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Small Native Fishes as a Food Based Route to Better Nutrition in Assam

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Abstract

Assam has some of the highest rates of anaemia and child undernutrition in India, even though fish turns up in almost every household meal. Small indigenous fish species (SIS) such as moa, puthi, darikona and chanda grow to about 25 cm at most. They live in the beels, rivers, paddy fields and ditches of the Brahmaputra and Barak valleys, and families usually cook and eat them whole, heads and bones included. Eaten this way they give vitamin A, calcium, iron, zinc, vitamin B12 and long chain omega 3 fatty acids in amounts that large farmed carps cannot match. Assamese cooking already makes good use of these fishes, yet wild stocks are shrinking as wetlands are drained, embankments cut rivers off from their floodplains and rice fields receive more pesticide. Growing mola together with carps in homestead ponds, letting fishing communities manage the beels, improving the drying and fermentation of small fish and adding small fish products to public food programmes could keep them on the plate. Small fishes give Assam a cheap and familiar way to reduce micronutrient deficiency, as long as fisheries policy starts to count nutrients as well as tonnes.

Keywords: Fish, Micronutrients, Assam, Mola, Wetlands, Aquaculture, Nutrition, Biodiversity

Introduction

Food security in India has long been measured in tonnes of rice and wheat. Nutritional security asks a harder question, which is whether people are getting enough of the vitamins and minerals that the body needs for growth, immunity and work. A household can have a full granary and still raise children who are short for their age and anaemic. Assam is a clear example of this gap. The fifth National Family Health Survey found that 68.4 per cent of children aged 6 to 59 months and 65.9 per cent of women aged 15 to 49 years in the state were anaemic and roughly one child in three under five years was stunted (International Institute for Population Sciences [IIPS], 2021). Female anaemia had risen sharply from the previous round of the survey.

At the same time Assam is a fish eating state. The Brahmaputra and Barak river systems, their floodplain wetlands (locally called beels), swamps, rice fields and village ponds support a large number of freshwater fish species. A checklist of the fishes of North East India compiled by Goswami *et al.* (2012) recorded well over four hundred species and a large share of them are small fishes that never reach a commercial market in any volume. These small indigenous fish species have fed rural families for generations. Research from Bangladesh, which shares much of the same fish fauna and food culture, has shown that these fishes are among the most nutrient dense animal foods available to poor households (Roos *et al.*, 2003. Bogard *et al.*, 2015).

What counts as a small indigenous fish

The term small indigenous fish species is usually applied to native freshwater and brackish water fishes that grow to a maximum length of about 25 cm in their adult stage (Felts *et al.*, 1996). In Assam the group includes moa or mola (*Amblypharyngodon mola*), several puthi species (Puntius and Pethia), darikona (*Esomus danricus*), chanda (*Parambassis ranga* and related glassfishes), kholihona (*Trichogaster fasciata*), small catfishes such as singi (*Heteropneustes fossilis*) and tengra (Mystus species) and goroi (*Channa punctata*). Small prawns are often caught and eaten together with these fishes.

Most SIS breed in floodplains during the monsoon, mature within a year and are caught with simple gear such as bamboo traps, lift nets and hand nets. Many households catch them for

their own pot rather than for sale. That makes them cheap or free at the point of consumption and it also means they are almost invisible in official production statistics, which tend to record only the catch that passes through markets.

Nutrient value of small fishes

The main nutritional advantage of SIS comes from the way they are eaten. A large carp is filleted or cut into pieces and the head, bones and viscera are often discarded or eaten by only one member of the family. A small fish goes into the pot whole. The bones supply calcium and phosphorus, the eyes and viscera of some species hold most of the vitamin A and the whole body contributes iron and zinc.

Mola is the best studied example. Roos *et al.* (2003) showed that mola contains very high levels of vitamin A, much of it concentrated in the eyes and that small fishes eaten whole made a large contribution to the vitamin A and calcium intake of rural Bangladeshi households even though the amounts eaten were modest. Bogard *et al.* (2015) analysed 55 fish species from Bangladesh and found that the small species, when eaten whole, were far richer in calcium, iron, zinc and vitamin A than the large farmed carps and tilapia that now dominate production. In their calculations a single standard portion of some small species could meet a substantial share of a young child's or a pregnant woman's daily requirement for several micronutrients.

Work on Indian food fishes points the same way. Mohanty *et al.* (2019) compiled the proximate and micronutrient composition of a wide range of Indian food fishes and found that small fishes such as mola were notable sources of minerals and vitamins as well as good quality protein. Many small fishes also contain the long chain omega 3 fatty acids EPA and DHA, which matter for brain development in the foetus and young child.

A second benefit is that fish improves the absorption of nutrients from the rest of the meal. Iron and zinc from rice and vegetables are poorly absorbed because of phytates, but animal tissue in the same meal raises the share of these minerals that the body takes up (Kawarazuka and Béné, 2011). In a rice based diet like that of rural Assam, a small portion of fish can therefore improve the value of the whole plate.

Place of small fishes in the Assamese diet

Small fishes have a secure place in Assamese cooking. They are cooked in light sour curries (tenga) with tomato, elephant apple or lemon, fried crisp with mustard oil, mashed into pitika with onion and chilli or wrapped in banana or taro leaf and roasted (patot dia). In upper Assam and among several ethnic communities small fishes are dried into sukoti or fermented. Fermented fish products such as namsing of the Mising community are prepared from small fishes and keep for months, which spreads the benefit of the monsoon catch over the lean season.

These habits make SIS easier to promote than many other nutrition foods. People already like the taste, know how to cook the fishes and are used to eating them whole. Children in particular can eat soft small fish more easily than bony pieces of large fish. What has changed is availability. Older people in many villages describe a time when small fishes could be caught from paddy fields and ditches every day in the rainy season and they now say that the catch has fallen.

The nutrition gap in Assam

The NFHS 5 figures for anaemia and stunting show that the problem in Assam is a shortage of micronutrients and quality protein more than of calories (IIPS, 2021). Iron deficiency is a leading cause of anaemia and deficiencies of vitamin A, zinc and calcium often occur alongside it. Supplementation through the National Iron Plus Initiative and vitamin A programmes reaches part of the population, but coverage and compliance vary. Food based approaches are needed alongside supplements because they deliver several nutrients together and depend on habits that families keep up on their own.

The first thousand days of life, from conception to a child's second birthday, are the period in which undernutrition does the most lasting damage. Small fishes fit this window well. They can be mashed into complementary foods for infants and their calcium, iron and DHA are needed by pregnant and breastfeeding women. Thilsted *et al.* (2016) argued that policy for fisheries and aquaculture should be judged by its contribution to healthy diets, especially for women and young children and not only by the volume of fish produced.

Pressures on wild stocks

The wild supply of SIS in Assam is under pressure from several directions. Beels and swamps have been drained, silted up or encroached for farming and housing. Embankments and roads have cut the links between rivers and floodplains, which blocks the breeding migrations of many small fishes. Pesticide use in rice fields has increased and small fishes that breed in paddy are directly exposed. Fine mesh nets and dewatering of

ponds and beels in the dry season remove brood fish together with juveniles.

Several small fishes found in Assam are now listed as threatened in national assessments (Lakra *et al.*, 2010). Global studies warn that declining fish catches could leave large numbers of people in poor countries short of micronutrients, because those people have few affordable substitutes (Golden *et al.*, 2016). Aquaculture in Assam has grown, but most of the growth has come from Indian major carps and other large species. These fishes are valuable for income and protein but cannot replace the micronutrient supply that SIS once gave rural families.

Raising production through polyculture and wetland management

The most tested way of putting SIS back into the diet is to grow them with carps. In Bangladesh, mola has been stocked in carp ponds without reducing the carp yield, because it feeds mainly on phytoplankton and breeds in the pond. Households can harvest a small quantity of mola every week for home use while the carps grow to market size (Roos *et al.*, 2007). This partial harvesting suits family needs and provides a steady supply of nutrients rather than one large harvest a year. The same model fits Assam, where many households already own small homestead ponds that are stocked with carps.

Rice fields are a second opportunity. Paddy cum fish culture is already practised in parts of Assam and in the hills of the North East. Keeping refuges for small fishes in field corners and reducing pesticide use would allow wild stocks to breed and recolonise the fields each monsoon.

Beels need a different approach. Many beels in Assam are leased out for short periods by the government and lessees have every reason to catch as much as possible before the lease ends. Longer leases or community management, closed seasons during the breeding period, protected sanctuary areas within beels and the restoration of channels between beels and rivers would help wild SIS recover. Since the main purpose is nutrition, the people who fish these waters for home use should be part of the management arrangements.

Hatchery production of small fishes is also possible. Seed of species such as mola, puthi and singi can be produced through induced or semi natural breeding and supplying this seed to farmers together with carp seed would make polyculture easier to adopt.

Processing, value addition and markets

Small fishes spoil quickly and the monsoon glut is followed by months of shortage. Better processing can extend the supply. Traditional sun drying often takes place on the ground and the product can be contaminated with sand and insects. Simple solar driers, raised racks and clean packing can raise the quality and price of dried fish. Fermented products need hygiene standards that keep their traditional character while making them safe.

New products are also being tried in South Asia, such as fish powder and fish chutney made from small fishes, which can be added to rice, dal or children's porridge. A shelf stable fish powder from local SIS could be used in anganwadi centres and school meals in Assam. Thilsted *et al.* (2016) noted that processed products of this kind let the nutrients of small fish reach people who live far from water or who cannot buy fresh fish every day.

Markets matter as well. When small fishes are sold, they are often cheaper per kilogram than large carps, which makes them accessible to poor buyers. Keeping them affordable while giving fishers a fair return will require attention to transport, cold chain and the role of traders.

Policy and programme links

The potential of SIS will not be realised through fisheries policy alone. Several links are worth building. The state fisheries department could include SIS in its seed supply and extension programmes and record production of small fishes separately. The health and women and child development departments could promote small fish in nutrition counselling for pregnant women and mothers of young children. The education department could explore the use of dried or powdered small fish in the PM POSHAN school meal scheme where local acceptance is good. Wetland conservation programmes could treat SIS habitat as a goal in its own right.

Research gaps also remain. Nutrient composition data for many Assamese small fishes are limited and most published figures come from Bangladesh. Systematic analysis of local species, studies of how much SIS households actually eat by season and trials of mola polyculture under Assam conditions would give planners a firmer base. The FAO (2024) has called for fish and other aquatic foods to be included more fully in national food and nutrition strategies and Assam is well placed to do this given its waters and food habits.

Conclusion

Small indigenous fish species are already part of the culture and cuisine of Assam and evidence from the region shows that they are among the most nutrient dense foods a rural family can

obtain. Eaten whole, they supply vitamin A, calcium, iron, zinc, vitamin B12 and essential fatty acids and they improve the absorption of minerals from rice and vegetables. In a state where about two thirds of young children and women are anaemic, this makes them a practical tool for nutritional security.

Wild stocks are declining, however and aquaculture growth has focused on large carps. Bringing SIS back into ponds, rice fields and well managed beels, improving the processing of dried and fermented products and linking these fishes to public nutrition programmes would allow Assam to use a resource it already has. Fisheries policy that values nutrients as well as tonnes would serve both fishers and the families who depend on these small fishes for a healthy diet.

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