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Nutritional richness and culture of aquatic faunal bio-resources with particular reference to small indigenous fish species, *Amblypharyngodon mola*

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Abstract
Present study is the analysis of micronutrients of a small indigenous freshwater fish species, Amblypharyngodon mola and its introduction in paddy cum fish culture system along with Indian major and medium carps. Results reveal that the fish species is rich in calcium, iron, zinc, and vitamin-A, selenium and iodine, essential for human health. Culture in paddy cum fish culture system the fish added an additional yields in the range of 43.4 to 75.8 kg/ha, sharing 6-9 % of the total production along with composite fish culture of Indian major and medium carps.

Keywords: Micronutrients, Culture, Paddy cum Fish, Amblypharyngodon mola

Introduction
Aquatic ecosystem possesses rich diversity of biological origin which includes several economically useful plant and animal resources benefiting us through generous supply of food of very high biological value and containing several vital bio-active components. These resources form the foundation on which the gene pool of species stock and strain are based. The faunal group starts from zoo-plankton to innumerable fish species, crustaceans, molluscs, amphibians and many others. Given the inadequacy and nutritional deficiency in the diet of large number of Indian population, the role of such aquatic bio-resources is vital for providing the required nutritional support and more specifically to provide micronutrient sources whose dietary deficiencies are widespread in rural India.They also serve multiple ecological functions. Of the ecosystem services provided by these priceless resources, the maintenance of nutrient flow for the sustainability of aquatic ecosystem as well as their dwellers needs special mention. The small local freshwater species including minor carps, catfishes, murrels, perch, eels, featherbacks and prawns, for example, are self-recruiting in nature and are able to provide enormous benefit by increasing the physical and economic access to food through increased bioavailability of high proportions of myofibrillar protein, long chain n-3 PUFAs, retinol (vitamin-A), cyanocobalamine (vitamin-B_{12}) minerals and trace elements like calcium, phosphorus, iron, zinc, magnesium, potassium, selenium, iodine (Roos et al., 2003 & 2007). The ecosystem and its dwellers as a whole act as sink to absorb enormous quantity of greenhouse gas, generated because of human activities. It is essential, therefore, that we take utmost care to enhance such aquatic resource base so as to ensure stability to supply of food sources as a long term means to alleviate nutritional disorder of heart and brain in particular thereby helping in the intellectual and emotional development among the rural youths.

Materials and Method
The fish species Amblypharyngodon mola has been collected from its natural habitat and introduced in the fish cum paddy culture system of Rahara Regional Centre of CIFA, West Bengal. Fish micro nutrients were estimated in laboratory of CIFA, Rahara.

Results

Amblypharyngodon mola (Fig. 1) – A valuable indigenous small fish

Fig.1: Amblypharyngodon mola

Common name
Mourala (West Bengal), Mourari (Orissa),
Moah (Assam), Mukni (Panjab)

Systematic position (Nelson, 1976)
Phylum Chordata
Sub phylum Vertebrata
Super class Gnathostomata
Grade Pisces
Class Osteichthyes
Sub class Actinopterygii
Order Cypreiniformes
Sub order Cyprinoidei
Family Cyprinidae
Sub family Cyprininae
Genus Amblypharyngodon

Amblypharyngodon mola, a priced commercially important indigenous freshwater carp minnow, has received much attention in recent years. Due to its very good taste, flavor and soft bones it is very much popular in several states of India particularly in West Bengal, Assam and Orissa.
Nutritionally the fish is very rich with several vitamins and minerals particularly calcium, phosphorus, iron, zinc, magnesium, selenium, iodine (Fig.2), apart from its easily digestible protein content. Its regular intake / consumption can improve the eyesight and general health of teeth and bones as per doctor's opinion.
The market demand of this species throughout the year is very high. Now a day, its availability is rapidly declining and become very rare in the market. In West Bengal the market value of this species ranges between Rs. 200 - 300 per kg. Due to high consumers' preference, the fish even in smaller sizes of 2-3 gr. in weight is marketed within a very short time.

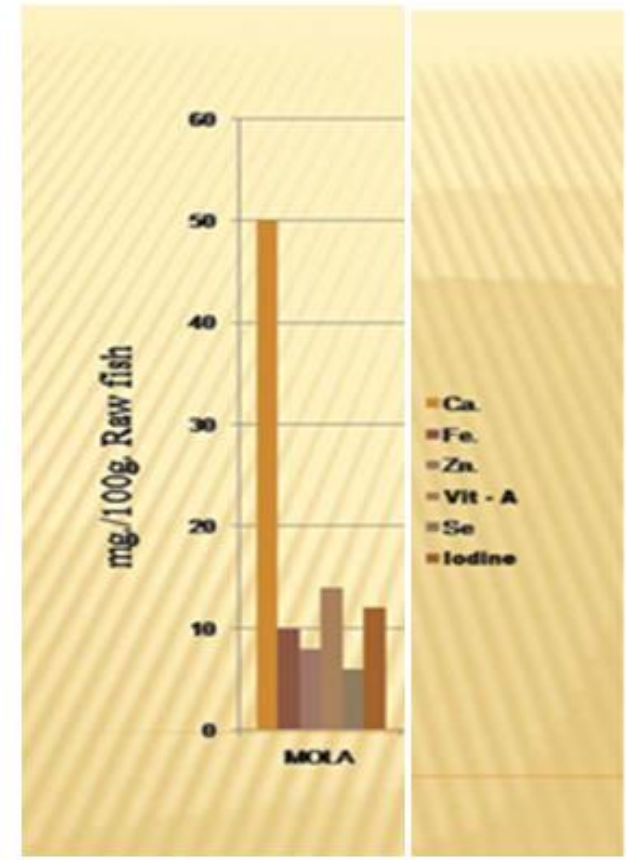

Fig.2: Micro nutrients of A. mola

Habit and habitat
The fish is available in Indian subcontinent, except Malabar region. It inhabits in different shallow areas of freshwater rivers, reservoirs, lakes, bells, boars, swamps, irrigation canals, ponds, floodplains and deep water paddy fields. It usually moves in shoal and prefers to live in shallow marginal surface water.
The species is herbivorous and prefers to feed on small algae belonging to Chlorophyceae and Myxophyceae. They also feed on periphyton, decomposed aquatic vegetative parts and organic matters. Negligible amount of zooplanktons are also taken as emergency food. The supplementary feeds such as rice bran, wheat bran, mustard oil cake, groundnut oil cake, etc. in powdered form are well accepted by them.
The species attain a maximum size of 75-80mm in length and 4.5-5.0g in weight within 8-10 months; even the species of 8 -10g weight are also seen. Females are slightly larger and broader than males. Both the sexes attain maturity when they become 40-45 mm in length. They breed naturally in stagnant water and have a prolonged breeding season (May to September).

Culture
Culture of A. mola along with IMC and / or exotic carps is not advocated generally in pond culture system keeping in view that they are prolific breeders in pond condition and compete for food, oxygen and space with the major carps.

However, they can be cultured in paddy fields under the integrated system of paddy-cum-fish farming along with major carps (Labeo rohita, Cirrhinus mrigala and Catla catla) and medium carps (Labeo bata and Cirrhinus reba). The research efforts done on paddy-cum-fish culture further added that culture of carps only in this system could not be much profitable because of their less growth due to frequent change of environmental condition within the paddy plot. The introduction of commercially important small indigenous fish species (SIFS) like A. mola was found very much suitable under such environmental condition along with other carps. The advantage of culturing this fish is to get an additional crop that enhances the total revenue generated from this ecological niche.

Under paddy-fish farming system one or two lateral deep ponds or peripheral channel are constructed along with the paddy plots. The periphery of the entire area of paddy plots and ponds are raised to make proper dyke so that stocked fish cannot escape from the ponds or paddy plots and wild fish cannot enter into the area from outside. Major carps, medium carps and *A. mola* are normally stocked in the ponds prior to monsoon. In the paddy plots deep water rice varieties are grown and paddy plots become flooded with rain water during monsoon months. Fish migrate from lateral ponds or peripheral canals to the paddy plots that are flooded with water. They breed, rear and develop their progenies within the paddy plots until water recede. Both submerged parts of paddy plants and aquatic vegetation offer the suitable substrata for growth of periphyton, which constitute the major source of natural food for them.

Experiments were conducted in Wastewater Aquaculture Division of CIFA, Rahara since 1988 in such modified paddy plots. Prior to monsoon major carps, medium carps and *A. mola* were stocked in lateral ponds. The matured male and female (1:1) of *A. mola* were stocked @ 1000 nos/ha. With the entry of monsoon rain, the whole paddy plots and adjacent lateral ponds became a single water sheet (Fig.3). The fish migrated into paddy growing area from the adjacent ponds. The khariff paddy plants and other aquatic weeds present in the paddy plots served as a very good breeding ground wherein fish breed naturally and their spawn grew by consuming the natural food available in the paddy plots.

Fig.3: Mola culture pond adjacent to paddy field

Fig.4: Fish produced in paddy cum fish culture system

It has been evidenced that introduction of the species into this system did not hamper the growth of other carps. Moreover, the fish added an additional yields in the range of 43.4 to 75.8 kg/ha, sharing 6-9 % of the total production (Fig.4). Due to their self-breeding habit, population increased 50-65 times more than the number stocked initially. Fish were harvested at regular intervals starting from the month of December-January and continued up to pre-monsoon period. Use of selective gear having desired mesh size was found very much effective to harvest relatively larger fish (2-4 g) leaving the smaller ones to grow further.

Conclusion

The availability of this highly priced fish in cultured ponds and other natural water bodies is gradually declining. Probably, the main cause of their population depletion in natural water bodies is water pollution due to indiscriminate use of pesticides in paddy field or other agricultural crop fields, which ultimately enter into the aquatic habitats through surface runoff. Use of several fish toxicant such as mahua oil cake, bleaching powder etc. for killing unwanted fish species during pond preparation has limited their availability in ponds.

Unless the conservation measures are taken with immediate effect this fish species may become extinct in near future. Culture of this fish in paddy cum fish farming offers an alternative approach to conserve and propagate them in responsible way. Keeping in view on the importance of the fish in bringing nutritional security for human beings particularly for the large rural poor masses who are traditionally dependent upon SIFFS, its culture in such type of need-based system is urgently required in extensive way. This may save the population as well as add high valued aquaculture product in the country's fish basket in future.

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