



What's 'Cooke'ing in the Bay?

Surf'n Surf'n Surf or
integrated aquaculture!

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Integrated multi-trophic aquaculture (IMTA) holds great potential for improving the sustainability of aquaculture. Based on an age-old, common sense farming practice, the by-products (wastes) from one species become inputs for another: fed aquaculture (fish or shrimp) is combined with extractive inorganic aquaculture (seaweed) and extractive organic aquaculture (shellfish). With the support of AquaNet, the Canadian Network of Centres of Excellence for Aquaculture, we have been developing this concept over the last five years at an experimental pilot scale by co-cultivating salmon (*Salmo salar*), kelp (*Laminaria saccharina* and *Alaria esculenta*) and blue mussel (*Mytilus edulis*) at several sites in the Bay of Fundy.

The project has five modules: seaweeds, mussels, food safety, environment and socio-economics. Data and experience acquired through this successful interdisciplinary approach support the establishment of IMTA systems for environmental sustainability (bioremediation), economic diversification (from fish filets to bioactive compounds) and social acceptability (better management practices). Innovative kelp culture techniques have been developed and improved both in the laboratory and at the aquaculture sites. Increased growth rates of kelps (46%) and mussels (50%) cultured in proximity to fish farms, compared to reference sites, reflect the increase in food availability and energy. Nutrient, biomass and oxygen levels are being monitored to model the bioremediation potential of an IMTA site. Over five years, none of the therapeutants used in salmon aquaculture have been detected in kelps and mussels collected from the IMTA sites; levels of heavy metals, arsenic, PCBs and pesticides have always been below regulatory limits. A taste test at market size conducted on site grown versus reference mussels showed no discernable difference.

A survey of aquaculture attitudes found that the general public is more negative towards current monoculture practices and feels positive that IMTA would be successful. A focus group social study revealed that most participants felt that IMTA has the potential to reduce the environmental impacts of salmon farming, benefit community economies and employment opportunities, and enhance the industry competitiveness and sustainability. All felt that seafood produced in IMTA systems would be safe to eat and 50% were willing to pay 10% more for these products if labelled as such.

Building on this R&D AquaNet success, we are now advancing the IMTA concept to the C (commercial) scale with the support of the Atlantic Innovation Fund from the Atlantic Canada Opportunities Agency. This project, with total project costs of \$7.3 million, will receive up to \$2.9 million from AIF over a five-year period. It will be conducted by the Institute for Coastal Marine Science, newly created by the two lead institutions, the University of New Brunswick and the DFO St. Andrews Biological Station. The industrial partners are Cooke Aquaculture Inc. and Acadian Seaplants Limited. The Canadian Food Inspection Agency will partner for the food safety aspects.

The project will address challenges in mussel production and quality, disease risk and feed supply. For seaweeds, technologies to increase production, improve product quality, and mechanize harvesting and processing will be developed and tested. The project will further develop computer models of nutrient plumes and site carrying capacity to guide the number and location of mussel and seaweed production units, thereby optimizing bioremediation at salmon sites and enhancing environmental sustainability. New value-added products and markets from IMTA mussels and seaweeds will be evaluated and the economics of IMTA will be documented to determine its net contribution to site profitability. Preliminary data of a bio-economic model already show that the addition of seaweed and mussel to salmon farming is profitable and helps reduce risks. We will also work on developing an appropriate food safety regulatory and policy framework that will allow the full development of IMTA operations to commercial scale.

Surf'n Surf'n Surf (Salmon'n Seaweed'n Shellfish) should be soon served at a restaurant near you!

1) Kelp (*Laminaria saccharina*) line cultivated in proximity to Atlantic salmon (*Salmo salar*) at Charlie Cove, Bay of Fundy, Canada (photo:Thierry Chopin).

2) Harvesting of kelp (*Laminaria saccharina*) cultivated in proximity to Atlantic salmon (*Salmo salar*) at Charlie Cove, Bay of Fundy, Canada (photo: Manav Sawhney).

3) Cultivation of blue mussel (*Mytilus edulis*) in proximity to Atlantic salmon (*Salmo salar*) at Charlie Cove, Bay of Fundy, Canada (photo:Thierry Chopin).

4) Blue mussel (*Mytilus edulis*) raft and a mussel sock grown next to Atlantic salmon (*Salmo salar*) cages at Bliss Harbour, Bay of Fundy, Canada (photo: Shawn Robinson).

