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## Study on the biodiversity status of loach species in Sylhet Sadar, Bangladesh

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### Abstract

The study was conducted to assess the present biodiversity status of freshwater loaches for 9 months in Sylhet Sadar. Data were collected using secondary literature review, visits and interview with the fishermen and fish traders. A total of 7 species under 2 families were recorded during the study. The highest numbers of loach species (6) were found from the family Cobitidae (99%) and only 1 species from the Balitoridae (only 1%). Some are used as food fish and others as ornamental fish. Among the total, 2 species were considered as threatened. Six fishing gears used by the fishermen, mostly used Ber jal and Jhaki jal. The less and non-availability of most species indicate alarming decline of the biodiversity in the surveyed area and the interviewed stakeholders reported that is due to environmental degradation and manmade causes. Appropriate fishing laws, public awareness and further study should be carried out to conserve the biodiversity of these species.

**Keywords:** Biodiversity, fish markets, fish traders, interview, threatened, public awareness

### 1. Introduction

Bangladesh has vast aquatic resources (both closed and open water bodies) and these are the principal sources of fish. (Rahman A. K. A., 2005) <sup>[15]</sup> listed 266 species of freshwater fishes under 12 orders and 55 families from Bangladesh. Among them, 143 species are Small indigenous Species (SIS). An important group in the freshwater fish fauna is the loach. (Hossain, 2014) <sup>[8]</sup> enlisted at least 293 fish species from 13 orders and 61 families were found in the rivers, streams, ponds, ditches, beels, haors, baors, lakes and floodplains of Bangladesh in which 25 loach species recognized under 3 families. The prominent member in the freshwater fish fauna is the loaches (family Cobitidae, Balitoridae and Psilorhynchidae). At least 24 species of loaches belonging to 10 genera and 3 families have been recorded so far in Bangladesh. Loaches are mostly scavengers and are omnivorous, usually not very fastidious about their food. Most of them are of small size. Some of them such as *Botia dario*, *Botia lohachata* are very colourful and are reared in aquarium. Many of the more brightly-colored loach species are famous with freshwater aquarists and for that reason importance in the aquarium trade. In Bangladesh, the loaches are distributed in the streams, rivers, beels, lakes and swamps. Most of them are SIS generally grow with natural care. (Nath P. C. D., Debnath S. K., Sharmin R., Benerjee S., Faroque M. G., Ali M. M., A 2010) <sup>[13]</sup> conducted a study to find out the fish biodiversity and socio-economic condition of fishermen in Borulia haor areas, Nikli, Kishoregonj. From the haor, around 47 fish species belonged to 19 families and 31 genera were identified. From the study of Dingaputa haor and its surrounding area of Mohangong Upazila, Netrakona District, 49 species of fish fauna including shrimp species were recorded. Among them, 7 species of carps, 12 species of catfishes, 4 species of snakehead, 5 species perches, 3 species of eels, 6 species < barbs, 2 species of minnows, 3 species of Clupied species and other miscellaneous 7 species including shrimp mainly *Macrobrachium rosenbergii* and *Macrobrachium malconsonii* were recorded (Islam M. J., Anisuzzaman M., Minar M.H., Sarker M.J 2013) <sup>[11]</sup>. They are delicious food with nutritional value. 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. However, as loach species of fish have been considered as an important source of essential nutrients, food and some of ornamental value,

they can play a vital role in the elimination of malnutrition and aesthetic value. Anyway, although some researchers have been conducted research on loach of fish poorly in specific some regions in Sylhet of Bangladesh at past, sufficient data on present biodiversity status of loach species in Sylhet of Bangladesh are not available. Hence, this study has assessed the present biodiversity status, determine availability of endangered and formulate recommendations for effective management strategies of loach fishes of loach species in Sylhet Sadar, Bangladesh.

## 2. Materials and Methods

### 2.1 Methodology

Methodology is a very important step in any scientific research. The study was based on field survey where primary data were collected from the respondents and direct observing the selected fish species in the field. The design of the survey for the present study, which is outlined in following Fig. 1.

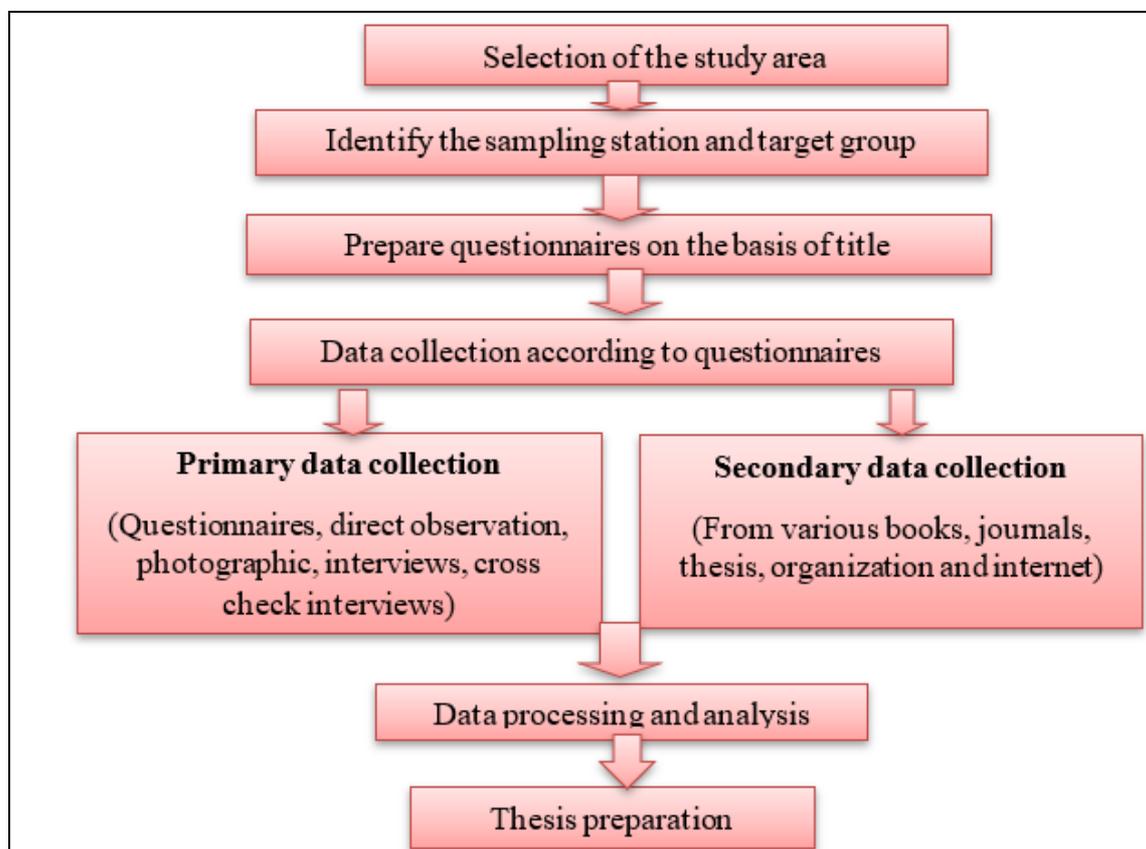


Fig 1: Methodology of the present study

### 2.2 Selection of the study area and study periods

The study sites were selected on the basis of the possibility of getting more specimens. Data and sample collection were carried out mainly in the three popular fish markets of Sylhet Sadar like Lal Bazar, Madina Market and Tukur Bazar Fish Market. Fish samples were also collected from the Surma river near Sylhet city, landing centers and some other fish markets of Sylhet Sadar. This study was conducted for nine months; from 02 April to 01 December, 2014. Frequent field visits (once a week) were made during this time to collect sample and necessary information.

### 2.3 Collection of fish sample and Species identification

The fish samples were collected with the help of fishermen from fishing area and from retailers of landing centers and fish markets. For this purpose, periodic visits were made in different spots of the study area. Collected sample were sorted, rinsed with tap water, color was observed and morph metric measurement were taken. Taxonomic studies were made on the basis of the physical features of the collected specimens. Fish were identified up to species level. The fish were identified using the species classification proposed by (Rahman A. K. A., 2005; Fish base, 2014, Hossain 2014) <sup>15, 5,</sup>

<sup>81</sup>. Identification was made on the morphometric and meristic characters. Photographs of each fish were taken by using digital camera. Fresh fishes were selected for taking photographs. A measuring scale was also provided with fishes at the time of taking shots to determine the size variation from species to species. Finally, the photographs were further enhanced and edited by using computer.

**2.4 Source of data:** There are two sources of data used for this work:

#### 2.4.1 Primary data collection

Data were collected from study area people who are directly or indirectly involved in fishing or selling fish and culturing fish from rivers and haors of Sylhet. For the data collection from the fish farmers, fish traders, labors, a questionnaire was prepared in accordance to fulfill the objectives for the study. Prior to creating the questionnaire, a draft questionnaire was developed and then tested in the study area. The questionnaire was then altered, modified and rearranged according to the experience achieved in the testing. The final questionnaire was then improved in logical sequence so that the respondents could answer chronologically. Questionnaire was constructed

into English and transferred to Bengali (Bangla) during the face-to-face interview of the respondents. Cross check interviews were conducted with paramount information such as local leaders, Upazilla fisheries Officers, workers from NGO where information was contradictory or requested for next assessment. The interviews of respondents were conducted in their office and house. After collection of data from the field, data were recorded in master table sheet. After completion of the pre-tabulation task, actual tabulation work was started. A number of tables were prepared on the basis of aim, objectives of the study. Finally, tabulated data were analyzed and condensed by using average, percentage etc.

**2.4.2 Secondary Data Collection**

Secondary data was collected from various sources including official documents from BFRI, DoF office and websites. Relevant journals and publications are downloaded from internets which are available in websites.

**2.5 Data Analysis**

After collection, the primary data and secondary data were reviewed, stored, coded and then input into computer for further analysis. At each stage of survey data sheets were compared with original data sheets to ensure the accuracy of data entered. All the collected information was accumulated and analyzed by MS-Excel and then presented in textual, tabular and graphical forms.

**3. Results and Discussion**

**3.1 Availability of loach species from study region**

A total of 7 species of freshwater loaches under 2 families followed by Cobitidae and Balitoridae were found, identified and preserved during the investigation period. There are 12 species present under the family Cobitidae in Bangladesh but 6 species were observed in the present study. From the literatures, it can be said that about 24 species of freshwater loaches are available in Bangladesh. (Hossain, 2014) [8] reported 16 loach species under 3 families (Cobitidae 9, Balitoridae 6 and Psilorhynchidae 1 species) in some districts (mainly Sylhet-Mymensingh) over Bangladesh in their study. (Mahalder B. and M. G. Mustafa 2013) [12] conducted a research on “Introduction to Fish Species Diversity, Sunamganj haor region within CBRMP’s working area 2011” under World Fish where they recorded 8 loach species under 2 families (Cobitidae and Balitoridae). The number of loach species found under two different families in the study region has been presented in Table 1 and the number of loach species found in three fish markets during the study period in Table 2. (Hossain and Haque 2005) [7] also found more or less same result about 7 species of loaches among recorded 135 species of fishes in the Padma River near Rajshahi. Balitoridae is an important loach family under which 9 species are existed. In the present study, 1 species was found under this family. Psilorhynchidae is another important family under which no species was found in the present study.

**Table 1:** Checklist of freshwater loaches reported during the study period

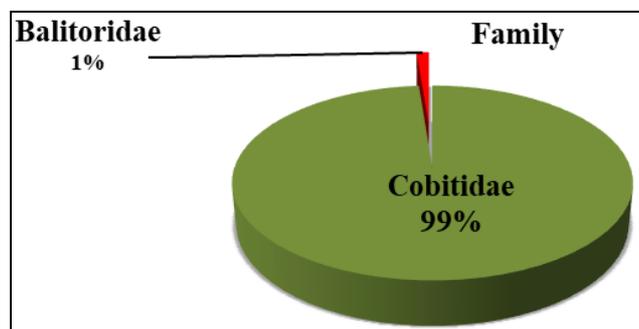
Family	Serial No.	Scientific Name	Local Name	IUCN Status (2000)	Fish Value
Cobitidae	01	<i>Botia dario</i>	Rani, Bou	Endangered	Ornamental fish
	02	<i>Botia lohachata</i>	Rani, Putul	Endangered	Ornamental fish
	03	<i>Lepidocephalichthys guntea</i>	Gutum	Not Threatened	Food fish
	04	<i>Lepidocephalichthys irrorata</i>	Puiya	Not Threatened	Food fish
	05	<i>Lepidocephalichthys berdmorei</i>	Puiya	Not Threatened	Food fish
	06	<i>Somileptus gongota</i>	Cheng Gutum	Not Threatened	Food fish
Balitoridae	07	<i>Acanthocobitis botia</i>	Balichata	Data Deficient	Food fish

**Table 2:** Checklist of freshwater loaches reported in three fish markets during the study period

Species	Recorded loach species in three fish markets		
	Tuker Bazar	Lal Bazar	Pathantula
<i>Botia dario</i>	✓	✓	✓
<i>Botia lohachata</i>	✓	✓	✓
<i>Lepidocephalichthys guntea</i>	✓	✓	✓
<i>Lepidocephalichthys irrorata</i>	✓	✓	✓
<i>Lepidocephalichthys berdmorei</i>	✓	✓	
<i>Somileptus gongota</i>	✓	✓	✓
<i>Acanthocobitis botia</i>	✓	✓	✓

**3.2 Family wise abundance of loach species**

Abundance of loach species composition in accordance with family has been represented in Fig. 2. There are 24 loach species under 3 families namely cobitidae, balitoridae and Psilorhynchidae among which 7 loach species under cobitidae (6 species) and balitoridae (1 species) are recorded. Between two families, cobitidae is dominant comprising 99% species composition where balitoridae is only 1%. (Afrose S. 2013) [1] found the total 39 species of fishes in the Old Brahmaputra River among which there was only 5.13% abundance of loach species. These results are also in line with (Chandra K. J. 2009) [4] enlisted 139 species of fishes of both exotic and indigenous origin belonging to 34 families and 87 genera available in the rivers, beels, haors, ponds and swamps of the greater Mymensingh, of which 7 loach species were recorded.



**Fig 2:** Family wise loach species composition in Sylhet Sadar

**3.3 Market wise loach species composition**

According to the survey study of three markets, it has been seen that the availability of loach species composition is

highest in Lal Bazar Fish Market while it is lowest in Madina Market. Monthly loach species compositions in different three markets of Sylhet Sadar are shown in the Fig. 3, 4 and 5. *Lepidocephalichthys guntea* has been found in highest percentage almost at every month than other loach species but on considering of every month its abundance is highest in December among the rest of months. *Botia dario* and *Botia lohachata* were found at proximately large percentage in April but after then decreasing gradually to December. There are other two species (*Somileptus gongota* and *Acanthocobitis botia*) which were found in small percentage in composition. There are more or less differences in percentage of species composition almost every month from April to December. From graph, it is clear that December is

the peak month which is under winter season when almost every species was found in largest amount compared to other months. The variation in composition of loach species in different markets usually depends on supply and demand of fish. Retailers of these markets said that these species abundance was high at past but now it has been greatly reduced. A similar output was also reported by (Amin R., Ahammad S, Amin H.A., Mahbub F., Miah M.U.2010) [3] identified a total of 61 small indigenous species of fish in Northwest part of Bangladesh among these species only 6 loach species were observed and mentioned that the number of the fresh water fish species has been gradually declining and some species have been locally extinct.

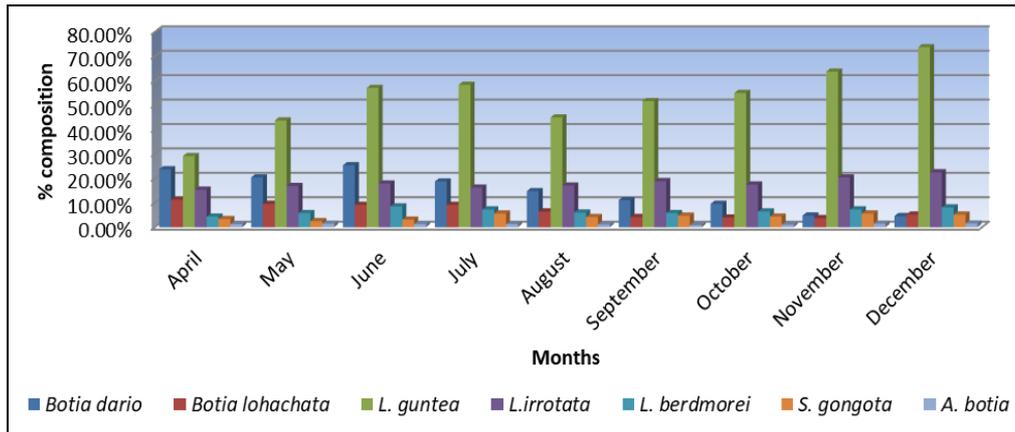


Fig 3: Monthly loach species composition in Toker Bazar Fish Market

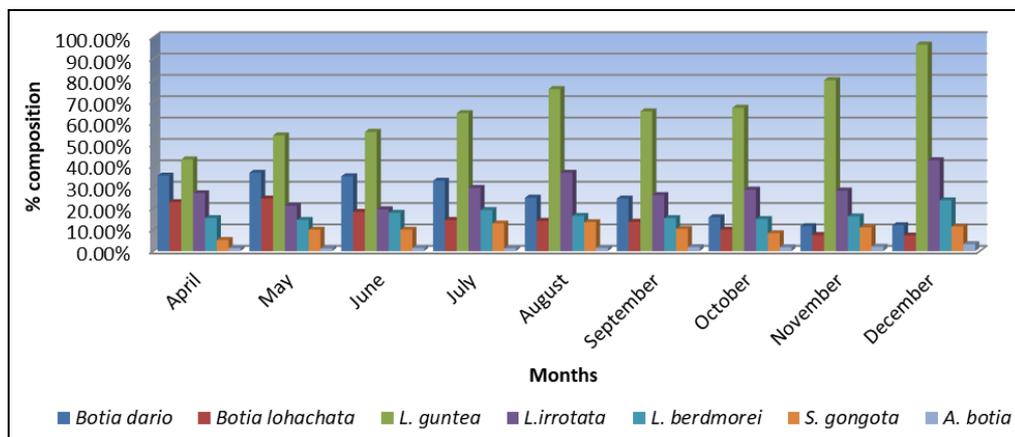


Fig 4: Monthly loach species composition in Lal Bazar Fish Market

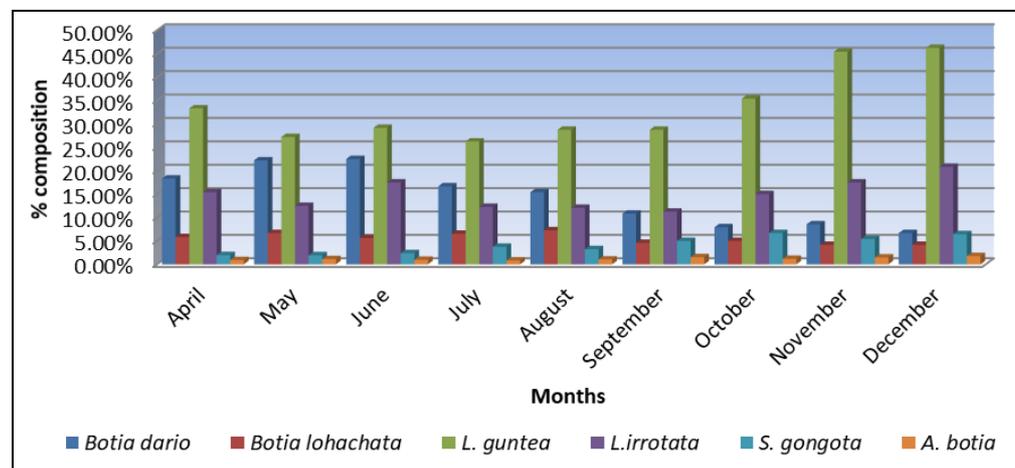


Fig 5: Monthly loach species composition in Madina Market

In case of percentage of species abundance, all loach species were not found more or less similar in overall composition of three markets loach species abundance. There are great differences in composition of seven loach species availability where *Lepidocephalichthys guntea* is highest in availability including 45% while *Acanthocobitis botia* is in the lowest position including 1% that is rarely available in the Fig. 6. In

regard to other identified and recorded loach species, the percentage of availability is not desirable. *Botia Dario* and *Lepidocephalichthys irrorata* were recorded more or less similar including 16% and 18% respectively. On the other hand, *Botia lohachata*, *Lepidocephalichthys berdmorei* and *Somileptus gongota* were almost similar including 8%, 7% and 5% approximate.

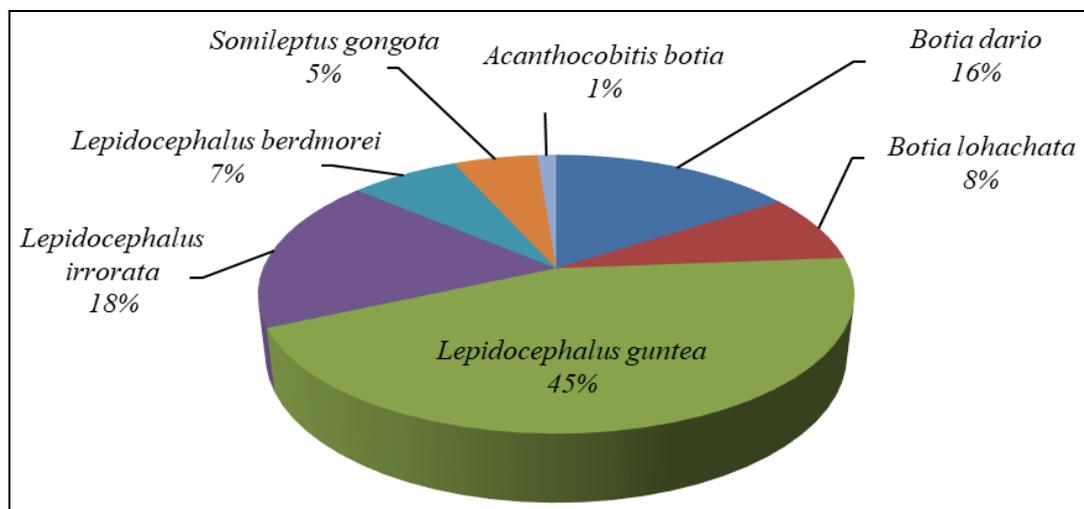


Fig 6: Overall composition of loach species in three fish markets

### 3.4 Comparative composition of loach species during the study period in Sylhet Sadar

During the study, loach species composition has been found varied from species to species among the reported species in the present study. Identified two ornamental fish species namely *Botia dario* and *Botia lohachata* were found approximately 25%-14% and 14%-5% on composition in the different fish markets of Sylhet Sadar shown in Fig. 7. Among available loach species, *Lepidocephalichthys guntea* is in the highest position including 66%-33% in percentage among three markets. On the other hand, *Somileptus gongota* and

*Acanthocobitis botia* are in the smallest amount with 10%-4% and 1.5%-1% on percentage of species composition in case of availability. Amongst three fish markets, highest composition of loach species was found in Lal Bazar than the rest two markets because the supply and demand of fish is high in this market due to geographical location in Sylhet Sadar. In contrast, smallest loach composition was found in Madina Market due to low supply and demand and besides, it is somewhat smaller market than the other two mentioned fish markets.

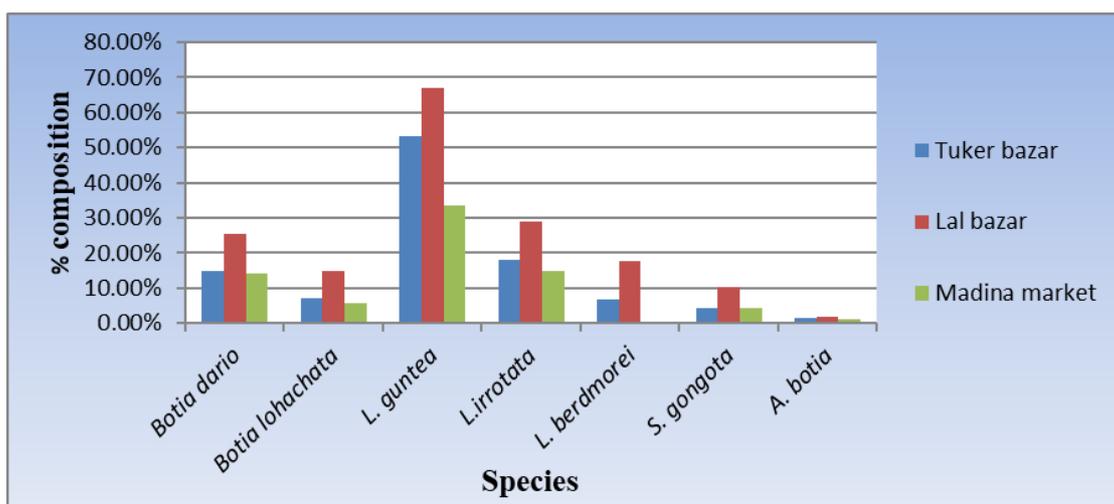


Fig 7: Comparative composition of loach species in three fish markets during the study period in Sylhet Sadar

During the survey in different markets and interview with fisherman, it has been come out that the number of loach species and its availability have been decreased noticeably compared to previous time and in the next future it will greatly reduce if it to be continued without taking any effective steps to conserve loach species biodiversity with other indigenous species. The present study indicates that

some loach species are more available and some are less available from April to December but most of the species largely found in the ending months of the year. *Lepidocephalichthys guntea* has been reported available hugely in every month than other species while the rest of loach species are rarely available and not available.

### 3.5 Classification and description of the recorded loach species in the study area

The detailed description of the 3 species of loaches are given below-

#### 3.5.1 *Botia dario*

##### Classification

Class: Actinopterygii

Order: Cypriniformes

Family: Cobitidae

Genus: *Botia*

Species: *Botia dario*

Common Name: Bengal loach,

Local Name: Rani, Bou



Plate 1: *Botia Dario*

**Taxonomic formula:** D.11-13(2-3/9-10); P1.14; P2. 8; A. 7-8(2/5-6)

##### Identifying Characteristics

- Body laterally compressed and head flattened at sides.
- Scales minute and lateral line present.
- Small ventral mouth.
- A strong bifid spine in a groove below eye.
- Body encircled by 7 oblique brown or black bands, separated by yellowish ones of equal or shorter width.
- Caudal with 2 to 4 broken black bands.
- Barbels 4 pairs, 2 rostral, 1 maxillary and 1 mandibular pair.
- Pelvics originate a little behind dorsal origin and caudal forked.

##### Fishery Importance

Though this fish is popular as delicious food but it is of no interest to fisheries. Usually it is reared in aquarium as aesthetic value.

#### 3.5.2 *Somileptus gongota*

##### Classification

Class: Actinopterygii

Order: Cypriniformes

Family: Cobitidae

Genus: *Somileptus*

Species: *Somileptus gongota*

Common Name: Gongota Loach,

Local Name: Pahari Gutum



Plate 2: *Somileptus gongota*

**Taxonomic formula:** D.2/8, P1.10; P2. 7; A. 7(2/5)

##### Identifying Characteristics

- Body sub cylindrical, tapering posteriorly.
- Upper profile of snout nearly straight or a little concave, rising abruptly to above eyes.
- Eyes close together situated high up at middle of head.
- Lips thick lower lip with papillae.
- 4 rostral and 2 maxillary barbels.
- A small erect pair above nostrils. Above nostrils tubular, posterior nostrils simple holes.
- Scales small, lateral line present.
- Head with fine warty excrescences. Two rows of open pores along dorsal surface upto origin of dorsal.
- Pelvics originate slightly in advance of that of dorsal. Caudal rounded.
- Greenish above, yellowish white below.
- A variable pattern along sides usually consisting of a series of about 5 large brown blotches.

Back usually with irregular bands descending up to lateral line. A dark patch on cheek below eye

##### Fishery Importance

This fish is of no interest to fisheries. It is a catching fish.

#### 3.5.3 *Lepidocephalichthys irrorata*

##### Classification

Class: Actinopterygii

Order: Cypriniformes

Family: Cobitidae

Genus: *Lepidocephalichthys*

Species: *Lepidocephalichthys irrorata*

Common Name: Loktak loach

Local Name: Puiya



Plate 3: *Lepidocephalichthys irrorata*

**Taxonomic formula:** D.2/7; P1. 1/6; P2. 1/6; A. 2/5

##### Identifying Characteristics

- Dorsal profile greatly arched above pectoral fin, ventral profile nearly straight.
- Snout curved downward, mouth ventral.
- Eyes minute, situated above in anterior half of head.
- A suborbital bifid spine below orbit. Nostrils close together separated by a valve.
- Four pairs of barbels, two rostra), one maxillary and one mandibular pairs: rostral pairs almost equal in size, maxillary pair longer.
- Dorsal as high as depth of body, its origin slightly behind that of pelvics.
- Caudal slightly forked. Pale olive with series of fine dark dots.
- Narrow irregular pale bars on dorsal surface.

**Fishery Importance**

This fish is of no interest to fisheries. It is just caught from inland open water for eating.

**3.6 Fishing gears operated for catching loach species**

Just loach species are not caught exclusively by specific fishing gears. These are caught with other mixed fish species together. Some variety of fishing gears and method are used by fishermen to catch these fishes. A total of 4 types of nets, 2 types of boats and 1 type of fishing method were recorded in the study region during the survey. The types of gears used by fishermen for fishing purpose in Sylhet region are shown in Table 3. The similar fishing gears used by the fishermen was recorded by (Galib SM, 2008) [6] in Chalan beel included 12 types of nets, 5 types of traps, 6 types of hooks and lines, 4 types of 48 wounding gears and 2 types of other fishing methods.

**Table 3:** Different type of gears used by the fishermen for catching loach species

Group name	Local name	English name
Seine net	Ber jal	Surrounding net
Lift net	Dharma jal	Hand lift net
Falling net	Jhaki/Khepla jal	Cast net
Falling net	Thela jal	Push net
Boat	Dingi nauka	Small boat
Boat	Kusha nauka	Small boat
Fishing methods	Katha	Bush trap

(Rahman S, 1996) [16] recorded among the different types of nets, the highest numbers of species (25) were recorded in the catches of ber jal, which was followed by jhaki jal (18) and relatively a smaller number of species (7) were recorded in the catches of thela jal.

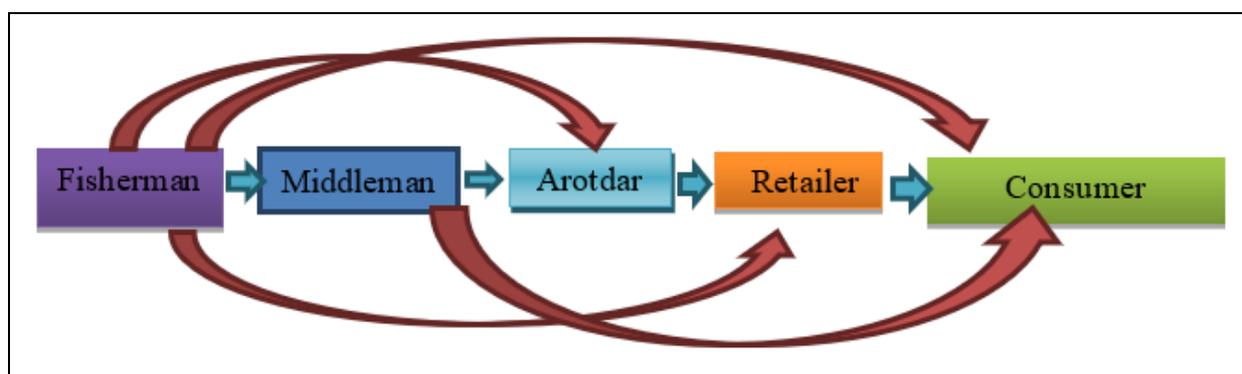
**3.7 Demand of loach species in the studied fish markets**

Loach species were not well demanded in past due to their high availability and abundance in rivers, hours, beels and other natural water bodies. But presently loaches are not commonly abundant in natural water bodies. Another important thing is that as the loach species are highly nutritional and tasty, they are highly demanded to health

aware people. Over 150 species among the 260 freshwater fish species of Bangladesh, have been identified as small indigenous species (SIS). These small indigenous fish species are the vital, infact the exclusively source of the protein and most of the fat-soluble vitamins for the rural people who represent more than 80% of the total population (Hussain M.G., 2010) [9]. However, these loach species are very expensive due to high demand in the market but supply is low.

**3.8 Market chain of loach species in Sylhet region**

The main sources of loach species in markets of Sylhet Sadar are rivers, haors, streams, canals and wetlands of different regions of Sylhet division. In case of Sylhet Sadar fish markets, the market chain from fisherman to consumers passes through a number of intermediaries: after buying fish from fisherman/farmer, middlemen (locally known as foria) bring them to the wholesale market of Sylhet and sale to the wholesaler (Arotdar). These fishes are brought in Sylhet Sadar through Trucks, engine boats, vans etc. The retailers buy fish from wholesaler through auction with a highest bid. The retailers then bring fish to particular market where they usually sale the fish to the consumers. Fisherman or fish farmer also sale fish directly to the wholesaler or even to the consumers in the Fig. 8 mainly in peri-urban fish markets. There are some consumers who are rich buy fish from Arotdar (wholesaler) directly at wholesale price without not going to retailers. It is a very common scenario almost in all the sites of Bangladesh that fishermen and fish farmers do not get expected price from their harvested fishes although consumers have to pay high price to buy from the retailers where ultimately middlemen become benefited. From the figure, it was clear observation that only 5% consumers received fish and fishery related products from fish producers/capturers directly and rest 95% fishes reached to the consumer levels through different intermediaries (beparis, aratdars, wholesalers and retailers etc.). Similar results also observed from the study of (Rokeya JA, Ahmed SA, Bhuiyan AS, Alam MS, 1997) [17] who revealed that fishermen hardly get chance to communicate directly with the ultimate consumers.



**Fig 8:** Marketing chain of loach species in Sylhet region

**3.9 Reasons for decline in biodiversity and overall availability of fish**

Biodiversity of loach species is declining day by day due to some activities that directly or indirectly hampering abundance of these species. The main reasons for decline in biodiversity and overall availability of fishes, according to questionnaire survey and data collected from fishermen and

other people adjacent to fish related activities are:

1. Siltation that occurs mainly in rainy season.
2. Overfishing throughout the year.
3. Destruction of fish habitats by roads, embankments, drainage and flood control.
4. Involvement of a lot of people in fishing and fish-based livelihood around rivers, canals, beels, wetlands etc.

5. Use of current jal and other destructive fishing gears.
6. Use of chemical fertilizer and over doses of insecticides and pesticides in agriculture land.
7. Water and environmental pollution and lack of water in dry season.
8. Drought occurs in summer season.
9. Creation of barrier and making obstacle in natural movement of fishes.
10. Brood fish and fry catch during breeding season.

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 fish resources (Ali, 1996) <sup>[2]</sup>. According to (Hussain and Mazid, 2001) <sup>[10]</sup>, habitat degradation recently has become a great concern in most aquatic ecosystems in Bangladesh. (Postel and Richter, 2003) <sup>[14]</sup> grouped the problem to global freshwater biodiversity under five interacting categories: water pollution; overexploitation; flow modification; destruction or degradation of habitat; and invasion by exotic species. The causes recorded in the present study are more or less same causes recorded by them.

### 3.10 Recommendation

1. Fishing law should be enforced and implemented so that conservation of loach species can be done from over fishing, use of illegal fishing gears etc.
2. Dredging the water body for retaining water throughout the year.
3. Removal of barrier and different obstacles for free movement of fishes in the water body.
4. Sustainable fishing should be controlled as part of the total fisheries resource to ensure quality fishing, and to keep fish stocks and their habitats, for present and future generations.
5. Public awareness about the nutritional value of loach species.
6. Further study should be carried out to know their reproductive biology to conserve the biodiversity.

### 4. Conclusion

Researchers have reported that the number of freshwater species has been gradually declining. Richness of loach species were very low than most of other indigenous species in the study area. Though these species are favorite to people both as food and ornamental value but the availability is not satisfactory comparison to demand. Very poor research and negligence on these species have increased threat of loach species diversity. Now loach species biodiversity is an alarming point, need urgent measures for conservation.

### 5. Acknowledgements

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