Capture based aquaculture of red snapper *Lutjanus argentimaculatus* in cages

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Introduction

Global production from aquaculture has grown substantially, contributing significant quantities to the world's supply of fish for human consumption. This increasing trend is projected to continue in the forthcoming decades also. It is envisaged that the sector will contribute more effectively to food security, poverty reduction and economic development by producing 83 million tonnes of aquatic food by 2030– with minimum impact on the environment and maximum benefit to the society with an increase of 37.5 million tonnes from the 2004 level (FAO). Aquaculture is a diverse sector using many strategies for fish production. The harvesting of wild individuals, either as broodstock whose eggs will hatch and develop under culture in ponds or cages, or as early life-history stages for on-growing under confined and controlled conditions is one of the strategies. This system of aquaculture production has been termed by the Food and Agriculture Organization (FAO) as capture-based aquaculture (CBA). It is a worldwide aquaculture practice and has specific and peculiarcharacteristics for culture, depending on areas and species. There is a worldwide distribution of this practice of the CBA, and some species which are cultured include shrimps (Penaeidae), milkfish (Chanoschanos), eels (Anguilla spp.), yellowtails (Seriolaspp), tunas (Thunnus spp.) and groupers (Epinephelusspp).

These species are caught and farmed using various techniques and systems, depending on different local cultural, economic and ethnical traditions. In some areas this is typically artisanal, rather than industrial in nature. Economic considerations are the key drivers for capture-based aquaculture. The selection of species for culture reflects their acceptability and demand in local or international markets. Market requirements are determined primarily by people's tastes and customs. As capture-based aquaculture potentially generates higher profits than other aquaculture systems, the market demand for the products and species cultured is high and it is likely that efforts to promote this activity will significantly increase. This development will be capable of causing a number of very important and diverse effects, not all of them beneficial.

Cage aquaculture is practiced in many part of the world and capture based aquaculture in cages is also popular. Recently Central Marine Fisheries Research Institute (CMFRI) has initiated culturing of marine finfishes in cages and it has proven successful in many maritime states. In this the adoption of sustainable capture based aquaculture initiative by the traditional coastal fishers the state of Karnataka is noteworthy. The participatory approach gave exposure to the local fishers on the finfish rearing aspects besides creating awareness on this lucrative farming technique. Encouraged by this success many fishermen group evinced interest in rearing finfish in suitable farming areas near their backyard. One of the species selected for capture based aquaculture was red snapper Lutjanus argentimaculatus. Factors such as their popularity as a food fish, high market price have contributed to substantial interest in red snapper aquaculture.

Site selection

Proper site selection for cage marine culture is of paramount importance as it may considerably affect construction costs, operating costs, growth and survival rate of the fish and the period of usefulness of the cages. Although floating cages can

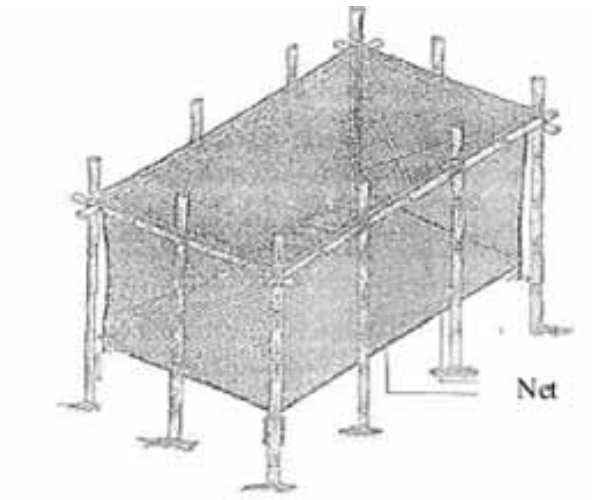
be usually towed away, sometimes it is not economical to do so. The site selection criteria adopted for aquaculture should be followed in the cage culture also. The site selected should have a minimum depth of 2.5 m, it should be free from pollution, with minimum fouling , should have good circulation of water to remove the waste materials falling from the cage etc. It is better to avoid the areas were phytoplankton blooms occur frequently and places where boats are operated. The place selected should have good accessibility.

Fish Seed Source

The estuaries are rich source of seed resources of cultivable fishes. In the estuary fishermen use cast nets and dragnets for fishes. Usually small sized fishes thus caught are not of economical value and is discarded. An attempt was made to popularize the concept of capture based aquaculture by judiciously utilizing these seed resources. Thus small sized red snappers which are of low market value were used for the cage culture.

Cage design

The cage size and shape was designed following the conventional cage design (Fig 1) modified to suit the localilty. Floating cages of 2.5 m x 2.5 m x 2 m, made of Netlon (mesh of 30 mm) lined with nylon net were fabricated for the fishes. These cages were installed in the estuary. Bamboo poles formed a cage frame to stabilize the



net. The cage was set when the tide recedes and the distance from the cage bottom to the ground was 0.3m and the height from the water surface to the highest point of the cage was 0.75 m. The top was covered with large meshed nets to prevent the escape of the fishes and also the predatory birds. Netlon mesh is used as outer cover to prevent the predation of crabs which is common in the estuaries.

Stocking of fishes

Since it is capture based aquaculture the fingerlings could be stocked continuously as and

when they are caught from the wild. But care should be taken to stock similar sized fishes in one cage as there are chances of cannibalism. For the cages of 2.5 m x 2.5m x 2 m, the stocking density of 500-600 nos. is found to be feasible. The fishes of size range 8-12 cm (15-20 g) were stocked in the cages.

Feeding: Feed used in the cages was trash fish (available in the locality), and the feeding quantity was in line with the body weight. The fish was fed twice per day in the early morning and evening and the feed amount was adjusted in line with the body weight (8% in the first month; 7% in the second month; 6% in the third month and 5% from the fourth month onwards). Feed is sliced into pieces before feeding.

Cage management: Routine cleaning of the outer net has to be done to prevent the clogging of the outer net which would hinder the water circulation inside the cage. Checking of the fishes for diseases and mortality should also be done regularly.

Growth of Red Snapper in cages.The growth of the fish ranged from 90-100 gm. per month with

and the fishes attained about 750-900 g after 8 months of culture. The fishes attained about 1.1kg to 1.3 kg after 13 months of culture.

Harvesting: Partial harvesting of the fishes could be done according to the market demand. About 70% survival is expected in cages. Total production from one cage is estimated at

308kg after 8 months. Approximate price for the fish in local market is Rs.280/

kg (US $ 4.5) and the amount realized is Rs.86240/- (US$ 1384).

When the capture based aquaculture is being practiced in high intensity some of the scientific factors has to be taken care. Carrying capacity of the water body where cages are installed is a very important factor. The number of cages should be according to the carrying capacity of the water body and if the number of cages exceeds its carrying capacity, it will effect fish growth and survival. There is a strong need for better data on the biology and fisheries of the species. Accumulation of uneaten feed and fish excreta under the cage can become an environmental problem, but this can be avoided by selecting a site with good water exchange to install the cage. Capture based aquaculture provides significant positive returns in areas with depressed and marginal economies, and an alternative livelihood for coastal communities. However, the difficulties of marketing fresh fish and supplying markets that demand live fish (e.g. groupers), and the need to expand markets limit its potential. Skill gaps are evident in the sector, including specific knowledge on economics and management, the suitability of individual (new) species for culture, information on their biology and dietary requirements, and marketing. Capture-based aquaculture is labour intensive in its farming and processing operations, and can contribute to poverty alleviation in developing countries.

Legal and security issues: We will have to envisage some difficulties in future development of capture based aquaculture. Security of the cages is the major issue. For leasing the inland waters and estuaries, the provisions are to be made. Leases policies should be guided by a set of rules and principles relevant to public trust responsibilities and should specify the size of farm, duration of farming and other terms of lease. Rents thus collected should be used for development of coastal areas.

Food safety issues: The success of cage culture depends on maintaining good water quality around the fish cages and so it is in the farmer's best interests to minimize environmental impacts. Size and intensity of the process should fit to the size of the water body and water exchange rate. It may facilitate to overcome adverse impacts on water and sediment quality. In common with other types of aquaculture, careful choice of aquafeed ingredients and on-growing sites, in addition to good management practices, are necessary to avoid the accumulation of chemical and antibiotic residues, in order to ensure the continued safety of farmed products. Capture-based aquaculture provides other opportunities to reduce the risks associated with food safety.