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ENVIRONMENTAL IMPACTS OF SEA CAGE FARMING AND ITS MITIGATIONS

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Introduction

Cage aquaculture requires suitable site, materials to fabricate cage, nutritionally balance feed and healthy seed. The cage farm depending upon intensification generates the considerable wastes which include uneaten food, excretory products (faecal matter and urinary products). Many cage aquaculture activities utilize chemicals for prophylactic as well as therapeutic purpose which further contributes to the total waste discharge. Further, microorganisms and parasites associated with caged fish also contribute towards cumulative environmental degradation.

Excretory products are dispersed in the water column by currents while solids (uneaten food, faeces) tend to settle towards the sea bottom. During sedimentation, some of the uneaten food is consumed by fish while some breaks down into fine particles. Nutrients are solubilized, the quantities released depending upon the composition of faeces and uneaten food, physical properties, temperature, depth of water and turbulence.

Water quality characteristics such as Dissolved Oxygen, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Ammonia, Turbidity and Secchi disc depth can also be altered in densely caged sites. However, changes in water and sediment characteristics are often transitory and only apparent during slack tides where dilution is much more rapid. Faeces and waste food, especially from intensively managed operations, have much higher levels of carbon, nitrogen and phosphorus than sediments. Therefore, sediments below the cages and in the immediate vicinity of cages sites may tend to elevates levels of organic matter and nutrients.

Highly enclosed, poorly managed sites often show signs of excess nutrients (Eutrophication) which leads to change in plankton and nekton community structure and function. Marine benthic communities also show similar patterns of response. Immediately under the cages at heavily impacted sites an azoic zone, devoid of oxygen and macrobenthos can be seen. Impact of open sea cage farming activity on marine environment has not been meticulously studied. However, possible environmental impact of sea cage culture activities those are highly enclosed and poorly managed can be summarized as follows.

- Discharge of cage effluent in highly enclosed, poorly managed sites leading to water pollution and Marine floor degradation and accumulation in farming and coastal areas.
- Issues related with use of fish meal and fish oil in fish feed, collection of trash fish for feeding carnivores
- Alteration of local food webs and ecology, and habitat modification
- Depletion of wild resources and biodiversity for seed or broodstock
- Spread of parasites and diseases to wild stocks
- Environmental and human health risks associated with chemical use in cage aquaculture
- Fish escape from cage leads to depletion of wild genetic resources through interactions between wild populations and cultured populations
- Impacts of introduction of exotics (deliberate or inadvertent)
- Resource use conflict (navigation and fisheries)
- Social/economic issues

Therefore, in order to minimize the adverse impact of marine cage farming, the cage farms should be stocked with appropriate fish species and stocking densities by adopting appropriate method of rearing. Feeding and feed management should be given utmost importance to improve cost-effectiveness of the cage farming. Proper post stocking management measures should be followed meticulously to ensuring the best possible water quality within cages. However, routine cage maintenance as well as maintenance of moorings, anchors and ancillary gear should be carried out to improve farm efficiency. Regular monitoring of stocks for signs of disease, removal of dead fish and treatment of infected stock should be carried out to reduce further damages to the environment. However, in the recent times, practice like IMTA which combines the appropriate proportions of the cultivation of fed aquaculture species (e.g. finfish/shrimp) with organic extractive aquaculture species (e.g. shellfish/herbivorous fish) and inorganic extractive aquaculture species (e.g. seaweed) to create balanced systems for environmental sustainability biomitigation) economic stability (product diversification and risk reduction) and social acceptability (better management practices) can be implemented to minimize the environmental impacts arising from cage farming activity.

References

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2. FAO. 2009. Environmental impact assessment and monitoring in aquaculture. FAO Fisheries and Aquaculture Technical Paper. No. 527. Rome, 675 p.

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