Submission Salmon Farm Relocation   Clive Barker Wed. 12th.

The role of the fisheries industry as a supplier of healthy food for humans, has never been more important. Aquaculture and stock enhancement (artificial reef) have been developed and can now help compensate for the reduced productivity of the wild catch. Add to this the prediction of expanding populations and climate changes. Aquaculture will have to take a more important role to produce food.

To achieve sustainable development of aquaculture, we need to deepen our understanding of the environment problem associated with aquaculture activities, and their affect on the ecosystems and carrying capacity of aquaculture grounds.

The most important factor in the contained culture of fish is oxygen. While the air we breath is measured in parts per 100, aquatic animals must survive on oxygen levels of parts per million, thus water flow is important to the carrying capacity of the site. The fact fish live in their own waste, water flow and dilution ratios of the ammonia nitrogen waste is also important.

Firstly, I wish to put to rest erroneous recalcution of fish wastes to person equivalents. The waste load from aquaculture has a totally different C.P.N. ratio and ratio between particulate and soluable waste are essentially very different. Fish wastes have been taken up and used by the marine food web for a billion years. This is in complete contrast to Picton's 2013 sewage outfall that allows 1.4 million litres per hour treated sewage complete with toxic chemicals from household and commerical industries into Queen Charlotte Sounds.

Review site with highest feed level.

7000 Tonne food; flow 0·24 m/s = 864 m/h or 20,736 metres/day.

Proposed circular cage = 78 m/dia 15 meters deep. 864 ÷ 78 = 11 exchange/hr.

Cage space 71675·6 m^3 x 11 = 788431 m^3 flow per hour x 24.

18922400 m^3/ day through cages.

Food fed 7000 kg year = 19 Tonne ave/day. This amount will vary from less to more.

Using the Japanese fish/seaweed method for Total Ammonia Nitrogen.

19000 kg x 40% protein food x 16% Nitrogen in protein = TAN.

19000 kg x ·4 x ·16 = 1216 kg TAN in food.

28000 kg x ·4 x ·16 = 1792 kg TAN in food.

1216 TAN 30% retained by fish 52% excreted via gills 18% in solids = 70%

1216 x ·7 = 851 kg TAN to water x 1000 = 851000 gms.

1792 x ·7 = 1254 kg TAN to water x1000 = 1254400 gms.

19 tonne food = 851000 gms TAN ÷ 18922400 m^3/day = 0·045 gm/m^3 (ppm)

Dilution 1 : 22,222000.

28 tonne food 1254400 gms TAN ÷ 18922400 m^3/day = 0·066 gm/m^3 (ppm)

Dilution 1 : 15,152000.

The other proposed sites have very similar results for TAN at the stated food water flow ratio. These amounts are not of overly great concern, more so when sites are in fact deeper than the 15m, thus dilution will be much greater. The mussel farms may also benefit from this. Never in the history of shellfish have they occupied the mid water food supply. These shell fish consume vast amounts of microalgae removing them from the water. One mussel can filter 300 litres of water per day according to Cawthron. Some added nutriments would help regeneration of the microalgae for mussel and zoo-plankton. Thus salmon farm could be more beneficial than harmful, creating a balance in the carrying capacity of the water.

Bio-deposits to sea floor.

The bio deposits are more debatable, although over-all size of the areas, plus the distance between sites and water flow and oxygen, I believe makes these sites workable.

There is documented findings, of both Picton and Petone meatworks outfalls into Queen Charlotte and Wellington harbour, that produced vast amounts of organic waste on the sea floor. The results were vast numbers of lug worms (polychaete) settled to feed and grow at these sites. Perhaps NIWA or Cawthron still have this information.

The interesting facts, polychaete worms are very important to the Northern Hemisphere sports fishery. Anglers paying upwards to $30 kg for them as bait.

Now it has been found these worms when fed to flat fish and prawn brood stock produce far superior and healthier larval offspring for on culturing. Marine worm farms are now being introduced into several countries.

The increased water flows at the new sites will result in more oxygen available for these worms to populate and feed on the organic bio-deposits. This would result in an extra food supply for some fish species. There were more fish around in the meatworks days.

Australia are using lug worms to clean up waste feed and faeces from prawn farms. As well they are trialling them in seawater down flow biological filter beds to help prevent filters blocking with organic debris.

Oxygen

18922400 M/3 day x 8 gms O_2/m3 = 151 tonne O_2/day available

28 tonne food x 250 O_2 kg = 7 tonne O_2/day used.

Barker

Summary

Truly responsible development must rest on the three pillars of sustainability. Environmental, Social, and Economical. It requires the focus on the three. Focus on only one would tilt the development goals.

I believe that the proposed salmon farm relocation plans fulfils this obligation. Environmental : Ratio of food to water flows has little impact, and overall could benefit shellfish and native zooplankton carrying capacity of the waters. If lug worms were added to the benthic site, this would add assimilative capacity under cages. Social : Employment opportunites and food security for present and future generations. Economical value is reached by producing a sort after food item, that is highly accepted internationally, creating overseas exchange. The whole culture system from egg to final product is all in house, creating a variety of employment opportunities.