CULTURE OF AIR-BREATHING FISHES

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INTRODUCTION

Though culture of fishes in ponds is one of the age old professions of the world, it is gaining prominence, because of the realisation that this source can supply rich and proteinaceous food for human consumption. Majority of the species selected from nature for rearing in ponds belong to the family of crops (Cyprinidae). Of late another group of fishes, collectively known as air-breathing fishes or live fishes is attracting the attention of fish culturists in the Far-East. Some of these hardy fishes have well developed accessory respiratary organs for breathing atmospheric air. This added advantage enables them to live even in foul waters deficient in dissolved oxygen which is one of the limiting factors for most of the fishes. As such, these fishes are quite suitable to be cultured in derelict and swampy waters, where carps cannot thrive well.

The common live fishes are the murrels *(Channa* spp.), the catfishes *(Clarias batrachus* and *Heteropneustes fossilis)*, the climbing perch *(Anabas testudineus)* and the giant gourami *(Osphronemus goramy)*. These are widely distributed in many South East Asian countries, Including India,

Culture of *clarias* spp. is practised on a large scale in countries like Thailand, Philippines, and Indonesia, where very high average production is reported from ponds. Such large scale culture of live fish is not done in any part of India. But these fishes are marketed mostly in live condition and in some places they are reported to fetch higher prices than the popular Indian major carps. In view of these favourable factors, the need for culture of air-breathing fishes has long been felt in the country. With this in view, the Indian Council of Agricultural Research initiated in 1971 an all India co-ordinated research project on the breeding and culture of live fishes.

Some useful information is already available on the biology, breeding and culture of these fishes, even though no comprahensive work was attempted on them till recently. However, the work that has been going on in some of the other South-East Asian countries has provided valuable information. It is felt that a review of this available information would greatly help in the promotion of live fish culture in India. Therefore, an account of the important live fishes is given in this communication.

CULTIVABLE LIVE FISHES

1. Murrels (*Channa* spp.)

There are several species of murrels, of which *Channa marulius*, *C. striatus* and *C. punctatus* are more important as food fishes. *C. marulius* grows to a maximum length of 1,200 mm. where as *C. striatus* and *C. punctatus* reach 900 mm. and 300 mm. respectively. These are freshwater river and swamp dwelling fishes, which are also suitable for culture in confined waters. They can also thrive well in wells. Murrels breed in ponds almost throughout the year, with the peak period extending from April through June. Their nest building habit with vegetation for laying eggs is well known. Fertilized eggs float on the water surface. Parental care is exhibited till the larvae attain early fingerling stage. The fry and fingerlings can be identified by their brilliant orange colour band. By virtue of having accessory respiratory organs, they can live in foul waters and can even thrive for months with very little water. Young fish are known to feed on small crustaceans and vegetable debris. Adults are highly carnivorous and piscivorous. They are also cannibalistic.

Murrels are reared as part of crop in swampy rice fields in Cambodia, Malaya and Thailand. They are reared in wells, ponds and reservoirs in Pakistan and Burma. In India, they are reared in wells, and are encountered freely in ponds and reservoirs, even though no serious attempts seems to have been made to culture them, except for some preliminary work done on their culture in the then Madras State. Only in recent years work has been initiated by the Central Inland Fisheries Research Institute (C. I. F, R. I.), to breed and culture murrels. This work includes attempts at fry and fingerling raising and culture in ponds using *Tilapia* as forage fish. In fry raising, the major constraint is poor survival, partly on account of the cannibalistic habit of these fishes. They cannot be cultured along with carps because of their predatory nature. Progress in murrel culture will depend on the success in raising their fry and fingerlings. Murrels are highly priced and are in good demand in Peninsular and North East India.

2. Giant Gourami *(Osphronemus goramy)*

This is considered to be a good guality table fish and is cultivated on a large scale in South-East Asian countries, like Indonesia, Thailand, Malaya, Cambodia and Vietnam. This species has been transplanted into Pakistan, Sri Lanka, Phillippines and India. It affords a fishery of some magnitude in certain parts of Peninsular India. The gourami is reported to reach a maximum length of 650 mm. By the end of first year it grows to 220 – 250 mm. and reaches about 450 mm. by the fourth year. It attains a weight of 4 to 4.5 kg. when it grows to over 600 mm. in length in about 6 years.

The nest-building habit of the species is well known. It breeds through out the year and attains sexual maturity during the second or the third year, The nests are built usually from pieces of grass and weeds and measure about 300 to 380 mm. in diameter with mouth opening of 100 mm. They are constructed in shallow waters of not more than 300 mm. depth. The female lays in the nest about 500 to 3,000 eggs which are then fertilised by the male. Because of the

oil globule present in them. these eggs are pelagic in nature. The eggs hatch out in 30 to 36 hours. The hatchlings generally float and cling on to weeds. The presence of labyrinthiform organ in gourami enables them to resist low oxygen content in water.

The fry and fingerlings primarily feed on zooplankton, insect larvae and soft vegetable matter, Adults feed mainly on plant leaves but are known to accept supplemental feeds readily and therefore lend themselves for easy raising in ponds and other small impoundments.

In India gourami culture has been attempted in the experimental fish ponds at Cuttack. It is reported that in 9 months the fry stocked at the rate of 2,500/ha attained an average size of 92 mm/15 g, In combination stocking with other fishes, the gourami reached an average length weight of 334 mm/688 g. during the above period. In this case, however, the gourami were only 75 in number out of a stocking density of 5,075/ha.

3. CLIMBING PERCH *(Anabas testudineus)*

The climbing perch is widely distributed throughout the South East Asian countries including India. It grows to a maximum length of about 230 mm and is considered to be a highly esteemed food of people in the region.

It is reported that this fish breeds throughout the year and attains maturity when it is only six months old. It breeds in confined waters and is quite suitable for culture in ponds, rice fields and reservoirs. Its peak spawning season in India is from May to October. Eggs are small yellow or whitish in colour. Because of the presence of oil globule they float in water. The incubation period is about 24 hours.

The climbing perch has been successfully bred by hormone treatment at the C.I.F.R.I., Barrackpore. Fifteen sets of *Anabas* could be bred, yielding about 46,500 hatchlings. Because of their cannibalistic nature, it is said that only 500 fingerlings survived and attained an average length of 65.5 mm and an average weight of 5.54 g in nurseries during 7 months of rearing. Depending on the length (100–164 mm) and weight (24–77 g) of the fish, the fecundity was found to vary from 10,710 to 36,477 ova. The presence ot labyrinthiform organ helps the fish to retain water for breathing and to remain for long periods out of water. The climbing perch though predatory it is not piscivorous. Fry and fingerlings feed on phytoplankton and zooplankton. Advance fry and adults feed primarily on molluscs, crustaceans, insect larvae, soft plant material and dead fish.

At present attempts are being made to culture this species in India. Anabas is often reared with catfishes and murrels in ponds and rice fields.

4. SINGHI *(Heteropneustes fossilis)*

This is a common catfish found in freshwater swamps, ponds and tanks throughout the country. It is also suitable for pond culture. The presence of accessory respiratory organ enables it to breathe atmospheric oxygen. It reportedly attains a length of 200 mm at theend of the first year and a maximum length of about 450 mm.

Though this species is not a very highly priced fish like murrels and the climbing perch, it is known for its nutritive, vitalising and medicinal qualities. The pectoral spines are very sharp and can inflict painful wounds when they are handled with less care.

This fish breeds in ponds and confined waters almost throughout the year, peak season being monsoon. During rainy days, fishes move from wells to shallow inundated areas of paddy fields for breeding. The eggs are greenish in colour and are usually found attached to weeds. This fish has been successfully induced to breed in India by administering in one injection 75–100 IU of human chorionic gonadotrophin. It is also possible to induce this fish to breed 8 to 10 weeks ahead of peak spawning season by administering pituitary gland injections. By hypophysation these fishes can be induced to breed several times in the same season. Even the spawning season could be prolonged by 2–3 months when the fishes are kept exposed to light during this period for about 12 hours every day. The incubation period extends from 18–20 hours and the newly hatched larvae measure about 2–7 mm in length. At this stage, the larvae feed voraciously on zooplankton. Therefore, it is suggested that before stocking the larvae, the nursery ponds have to be prepared to have abundant zooplankton to get better survival of hatchlings.

5. MAGUR (*Clarias batrachus*)

This is another catfish which has several similarities with singhi and is more widely distributed in India, Sri Lanka, Pakistan, Burma, Thailand, Malaya, Vietnam, Indonesia and Philippines. It has also been introduced to United States, where it is commonly known as 'walking catfish'. The accessory respiratory organs present in this fish not only help the fish to breathe atmospheric air but may also probably be serving a hydrostatic function. Magur matures when they are one year old. Though it breeds almost throughout the year, it has a short, well defined breeding season restricted to the monsoon. The observations made at the College of Fisheries, Mangalore on the fish collected locally from paddy fields and wells have revealed that magur breeds during the months June-July in this region.

In addition to natural breeding, this fish has been successfully induced bred both through hypophysation and stripping. Experiments conducted at the College of Fisheries, Mangalore have resulted in successful breeding of magur by administering homoplastic and heteroplastic pituitary extract injections. In the latter case, for the first time, the pituitary glands from marine catfish *Tachysurus* spp. were used sucessfully. The dosage administered varied from 12 to 30 mg/kg weight of fish given in two doses, a provocative dose of 5–10 mg/kg and a final dose of 8–20 mg/kg with

a 5–6 hours interval, as is usually done for major carps of India.

It is well known that magur lays eggs in the sheltered areas of the pond or paddy fields, in old tin containers, pots, crevices, pits or holes which have been sometimes referred to as nests. It is reported that generally 2,000 to 15,000 fry are found in the nests of magur. However, experiments conducted in the College of Fisheries, Mangalore have shown that fishes weighing from 75 to 200 g can produce 1,968 to 7,380 eggs. The eggs hatch within 20–32 hours after breeding, with the water temperature ranging from 24 to 28°C. Fish larvae start feeding on zooplankton from the 5th day after hatching.

Culture of *Clarias* spp. is being done in several South East Asian countries, of which, considerable work has been done in Thailand. It is reported from Thailand that a 400 m^2 and 2.5 m deep pond can be stocked with 40,000 of *Clarias* and that by intensive feeding, 4,300 kg of fish could be harvested in a period of 5 months from such ponds. Based on this yield a possible production of as much as 107,500 kg/ha with a food conversion ratio of 6:1 has been estimated. Fish wastes of canning factories and fish offal have been used as fish feed in this experiment. When enough of fish offal was not available, cooked rice mixed with vegetables and peanut cake was given. Fishes were fed with this feed at the rate of about 6–8 percent of body weight, once in the night and twice in the day.

As stated earlier, enough of stress has been made by several fishery workers, to take up culture of these live fishes in India. Further, the Fish Seed Committee of the Government of India has also recommended intensification of their culture. Short-term feeding experiments were conducted at the College of Fisheries, Mangalore to find out the acceptability of cheaply available feeds by magur. The fingerlings of magur stocked in 5 m x 5 m x 1 m cement cisterns at the rate of 100,000/ha were given 6 percent of the body weight of chopped and cooked marine trash fish as feed per day. From this it is estimated that the production of magur in cement tanks could be raised to as high as 6,000 kg/ha/yr with a survival rate of 80.2 percent.

Conclusion

It can thus be concluded that the high yields obtained through the culture of some of the live fishes in South East Asia should encourage us to take up this culture all over the country, atleast on a small scale to start with. It is an established fact that the live fishes can be cultivated with much ease in derelict and unproductive ponds, marshes and swamps, where it is not possible to raise many other species of cultivable fishes. These fishes have been found to mature earlier than some of the carps and readily breed in natural confined

waters, as well as responding to induced breeding by hypophysation. It is also well known, that live fishes are much more hardy by nature and by virtue to possessing accessory respiratory organs, can easily withstand not only foul waters, but also can stay for varying lengths of time out of water. India still abounds in semiderelict waters and without having to spend a lot on their reclamation. We can fruitfully utilise them for live fish culture. This will serve to give the country the much needed protein-rich food and employment to several.

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NEWS AND NOTES

Seafood Exporters Association of India Organises an Ad-hoc Committee in Bombay

As a part of a vigourous drive to extend its activities to the various seafood processing centres along both the coasts of India, the Seafood Exporters Association of India held a meeting of its Managing Committee in Bombay on 22nd April. The meeting held in Hotel President, Colaba, was attended by nearly 40 members representing various processing/exporting units functioning in the Bombay region. Managing Committee members attending the meeting were Mr. M. V. Thomas (President), Mr. M. Vasudevan (Vice-President) and Messrs K. K. P. Menon, P. K. Sadanandan and P. N. Sivasankaran Nair (Members).

Mr. R. D. Pusalkar (New India Fisheries Ltd.) who is a special invitee to the Managing Committee from Bombay welcomed the Managing Committee members and all the invitees who took time to attend the meeting. He outlined the programme of the Association to hold periodical meetings of the Managing Committee in various important centres of the industry.

Mr. M. V. Thomas, President, gave a brief history of the Association and its activities and appealed to all the seafood industrialists to collect themselves under the banner of the Association so as to make it a strong, well knot and effective body. He was highly critical of the differential treatment meted out by the Government to the fully export oriented and potentially labour intensive seafood export industry which ranks very high among the nation's major export earners. While massive assistances are offered to jute, rubber plantations etc. marine products which also comes under the domain of the same Agriculture Ministry, gets but a raw deal, Mr. Thomas complained. This discrimination he said, can be eliminated only with the concerted efforts of all those in the industry who should join hands in a big way and get ready for a fight. To this end he appealed to all the seafood industrialists in India to enroll themselves as members of the Association and make it a powerful instrument of progress.

Mr. Thomas was highly critical of the role of the MPEDA, which has failed to do anything to help the industry. He informed the gathering of the intention of the Association to organise regional committees in various centres.

Several of the industrialists present, were severely critical of the policies of the Government and the working of the MPEDA.

Since certain formalities relating to amendments to the constitution have to be carried out before regional committees could be set up, an ad-hoc committee consisting of Mr. R. D. Pusalkar, as Chairman and M/s. Sitaram Dhanu, G. R. Kassamali, A. Johnson and Dr. S. V. Gokhale as members was constituted.

M/s. New India Fisheries hosted all the participants to a Lunch while M/s. Castlerock Fisheries hosted them to a Dinner.