STUDIES ON THE BREEDING AND REARING OF *CYRINUS CARPIO COMMUNIS* L. AND *LABEO ROHITA* (Ham.) IN THE ALTITUDINAL SITUATIONS OF MEGHALAYA ALONG WITH AN EXPERIMENT ON COMPOSITE FISH CULTURE

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ABSTRACT

The present investigations were focussed on the various breeding and culture aspects of the Common Carp, Cyprinus carpio communis L. and the Indian major carps, Labeo rohita carried out at different altitudinal situations in Meghalaya State during the years of 1977, 1978 and 1979. These experiments included breeding, suitability of different egg collectors, rearing of spawn to fry, fry to fingerlings and fingerlings to table size fish along with an year round experiment on composite fish culture.

The most efficient of the egg collectors proved to be the Coconut fibre raft which was five times more efficient than the Aluminium wire frame nylon net, 3.5 times than the Wooden frame nylon flap and twice efficient than the aquatic weed.

Based on the breeding experiments conducted during the 3-year period, the percentage of hatching in the different years were 62.2% in 1977, 64.2% and 53.7% in 1978 for the two experiments and 76.14%, 61.9% and 81.8% in 1979. The loss of most of the fertilized eggs and their hatchability were due to a fungal infection caused by Saprolegnia which were seen to bloom in the rotting weed even from the very first day of egg incubation and spreads to the unfertilized eggs specially at low temperatures. However, in 1978 in addition to the fungal infection the low hatching was also attributed to rain and hailstorm and the prevailing cold temperature (14.5 to 19.5°C).

The rearing experiments on Common Carp were carried out for the three year period (1977-1979) in various combinations

of habitats and feeding regimes. Further, these experiments relate to the rearing of the spawn to fry, fry to fingerlings and fingerlings to table size.

It is very clear at the present altitude in spite of the species differences the growth rate in the Common Carp fry is certainly retarded about 3 to 5 times lesser since what is obtained in 15 days at the plains is reached only in a mean period of 75 days. Thus the faster growth achieved in the tropics is due to much warmer temperature and whereas at Fish Dale farm at Shillong the slow growth rate was mainly due to the prevailing low water temperature in addition to the water having an acidic pH range, low alkalinity and low plankton production. It may be added that despite these somewhat adverse environmental conditions along with low plankton production, the frys probably survived subsisting mostly on the supplementary feed of rice bran and mustard oil cake fed every alternate day, augmented by weekly addition of nutrients manuring with cowdung.

The major advantages of rearing spawn in closed and fixed nurseries (hapas) are that these are primarily predator free in addition to the maintenance of a fair degree of constancy and free from the influence of some of the physical factors such as heavy rains and hailstorms which do not normally affect such hapas as these are covered at the top. Nevertheless, the meshes of the hapa always facilitated the entry of phytoplankton and zooplankton and encouraged the growth of periphyton which also form added nutrition as these organisms are known to be a primary fish food. The other benefits of such confined rearing of spawn are that the hapas serve to be hygienic since the waste

matters are unused food or faecal matter are easily seeped down through the meshes and also reduces the elaborate manual labour which are otherwise needed in nursery ponds. Such closed rearing reduces the strain and injury to the fry while netting which could not be avoided in nursery ponds.

The gross growth increment in the plastic pools is almost similar to that achieved in the nylon hapas as well as the rate of growth is retarded as was also seen in hapa. These results once again confirm the altitudinal effects of the physicochemical and biological factors in the present study, as compared to the findings in the plains. However, the mortality rates in the plastic pools (28.4%, 39.6%, 21.4%, 16.6%) are on the higher side when compared with the nylon hapas. While it is not possible to pinpoint the causes precisely, it may be suggested that the total isolation and confined nature of the plastic pool habitat with no physical contact with the surrounding water medium probably led to accumulation of toxic metabolites in addition to lack of inflow of any food material from the surrounding environment as was the case in the immersed nylon hapas.

The rearing experiments were designed with a primary purpose of finding out the growth and survival of Carp fry to fingerling size by employing not only different feed combinations but also during the off season of the annual cycle, in contrast to the conventional practice of fry rearing from May-July, soon after the breeding season in March and April. Normally, in these Hill Regions these frys are reared to fingerlings of about 3-6 cm length and 5.0 gm weight for a 3 month period (May-July) before they are distributed for stocking.

A comparison of the growth and production in the different plastic pools, reveals that the optimal yield was obtained in Pool 1, followed by those of Pools 2, 3, 4 and 5 in that order. This could be undoubtedly due to the differences in the nutritive value of diets offered in the pools, which enabled the fry in Pool No. 1 and 4 to grow better, probably by efficient conversion. The present results have further shown that while addition of organic manure certainly encouraged better growth as seen between Pools 1 and 2, oil cake alone could probably enhance growth as seen in Pool 4, since the growth in this system was even more than in Pool 2 with rice bran and mustard oil cake. The growth in Pool 3 with rice bran alone did not yield good results. It may therefore be suggested that even oil cake alone or when supplemented by cowdung would probably yield optimal growth rate at this altitude.

The third and final phase of the present series of experiments on the Common Carp was the rearing of fingerlings to table size as conducted in a pucca nursery pond at an altitude of 1,550 m at the Fish Dale farm, Shillong for one year during 1977-78. The size range of fingerlings used were between 6.0-16.0 cm and 5.0-50.0 gm. As a result of this experiment, the mean weight attained by these fingerlings was between 65-585 gm, with the individual maximum of 585 gm. Based on this rate of growth the total production worked out to 4,240 kg/ha/yr. The monthly record maintained on growth increment showed that most fish attained their maximum growth during the first five months of the rearing. This period extended from November to April which included the months with rising temperature soon after

winter. An interesting sidelight of this experiment is the attainment of sexual maturity and subsequent spawning of a few of the larger females as clearly evidenced by the presence of newly recruited fry of 3.0-3.5 cm long and 0.6-1.0 gm in weight in the population.

While relating the groups of plankton to the growth of fish it was seen very clearly that among the phytoplankton, it was Euglenophyceae and among zooplankton it was Protozoa which showed positive correlation with the growth rate of the fish. It is known however, that very high production of fish are noted from waters with blue-green algae specially the plankton feeders in the lowest trophic levels grew well and high yield (Sreenivasan, 1966) though occassional mortality due to oxygen depletion simultaneously have been recorded (Sreenivasan, 1964). However, in our case it is an omnivorous feeder and has proved that it is the disturbance created by these fishes on the sides and bottom of the ponds releasing the necessary protozoans and flagellates like Euglena which has definitely improved in their growth rate.

An outcome of the rearing experiments from fingerling to table size fish is an attempt to calculate the overall economics of the monoculture of Common Carp in Shillong area in terms of expenditure incurred and the total return of fish from the experiment. The results of the present experiment at Fish Dale, Shillong, indicate that on the basis of a total input of Rs.408/-, the cost of production of a kilogram of fish worked out to Rs.3.85 as compared to the cost price range of Rs.2.38 to Rs.2.93 kg reported earlier from the composite fish culture

experiments conducted by the Central Inland Fisheries Research Institute in different regions of the country (Jhingran, 1978). This production cost of under Rs.4/- in the present study is to be compared with the prevailing market rate of fish price at Rs.16/- kg. Thus, the cost of production is just one fourth of the current selling price, in spite of the fairly high cost of supplementary feeds in the hill regions used in the present study.

The present series of predatory experiments on one vertebrate and the three invertebrate predators have shown that the overall predatory propensities on 100 carps spawn in terms of percentage are 31% and 56% for the dragonfly nymphs, while 22.4% and 18% for the notonectids and frogs respectively. Thus it may be concluded that the most important predatory pressure at these altitudinal ponds are due to the dragonfly nymphs followed by the notonectids and the frogs in that order of descending magnitude.

Further the breeding, spawning and rearing experiments on the Indian Major Carps, Labeo rohita at this altitude, may be concluded that this naturally acclimated tropical species from the plains of India could be bred and reared at intermediate altitude, though with limited success. The present concensus based on available information points to the fact that breeding and growth of major carps, perhaps, cannot be attributed to any one single factor as a combination of several abiotic and biotic factors of the environment is involved. The present experiments conducted only reveal that induced breeding and subsequent

rearing of Rohu (Labeo rohita) are possible at the lower altitudes of these hill regions and the environmental factors are not totally unsuitable.

The composite fish culture experiment tried for the first time in the State of Meghalaya at a relatively warmer altitude of 850 m with fingerlings of Silver Carp, Common Carp, rohu and mrigal showed that rohu had the least growth reaching a maximum of 240.0 gm, mrigal fingerlings obtaining a maximum of 305.0 gm, Common Carp growing to 655.0 gm and the Silver Carp showing the best growth of 715.0 gm at the end of the growing period.

These different experiments discussed above have given some baseline information on the culture potential of water systems in the State of Meghalaya in North Eastern India. It is admitted that various constraints beset such field oriented researches, particularly in countries like ours. These studies had to be undertaken in collaboration with the local State Fisheries Department who offered their field facilities. Since this Department itself is in a state of infancy, not much help could be obtained. Nevertheless, the present studies have opened up some problem areas for further intensive work. It is hoped that a combination of the available technology in the country and the few techniques evolved in the present study will ultimately help in establishing sound aquacultural practices in this part of our country.