

Table 3. Hypothesis and future changes in aggregate utilization of fisheries products in sub-Saharan Africa.

Influencing variable	Elasticity of response	Hypothesized trend in variable (not in per capita)	Hypothesized net effect on aggregate fisheries utilization (percentage per annum)
Real income	0.75	1.6	1.20
Real fish price	-0.75	1.0	-0.75
Real meat price	0.70	1.0	0.70
Real price of starch	-0.70	0	0
Urbanization	0	6.0	0
Energy use	0.14	5.0	0.70
Population growth	0.28	3.0	0.84
Aggregate effect			2.69
Aggregate effect per capita with 3% population growth rate			-0.31

consumption is likely to continue to grow next to large inland bodies of water. If the real price of meat continues to rise in Africa, as it has for the last few years, the demand for fish will increase at an even more rapid rate. The consumption of fish in rural Africa is also constrained,

to a large extent, by production. Freshwater aquaculture has not yielded significant evidence of widespread replication in Africa at current fish prices and production costs. If this supply constraint is removed through technological progress, it may have a significant impact on the trends

of fish consumption in the region given the good demand prospects.

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The Role of Small Indigenous Fish Species in Food and Nutrition Security in Bangladesh

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Abstract

In Bangladesh, only 6% of the daily food intake is animal food of which fish accounts for about 50%. Rice is the mainstay, making up 60% of the daily food intake. However, many nutrients such as vitamins A and C, iron, calcium, zinc and iodine are not found in rice and have to be obtained from other sources. Small indigenous fish are a vital contribution to the diet of the rural poor in Bangladesh, where more than 30 000 children go blind every year from vitamin A deficiency and 70% of women and children are iron-deficient. Small fish, which are less than 10 cm in length and usually eaten whole with the organs and bones, contain large amounts of calcium and possibly iron and zinc. The larger fish promoted in aquaculture do not contribute significantly to calcium intake. Some species also contain large amounts of vitamin A. Much of the small indigenous fish (SIS) of Bangladesh are caught in floodplains and natural waterbodies. Small fish are eaten frequently in small amounts and are more equally distributed among family members than big fish of which men get the larger share. Unfortunately, overfishing and the deterioration of natural habitats have resulted in a decline in SIS. When measures are taken to improve food and nutrition security, there should be a focus on production of small fish so that greater quantities are accessible for consumption by the rural poor.

In Bangladesh, rice is the mainstay of the diet. Boiled rice is eaten at least twice daily with small amounts of vegetable and fish. According to the national survey conducted in rural Bangladesh in 1981-1982, total food intake was 765 g raw food/capita/d, of which 60% was rice, 30% was vegetables and 6% animal food (Ahmed and Hassan 1983). Fish made up 53% of the animal food intake and contributed 23 g/capita/d. More recent minor studies in parts of rural Bangladesh showed that the total food intake has not changed significantly while the diet composition has changed—rice intake has increased and the intake of fish and vegetables has decreased.

The Bangladesh diet is dominated by a single food—rice. This means that rice is the major source of energy and nutrients in the diet. However, there are some essential nutrients like vitamin A, vitamin C, iron, calcium, zinc and iodine which are not found in rice or found only in minor quantities. These nutrients must be supplied by other foods like fish and vegetables. This simple relation between food, energy and essential nutrients must be borne in mind to ensure food and nutrition security.

In Bangladesh, fish is an important source of protein as well as minerals and vitamins. This is recognized in the old proverb—fish and rice make a Bengali. The majority of fish eaten by the rural poor is the small indigenous fish species (SIS), which have been defined as species which grow to a maximum length of about 25 cm (Felts et al. 1996). However, many SIS are less than 10 cm long and these are typically eaten whole, with organs and bones. Analyses of SIS showed that they contain large amounts of calcium and most likely also iron and zinc. Some species, for example mola (*Amblypharyngodon mola*), dhela (*Rohtee cotio*), darkina (*Esomus danricus*) and kaski (*Corica soborna*) also contain large amounts of vitamin A (Table 1).

In Bangladesh, where 30 000 children become blind each year from vitamin A deficiency, SIS can

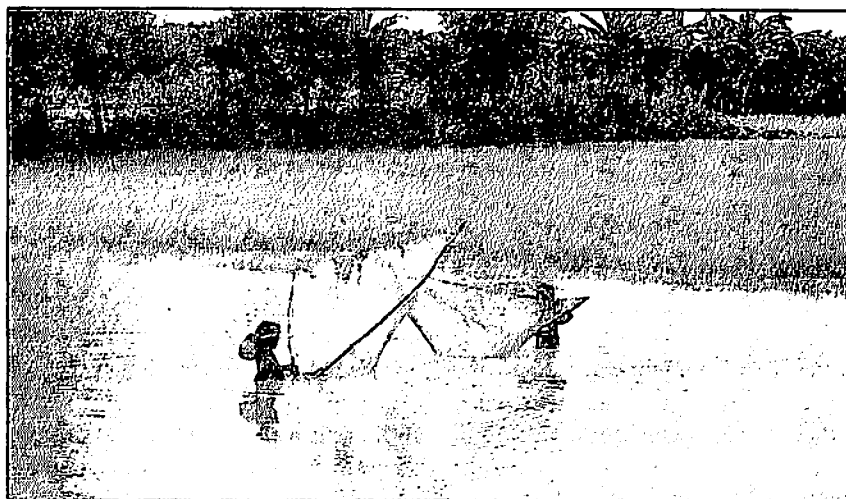


Photo by Barry Ison

Fisheries of small, indigenous fish species play an important role for the intake of micronutrients among rural poor in Bangladesh.

play a vital role as a rich source of vitamin A. For example, a meal with 23 g mola supplies 450 µg vitamin A or 90% of the recommended dietary allowance (RDA) of a 4-6-year-old child (NRC 1989) (Table 2). However, the same amount of silver carp only contributes 1% of RDA for children. In fish vitamin A is present as retinol and anhydroretinol which are readily absorbed and utilized by humans, while in vegetables vitamin A is found as β-carotene which is as not readily absorbed as retinol and is destroyed to some extent by cooking.

All small fish contain large amounts of calcium. Big fish, like silver carp (*Hypophthalmichthys*

molitrix) and rui (*Labeo rohita*), which are promoted in aquaculture do not contribute significantly to calcium intake since the bones are not eaten (Table 2). In countries like Bangladesh where milk and milk products make up only a small amount of the diet, small fish can be an important calcium source. Recent bioavailability studies conducted in both rats and humans showed that small fish was as good as milk as a calcium source. In humans, calcium absorption was 24±6% from small fish and 22±6% from milk.

Fish can play an important role as a source of iron in the diet. This is of special importance in Bangladesh where 70% of women and children

Table 1. Vitamin A, calcium and iron content in fish.

Fish species	Per 100 g raw, edible parts		
	Vitamin A (µg)	Calcium (mg)	Iron (mg)
SIS			
<i>Mola (Amblypharyngodon mola)</i>	1 960±214	1 071±41	7±4
<i>Dhela (Rohtee cotio)</i>	937	1 260	-
<i>Darkina (Esomus danricus)</i>	1 457	-	-
<i>Chanda (Chanda sp.)</i>	341	1 162	-
<i>Puti (Puntius sp.)</i>	37±16	1 059±161	-
<i>Kaski (Corica soborna)</i>	93±8	-	-
Large fish, adult			
<i>Hilsa (Hilsa ilisha)</i>	69	126	3
Silver carp (<i>Hypophthalmichthys molitrix</i>)	17	268	-
<i>Rui (Labeo rohita)</i>	27	317	-
Large fish, whole juvenile fish, including organs and bones			
Silver carp (<i>H. molitrix</i>)	13±3	-	-
Tilapia (<i>Oreochromis niloticus</i>)	19±15	-	5

SIS small indigenous fish species
- missing value

Table 2. Contribution of fish species to recommended dietary allowances (RDA) for children (4-6 years old).

Fish species	% RDA in 23 g raw, edible parts		
	Vitamin A	Calcium	Iron
<i>Mola</i>	90	31	16
<i>Dhela</i>	43	36	-
<i>Puti</i>	2	30	-
Silver carp	1	8	-
<i>Rui</i>	1	9	-

- missing value

suffer from iron deficiency. Besides being a rich iron source, fish also has an enhancing effect on the bioavailability of iron from other foods in a meal. Studies of rice and small fish meals are being conducted to determine iron bioavailability from small fish as well as the enhancing effect of small fish on bioavailability of iron from rice.

Minor food consumption surveys have shown that SIS, unlike large fish, are eaten in small amounts many days per week and thereby make up part of the everyday diet. Small fish are prepared with a little oil and vegetables leading to a greater variation in the diet. Small fish are also more equally distributed among family members, while males get a larger share of big fish. The nutritional value of SIS is local knowledge in Bangladesh. In a survey conducted in 1993 in a village in Mymensingh district, 25% of the women (a total of 119) said that mola is full of vitamins and 45% said that mola protects the eyes. Small indigenous catfish, singh (*Heteropneustes fossilis*) and magur (*Charias batrachus*) were said to increase blood volume, by 74% and 49% of the women, respectively.

When measures are taken, much of the small fish is caught in floodplains and natural waterbodies such as "baors", "beels" and "haors". A survey conducted in 1993 in four districts showed that more than 60% of the households were engaged in subsistence inland fisheries contributing to the intake of SIS (ISPAN 1993). However, inland fisheries in Bangladesh are

declining due to overfishing and deterioration of the natural fish habitats. When measures are taken to improve food and nutrition security, there should be a focus on the production and consumption of SIS. Agricultural systems, including floodplains fisheries and aquaculture, should protect and promote the production of small fish in order to make them accessible in greater quantities for consumption by the rural poor.

Note:

This paper will form part of the background for the presentation "Policy issues deriving from the impact of fisheries on household food security, nutrition and intrahousehold welfare" by Shakuntala Haraksingh Thilsted and Nanna Roos at the Workshop on International Consultation on Fisheries Policy Research in Developing Countries: Issues, Priorities and Needs, to be held 2-5 June 1997 in Hirtshals, Denmark.

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(*Puntius sophomore*) and *chela* (*Chela* sp.) is being conducted by A.H.M. Kohinor at the Department of Fisheries Management, Bangladesh Agricultural University. Also, Nanna Roos is conducting a Ph.D. study "Implementation of aquaculture in small, seasonal ponds in Mymensingh, Bangladesh: an analysis of nutritional impact and resource management" at the Research Department of Human Nutrition, the Royal Veterinary and Agricultural University, Denmark. This study is funded by the Research Council for Research in Developing Countries, Ministry of Foreign Affairs, Denmark.

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