



Diversity of Small Indigenous Freshwater Fish Species (SIFs) in Assam; Nutritional Contents and Medicinal Importance: A Review

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ABSTRACT: Assam is enriched with varieties of water bodies. All these water bodies are the house a wide variety of fish species. Diverse fish species, including Small indigenous Fish species (SIFs) were recorded by various workers from different rivers and wetlands of Assam. SIFs are considered as a source of rich food. They are the source of high-quality protein, dietary calcium, essential fatty acids, amino acids and some of the principal vitamins and minerals. Fish plays a significant role in nutrition and food security but often little recognized element in food security and nutrition. A good number of fish species are consumed as medicine by different ethnic tribes of Assam. In the present paper a review on the diversity of small indigenous freshwater fish species in Assam and their nutritional contents and medicinal importance are presented.

Keywords: Fish Diversity, SIFs, Assam, Nutritional content, Ethnomedicine.

I. INTRODUCTION

Fishes are cold blooded vertebrates having an aquatic mode of habitat [1]. Fish constitutes almost half of the total number of vertebrates in the world [2]. Fishes which grow to a size of 25 cm or 9 inches in mature stage in their lifecycle are called 'SIS' or Small Indigenous Species [3]. They are also called SIFs (Small Indigenous Fish Species). Small Indigenous Fish Species are a rich source of dietary calcium because most of the bones are eaten [4]. Fish have a very special consideration and place in human civilization from the time immemorial. Fish is one of the most important sources of food [5]. The live weight of majority of fish usually consists of about water (70-80%), protein (20-30%) and of lipid (2-12%) [6]. Therefore, fish is considered as one of useful source of several minerals, especially if bones are consumed. Furthermore, some nutritional components of fish have functional effects on human health. For example, fish oil is one of the most important natural sources of polyunsaturated fatty acids including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which have been proven to have useful effects on human health. SIS fish is a vital source of vitamin A, along with calcium for rural poor households [4]. It has been reported that some species such as *Amblyphayngodon mola*, *Osteobrama cotio* and *Esomus danricus* contain high amount of vitamin A and other micronutrients and minerals [7].

Certain fishes and their by-products contribute to useful Ayurvedic and Unani medicines for the treatment of duodenal ulcer, skin disease, night blindness, general weakness, loss of appetite, cold, cough, bronchitis, asthma, tuberculosis etc [8]. The people of the rural areas of Assam used many locally available fishes for medicinal purpose from time immemorial. Different ethnic communities are used indigenous fish species against various diseases from anaemia to gynaecological problems. The present communication is a review on the diversity of small indigenous freshwater fish species in Assam and their nutritional contents and medicinal importance.

II. DIVERSITY OF SMALL INDIGENOUS FRESHWATER FISH SPECIES IN ASSAM

Assam is enriched with varieties of water bodies including rivers and beels or wetlands. The various types of wetlands found in Assam are Lakes / Ponds, Ox-bow Lakes Marshy areas etc. Fish diversity of these water bodies are under serious threat due to environmental degradation and related problems. Today it is well known fact that the environment degradation has caused damage to biodiversity including plants & animals [9]. In spite of that, all these water bodies are the house a wide variety of fish species. Several workers were reported variety of fish species, including SIS from different rivers and wetlands of Assam. There are about 69 species of fishes in Lake of Assam belonging to 49 genera, 24 families and 11 orders. Of these fishes, 84.2% belonged to the primary freshwater group (cyprinids 35.39%), while the rest to the peripheral class [10]. In another study recorded 18 species of fish in Brahmaputra river and its tributaries in Assam, comprising 15 genera and 10 families. Most of the species they recorded and collected were have economic value as food, medicinal, recreation and aesthetic purposes [11]. About 27 SIS belonging to 5 orders, 17 genera of 13 families were recorded from Jorhat, Assam [12]. A total of 52 SIS fish belonging to 15 families and 33 genera were recorded from the entire upper stretches of river Brahmaputra. Cyprinidae was found to be most abundant family with 22 species (42.31%), followed by Bagridae with 9 species (17.31%) and Cobitidae family with 4 species (7.69%). They also recorded *Botialohachata* which was not recorded earlier from this part [13]. Another study from Dimalbeel of Kokrajhar Assam recorded 67 number of fish species including 4 exotic fish belonging to 49 genera under 25 families from 8 orders [14]. Other workers also recorded and documented fish diversity from different rivers of Assam [15-18].

Some of the important Small Indigenous Freshwater Fish Species recorded by various workers from Assam

are listed below and arranged in an order having Zoological name, family name, order, local name in Assamese language, and IUCN threat status as per CAMP Report, 1998 [19].

1. *Paracanthocobitis botia*, Nemacheilidae, Cypriniformes, Botia, LR-nt
2. *Amblypharyngodon mola*, Cyprinidae, Cypriniformes, Moa, LR-lc
3. *Anabas testudineus*, Anabantidae, Perciformes, Kawoi, VU
4. *Aspidoparia morar*, Cyprinidae, Cypriniformes, Bariala, LR-nt
5. *Botia dario*, Botiidae, Cypriniformes, Gethu, NE
6. *Chandanama*, Ambassidae, Perciformes, Chanda, NE
7. *Channa gachua*, Channidae, Perciformes, Cheng, VU
8. *Channa punctatus*, Channidae, Perciformes, Goroi, LRnt
9. *Channa stewartii*, Channidae, Perciformes, Chengalee, NE
10. *Clarias batrachus*, Clariidae, Siluriformes, Magur, VU
11. *Glossogobius giuris*, Gobiidae, Perciformes, Patimutura LR-nt
12. *Heteropneustes fossilis*, Heteropneustidae, Siluriformes, Singi, VU
13. *Macragnathus pancalus*, Mastacembelidae, Symbranchiformes, Tura, LR-nt
14. *Mystus bleekeri*, Bagridae, Siluriformes, Singorah, VU
15. *Mystus cavasius*, Bagridae, Siluriformes, Borsingarah LR-nt
16. *Mystus tengara*, Bagridae, Siluriformes, Rongasingora NE
17. *Nandus nandus*, Nandidae, Perciformes, Gedgedi, LR-nt
18. *Puntius chola*, Cyprinidae, Cypriniformes, Puthi, VU
19. *Pethia conchoniis*, Cyprinidae, Cypriniformes, Puthi, VU
20. *Systemussarana*, Cyprinidae, Cypriniformes, Seneeputhi, VU
21. *Pethiaticto*, Cyprinidae, Cypriniformes, Chakariputhi, L-Rnt
22. *Rosbora daniconius*, Danionidae, Cypriniformes, Danikona, NE
23. *Salmostoma bacaila*, Danionidae, Cypriniformes, Selkona, LR-lc
24. *Trichogaster chuna*, Osphronemidae, Perciformes, Vecheli, NE
25. *Trichogaster fasciata*, Osphronemidae, Perciformes, Khalihona, LR-nt
26. *Trichogaster lalius*, Osphronemidae, Beloniformes, Ronga Khalihona, LR-nt

27. *Xenentodon cancila*, Belonidae, Beloniformes, Kokila, LR-nt
En-Endangered; VU-Vulnerable, LR- nt- Lower risk near threatened, LR-lc- Lower risk least concern, NE- Not evaluated.

III. NUTRITIONAL QUALITY OF SIFs

Fish contribute a significant amount of animal protein to the diets of people worldwide. In addition, fish is an important source of essential vitamins and minerals while also having a low content of saturated fat, carbohydrates and cholesterol. Fish is highly nutritious and serves as a valuable supplement in diets lacking essential vitamins and minerals. Nutritional quality of some Indigenous fish species was recorded by various researchers.

Twenty-three small indigenous fish species (SIS) in the size range of 3-18 cm were analysed for proximate composition and minerals (Ca and P) content to evaluate their nutritive value. The moisture content of different species ranged between 71.00 and 81.94%. The muscle protein content among the species varied widely (16.16-22.28%). The carcass lipid content varied between 1.87 and 9.55% and showed an inverse relationship with the moisture content, the calcium and phosphorus contents ranged between 0.85-3.20% and 1.01-3.29%, respectively [20].

Protein content was estimated as 18.46%, 15.23%, 14.08%, 18.26%, 16.99%, and 15.84% in *A. mola*, *G. chapra*, *P. chola*, *C. nama*, *A. coila*, and in *P. atherinoides* respectively. The highest value of lipid content was recorded in *G. chapra* (5.41%) and the lowest was in *C. nama* (1.53%). The fat content recorded in *P. chola* (3.05%), *A. coila* (3.53%) and in *A. mola* (4.10%) Ash content found in *P. atherinoides* (3.29%) and in *C. nama* (3.92%). The value of ash in *P. chola*, *A. mola*, *A. coila*, and in *G. chapra* recorded as 1.19%, 1.64%, 1.98% and 1.55% respectively, the moisture content was recorded as 74.43%, 76.38%, 75.06%, 73.32% in *P. chola*, *A. mola*, *G. chapra* and in *P. atherinoides* respectively [21].

Nutritional content in some SIS are as follows – [22]

Table 1: Nutrient quality of snakehead fishes.

Fish species	Local name	Moisture %	Ash %	Protein %	Lipid %
<i>Channa striates</i>	Shol	82.66	0.39	15.49	1.47
<i>Channa punctatus</i>	Goroi	81.93	1.25	15.22	1.6
<i>Channa marulius</i>	Sal	81.42	0.6	16.19	1.79

Table 2: Nutrient Quality of minor carps.

Fish Species	Local name	Moisture %	Ash %	Protein %	Lipid %
<i>Puntius sp.</i>	Puthi	75.02	3.34	18.08	3.56
<i>Amblypharyngodon mola</i>	Moa	76.68	2.5	17.95	2.87
<i>Esomus danricus</i>	Dorikona	77.2	2.54	17.12	3.13
<i>Chanda nama</i>	Chanda	78.03	2.15	17.77	2.05
<i>Nandus nandus</i>	Gedgedi	78.61	2.83	15.8	2.75
<i>Xenentodon cancila</i>	Kokila	79.57	2.02	15.65	2.76
<i>Anabus testudineus</i>	Kaowi	76.6	1.62	19.5	2.27

Six small indigenous fish species from Brahmaputra river and its tributaries were analysed for their nutritional values and found proximate composition of protein and crude fat in all six fish ranged from 15.65 (*S. phasa*) to 20.88% (*C. garua*) and 2.91 (*C. garua*) to 13.23% (*S. phasa*), respectively [23].

Another studies on the biochemical composition of small indigenous fish species also reveals the presence vitamin A, Calcium and Iron [6]. rich in protein and minerals and highly nutritious [21]. It has been reported that some species such as *Amblyphayngodon mola*, *Osteobrama cotio* and *Esomus danricus* contain high

amount of vitamin A and other micronutrients and minerals [7].

Table 3: Nutrient quality of catfishes.

Fish Species	Local name	Moisture %	Ash %	Protein %	Lipid %
<i>Heteropneustes fossilis</i>	Singi	80.44	0.94	15.14	3.49
<i>Clarias batrachus</i>	Magur	80.74	0.95	15.22	3.08
<i>Mystus tengara</i>	Ronga singora	77.17	1.48	17.86	3.84

IV. SIFS AS ETHNOMEDICINE BY ETHNIC COMMUNITIES OF ASSAM

Zoo-therapeutic is an indigenous knowledge system built up by a group of people through generations. It plays a significant role in the healing practices of different ethnic groups. Different workers documented application of fishes in primary healthcare by different ethnic communities of Assam as ethnomedicine. 14 species belonging 7 families were recorded in the

treatment of 25 disease conditions. Traditional health-care practices of the Karbis include both local and oral applications and rituals to cure diseases. Use of fish to cure mental depression like symptoms locally referred as *nihukachingtung* is also reported. Studies among the Dimasa and Thadou tribes also revealed the use of fish in traditional medicine as therapies against different ailments, but do not use fish in rituals [24]. Eleven species of Small Indigenous fish species *Channa punctatus*, *Clarias batrachus*, *Heteropneustes fossilis*, *Amblyopharyngdon mola*, *Channa gachua*, *Nandus nandus*, *Glossogobius giuris*, *Puntius sp.*, *Rasbora daniconius*, *Xanthodon cancila*, *Anabus testudinius* are used by Tea tribe and other communities of Jorhat, Assam against diseases like weakness, white discharge in females, for healing the infection of measles and chicken pox, Stomach pain, body pain, colorblindness, anaemia, against urination of child and for good eyesight etc. The zoochemical investigation of these fish species by different provides validation on the traditional belief of the application of these fish species [25]. SIFs are used in ethnozoological remedies by the Indigenous Inhabitants in adjoining areas of the Pobitora Wildlife Sanctuary of Assam [26].

Table 4.

Sl No	Scientific name	Mode of preparation	Ailments	Validation
1	<i>Channa punctatus</i> (Goroi)	Taken as soup with <i>Piper nigrum</i> . Fried with <i>Lasia spinosa</i> and consumed	For weakness Against white discharge in females	The quantity of Moisture, Ash, Protein and Lipid in <i>C. punctatus</i> is 81.93%, 1.25%, 15.22%, and 1.60% respectively. [22]
2	<i>Clarias batrachus</i> (Magur)	Prepared as soup with <i>Piper nigrum</i> and <i>Spinacia oleracea</i> Fried fishes with processed bamboo shoot (Kharisha)	For weakness For healing the infected of measles and chicken pox	Easily digestible high-grade protein, high concentration of iron & beneficial lipid content indicates its high acceptance as medicinal fish [29]. Polyunsaturated fatty acid (PUFA) was estimated to be 25.56% in magur[30].
3	<i>Heteropneustes fossilis</i> (Singi)	Taken as soup with <i>Piper nigrum</i>	For anaemia and weakness	Moisture 80.44% , ash 0.94 % , Protein 15.14 % , Lipid 3.49% [21] indicates high nutritional value.
4	<i>Amblyopharyngdon mola</i> (Moa)	Taken as soup with a medicinal herb <i>Murrayakoenigii</i> (Narasingha)	Stomach pain	The protein content was estimated as 18.46%, fat content recorded as 4.10%. The moisture content was recorded as 76.38%. protein of high biological value, particularly sulphur containing amino acids [31] which are act as anti-pain agents.
5	<i>Channa gachua</i> (Chang)	Soup with <i>Piper nigrum</i> and asiaticpannywort	Internal Body pain	Non-essential amino acids that appear to be in abundance in <i>Channaspextracts</i> include amino acids such as glutamic acids and aspartic acid [32], amino acids are important in influencing the sense of pain and in healing wounds [33]
6	<i>Nandus nandus</i> (Gedged)	Fried fishes are taken with boil rice	Colour blindness	Protein 15.8 % , Lipid 2.75% [22]
7	<i>Glossogobius giuris</i> (Patimutura)	Burnt fishes are consumed orally	Against urination of children	---
8	<i>Puntius sp.</i> (Puthi)	Taken as soup with <i>Lycopersicum</i> and <i>Altermanthera sessilis</i>	For good eye sightness	Protein content 14.8%, fat content [20] Medium Oil-High protein. Medium oil-High protein [5]
9	<i>Rasbora daniconius</i> (Dorikona)	Steamed fishes in the leaves of <i>Alpinia allughas</i> are given.	For good sight ness.	High Protein and lipid content [22]
10	<i>Xanthodon cancila</i> (Kokila)	Used as forceps	For dissection of ulcer, boil etc	---
11	<i>Anabus testudinius</i> (kaoi)	Taken as soup with leafy vegetables	As painkiller after parturition	High Protein and lipid content [22]

Study about the traditional knowledge of treating various ailments using fish and their body parts among the

karbis of Karbi Anglong district of Assam, recorded 16 species of fishes which are being used for near about 30 ailments. These fishes are used as whole or body parts for the treatment of different kinds of ailments like Kala-azar, malaria, small pox, night blindness, common cold, rheumatoid arthritis etc. Traditional health care practices among Karbis include oral therapy, contact therapy, by preparing solutions [27]. Application of locally available SIFs by Mising Tribes of Dhemaji, Assam against certain common ailments were also recorded by workers [28].

The Table 4 summarizes the Scientific name of the fishes used for the purpose of the treatment of diseases by different communities of Assam, followed by vernacular name, mode of preparation, ailments for which the fish is used and Validation to the ITK.

From various biochemical and nutritional studies of some freshwater fish species indicates that these fish species contain four basic ingredients in varying proportion such as water, protein, fat and ash other important nutrients like vitamin and minerals also present in abundance. proximate composition analysis showed that they are also rich in micronutrients. Beside this fish species also contains antioxidant. Antioxidant level and nutrients in sixteen small indigenous fish species (SIS) of Bangladesh. Eight marine and eight freshwaters were measured by Thin Layer Chromatography (TLC) and 2, 2-Diphenyl 1-picrylhydrazil, 95% (DPPH) free radical scavenging method. The highest antioxidant activity was observed in *Heteropneustes fossilis*. The study suggests the presence of potent antioxidant and appreciable amount of nutrients in selected fish samples [34]. Thus, the zoochemical investigation of these fish species provides validation on the traditional belief of the application of these fish species as ethnomedicine. However, the composition, however, varies greatly from species to species and also from individual to individual depending on age, sex, environment and season

V. CONCLUSION

Indigenous fish species are the common food item among the local populace with traditionally identified pharmacological benefits in treating different ailments. Many fish species are considered as diet supplement for elderly people. Fish plays a major role in the diet constituting the only animal protein source among rural poor households. Thus, fish can play an important role in food security and able to supply cheap and safe food, especially for the rural poor of the world. Small indigenous fish species plays a very significant role in Assam, especially in rural Assam. They provide food, nutrition and supplementary incomes to the fishermen of the rural areas. They act as a source of vitamins, proteins, calcium and iron to the rural poor. Because price of the small fishes is affordable for poor too. They are the principal source of essential animal protein for the people of upper and lower middle-class families of both rural and urban areas. In India, out of 765 native freshwater fish species documented by NBFGR, about 450 may be categorized as small indigenous freshwater fish species. The maximum diversity of the SIF's has been recorded from the North East region. Various biochemical and nutritional studies of these freshwater fish species indicate that these fish species contain four basic ingredients in varying proportion such as water, protein, fat and ash other in potent nutrients like vitamin and minerals also present in abundance. These Indigenous fish species are also traditionally used for treating different ailments.

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