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Fact Sheet

Integrated Multi-trophic Aquaculture





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Integrated aquaculture

the idea of growing finfish, shellfish and seaweed together for the benefit of all crops and the environment is a concept that is catching on, but is Canada ready?

"The aquaculture industry is still at an early stage of evolutionary development both in Canada and globally," states Dr. Thierry Chopin, professor at the University of New Brunswick, one of the lead experts in integrated aquaculture, and principal investigator for AquaNet, the Network of Centres of Excellence for aquaculture in Canada.

"As the cost of production and the market price to the consumer have decreased, much of the open-sea finfish culture has entered a commodity market where increasingly larger volumes are required to maintain profitability, raising questions about nutrient waste treatment and removal. Maintaining sustainability, not only from environmental, but also from economic, social and technical perspectives, has become a key issue."

The challenge is how to increase the production capacity of an existing site when spatial expansion options have their limits? One

of the possible answers is to increase the level of technology involved in the production of seafood so that food and waste handling systems are all actively considered in the growing operation from the start, and are modelled after natural ecosystems.

One of the innovative solutions being proposed is integrated multi-trophic aquaculture, which combines, in the right proportions, the cultivation of salmon (fed aquaculture) with that of mussels (organic extractive) and kelps (inorganic extractive) aquaculture for a balanced ecosystem management approach that takes into consideration site specificity, operational limits, and food safety guidelines and regulations. All the components of the system would have an economic value as well as a role in the re-cycling processes.

An AquaNet interdisciplinary team of scientists from the University of New Brunswick in Saint John and the Department of Fisheries and Oceans in St. Andrews and industrial and government partners (Heritage Salmon Ltd., Ocean Nutrition Canada, Acadian Seaplants Ltd., the Canadian Food Inspection Agency, the Atlantic Canada Opportunities Agency, and the New Brunswick Innovation Foundation) is one of the world's leading groups promoting and developing such balanced integrated aquaculture systems. The researchers have been working together since 2001 through a project in the Bay of Fundy, New Brunswick, that is supported by AquaNet.

The research to-date has demonstrated that integrated multi-species aquaculture is not only biologically feasible but that it also contributes to:

1. a more beneficial use/conversion of food and energy,
2. environmental services through bioremediation and compliance with upcoming discharge/effluent regulations,
3. improved knowledge of the incremental costs and economics of scale of operations, and
4. better understanding of the implications of a diversified production of marine crops on cash flow and environmental stability, and on minimizing risks and public concern.



Researchers have been successful, for example, in accelerating the full life cycle of kelps, documenting mussel feeding and biofiltration rates, demonstrating that mussels and kelps benefit significantly in growth when cultivated in proximity to salmon, verifying the absence of faecal coliforms and therapeutic residues in mussel and kelp tissue, and monitoring environmental indicators at production and reference sites. A survey of the social acceptability of integrated aquaculture is under way.

To move research from the 'pilot' to the 'scale up' stage, some current federal and provincial regulations and policies need to change. A workshop in March 2004 in Saint John, NB, brought together representatives from federal and provincial agencies involved in aquaculture regulations and policies, researchers, industry, professional associations, and environmental NGO's to define an appropriate regulatory and policy framework that will allow the development of commercial scale integrated operations. The participants identified specific hurdles that are now being addressed at the provincial, regional and national level.

Further research priorities include environmental aspects such as carrying capacity, diseases, predator-prey behaviour, environmental impacts, social aspects related to public perceptions, and economic aspects such as cost of production and market impacts, processing infrastructure and market opportunities.



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