

Michele Patterson

Welcome and thank you for coming out on a beautiful day like this. When you plan these things you never really realize what's going to be going, until you hear about everything that's happening on the same day you planning an event. I know there are a number of things going on in town, plus we have one of the rare beautiful weekends in the community. Thank you so much for coming and your time.

I'm just going to give you a couple of minutes of what World Wildlife Fund is, who we are, and what we are doing here. Our organization has been in Canada since the 1960s and it's one of the largest conservation organizations in Canada. We have 60000 members in Canada and 10000 in BC. Over the next couple of years, the focus of the organization, of the program, is Marine. In that regard realized that we couldn't do marine program work from Toronto, so we opened up offices in Halifax and Prince Rupert in the year 2001. We already had an office Iqaluit. I've actually lived here for about 9 years, between here and Terrace, so they were really happy to find someone who actually lived in the community and had been doing some work, to take this job.

Most of what I am doing in the North Coast is Marine Protected Area work. Trying to educate and inform people about what marine protected areas are. There are some existing sites that have been in development for a number of years by the government of Canada, which we are trying to work towards having implemented. We also believe that marine protected areas are a part of an integrated approach to conservation of biodiversity. So in that regard we are not just looking at some specific, isolated sites and not thinking about anything else. We have to talk about the rest of the things that are going on: sustainable communities, sustainable fisheries, conservation, an economy that is connected on the social, economical, environmental, and cultural front. So we're in the North Coast. The office was put in Prince Rupert and not in Vancouver, which was a surprise to a lot of people. Partly that's because the Gwaii Haanas Marine Conservation Area, which is one of my biggest projects; and also because this is where development is heading. We have a lot of cold, clean, un-allocated pristine water up here that a lot of people would like, including us, to be able to use it – to generate economic development for our communities. What WWF wanted to do by opening their office in Prince Rupert was to get ahead of the curve, that while we are opening up the North Coast to marine industrial development, that we are going to be doing it right.

We have a big education and outreach component to our program, here on the North Coast. A part of that is bringing in speakers, I'm sure that many of you have been to some of the ones we've had over the past year. We've had about 8 people in Prince Rupert, some of them international, some of them local, to talk about marine-related ecology issues and conservation. Aquaculture is not actually an area that I am engaged in, it's not a file that I carry. I do work on protected areas and aquaculture comes up all the time, of course. It's a very hot topic in BC right now. WWF is understands and is also very concerned about aquaculture and its impacts on the marine environment. So under our education and outreach program we decided to bring a number of people to Prince Rupert, who've never been here before, to talk about some of the concerns, impacts, and solutions about open-net cage fish farming. It's not an area of expertise for me, so I wasn't going to be the one from WWF to talk about it. One of our panellists here today is from our WWF-Norway office – she carries the fish farm portfolio for the organization

globally. She will tell you about that herself, but she works with aquaculture in many countries.

To do this event, we partnered with the T 'Buck' Suzuki Environmental Foundation, with whom I've had a long association, as well; I used to work for them as well – in the early days of my career. Their focus is protecting fish habitat.

I'm really pleased that you came today, I appreciate very much that you took the time. I would like to say thank you to Des Nobels and Erika Boulter, who works for me for putting this together. It's really an event that they coordinated and planned. Thank you very much to both of you.

I'm going to introduce the speakers and then I'm going to introduce David Lane from the T 'Buck' Suzuki Environmental Foundation, who's going to moderate the discussion and question period.

So, the people we have with us today, in no particular order are:

Maren Esmark from our WWF-Norway office. Maren is one of the Marine Conservation Officers for the last 2 ½ years and she is coordinating some of our international on aquaculture. Mostly salmonids, but they also get into some of the marine species such as cod. She also works closely with conflicts around marine protected areas and the siting of fish farms.

We also have Rod Sam, sitting in over in the corner. He promises me he'll come up here later, when it's his turn. He is from the Ahousaht First Nation and he is the Chairman of the Fish Farm Committee for them. He has been actively involved in this issue for a number of years. He was a previous member of the BC Aboriginal Fisheries Commission Salmon Aquaculture Implementation Advisory Committee.

And we have Dr. John Volpe. John is getting most people's attention in BC through his work in the University of Victoria, studying the invasion ecology of aquaculture escaped Atlantic salmon. He was appointed Assistant Professor of Invasion and Fisheries Biology at the University of Alberta in 2001. So he works a lot on looking at the influence of the aquaculture industry on the biology of coastal BC; including Atlantic salmon escapes, effluents, and sea lice.

And then we also have Dr. Rashid Sumaila who is the Director of the Fisheries Economics Research Unit at UBC Fisheries Center. He specializes in marine ecosystem valuation, bio-economics and the analysis of the global fish trade.

Those are the speakers, but we had also invited and talked to the BC Salmon Farmers Association about sending a rep up to be a part of our panel. We do believe it is worthwhile to have all the information. They declined and said that they "*get quote*". So I expect we'll see something, there are going to be more forums in the future.

And then last but not least, I'm going to introduce the moderator of the event, and then I am going to step down. David Lane is the Executive Director of the T 'Buck' Suzuki Environmental Foundation. He is also a previously a member of the BC Aboriginal Fisheries Commission's Salmon Aquaculture Implementation Advisory Committee. His organization is also a member of the Coastal Alliance for Aquaculture Reform. David I'll let you come up...oh. It's because I didn't write your name down Bob, I'm sorry.

Bob Hill is the President of the Tribal Council and he is going to welcome the speakers and everybody on behalf of the Tsimshian Nation.

0:08:52

Bob Hill

Thanks Michele. I knew she was embarrassed when she started.

I would like to thank Des Nobels for calling me a couple of days ago... Des? Oh, there he is back there. He promised me there was going to be a wrestling match. World Wrestling Federation – I was looking forward to rolling around on the floor this morning, this afternoon. It gives me great pleasure to welcome you to our town this morning, especially those that are from across the ocean. I think it's important that we learn from some of the mistakes that were made by some of our pioneers in regard to aquaculture of any type. I just recently concluded a conference on Energy and Mines, at the Crest Hotel. Some of us that are here now were in attendance as well. It was interesting to note some of the presenters and how global thinking can affect today's issues – I think that is deeply important. I would like to add today that I represent the Tsimshian Nation; it is representative of 7 communities in Canada and one in Alaska. We describe our traditional territory in this manner: it represents a third of the Coast of BC as we know it, and about a third of the watershed of the Skeena River. Our neighbours to the West of us, of course the Haida, by gentlemen's agreement we also command about half of the Hecate Strait. And I really think that's important as well. One of the laments of the Tsimshian's traditional territory and one of the primary reasons that our respective reserves, the concentration camps that the governments forced us into – and I say that in all seriousness - because 'out of sight out of mind' in the early days when the Commissioner allotted out reserves. Our lands, and our oceans is part of our land as well. That is important because after hearing Brian Peckford (spelling) at the last conference. He was there at the time; he was negotiating the land the Accord with Canada. Canada tried to limit them to just to land-based province but he said 'no, our land is under the Ocean as well'. So that's where my Nation is weighting in it too; because it is absolutely crucial to have a green light all around us.

The communities I represent then. The Southernmost one is Kitasoo. Everybody knows the success that community has had, as far as salmon farming is concerned. Coming farther North is the community where I come from is a smaller community is called Hartley Bay or the Gitga'at people – just at the Northern entrance to Douglas Channel. Then we have one of the largest communities that I represent (*Kitkatla*). I would like to recognize their Chief Councillor, Clifford White, who's in the front row right now. They are another one of the communities that might be venturing into salmon farms. Right across the harbour called Metlakatla – Metlakatla, BC. And the other larger community is of course; North of us is commonly known as Lax Kw'alaams. And we have a representative here from Port Simpson, Frank Wesely. And inland we have two of the other communities, Kitsumkalem and Kitselas.

It's important to know the geography of the Tsimshian because Canada has an obligation to consult with those communities when they are entering into new initiatives. They also have an obligation to consult with those communities insofar as oil and gas is concerned. The reality of the day is that there have been a number of court cases that have been challenged in the court. The most recent one, of course, is Delgamukw - court cases such as (inaudible) is another one - that provide some substansive (inaudible) as far as title and ownership is concerned. One might ask, 'how does the President of the Tribal Council view aquaculture?' I'm what is commonly known as a fence-sitter, because my mandate I receive is from each and every community that I represents. Insofar as Kitasoo, who has

been successful in their aquaculture, I have to support that. At the same time the new initiative in Kitkatla, I have to support that as well. But more importantly, I also support those communities that do not agree with that initiative. So it is a difficult path that I walk from time to time. Clearly, one issue is, I've had a meeting with Stan Hagen, Minister of Sustainable Resources for BC. He has assured us in a number of different platforms and at a number of different meetings - Science Council and UBC meetings - that our wild stocks are going to come first. At the same time we have to take government to task, when Bart Proctor and Dave Rolston and myself and also Kitkatla were going to take the lead on some funding from the BC Science Council. We were turned down simply because the issue in the Broughton Archipelago was highlighted, that was the buzz-word of the day. I think what needs to happen in the North Coast, we need to see some funding for research. The sea lice infestation in the Broughton Archipelago is very real; we need to pay close attention to that. As far as the bottom line is concerned, from UBC (*sea lice forum*), you can't eliminate sea lice, it's part of nature. But you can certainly manage it. The issue at the Broughton Archipelago is that of the way the siting of the pens are, it acts as a trap. There is also a huge bloom of sea lice. On the whole coast of BC, sea lice are evident. There isn't a spot on the coast of BC where there are no sea lice. But it's the infestation; the huge bloom of sea lice is what we're concerned with. As the smolts leave our streams heading out for the ocean, during their migration, they will pick up sea lice. Upon their return, you and I know, I've been fishing all my life and I have always been aware of the issue of sea lice. So I think this government has a responsibility - also that Canada has a responsibility - to direct funds to the North Coast so that we can at least enter into this particular initiative, with some very concrete evidence that we can control the infestation of sea lice if it does occur on the North Coast.

I'm particularly happy about the Nuu-chah-nulth man staying in Prince Rupert. I'm very happy to announce that a part of the initiatives that the Tsimshian Nation has done is to build bridges in this community - even up to bringing the Prince Rupert Economic Development Commission under my roof at the Tribal Council. They are working very closely with our community, they will be moving in June. We also are very active in the issue of tourism; we are working directly with the Port Authority - we are partnering with them. We are going to be part of that industry, collectively as a Nation.

Those of you that have come and brought all of your sunshine with you, it's a little strange for us in Prince Rupert. I hope by the attendance we have here there isn't that meaning - if it was raining, this hall would be packed - standing room only. There are also other functions going on this week, as we know, today. I really congratulate the people who did come out for this important forum. I hope that your discussions are going to be very intense. I think the only way you're going to accomplish anything out of this particular meeting, with this atmosphere, is that we need to work together. I say that because I really understand; take it from someone who knows - trying to keep the 7 communities of the Tsimshian Nation together. I think it can happen. Personally, that isn't a Nation's stand, I firmly believe in both initiatives. The wild stock fishery and aquaculture can go hand in hand, providing that the research is done, and done to the degree that we can be satisfied, and we have a comfort level. I do believe that wild stocks do have to come first, that's why I'm opting in too and taking this government to task - to take the research money and bringing it North. Not to the Nanaimo Biological Station or to University of BC down South. And we certainly don't want UNBC also to handle the

funding; they've already handled the funding for oil and gas. I mean that's all the way to Prince George, there's no fishing in Prince George as far as I know.

Anyway, I welcome every one of you today. Enjoy the city of Prince Rupert. Enjoy the traditional territory of the Tsimshian. And get to know your neighbours. Thanks Michele.

0:19:46

Michele Patterson

Now I would like to introduce David Lane who will moderate the event today. Before I do I just want to point out that there are a number of materials in the back of the room. Please help yourself, only a couple of things that are for display only, the rest of it is to take away. There is also a beautiful poster back there; there are 600 of these in our office, so I'm hoping that you will take some away. We brought a hundred with us, so there are some rolled up and when they run out we will roll some more. It's the Gwaii Hanaas Marine Conservation Area poster that just came out recently. It's produced by World Wildlife Fund Canada, Parks Canada, Fisheries and Oceans Canada, and the Council of the Haida Nations. It's on both sides, it's very beautiful. Thank you. David, you're up.

0:20:33

David Lane

Thanks Michele. And thanks Bob, for those opening remarks. We have four excellent panellists today. How we are going to organize things is to start off with the first two panellists, have a bit of a break – there's coffee and munchies in the back -, then our final two panellists, then we'll open the floor for questions that you want to get into a little more details, things that you might be concerned about – that you might want to pursue a little bit more. We're going to give each presenter about 20 minutes; we're going to give Dr. John Volpe a little bit more because he's got quite a lot of ground to cover on the science end. With that in mind, we're going to start off with John just so that he can launch into some of the scientific work he's been doing, the problems he's been seeing, and his research which is at the forefront.

John Volpe

Thank you very much. Can you hear me at the very back? (*waves away mike*) First of all, I would like to thank the organizers for inviting me up here today to talk to you. I appreciate the opportunity and I appreciate you taking the time out from everything else that was mentioned and the hockey game – if anyone has the recent score, I would appreciate it.

What I am going to do – my purpose today – is to act as a shotgun; to throw out a bunch of issues to you, and then each one will be taken up by the subsequent speakers in more detail. I would like to put a few things on you radar. We're not going to solve all of them, but at least if you're aware of them we might start some collaboration, some talking with people, and we might start working towards some kind of a resolution.

The title of my presentation is Science Friction; slide has contact info there on the website.

A lot of my work, until recently, has been concentrated on almost exclusively escapees. And in BC our aquaculture produces over 80% Atlantic salmon, which as the name suggests they don't belong here. When they escape, which they do in large numbers, the

question then becomes, what becomes of these fish, what are the impacts of these Atlantic salmon on our native Pacific salmon, at what point do we become worried. When I began this research a number of years ago the first barrage of excuses or explanations was, they cannot escape – before long you started seeing Atlantic salmon on board commercial fishing boats. Four years after they had become common on these fishing boats was the first recorded escape from a farm. Quite interesting. We don't really know how many escape; farmers don't know how many escape, academic people don't know, governments certainly don't know. Rough estimates 0.5 – 1% of the caged population will escape during the production cycle. Using recent production numbers, that suggests between 55,000-111,000 Atlantic salmon will escape every year. We also (inaud). Now, Alaskan Fish and Game after consultation with BCSFA, said 'wait a minute', those numbers are way too low. After our consultation we suggested about 5% of production fish escape during the production cycle. If that's the case, the number 440,000 escaped Atlantic salmon per year, 100,000 or so Chinook, and 23,000 - and change - coho. Bottom line is these are rough estimates, we don't know how many fish are going out into the water, nobody knows. Perhaps the truth is somewhere in between, we just don't have the numbers. Bottom line is there's a lot of fish going out. So what are the impacts?

What about recoveries, how many fish actually seeing in the wild? In 2000, 7,833 Atlantic salmon were reported, as captured, in the Atlantic Salmon Watch program, which is a 1-800 number you can phone if you happen to see an Atlantic salmon in the wild. An additional 145 Atlantic salmon were reported in fresh waters. The 'reported' is underlined because if you come across an Atlantic salmon: one, you have to know it is an Atlantic salmon; two, you have to know about the Atlantic Salmon Watch Program – you have to know what the number is - and three, you have to be motivated to call. That's a lot of 'ifs'. But even so, 7,833 were reported. These 7833 along with the 145 are reported as the number - that this somehow reflects reality. This is a dangerous precedent. We have no idea on the (inaud) error around those numbers. We have no idea how accurate that is.

In 2000, we had an opportunity to ground truth these numbers. Along bottom axis August 1, 2000 to the 27th, these are the number of Atlantic salmon captured in area 12 fishery – area 12 only. And it's across one month or 15-17 days of active fishing. On the 1st of the month we have a large escape, 4500 escaped from a salmon farm in the area. Then the commercial fishery saw slight recaptures on board these boats, and then it backgrounded to nothing. The fish, presumably, dispersed out of the area. Then 32,000 escapes in Sergeant's Pass, (inaud) fishery and then dispersed again. Interesting thing is, these numbers of reported escapes do not include the voluntary reports of the Atlantic Salmon Watch, this was Alexandra Morton – who lives in the Broughton Archipelago - calling every fishing boat on the grounds 5-7 times a day asking 'how many Atlantic salmon do you have?', 'how many Atlantic salmon do you have?' 'are they different from the ones you caught before?', she asked 'are you reporting them to DFO?'; absolutely every time the answer was 'no, I don't talk to DFO'. Interesting.

So in that one month period of only 15 days active fishing we documented – well Alex did - , 10,826 Atlantic salmon caught in that small period. The Atlantic Salmon Watch program across all of BC, for the entire year, documented 7833. So in this one small time frame in one fishing area, we documented 41% more than they documented for the entire

coast for the entire year. What this suggests is that the voluntary survey is not going to provide the kind of information we need if we are going to evaluate the risks associated with these escapes. That's woefully underestimating the escapes.

To date, myself and my student have documented 3 feral populations on Vancouver Island. My work, until recently, was restricted almost entirely to Vancouver Island. (inaud) These 3 rivers, as you are probably aware, support feral populations – these are populations with juvenile atlantics salmon in them. Two of them support multiple year classes of Atlantic salmon, they are producing juveniles. It is worth noting, when you look at the amount of water myself and my students have covered, relative to the amount of habitable water out there – is not statistically different from zero. We haven't actually done anything and yet we found 3 feral populations. Imagine what (inaud) and then start looking from Alaska to Washington. There are some pictures; these two individuals here are a part of a school of 111 that we found in one pool in Salmon River. In one pool, 111 adults heading upstream to spawn. This is a bear killed Atlantic salmon in the Whynock River that we found. To date there have been adults reported in 81 streams in BC. With the exception of our crew, there's not really a lot of effort out there. A lot of captures from sports fishery, so the rivers with out a lot of sports activity on it simply aren't surveyed (inaud).

To consolidate and overview of a lot of research; in the interest of time just going to distil it down to a few bullets. Right now we've got 10s - 100s of thousands escaping annually – we don't really know how many, we've got significant marine survival – Atlantic salmon are popping up on commercial boats all the way up to Alaska, there have been Atlantic salmon caught in the Bering Strait. The most northerly escape, Point Hood north of Vancouver Island, Atlantic salmon naturally engage in long range migration – so is the case it appears with the 'new Pacific salmon'. Adults are ascending every major drainage on Vancouver Island, I've been to them, I've seen them, and they're there. Production fish are capable of spawning, we've done these experiments (inaud) peer reviewed documents if you wish. Production fish are capable of spawning, we've demonstrated it in a lab, and we've demonstrated it in the wild. Feral progeny, juvenile Atlantic salmon, are capable of competing with the native salmonids. Again, we have documented this. This is not a point of debate any longer. What keeps coming back is 'why did the historical introductions of Atlantic salmon fail?' If you are familiar with this argument, you will know that between 1905 and 1934, - depending on whose numbers you believe – between 5.5 and 13.2 million Atlantic salmon were introduced to the coast of BC to the rivers for sports fishing. But those introductions failed. The logic was because the streams were saturated with Pacific salmon, there was no habitat available and the big tough Pacific salmon were not going to let these interlopers, these Atlantic salmon come in. Plus, these Atlantic salmon had been trucked, or trained, across the countries in milk crates or whatever released to the rivers (inaud). And then everyone stood around waiting for the fish to return and they never showed up. So there was a considerable amount of effort to introduce Atlantic salmon in the early 1900s –nothing ever came of it. The logic then becomes that nothing will come of it now. The assumption there is that the fish that were being introduced then are the same as the fish that are being introduced now; and that the habitat is the same now as it was then. If those two points are consistent then it is the same experiment. But it's not the same experiment. We're introducing large pre-adult/adult fish that are vaccinated and high condition factor into areas that are under

represented in Pacific salmon, habitat space is freely available, and resources are good. And we are introducing these fish from point-sources – of farms – year after year after year in large numbers. That is exactly how you introduce species. As the environment ebbs and flows, the window of opportunity for colonization in some years will be very small; in some years it will be very large. It's not constant. The environment is a dynamic thing. If you continually introduce fish, then when the window of opportunity broadens wide enough for colonization to occur, the fish will be there to take advantage of it. And I think that is exactly what we are seeing.

To get into this question, I'm going to condense five years of rather painstaking research into a couple of slides. Simulated stream channels at UVIC to end the question exactly what constitutes success for Atlantic salmon, under what conditions will these fish colonize and under what conditions will Pacific salmon provide resistance to colonization. Distilling down into logical (inaud). Key component, if Atlantic salmon has access to habitat prior to being challenged by native salmonids – that fish that otherwise would have been competitively inferior, is now superior. And the logic goes that if you are a territorial animal, you are maintaining your territory, for a reason – presumably because it gives you access to the kind of resources you need to survive. And if it is a particularly profitable habitat, you will defend it very vigorously. But you have to know what the worth of that habitat is. Atlantic salmon make that valuation within 3 days. You introduce a fish into a stream it is complement naïve as to what the carrying capacity – what the resources are – available. But it establishes a territory and decides how vigorously it is going to defend that territory in 3 days. You introduce fish on top of it, and those Atlantic salmon will compete successfully because they are competing against individuals that are naïve of the worth of that habitat. Now let's go back to the early 1900s, when Atlantic salmon were dumped into the rivers that were saturated with native salmonids. The native juvenile salmonids knew the worth of their habitat, they defended it. The Atlantic salmon just got off the train, they got dumped into the river and they have no idea what's going on. What am I fighting for, I have no idea but –bang - I'm getting hammered by this guy. Well, I'll go over here, to this part of the river, no, I'm getting hammered by him. And they keep going and they pinball through the river until they land in habitat where they are not getting attacked. Well, why are they not getting attacked? That habitat is crap. And so they perform poorly and eventually they die. Steelhead are ecologically almost identical to Atlantic salmon. They are the ones that are going to determine whether Atlantic salmon colonize or not, in the short term. Right now the Vancouver Island streams are between 10-20% of the long term averages for steelhead numbers. That means that between 80-90% of the habitat is unutilized. An Atlantic salmon that emerges from the gravel in these rivers can go weeks without seeing a steelhead, let alone 3 days. It then establishes its territory. That territory then becomes unavailable to subsequent challenge from native salmonids. That's exactly what we are seeing in the rivers today.

I want to now step back. That's my invasion spiel. It's happening, if you think it's not, you are fooling yourself. These fish are colonizing. We still don't know and cannot say if this (inaud). I'll tell you, it's not going to be good. It may not be that bad, but it's not going to be good.

So let's talk about aquaculture in general, some of the other things (inaud). I took this from the BCSFA webpage; unfortunately they're not (inaud). I will speak for them

anyway. “quote comparing space of airport”. It’s true. If you take all the net pens and put them side by side they do indeed take up a very small area relative to the coast. But the key phrase is that the area of habitat affected is also very small. Well, let’s talk about that. A colleague (inaud) University of Washington (inaud) calculation. There are four farms in Bremerton. These four farms produce about 5.2 lbs of feces per year that are introduced right into the Puget Sound. The people of Seattle who – 830,000 strong – purchased a state of the art filtration and sterilization plant that cost \$536M, and costs about another \$80M/year to operate; they introduce about 4M lbs feces (Total Suspended Solids). The greater population of Seattle introduces ¼ less effluent than four farms in Bremerton. We have somewhere around 104 farms in BC and we are going to see a large increase in that number. At this point there is a socio-economic imbalance; who’s being asked to shoulder the risks and who’s in line to receive the benefits. The cost to the farm for a (inaud) filtration/sterilization (inaud). I submit to you that all of the ecological issues we are here to talk about today – escapes, wastes and we are going to talk about a few more before I am done – these are all manifestations of underlying social/economic imbalances between coastal communities and their governments. The ecological issues are kind of a by-product. We can run around trying to solve these ecological issues like running around trying to put out fires, but it is very much like treating the symptoms and not the disease. (inaud)

What else is coming off these farms?

Antibiotics – these are 1998 numbers that are fairly constant until now – 6.5 tonnes of antibiotics used on BC farms. These are broad spectrum oxytetracycline, basically that means kill everything. The problem is that when the feed that is used (inaud) is not consumed 100%, it falls through the cages and gets taken up by benthic organisms around the netcages. They end up getting chronic low doses of antibiotic. When you go to the doctor and you get a regime of antibiotics – what is the first thing you are told? Finish the regime. Even if you become asymptomatic, finish the bottle. Because what happens is: you take the first few pills and that knocks out all of the bugs that are susceptible to that antibiotic. But there is still going to be a sub-population of bugs in your body, not enough to cause symptoms, but they are there – and they are resistant to the antibiotic in the first go. You need to keep hitting them with the antibiotic and eventually they will go. Well that’s what happens when you get shrimp, crab, and other benthos taking up low doses of antibiotic. It kills the bugs that are susceptible but leaves the ones that are not – before long you have super bugs. That is what we are seeing now in farms, is antibiotic-resistant bacteria. We are seeing it in animals that end up on our food table, crabs, shrimp, etc.

Pesticides - they are the ones that are used to control sea lice – talk about this in a little bit more detail in a minute. Sea lice as you are aware are a parasite that can cause great damage to salmon. But the treatment of it (inaud) takes out all organisms that go through any kind of moulting stage. So again crab, shrimp, zooplankton and so forth – these are the base of the food chain. Copper - the net treatments. The nets get fouled with fouling organisms that cut down the water flow through. You want clean oxygenated water coming into your farm and taking waste products away - that’s the whole basis of this operation. Anything that obstructs that flow, you want to get rid of it. So you use, usually copper based antifoulants. It is illegal to paint your boat with this stuff but your dinner can grow up right next to it. If you took a salmon, mid-production cycle and cut it in half,

it would be the colour right about there (*indicates wall*) – a dull grey colour. The red colour in wild salmon comes from the bioaccumulation of krill and other crustacean the carotenoids. This stuff is very expensive, you don't want to feed it to the salmon because – as we all know – salmon prices are very low and you cannot absorb that kind of cost. The way around that is to use artificial carotenoids that are distilled from a petrochemical process. The marketing analyses have shown that some markets like their salmon redder, some like it a little more orange, some like it a little more on the yellow side. You can order your (inaud) using the SalmoFan. About 32 is the most popular colour but down in the southern states they'll eat it down around 29 or 30. The product is actually coloured to suit the market, using these artificial carotenoid. This is not particularly news. However these carotenoids have been linked to rectal damage to people and they are causing a lot of problems with generally chemically sensitive people. You are going to have to eat a lot of salmon – the average person - before you are in any kind of 'red zone' for health damage. The problem is, which is systemic of this whole issue, is that you are not told about it. When you purchase farmed salmon, you are implicitly advocating the production methods that went into producing that product. And unless you are armed with the full breadth of knowledge of what went into producing it, you are essentially contributing to something that you may not want.

So that's what's coming out – what's going in. Salmon, unlike all other farmed animals that we are familiar with – with the exception of shrimp – are carnivorous. We don't farm tigers. There is a reason for that – you would have a hell of a deer bill. It takes a lot of fish to make a little bit of farmed salmon. The numbers that get tossed around here are usually pretty ambiguous. They don't take in the fact that the pellets are made of fishmeal and fish oil. When you take fish oil into the calculation – it requires around 34 kg of wild edible fish to make on 1kg of farmed salmon – not including by-catch. So this idea that we're going to feed the world with the blue revolution is not going to happen with salmon – it's a net loss. The marine area required to produce farmed salmon is 40,000 to 50,000 the production area. So in BC, the average size of one farm is a hectare of surface area, therefore it requires up to 50,000 hectares of ocean and all the water under it – suck that dry of all organisms and grind it up into fishmeal and feed it to your salmon. That's what it's going to take to get those fish through a production cycle. The European industry, which is at the forefront of producing salmon, requires approximately 90% of the North Sea's primary production - 90% of the biological activity in the North Sea (inaud). BC salmon farms require 7.8M hectares of ocean – sucked dry – to feed our farmed salmon. What do we do? Do we go to the Johnstone Strait and suck it dry? No – we go to other places in the world who don't have such a big problem with collapsing the coastal fisheries for short term economic gain – namely Peru and Chile. What we are talking about here is a high fat fish: herring, mackerel, anchoveta, anchovy, and sardinella. These stocks are mined at unsustainable rates; they've got about 9 years of economic viability before they are gone. To add an ironic twist of fate, these fish are the very fish upon which those commercial fisheries in that part of the world are based. We need fish farms, we need (inaud) for our coastal communities – I'm sensitive to that. But at the same time, we are forcing these communities to spiral into poverty because through international trade agreements, WTO etc, we are forcing them to extinguish their coastal ecosystems to support ours. Well, in fact to support our destruction of our own coastal ecosystems. There's a world glut in salmon – prices at their lowest in equal dollars than

they ever have been. The commercial salmon fisheries now fish harder than they ever have in the past to maintain the same earning power. So this idea that fish farming will take the pressure off the commercial stocks, does in fact just the opposite, it intensifies. So what else is coming out. Because you are taking vast amounts of fish, distilling them down into small bits, and feeding the small bits to the salmon – you are biointensifying the toxins. So you get feed contaminated with PCBs, and a bunch of other stuff I don't even want to try to pronounce. Bottom line: how many servings of BC farmed salmon before you are in excess of the WHO guidelines for PCBs, dioxins, etc. 1.5 servings of farm salmon a week and you are in excess of WHO guidelines.

What else goes in? Well, there's a huge amount of energy is required to raise farmed salmon. This came from the work of Peter Tydeman now with . Took all the energy it takes and converted them into litres of diesel. How much energy is required to produce a round tonne, (inaud) Chinook for example, it takes 3 times the amount of energy to produce a tonne of farmed Chinook than it does a wild capture. Because it's all offshore in Central America, boats offshore, collect forage fish, bring to shore, process into meal and oil (hugely energy expensive) then transport them to northern hemisphere fish farms, get it out to the farms, feed it to the fish, the fish themselves raised in heated hatcheries and then shipped to the marine environment, grown up, brought back to the processing plant, then to market (inaud). So there's no energy savings to be had there either.

So how does this stack up on the EORI (inaud) – how much energy do I get back for what I put in. So if you're farming seaweed you're getting a 100% return on your energy investment. Industrial salmon aquaculture is a very thin sliver if we think of - aquaculture activity as a pie – looking at aquaculture activity around the world. Farming carp in Indonesia you get a 94% return on your investment. Aquaculture can be done – hugely effectively and efficiently. We don't want to paint all aquaculture with the same brush. Commercial aquaculture: 3.3% return on your investment. (inaud) No way for any sustainability argument. However, it's downright 'green' compared to beef which is 0.8%, so it's all relative.

Sea lice – an issue I don't need to talk too much about. I'm sure you're all aware of it. Pictures of sea lice on fish in the Broughton Archipelago. This is the kind of a situation we are dealing with. A fish this size would require 3 lice to kill it that one has 42. The black boxes are active fish farms in the Broughton Archipelago. The numbers represent mean number of sea lice taken from pink salmon. As you are all aware, pink salmon are very small when outmigrate, so it only takes one or two lice to kill these fish, here are the numbers. As you start in the back away from the fish farms, the numbers are relatively low – they peak as you approach the fish farms (inaud). Single largest collapse of salmon anywhere in the world on record at any time recorded in the Broughton pink salmon populations and it is associated with the fish farms. There's lot of spin going on, lots of 'well if you go back to 1952', yada yada well I would like to look back past 1952 – to get a true baseline of what's going on. It's as close to cause and effect as you can get right now. We are working in collaboration with another group of individual right now trying to get away from the correlations, and look at the cause and effect. Until that data are in nothing is for sure, but this is a huge red flag. This is something you need to be aware of. Here are the pink salmon pictures from that study, these are not selected because they look particularly tragic, these are just, let's just dip in the water and see what we get. To treat them they are using Slice. The active ingredient in Slice is *Emamectin benzoate*.

This is the actual ingredient label for a product designed for land, with the only active ingredient as *Emamectin benzoate*. The environmental hazard says this pesticide is toxic to fish, birds, mammals and aquatic invertebrates. Remember this is what they are feeding them; this is the best solution we can come up with. We'll feed the fish *Emamectin benzoate*. Do not apply directly to water, or to areas where surface water is present, or to intertidal below the mean high tide mark. etc etc. But go ahead and feed it to the salmon. This is the state of the science folks. You may have been led to believe that everything is fine, we know what we're doing but – It should be said that I'm not funded by anybody. I do not receive money from the Suzuki Foundation or any of the NGOs. I don't receive money from the industry. I don't receive any funding at all. I just do what I can. I am not receiving anything from being here. I don't profit or suffer if the industry goes up or down. But this? Surely we can do better than this.

Here is the last slide. This is all in support of jobs, right? Again, I am sensitive to that, I myself may be looking for work before too long – if I keep this up. This is looking at Norway to lead the way. Production and employment for 1985-2000, you can see employment increasing to a height of about 5000 employees in 1989, and then a consistent decrease over time. Production has been increasing as employment decreases. So if we look at BC, we employ about 1800 direct jobs in the coastal communities right now, we employ over half the people they do in Norway and we produce a tiny fraction of the salmon. On average, the Norwegians produce 200 tonnes per job; in BC we produce only 24 tonnes per job. Hugely inefficient. Remember, salmon prices are down right now and their going down more. Chilean production is increasing. In order for BC to compete on global market, we will have to increase production on orders of magnitude and cut employment if we want to remain viable on the world market. So be very, very careful about accepting the argument that this will be the windfall for coastal communities.

One last thing, for picking up at the back of the room. The Atlantic salmon program is not capturing – literally – the numbers of Atlantic salmon that are showing up onboard commercial vessels. If you are a fisher or know of a fisherman, please take one. We will come to collect them from you. That's a lot of biological information in there. There is a 1-800 number. We will share our information with DFO so nobody is getting left out of the loop. We will do a better job of surveying captures.

0:57:55

David Lane

Introduces Maren Esmark. From WWF-Norway.

Maren Esmark

Marron thank you for the invitation similarities between here at Norway papers that say kill the seals or will lose all the fish. my presentation called threats and solutions. I focus on solutions that had been tried and failed and some that had been tried and worked in Norway. To put aquaculture into perspective trout and salmon are a tiny fraction. China has the greatest amount of aquaculture but they're largely vegetarian species quite sustainable.?? The point I am trying to make is that aquaculture is growing, and the trend is going to tuna, salmon, and trout, and other high-value species. W. W. F., we have been

working with aquaculture for some years , shrimp farming -- lately it's been tuna. Tuna farming catches the tuna small, about 60 kilos, put in the net, tow the net to shore -- for many days, maybe a month -- keep them, feed them on until they grow to the size that the market wants. And at the time when the prices are right, they sell them. Of course the tuna stocks are going way down. Salmon and trout, that is what I am here to talk about. In Norway it is mainly Atlantic salmon and rainbow trout (which is an introduced species for us -- like Atlantic salmon is here). And the problems that I am going to talk about: the speed, discharge, disease. I want to make one point clear, as I have understood it, you might get aquaculture development quite soon in this area, and you don't have any at the moment. And as I have understood it, the conflict level in B.C. is quite high at the moment and your government has not really taken care of the problem, yet. Is that correct? And also that you are having fights with industry and it is hard to get fish farmers to accept and to say in the public that, yes we do cause sea lice problems, and yes, we do have escapements and yes, it has an impact. While, in Norway, the government admits that and to some extent also the industry. We don't have to have industry accepted it, because government does. In Norway the a lot of reports from the ministry of fisheries and the ministry of environment are saying that the biggest problem with aquaculture is sea lice and escapes. It's a fact. That doesn't necessarily mean that we shouldn't be doing salmon farming. The point is, the problems are there and it could be a problem with the wild salmon. We need to solve it. We need to find a solution so that those two can coexist. This is a statement that we made that salmon farming contributes to overfishing, a lot of people don't agree with this statement. The only species they will say this actually applies to is the Blue Whiting in the North Sea. Totally overfished -- they expect a collapse in the next years, most of it goes into fish farming -- most of it goes into salmon farming. Most of the species used for fish meal and oil, are little pelagic fish is -- highly important in their ecosystems. Because their prey for other fish. Like our organization would like to say, their prey for the Dolphins and the puffins -- for all these beautiful animals -- but they are. They are also prey for cod, and other more commercially important species. We don't know the effects of fishing those tiny little species -- but we're about to find out. At the moment many of these fisheries are still sustainably harvested, what we need to make sure of it is that the fish meal used either comes from other sources like vegetable oils. They are starting to use grapeseed oil instead of fish oil in Europe. Because some of the big supermarkets are asking for more sustainable fish. And also the best thing to is to use the fish offal from the fish plant -- tails and fins and the head -- and reduce them to fish meal. That's great. Using a waste to produce a high quality fish. But we need a solution soon. Because it will only take 5 to 10years and then the date aquaculture industry will take 100 percent of the world's fish oil production. Discharge of nutrients. Well in Norway they have numbers on the discharge. Blue circles are discharge of both phosphorus and nitrogen. The rest of the colors show background -- what normally comes out of the rivers. The map also shows aquaculture activities and local populations. (inaudible) Norway is less populated, most people live in the South. To put it into perspective, we are talking about a huge amount of nutrients. But so far it has not been a big problem. Norway has deep fjords and quite good currents.(inaudible) We have other problems. Because a of aquaculture, Norway does not comply with the obligations of the other(inaudible)around the North Sea to to cut our discharges of copper. The other countries comply but not Norway. The discharge

keeps growing. A farmer will say "but look, my use of copper is down from last year". That's great but industry has grown?? Percent. So it doesn't really help because the total discharge is still growing. Antibiotics (inaudible) toxic in high concentrations. A lot of research has to be done to see if this Slice is having the impact that we fear it may. As far as I know it's not causing big problems. So what kind of solutions are there to pollution. Exclusion zones – no fish farming in the North of Norway too much nutrients. Good sightings. Good feed management -- feed his expensive. You cannot find a fish farmer who is wasting his feed. You want to give just the right amount that the fish will eat. The good thing is that the fish farmer is interested in reducing the waste going out. With good management it is no problem to keep the farm from having an impact on the bottom. And in Norway you have fallowing every second year. Then the sea floor will have time to recover. Good health management -- with good health management you might not need all of these antibiotics. Antibiotics use in Norway and production – graph. As you can see the total use of antibiotics in Norway over the last 10 years ?? Kilos. Compare that to agriculture -- it is huge and agriculture. With enclosed systems of course you could control your discharge. It would be a great solution actually to all the problems. Except its (inaudible). The cleaning fish -- this is something we use in Norway instead of sea lice treatment. It is a little Wrasse type fish that actually eats the lice. It starts with the larger ones with the strings (gravid females), then it takes the smaller ones and when there's no lice left it starts eating the stuff off the nets -- small mussels. Unfortunately it's not as convenient as sea lice treatment. They use Slice instead of the cleaner fresh. We are trying to get then used to using the fish because it is a nice way to do aquaculture. We are trying to get rid of the pesticides. The sea lice kills. Yes it is an actual parasite. Of course if you have a lot of fish farms you have a lot of sea lice because it is there all year-round in the fjords. In former years there wouldn't be a farming in the fjords. When the smolts were migrating out (inaudible). Exclusion zones -- don't let farms in the mouths of important salmon rivers, don't let them on the migratory routes of your own fish. Health management system and strict monitoring. Every second week every fish farmer has to take out 25 fish, and report on the sea lice. This is sent to the government so at all times the government has data on the sea lice. Unfortunately it is not public yet, we're hoping they will be. If you have an average of more than 0.05 mature female sea lice per fish you, have to treat. Especially in the vicinity of the smolts when they migrate out -- you have to treat. But all farmers have to do it at the same time in an area in order to make it work. You just need one bad fish farmer not complying to the rules to destroy the whole management system. This is some research died in the middle of Norway by a veterinarian whose heart goes with the wild salmon. He was working as a veterinarian for the fish farmers and he got all the fish farmers in an area to work together, all treating for sea lice at the same time -- and treating the smolts migrate out. The red shows 1999 the blue is 2000 and degree in is 2001 -- I think the numbers from 2002 will be even better. It shows good control, distribution is completely reduced. Escaped fish -- it has been a really horrible year in Norway for escaped fish. 630,000, but as the official number but as John has pointed out there are probably more -- as leakage coming out. I have heard that in BC there is a new law saying you have to report on every fish that escapes. In Norway I think you have to report big numbers, like if it is over 100 or a bit more than that. As the mating number for spawning wild salmon is 500,000, we are having a huge experiment with our wild

salmon fish stocks in our area. We don't know what impacts this will have -- I guess we'll find out in 10 or 20 years. We're hoping that the farm fish will not impact, that they will die. And that those that spawn will die as well -- we will have to see how that goes. The wild salmon and a farm salmon spawn together their offspring have less possibility of survival. U.N. definition of sustainability of biodiversity -- get quote. If you have more escaped fish than wild fish that is not sustainable use. Exclusion zones and good siting -- no fish farms nearby important salmon rivers or migratory routes. And the most important for in is that you going before development takes place to designate the places where we don't want fish farms. Obligatory escaped prevention measures should be a standard, get them know. Standards (inaudible) enforcement (inaudible). High rate of escapes last year -- no excuse anymore (inaudible). Get the standards in. (inaudible). Individual tagging of the fish, so that if a fish escapes, we will no where it came from. That would also solve some problems with leakage and see if it is true that no fish escape every year without us knowing about it. Also enclosed systems might solve that problem. But if it collapses, it might as well have been fish farming with the escapes. I under scored health fines, and loss of license. In Norway they actually had a fish farmer in jail last year. Not a lot of escapes -- he dropped a lot of sick fish close to the cages. Not good. Wildlife disturbances. It is also very important to find areas that are very important important for other wildlife. In Norway is his coastal cod, where it spawns. On the East Coast here, lobster areas are very important. And that is what the local communities need to do -- sit down on land and put down sites that you are know of that are important for wildlife. Seal habitat, wild migratory routes, inaudible, and a lot of areas where you have seabird colonies; then say 'don't go there to we don't want fish farms there. It will make it easier for industry and nature if you can find these areas before they start developing the industry. "Conservation first". Map showing exclusion zones in Norway to salmon. Unfortunately it's not really true -- most of the fjords are cut in half. Just the beginning of the fjords (inaudible). But it's a start. This is Iceland -- fjords are closed, all these exclusion zones are only for wild salmon. You need to know what you've got and where it is and how it works -- if you want to find the values that you want to protect before you start developing this industry. And you need to know what potential impacts the development of might have on your wild salmon -- you know those impacts: sea lice and escapes. Protect those areas. The best thing is to get government to protect them; the next best thing is to get agreements with the industry. Setup operational guidelines, mitigation networks, what can we do to minimize the risks. And again -- it is the industry that has the responsibility for not impacting to to the wild salmon.

1:21:13

David Lane

Thank you very much Maren. It is good to have a perspective from Norway, they've had this a lot longer than we have.

A short break, 5 minutes. Two more speakers. 5 minutes.

And next we're pleased to have a speaker from the University of British Columbia Fisheries Center, Rashid Sumaila, to talk about the economics of salmon farming.

Rashid Sumaila

Thank you very much. Thank you all for coming and giving me the opportunity to address you. I think the first two talks we had are a very good background. Because the economics is based on the science, you need the basic information before you can start talking about valuating. The first thing I thought I should do is to give you a number of quotations that I have picked up from literature around. Quotation 1 "The government of Canada recognizes the significant societal benefits associated with aquaculture, as a result it is made sustainable aquaculture development a key federal priority." I underlined the word sustainable. I agree -- whatever the benefits we should aim for sustainable aquaculture. Quotation 2 "while Canadians are interested in realizing the full potential of aquaculture, they are also concerned about issues such as escaped farm salmon, foods security, habitat interactions, water quality, navigational safety, and aquatic animals". And again I have underlined the key points. There may be some benefits but there might also be some costs. We are concerned about these together. Quotation 3 "To benefit Canadians now and in the future through the culture of aquatic organisms, while upholding ecological and socio-economic values associated with Canada's oceans and in land waters". It is important that it is not just about now, it is also about the future. Again you get the point, it is not just a one-way direction -- we have ecology, we have social concerns -- in addition to whatever economic benefits we hope to get from aquaculture. Last quote "the idea that aquaculture will provide income for coastal communities is somewhat, I would say, in doubt". And is in that a wonderful quote? This is John's quote (indicates Volpe), I picked up somewhere. You have all these views floating around: benefits -- probably there or may be there, ecology -- might be a problem, and so on and so forth. Now, what I did next is to talk about sustainable development and its role and how aquaculture fits into it. Next slide. Aquaculture in the context of sustainable development. As many of us are aware, the Brundtland Report, which was commissioned by the United Nations kind of gave us a vision of what sustainable development is. This is a quotation from that, "development techniques the needs of the present without compromising the ability of future generations to meet their own needs". I so we want to meet our needs without forgetting our children and our grandchildren, right? So there is this other aspect to aquaculture that we should be taking into account. Next slide. Elements of sustainable aquaculture --the kind of things, in Canada's view, to get aquaculture to meet the sustainability concepts. One of them is maintaining or enhancing the quality of life and the environment for present and future generations -- that is always on online when we go for development. Respecting the interests and values of all users and considering those rights and values in decision-making. We should recognize this and incorporate it. We should also respect the constitutionally protected aboriginal rights. We should have these all taken care of. Of finally, organizing aquaculture operations in the most efficient, competitive, and environmentally responsible manner. Social, environment, ecology -- continuing themes. Now, after giving you all of this background what's does it mean to the economists when you take all these things together. From a distance I drew a conclusion. What we are actually aiming at, is something called the Net Contribution for aquaculture. It is all about the added value -- what counts in addition. You don't just look at the revenue and markets culture -- yes, it is going to be somewhere doing fine. It is all about what extra value that brings to the table. Each of the above quotations expresses the need to (inaudible) total

costs and benefits. We're talking about the total costs and weigh it against the total benefits. And this total is in a very broad sense of the word. "Well-being of Canadians -- get quote?". I don't think there are many of us that would disagree with this especially when it is the net contribution that matters the most. When you look at the benefits of aquaculture as an economist you look at different scales at which different benefits occur. In terms of the individual -- what do I get out all taking part in this industry. We can also think of it in terms of the firm, the Company, the organization that is carrying out this activity. Then you move to the next level, the community level, what it is in it for the community -- the Prince Rupert community. And then you move on to the nation -- all of Canada. So it depends on the scale you are using. In fact, if you want to go big time, you go global. So you really find a range of scales -- the benefits differ. Sometimes the individual and the firm make a lot and the community suffers and the nation may benefit -- and so on and so forth. And when you do these valuations all of these things come into play. The first and second are usually described in literature as private benefits. These are benefits that go to private individuals or private companies. Nos. 3 and 4 are described in our literature as so societal benefits -- needs 2 often cause debate and anger. Depending on who you are -- what you want? Do you want a social benefits for Prince Rupert, for Canada as a whole -- you need to evaluate this for example. In terms of evaluation, you can divide your valuation in two 2 broad categories. Financial analysis of aquaculture -- which is actually the calculation for the private firms. And then you can get into the full cost benefits analysis -- which is on the level of society/the nation. Under the cost benefit analysis there are two more categories: the conventional approach and something that I introduced recently in literature called the generational approach. The difference between the financial and the cost benefit is -- financial is in terms all of just the Company "if I take this business I will make some profit". (Inaudible). When you come to the society, that is when you want to really capture all of the external costs and benefits. This is where all of the points you (indicates Maren and John) come into play. What is good for the firm and private individuals is not necessarily good for coastal area. What is the cost to the private worthy individual is not the costs to the total coastal area. This is where society comes in. Also questions of the distribution of benefits come into play. Who makes the money and who suffers the costs? This could be the same entity. But sometimes those who suffer the costs were not those who reap the benefits and then you have all of this anger and debate. That we try to treat in the cost benefit analysis. The generational is more intergenerational issues that taking into account. What we do today, to our ecosystems for example, will affect the what our children and our children's children will have to face. In terms of (inaudible) I tried to capture that in what I call generational cost benefit analysis. This is, in essence, conventional approach (inaudible). So this is my generic flowchart are for comprehensive economic analysis of aquaculture. On the top, what I call 1, actually deals with the financial analysis. This is what private companies engage in -- checkout all of their costs and its all leads to the financial analysis. (Inaudible) As far as the firm is concerned, life is fine. Then we go to the second level -- society. This is where you capture the broader benefits and costs equation. So you have to adjust your financial analysis to capture the kind of problems like escapes, problems like to see lice, and the facts on the ecosystem. These do not generally appear in the accounts of the private company.(Inaudible). Here I introduced something called discounting clocks.

Again, I don't want to bother you with the details about it. The main issue there is that -- if I start and aquaculture operations; in five, 9, or 10 years I am gone; I have made my profits. But the consequences may still be there. This approach is away to really have a long-term view to this situation. You can capture all of the long-term costs and benefits -- the costs and benefits that occur after the business is gone -- that the financial analysis and even the the generational analysis will not capture. There are three approaches to, so if you ask me to (in audible). I will tell you that probably the private company will make X number of dollars and you take all of their communal and societal concerns -- well, it could be positive, it could be doing something that is really good. Imagine that you are walking a down the street and there is some yard that has beautiful flowers and every person that walks by gets the positive vibrations or feelings. So on the societal benefits are actually greater than the individuals -- in some cases. In most cases, it is less. So you have all of these when you're a policymaker in making your decision -- which is hopefully the best. Because your community is thinking about aquaculture, one I'll do things is to do these valuations and I think also that this is an opportunity for you to him look into different systems and try to make the decision to have the best one to suit your needs. This is a finfish and shellfish aquaculture comparison. There are certain properties on each of these, which will go into the final calculation. I would like to know what kind of feeding habits -- carnivorous or filter feed. Feed -- three kilos of feed to make .5 kilos of fish. Work best into your benefits and costs. All of these benefits factor into my calculations and so on and so forth. Environmental impacts of finfish in literature shows a high impact. Shellfish in the literature shows a lower impact. And all of these factor in to my calculations. You might also want to think about the intensity you want. Intensive or extensive systems. They have qualities and characteristics that go into your net benefits -- financial, social, generational, and discounts. Do you want to go large-scale or small-scale? (Inaudible) costs to the environment is socially and so on and so forth. Get into the last slide. So from this quick run, the messages that I would like you to take home. Bullets: given a the complex nature of the benefits and costs of aquaculture it is crucial that a thorough analysis of these costs and benefits are carried out before they are embarked upon. The net benefits from different types of aquaculture operations are made to be carried out in order to choose the best possible operation. It is a great opportunity to evaluate different types of operations to decide on those that will give to community with the highest possible benefits. Thank you.

1:37:55

David Lane

Thank you very much Rashid. Our final panelist has come in from the Ahousaht first nation on the West Coast of Vancouver Island. I would like to welcome Mr. Rod Sam to give that perspective on their dealings with a high density of salmon farms in their first nation's territories. One predominant group named Pacific National Aquaculture which is actually owned by the Norwegian government -- something that is odd, I find. But Rod, give us your experience with fish farms in your territory.

1:38:36

Rod Sam

Thank you. I will try to be as brief as I can. Thank you (laughter). It's been a long day already, I've been up since 4 AM on the road. First and foremost I would like to thank you for the invitation and for your hospitality here. It has been wonderful being welcomed by your chief here. I am here to give an honest perspective. Pacific national aquaculture in our territory has 16 sites, 16 tenures. At this point they are not all active, there are eight -- about half -- that are active. Some of the problems that they are having are problems with disease -- IHN -- they are having a massive die off. Other things I would like to talk about is where we are going, where we have been, and how we got there. From being up here, what I have heard is where Ahousaht was previously. We were actually one of the more radical nations who were actively opposing fish farming in our territory. We, at times, occupied farms, got right on their sites and gave them eviction notices to tell on that we didn't want them in our territory because of the concerns that we had and continue to have about the environment. We have a protocol agreement now, to help us address the issue. Previous to that there were civil disobedience and court actions. We brought PNA to court to get a farm out of the mouth of a salmon bearing stream. As other speakers mentioned earlier they should not be putting farms at the mouths of salmon streams or on the migratory route. That was one of the reasons that we did move forth to get them out -- and we were successful in getting them out. In the end government and industry came back from court and just kind of moved the farm to another area. To Bear Bluff, if you have ever heard about it, they are having a massive die off up there due to an algae bloom. Also mentioned within our protocol agreement -- first and foremost -- that PNA and Cermaq recognize our hereditary of our hereditary chiefs in our area. Industry recognizes that our hereditary chiefs have ownership over land and the water in our area. That was key in our negotiations with them; also the protection of the environment. Did we do that? -- protect the environment? One of the things we are pushing for is the implementation of some of the great technology that was mentioned by the other speakers like closed containment systems. Industry and government have always told us that it is too expensive to have full scale systems in any areas. As First Nations we want to be able to do that. We are negotiating with industry and government rights now, to secure funding to move forward with a full scale operation in our area. To see about the viability of it -- if it is wrong or right whether it is viable. That is part of our protocol agreement with industry. Within the agreement, there is a training phase in there. We want our people to move up the ladder in regards to not only farm workers but we want them to be farm managers we want them to be area managers. We have a number will work in the plant -- processing plant -- and we want them in to move up in managerial areas in that. What was key in that is that in the agreement, that 50 percent employment for First Nations by 2005 -- we are at 25 percent now relative to employment. We have a couple of years to get up to 50 percent. We're working with it. We are also pushing forward with ideas of joint ventures to not only look at farm sites but also looking at net loft opportunities. We are also negotiating with industry and the government to secure funding on that. That it be for preparing the nets and making the nets -- that would be about 20 more full-time positions, I don't know how many part-timers. That is what's in the agreement so far. Further down the road we are looking at a hatchery for smolts -- to get the fish a little closer to the sites. Also, down the road, we are looking at small engine repairs -- we made a note that industry is running around in boats and they will need someone to repair

them. We are moving from Atlantic salmon more to the Chinook, have all Chinook in our area. We are looking at that option -- so we don't have any foreign species in our area. Also mentioned that we have Black Cod experimentally farmed so far. Our goal for monitoring -- we have the Best Management Practices person who is out there monitoring the sites and how they are complying with the BC Salmon Farmers Code of Practice. They are they are to make sure that things are being done to the code; they are making recommendations and setting priorities. Studies -- industry and government have always told us that there have been the study is done on the impact on the bottom. We have always been told in Clayoquot Sound, that there have been studies done in Boughton Archipelago. They are like day and night -- totally different areas. So we are applying for studies to be done in our area, locally -- not having studies brought in from somewhere else. Something may not be affecting over there, but it might be a different story in our area. Other things that we recognize -- it is important to have a working document that is adaptive in regards to if there is not something been addressed. We can sit down with PNA to talk about it. (inaudible) negotiating clause in there. We have an agreement about resolving (inaudible). We have that option in it, it will be worked on. We are pushing for a protocol person to be hired in our area who will work on nothing but the support clause. At this point in time, it is a young document -- it was only signed last September. We had a bunch of people come in (inaudible), government, Cermaq, scientists. I am not here to say if industry is good or bad -- but it is here. So we are working with them to improve the way that they operate in our area. One of the things that we saw in this area, the need for consultation from the government is key -- not only from government but also from industry. It must be an active part, on their part. They need to come to First Nations and ask what concerns you have if we were going to put a farm in here. They need to have your input. It is a requirement for consultation -- we call them on it. Its needs to be talking with them, you cannot just drop a letter in the mail and say do you have any concerns. We pushed hard for them to come to the table and sit across from us to talk to us and hear us out -- and not letters or phone calls. But playing a more active role with industry operating in our areas. (inaudible) document/contract, we had an "out" clause. If we feel that industry is not operating to the specifications that we ask of it, we have the option to opt out. Now things are not going quite as smoothly as we would like -- but we're working on. We have agreed to work on the industry and government to make sure that everyone is on the straight and narrow -- so we can see what they are doing in our area, about the environment. Me and one of my colleagues, we went over a list of things -- different species -- mammals or invertebrates, which we have in our area. We have fifty eight different species that are directly or indirectly affected by the fish farms -- and that's just us young guys. What if we went to some of the elders, and asked for their input? I am sure that list would grow bigger and longer. My dad was an elder and I went to him for guidance during negotiations with the fish farms. That is -- I guess -- as short as possible. I will be around; if you have any questions I will try to answer them to the best of my ability. We have a fish farm committee that I am the chairman of -- it is all we deal with, nothing but fish farms. I am quite active in that area of salmon aquaculture. (inaudible) lot of science (inaudible). Actually, I have been getting a couple of days of work every now and again. Getting to know what they are doing on the sites, observing their working environment. Thank you very much for your time, if you have any questions I will be around.

1:53:25

David Lane

Thank you to all of the panellists. It is now it is your chance to get answers to your more specific questions. We have a mike here, I hope it is on (can someone check that). Any questions you have: you can address specific panellists if you would like to find out more, or if it is a general question whichever panellists feels that they can give you the best answer, will. Go ahead.