

## **Intensive aquaculture and sustainable regional development in the Arctic region – from controversy to dialogue (AquaLog)**

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# Report

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<p><i>Summary/recommendation:</i> The main objective of the AquaLog project is to understand factors and forces that influence the aquaculture controversy in the Arctic communities. This report summarizes the second workshop in Vancouver, Canada 23-27<sup>th</sup> April 2017. The project is funded by the Nordic Council of Minister and the Norwegian Fram Centre.</p>	
<p><i>Summary/recommendation in Norwegian:</i> Aqualog er et nettverksprosjekt finansiert av Nordisk Ministerråd og Framsenteret. Hensikten med prosjektet er å øke forståelsen av konflikter rundt akvakultur og hvordan disse håndteres i de arktiske landene. Rapporten oppsummerer prosjektets andre arbeidsseminar, som fant sted i Vancouver, Canada fra 23. -27. april 2017.</p>	

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# 1 Introduction

The Arctic is rich in resources, which presents both challenges and opportunities for the Arctic communities. If the intensive aquaculture industry in the Arctic is to be in a position to supply the population with healthy food, it is dependent on its capability to balance economic growth and sustainable development. This industry has the ambition to expand; however, aquaculture is facing major challenges related to environment, climate changes (e.g. higher water temperature) and the local/global political and economic tensions (e.g. global corporate control over local area and resources).

The overall objective of the AquaLog-project is to establish a network to understand factors and forces that influence the aquaculture controversy in the Arctic. The aquaculture controversy in the Arctic will be highlighted by exchanging knowledge from already completed and on-going research projects in Sweden, Iceland, Faeroe Islands, Norway, and Canada.

The specific objectives are to:

- Identify similarities and differences regarding the aquaculture controversy in the various Arctic communities,
- Identify challenges and opportunities in relation to sustainable regional development of aquaculture in the Arctic, and its interaction with the Arctic communities,
- Better understand and manage the effects of aquaculture on indigenous peoples and Arctic communities,
- Transfer knowledge to politicians and bureaucrats,
- Influence upcoming sustainability strategies and initiatives, and
- Establish research projects related to aquaculture development management in the area.

## 1.1 First AquaLog workshop

The first AquaLog workshop was held 14<sup>th</sup>–15<sup>th</sup> April 2015. The members of the AquaLog project first met in Tromsø, Norway with participants from Canada, Iceland, Faroe Island, Norway, and Sweden. This first workshop revealed that the controversies in the five Arctic countries concern several of the same issues, where environmental integrity seems to be a very important sub-theme. This despite the countries being very different in terms of the size of the countries and populations, aquaculture production volumes, etc. Another issue is local opposition and controversies over Aboriginal and local community rights, and the diverging attitudes towards aquaculture production in local communities. For more information see Karlsen et al. 2015<sup>1</sup>.

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<sup>1</sup> Karlsen, K.M., Andreassen, O., Hersoug, B. (2015). From controversy to dialog in aquaculture. Nofima report 33/2015.

## **1.2 Second AquaLog workshop**

The second AquaLog workshop was held 23-27<sup>th</sup> April 2017. As controversies over Aboriginal and local community rights are more visible in Canada, than in the Nordic countries, the second workshop was held in Vancouver, Canada. The focus was to get a better understanding of how aquaculture production impact on indigenous peoples and Arctic communities, of the interaction between aquaculture companies and Arctic communities, and the similarities and differences of the aquaculture governance system in the different Arctic states related to local participation and opposition.

### **1.2.1 Participants**

The following institutions and companies participated at the second AquaLog workshop:

- Ann-Magnhild Solås, Nofima, Norway
- Bjørn Hersoug, the Norwegian College of Fishery Science, UiT - the Arctic University of Norway
- Camilla Brattland, Centre for Sami Studies, UiT - the Arctic University of Norway, Norway
- Celeste Digiovanni, University of Ottawa, Canada
- Dorothee Schreiber, Tamarack Research, Montreal, Canada
- Erik Olofsson, Torsta AB, Sweden
- Ingrid Kvalvik, Nofima, Norway
- Jahn Petter Johnsen, the Norwegian College of Fishery Science, UiT - the Arctic University of Norway
- Knud Simonsen, Aquaculture Research Station of the Faroes, Faroe Islands
- Nathan Young, University of Ottawa, Canada

### 1.2.2 Program for the field trip/excursion

Sunday April 23 <sup>th</sup>	Travel from Vancouver city to Campbell River on Vancouver Island
Monday April 24 <sup>th</sup>	Visit at the Marine Harvest Philips Arm farm. Interview with Odd Grydeland in Campbell River. Interview with Richard Harry, organization Executive Director, Aboriginal Aquaculture Association in Campbell River Travel to Tofino
Tuesday April 25 <sup>th</sup>	Visit at Ahousaht First Nation Fisheries Council, Ahousaht First Nation Interview with Tawney Lem, West Coast Aquatic in Port Alberni

### 1.2.3 Program for the second AquaLog workshop

The second AquaLog workshop was arranged at UBC campus, Wednesday April 26<sup>th</sup> 2017.

Programme for the workshop:

- Welcome and introduction, Bjørn Hersoug, Coordinator
- Norwegian salmon farming at the cross-roads? Bjørn Hersoug, UiT - The Arctic University of Norway, Norway
- The Changing Political Landscape of Aquaculture in Canada, 2009-2017, Nathan Young, University of Ottawa, Canada
- Comparing indigenous relations with aquaculture in Norway and Canada, Dorothee Schreiber, Canada and Camilla Brattland, UiT - The Arctic University of Norway, Norway
- Catherine Emrick, Senior Associate, Aquaculture Innovation, Tides Canada
- Discussion with Karen Calla, director of the aquaculture division in Western Canada
- Discussion with Nathan Bennett, University of Washington
- Short presentation from Richard Sparrow, B.C. First Nations Fisheries Council
- Aquaculture and regional development in the Faroe Islands, Knud Simonsen, Aquaculture Research Station of the Faroes, Faroe Islands
- From cage to land based in Sweden, Erik Olofsson, Torsta AB, Sweden
- Controversies, aquaculture governance and coastal zone planning, Ann-Magnhild Solås and Ingrid Kvalvik, Nofima, Norway
- Summary of the workshop and further plans, Nathan Young and Bjørn Hersoug
- Meeting with:
  - Mark Saunders (former head of the Department of Fisheries and Oceans (DFO) Pacific Region, Science Division and current lead of International Year of the Salmon (IYS),
  - Paul Sprout (former Department of Fisheries and Oceans (DFO)),
  - George Iwama (Assistant Director, Institute for the Oceans and Fisheries, University of British Columbia) and
  - Madeleine Young (Coordinator IYS) on future research opportunities and collaborations.

## 2 Summary on institutional differences and similarities

The presentations and discussions on institutional differences and similarities of the different countries are presented below.

### 2.1 Canada

The Canadian aquaculture industry includes finfish and shellfish production. Of this, salmon farming constitutes 80% of the industry by value. Salmon aquaculture production in Canada is approximately 122,000 tonnes annually, with a value of approximately \$730 million (CAD). Salmon farming occurs on both the Atlantic and Pacific coasts, with British Columbia being home to 60% of overall production. Overall, Canada is a small- medium-sized player in global markets for farmed salmon. Exports are minimally-processed and are overwhelmingly destined for the United States.

Canada is a federated state with a complex division of powers between national and provincial governments, which makes regulation of the salmon aquaculture industry complex. Oceans and inter-provincial waterways are the responsibility of the federal government, as are international trade, food safety, and certain environmental considerations. The provinces are responsible for natural resource management, land management (which in some instances includes coastal, inter-tidal, and nearshore marine spaces), environmental policy, and business regulation. Salmon aquaculture therefore exists at the intersection of these jurisdictional responsibilities, making governance of this industry uniquely challenging.

Despite being a relatively small producer, controversies over salmon aquaculture in Canada are enduring. In British Columbia, key issues of disagreement include interactions and possible threats to wild Pacific salmon populations (via habitat degradation and pathogen transfer), impact on the ocean environment, impacts on other rural industries such as tourism, and impacts on indigenous rights and traditional food sources. Debates on these issues have long blended scientific and ethical/moral narratives. For more information, see Young and Matthews (2010).

The aquaculture controversy in Canada has evolved substantially since 2009 due to a number of key biophysical and political events. A decision of the BC Supreme Court in 2009 moved responsibility for regulating the environmental impact of salmon farming from the province to the federal government (the decision did not apply in Atlantic Canada). This concentrated decision-making in the hands of a single level of government, although the province still retains control over licensing. A second decision in the Federal Court of Canada in 2015 limits the ability of the federal government to rely on industry self-monitoring and self-reporting, thus renewing the call for direct oversight of the industry.

Despite the 2015 ruling, the DFO refuses to test hatchery-raised salmon smolts for the presence of dangerous salmon viruses before allowing the transfer of fish to open net cage pens in the ocean. This is of grave concern to advocates for wild salmon in British Columbia. The case of heart and skeletal muscle inflammation (HSMI) illustrates the failure of federal oversight and has become a flashpoint in the controversy over the industry in BC.

Eggs/smolts bound for fish farms can harbour (among other diseases) a virus leading to HSMI, which is one of the main disease threats to fish farming operations worldwide. This disease has now been confirmed in British Columbia fish farms by a team of researchers that includes a DFO scientist. A



European strain of the piscine reovirus (PRV) that causes HSMI has been found in wild salmon, but wild fish that develop HSMI, unlike those in fish farms, quickly succumb to the disease and/or to predation. In Canada, the salmon aquaculture industry, with the support of DFO, claims that PRV does not cause HSMI, even though this link is a well-accepted fact by fish health experts in Norway, and was established after extensive scientific debate. A new lawsuit, following up on the 2015 ruling, is now before the courts. It seeks a court order to force the Minister of Fisheries and Oceans to abide by the 2015 court decision and “apply the precautionary principle when approving fish transfer licenses.”

The year 2009 saw a dramatic reduction in the number of sockeye salmon returning to the Fraser River system to spawn. These ultra-low returns spurred the federal government to convene a Judicial Inquiry, headed by retired BC Supreme Court Justice, Bruce Cohen. The Cohen Commission received thousands of submissions over more than a year of hearings. At the end of the scheduled hearings in December 2011, Judge Cohen re-opened the inquiry to hear testimony that wild, Cultus Lake salmon (one of the most endangered runs on the Fraser River system) had tested positive for infectious salmon anemia (ISA) virus — a virus that is associated with lethal and devastating outbreaks on fish farms. It came to light that DFO had attempted to hide this data from the Commission. The problem of transparency plaguing DFO, and its split mandate — on the one hand to protect wild salmon, and on the other to promote the salmon aquaculture industry — were brought into sharp relief in the testimonies heard by Judge Cohen.

Cohen ultimately concluded that no single factor was responsible for the decline, but included several recommendations for regulating the salmon aquaculture industry, including the removal of farms from salmon migration routes if the government was not certain that they posed minimal risk. There is also a moratorium on industry expansion until it has been proved that the industry does not impact wild salmon negatively. The Cohen recommendations have become a key focal point for groups skeptical of salmon aquaculture.

The mid-2000s onwards have also been a time of unprecedented environmental changes. Warmer Pacific waters (colloquially called “the Blob”) in 2013-2015 have had an impact on wild Pacific salmon populations. Warmer river temperatures and lower flow volumes (due to reductions in winter snowpack) also appear to be affecting the behaviour and survival of adult salmon returning to spawning grounds.

These environmental changes are causing renewed scrutiny on the salmon aquaculture industry, in part because it is a “governance object” that is more controllable than changing climate and animal behaviour. By consequences, the salmon aquaculture industry is expanding production incrementally within its existing suite of licenses, and does not plan for large expansions in the near future. The industry promotes its existing partnerships and signed agreements with indigenous groups as being a step towards recognition as a legitimate user of nearshore space. However, we heard a variety of perspectives during our research meetings on this subject, including criticisms that agreements with industry do not reflect majority opinion in many indigenous communities.

## **2.2 Faroe Islands**

### **Process – licenses and sites**

Farming of salmonids grew into an industry in the Faroe Islands during the 1980s, where typical several small entities were established in sheltered embayments and straits. After several set backs in the industry the number of companies reduced dramatically, and slight modifications were done in the regulatory framework each time. The main change of the organization of the industry happened in the wake of the devastating outbreaks of the ISA disease in the first years of this millennium. This led to a regulation framework based on management zones (MZ), which in its first edition typical was single embayments or fjords separated by straits with strong tidal currents, wherein all operations should be coordinated in terms of stocking, treatment, and harvest, or as phrased in the public as “one fjord - one farmer”. Through merging and reorganization of companies, which today are reduced to only 3 companies, there are only one single operator in each of the original MZ, although some of MZs still may include several farming sites. In 2010 and again in 2012 the MZs were enlarged beyond the natural settings of the embayments and fjords, and the separations zones were in most areas included. From a natural science perspective, the MZ now becomes more territorial areas allocated to the actual operator in each MZ.

The license to farm in a site is formally issued by the Minister of Industry according to the Act on aquaculture, which requires that conditions in the acts of food security, animal diseases, and environment are fulfilled. In practice the first three acts are administrated by the Food and Veterinary Authority under the Ministry of Industry, while the last act is administrated by the Environment Agency, which currently is a body under the Ministry of Health and the Interior.

The process of a new license includes hearings from the local municipalities, conservation authorities and other potential users in the area. The license, which may be valid up to 12 years, is for a site, which typical is an area much larger than required by the actual plant. When a license is provided, approved management, surveillance and production plans are required for each production cycle.

### **Participation in aquaculture**

The main participants are the three salmon farming companies, which all are relatively vertically integrated from hatcheries to sales and distribution, and the central authorities. In addition there is companies providing various services to this industry and research institutes. New in the aquaculture landscape is seaweed farming. Other participants are municipalities, coastal - especially lobster fishermen, tourists, recreational and some other interests.

### **Knowledge production themes and issues**

In the development of the industry substantial knowledge transfer was first from Danish trout farming and later from the Norwegian sea farming. After the reorganization of the industry after the set back first in this millennium, knowledge transfer from Norway and other salmon farming countries has continued, but the search for new technologies and knowledge is widened to be more global, and at the same time development in the industry, in government bodies and research institutes has increased and made the industry a global frontrunners in some areas. However, if measured in spent funding relative to produced volume, there is still room for significant improvements before reaching the level seen in the neighbouring countries.

### **Types of conflicts**

Area conflicts are mainly with coastal lobster fishermen, while minor issues have been related to the emerging tourist industry, municipalities mainly by locating sewer outlets, disturbance of nature sceneries views by locals as well as tourists, and the environmental foot print of the industry and how this should be monitored and handled.

Other conflict is interpretation of the limitation in the Aquaculture act that no person or entity can control more than 50 % of the farming licenses in the process of merging companies and sites, in the realization that near all sites were sea farming with known technology are in use, and how the actual calculations should be handled in case of establishment of new sites. Also the limitation of foreign ownership and how the tax-system benefits central municipalities hosting the main offices and processing plants relative to the rural small municipalities providing space to the fish farms are issues for debate.

The present regulation provides to a large degree control over the MZ to the licensed salmon farmers, which currently makes it problematic to initiate other farming activities within the same framework. A proposal to modifications of the present act is currently out for hearing.

### **Conflict resolution approaches and strategies**

The development and implementation of the new regulation after the setback caused by the ESA mentioned above, was in large degree lead by the industry in good cooperation with the representatives from the authorities. Other emerging issues has been settled in a similar way in some cases with local research institutes or/and external expert groups as the neutral facilitators.

The tradition for planning and mapping is not well developed in the Faroes, and the resources for this task is generally limited. Meanwhile, the number of involved parties is quite limited, which generally implies relatively easy task to get the involved parties around the same table, in particular when it is required by a given situation.

### **Lessons learned**

The salmon industry is currently responsible for near 50% of the export from the Faroes, which is the fifth biggest salmon producing country measured by volume, and far the largest measured in volume per capita. Due to near full exploitation in available sites with present technology, the land-based phase of the production is already expanding, and new semi-enclosed solutions is expected in near future. However, further expansion in production has a clear horizon. Due to its size in produced volume, as a country and as part of the global community, the Faroese influence on the global market is very limited. Further, the hydrography makes the entire sea farming network highly connective in terms of diseases. This implies that all solutions for a sustainable industry at home and lowering the potential risks from outside must be searched.

## 2.3 Norway

The Norwegian aquaculture system is based on licenses and sites. The government allocates licenses (at present ca. 1000) while the coastal municipalities are responsible for distributing production sites, in a complicated process overseen by the County authorities. At present the aquaculture industry is highly profitable, but the actual production has stalled at 1.2 million tons per year, or the same volume as produced in 2012. The government has high ambitions for the industry, opting for a triplication of the volume by 2030, but besides the problems related to sea lice, lack of space in terms of good production sites seems to be a major obstacle. Here the municipalities are claiming: “No pay, no cure!” - clearly indicating that they seem to receive too little of the present windfall gains in the aquaculture industry.

Access to space is regulated through a complicated process of coastal zone management, where each of the 275 coastal communities are responsible for the actual planning of “their” sea areas, stretching out to the base lines + one nautical mile. Plans can be made as separate coastal zone plans or as integrated plans for the entire municipality. In this process all stakeholders are invited to give their submissions, but in practice the participants are often limited to aquaculture farmers, fishers, both professional and recreational, i.e. in particular wild salmon anglers. Several state agencies are given veto powers as to where aquaculture sites can be located, including the Sami Parliament, which is the representative elective government body for the Sami people in Norway.

Part of the Norwegian success in salmon farming is due to the open system for knowledge production. The system is comprised of research being undertaken in universities, research centers and by the industry itself. All issues from fish health to technologies, economics and management are examined, and large amounts of money are each year spent by public as well as private entities. However, so far sustainability has mainly been a question of biological sustainability, while economic and social issues have been lagging behind.

While conflicts may vary from one municipality to another, the main conflict in the northern Counties is between fishers and the aquaculture industry, while in the southern Counties the conflicts are dominated by recreational interests. Fishers of wild salmon are in conflict with the aquaculture industry all along the coast, while military interests (the Navy) and their limitations on marine activities, including fish farming, in large marine areas, have so far largely gone unnoticed. Over time Sami interests have also become more pronounced, especially in the northern Counties where the Sami Parliament has taken an active role in protecting Sami interests through its influence on coastal zone planning processes. This is in sharp contrast to the model of interaction between the industry and First Nations in Canada, where direct agreements are more common and the state and local governments do not have the same planning authority over coastal space as in the Norwegian coastal zone.

From our visit to and conversations with different First Nations in British Columbia, it was also interesting to experience the differences not only between material and social conditions, but also in the points of view on the industry depending on benefits and to what extent concerns were addressed in interaction with the industry. While some First Nations have direct agreements with industry (such as Ahousaht), and others cooperate on a range of issues and contracts, a majority of First Nations in British Columbia seem opposed to the industry. A similar diversity in indigenous/local community-industry interactions can be observed in Norway, ranging from communities who advocate for allocation of fish farming licenses to their sea areas, to complete rejection of aquaculture due to

environmental concerns for wild salmon, whitefish fisheries, and the marine environment. Recognition of indigenous rights to fisheries and to sea water areas is a small, but emergent, part of the conversation which may play a larger role in the future, but not as large as the role of the courts in Aboriginal rights recognition in Canada. There are no direct agreements between the Sami Parliament or Sami or local communities and the industry, although there are instances of sponsorship towards individual municipalities from industry actors.

The general approach to industry development in Norway is rather that conflicts should be solved through local government planning, in a process where conflicting interests and space allocation are sorted out prior to the municipalities' approval of the plan. Nevertheless, over the last ten years many conflicts have been decided at government level, where the Ministry of Fisheries and Coastal Affairs has made the final decision. When plans are old or out of date, sites have to be allocated by dispensation, which in turn has generated many new conflicts. At present there are heated debates regarding the footprint of the aquaculture industry, and large parts of the public are not convinced that the industry is doing enough to sort out the problems of sea lice, escapes, genetic interaction with wild salmon stocks, alleged impacts on major commercial fisheries, and pollution. Hence, while the product (salmon) is still enjoying great public approval, the industry is scoring lower and the rate is falling.

In technological terms the Norwegian salmon industry is a front-runner and in competing countries like Canada, Iceland, Scotland and Chile, the same Norwegian solutions are being promoted (largely by Norwegian owned companies). Open net pens in protected fjords have been the greatest competitive advantage for Norwegian salmon farmers. However, this system is now being challenged by production on land or by semi-closed net pens at sea. In spite of excellent returns and ever increasing production records (in terms of value) salmon farming is at present, challenged by lack of legitimacy. This has so far been countered by facts and figures, but rhetoric seems to trump scientific information. One of the main lessons gained from the Norwegian aquaculture system is that greater transparency would benefit all parties. Furthermore, that the various public agencies need to cooperate closer in order to streamline the process of getting access to new sites, a prerequisite for increased production. This is in particular a challenge when Norway is facing a dramatic decline in the oil and gas industry. Aquaculture is in this respect considered one of very few alternatives for people residing in small coastal and rural communities.

## **2.4 Sweden**

### **Process – licenses and sites**

In five different national inquiries the hydropower dams in the north of Sweden has been pointed out to have a great potential for aquaculture. The potential are due to a much altered ecosystem, oligotrophic waters, remote rural areas and clean cold waters. If the fish is farmed in open cages at least 50,000 tons can be farmed in these waters. The Swedish breeding programs for Arctic Char and Rainbow trout is another factor that is of great importance. As in Norway the aquaculture industry is highly profitable and the government has high ambitions for the industry, but the volume of farmed fish has stagnated at 12,000 ton a year. Appeals concerning eutrophication, fish diseases and escapees has stopped at least 10,000 – 15,000 tons of new production since 2012.

The license system in Sweden is based on site, permit and feed consumption (total phosphorus emissions). The fish farming company are responsible for finding a good locality for the farm and start

the process of getting a permit. Several attempts has been made to copy the Norwegian system where the municipality's should point out good locality's for fish farming in their comprehensive plans, but so far all these attempts has failed. The reason for this is that almost all of the land and waters in these power dams are privately owned. To get access to a good farm site, a lease or option agreement to buy the land and water are made between the fish farmer and the landowner. When such an agreement is signed the application process for a license can start. The license process contains four cornerstones, stakeholder consultation with authorities (county board, board of agriculture, EPA, Swedish agency for marine and water management) and the municipality, extended consultation process with local residents, NGO,s and competing activities (tourism, fishing, first nations, other water users, etc.), the application, and the environmental impact (EIA). The two stakeholder consultations gives the fish farming company a good hint on what is important to address in the EPI and application so that conflicts and appeals can be avoided. The size-limiting factor for the fish farm is the feed consumption, which is correlated to total phosphorus emissions into the lake. Depending on factors like water turn over, depth, size and background levels of phosphate, different lakes have different prerequisites for fish farming. The volume of fish farmed in a certain lake is calculated by an equation provided by the EPA. The EIA document shows how the activity will affect the environment and human health.

### **The process in short**

**Application:** The procedure starts with an application that is submitted to the permit authority. The application must include a report on the activity, its impact, the parties concerned as well as other relevant matters that are needed in the permit consideration and stakeholder consultations reports.

**Opinions:** After the application is submitted, the authority in charge of the procedure needs to request opinions from various stakeholders, who are specified in the Acts.

**Complaints:** before passing a decision on a permit, the permit authority shall provide those whose rights or interests might be concerned (party concerned) with an opportunity to lodge a complaint regarding the matter. Persons other than parties concerned shall be provided with an opportunity to state their opinion.

**Publicizing the permit application:** The permit authority needs to publicize permit applications, additionally relevant authorities and those especially concerned by the application need to be notified separately.

**Permit decision:** Environmental permits are issued either until further notice or for a fixed period. The grounds and justification of the ruling shall be indicated in the permit decision. The decision must respond to separate demands made in opinions and complaints.

**Appeal:** A permit decision may be appealed to the court as laid down more specific in the Acts. The right to appeal pertains to persons whose rights or interests may be affected by the matter as well as certain authorities specified in Section 97 of the Environmental Protection Act.

### **Participation in aquaculture?**

County board, Swedish board of agriculture, EPA, Swedish agency for marine and water management, Municipality, local residents, NGOs, competing activities such as tourism, fishing, first nations, other water users, etc, Environmental Assessment Delegation, Land and Environment Court, Land and Environment Superior Court.

### **Knowledge production themes and issues**

Fish farming research has been going on since the beginning of 1980 mainly at the University of agriculture (SLU) and at Gothenburg University. The Swedish system for knowledge is open and research is undertaken in universities, research centers, no research is made by the industry itself, but the industry do participate in different research projects. Swedish research has been lagging for a couple of years due to reorganization at SLU. The issues at concern are breeding programs for arctic char and rainbow trout and environmental projects and some feed projects. EU project play a large part in Swedish aquaculture, issues that is not quite research and not industry can be discussed and worked with in a EU project.

### **Types of conflicts**

The main conflict in Sweden is about aquaculture's impact on the environment. Aquaculture is accused of polluting the water with sludge, eutrophication, fish disease, interactions with wild fish, scaring away the fish tourism, use of large amounts of antibiotics and other medicine in the feed, and aquaculture is also accused of emptying the oceans and starving the people in Africa and so on. There are also conflicts between RAS farmers and open cage farmers, "it's not sustainable". When public funding is limited RAS and open cage farmer's fight and argues about what farming method is the best and both parties have lobbyists that massage politicians and authorities with information. There is also a conflict between farmers and authorities on the problems with new licensees and time consuming expensive process to get one.

The knowledge of aquaculture in general (among common people) is low compared to Norway, Iceland and the Faeroes.

### **Conflict resolution approaches and strategies**

Present conflicts are solved in court.

### **Lessons learned**

One of the main lessons gained from the Swedish aquaculture system is that greater transparency would benefit all parties.

In Sweden open cages are considered as an obsolete technology with no future. New entrepreneurs have to be more humble, transparent and accommodating with local entities to minimize conflicts if they what to use open cage farming methods.

Land based RAS farms has so far a very low risk of conflicts.

Municipalities should put conflict free aquaculture sites in their comprehensive plans. Licenses can then be sold or rented out to farmers by the municipality. The municipality and the local entities have to set up the framework for what type of aquaculture they can accept. In that way people living close to a fish farm becomes more involved and feel that they have a say in the process, in short terms more local governance.

## **2.5 Iceland**

### **Process – licenses and sites**

Until recently, the aquaculture production in Iceland has mainly been in land based facilities, most of which were built around 1990. The largest of these fish farms have a capacity for 1500 mt annual

production and were originally designed for salmon production although currently they are mainly used for producing Arctic charr. Attempts were made at large scale cage rearing of salmon just after 2000 but discontinued. In recent years, the production of Atlantic salmon in Iceland has increased from less than 300 mt in 2008 to a predicted 11 000 mt in 2017 and more than 24 000 mt is forecasted for 2018. Current licences are for production of near 40 000 mt and applications are in progress for a production of over 71 000 mt or even more.

According to the laws on aquaculture in Iceland, the Minister of Industry and Innovation is responsible for public administration of aquaculture affairs through the Icelandic Food and Veterinary Authority (FVA). The minister can restrict aquaculture in certain areas and now cage aquaculture of salmon is not allowed in most fjords on the north and west coasts to protect wild salmon populations. This restricts cage culture of salmon to the Northwest Fjords and in the East Fjords.

Operational licenses for production of salmon are issued by the FVA and The Environmental Agency of Iceland. Applications are sent to the FVA which, in turn, consults other government agencies and municipal authorities before issuing licenses. Licences are valid for ten years, although licences may be issued for a shorter period if local (e.g. ecological) conditions require. The licence can be revoked if the applicant does not conform with laws and regulations on aquaculture. The applicant pays a fee to cover the cost of processing the licence, but no other charges apply except annual fees for inspections. The application must contain information on the ownership of the company, quality standards, documents, a description of the equipment used and a confirmation that it meets the Norwegian NS 9415:2009 standard, expected production volume and an estimation of the carrying capacity of the area. The application must also include the decision of the National Planning Agency (NPA) regarding environmental impact assessment (EPA). In most cases, the NPA will require an EPA to be conducted before licences are issued for larger sea cage farms or for expansion of production. The process for the EPA includes consultation with relevant government agencies, municipalities and stakeholders.

### **Participation in aquaculture**

Until recently, all fish farms in Iceland were locally owned. From around 2000, fishing companies owned most of the larger farms injecting the investment required for the further growth of aquaculture in Iceland. The ownership of Icelandic fish farms has changed in recent years. Stolt Sea Farm has recently constructed a land based facility for Senegal Sole which is now being expanded for production of 2000 mt. Norwegian companies have invested significantly in Icelandic salmon production in recent years.

The company Stofnfiskur produces eggs for the Icelandic salmon companies and for export. Stofnfiskur was recently sold by the Icelandic owners to a company in the UK. The eggs that Stofnfiskur produces with their selection programme are descended from Norwegian stocks.

### **Knowledge production themes and issues**

During the initial development of aquaculture in Iceland in the early nineties, companies relied on Norwegian experience. However, the development of large scale land based aquaculture in Iceland relied also on considerable local development which has been funded by the Ministry of Fisheries and The Icelandic Centre for Research. The recent development of cage culture of salmon depends also on Norwegian technology.



### **Types of conflicts**

In contrast to sea cage culture of Atlantic salmon, the land based aquaculture in Iceland has never been a source of controversy in Iceland. The conflicts related to sea cage culture revolve around potential impact of aquaculture on wild salmon stocks. The discussion has polarized between fish farmers and municipalities with interest in salmon aquaculture on one hand and owners of salmon fishing rivers as well as angling associations on the other hand. The debate is primarily about the effects of escapes on wild salmon stocks and the potential effects of sea lice on wild smolts. The anti-aquaculture lobby has suggested that experience from Norway and Scotland suggest that aquaculture has had negative effects on wild stocks. The pro-aquaculture lobby (fish farmers and the municipalities in the North West and East Fjords) have responded by pointing out that the fish farms use the best available technology and that aquaculture has opened up new possibilities for developing work in areas suffering badly from depopulation and declining communities for decades.

### **Conflict resolution approaches and strategies**

The ban on sea cage aquaculture of salmonids in the western and northern part of Iceland, instigated by the government in 2001, can be viewed both as a measure to protect wild salmon populations and as a resolution to the debate on sea cage aquaculture. The ban excluded salmon aquaculture from areas where the largest salmon fishing rivers are found and restricting sea cages to areas where there are no or few wild salmon populations. The extent of the ban is still being debated and the current minister of industries and innovation has suggested that further restrictions to sea cage aquaculture may be imposed.

Recently, the Marine Research Institute produced a risk assessment for salmon aquaculture in net cages. There it is concluded that the acceptable salmon production in Iceland 70 000 mt. However, this risk assessment will be under constant review depending on outcome of studies monitoring the presence of aquaculture fish in rivers and the status of the wild populations.

In December 2016, the ministry of industries and innovation formed a task force for drafting an official policy on aquaculture. The task force members came from the ministries of industries and environment, the Icelandic Fish Farmers Association and the Federation of Icelandic River Owners. The task force finished the work in late August 2017 and made a number of suggestions about the future of salmon aquaculture. These include, among others, to limiting production to 70 000 mt as suggested in the risk assessment and restricting further areas that were previously open to aquaculture. The taskforce also suggest that fish farms should be charged for use of natural resources although these fees can be waived when sterile triploid salmon is produced. The fees will mainly be used to establish infrastructure in areas where salmon production is increasing. Furthermore, the task force made a number of recommendations for the structure of the licence process and the monitoring of aquaculture.

It remains to be seen, to what degrees these suggestions will be implemented and how much they will contribute to the resolution of the debate on aquaculture.

### **Lessons learned**

The authorities (ministry and agencies) in Iceland were poorly prepared for the rapid expansion of salmon aquaculture in recent years. For example, the Marine Research Institute was in the process of completing an assessment of carrying capacity of Icelandic Fjords at the same time as aquaculture is expanding. Government policy on aquaculture was lacking although the Ministry of Industries and

Innovation founded a committee that will draft a policy statement for the sector. Moreover, the tools for the resolution of issues such as the aquaculture debate are not in place.

### 3 Presentations at the second AquaLog workshop

The presentations from the second AquaLog workshop are available below:

- Norwegian salmon farming at the cross-roads? Bjørn Hersoug, UiT - The Arctic University of Norway, Norway
- The Changing Political Landscape of Aquaculture in Canada, 2009-2017, Nathan Young, University of Ottawa, Canada
- Comparing indigenous relations with aquaculture in Norway and Canada, Dorothee Schreiber, Tamarack Research, Montreal, Canada and Camilla Brattland, UiT - The Arctic University of Norway, Norway
- Aquaculture and regional development in the Faroe Islands, Knud Simonsen, Aquaculture Research Station of the Faroes, Faroe Islands
- From cage to land based in Sweden, Erik Olofsson, Torsta AB, Sweden
- Controversies, aquaculture governance and coastal zone planning, Ann-Magnhild Solås and Ingrid Kvalvik, Nofima, Norway

Norwegian salmon farming at the cross-roads?

by

Bjørn Hersoug,  
UiT - The Arctic University of Norway, Norway

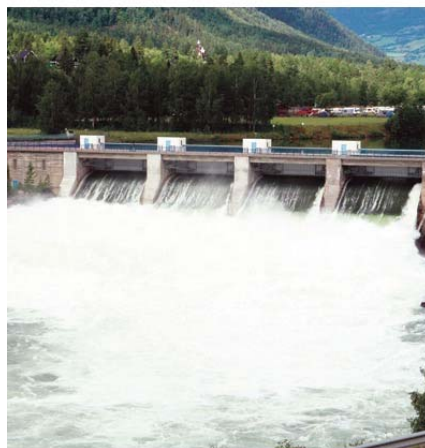
## Norwegian salmon farming at the cross-roads



Bjørn Hersoug, Norwegian College of Fishery Science,  
University of Tromsø, The Arctic University of Norway  
Canada 2017

## Three smart solutions

- 1906-1909: The concession laws regulating hydroelectric power
- 1963: The Petroleum Act (all oil and gas resources belong to the Norwegian state)
- 1977: 200 miles EEZ regulating marine resources



Canada 2017

## Our planning system at sea – not so smart?

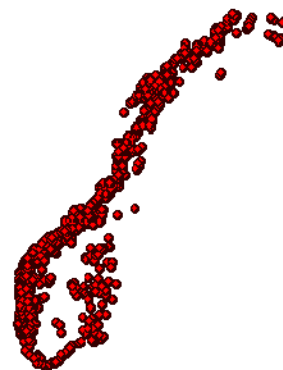
- Complicated
- Slow
- Sector interest with veto powers
- Not geared to eco-system management



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## Plenty of space?

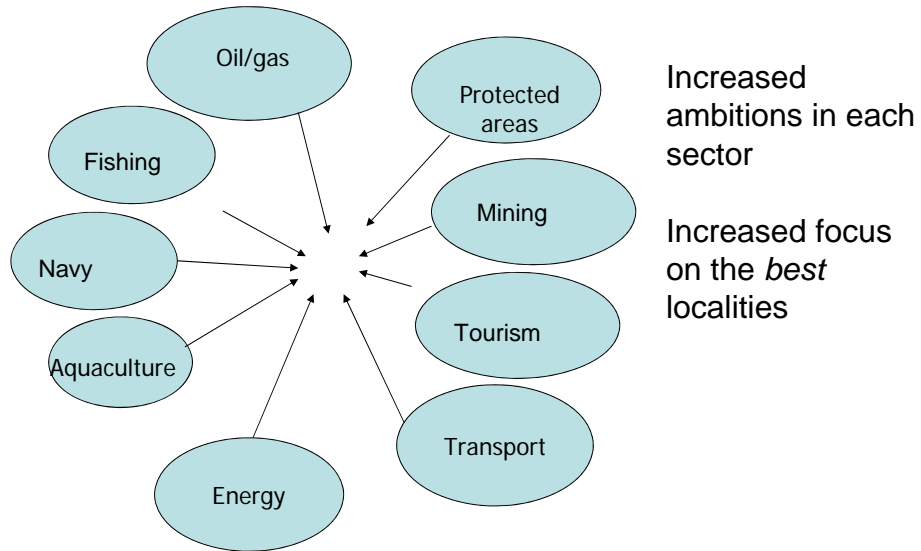
- Starting point: 2500 km of coastline (101,000km if all fjords and islands are included) and only 5 million people
  - Conclusion: there should be more than sufficient space for all activities
- But:
- Rapid expansion in all coast related sectors and industries
  - All areas not equally valuable (the need for "super localities" in aquaculture)



Aquaculture localities 2015

Canada 2017

## Several competing interests

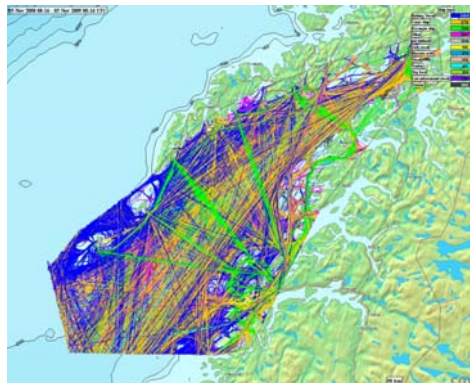


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## In the old days

We had two user groups:

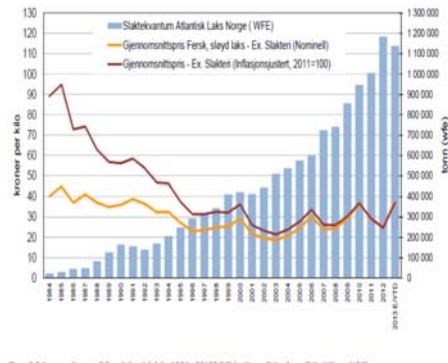
- Fishers and sea transport
- Mutual adjustment
- Area management in fisheries to secure catching rights during the seasonal fisheries
- Transport lanes had priority
- No need for spatial planning



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## Aquaculture: The new guy on the block

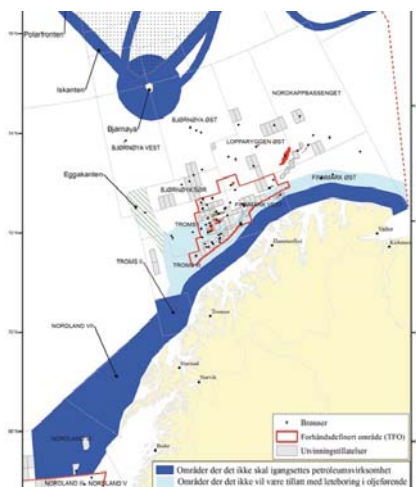
- *Salmon in net pens at sea* a new development from the early 1970s
- Sea area became a production asset
- Need for exclusive use
- Political allocation of licenses (to be a decentralised industry)
- Planning as a **requirement** for allocation of licenses



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## Different planning systems

- Oceans: *Indicative* plans for the Barents Sea, the Norwegian Sea and the North Sea
- Revised every four years
- Ministry of Environment responsible
- Cooperating with all relevant sector agencies
- “How to introduce the oil industry in troubled waters”



Canada 2017



## Planning within coastal waters

- Plan and Building Act of 2008
- 276 coastal municipalities with their own plans
- Planning in sea as part of municipality plan or as separate coastal zone plan
- Planning of sea areas= voluntary



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## Status 2017

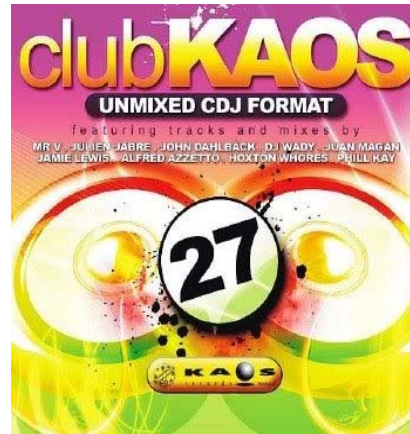
- New Planning and Building Act in 2008
- Conservation plans on national and county level
- Coastal shipping lanes: a national responsibility (Kystverket)
- Integrated management plans for the Barents Sea + Lofoten, the Norwegian Sea and the North Sea
- Consequence analysis for oil and gas development (PUD and PAD)
- Management plans for fish stocks
- Nature Index for Norway
- Water directive (following the EU)
- National and regional conservation plans



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## Plan chaos?

- Area plans
- Resource plans
- Sector plans
- Ecosystem plans
- Conservation plans
  
- Difficult coordination
- Local plans can be overturned by national requirements
- National plans can be delayed by local foot dragging
- So far; no system for optimal allocation of space



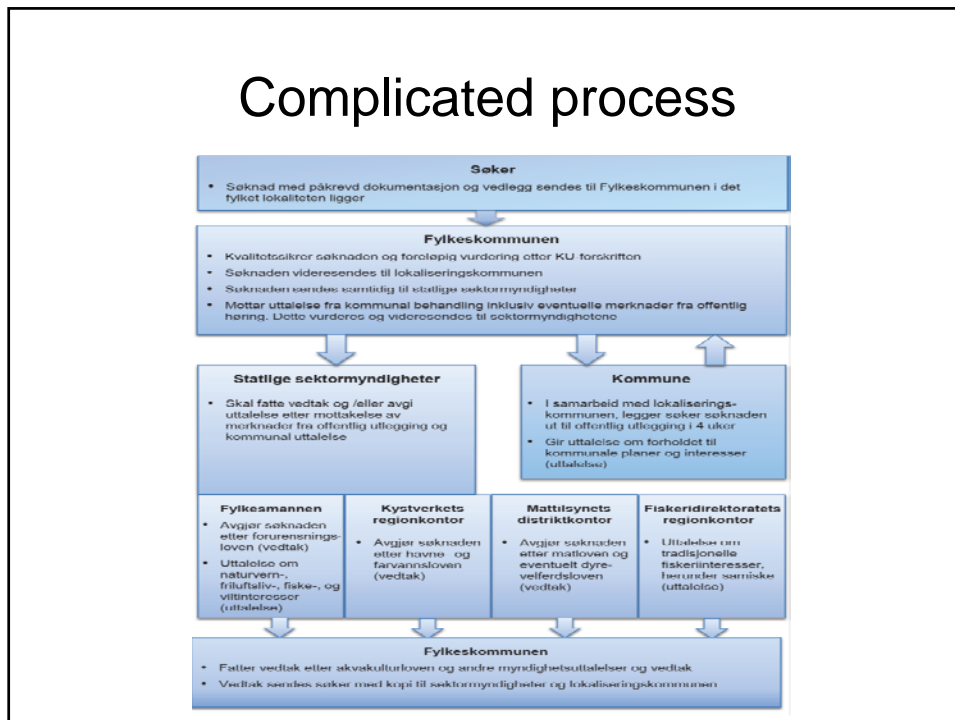
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## Two systems for doing aquaculture

- Getting a **license**: Apply or buy
- Getting the right to farm salmon and trout
- Regulated by maximum allowed biomass (MTB)
- 780 or 945 MTB
- Industry strictly regulated by several ministries
- The Ministry of Trade, industry and fisheries (NFD) responsible
  
- Getting a **location**:
- Seek the best place
- Application to the municipality
- Dependent on where they have allocated A-areas (or multi-use areas)
- Localities certified for 780 to 10,000 tons MTB
- County authorities coordinate the process

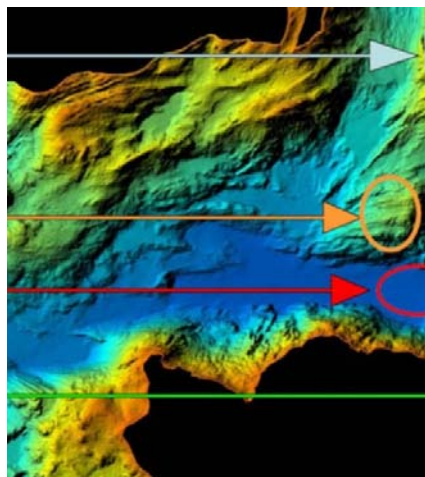
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## Complicated process



## What about the other stakeholders?

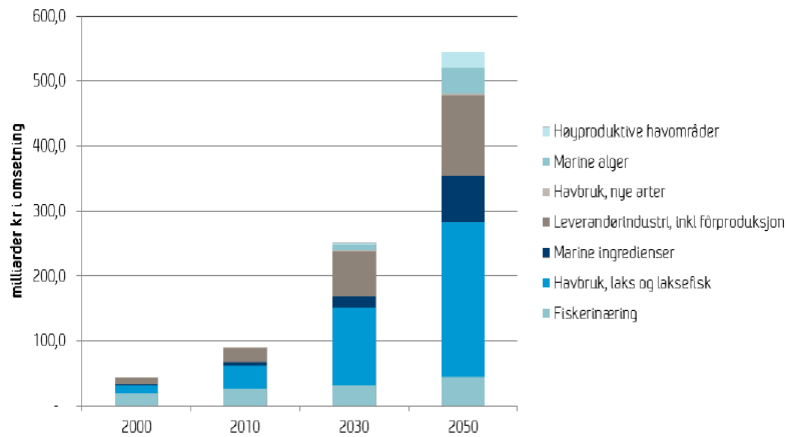
- NO to aquaculture, if:
- Conservation areas
- Fishing grounds
- Shipping lanes
- Biodiversity concerns
- Important recreational areas
- These agencies have VETO power!



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## The optimistic news

### Scenário 2050: Potensial for marin verdiskaping

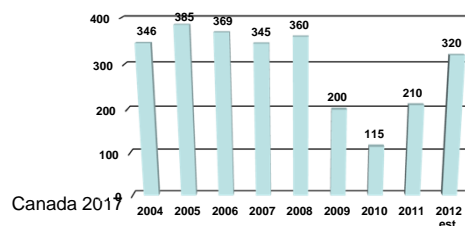
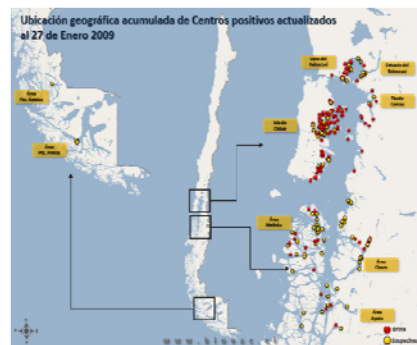


Figur 1-3 Potensial for marin verdiskaping

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## The bad news

- Chile as an example of too rapid expansion, without necessary controls
- ISA was not an earthquake!
- There is a need for planned expansion
- How to expand while being sustainable ?



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## Three large challenges

- Sea lice
- Escapes
- Available areas

### Four new initiatives:

- Green licenses
- A new growth regime
- Development licenses
- Onshore (land-based) production



Canada 2017  
NFH 2017

## The challenge: How to get access to more space?

- The Area committee 2011:
- 25 proposals to solve the most pressing problems in the aquaculture industry
- Production areas (23) and put out zones (at least 4 in each area)
- Using smolt mortality as an indicator (at present 20 % loss)
- Forced relocation of farms in crowded areas (stick and carrot)



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## Green, greener, greenest

45 green licenses

Group A

20 stk Troms og Finnmark  
10 mill. NOK per License  
Max 0,25 lice per fish

Group B

15 stk. public auction  
Entire country  
Max 0,25 lice per fish

Group C

10 stk. «Deep green»  
Entire country  
10 mill. NOK per license  
Max 0,1 lice per fish

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## The traffic light system

- The industry would like a stable framework for growth
- *No growth in Norway since 2012!*
- To be implemented from October 2017
- Based on the environmental conditions in 13 different production zones along the coast
- So far, one indicator: the number of sea lice per salmon
- MTB to be regulated up or down (or stable) 6% every second year
- The system heavily disputed by industry organisations



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## Development licenses (from 2016)

- An attempt of developing new technologies
- Further offshore or closed systems in the fjords
- So far 45 applicants, but only 3 granted
- Involves heavy investments (200-900 mill NOK)
- Therefore applying for many licenses (6-39)
- Licenses for free , but 10 mill NOK if successful after 15 years



KMD S@minnaafab@n 2017

## Landbased systems

- Licenses for free
- One granted, several pending
- Economic viability?
- Pumping costs and problems of getting rid of offal
- Larger smolt (up to 2 kg on land) a more realistic scenario
- New facilities for larger smolt built and planned along the entire coast

Land-based salmon farming.  
Future or fantasy?



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## The real Challenge: No pay, no cure!

- In the old days: local owners, local workers, local tax
- Now: central owners, partly local workers, little tax
- Very different incomes depending on processing structure
- So far no area fee, so..
- Many municipalities not interested in more aquaculture

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"I'm worried. I'm rich, but I'm not getting richer."

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## No shortcut to progress!

- The new production areas do not follow municipality borders
- Ecosystem based planning do not follow municipality borders
- 3 (4) possible solutions:
  1. Bottom up (municipalities)
  2. Intermediate (county)
  3. Top down (government)
  4. Inter-municipality plans



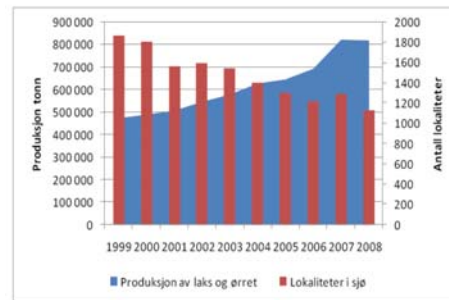
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## Small chances of state planning

- Politically disputed: difficult to reduce local influence for democratic reasons
- State planning ended in failure last time (in the 1980s)
- Still, strong demand for an ecosystem approach to planning (the municipalities are too small, planning capacity and competence = weak)
- The state has to clarify demands for planning and impact assessments (mandatory)

Areal



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## A better option: Inter-municipality planning

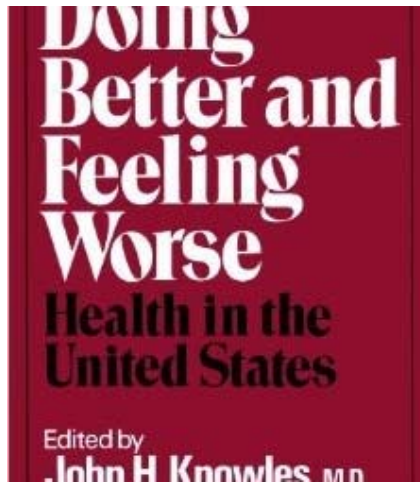
- Here a case from the north, 13 municipalities making up a joint plan, saving time, money and political troubles
- Consequence analysis on two levels required (plan level and locality)
- Rapid changes in salmon farming require changes in plans and planning
- Major revision every 4 years, minor revision every year?
- A need for joint planning of larger sea areas
- Sea current modelling and coordinated management of all farms in the same area



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## Doing better, feeling worse?

- World champion in salmon farming
- Fish stocks in good shape
- Increasing tourism
- 400,000 recreational boats in use!
- Large and leading oil & gas sector



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## Troubled waters: Legitimacy

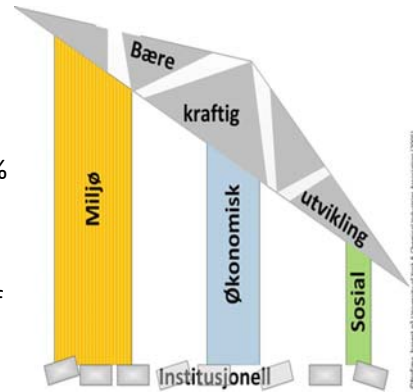
- Norway has less troubles than Canada, Scotland and Chile
- The *industry* has lower rating than the *product (salmon)*, and public approval is declining
- Room for improvement, but hardly any final solution! (organisation, knowledge, process, participation, etc).
- Today's system sub-optimal in relation to opportunities
- Facts are not sufficient!
- «Metaphores and retorics trump facts in most public debates regarding salmon farming»



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## What is sustainable?

- In Norway: an increased focus on sustainability (in biological terms)
- The growth of Norwegian salmon (and trout) farming not limited by space or ecological limits, but
- **What is tolerated by Norwegian politicians and foreign consumers** (95% for export)
- The real challenge: how to get around these limitations
- One new attempt: the development of a sustainability index to monitor the situation and to offer transparency to politicians as well as consumers



NFH 2017

## Room for improvement

- More dynamic system
- More resources to coastal management
- Less sectoral
- Need for coastal Mareano program (mapping of sea bed)
- Planning for larger areas
- Regulating so that coastal peoples get more of the benefits!



Canada 2017

The Changing Political Landscape of Aquaculture in Canada,  
2009-2017

by

Nathan Young,  
University of Ottawa, Canada

# The Changing Political Landscape of Aquaculture in Canada, 2009-2017

Nathan Young  
Sociology  
University of Ottawa, Canada

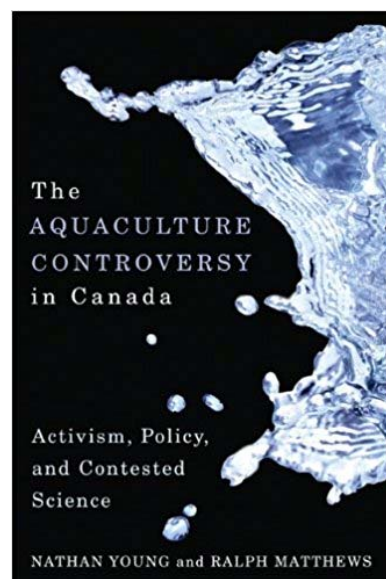
April 26, 2017

## Qualitative shifts in the Canadian aquaculture controversy

Phase 1 - 1980s - early 1990s

Phase 2 - Early 1990s-2009

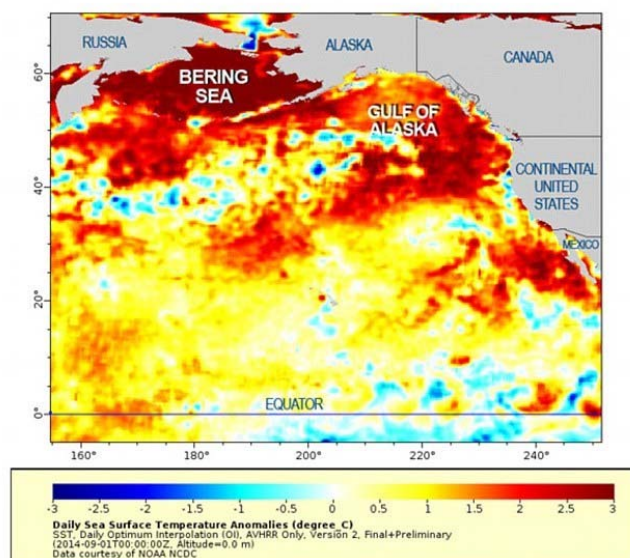
Phase 3 - 2009-today



## Phase 3 (?) Since 2009

- Biophysical developments
- Political-legal developments
- Changing internal dynamics of the controversy
- The “word” in Ottawa (an unscientific assessment)

## Biophysical developments





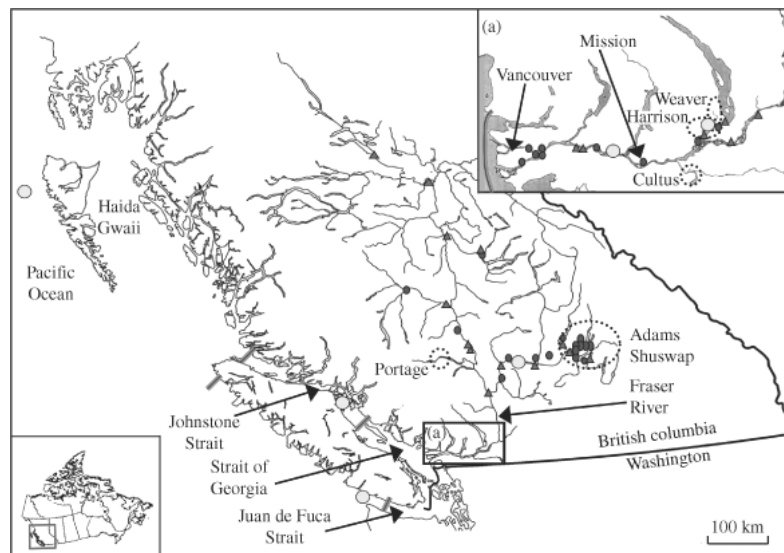
*Journal of Fish Biology* (2012) **81**, 576–599

doi:10.1111/j.1095-8649.2012.03360.x, available online at wileyonlinelibrary.com

## Dead fish swimming: a review of research on the early migration and high premature mortality in adult Fraser River sockeye salmon *Oncorhynchus nerka*

S. G. HINCH\*†, S. J. COOKE‡, A. P. FARRELL§, K. M. MILLER||,  
M. LAPOINTE¶ AND D. A. PATTERSON\*\*

\*Pacific Salmon Ecology and Conservation Laboratory, Centre for Applied Conservation Research and Department of Forest Sciences, University of British Columbia, 2424 Main



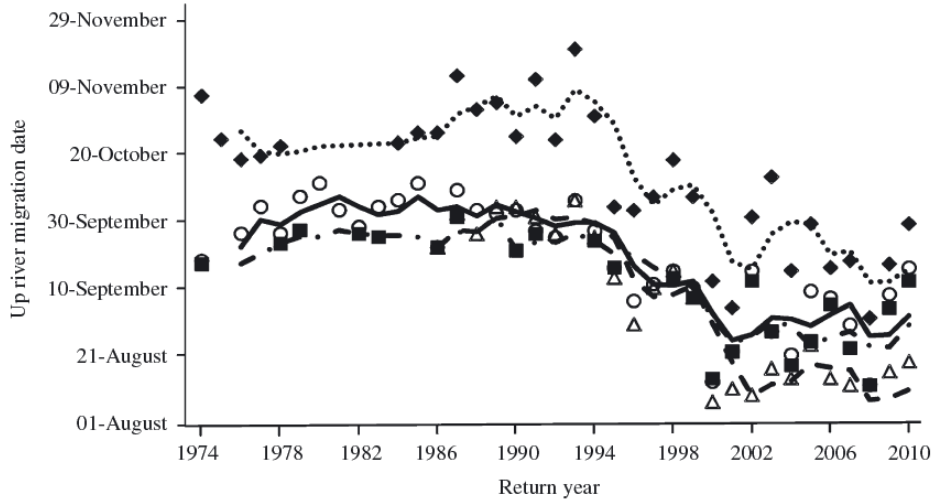


FIG. 2. Median upriver migration date (50% of the run has passed a hydroacoustic facility near Mission BC, see Fig. 1) from 1974 to 2010 for four populations [Weaver (○), Adams (■), Harrison (△) and Cultus (◆)] of late-run *Oncorhynchus nerka*. Lines are based on running 3 year averages.

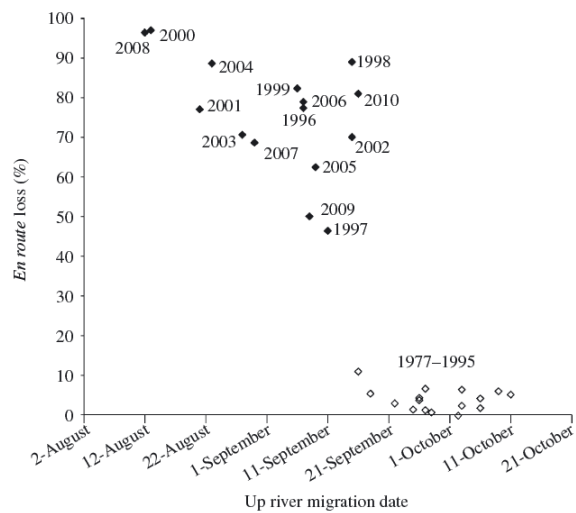


FIG. 4. Relationship between *en route* loss (as a per cent of the total run) and the median upriver migration date (50% of the run passed the Mission hydroacoustic facility) for Weaver Creek *Oncorhynchus nerka*. ◆, years since the early-migration phenomenon began for this population (1996–2010); ◇, years prior to major change in river-entry behaviour but after the start of the Mission hydroacoustic facility (1977–1995). Estimates of absolute levels of *en route* mortality are very large in some years (e.g. 2000, 270 000 fish; 2001, 165 000 fish; 1998, 490 000 fish).



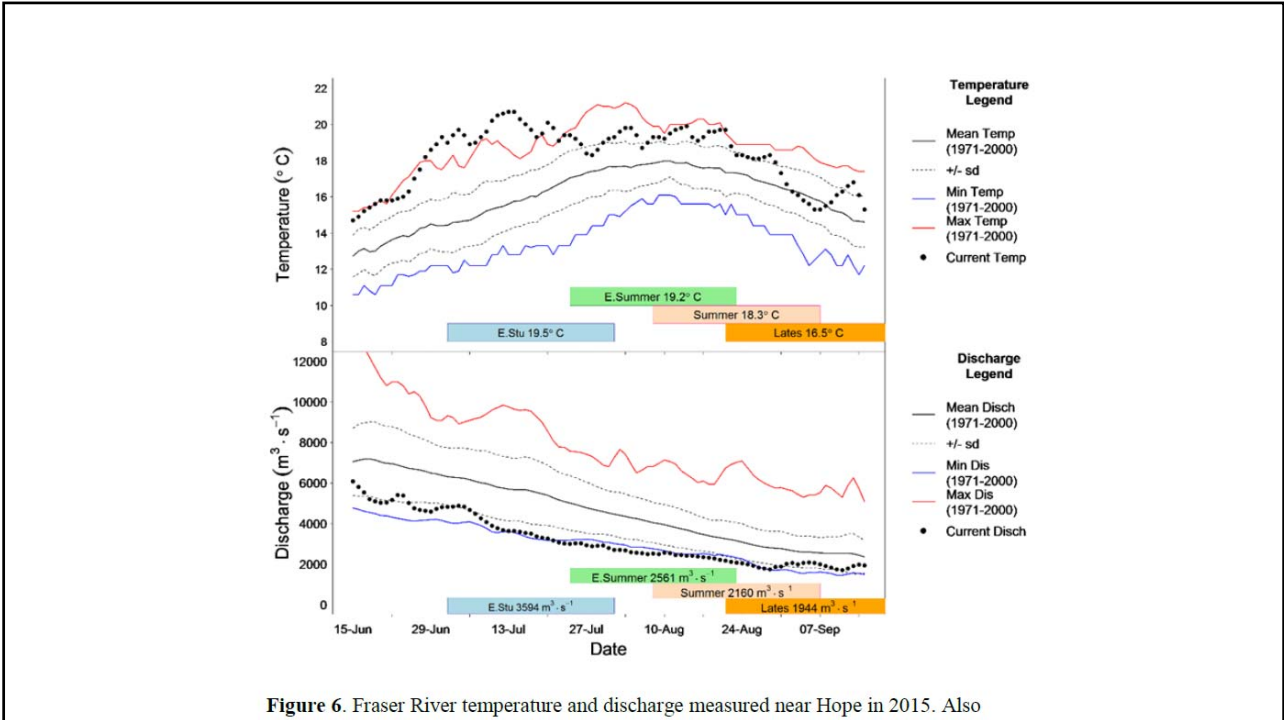
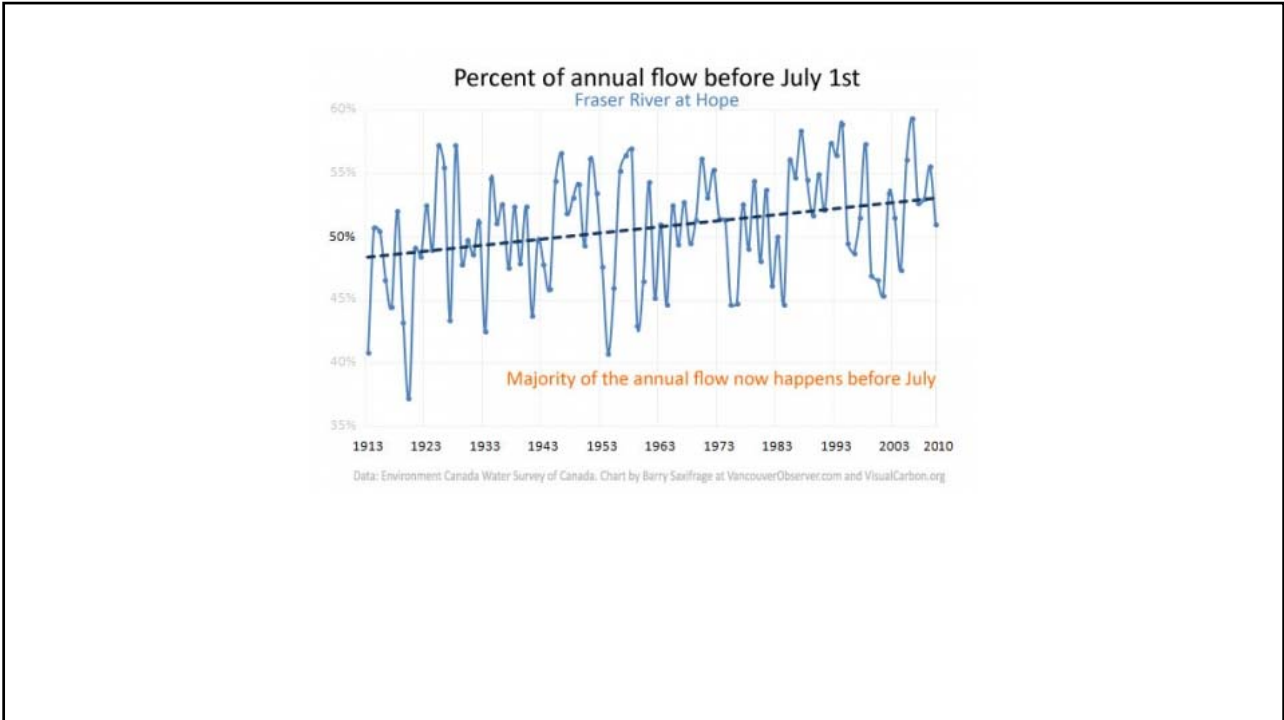


Figure 6. Fraser River temperature and discharge measured near Hope in 2015. Also

## 'Grim' Fraser River salmon runs even worse than forecast



**GORDON HOEKSTRA**

[More from Gordon Hoekstra](#)

Published on: August 8, 2016 | Last Updated: August 8, 2016 6:08 PM PDT

## Fraser River sockeye run at lowest level in more than 120 years, Pacific Salmon Commission reports

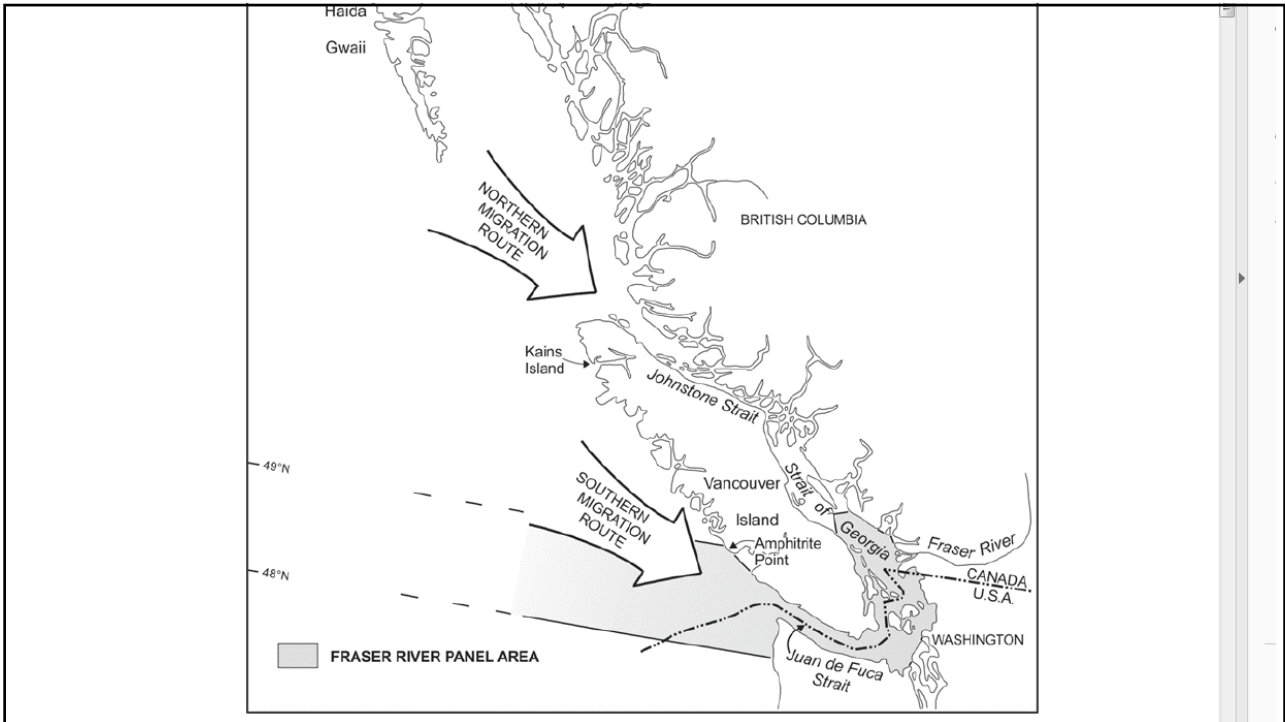


**BRIAN MORTON**

[More from Brian Morton](#)

Published on: August 19, 2016 | Last Updated: August 19, 2016 8:14 PM PDT

Political-legal developments



**IN THE SUPREME COURT OF BRITISH COLUMBIA**

Citation: ***British Columbia (Agriculture and Lands)***,  
2009 BCSC 136

Date: 20090209  
Docket: S083198  
Registry: Vancouver

Between:

**Alexandra B. Morton, Pacific Coast Wild Salmon Society, Wilderness Tourism Association, Southern Area (E) Gillnetters Association, and Fishing Vessel Owners' Association Of British Columbia**

Petitioners

And

**Minister of Agriculture and Lands, The Attorney General of British Columbia on Behalf of The Province Of British Columbia, and Marine Harvest Canada Inc.**

Respondents

Federal Court



Cour fédérale

Date: 20150506

Docket: T-789-13

Citation: 2015 FC 575

Ottawa, Ontario, May 6, 2015

PRESENT: The Honourable Mr. Justice Rennie

BETWEEN:

ALEXANDRA MORTON

Applicant

and

MINISTER OF FISHERIES AND OCEANS and  
MARINE HARVEST CANADA INC

Respondents

2015 FC 575 (CanLII)

## The crash of 2009

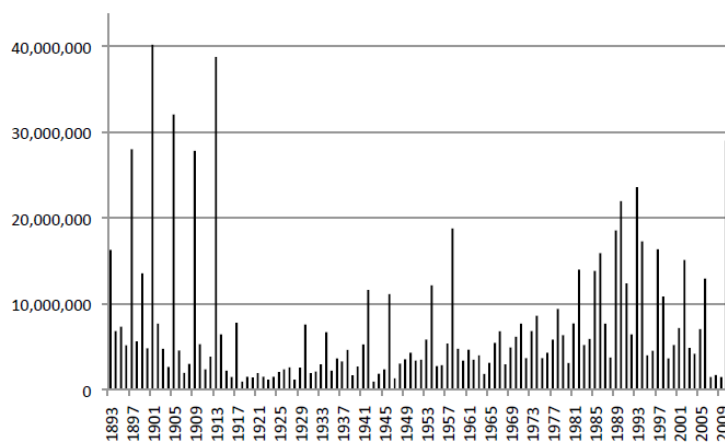
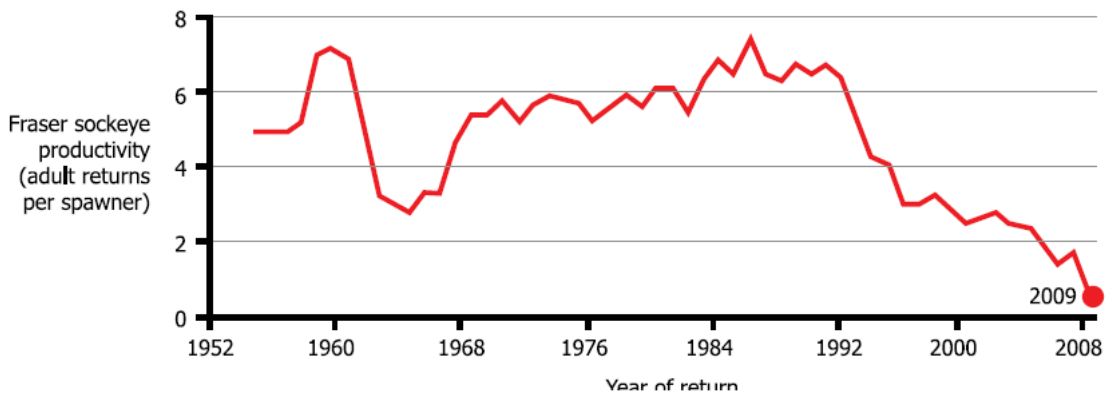


Figure 1.1.1 Total Fraser River sockeye returns, 1893-2011

Note: The Hell's Gate rockslide in 1914 was a catastrophic event widely accepted as being responsible for the reduced returns in the following decades. The 2011 estimate is preliminary.



## The Cohen Inquiry (2010-2012)

- Commission of Inquiry of the Government of Canada
- \$26 million
- 133 days of testimony
- 179 witnesses
- 2,145 documents as exhibits
- 14,166 pages of transcript

In brief, the Terms of Reference direct me

- (A) to conduct the Inquiry without seeking to find fault on the part of any individual, community or organization, and with the overall aim of respecting conservation of the sockeye salmon stock and encouraging broad cooperation among stakeholders,
- (B) to consider the policies and practices of the Department of Fisheries and Oceans (the "Department") with respect to the sockeye salmon fishery in the Fraser River

## Cohen on aquaculture

- Thick testimony, thin conclusions
- Judicial review of science = strange language
- Aquaculture as an “actionable” file



## Cohen on aquaculture

Data presented during this Inquiry did not show that salmon farms were having a significant negative impact on Fraser River sockeye. However, as noted above, the statistical power of the database (containing fish health data from 2004 to 2010) was too low to rule out significant negative impact.<sup>76</sup> I accept the evidence of Dr. Korman and Dr. Dill that scientists need another 10 years of regulatory data (until at least mid-2020) before they can more confidently identify any relationships that may exist.

### DFO's mandate in relation to wild fish

- 2 In relation to wild fisheries, the Department of Fisheries and Oceans should act in accordance with its paramount regulatory objective to conserve wild fish.

- 15 The Department of Fisheries and Oceans should explicitly consider proximity to migrating Fraser River sockeye when siting salmon farms.

- 19 On September 30, 2020, the minister of fisheries and oceans should prohibit net-pen salmon farming in the Discovery Islands (fish health sub-zone 3-2) unless he or she is satisfied that such farms pose at most a minimal risk of serious harm to the health of migrating Fraser River sockeye salmon. The minister's decision

Changing internal dynamics of the controversy

## Changing internal dynamics of the controversy

- The protest/participation dilemma
- Pipelines!
- Technological change
- Intersections of threats

### Salmon Aquaculture Dialogue

The **Salmon Aquaculture Dialogue** (SAD), a science-based forum initiated by World Wildlife Fund (WWF) in 2004 to engage NGOs and the world's largest aquaculture companies, is working to set international standards for salmon farming. CAAR engaged in this multi-stakeholder dialogue to try to ensure that whatever standards were developed were as rigorous as they could be considering the wide range of interests represented in the dialogue (from industry to social justice to environmental protection). CAAR felt that it was necessary to have a strong voice at the table to push for greater environmental protection than might otherwise have been achieved in our absence and to support the call for more rigorous social standards.

## The word in Ottawa

## The word in Ottawa

- Political support for aquaculture is strong
- First Morton decisions was welcome, second not so much
- Cohen provides a roadmap of sorts
- New injection of science funding for intersectional challenges





Questions?

[Nathan.Young@uottawa.ca](mailto:Nathan.Young@uottawa.ca)

Comparing indigenous relations with aquaculture in Norway and  
Canada

By

Dorothee Schreiber, Tamarack Research, Montreal, Canada  
and  
Camilla Brattland,  
UiT - The Arctic University of Norway, Norway

## Comparing indigenous-aquaculture relations in Norway and Canada. Environmental challenges and governance strategies

Camilla Brattland  
Post doctor  
Arctic Governance and Indigenous Innovation  
Centre for Sami Studies  
UiT The Arctic University of Norway

Dorothee Schreiber  
Research Associate  
Centre for Sami Studies

AquaLog workshop, Vancouver, 26.04.2017



## Indigenous-aquaculture industry relations in Norway and Canada

Different environmental and governance contexts, similar controversies

Few international indigenous networks on aquaculture

- Indigenous salmon network (Salmon Voices workshop 2011)
- Research projects: AquaLog, Coreplan (Nofima), TriArc and IndGov projects (SESAM)



Photo: Felix Atencio

## Environmental and governance dimensions

- What challenges do First Nations in B.C. and Sami have in common?
- History of dispossession and marginalisation

### A contested industry

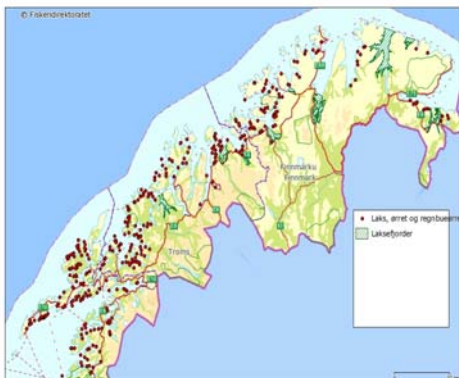
- Environmental conflicts with indigenous livelihoods and marine ecologies
- The roles of traditional ecological knowledge (TEK) and science

### Different governance strategies

- Governance mechanisms for regulating relations between the industry and indigenous peoples (regional, state, province, international levels)
- Direct relations
- State governance mechanisms

## Comparing two coasts with Atlantic salmon farming: Northern Norway and B.C., Canada

Aquaculture locations in northern Norway



## **Colonialism in Norway and Canada**

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- Forced assimilation policies
- Residential schools
- Loss/reduced access to commercial fisheries
- Industrialization and capitalization of resources
- Dispossession of land and resources
- New neoliberal modes of governance

**“History is more a part of the present than it ever was in the past.”** (Michael Marker, 1999)

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- First Nations’ stances towards fish farming cannot be understood apart from the colonial process of dispossession – loss of lands, fisheries, resource economies.

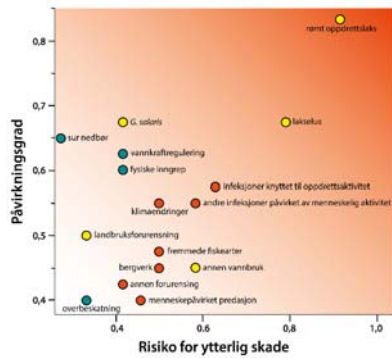
## Canada: Salmon migration routes and fish farm tenures, Broughton Archipelago



## Canada: Environmental matters of concern

- ISAv recognized in Norway as having contaminated coast of Chile through egg imports.
- Basic facts about viruses accepted in Norway are disputed by industry and government here.
- In Canada, ISAv infected fish can be grown to size and sold.
- Federal court found DFO to make unsupported statements of science and to shelter behind industry claims. [Morton vs. Minister of Fisheries and Oceans 2015]
- Cohen Commission: "I heard evidence that suggests confusion on the part of DFO respecting its paramount regulatory objective to conserve the health of the wild stocks."

## Norway: Sea lice, disease and genetic interaction with wild salmon major concerns



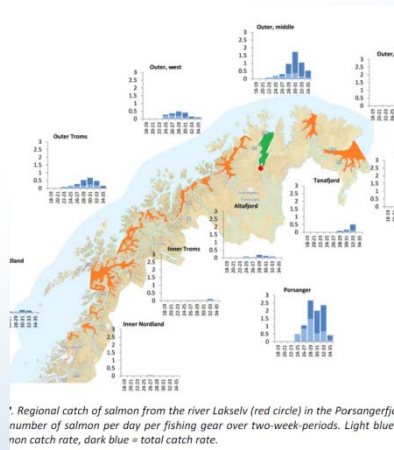
Scientific council for anadromous salmonids, Norway, 2016

### Norway

- *Two major threats towards wild salmon:*
- Diseases and sea lice (limits to growth for the industry, new government policy)
- Escapes and genetic interaction (one of the criteria for healthy salmon rivers)
- *Impact on marine fisheries:*
- Spatial conflicts
- Fishers' knowledge claims: pollution and influence on wild fish stocks (spawning behaviour)

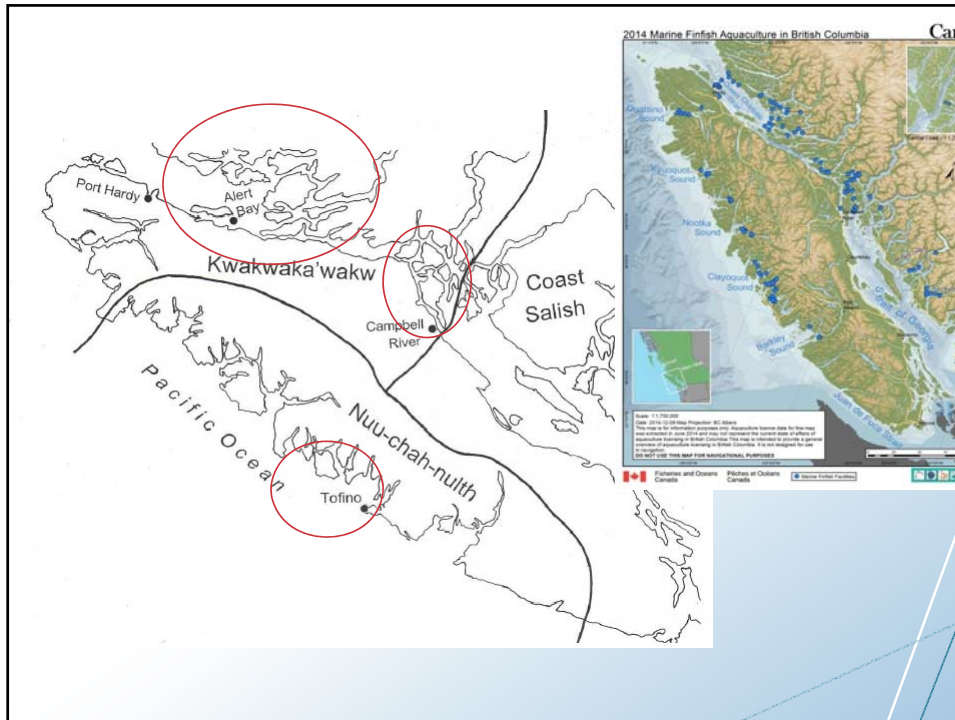
## Norway: Wild salmon interactions (river and coastal fisheries)

- Over a mill tons of farmed salmon produced annually around the Atlantic
- Wild salmon catches 2 – 3000 tons (5% in the Tana river)
- Genetic interaction: hybridisation decreases wild salmon survival
- Approximately 8 % farmed salmon in northern Norwegian coastal salmon catches
- Source: Kolarctic Salmon project  
<https://prosjekt.fylkesmannen.no/Kolarcticsalmon/>



\* Regional catch of salmon from the river Lakselv (red circle) in the Porsangerfjord. Number of salmon per day per fishing gear over two-week-periods. Light blue = non-catch rate, dark blue = total catch rate.





## Strategies Agreements with First Nations as business strategy

*"Our people make Marine Harvest Canada a great company. It is only through our dedicated workforce and their tireless commitment, energy and effort that we are able to produce world-class salmon." -- Dean Dobrinsky, Human Resources Director*

### First Nations People

**Aboriginal Peoples and Marine Harvest Canada Working together**

Marine Harvest Canada's aquaculture operations are located within the traditional territories of First Nations people. The

<http://marineharvest.ca/people/first-nations-people/>



## Thlowitsis First Nation in the Broughton Archipelago has a partnership with Grieg Seafood

FORESTRY & FISHERIES

### Two First Nations say Sea Shepherd 'not welcome'

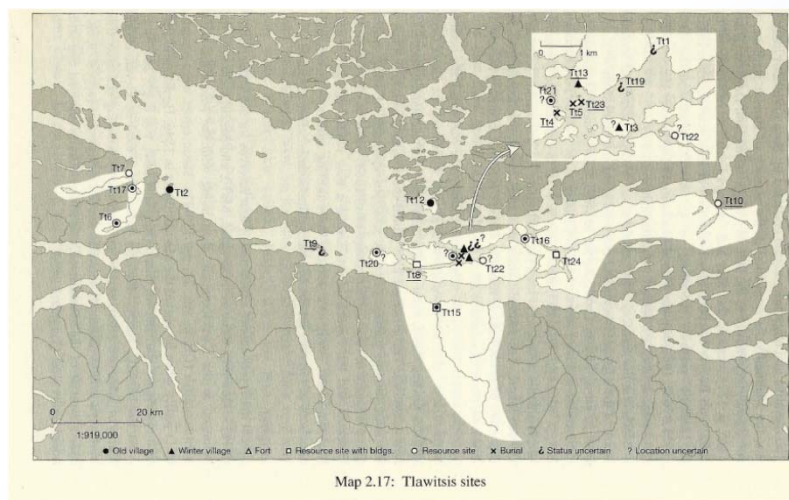
Virus-hunting Sea Shepherd won't get cooperation of at least two coastal First Nations

By Nelson Bennett | July 21, 2016, 10:06 a.m.



<https://biv.com/article/2016/7/two-first-nations-say-sea-shepherd-not-welcome-nel/>

## Thlowitsis First Nation sites

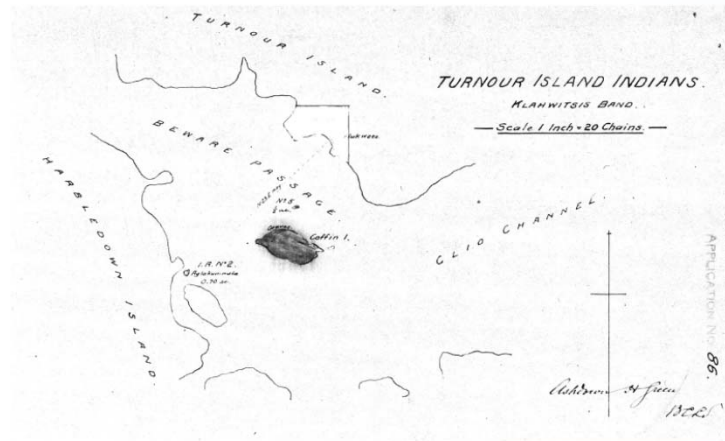


Map 2.17: Thlowitsis sites

Robert Galois, *Kwakwaka'wakw Settlements 1775-1920*, UBC Press 1994.

## Thlowitsis First Nation – dispossession and residential schools

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"I have heard of the law and I am told by people who know the law that no one can take another one's land away from him for nothing. ... I wonder what the Government expects me to live on and to earn money from?" Chief Johnnie Clark, addressing McKenna-McBride Commission 1915

## Thlowitsis First Nation

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Chief John Smith, Thlowitsis First Nation, 20 July 2016 Press Release on the Thlowitsis agreement with Grieg Seafoods and why "Operation Virus Hunter" is not welcome:

"The Thlowitsis First Nation historically had absolute power over our traditional territory, our resources and our right to govern and manage our lands and resources. Today we affirm our aboriginal rights and title to our unceded and sovereign Territory."

## Ahousaht – west coast Vancouver Island



## Ahousaht – Yakswiis Warriors



## Broughton Archipelago



Photo: Tamo Campus



Photo: Melissa Willie

## Exploiting colonial history in the Broughton: Marine Harvest and the Mamalilikulla-Qwe'Qwa'Sot'Em (Sewid family)



*Rick Sewid, left, and Dwayne Creelman on the Bear 1, alongside Marine Harvest's Wicklow farm.*

### Broughton First Nation secures MH deal

A First Nation in northeast Vancouver is using a new vessel to assist Marine Harvest Canada in the Broughton region.  
Author:  Laura Braden, PhD

<http://www.fishfarmingexpert.com/news/broughton-first-nation-secures-mh-deal/>

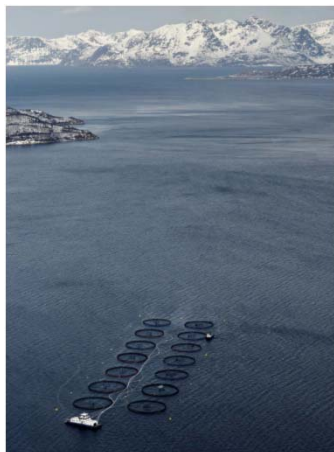
## “Mamalilikulla - Qwe’Qwa’Sot’Em” – how damage to Indigenous law benefits fish farmers

- Sewid family claims to be descendants of the “real” Gilford Island (Kwikwasut’inuxw ) people.
- “Although we had a chief there he [the Indian Agent] didn’t like to go see him because he felt that he could get more out of me than him, so he would come and see me and I had a lot of ideas”
- “Mr. Todd always used to think that that [industrial reserve, Alert Bay] was the best place for a young man like me because it had been set aside for the progressive people.” (James Sewid, *Guests Never Leave Hungry*, p. 128)



Chief James Sewid and Daisy Sewid Smith, 1987.  
Photo: Martine J. Reid

## Governance dimension – Sami examples



- Sami-owned licences in Tysfjord beginning of 1990s
- Increasingly multi-national ownership
- Few direct negotiations between industry and municipalities on impacts on indigenous communities
- The Sami Parliament a central player in coastal zone planning
- Consultations with government an important tool available for the Sami Parliament



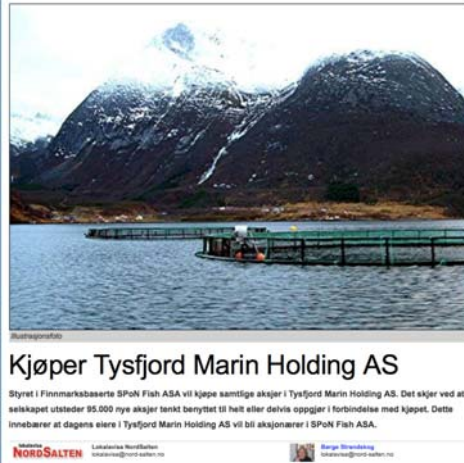
## Tysfjord – aquaculture as a contribution to indigenous economy and culture

Licences granted to support the local economy and cultural survival of the Lule Sami community of Musken (2002)

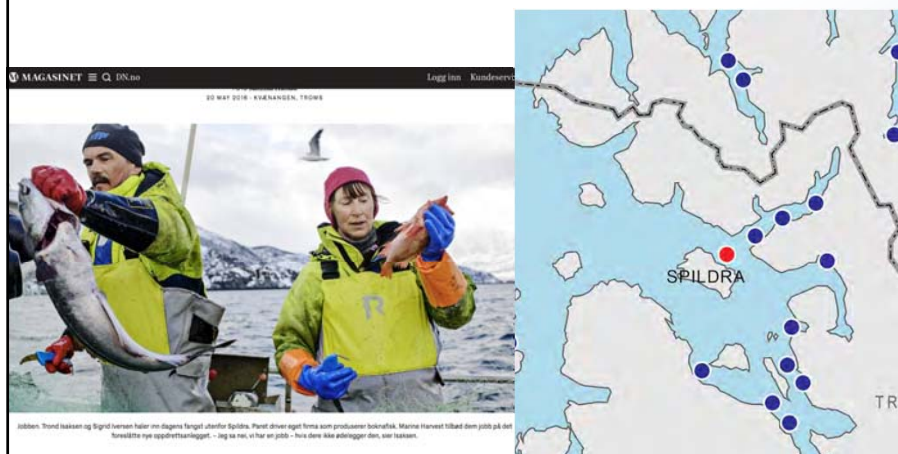
Did not have the desired effects on employment and community well-being (Sandersen 2005)

Remains an employment opportunity for young Sami in Tysfjord (Grytås 2016)

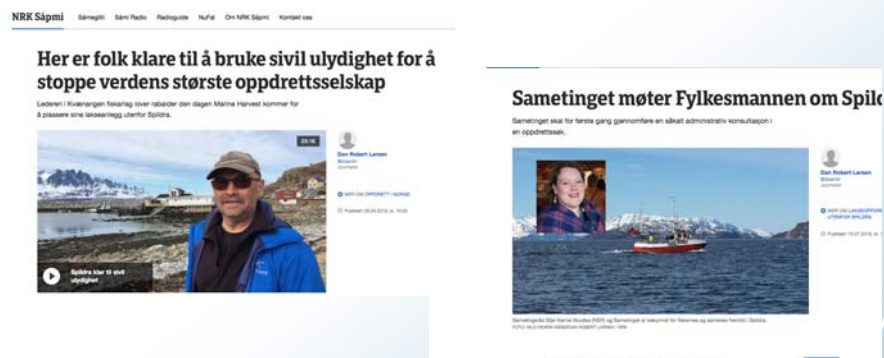
Contested among local environmental groups (Sandersen and Dale forthcoming)



## The Spildra Controversy – the increasing role of the Sami Parliament in coastal governance



## The Sami Parliament's consultation status (Brattland and Eythórsson 2016)



“Ready for civil disobedience” and “The Sami Parliament meets the County Governor”  
Source: [www.nrk.no/sapmi](http://www.nrk.no/sapmi)

## Summing up



The “Yakswiis warriors,” Ahousaht 2015. Photo: Bonnie Glambeck

- An environmental and governance crisis
- Environmental dimension – impacts on wild salmon (genetic impacts vs. disease)
- In Canada, governance crisis can to a greater extent be traced back to history of colonialism
- Governance relations:
- Individual First Nations consulted vs. Sami Parliament's role
- In Canada direct agreements between bands and industry
- Norway the role of the Sami Parliament in planning processes

## References

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- Brattland, Camilla and Einar Eythórsson 2016. The Spildra Case/Fiskesløyfa. In *Ottar 4/2016*, Tromsø Museum, Norway
- Grytås, Gunnar 2016. The fish farming fjords, a tax paradise. In *Ottar 4/2016*, Tromsø Museum, Norway
- Sandersen, Håkan 2005. An evaluation of the granting of ethnic aquaculture licences to the Lule Sami community of Musken, Norway. Fjordfolk på konsesjonsjakt. Evaluering av tildelingen av laksekonsesjoner til den lulesamiske bygda Musken i Tysfjord. Nordlandsforskning rapport nr 10/2005, Bodø.
- Schreiber, Dorothee and Brattland, Camilla (eds.) 2012: *Salmon Cultures. Indigenous Peoples and the Aquaculture Industry. Workshop proceedings.* Rachel Carson Center, Perspectives 2012/4. Munich, Germany. Also available at <http://site.uit.no/salmonvoices/>
- Scientific council for anadromous salmonids, Norway 2016. Anon. 2016 Status for norske laksebestander i 2016. Rapport fra Vitenskapelig råd for lakseforvaltning nr 9, 190 s.
- Torbjørn Forseth, Bjørn T. Barlaup, Bengt Finstad, Peder Fiske, Harald Gjøsæter, Morten Falkegård, Atle Hindar, Tor Atle Mo, Audun H. Rikardsen, Eva B. Thorstad, Leif Asbjørn Vøllestad, Vidar Wennevik, Handling editor: Mark Gibbs; The major threats to Atlantic salmon in Norway. *ICES J Mar Sci* 2017 fsx020. doi: 10.1093/icesjms/fsx020



Aquaculture and regional development in the Faroe Islands

by

Knud Simonsen,  
Aquaculture Research Station of the Faroes, Faroe Islands

# Aquaculture and regional development in the Faroe Islands

Knud Simonsen,

Fiskaaling/Aquaculture Research Station of the Faroe Islands

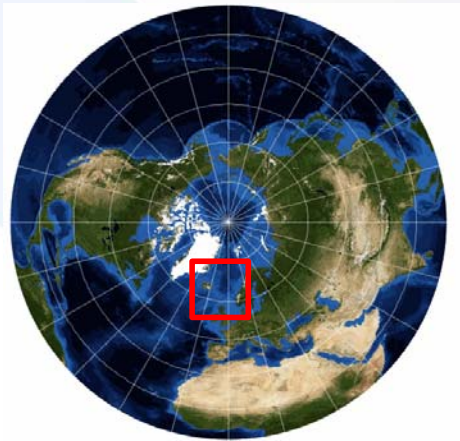
[www.fiskaaling.fo](http://www.fiskaaling.fo)

Presented at the AquaLog workshop entitled: '**Intensive aquaculture and sustainable regional development in the Arctic – From controversy to dialog**', 26<sup>th</sup> April 2017, Vancouver, BC, Canada

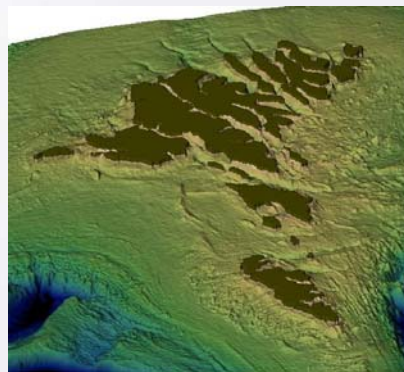
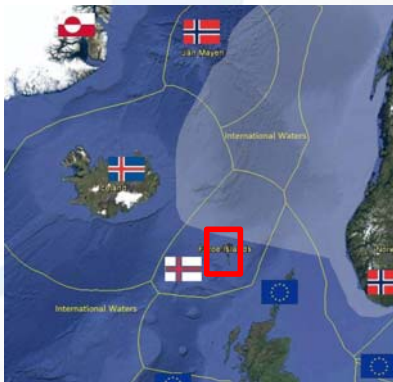
## The next few minutes...

- Faroe Islands:
  - Location
  - The aquaculture history in short
  - Economic importance
- Remote sites benefits central regions
- The sea lice challenge
- Current development of the industry
- Summary

# Faroe Islands



- 18 islands
- 110km from north to south
- 1399km<sup>2</sup> land
- 275.000km<sup>2</sup> territorial waters
- 300km to next neighbour
- 50.000 inhabitants



# Fiskaaling

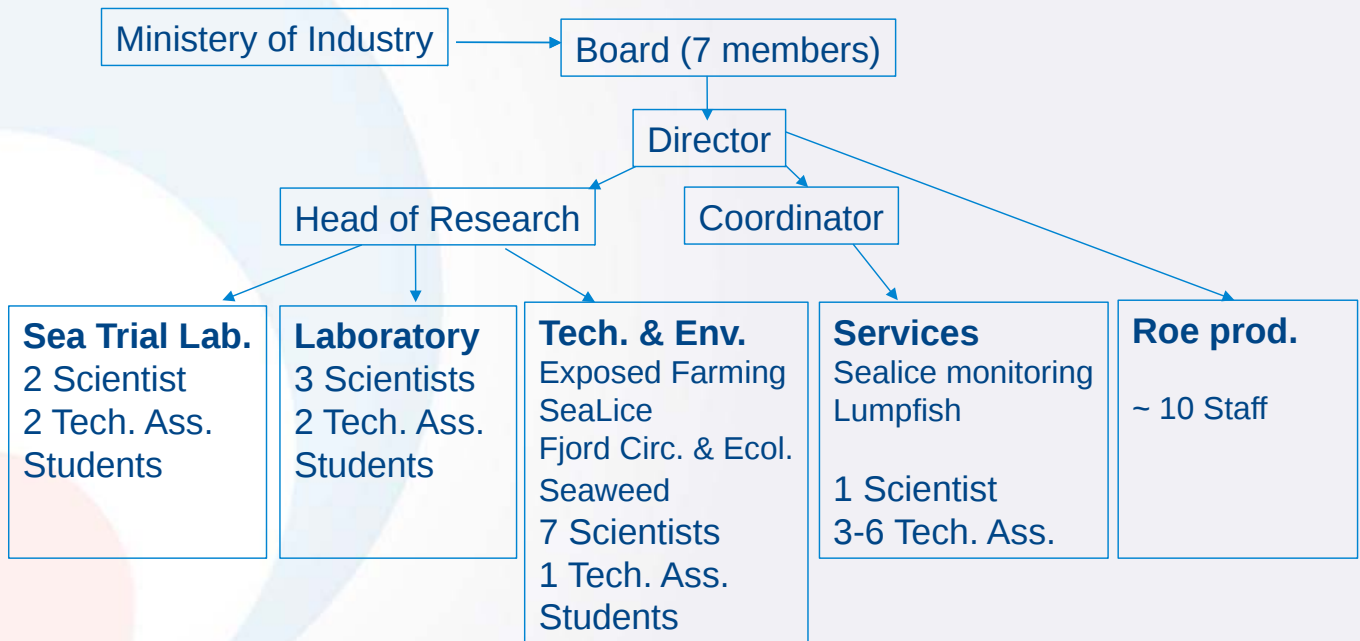
## Aquaculture Research Station of the Faroes

- Late 1960'ies: Entrepreneurs made the first attempts to farm rainbow trout in the Faroes.
- 1970: Non-profit company owned by the government
  - Founded with the task to develop a fish farming industry in the Faroe Islands
  - Main focus on egg and juvenile production.
- 2005: Change of the main focus to general aquaculture related research.
  - Funding from the local government, research grants and the industry
- 2010: Start of services for the industry, incl. sea lice and gill disease surveys, cage analysis, etc.
- 2016: Decided to phase out the egg and juvenile production.



# Fiskaaling

Aquaculture Research Station of the Faroes



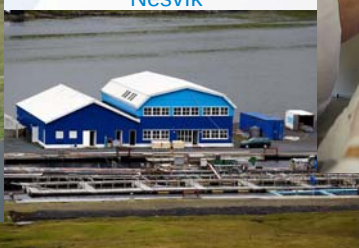
## Facilities

- Main station: við Áir
  - Offices
  - Salmon egg and juvenile production
  - Services and consulting
- Marine research station in Nesvík
- Workshop/Storage in Kollafirði
- Molecular Laboratory in Tórshavn, iNOVA
- Broodstock station in Skopun
- Research boat

Kollafirði



Við Áir



Nesvík



Tórshavn



Skopun



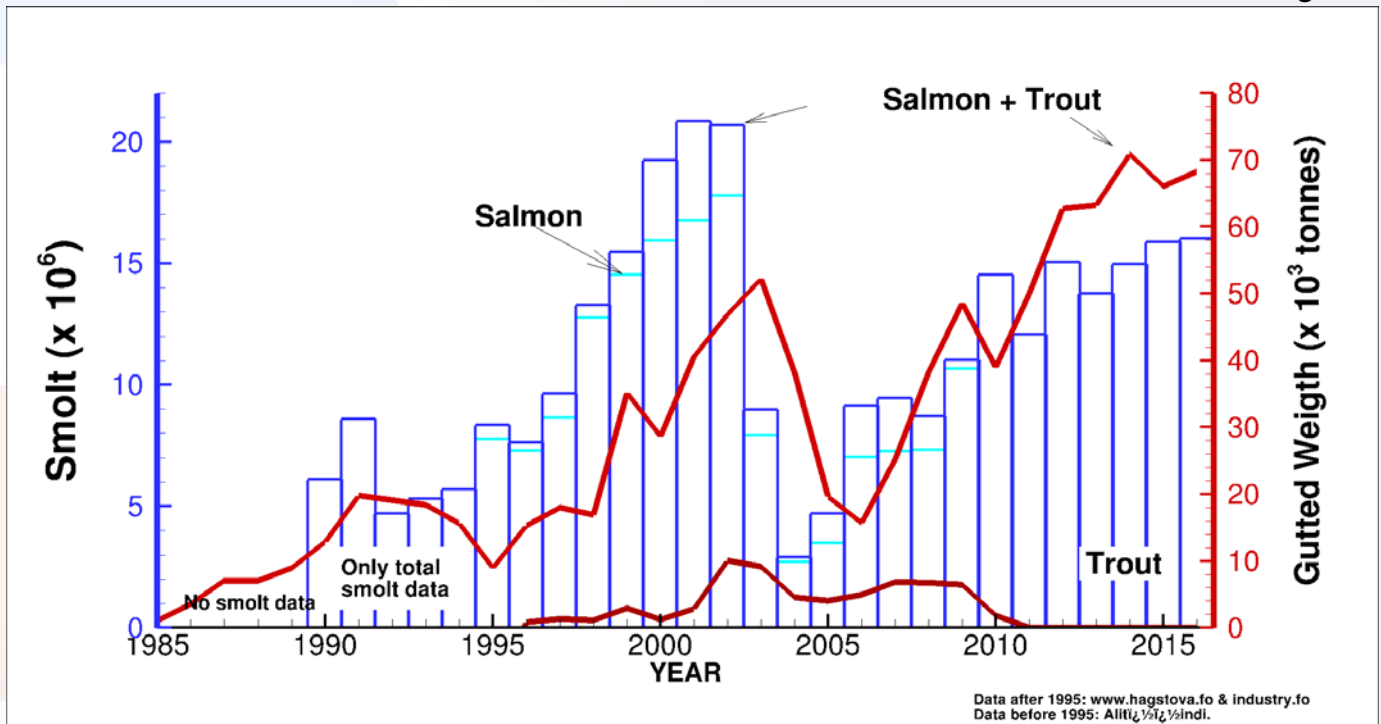
R/B Andrias Reinert



# History

- of the production of salmonids

Corresponds to  
~82.000 tonnes non gutted

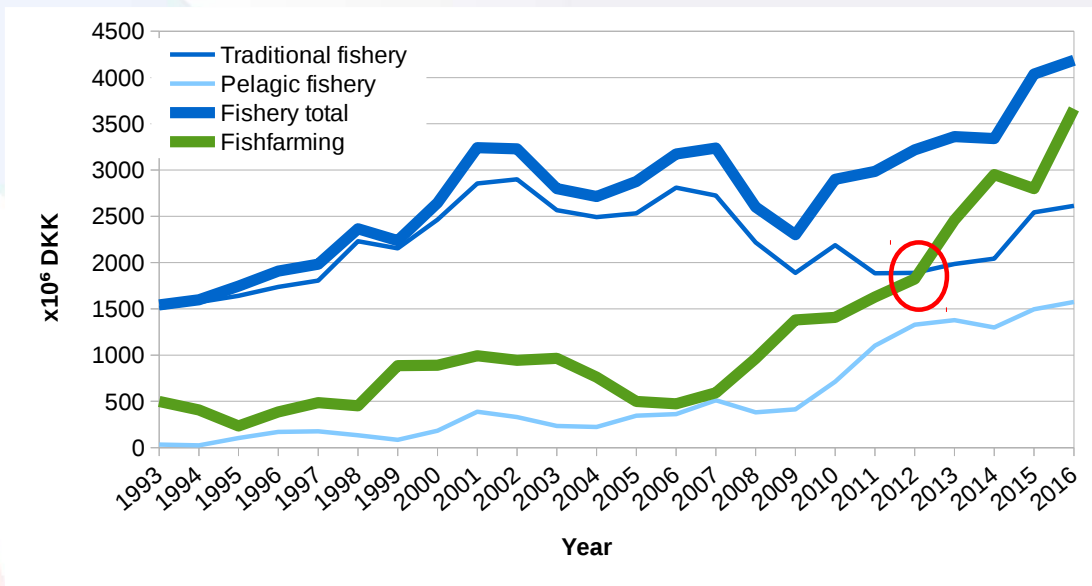


# Production of Atlantic Salmon

	<b>Tonnes</b>		<b>Tonnes/Capita</b>
Norway	1191000	Faroe IIs.	1.640
Chile	498000	Norway	0.223
Scotland	170000	Scotland	0.032
N.-America	154300	Chile	0.027
Faroe Isl.	80000	Iceland	0.022
Australia	45000	N.-America*	0.004
Ireland	16000	Ireland	0.003
Iceland	7500	Australia	0.002
Other	10200		

\* Only Canadian population in estimate

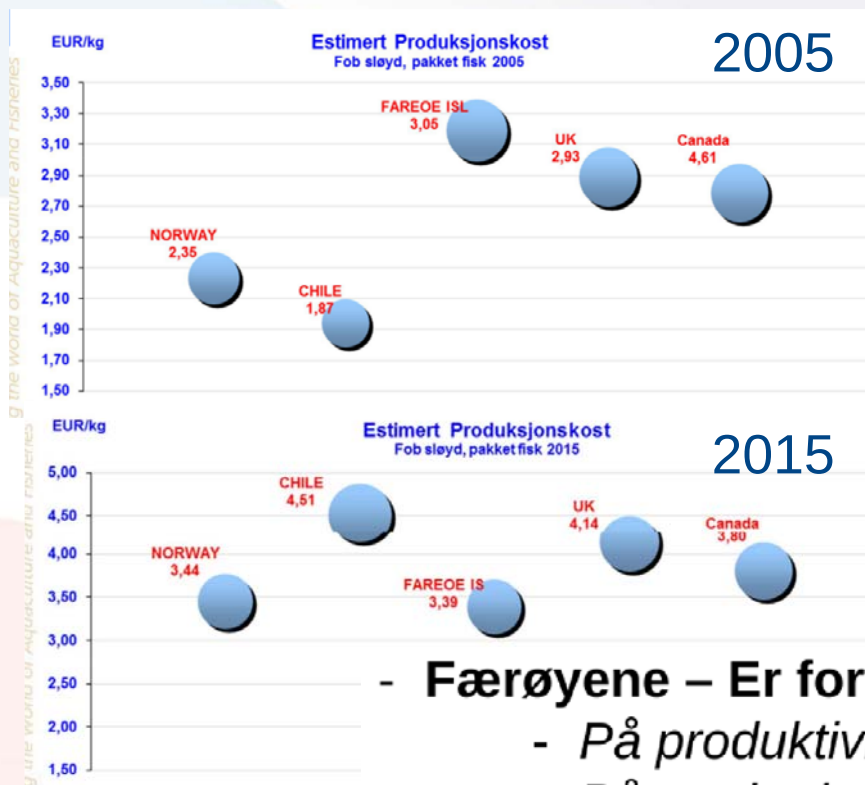
# The export value



In export value fish farming

- exceeded the traditional fishery in 2012
- together with fishery responsible for more than 90% of the total export

# Status of the industry



Source:  
Ragnar Nystøyl,  
Kontali Analyse as

- **Færeøene – Er fortsatt «Best in Class» !**
- På produktivitet
- På markedstilpasning
- På produksjonskost

# Yes, but .....

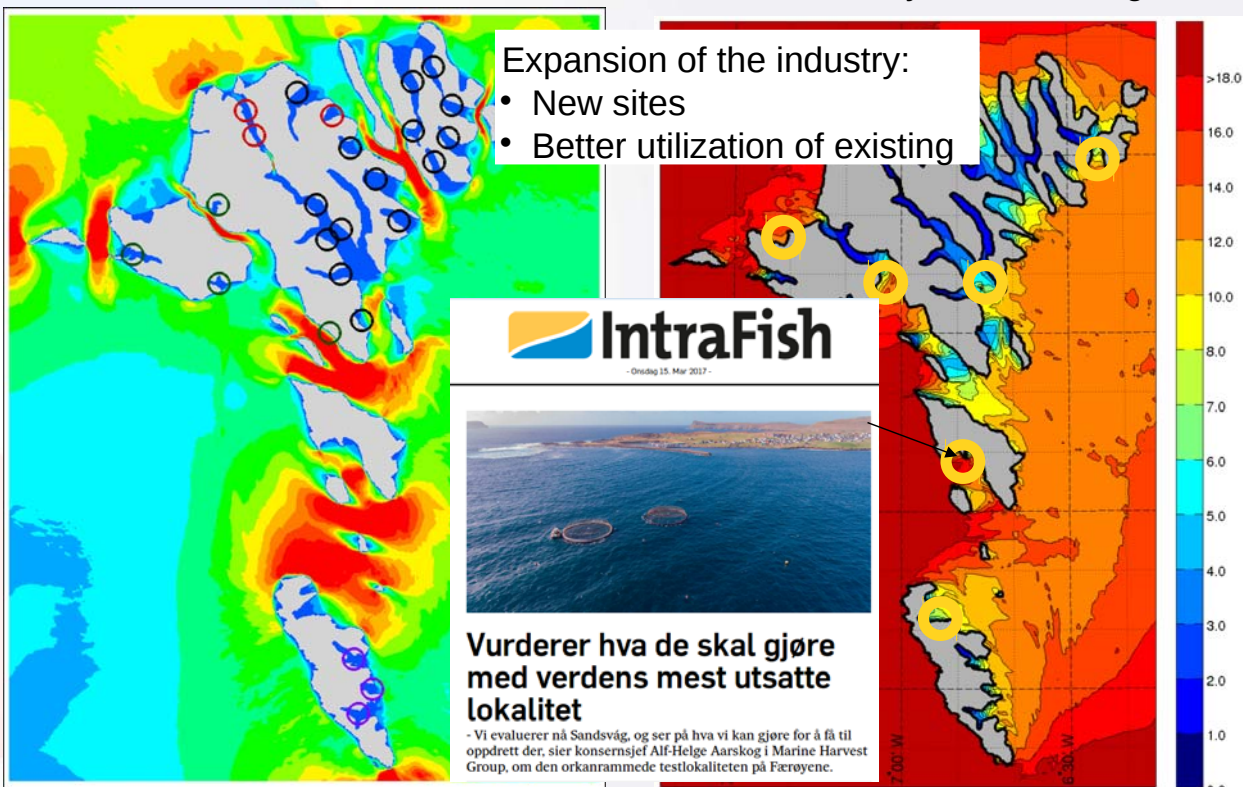


- Few (~none) sites left to expand with available cage technology
- Sealice
- Present legislation is problematic for
  - Existing salmon farmers to expand
  - Farming of other products

## Physical settings and sites

Max. Tidal Current (m/s)

Estimated 50 year wave height






Simonsen & Niclasen, 2012

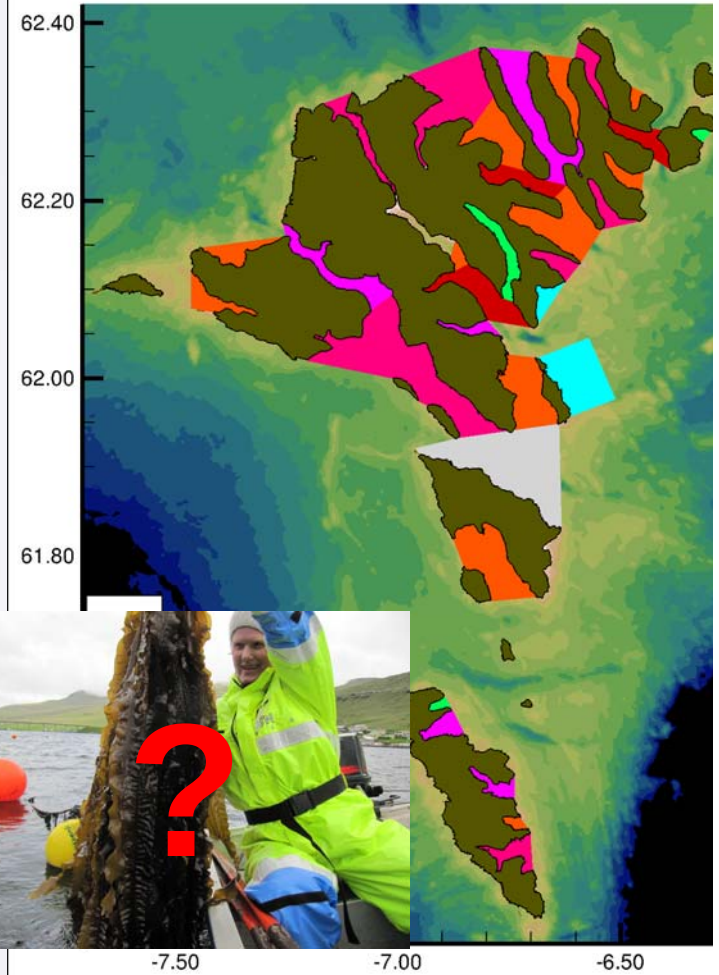
Niclasen & Simonsen, 2012



# Present MZ's

- “One fjord – One Farmer”
- “All in – All out”
- In 2012, and again in 2014 most MZ were enlarged from covering a fjord to present areas.

-  Allocated 'non-salmonid' farming
-  No farming area. Broodstock in landbased facilities.
-  Testsite for offshore cages



# Farming licenses in the Faroes



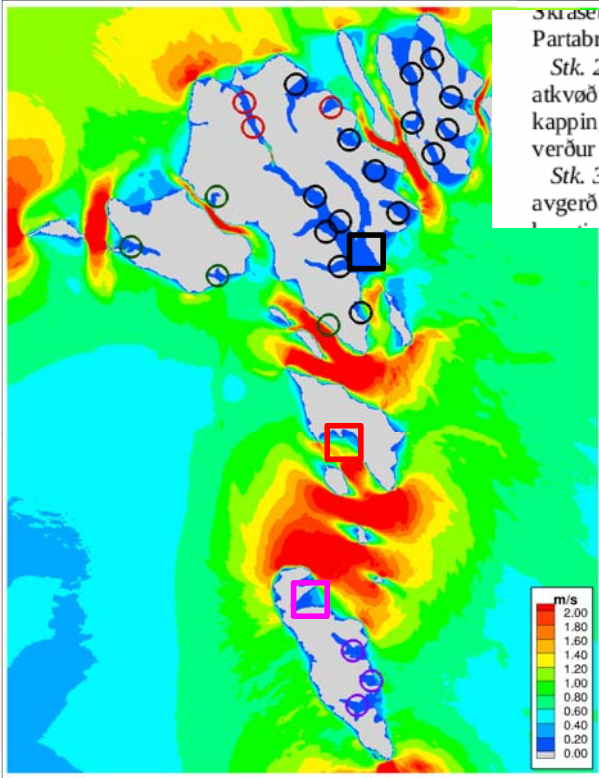
- 12 year production in an area
- Hand in a management plan for each production cycle
- Number of fish regulated by
  - Benthic monitoring parameters
  - Sea lice number (since 2016)
  - Appearance of disease(s)

Production on each site: 3000-15000 tonnes



# New salmon sites political difficult

Max. Tidal Current (m/s)



Skilaseingjar færoya, ella sum ein nabooyar skilaseingjar færoya sum undan stovnan. Partabrovini skulu vera navnapartabrov.

Stk. 2. Eingin likamligur ella juridiskur persónur kann beinleiðis ella óbeinleiðis við atkvøðurætti ella á annan tilsvarandi hátt hava ræði á alifyrirtekum, smbr. § 13 í kappingarlógini, sum hava meira enn 50% av aliloyvum. Verða aliloyvir lögð saman, verður ásetingin í pkt. 1 bert nýtt fyri hesi aliloyvi. Pkt. 1 og 2 galda ikki smoltloyvi.

Stk. 3. Landsstýrismaðurin skal skrivliga hava upplýsingar um broytingar í ognar- og avgerðarrættindaviðurskiptunum og avhending av aliloyvum. Verður mettt, at ein

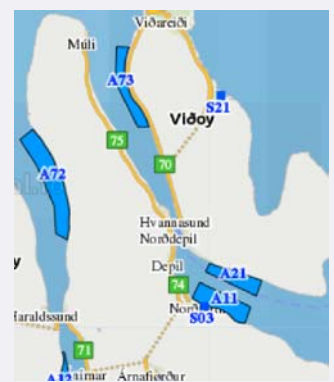
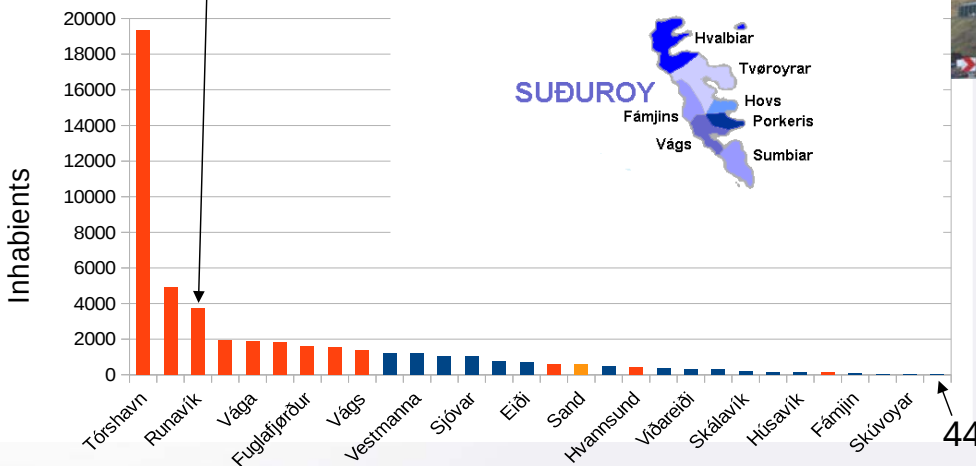
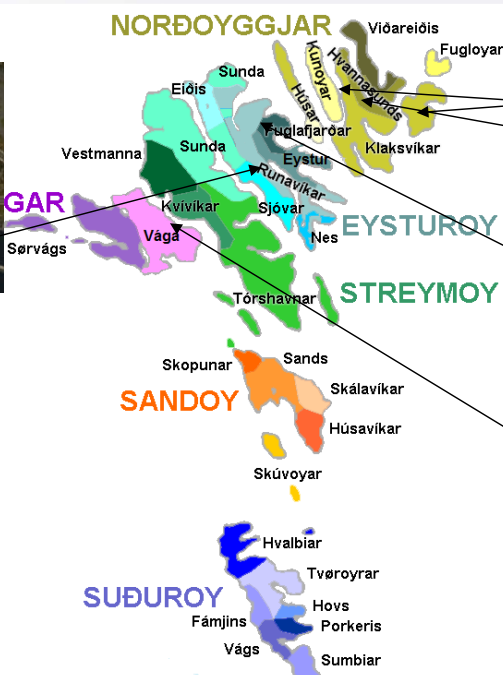
... no person or legal entity can control more than 50% of the licensees.....

The present situation is an example of political/bureaucratic calculus expertise, which is leading to debate!!

Is not made simpler by potential new sites!!!

Simonsen & Niclasen, 2012

## Municipalities



# The sea lice situation



# Wild salmon in Faroes waters

No native salmon stock in Faroes rivers!

But, - Faroese waters are natural feeding grounds for stocks migrating from rivers in other countries



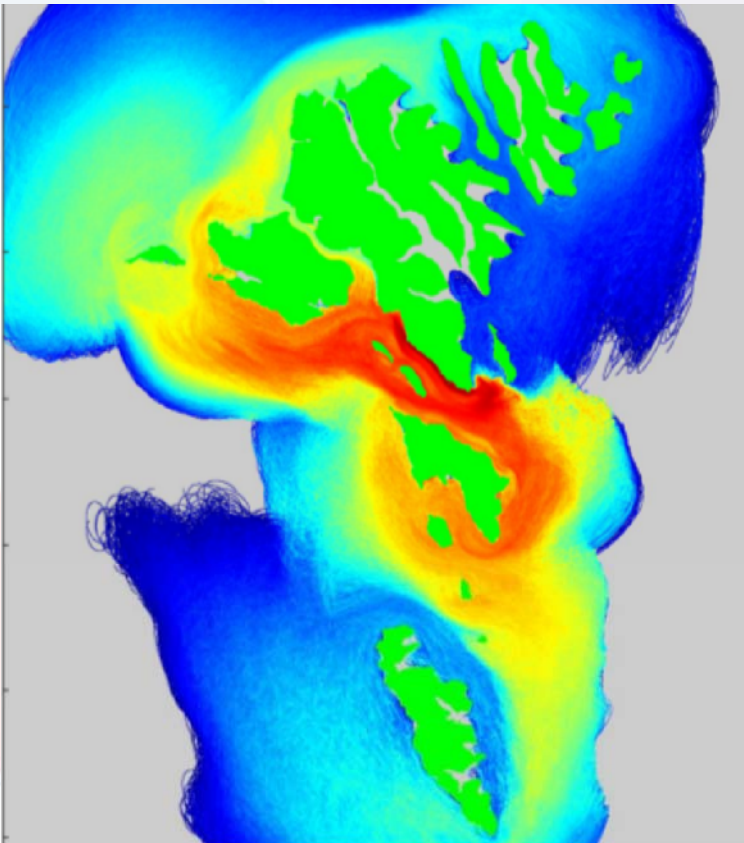
Source: NASCO

Faroese legalization is NOT build to protect the wild fish!

But to

- reduce dispersion of sea lice in order to minimize the damage on the farmed salmon
- reduce and eliminate resistance (towards treatment) in sea lice

# Dispersion of sea lice



Dispersion from a single farm and the average age of the sea lice.

Moved from

'single farm challenge'

to

'we are all in the same soup'

## The new sea lice regulation

Counting at least every 14'th day

All cages (at least 10 fish) m og seiðarustum á laksi og ærabogastum skal gerast eftir skrivligari vegleiðing frá Heilsufróðiligu starvstovuni í minsta lagi 14. hvønn dag. Allir ringar skulu teljast hvørja ferð.

Stk. 2. Teljast og skrásetast skulu

- 1) vaksnar kvennlís,
- 2) stórar flytforar laksalís,
- 3) smáar flytforar laksalís,
- 4) seiðalís og
- 5) fastar lís.

1. Gravid female Limit: 1.5 gravid male

2. Big pre-adult + mature male lice (>5 mm)

3. Small pre-adults (<5 mm)

4. Caligus elongatus

5. Chalimus

Marks (Klipp)

1.5 gravid → 1 mark

3.0 gravid → 2 marks

4.5 gravid → 3 marks

....

Chemical treatment → 2 marks

Single cage treatment →

$$Klip = (Klip_{kemi./kombi} \cdot N_{behandl.}) / N_{total}$$

**Marks    Number of fish**  
**In next prod. cycle**

<10:    Increase

10-20:    Same

>20:    Reduced

Above limit in three counts in a row:

Removal of the fish within 2 months



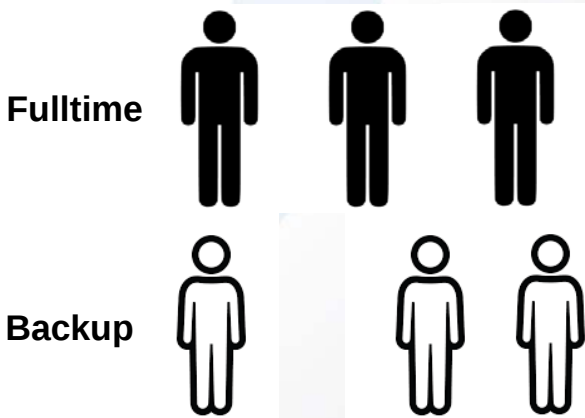
# Sea lice counters & counts

§ 10. Allar lúsateljningar eftir § 3 í hesi kunngerð skulu gerast av **P/F Fiskaaling**. Aðrar lúsateljningar kunnu gerast av øðrum.

All sea lice counts to be reported to the authorities most be done by Fiskaaling

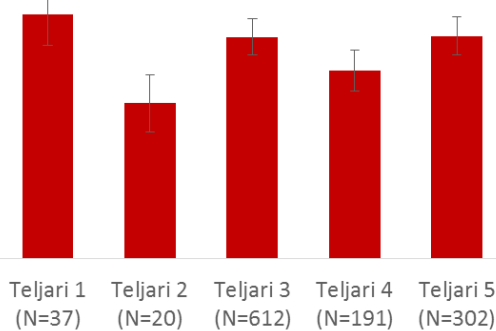
## The count results are

- Not public (yet)
- Distributed to authorities, veterinaries and (all) farming companies within 24 hours.
- Monthly meeting at Fiskaaling with the veterinaries and quality/region managers from all companies (NOT the authorities)
- New: Monthly conversation for the lumpfish (cleanerfish) mangers.
- Latest: The authorities are applies to us for a similar nonformal information system

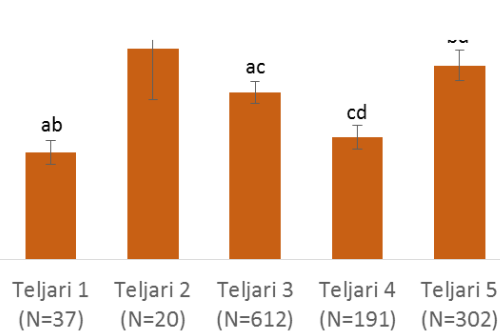


# Statistics on the counters

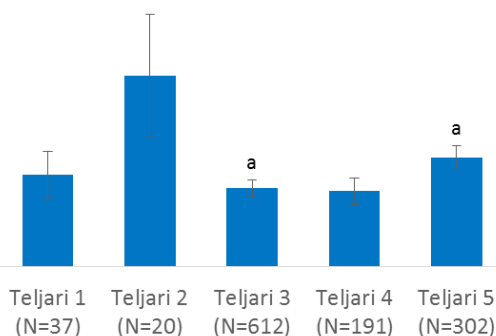
Kønsmodne hunlus



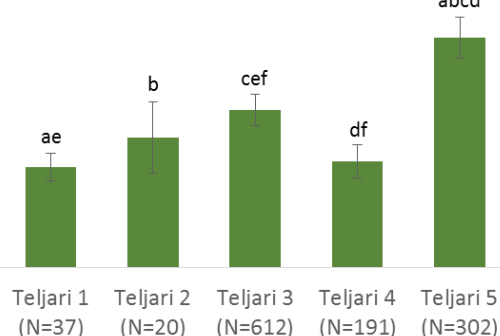
Preadulte + kønsmodne hanlus



Skottelus



Chalimus



# Current development in the industry

‘Large smolt’ production on land:

Current situation:

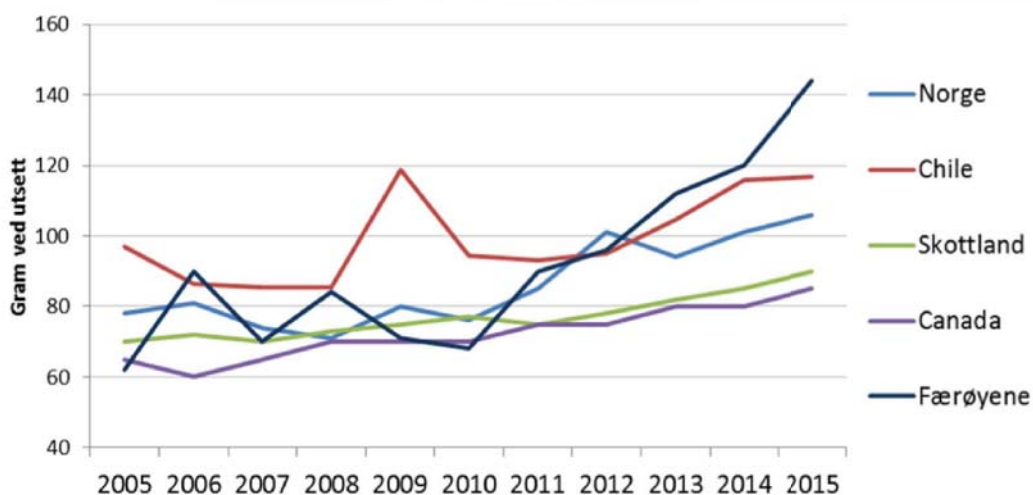
- Currently several huge construction works ongoing
- More ‘high skill’ staff required in the future

Purpose:

- Shorten the production time in sea water,
  - e.g. shorten sea lice exposure time
- Reduce mortality (larger and stronger smolt)
- Better utilization of existing sites
  - -> larger stress on the environment
- Farming possible in more exposed environment

## Smolt size development

● Average in 2016: 200g



# Large smolt production - Hiddenfjord



Production time (days) from roe to 6 kg salmon:

	Land	Sea	Fallow
Average for all companies in 2016:	390	524	60
Hiddenfjord*	554	360	60

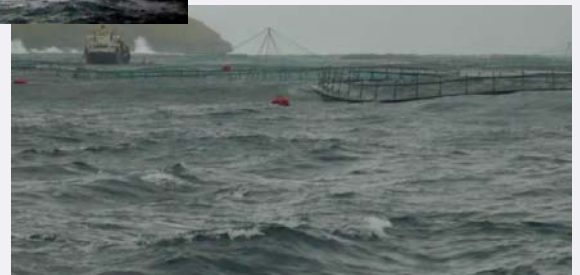
\*Last production cycle at Miðvág site (700.000 salmons)

## Summary

The aquaculture industry in the Faroe Islands is notified as “best in class”

But

- Alle (nearly) sites are in use
- Challenges (political) to issue new licenses
  - Discussions on how the regulation should be interpreted
  - All rights are practically given to the salmon farmers: Establish farming of other species is only possible in agreement with the present salmon farmers
- Centralization and vertical integration of companies may drain capital from municipalities hosting the farms.
  - Size of municipalities compared to the companies is an issue.
- The sea lice ‘battle’
  - Understanding that this is not a single farm challenge
  - Monthly non-formal meetings has been instrumental
- Large smolt production
  - New high skill jobs in ‘remote’ areas
  - Successful in shorten the production time in sea
  - Farming in more exposed areas
  - Reduction of the sea lice challenge
  - But- increase stress on the environment in low-energetic areas



Thank you for your attention.

Questions?

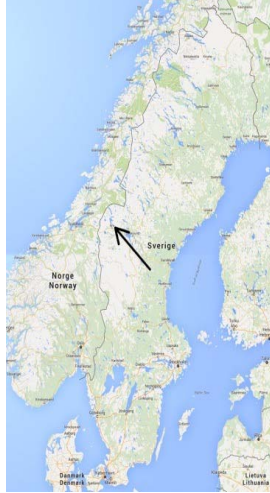
Photos: G. á Norði (1,3) & J. E. Simonsen (2)

From cage to land based in Sweden

by

Erik Olofsson,  
Torsta AB, Sweden





# TORSTA AB

## Region of Jämtland

### *Themes*

- Agriculture
- Aquaculture
- Forestry
- Food
- Energy
- Rural development

### **National level:**

The Swedish Board of Agriculture has, in cooperation with other authorities, industry, NGO:s developed a National strategy.



There is now a Aim:

Swedish

aqua

able business with an ethical

**Regional level:**

The different regions in Sweden start to build different identities regarding aquaculture.



Production  
12000 tons of fish

2000 tons blue mussels

50 tons of land based  
production, tilapia, pike,  
perch, catfish, perch ,

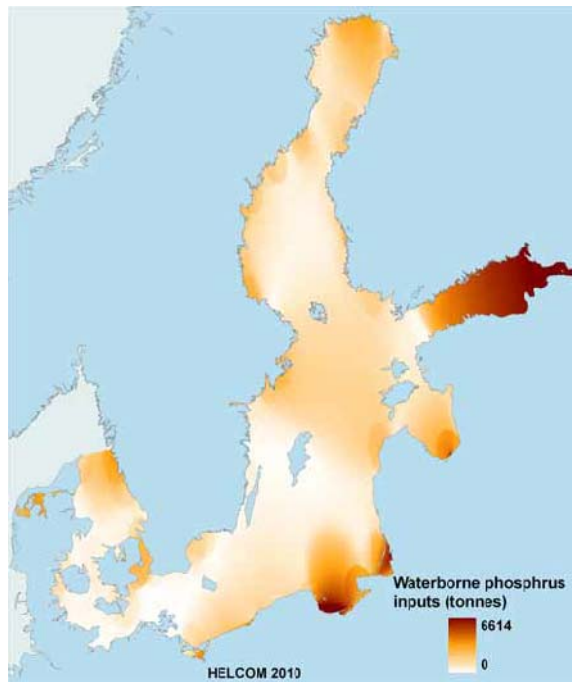


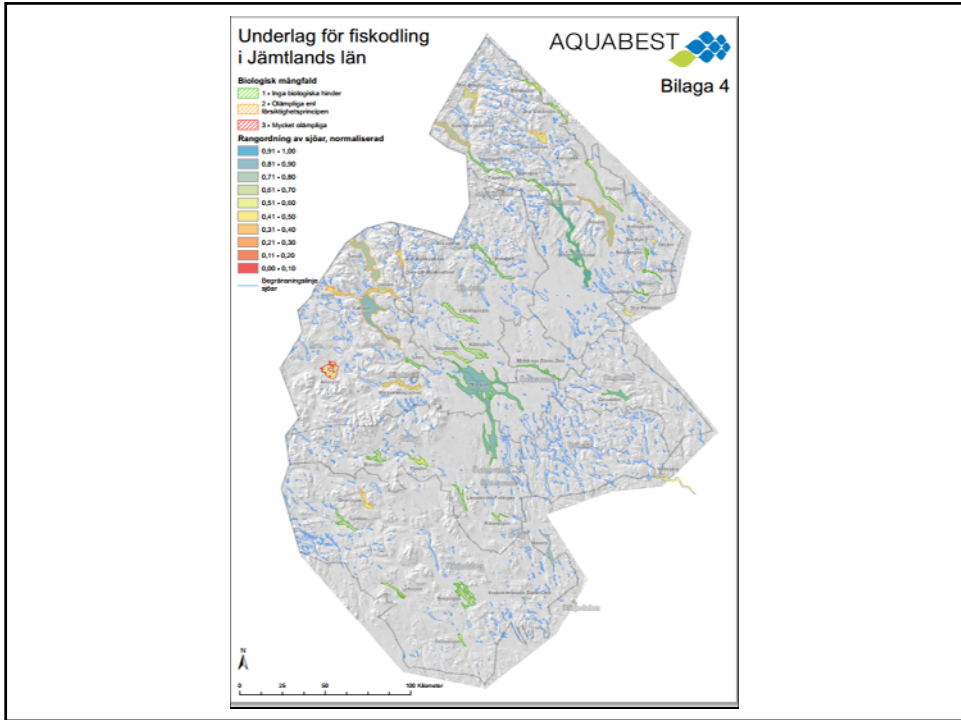
**Bottlenecks**

- Eutrophication
- Escapes
- Diseases
- Esthetic / Space
- (NGO's)

**Legislation**

- Fish
- Food
- Environmental
- Infectious Disease
- Building





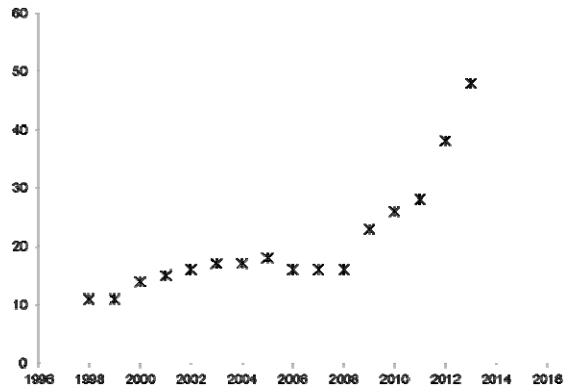


**Production in Jämtland  
Aquaculture**

<b>1985</b>	<b>2007</b>	<b>2017</b>
<b>100 tons</b>	<b>500 tons</b>	<b>4500 tons</b>
<b>60</b>	<b>5</b>	<b>4 Companies</b>



**Production 2017 is 4500 tons in 4 company's and the number of employs has more than doubled since 1996.**



### **Production in Jämtland Aquaculture**

**New application for a 6000 ton cage farm**

**Application to increase production In a cage farm from 500- 1500 tons**

**Application to increase production in a cage farm from 500- 1000 tons**

**Application for a 4000 ton Land based RAS farm**





**How to get a permit for aquaculture**

**1 Application (company)**

**2 Environmental impact description (company)**

**3 Send it to the court**

**Court  
County board  
Company  
Court  
Stakeholders  
company  
Court  
Hearing  
Sentence  
appeal, appeal.**



**How to get a permit for aquaculture**

**1 Application (company)**

**2 Environmental impact description (company)**

**3 Send it to the court**

**Court  
County board  
Company  
Court  
Stakeholders  
company  
Court  
Hearing  
Sentence  
appeal**

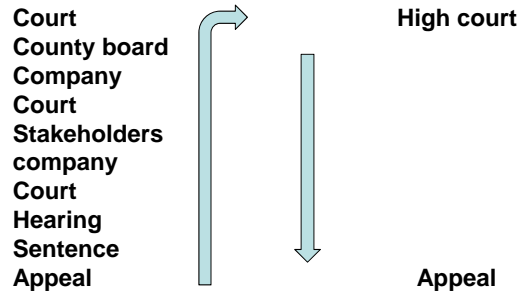


**High court**



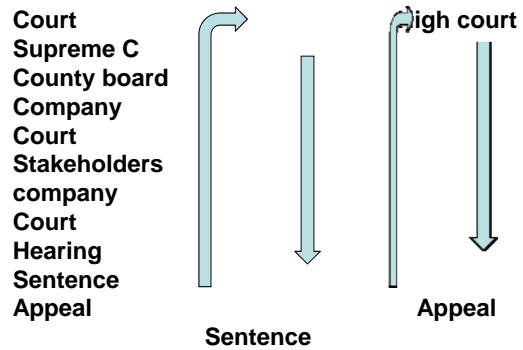
**How to get a permit for aquaculture**

- 1 Application (company)
- 2 Environmental impact description (company)
- 3 Send it to the court



**How to get a permit for open cage fish farm**

- 1 Application (company)
- 2 Environmental impact description (company)
- 3 Send it to the court



**It Takes Years!!**

Fishing in open cages is not permitted  
[2017-03-13] Land and Environmental Court

**The Land and Environmental Court of Appeal has today issued judgments in four cases concerning permits for the farming of fish in open cages. IM 8673-15 and M 8882-15, which deals with licenses for fish farming in Omnefjärden and Mjältösundet, both in the municipality of Kramfors, and in M 2620-16 for permission for fish farming and winter storage of fish in Nätrafjärden in Örnsköldsvik Municipality, the Land and Environmental Court Concluded that the activities can only be allowed during a settlement period of three years.**

It seems like new permits for open cage fish farming is no longer possible. Every application for a new permit has been denied and appealed.





## **Land based RAS Farm**

**4000 tons production of arctic char in region of  
Jämtland**

**Time to sentence... Less than a year....**

**With RAS technique.**

**No conflict with landowners**

**No conflict with village organization**

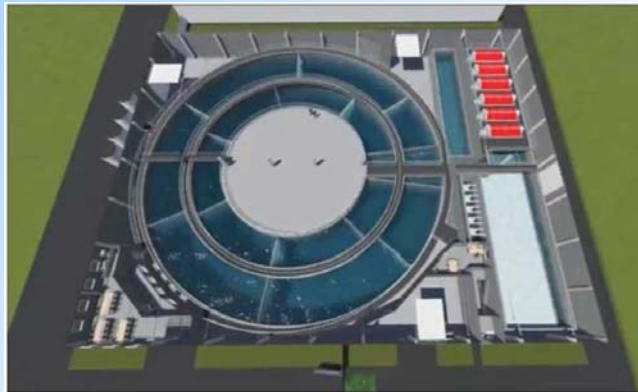
**No conflict with fishers**

**No conflict with tourists**

**No conflict with NGO's**

**Agro Aqua benefit's**

**No conflict with the  
Municipality**



Controversies, aquaculture governance and coastal zone  
planning

by

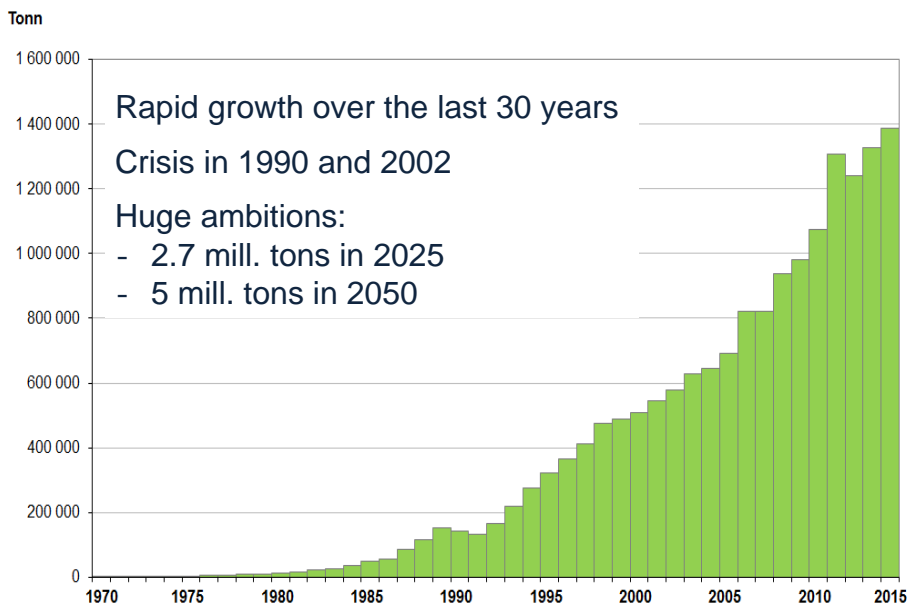
Ann-Magnhild Solås  
and  
Ingrid Kvalvik,  
Nofima, Norway

# Controversies, aquaculture governance and coastal zone planning

Ann-Magnhild Solås  
and Ingrid Kvalvik  
AquaLog, Vancouver, April 2017



## Development of the Norwegian salmon industry



## Controversies: A battle for space?

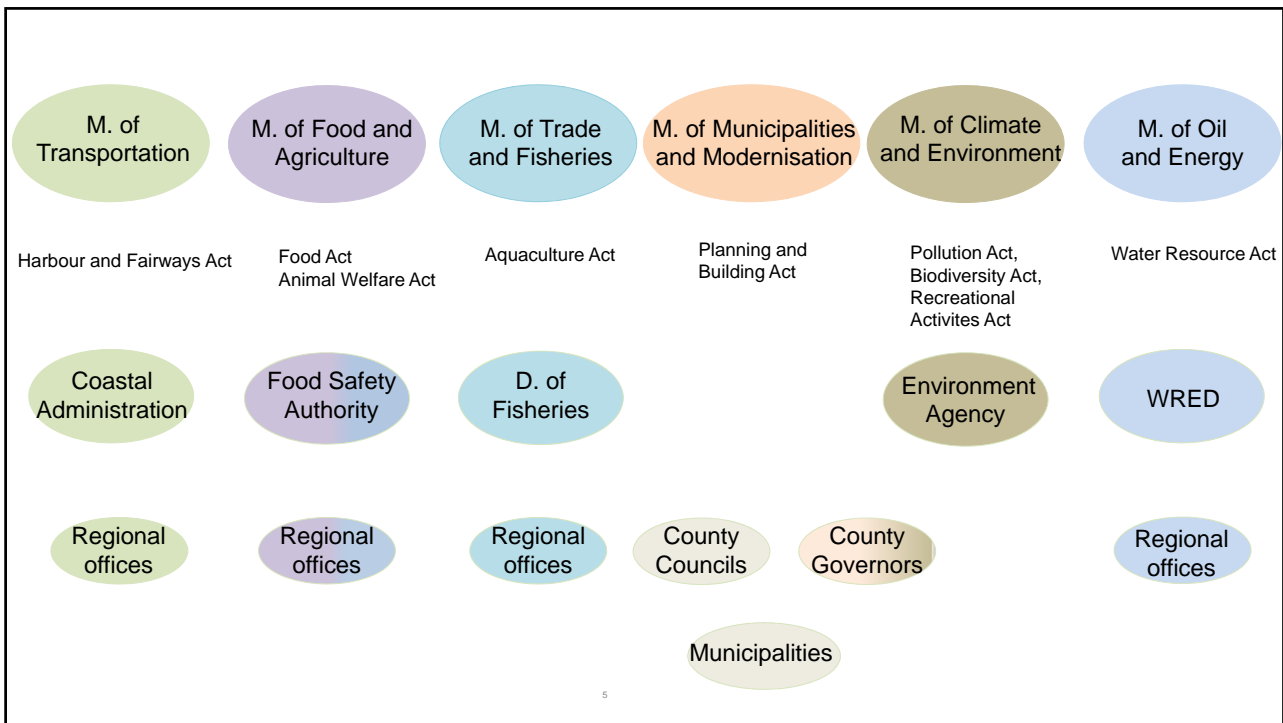


## Controversies: What are the impacts of aquaculture?



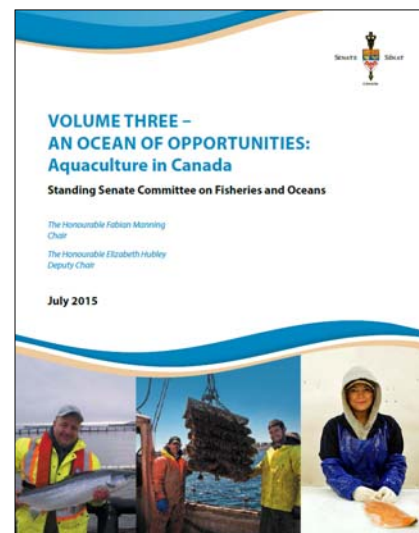
<http://www.bt.no/nyheter/lokal/Fiskerens-har-aldri-sett-lignende-3330766.html>





## A paradox?

- Elements of the Norwegian model are recommended in Canada:
  - Coherent set of regulations
  - Transparency
  - 22 week limit for approval processes
  - A ‘one-stop shop’: A single authority coordinates the work of all the regulatory authorities (in site approval processes)



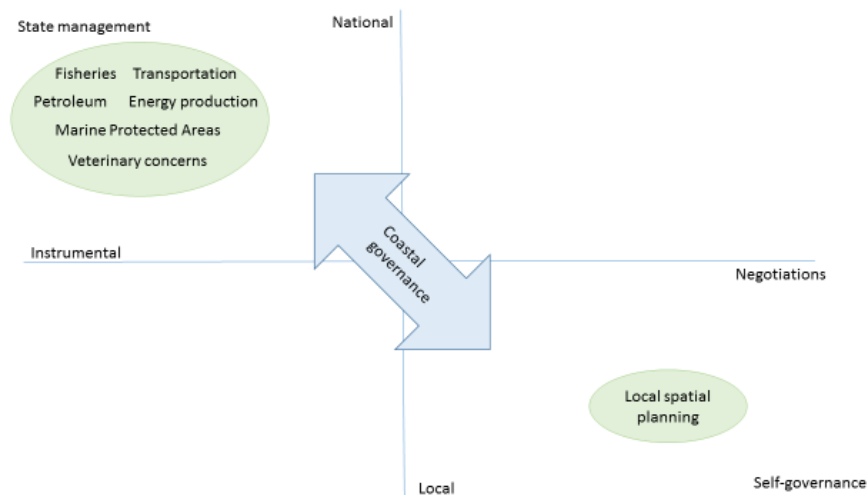


...this one-stop shop would **solve the problems of duplication, overlap, contradiction, cumbersomeness, lack of clarity, and inconsistency** inherent to the current federal regime.

Standing Senate Committee on Fisheries and Oceans, Canada  
*An Ocean of Opportunities: Aquaculture in Canada, s 23*



## Two different modes of governance?



## ManAqua

### Building a Sustainable Future for the Aquaculture Industry: Local Legitimacy, Area Access and Strategies to Manage Controversy in the Coastal Zone



- The municipality - gate keeper and door opener for aquaculture
- Changing municipal – company relation

## ManAqua: Main findings

### Case study of local opposition in a municipality:

- The responses to the expansion of the industry are to a large extent connected to how people see their relation to nature

### Industry's CSR strategies:

- Need for companies to adapt their strategies to the highly varying local contexts
- Importance of proactive strategies involving a shift towards deeper, more systematic involvement with local stakeholders.

### Variation in municipal – company relations:

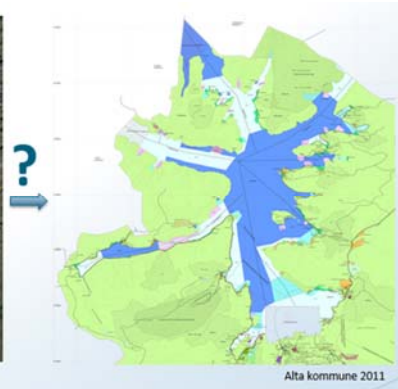
- From case-to-case contact, to more or less formal networks or partnerships with the municipalities



## What are nature's benefits– and how do we take care of them?



Bilder ©2014 Landsat, IBCAO, Kartdata ©2014 Google



Alta kommune 2011

- Which coastal ecosystem services can we identify?
- What are the practices of planning?
  - Process?
  - Participation?
  - Knowledge production? (Maps, numbers, reports)
  - Conflict resolution?



### News



Interview round in Lenvik



Many paths to the goal



How to manage people, coral and sea snakes



The coast: What values are to be found - and how do we take care of them?

[www.coreplan.no/en](http://www.coreplan.no/en)

## SociAqua (2016-2018) (postdoctoral project)

- How do rules and regulations enable socially sustainable salmon farms?
- How do various actors understand and facilitate social sustainability?

Main focus: Norway, will visit UBC (IRES) August 2017 – June 2018

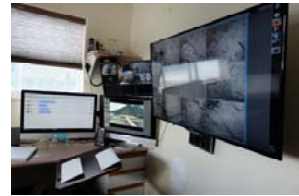


## AquaLog (aquaculture + dialog)

- Understand the factors and forces that influence controversies over aquaculture
- Members from Norway, Sweden, the Faroe Islands, Iceland, and Canada



# It's complicated!



15

Thank you for your attention.

Contact:  
ann-magnhild.solas@nofima.no  
ingrid.kvalvik@nofima.no (ManAqua)



Foto: Frank Gregersen, Nofima

