

THE PLACE OF SUSTAINABLE AQUACULTURE IN 'BLUE GROWTH' STRATEGY FOR THE BALTIC SEA

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Among the Baltic Sea countries only Finland has essential fish farming production based on marine aquaculture. The amount of food fish cultivated in Finland in 2010 was about 11.8 million kilograms. Value of food fish production was EUR 44.0 million. The food fish supply consisted of 11.0 million kilograms of rainbow trout, about 0.7 million kilograms of whitefish (*Coregonus lavaretus*) and just under 0.1 million kilograms of other food fish species. The major part (80%) of farmed fish is from the seawaters. However the potential capacity of Baltic Sea is about 300 million kilograms for annual aquaculture total harvest. Just three of Baltic countries like Finland, Estonia, and Russia are able to produce up to 70 million kilograms in the Gulf of Finland waters. Nowadays the stake of European aquaculture is only 4,5% from the World production and fish farming in brackish water in Europe has the minor part. The Baltic Sea is a reserve for brackish water aquaculture growth in Europe.

The Baltic Sea Region faces enormous challenges including fishery declines, eutrophication due to excessive nutrient input as well as the effects of climate change. But innovative technologies provide opportunities for new uses of marine ecosystems, which can be both commercially appealing and environmentally friendly (Blue Biotechnology in the Baltic, 2012). Nowadays typical aquaculture is intensive monoculture. This concept has several disadvantages both from an environmental point of view. The environmental pollution is a very important problem in the intensive fish farming. It is well known that salmon rearing causes the drift of 5-25% feed mass from the net cages. On the other hand polyculture production systems could represent ways of increasing production volume and utilizing the biodiversity of marine ecosystems. Combining cage system with an artificial reef could solve the problem of the waste conversion. The reefs installed around the cage become inhabited with various filtering organisms. Waste products from the cage might be used as food and contribute to the strengthening of bio-filtration belt, thus increasing the self-cleaning capability of the sea area (Bugrov, 1991). The most advanced systems are termed Integrated Multi-Trophic Aquaculture (IMTA) and combine the cultivation of fed species (e.g. finfish) with extractive species, which utilize the inorganic (e.g. seaweeds) and organic (e.g. suspension and deposit feeders) excess nutrients from the fed aquaculture (Marine Board-ESF, 2010).

There are engineering and biological aspects that we need to consider as risk factors to provide an accurate estimation for sustainable aquaculture development in the Baltic Sea. Among engineering aspects the main is risk of damage of floating cages because conventional floating cages at water surface cannot withstand storm waves and ice fields. Key biological aspects are wave impact to fish and overheating in the summer season. Submersible cage system is the solution for offshore aquaculture. This is the way to avoid conflicts between users, reduces risk of fish overheating, cage damage by storms, drifting rubbish or ice and enables successful fish farming in open sea areas. At ice-infested waters submersible cages could be used for all-year round and seasonal fish farming. Before winter time cages will sink into safety depth to prevent the ice hazard (Bugrov, 2006). IMTA sea farms based on a submersible concept are able to produce different fin fish species, macro algae (*Furcellaria lumbricalis*) and blue mussels (*Mytilus edulis*) as raw material for new pharmaceutical and cosmetics products, as well as may be a way to remove nutrients from the Baltic Sea.

References

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