

Towards a Sustainable Land-based Closed-containment Aquaculture System

Backgrounder

The Project:

A scientifically monitored grow-out trial of farmed Atlantic salmon in a commercial-scale, land-based closed-containment system

The Purpose:

To measure all details of growth, material costs, fish health, feed conversion, pesticide/antibiotic use and other key parameters for Atlantic salmon production

The intent is to develop systems to reduce the massive impact salmon aquaculture is presently having on the inshore marine environment, on wild Atlantic salmon populations, and on other species affected by aquaculture's wastes, pesticide impact on other species, and escape of farmed fish on critically low numbers of wild Atlantic salmon in the regions where net-pen operations exist.

The Project Partners:

- The Conservation Fund, a leader in closed-containment aquaculture systems, through its Freshwater Institute, based in Shepherdstown, West Virginia. The Conservation Fund has advanced land and water conservation for 25 years and has produced over 200 tonnes of trout, charr and salmon in its land-based systems in recent years.
- The Atlantic Salmon Federation (ASF), dedicated to the conservation, protection and restoration of wild Atlantic salmon and the ecosystems on which their well being and survival depend, has decades of experience scientifically measuring and monitoring aquaculture impacts .

The System:

- Closed containment
- Water recirculation technology to reduce the operation's "water footprint"
- 99.8% of the water is reused
- 99% of fish wastes and phosphorus reclaimed, and available for fertilizer use
- Filtering to reduce need of antibiotics and pesticides in maintaining healthy fish
- Pesticide-free production of healthy salmonids
- Measurement of key parameters to provide high quality scientific and economic information on which future development decisions can be made

The Goals:

- Improve biosecurity to reduce impact on wild populations
- Reduce stress and disease outbreaks
- Reduce impact of parasite pesticides on the environment
- Reduce energy consumption and improve waste disposal

- Identify criteria to optimize the growth, health and quality of farmed Atlantic salmon
- Conduct production trials to allow a realistic economic analysis of results
- Sustain the aquaculture industry's growth, without jeopardizing wild salmon populations, other species, and the marine environment
- Reduce aquaculture's impact on the environmentally important forage fish now used for feed, and replace this with vegetable proteins
- Develop systems that invest in sustainable operations in local communities in ways that allow future generations to use the same resources
- Provide a way for salmon aquaculture to expand, perhaps in areas closer to major markets, beyond the very limited area in which it presently exists - and in which it comes into conflict with others using the marine environment

The Facility & Parameters:

- Circular Tank based 4,800 L/min water recirculation system
- 12-month grow-out trial
- Project team includes a scientist researcher of aquaculture systems; a veterinarian, and an aquaculture production manager

The Present Situation with Marine Aquaculture:

- Aquaculture industry size, Canada & US
 - Canada is the fourth largest aquaculture producer, with 38,957 tonnes on the Atlantic coast, and 71,000 on the Pacific Coast in 2010.
 - US produced an additional 11,127 tonnes in Maine and 7,930 tonnes on the Pacific coast, in 2010

The Shortcomings of Marine Aquaculture:

- Sites can be a reservoir for greatly increased densities of disease and parasites which are becoming highly resistant to chemicals available. Alternative chemicals are highly toxic to crustaceans at all life stages.
- Escapees enter salmon rivers and breed with wild Atlantic salmon. Major scientific studies, some extending a decade, show low survivability for the offspring.
- Degradation of the waters and bottom with faecal and feed wastes leading to high levels of bacterial growth
- Major consumer of forage fish that go to make up the feed. There is major concern about the long-term health of these species, which are critical to the environment.
- Marine aquaculture can only be practiced in very limited areas in Canada and the US. This is putting extreme pressure on critically low wild Atlantic salmon populations on the east coast and raises serious questions on the Pacific Coast about farmed salmon impacts.