A Canadian-Norwegian Collaborative Approach to Fish Health and Welfare Issues

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Aquaculture in Canada and Norway

- Similar species being farmed (Atlantic salmon and Atlantic cod)
- Similar disease problems (viral ISA, nodavirus)
- Increasing intensity of production at hatchery and net pen sites has increased concerns of impact of fish health and welfare
- Research needs similar – need tools to measure health and welfare of fish

SEAFOODplus Session AQUA 2006, 11 May 2006, Firenze

Canadian-Norwegian Collaborations

Funding to facilitate collaboration

Initiation of collaboration – at scientist to scientist level

Examples of collaboration – past, present, future

AquaNet

Canada's Research Network in Aquaculture

Mission

- **To foster a sustainable aquaculture sector in Canada through high quality research and education**

Vision

- **To help achieve the long term viability and sustainability of the aquaculture sector by significantly contributing to:**
  - **Diversification of species**
  - **Harmonisation of users**
  - **Integration of disciplines**

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AquaNet's Network of Partners

Pacific Salmon Forum

Canadian Aquaculture Industry Alliance

The Norwegian College of Fishery Science

Aboriginal Aquaculture

Fiskeriforskning

Fisheries and Oceans Canada | Pêches et Océans Canada

ACRDP NAAHP AMD

Great Lakes Fishery Commission

Coastal Alliance for Wild Salmon

Canadian Research Coalition for Safe Food and Water

Norwegian Institute for Nature Research (NINA)

Collaboration: Workshops

October 2004 - AquaNet Fish Welfare Workshop, Campbell River, Canada

Proceedings: www.aquanet.ca/English/research/forum_welfare.php

Collaboration: Workshops

January 2005 – Fiskeriforskning Fish Health Workshop, Tromsø, Norway

Proceedings: www.aquanet.ca/English/research/fish/cfp_bg/index.htm

Collaboration: Workshops

April 2006 – AquaNet Fish Health & Welfare Workshop Vancouver, Canada

Collaboration: Newsletters

UTSIKT TIL havbruk
nr. 4 • 2005
presentert av Fiskeriforskning

Felles interesse for fiskehelse

Fiskeriforskning og AquaNet i Canada har felles mål om "å bidra til en levedyktig oppdrettsnæring" i våre to land.

Fact Sheet

Joint Research Helps Define Fish Welfare And Improve Fish Health

Fiskeriforskning and AquaNet Research Collaborations

Seafood consumers are showing a growing interest in the well-being of fish, especially when reared under intensive culture conditions. A reality in Europe for some time, heightened consumer awareness is now also gaining momentum in North America. Fish farmers and governments are paying increased attention to the conditions and practices that influence and ensure fish welfare and thereby contribute to ongoing efforts of improved fish health, seafood quality and consumer acceptance. But what does fish welfare mean, how can it be measured and assessed, and how does it affect fish health?

Defining an acceptable and measurable level of fish welfare in aquaculture operations and mitigating fish diseases affecting farm operations are high priority areas for both Fiskeriforskning, Norway's leading institute for fisheries and aquaculture research, and AquaNet, Canada's research network in aquaculture. Building on an agreement to advance research of mutual benefit to both countries, researchers from the two organizations are coordinating efforts in these two key areas.

FISH WELFARE

The goal of both AquaNet and Fiskeriforskning is to increase the understanding of the natural behaviour and physiological needs of fish and help ensure that discussions of welfare can be grounded on objective, research-based knowledge. Norwegian researchers have carried out studies for a number of years to quantify welfare in fish. A joint forum, held in Canada in September 2004, identified research needs in Canada to develop practical, science-based fish welfare indicators that the industry can use to assess and improve animal welfare. To self-regulate, the measuring process needs to be simple yet ensure the measures are valid. Key aspects affecting fish welfare on aquaculture farms include environmental conditions (e.g., water quality), stocking density, feed and feeding, and harvesting and slaughter.

Different perspectives will form the basis for research projects involving studies in both Norway and Canada:

- Biological, physical and bio-chemical indicators to monitor aspects such as health, growth, and reproduction;
- Behavioural indicators such as swim patterns, feeding behaviour to compare with natural behaviour; and

www.fiskeriforskning.no

www.aquanet.ca

Collaboration: Research

(1) Risk of sea lice infestation during the out migration of salmon and sea trout smolts.

→UBC (McKinley, Butterworth), Fiskeriforskning (Bjørn)

(2) Escapement behavior of cod from sea cages.

→UBC (McKinley), Fiskeriforskning (Damsgård)

(3) Intensive smolt production and the impact on fish welfare and risk of winter ulcer disease.

→UBC (Balfry), Fiskeriforskning (Toften)

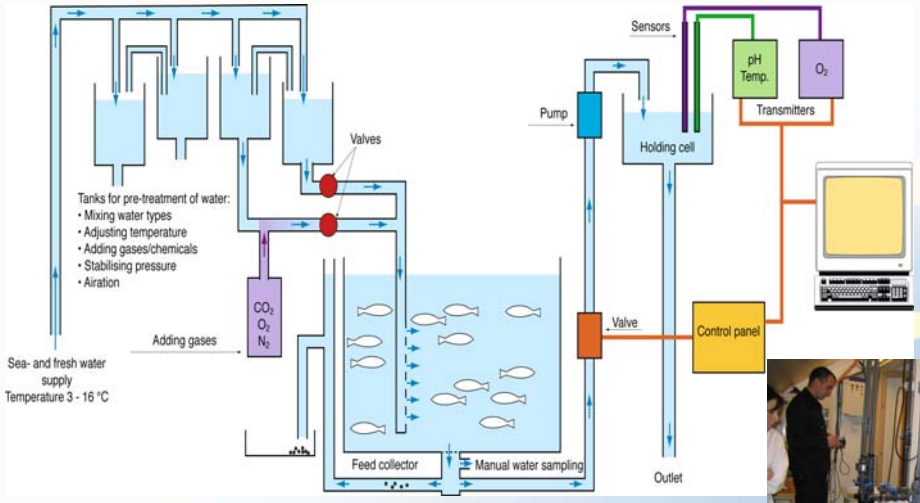
Use of sea water in intensive smolt production: Effects on health, welfare and risk of winter sores

H. Toften, H. Mikkelsen, B. Damsgård, U. Sørum, T. Kristiansen, H. Telen, B. Rosseland, B. Salbu, S. Handeland, S. Stefansson, S. Balfry

Experimental treatment groups

Treatment Group	Salinity (‰)	Sp.Water Flow (l/kg/min)	O_2 out (%)
1. FW/H_{SWF} (control)	0	0.83	90
2. FW/L_{SWF}	0	0.13	90
3. SW/H_{SWF}	20	0.83	90
4. SW/L_{SWF}	20	0.13	90
5. SW/L_{SWF} /HO_2	20	0.13	135

Technical equipment for manipulation of water



Experimental design

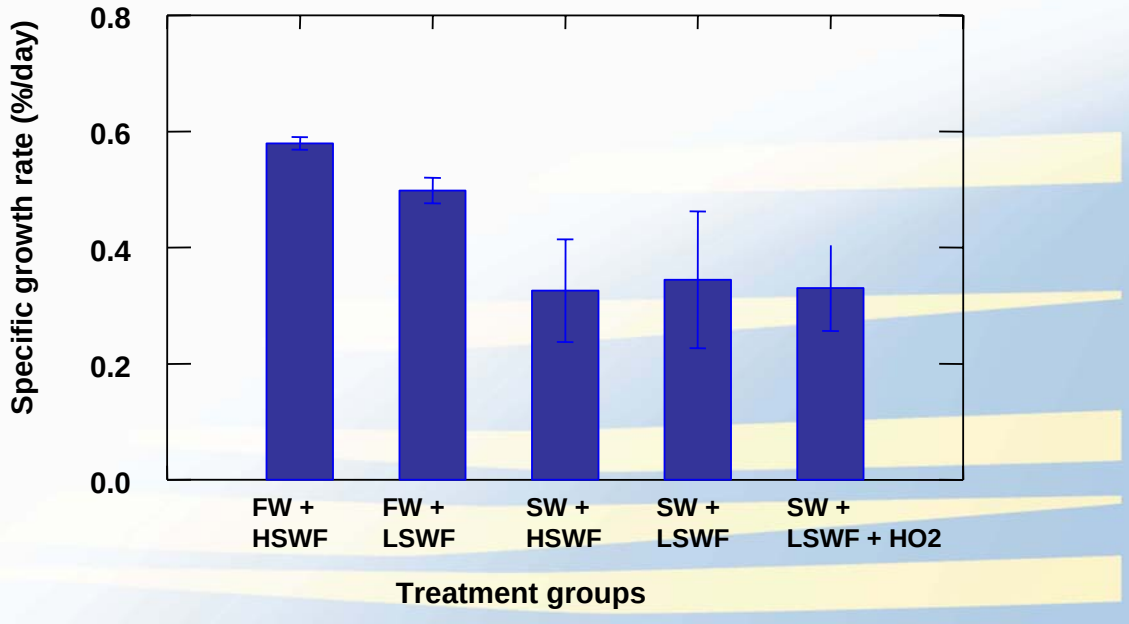
- 5 treatments
- duplicate 500 l tanks
- 80-90g fish at T_0, ~ 60 kg/m3
- temperature 7°C
- light regime (continuous light)

- sampled at 2 & 5 weeks after water treatment
- disease challenge performed at 5 weeks

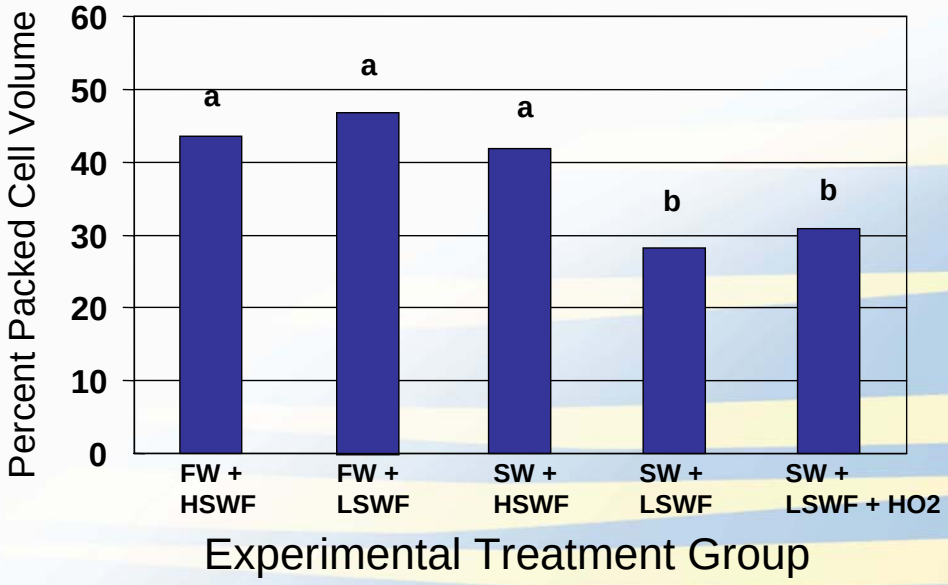
Biological parameters

- Growth performance – weight, length, condition factor, feed intake, feed conversion …
- Necropsy – internal and external (sores)
- Mucus – antibacterial activity
- Gills – Na^+ /K^+ ATPase, trace metals, histology
- Histology – skin, gills, kidney
- Liver – oxidative stress
- Muscle – water content
- Kidney – histology, bacterial counts
- Blood – cell counts, hemoglobin, hematocrit, glucose, cortisol, glucose, respiratory burst activity, lysozyme …

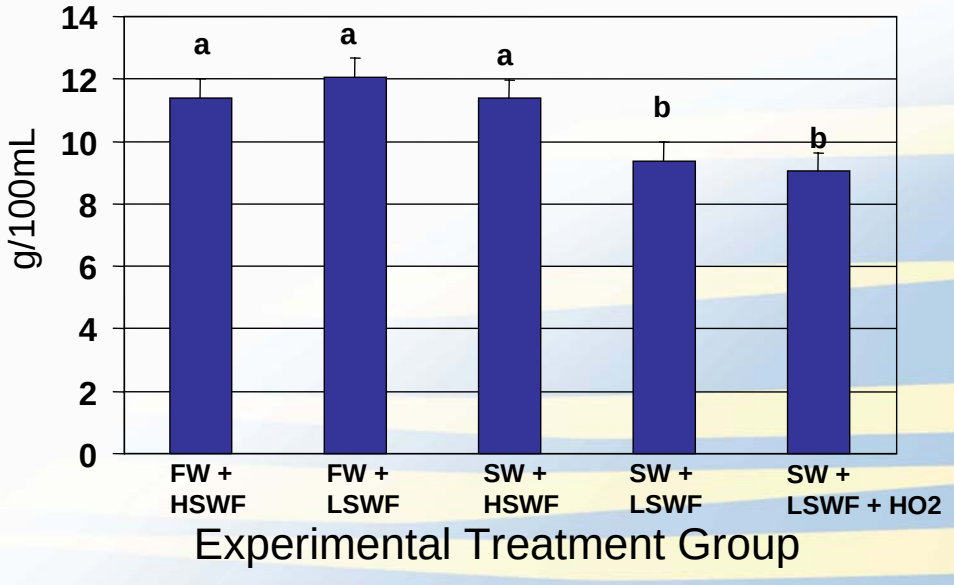
Growth during water treatment



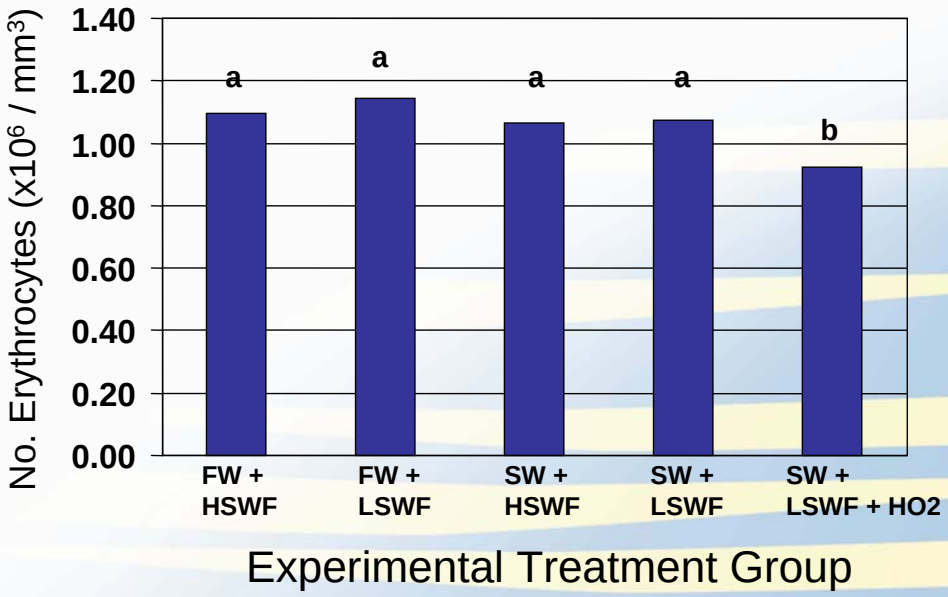
Hematocrits after 5 wks treatment



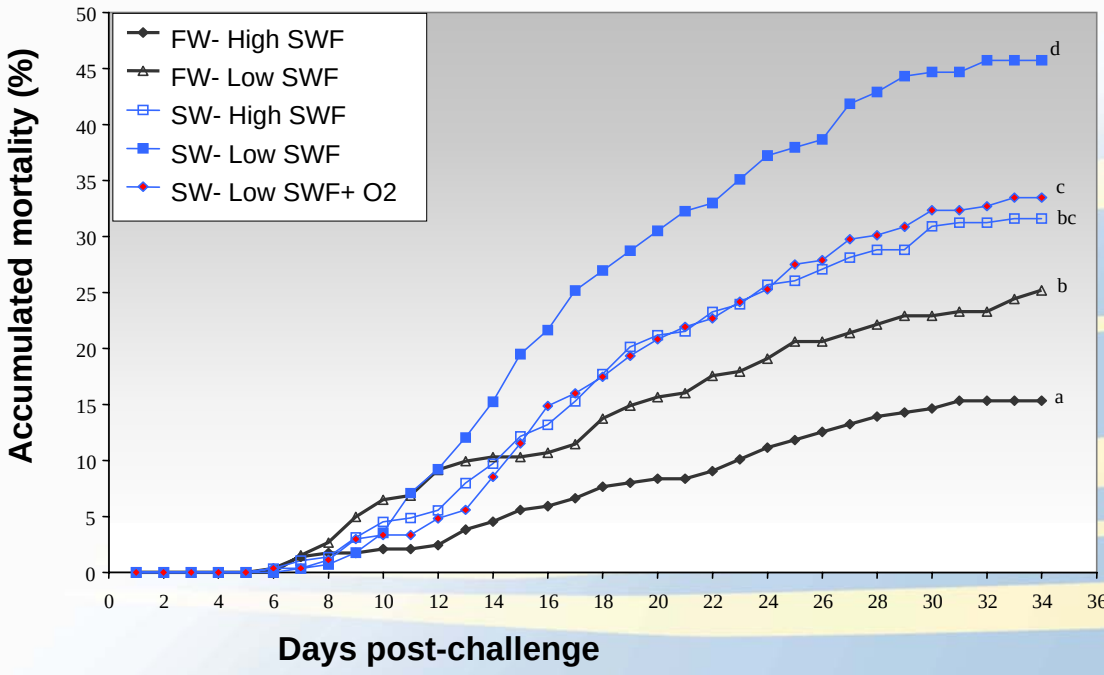
Hemoglobin after 5 wks treatment



Erythrocyte numbers after 5 wks treatment



Mortality after challenge with *Moritella viscosa*



Future Collaborations?

Early detection of infectious hematopoietic necrosis virus (IHNV) and infectious salmon anemia virus (ISAV)

*** Erling Sandsdalen, Fiskeriforskning**

Examination of vaccination, water quality and smoltification on disease resistance and immunity of hatchery reared Atlantic salmon

*** Hilde Toften, Fiskeriforskning**

Acknowledgements

- **AquaNet**
- **Fisheries and Oceans Canada**
- **Fiskeriforskning**
- **SEAFOODplus, ETHIQUAL**

SEAFOODplus Session AQUA 2006, 11 May 2006, Firenze

A better life with seafood…

www.seafoodplus.org