with IMTA is so important.

Do you see a net-pen aquaculture eventually evolving such that all sites will become IMTA sites?

Mr. Thierry Chopin: In New Brunswick, for example, at the present time we have 96 sites. I don't think that all 96 sites will become IMTA sites, especially since some of these 96 also are disappearing as salmon sites because they do not have enough currents and all those things. So not all of them are okay for salmon; not all of them are okay for IMTA.

Also what is important is we have 96 sites, but because of the bay management strategy only two-thirds are in operation at any given time because there are fallowing periods. So the Bay of Fundy is divided into three bay managements: year one, year two, and one year of fallowing. It means that there are rotations, so at any given time you have around 60-some sites working, but not the 96. What we have to do is also put in place these rotations of IMTA sites, and there are a lot of logistical aspects that we will have to solve in the future.

● (1720)

Mr. Robert Sopuck: Thank you.

The Chair: Thank you very much, Mr. Chopin.

I have one question for you. A previous witness we had before the committee, Ms. Milewski from the Conservation Council of New Brunswick, dismissed your findings in integrated multi-trophic aquaculture. I guess my question to you would be, has Ms. Milewski ever consulted with you, or has the Conservation Council consulted with you on your findings?

Mr. Thierry Chopin: It's very interesting.

We have always invited Ms. Inka Milewski of the Conservation Council of New Brunswick to come to our workshops. She decided not to come, and instead she preferred to cross swords, I would say, through the media, or maybe through your committee. It's too bad.

I would say it's partially true or nice editing. One time I had to write a rebuttal in the *Telegraph-Journal* in Saint John because she had cited an example. I told you it didn't work, she said, and as a matter of fact there is a new paper out that says it doesn't work. Unfortunately for Inka Milewski, I was a reviewer of that paper a few months before. So I knew the paper very well, and the sentence said that it doesn't work at higher concentration. That was omitted, or deleted. It was a classical curve where things work, work, work and they reach a plateau, and when there's too much organic it doesn't work. That's fine.

As an example, for sulphides, here is an example where there is a comparison. I don't know which site she's talking about, but I think when she said the island, she has numbers.... I don't know how she got these numbers, but let's say she has numbers. She's comparing production of a year-one site with little fish eating not much, so not many sulphides. Then she compares that to the same site in year two, where the fish are much bigger. If you look at the feed cycle for a site, year one is like that because it's little fish, and year two is like that because it's big fish.

Automatically, you will have higher sulphide numbers. When we are just in the process of equipping a site with a few mussel rafts, or a few seaweed rafts, you cannot say that it's a fully operating IMTA site. That's where I said previously that we are comparing apples and oranges, meaning it's not appropriate and it is a misleading conclusion.

The Chair: Thank you very much, Dr. Chopin. We really appreciate your time.

Ms. Duncan, you're back. Did you want to ask some questions at this point?

Ms. Kirsty Duncan: Do I have time?

The Chair: You do.

Ms. Kirsty Duncan: Thank you.

I appreciate your testimony.

It's my understanding that one of the primary purposes of IMTA is to mitigate the environmental impacts of traditional open net aquaculture by reducing nutrient deposition and carbon dioxide emissions. You addressed that.

It's also my understanding that this committee has heard from Ms. Milewski that the expected environmental benefits of IMTA have not always been borne out, and that at some IMTA sites sulphide levels in the sediment have actually increased after a traditional aquaculture site became an IMTA site.

Can you account for that?

Mr. Thierry Chopin: I just did, but I can repeat.

Ms. Kirsty Duncan: If it's on the record—

● (1725)

Mr. Thierry Chopin: Basically, in a few words, you cannot compare a site that is in year one production, with little fish eating very little, so sulphide numbers are low, to second-year production where you have much bigger fish eating much more, and your sulphide number will be much higher, irrespective if you have IMTA or not.

I don't know exactly how she got the numbers, but whatever site it is, that's exactly what we have: we are comparing oranges of year one with apples or bananas of year two. And that's irrespective of having a few mussel rafts or seaweed rafts, so it's not a valid comparison. That doesn't work.

Ms. Kirsty Duncan: Dr. Chopin, in your work you've done the valid comparison. You just said you're not sure where she got her data. So how can you say we're comparing apples and oranges?

Mr. Thierry Chopin: Because I know at the time when we moved to the island, it was a question of rotation in the bay management system—so year one, year two, fallowing, then year one, year two. I know that when we moved to the island, the sites were in year two fish, the big fish, and we moved to a few sites by putting a few rafts, so we don't expect that suddenly overnight the sulphides will disappear. It takes time.

Ms. Kirsty Duncan: How long does it take, and can you table the data with this committee, if your're able to share that? And what would the curve look like for the sulphide levels to go down?

Mr. Thierry Chopin: That's why there is this year of fallowing, the fallowing periods. That's why the Bay of Fundy is rotating. We have bay management one, where you have fish in year one—that's also for disease control—and then bay management number two, and then the fallowing period when the site can recover.

So there is that, plus what is always happening with the feed. You can see this very clearly: year one is like this and year two is like that. So what we hope to do with IMTA is like this and like that. Now, I don't think that's something we have to discuss. I don't think IMTA will be one hundred percent remediation. And then the question should also be do we need one hundred percent remediation? After all, we need nutrients in the sea water—if we try to grow things in distilled water, nothing will grow in distilled water. So we need some culture soup, if you want, but the thing is to be okay with assimilative capacity. That's where assimilative capacity or carrying capacity, that's where we have to be sure that it works. So when we are within that, we could do a reduction. But I don't think we need one hundred percent reduction.

Ms. Kirsty Duncan: Can you table that data with the committee?

Mr. Thierry Chopin: The data of what?

Ms. Kirsty Duncan: How it is in the first year, what it is in the second year, and then what it's like in fallowing?

Mr. Thierry Chopin: There is the feeding curve. I am showing you a typical curve from the industry. I don't have them.

Ms. Kirsty Duncan: Could you table that? Can someone table that?

I'll move on.

Are there any barriers in the provincial land tenuring system for aquaculture operations that may hinder the development of IMTA or open ocean aquaculture systems?

Mr. Thierry Chopin: I also mentioned before that IMTA as such was not able to legally operate until we modified the Canadian shellfish sanitation program. There was a little paragraph, twelve lines, that was saying you cannot cultivate two species closer than 125 metres. It took us four years, and we have also eight or nine years of data that say that these 125 metres don't mean anything, if you have the right monitoring and everything. So the Canadian shellfish sanitation program was modified.

Ms. Kirsty Duncan: Yes, you said that, but are they any further barriers that you would like to discuss with the committee?

Mr. Thierry Chopin: Yes. We have to be sure.... There are some discussions about the Fisheries Act. The Fisheries Act is an old document from 1868 that has been amended a few times, and it still needs a lot of updating. Then there is discussion of do we need an aquaculture act? Even if an aquaculture act is developed in the future, we have to be very careful that with aquaculture we don't take the same approach as with fisheries, which is a mono-specific approach: we want to manage one species in isolation, and another species in isolation. The problem with fisheries is that it has been missing the species interaction, and that's why we have problems with management.

So in aquaculture, if in the future there is an aquaculture act, I hope we don't fall into the same trap of doing it one species at a time. We have to look at the species interaction and we have to allow for that, and we have to allow for IMTA, because if we have the same travails of going into regulation one species at a time, we will have the same problems.

● (1730)

Ms. Kirsty Duncan: Dr. Chopin, you raised—

The Chair: Thank you very much. I'm afraid I'll have to cut you off, Ms. Duncan. Time has elapsed here.

Dr. Chopin, I want to thank you very much for taking the time to come and appear before our committee today and answer our many questions. On behalf of the entire committee, I want to say thank you very much. We certainly do appreciate your time. Thank you.

There being no further business, this meeting stands adjourned.

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