FISH AND FISHERIES

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CRITERIA FOR SPECIES SELECTION IN AQUACULTURE

The biological resources for aquaculture include a variety of organisms that could be raised in fresh, brackish and marine waters. Most of the cold blooded aquatic species exhibit a series of transformations from hatching to adult stage during which they do not resemble the parents either in appearance or in food habits. Aquaculture therefore implies rational rearing of the organisms to augment food production for the human population or restocking the open waters to replenish the natural stock for commercial exploitation. It involves not only control of growth and breeding but also improvement of quality of the product. As such fish cultivation is possible only among restricted number of species which posses certain desirable characteristics for culture purposes.

1. Growth potential

Rapid growth rate ensures rearing of the organism to a consistent size in the shortest possible duration. Fortunately in the tropical and subtropical waters the culturist does not face the problem of stunted growth unlike what is obtained in the temperate waters during winter.

2. Feeding habits

The organism should have the ability to utilize the natural food efficiently as well as accept an inexpensive artificial feed at a low conversion ratio. The cost of feed is often the decisive factor in the economic viability of culture of a species. Therefore, the organisms should be nonpredaceous, planktophagus and preferably herbivorous. A fish which can convert the decaying organic matter or the next link in food chain viz; the algae directly into edible flesh is preferred in the developing countries, since food bill can be kept low. But there are only a few organisms under this category such as the milk fish and mullets. It takes only some manuring of the ponds to stimulate the growth of plants and a variety of organisms in succession thereof. Another group of culturable organisms that are low in the food chain are the bivalve molluscs such as mussels and oysters which are filter feeders. Although the culture of herbivorous fishes is more economical, the carnivorous fishes and prawns are also cultured as they are said to have a better flavour than the cultured herbivorous fishes, to cater to the consumers' taste and preferences. These organisms need a fair amount of animals protein in the form of fish meal or trash fish or formulated pelletised feed in their diet for good growth which is quite expensive. Some valuable species require a high quality food, often fresh or deep frozen or a high grade fish meal to grow fast and develop a special flavour which is appreciated by the consumer. Such organisms are considered as luxury item and can be cultured only in developed countries from the economics point of view, since the consumer is prepared to pay a fancy price for such products as in Japan.

3. Reproductive habits

In general, animals which produce fewer and larger eggs have larger and less delicate larvae. The harder the eggs and larvae the easier it is to rear them. But many marine fish and invertebrates produce small eggs which hatch into tiny delicate larvae which pass through several developmental stages each with distinct environmental and nutritional requirements. Such species however depend merely on the capacity for prolific breeding. Growing fish and invertebrates therefore require special care for larval feeding and survival and poses constraints on successful rearing from egg to adult. However the high fecundity with multiple or protracted breeding habits affords definite advantage for selective rearing of species. A species with a closed breeding cycle i.e., capable of being grown in full life cycle from egg to egg will be ideal, since the seed resources from wild which are subject

to the vagaries of nature are undependable. Further, too much dependence on the wild seeds might adversely affect the fish stock.

4. Compatibility for multi species culture

This concept rests on the utilization of the available food resources in the different ecological niches of the culture enclosures by the various species having different feeding habits and distinct feeding zones. Therefore fishes with complementary feeding habits when stocked together help in maximizing production from the ponds.

5. Palatability

The cultured species either fresh or processed should have consumer acceptance. Low bone to fish ratio, flavour and high nutritive value enhance the acceptability of the product.

6. Hardiness

The species must be hardy and disease resistant under conditions of high density stocking. In culture ponds, over crowding leads to cannibalism depending upon the species as well as increase of waste products in direct proportion to density. Animals under crowding and stress are also more likely to succumb, since they become easily susceptible to diseases caused by virus, bacteria, fungi and multicellular parasites. Cannibalism can be reduced by giving enough food and shelter. The effect of metabolites can be minimised by frequent exchange of water or sufficient aeratiton. The organism should have a good resistance to handling during culture operations. It should also be easy to harvest at the end of the culture period.

The species should be euryhaline capable of adjustment to widely fluctuating salinity of the environment from traces to 40%. It should also have a good to tolerance to temperature variations from 20 — 32°C.

The candidate species include catadromous fishes such as the eels which live in fresh or brackish waters and go to the sea for spawning and anadromous fishes such as the salmon and shad showing a reverse behaviour. Other species include purely marine fish spending their entire life cycle in the sea but may be raised in brackish waters. Freshwater fishes can sometimes be raised in salt water, so also the reverse, nearly as good as in their original medium. Major marine and brackish water species, suitable for culture, include fin-fishes such as the milk fish, grey mullets, sea bass, groupers, rabbit fish, eels and gobiids, crustaceans such as the penaeid and non penaeid prawns and crabs and molluscs such as edible oysters, pearl oysters, clams and cockles and others such as holothurians, turtles and sea weeds.

S. Ramamurthy

SHRIMP DISEASES, THEIR PREVENTION AND CONTROL

Disease problems arising in aquaculture can be mainly attributed to environmental deterioration, since the shrimp pathogens are basically facultatively pathogenic in nature. The metabolic waste products of shrimps and products of microbial activity on the highly nutritious shrimp feed such as ammonia, nitrite, hydrogen sulfide, etc. may accumulate in the culture ecosystem when water management becomes inadequate. Hence stocking density of shrimps and feeding rates must always be maintained at optimum levels. A great deal of research needs to be carried out on the use or chemicals and antibiotics either for prophylactic or therapeutic purposes in aquaculture. Chemicals and antibiotics must be used with utmost restraint only with expert opinion. Hence, adequate scientific measures including careful pond preparation, water quality and pond bottom management must be adopted to prevent outbreak of diseases. Periodic disinfection of equipment used in shrimp farms and hatcheries helps a great deal in containing spread of diseases. The hatchery and farm personnel must always be vigilant on the status of health of shrimps and promptly take action to prevent outbreak of any epizootics. Successful disease-free aquaculture operation can be achieved by scientific planning and proper management of farming environment.

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RESERVOIR FISHERIES OF TAMIL NADU. I.

Introduction :

Tamil Nadu (erstwhile Madras Presidency) has been the pioneer, trendsetter, and leader in reservoir fisheries development and research. Eventhough Mettur Dam was sealed only in 1934, Dr. Sundera Raj visualized the ecological changes expected in the Kaveri system and transplanted *Catla catla* from Godavari in 1922 itself. His genius lay in the site selection for stocking at Hogainakkal. He also anticipated the disappearance of Hilsa. This nucleus of *Catla* multiplied year by year sustaining a good fishery.

Resources:

The area of reservoirs in Tamil Nadu is about 52,700 ha., of these 12,760 ha waterspread is leased out to the Fisheries Corporation. Mettur Dam, Poondi Reservoir and

Veeranam Tank are under licensing scheme. The rest are operated by the Fisheries Department.

Development :

Dr. Sundera Raj sowed the seeds of development but K.N. Anantharaman ICS, initiated the 'Deep water Fishing' programme in 1949 in Mettur Dam, which resulted in a catch of 84 tons of fish in 1950-51 and 666.6 tons in 1951-52. Madras Fisheries adopted the policy of having a fish farm at the site of each reservoir. This would enable rearing fingerlings to stock size, storing them and planting them in the reservoir. In the fifties, other Indian Carps like Rohu, Mrigal and Calbasu were also introduced. Similarly, a lot of planning went into the development of Bhavanisagar. Preimpoundment studies were made in 1950 while the dam was sealed in 1953. Intensive limnological studies were made continuously from 1953 to 1979. To offset the disappearance or dwindling of native species like *Barbus dubius, Cirrhinus cirrhose, Labeo fimbriatus, L. kontius* as well as the mahseer and *B. hexagonolepis*, gangetic carps were introduced. A pleasant surprise was the dominant position attained by *L. calbasu*, which from 12% of total catch in 1963-64, peaked to 47% for over 22 years and dominated the fishery without much stocking support. The valuable cat fishes like *Wallago attu* and *Mystus aor* also contributed to nearly a third of total catch. Other management practices like stock manipulation, stocking, 'limited entry' system (not more than 50 coracle units permitted), conservation, etc were adopted. But after reaching a yield of 341 t, there has been a fall and the fisheries are in an unacceptably low level. Eventhough technologies in fish breeding rearing, culturing, and capture have improved, the fish catches have declined in both these reservoirs. On the basis of multiple factors examined Mettur should yield 750 t and Bhavanisagar 400 t/yr, on a modest estimate. But they have dropped to very low levels. In three years from 1989-90 to 1991-92, the yield from Mettur was less than 120 t/yr. Similarly Bhavanisagar (managed by TNFDC), the catches were 107 t, 192 t and 129 t respectively for these years.

Two other reservoirs are worth examination. Sathanur, a carp dominated reservoir has been giving satisfactory yields. Catla stocked in 1957, soon after the dam was closed, multiplied in profusion and formed the dominant fishery, reaching upto 90% of total catch. This high value fish gave high revenue too. Here also the 'limited entry' policy (not more than 30 coracle units) gave high income and incentive to share fishermen. After reaching 237 t in 1981-82, catches never crossed 200 t in any year and in many years it was even below 100 t. This reservoir was advertised as the best major carp reservoir but had now lost its glory. All the above three reservoirs reached a watershed in 1981-82, after which the catches went down drastically. In order to avoid the pitfalls of monospecies fisheries (of Catla) in Sathanur, stock manipulation was done by changing the mesh size of nets and by stocking rohu, mrigal, *L. fimbriatus, C. cirrhosa, Calbasu* etc. By this process, carps other than Catla now account for over 50%, while Catla still yields about 40% with catfishes yielding about 5%.

In the case of Amaravathy, it has become out and out a Tilapia reservoir. It was intentionally stocked in 1957 and has displaced all native species like *Barbus dubius, Labeo fimbriatus, L. kontius B. carnaticus, Barilius sp* etc. The high percentage of Tilapia (80 to 90%) and the very high yields of fish go together. In terms of revenue, the income does not match the catches because of the low market value of Tilapia (less than 1/3 of the value of carps). But the social benefit is high because the nutritious fish is made available to the less affluent rural and semiurban population. The total yield from Amaravathy in the last 25 years ranged from 21 tons to 427 t. Regeneration of Tilapia without stocking, reduces the cost of stocking and maintains the high yield. It is also noteworthy that the major carps when stocked properly are recorded in the catches.

SOME SALIENT FEATURES OF FISH POPULATIONS :

From Bhavanisagar, the native species, *Tor khudree, B. hexagonolepis, L. kontius, B. carnaticus, C. cirrhosa,* disappeared But the introduced *L. calbasu* established itself successfully. The catfishes wallago and *Mystus aor* also stabilized themselves and yield a good fishery (1/3 of total catch). *Tilapia* made its appearance and attained the status of a fishery (18% of total). This coincided with a reduction in catfish populations. Indian major carps are giving good yields when proper stocking is done (upto 55% of total). The role of wallago is to control the trashfish population and upgrade the low value small fish into high value wallago fish. A disturbing feature is the decline in the average size of Calbasu, mrigal, Catla, rohu, and even of catfishes. This requires proper management actions. In Mettur also similar undesirable trends are noted. Improper management leads to decline in fish catches.

GENERAL OBSERVATIONS:

The total reservoir fish production has not improved in recent years. In fact it is declining from 1754 t in 1990 - 91 to 1258 t in 1992-93. Despite a threefold increase in fish seed production and recorded good stocking (?), reservoir catches have not at all shown any improvement. Frequent monitoring, assessment, conservation, correct stocking and restriction of fishing units is the remedy for the falling catches.

A. Sreenivasan

FORUM NEWS

The Fourth Annual meeting of the General Body was held at 10.00 hrs. on the Second Saturday, 8th April 1995 in the Library Hall of the Directorate of Fisheries, Madras and the following office-bearers were elected for the year 1995–96 :

Chairman	:	Sri K. Chidambaram
Vice–Chairman	:	Sri K. Davidson Thomas
Secretary	:	Sri M. V. Natarajan
Treasurer	:	Sri M. Kathirvel
Executive Council	:	Sri T. Kanakasabapathy
		Sri A.D. Isaac Rajendran
		Sri P.T. Meenakshisundaram
		Dr. V. Gopalakrishnan
		Dr. K. Alagaraja

The Editorial Board is constituted out of the elected members of the Executive Council. They are :

1. Sri A.D. Isaac Rajendran
2. Sri P.T. Meenakshisundaram
3. Sri M. Kathirvel

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Sri P.T. Meenakshisundaram
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OBITUARY

It is with deep regret that we record the death of Shri K. Virabhadra Rao, Retired Senior Research Officer, Central Marine Fisheries Research Institute on 22nd May, 1995 at Pondicherry. He was 84.

CONDOLENCE

The members of the Fishereis Technocrats Forum, Madras-6 are deeply moved by the news of the death of Dr. Amudha, daughter of Mr. M.V. Natarajan, Secretary, Fisheries Technocrats Forum, Madras-6 on 30th July, 1995. Members convey their condolence, deep sorrow and sympathy to the bereaved family members.

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