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Biodiversity and Seasonal Abundance of Small Indigenous Fish Species (SIS) in the Rivers and Adjacent Beels of Karimganj (Kishoreganj, Bangladesh)

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ABSTRACT

Small (length <25 cm) indigenous fish species (SIS) play an important role in providing animal sources of protein in the poor rural houses of Bangladesh. They are also valuable sources of vitamin A, calcium and Iron. But since the green revolution started in Bangladesh their diversity has been decreased alarmingly. This investigation was carried out from December 2010 to November 2011 in the rivers and beels of Karimganj Upazila, Bangladesh to assess the biodiversity status of SIS. The samples were collected from Balikhola fish landing centre and the area was visited at least once in a month. However, during the study period, only 30 species belonging to 7 orders and 15 families were identified where 19 species had normal abundance, 6 species moderate abundance and 5 species least abundance. The highest number (9) of species was recorded from the family Cyprinidae and *Puntius sophore* being the most dominant. Among the families, contribution of Cyprinidae was 30%, followed by Bagridae and Schilbeidae 10%, Channidae and Clupeidae 6.67% and rest of the each family was 3.33%. The species comprised 39% catfishes, 22% minnows, 17% barbs, 10% perch, 5% snakeheads, 2% gourami, and river shads, loaches, gar, glass fish, goby were 1% individually. The highest number of species (25) was found in October and the lowest (3) in February. The maximum yield of SIS was found in (Sep-Dec) period and the least availability of SIS found during (Jan-Apr). Among the fish species, 2 were considered as critically endangered (CR), 4 were endangered, 3 were vulnerable (VU) and 2 were Data Deficient (DD). From this report, general people, researcher and policy makers would be able to know about the valuable SIS fishes of the study area, their present biodiversity status and their seasonal abundance. The information will be helpful for proper conservation and management of the SIS.

Key words: SIS, biodiversity, seasonal abundance, Bangladesh

INTRODUCTION

Fish and fisheries are indispensable part in the livelihood of the peoples of Bangladesh since the time immemorial. In 2009-10, about 10% of the peoples directly or indirectly depend on fisheries, 58% of the national protein is supplied from fish, 2.70% export earnings come from fish and fish products and SIS contributes 27% of total fish production in our country (DoF, 2011).

Bangladesh has a globally important wetland ecosystem and associated aquatic biodiversity ranked third in Asia. Small indigenous fish species (SIS) are those small fishes which attains a maximum length of 25 cm (Felts *et al.*, 1996; Hossain and Afroze, 1991; Hossain *et al.*, 1999a). Bangladesh has approximately 260 indigenous fresh water species where 143 species are classified as small indigenous species (Rahman, 2005). SIS contains huge amount of vitamin-A and vitamin-D which are very good for human bones, teeth, skin and eyes. SIS also supply good amount of calcium, phosphorus, iron, iodine etc. These minerals are essential for developing resistance against disease in human body (Hasan *et al.*, 2012; Noss and Harris, 1986).

Fish is considered as an easily digestible food item and rich source of animal protein (Khan *et al.*, 2013). The rural people of Bangladesh are largely dependent on SIS for animal protein but there is lack of concern over the constant decline of SIS biodiversity. Little is known about the status of SIS biodiversity in Bangladesh. There are very few cases where baseline information on seasonal abundance and distribution of SIS is available (Ahmed *et al.*, 2012; Hossain and Afroze, 1991; Hossain *et al.*, 1999b; Hasan *et al.*, 2012; Kostori *et al.*, 2011). However, no contemporary comprehensive assessment of the SIS fishes in the study area is available. There are considerable data gaps which makes access and harmonization of information as a challenge. Thus, in light of the above and considering future prospects of SIS fishes in Bangladesh, the present study was aimed at providing the present status of biodiversity and seasonal abundance of SIS in the study area.

MATERIALS AND METHODS

Study area: The study was conducted from December 2010 to November 2011 mainly in the Balikhola Fish Landing Center of KarimganjUpazila (24°.30'N 90°.87'E). The study area is about 45 km far from the Kishoreganj district town. The Fish Landing center is bounded by mainly Dhanu River in the east and Kalapaniabeel in the south (Fig. 1). Other adjacent rivers and beels include Narsunda, Bathail, Singua, Balia, Bara, Sukhua and Kalai. Fishes from these water bodies are also sometimes landed here. This landing center has a major role in total SIS distribution and marketing of Kishoreganj district.

Data collection: The study was based on survey, and data were collected from wholesaler/aratdar, fishermen, retailers and other related persons by interview. Data were also collected by using PRA (participatory rural appraisal) tools about species diversity, seasonal abundance and production and baseline information. The entire areas of the beels and part of Dhanu river were visited by boat and surrounding land areas were also visited. For justification of the collected data, cross check interview were conducted by key informants, such as Upazilla Fisheries Officer. Research papers on the fish fauna of Bangladesh were also consulted towards compiling the past data of abundance and availability for assessing biodiversity status.

Participatory rural appraisal (PRA): The Participatory Rural Appraisal (PRA) technique was used for gathering baseline information about the landing site and beels, their resources, seasonal availability of SIS and related problems. Specific information regarding the abundance, fishing and marketing of SIS were also collected during PRA session. The tool used to conduct the PRA was Focus Group Discussion, which included all of the important stakeholders, such as fishers, aratdars, government officials and local people.



Fig. 1: Map of study area (Source: Wikimapia)

Collection of fish samples: Monthly fish samples were collected from the landing center. The samples were preserved with 10% formalin and brought to the Fisheries Laboratory of Noakhali Science and Technology University, Noakhali for further identification. From the samples, catch rate and species composition were analyzed. After that, weight (g) of each of the species was taken and the percentage composition of each of the species was calculated.

Identification of the collected samples: The collected fish samples were identified to species level using standard taxonomic viz., Rahman (2005) and Freshwater Fishes of Bangladesh and Encyclopedia of Flora and Fauna of Bangladesh, FAO identification sheets, ITIS (Integrated Taxonomic Information System) standard report (<http://www.itis.gov>), Fish Base (<http://fishbase.org>) and other reference books. All data were analyzed with Microsoft Excel 2007.

RESULTS

SIS biodiversity: The result of the study revealed the occurrence of 30 Species belonging to 7 orders and 15 families. The highest number of species (9) found from the family Cyprinidae. Among the families, contribution of Cyprinidae was 30%, followed by Bagridae and Schilbeidae 10%, Channidae and Clupeidae 6.67% and rest of the each family was 3.33% (Fig. 2).

Among the species, 9 catfishes, 6 minnows, 3 barb, river shads, snakeheads and loaches were 2 individually and minor carp, gar, glass fish, goby, gouramy and perch were 1 individually. Here

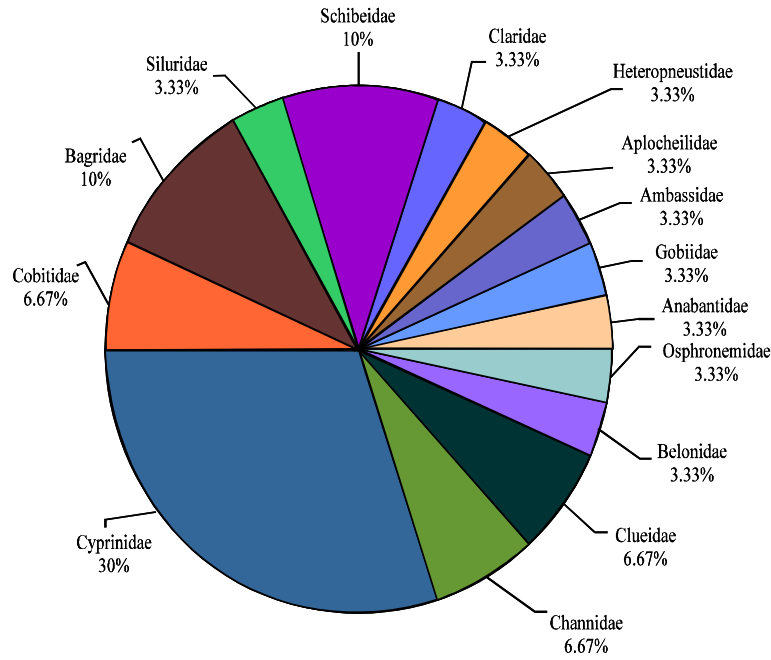


Fig. 2: Percentage contribution of different families in species composition at Balikhola Fish Landing Center

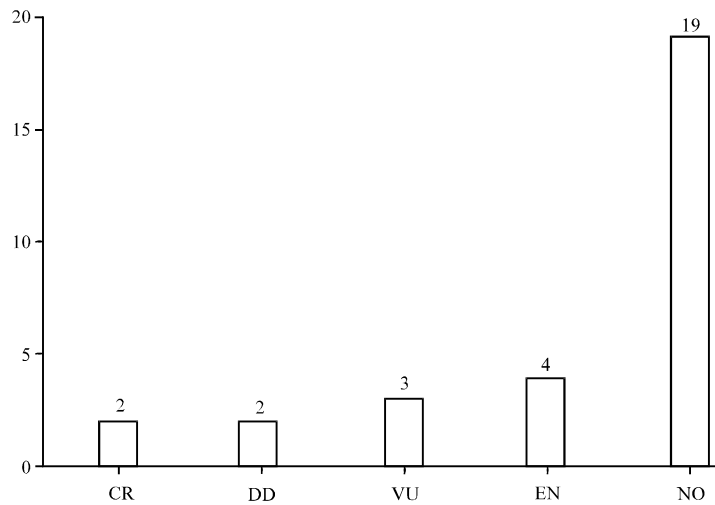


Fig. 3: Number of different group of SIS, with their biodiversity status. CR: Critically endangered, DD: Data deficient, VU: Vulnerable, EN: Endangered, NO: Not thretened

it is observed that 19 species had normal abundance, 6 species moderate abundance and 5 species least abundance (Table 1).

Among the total number of species found during the study, 2 species were critically endangered (CR), 2 were data deficient (DD), 3 were vulnerable (VU), 4 were endangered (EN) and 19 species were not threatened (NO) based on IUCN [10] list of threatened fishes of Bangladesh (Fig. 3).

Table 1: Local name, scientific name, family name, species groups and abundance of SIS found in Balikhola Fish Landing Center

Local name	Scientific name	Family	Abundance	Biodiversity status
Batasi	<i>Pseudeutropius atherinoides</i>	Schilbeidae	+++	NO
Bele	<i>Glossogobius giuris</i>	Gobitidae	+++	NO
Bujuritengra	<i>Mystus tengara</i>	Bagridae	+++	NO
Chanda	<i>Chanda nama</i>	Ambassidae	+++	NO
Chapchela	<i>Chela cachius</i>	Cyprinidae	+++	DD
Chapila	<i>Gudusia chapra</i>	Clupeidae	+++	NO
Cheng	<i>Channa orientalis</i>	Channidae	++	VU
Cholapunti	<i>Puntius chola</i>	Cyprinidae	+++	NO
Darkina	<i>Esomus danricus</i>	Cyprinidae	+++	DD
Dhela	<i>Osteobrama cotio</i>	Cyprinidae	+	EN
Garuabacha	<i>Clupisoma garua</i>	Schilbeidae	+	CR
Gulshatengra	<i>Mystus cavasius</i>	Bagridae	++	VU
Gutum	<i>Lepidocephalus guntea</i>	Cobitidae	+++	NO
Jatpunti	<i>Puntius sophore</i>	Cyprinidae	+++	NO
Kachki	<i>Corica soborna</i>	Clupeidae	+++	NO
Kajoli	<i>Ailia coila</i>	Schilbeidae	++	NO
Kakila	<i>Xenentodon cancila</i>	Belonidae	+++	NO
Kanpona	<i>Aplocheilichthys panchax</i>	Aplocheilidae	++	NO
Kholisha	<i>Colisa fasciata</i>	Osphronemidae	+++	NO
Koi	<i>Anabas testudineus</i>	Anabantidae	+++	NO
Leuzzadarkina	<i>Rasbora rasbora</i>	Cyprinidae	+	EN
Madhupabda	<i>Ompok pabda</i>	Siluridae	+++	EN
Magur	<i>Clarius batrachus</i>	Clariidae	+++	NO
Mola	<i>Amblypharyngodon mola</i>	Cyprinidae	+++	NO
Rani	<i>Botia dario</i>	Cobitidae	+	EN
Sarpunti	<i>Puntius sarana</i>	Cyprinidae	++	CR
Shing	<i>Heteropneustes fossilis</i>	Heteropneustidae	++	NO
Taki	<i>Channa punctatus</i>	Channidae	+++	NO
Tengra	<i>Mystus vittatus</i>	Bagridae	+++	NO
Titpunti	<i>Puntius ticto</i>	Cyprinidae	+	VU

+: Least abundance, ++: Moderate abundance, +++: Normal abundance, CR: Critically endangered, EN: Endangered; VU: Vulnerable, NO: Not threatened and DD: Data deficient

Seasonal abundance: In Bangladesh SIS harvesting is mostly seasonal. Maximum species (25) were found in October and least species were found in February. Fishes were more or less available round the year. But all the species were not available in all seasons. There were also some species which were found throughout the year. The highest number of species (25) were found in October and lowest numbers of species (3) were in February (Fig. 4).

Yield of SIS was highest (155900 kg) during September to December. Fishing effort was also highest in post monsoon period due to availability of more SIS. Highest fishing gears also used in post monsoon period (Table 2).

According to the total yield of SIS it is revealed that, Jatputi (*Puntius sophore*) was the top among the 5 highest yield SIS 45000 kg, followed by pabda (*Ompok pabda*) 30000 kg, Mola (*Amblypharyngodon mola*) 26500 kg, Batashi (*Pseudotropius atherinoides*) 25000 kg, tengra (*Mystus tengara*) 21000 kg during the study period are presented in Fig. 5.

Table 2: Yield of SIS in 3 different seasons at Balikhola Fish Landing Center

Species groups	Yield (kg)		
	Jan-Apr	May-Aug	Sep-Dec
Minor carp and minnows	1300	25000	30000
Barbs	1000	15000	45000
Gobies	0	0	1700
Gars	0	0	1500
Snakeheads	150	5500	8000
Catfishes	8000	60000	40000
Loaches	0	0	1600
Perches	9000	500	17000
Gouramies	1900	600	2400
Glassfishes	200	1800	1700
River shads	500	1700	0
Total	23350	110100	155900

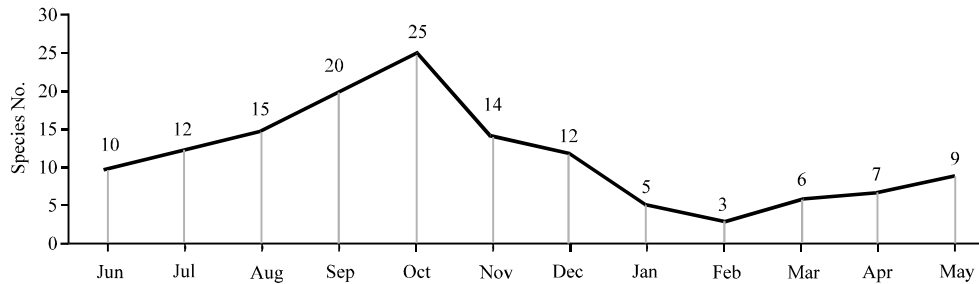


Fig. 4: Monthly variation in species No. at Balikhola Fish Landing Center during the study period

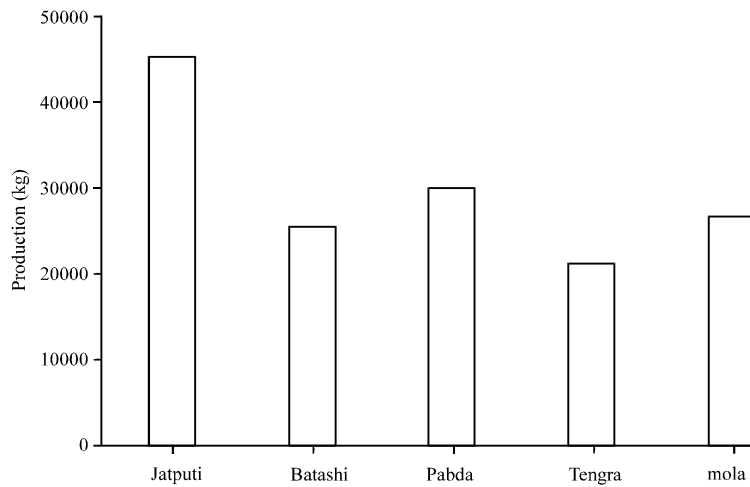


Fig. 5: Yield of 5 highest available SIS at Balikhola Fish Landing Center

Among the least available SIS, Rani (*Botiadario*) and Dhela (*Osteobrama cotio*) were lowest 0.5 kg, titputi (*Puntius ticto*) and gaurabacha (*Clupisoma garua*) were 1kg and Leuzzadarkina (*Rasbora rasbora*) was top 1.5 kg during the study period presented in Fig. 6.

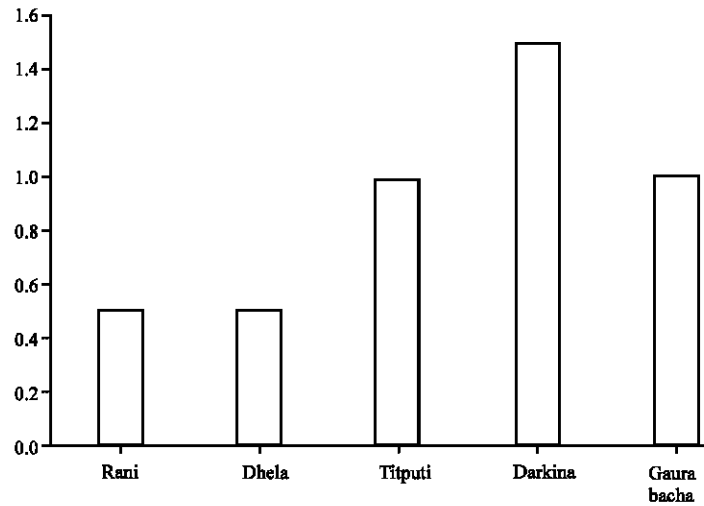


Fig. 6: Yield of 5 least available SIS at Balikhola Fish Landing Center

DISCUSSION

The results clearly depict the biodiversity of the SIS in the study area. There were some rare species which were very incidentally or occasionally available, such as *Botia dario*, *Clupisoma garua*, *Puntius ticto*, *Osteobrama cotio* etc., according to Khan *et al.* (2000) *Botia dario* is endangered, *Clupisoma garua* is critically endangered and *Osteobrama cotio* is endangered. Based on the result of the catch composition of the 30 species recorded, the most abundant species were found to be *Amblypharyngodon mola*, *Chela cachius*, *Pseudeutropius atherinoides*, *Esomus danricus*, *Puntius sophore*, *Lepidocephalus guntea*, *Ompok pabda*, *Mystus cavasius*, *Mystus vittatus*, *Colisa fasciatus*, *Clarius batrachus*, *Channa punctatus*, *Glossogobius giuris*, *Xenentodon cancila*, *Corica soborna*, *Puntius chola*, *Anabas testudineus*, *Chandanama*, *Gudusia chapra*. The second category in order of declining abundance includes *Puntius sarana*, *Ailia coila*, *Mystus tengara*, *Heteropneustes fossilis*, *Aplocheilus panchax* and *Channa orientalis*. The least abundant species were found to be *Puntius ticto*, *Osteobrama cotio*, *Rasbora rasbora*, *Clupeisoma garua*, *Botia dario*. Catfishes were the dominant group comprising 39% species. Nurullah *et al.* (2001) also reported that abundance of Puntis, Mola, Tengra, Batashi, Pabda were higher than other SIS, Kholisha, Chanda, Chapila were moderately abundant and Dhela were least abundant in Kishoreganj district agreeing with my findings.

The availability and abundance of the SIS were recorded during the entire study period. Fishes were more or less available round the year. But all the species were not available in all seasons. Ahmad (1997) observed that seasonal fluctuation in the fish species is a normal phenomenon. There were also some species which were found throughout the year. The highest number of species (25) was found in October and lowest numbers of species (3) were in February. Abundance of fish also varies from season to season depending on demand and production. Abundance of SIS during (Sep-Dec) was comparatively higher than the rest of the year. Thilsted *et al.* (1997) also found maximum availability of SIS during October. Least availability of SIS were found during (Jan-Apr) agreeing with the findings of Thilsted *et al.* (1997). All the species were not readily available in the markets or landing centers. Hossain (1996) also studied various aspects of Small Indigenous Species (SIS) of fishes in Bangladesh and found that the demand for the fishes remain relatively constant throughout the year but observed a great variation in the production scale from month to month agreeing with my findings.

Among the available 30 SIS species, under Cyprinidae family exists in highest number and dominated by weight by Jatpunti (*Puntius sophore*) a typical barb in Bangladesh. Nurullah *et al.* (2001) also reported that Puntius (*Puntius sophore*) was at top of the list in percentage in Kishoreganj. Catfishes were highest by percentage composition at Balikhola fish landing center except in (Sep-Dec), when minor carp and minnows and barbs were dominant.

According to Khan *et al.* (2000) Bangladesh National Categories, we found 2 critically endangered (CR) species. Highest number of species was found from the not threatened (NO) categories. Once upon a time, small fishes were abundant in the rivers, beels, jheels, canals, streams, ponds etc., in Bangladesh (Ahmed, 1984; Talwar and Jhingran, 1991; Shafi and Quddus, 1982). But now a days, these species of fish are going to be extinct despite of their ability to reproduce naturally due to environmental degradation.

Fish habitat destruction by roads, embankments, drainage and flood control, and natural siltation along with over-fishing, have been commonly cited as causes of the deterioration of the country's resources (Ali, 1996). Principal causes behind the recent increase in the loss of fish biodiversity in Bangladesh include habitat alteration, fragmentation and simplification. Physical habitat is altered by channelization, construction of embankments and diversions, siltation and degradation of wetlands. According to Hussain and Mazid (2001), habitat degradation recently has become a great concern in most aquatic ecosystems in Bangladesh.

As a result, natural SIS population has declined in the area. Indiscriminate and destructive fishing practice has caused devastating effect to the aquatic biodiversity (Hossain *et al.*, 1999). Recent estimates suggested that worldwide 20% of all freshwater species are extinct, endangered or vulnerable (Moyle and Leidy, 1992). According to the fishermen and local community living around the area, some SIS of the area are either extinct or in the verge of extinction due to habitat destruction, indiscriminate fishing and pollution.

Bhuiya (2002) conducted a study on haor fisheries resources in Itnaupazilla under Kishoreganj district for a period of one year and observed 9 barbs. In the current study 4 barbs are found in the landing center indicate the alarming declining of barb species. This report highlights the present status of SIS biodiversity in the study area. The information will be helpful for fishermen, researcher and policy makers for proper conservation and management of the SIS.

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