Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 07, pp.54441-54443, July, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

REVIEW ARTICLE

REVIEW ON PROS AND CONS OF AQUACULTURE

*,[1]Shiva Kumar, D., [1]Srikantaswamy, S., [1]Abhilash, M.R. and [2]Smitha, N.

[1]Department of Studies in Environmental Science, University of Mysore, Manasagangothri, Mysuru-570 006
[2]Department of Studies in Botany, University of Mysore, Manasagangothri, Mysuru-570 006

ARTICLE INFO

Article History:
Received 21st April, 2017
Received in revised form
06th May, 2017
Accepted 10th June, 2017
Published online 31st July, 2017

Key words:
Fisheries, culture,
Stack, Harvesting,
Nutritive value.

ABSTRACT

An understanding of the principles of operation of capture and culture fisheries helps to throw light on the definition of aquaculture. The expressions capture and culture fisheries are self-explanatory. In the former, one reaps the aquatic harvest without having to sow, whereas, in the latter, one has to sow the seed, nurse it, tend it, rear it and harvest it when it grows to marketable size. Culture fisheries are usually carried out in small water bodies which can be manipulated, pre-prepared for stocking; which are often manured and/or fertilized before, during and after stacking; and/or where fish are fed from extraneous sources. The principles of management of capture and culture fisheries are very different from each other. In the case of capture fisheries one has to attempt to harvest maximum sustainable yield by regulating fishing effort and mesh after taking into account parameters of population dynamics such as rates of recruitment, natural and fishing mortalities, fish growth and size at which recruitment occurs. Management of capture fisheries requires knowledge of the dynamics of the fish populations under exploitation. For effective aquaculture, one has to gain familiarity and control water quality to enhance its biological productivity; one has to understand fish nutrition so as to be able to formulate nutritionally balanced fish diet; one has to delve deep into fish genetics so as to be able to evolve new varieties and strains which bestow commercial advantages to the product in terms of superior growth rate, nutritive value, bonelessness, taste, odour etc.; one has to prevent incidence of fish infections and diseases through prophylatics and therapeutics.

Citation: Shiva Kumar, D., Srikantaswamy, S., Abhilash, M.R. and Smitha, N. 2017. "Review on pros and cons of aquaculture", *International Journal of Current Research*, 9, (07), 54441-54443.

INTRODUCTION

All shades of intermediate stages between true capture and culture fisheries exist such as in man-made-lakes, which are stocked extraneously but where no manuring, fertilizing and feeding are generally done. Stocking is often done in large water-bodies such as lagoons and rivers where natural stocks have undergone 'depletion'. The principles of management of capture and culture fisheries are very different from each other. In the case of capture fisheries one has to attempt to harvest maximum sustainable yield by regulating fishing effort and mesh after taking into account parameters of population dynamics such as rates of recruitment, natural and fishing mortalities, fish growth and size at which recruitment occurs. Management of capture fisheries requires knowledge of the dynamics of the fish populations under exploitation. The extended exclusive economic zone of 200 miles brings into focus the national and international complexities of regulating the capture fisheries of the seas and the oceans and apportionment of the marine harvest because fish populations do not abide by man-made boundaries. In the case of culture fisheries, no detailed knowledge of the population dynamics of the cultivated finfish or shell fish is involved. Here, one has to breed, if one technically can, the chosen fish under controlled conditions, if it does not breed naturally, and develop fish husbandry practices so as to be able to formulate economically viable technologies. For effective aquaculture, one has to gain familiarity and control water quality to enhance its biological productivity; one has to understand fish nutrition so as to be able to formulate nutritionally balanced fish diet; one has to delve deep into fish genetics so as to be able to evolve new varieties and strains which bestow commercial advantages to the product in terms of superior growth rate, nutritive value, bonelessness, taste, odour etc.; one has to prevent incidence of fish infections and diseases through prophylatics and therapeutics.

Corresponding author: Shiva Kumar, D.,
Department of Studies in Environmental Science, University of Mysore, Manasagangothri, Mysuru-570 006

Objectives of Aquaculture

Having defined aquaculture and mentioned some of the reasons which have contributed to imparting a fillip to aquaculture in recent times, it is proper to state the objectives of aquaculture. These are:

- Production of protein rich, nutritive, palatable and easily digestible human food benefiting the whole society through plentiful food supplies at low or reasonable cost.
- Providing new species and strengthening stocks of existing fish in natural and man-made water-bodies through artificial recruitment and transplantation.
- Production of sport fish and support to recreational fishing.
- Production of bait-fish for commercial and sport fishery.
- Production of ornamental fish for aesthetic appeal.
- Recycling of organic waste of human and livestock origin.
- Land and aquatic resource utilization: this constitutes the macro-economic point of view benefiting the whole society. It involves (a) maximum resource allocation to aquaculture and its optimal utilization; (b) increasing standard of living by maximizing profitability; and (c) creation of production surplus for export (earning foreign exchange especially important to most developing countries).
- Providing means of sustenance and earning livelihood and monetary profit through commercial and industrial aquaculture. This constitutes the micro-economic point of view benefiting the producer. In the case of small-scale producer, the objective is to maximize income by greatest possible difference between income and production cost and, in the case of large scale producer, by maximizing return on investment.
- Production of industrial fish.

Types of Aquaculture

As habitats of aquaculture, there are three categories of waters, viz. fresh, salt and brackish. Fresh waters, generally abounding in the inland areas of a country, and the salt water of the seas and oceans, are characterized by a wide difference in their salinities ranging from nil in the former to nearly 35 ppt in the latter. The difference in salinity within each category of water, fresh and sea, is restricted to rather narrow limits. The salt content of fresh and sea water exercises a very selective influence on the fauna and flora that live in each type of water.
Notwithstanding differences in the physico-chemical characteristics of its habitats (viz. fresh water, brackish water and sea water) aquaculture systems are of several kinds. Most of the systems are highly variable in magnitude and intensity ranging to serve as one-family units or large scale commercial enterprises. The different kinds of aquaculture are:

- Static water ponds.
- Running water culture.
- Culture in recirculating systems: in reconditioned water and in closed systems.
- Culture in rice fields.
- Aquaculture in raceways, cages pens and enclosures
- Finfish-culture cum livestock rearing.
- Hanging, ‘on-bottom’ and stick methods of oyster culture.

Factors which have been unfavorable to the development of aquaculture are

- Shortage of fertilizers in most developing countries and their allocation to agriculture. In this respect, there is a measure of conflict between agriculture and aquaculture.
- Increasing prices and even the availability of fish meal, which, as stated earlier, is the ingredient of most fish-feeds. This is linked with the Peruvian Anchovy crisis, which, apart from aquaculture, adversely hit agriculture, through scarcity of guano and fertilizer, and poultry industry through scarcity of fish meal. This has led to search for cheaper protein substitutes in fish feeds and spurt of research activity in that direction in different countries.
- While a general global environmental consciousness has ameliorated aquatic pollution and has thus helped fish culture, aquaculture itself is considered by some as a polluting agent, through release of water containing fish metabolites leading to eutrophication in the recipient waters, which may be a stream or a river or another kind of natural water-body. Discharge regulations which are applicable to aquaculture by authorities in some countries.
- The basic fact is that fishes in general help to keep the aquatic environment clean through exercising biological control of vectors (eg. of water-borne diseases like malaria, filaria etc). Aquaculture water and pond bottom mud often act as fertilizers to agricultural fields. Rarely does aquaculture discharge-water cause pollution.
- Authentic proof it required to establish that aquaculture is a polluter. In whichever case, if it is proved that aquaculture has polluted the environment, the discharge water from aquaculture establishment would need to be treated and rendered innocuous before release.
- Aquatic pollution, through discharge of agricultural pesticides, domestic wastes, trade effluents and oil spills, has very adversely affected aquaculture. In this respect, there is a measure of conflict between agriculture, especially cultivation of high yielding varieties (HYV) of cereals, and aquaculture. E.g. cases of fish kills in streams and other water-bodies where pesticides fall or where industrial effluents are discharged and adverse effect on oyster beds off Japanese, U.S.A. and French Coasts. The well known cases of oil spills are those of the tankers: Tory Canyon (1967) and Amoco Cadiz (1978).
- Absence of a constitutional provision for aquaculture as a discreet national activity and legal frame-work for governing its development and administration in most of the countries of the world are standing in the way of entrepreneurs making investment in aquaculture.

Advantages

- Low water requirement - can utilize small water sources and/or be connected to the public water supply
- The system can achieve optimal temperature and enables optimal and stable production all year round, independent of seasonal variation, this makes the production predictable for all 365 days
- The required area for a given production is relative small, because a very high density and a high growth rate is possible in the controlled environment
- Reduced risk of diseases, all incoming water is disinfected in addition to UV disinfection inside the farm

- Optimal and stable production secure high and stable quality of the fish
- Control and traceability
- The incoming water can be treated to achieve the desired quality.
- The effluent can be reduced to a minimum, and therefore be controlled.
- Sludge from the system can be treated to produce an odour free fertiliser with desired dry matter content

Disadvantages

- The system is relatively advanced, and is dependent upon a regular power supply. It requires an emergency power generator and a security system which is in function at any time.
- The system requires special competence and needs a highly qualified work force
- The system is relatively expensive to set up, and requires a minimum production capacity for an economical operation. Can only be used for high valuable fish species with a relative high price.

REFERENCES

AFFA 1999. National Policy for the Translocation of Live Aquatic Organisms. http://www.brs.gov.au/ translocation. html Agriculture, Fisheries and Forestry Australia.

Brown, J.R., Gowen , R.J., and McLusky, D.S. 1987. The effect of salmon farming on the benthos of a Scottish sea loch. *Journal of Experimental Marine Biology and Ecology:* 109.

Carss, D.N. 1990 Concentrations of wild and escaped fishes immediately adjacent to fish farm cages. Aquaculture 90: 29-40.

Crawford, C.M. 2001. Environmental risk assessment of shellfish farming in Tasmania. Tasmanian Aquaculture and Fisheries Institute, University of Tasmania.

Crawford, C.M., Mitchell, I.M. and Macleod, C. 2001. The Effects of Shellfish Farming on the Benthic Environment. Draft Final Report to the Tasmanian Oyster Research Council: October 2001.

D.A., Lewis, M.E. and Ma Shen. 1989 Responses to organic enrichment of infaunal macrobenthic communities under salmonid cages. Marine Biology. 103, 211- 214.

De Grave, S., Moore, S.J. and Burnell, G. 1998. Changes in benthic macrofauna associated with intertidal oyster, Crassostrea gigas (Thunberg) culture. Journal of Shellfish Research 17, 1137-1142.

DPIF 1996. Predictive Modelling of Carrying Capacities of Oyster (Crassostrea gigas) Farming Areas in Tasmania. Department of Primary Industry and Fisheries, Tasmania.

DPIF 1997. Marine Farming Development Plans for Tasmania – D'Entrecasteaux Channel. Department of Primary Industry and Fisheries, Tasmania.

DPIWE 2001. About Marine Farming. http://www.dpiwe. tas.gov.au. EAO. Salmon Aquaculture Review.

Environmental Assessment Office, British Columbia.

Gowen, R.J. Brown, N.D., Bradbury and D.S. McLusky 1988. Investigations into benthic enrichment, hypernutrification and eutrophication associated with mariculture in Scottish coastal water 1984-1988. Report to Highlands & Islands Development Board, Crown Estates Commissioners, Nature Conservancy Council, Countryside commission for Scotland and the Scottish Salmon Growers Association.

Grant, J., Hatcher, A., Scott, D.B., Pocklington, P., Schafer, C.T. and Winters, G.V. 1995 A multidisciplinary approach to evaluating impacts of shellfish aquaculture on benthic communities. Estuaries 18:124-144. 15

http://www.eao.gov.bc.ca/ FFI 2000. Australian Marine Aquaculture Map, Fish Farming International, UK.

Kaiser, M.J., Laing, I., Utting, S.D. and Burnell, G.M. 1988 Environmental impacts of bivalve mariculture. Journal of Shellfish Research 17, 59-66.

La Tene Maps, Ireland. Gavine, F., and McKinnon, L. 2001. Environmental monitoring of marine aquaculture in Victorian coastal water: a review of appropriate methods. Marine and Freshwater Resources Institute, Report No. 46 DRAFT.

Lewis, A.G. and Metaxas, A. 1991 Concentrations of total dissolved copper in and near a copper-treated salmon net pen. Aquaculture 99: 269-276.

NPI National Pollutant Inventory. 2001 Emission estimation technique manual for aggregated emissions from temperate water finfish aquaculture. Environment Australia, June 2001.

NRE 2001. Fisheries Victoria Aquaculture Production Information Bulletin 2000. Natural Resources and Environment, Victoria. Pearson,

Pemberton, D. and Shaughnessy, P.D. 1993. Interaction between seals and marine fishfarms in Tasmania, and management of the problem. Aquatic Conservation: Marine and Freshwater Ecosystems 3, 149-158.

Peterson, L.K., D'Auria, M.D., McKeown, B.A., Moore, K. and Shum, M. 1991. Copper levels in the muscle and liver tissue of farmed chinook salmon, Oncorhynchus tshawytscha. Aquaculture 99: 105-115.

Ritz, D.A., and Lewis, M.E. 1989 Salmonid farms: good and bad news. Australian Fisheries, July. Ritz,

T.H. & Rosenberg, R. 1979. Macrobenthic succession in relation to organic enrichment and the pollution of the marine environment. Oceanography and Marine Biology Annual Review. 16: 229-311

Thorne, A.J. 1998. Alterations in the structure of macrobenthic communities related to the culture of oysters (Crassostrea gigas). B Sc. (Hons.) thesis, University of Tasmania. Willumsen, B. 1989. Birds and wild fish as potential vectors of Yersinia ruckeri. Journal of Fish diseases 12: 275-277.

****