Ecosystem approach translated to sustainable Aquaculture

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The vision for the sea nation Norway is to uphold our rich and clean seas and coastal waters. Norwegian Aquaculture is a vital industry using these waters and has had a steady increase in production over the years. The economic value of this production has now surpassed traditional fisheries in export value with at total income in 2009 of approximately 20 billion NOK in first – hand turnover. It is of vital importance to Norway that this production is done within the limits that the environment can tolerate and that we are able to assess the effects on not only local scale but the ecosystem as a whole.

Institute of Marine Research shall more specifically give knowledge based advice on issues related to environmental effects of Aquaculture and have special focus on three recognised environmental impacts: carrying capacity relating to pollution and discharges, genetic interaction and escapes and disease dispersal including parasites. In addition we have focus on animal welfare especially in defining what is good welfare for fish and what indicators can we use to monitor this in the whole production cycle.

Fish farming supply coastal waters with organic matter that mainly consists of uneaten feed and faecal material. A Norwegian Standard (NS 9410) has been developed that document how this should be monitored under and adjacent to fish farms and state what action should be taken if the acceptable values are exceeded. However, interactions between for instance wild fish and farms are poorly understood and studies are undertaken to describe the overall impact to the ecosystem and the marine food web. To achieve an ecosystem –based management it is important to understand these interactions.

It has been shown that both salmon and cod can and will escape from fish farms from time to time. For salmon negative genetic impacts of the escapees has been documented and we are undertaking studies to ascertain if the same can be said for cod. Surveillance of the long time effects in rivers show that farmed fish and the hybrids of wild and farmed fish have lower fitness and reduced return rate to the river. The best solution would be to avoid escape all together but accidents can always happen. We are therefore also looking into if the fish can be made sterile and thus stop the maturation so a cross with wild fish is impossible. There is however production, ethical and welfare issues that needs to be addressed.

One of the main problems in salmon aquaculture is the parasitic salmon lice. It is no longer a production problem for the farmed salmon but due to the high numbers of farmed fish the total production of the parasite and subsequent dispersal in the environment can have detrimental effects on wild salmonids ie salmon sea trout and arctic charr. The wild migrating post smolts can potentially be exposed for too many parasites on their way through the fjordic environment and the coastal zone. The situation is monitored every spring and the development is used as a basis for the advice to the National Food Safety Authorities on how to best handle the problem.

Our challenge is to provide the necessary knowledge through our research, to monitor enough in the right geographical places and to integrate this knowledge into our advice so the authorities can make decisions on a sound basis. International cooperation is central for the Institute to achieve these goals.