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Abstract

The survey was carried out in Manas national park and its adjacent villages, from January 2014 to September 2014. A total eighty five indigenous (85) ichthyospecies were identified from seven randomly selected lotic and lentic water bodies from Manas National park and its fringe village’s areas during the survey period. Out of these eighty five (85) ichthyospecies belonging to 10 orders and 26 families and 55 genera and from these 85 ichthyospecies 2.35% belong to order Anguilliformes, followed by Beloniformes 1.17%, Clupeiformes 3.53%, Cypriniformes 41.18%, Cyprinodontiformes 1.17%, Osteoglossiformes 2.35%, Perciformes 22.35%, Siluriformes 20%, Symbbranchiformes 4.71%, and Tetraodontiformes 1.14%. And out of eighty five (85) ichthyospecies 88.24% considered as LC, 1.17% considered as EN, 1.17% considered as VU 7.05% considered as NT, 1.17% considered as DD and 1.17% considered as NA as per IUCN 2014.3 Status report. Pisodonophis boro and Schistura corica are important finding during survey.

Keywords: Ichthyofauna, Manas National park, Threats, Assam

Introduction

In third world countries, fish constitute one of the most important and easily available food-item of sustenance for many people. Ichthy are immutable living components of water bodies. Ichthy form is the most diverse and protean group of vertebrate. Assam is gifted with many extensive water bodies commonly known as Beels [11]. The Brahmaputra drainage system in North East India is one of the largest hydrographic basins in Southeast Asia and sustains a very rich and diverse aquatic gene pool, particularly fishes and such as the region is featured among the global hotspots of fresh water fish diversity [12]. The north-east part of India is gifted for verities of fresh water habitats mainly in the form of the mighty Brahmaputra and its major tributaries. River with its tributaries and rivulets are a unique type of ecosystem which generally cover different types of bio-geographical regions. River is the natural drainage system of the land mass of the earth which move continuously. In Assam, the tributaries of river Brahmaputra basin through supports plentiful biodiversity and offers livelihood and nutritional security has been less studied from conservation point of view. The planet has the divergence of supporting huge ichthyofaunal diversity; represent more than half of the total number of approximately 54,711 valid vertebrate species [21]. There are descriptions of an estimated 27,977 valid species of fishes [21] of 54,711 vertebrate species recognized the world over 27,977 under 515 families and 4,494 genera [21] are valid species of fish of which 11,952 are of freshwater and 12,457 species using freshwater. The Indian subcontinent ichthyofauna is an assemblage of about 2500 species depicting diverse characteristics, of which 930 belonging to 326 genera, 99 families and 20 orders inhabiting the inland waters and 1,570 are marine [22]. Out of these 400 species are commercial important, which include cultured, cultivable and wild. On the global scale, Indian fish represents 11 % of specie, 24% of genera, and 57% of families [27].

Northeastern Region of India is globally known as a global fresh water hotspot for ichthyofaunal diversity. Ichthyofaunastic studies of the northeastern region of India, which is elements of the Indo-Gangetic region and to some extent, elements of the Myanmar’s and South-Chines region [16] is barely studied. Hora [2, 3, 4, 5, 6, 7, 8, 9, 10] is one of the pioneer workers on the fishes of northeastern India. Ghosh and Lipton [1] had reported 172 species of fishes with reference to their economic importance while Sen [13] recorded 187 species of fishes from Assam and its environs. The fresh water ichthyofaunal diversity of Assam was reported by Dey [18, 19] is one of the pioneer workers on the ichthyofauna. Sinha [14] compiled a list of 230 species of fishes from northeastern India. Nevertheless, Nath and Dey [24] recorded 131
species of fishes from the drainages in Arunachal Pradesh alone. Later Sen [17] compiled a list of 285 fish species belonging to 114 genera under 38 families of fishes from northeastern India; which is approximately 33.13% of total India fresh water fishes. To the best knowledge of the author, there was no morphological based research effort on ichthyofauna was carried out in Manas National Park. Subsequently, the aim of the present paper was to carry out the first comprehensive morphological based research effort on ichthyofauna in Manas national park Assam.

2. Methodology
The survey was carried out from January 2014 to September 2014.

2.1: Location of Study area: The present work was carried out in Manas National Park (26°35'-26°50'N, 90°45'-91°15'E) and its fringe villages. Manas national park is a major conservation area. It forms a part of Malayan and Indo-Bhutan realms and is a key conservation area in the Jigme Dorji-Manas- Bumdaling conservation landscape in the eastern Himalayan ecoregion [15]. It is an internationally renowned protected area in India. The study area included the Bansbari range of Manas national park which is 17 km from Barpeta road. It is in the Barpeta District of Assam. Manas national park occupies an area of 500 km².

Fig 1: Study area survey Map

MAP OF THE STUDY AREA

Map showing the study area in Manas National Park, Assam, India.
3. Result and Discussion
Manas national park not only holding unique wildlife diversity but also provides a convenient habitat for fresh water ichthyofauna. Manas national park have diverse verity of fishes such as Catfishes, loaches, Barbs, Gobies, Eels, different Gouramis and different Garra sp. etc. A total eighty five indigenous (85) ichthyospecies were identified from seven randomly selected lotic and lentic water bodies from Manas National park and its fringe village’s areas during the survey period. Out of these eighty five (85) ichthyospecies belonging to 10 orders and 56 genera and from these 85 ichthyospecies 2.35% belongs to Order Anguilliformes, followed by Beloniformes 1.17%, Clupeiformes 3.53%, Cypriniformes 41.18%, Cyprinodontiformes 1.17%, Osteoglossiformes 2.35%, Perciformes 22.35%, Siluriformes 20%, Symbranchiformes 4.71% and Tetraodontiformes 1.14%. And out of eighty five (85) ichthyospecies 88.24% belongs to Order Anguilliformes, followed by Beloniformes 1.17%, Clupeiformes 4.71%, and Tetraodontiformes 1.14%. The fin-formula is consist with the letters D for dorsal and P for pectoral.

3.1 Morphological Information (Body, Fin Formula, Barbels & Lateral Line) Of Ichthyospecies from Manas National park
All the relevant morphological characteristics details about fresh water fishes were done by author through morphological study. The arrangement of fish families is based on Jayaram (2013). The fin-formula is based on the local name. The fin formula is abbreviated as D for dorsal fin, D1 for 1st dorsal fin, D 2 for 2nd dorsal fin, P 1 for pectoral fin, P1 for pelvic fin, P2 for pectoral fin, A for anal fin and C for caudal fins.

I. ORDER – OSTEOGLOSSIFORMES
Family- Notopteridae
   Fin formula-D1. 9; P1. 14-16; P2. 6; A. 114-118.

   Fin formula-D1. 8; P1. 15; P2. 6; A. 98.

II. ORDER - ANGUILLIFORMES
Family – Anguillidae
   Fin formula-D1. 223; P1. 16; P2. 0; A. 225; C. 11

   Fin formula-D1. 0; P1. 0; P2. 0; A. 0; C. 0

II. ORDER- CLupeiformes
Family- Clupeidae
   Fin formula-D1.11; P1. 10; P2. 6; A. 20-22. C. 19-21

   Fin formula-D1.14; P1. 14; P2. 6; A. 18. C. 19

Family- Engraulidae
   Fin formula-D1.11; P1. 13; P2. 6; A. 57; C. 19

III. ORDER – CYPRINIFORMES
Family – Cyprinidae
   Fin formula-D1.9; P1. 15; P2. 9; A. 7; C. 17

   Fin formula-D1.9; P1. 15; P2. 9; A. 9. C. 16

   Fin formula-D1.9; P1. 14; P2. 9; A. 9. C. 14

   Fin formula-D1.6; P1. 11; P2. 7; A. 8; C. 20

   Fin formula-D1.7; P1. 10-11; P2.6-8; A. 8; C. 18-20

   Fin formula-D1.9; P1. 12-13; P2.9-10; A. 9; C. 18-20

   Fin formula-D1.10; P1. 11; P2.9; A. 9; C. 19

Fin formula-D1.15; P1. 17; P2.9; A. 8; C. 15


Fin formula-D1.6; P1. 13; P2.6; A. 11; C. 18-21


Fin formula-D1.8; P1. 11; P2.9; A. 8; C. 19-22


Fin formula-D1.9; P1. 14; P2.9; A. 7; C. 17-19


Fin formula-D1.11; P1. 13; P2.8; A. 12; C. 18


Fin formula-D1.15; P1. 12; P2.8; A. 16; C. 19


Fin formula-D1.11; P1. 10; P2.8; A. 7; C. 18-20


Fin formula-D1.10; P1. 15; P2.9; A. 7; C. 17


Fin formula-D1.11; P1. 12; P2.8; A. 9; C. 17


Fin formula-D1.11; P1. 16; P2.9; A. 7; C. 15


Fin formula-D1.17; P1. 16; P2.9; A. 7; C. 16


Fin formula-D1.17; P1. 14; P2.9; A. 7; C. 17


Fin formula-D1.10; P1. 14; P2.9; A. 32; C. 15


Fin formula-D1.11; P1. 13; P2.9; A. 7; C. 19


Fin formula-D1.10; P1. 14; P2.9; A. 8; C. 17


Fin formula-D1.10; P1. 13; P2.8; A. 7; C. 16-18


Fin formula-D1.9; P1. 12; P2.9; A. 7; C. 17


Fin formula-D1.11; P1.14; P2.9; A.8; C. 21


Fin formula-D1.11; P1. 13; P2.9; A. 7; C. 20


Fin formula-D1.11; P1.15; P2.9; A.8; C. 17

furcate.
Fin formula- \textbf{D}.10; P. 13; P.2.8; A. 15; C. 16

Fin formula- \textbf{D}.4; \textbf{P}.13; \textbf{P}.7-8; A. 15; C. 16

37. \	extit{Tor putitora}: (Local name: Jonga tora pithia) – Body is compressed. Two pairs of barbels present. Mouth small. Caudal fin deeply forked. Body colour bright golden yellow.
Fin formula- \textbf{D}.9; P.15; P.2.9; A. 5; C. 21

Family – Balitoridae

38. \textit{Acanthobobitis botia}: (Local name: Kukur botia) - Body elongated, laterally compressed. Abdomen rounded. Ventral profile flat. Eyes small. 3 pairs of barbels present. Body colour is oliveaceous. 6 “<>” shaped bands on caudal fin.
Fin formula- \textbf{D}.3; P.10; P.2.8; A. 6; C. 23

39. \textit{Schistura corica}: (Local name: Boirali) - Body is moderately compressed. Mouth is semicircular. Caudal fin slightly emarginate. 3 pairs of barbels presents. 10-12 black blotches present along with lateral line. Eyes moderate.
Fin formula- \textbf{D}.10; P.12; P.2.6; A. 6; C. 17

Family- Cobitidae

40. \textit{Botia derio}: (Local name: Rani botia) – Body elongated, laterally compressed. Abdomen rounded. Mouth small and situated ventral part of the body. Four pairs of barbels present”. Eyes are large. Anal fin is short. Six or Seven are yellowish vertical bands on the body. Caudal fin deeply forked. Lateral line is present.
Fin formula- \textbf{D}.11; P.14; P.2.7; A. 6; C. 23

41. \textit{Botia dayi}: (Local name: Botia) – Body elongated, laterally compressed. Head long, pointed. Abdomen rounded. Mouth small and situated ventral part of the body. Lateral line is present. Four pairs of barbels present”. Eyes are large. Anal fin is short. Caudal fin deeply forked. Mouth small. Whole body reticulated with dark brown bands which enclose different sizes yellowish spots.
Fin formula- \textbf{D}.12; P.14; P.2.8; A. 7; C. 21

Fin formula- \textbf{D}.8; P.8; P.2.7; A. 6; C. 16

IV. ORDER – SILURIIFORMES

Family – Bagridae

Fin formula- \textbf{D}.7; P.9; P.2.5; A. 12; C. 18

Fin formula- \textbf{D}.9; P.13; P.2.8; A. 15; C. 16

Fin formula- \textbf{D}.8; P.9; P.2.5; A. 8; C. 21

Fin formula- \textbf{D}.7; P.10; P.2.6; A. 13; C. 19

47. \textit{Mystus viitatus}: (Local name: Singora) – Body short and elongated. Head short and flattened. Eyes medium in size. Lateral line complete. Adipose dorsal fin short. A black spot on shoulder. 2 light metallic black longitudinal bands present in body. 3 pairs of barbels present”.
Caudal fin forked.
Fin formula- \textbf{D}.7; P.9; P.2.6; A. 11; C. 17-20

Fin formula- \textbf{D}.7; P.11; P.2.7; A. 12; C. 17-19

Family- Clariidae

Fin formula- \textbf{D}.6; P.10; P.6; A. 52; C. 16

Fin formula- \textbf{D}.6; P.7; P.6; A. 68; C. 18

Family- Siluridae

Fin formula- \textbf{D}.5; P.14; P.2.9; A. 67; C. 17

Fin formula- \textbf{D}.4; P.12; P.2.8; A. 71; C. 19

Fin formula- \textbf{D}.5; P.14; P.2.10; A. 87; C. 21

Family – Schilbeidae

54. \textit{Allia Coil}: (Local name: Kajoli) – Body elongated and
compressed. Adipose dorsal fin very small. Lateral line complete. Eyes small. Lips thin. Caudal fin forked with black edge. Barbles four pairs. Body colour silvery white. Fin formula-D 1. 6; P 1. 13; P 2. 5; A 73; C 23

55. *Eutropiichthys vacha*: (Local name: Vacha) - Body elongate and compressed. Mouth large. Eyes large. Lateral line complete. Lips thin. Dorsal spine small. Barbles four pairs. Caudal fin deeply forked. Body colour grayish white. Fin formula-D 1. 7; P 1. 14; P 2. 5; A 49; C 19

56. *Neotropius atherinoides*: (Local name: Bordiya) - Body elongated, compressed. Abdomen rounded. Head small. Mouth wide. Lips thin. Eyes large. Four pairs of barbels present. Colour silvery and olive greenish on back. 4 longitudinal bands from opercula region to base of caudal fin. A black spot on base of caudal fin. Caudal fin forked. Fin formula-D 5; P 7; P 2. 5; A 32; C 16

**Family – Sisoridae**

57. *Gagata cenia*: (Local name: Kyaketta) - Body elongate, compressed and flattened on ventral surface. Eyes large. Barbles four pairs. Dorsal and pectoral spine present. Adipose dorsal fin small. Lips thick. Lateral line complete. Caudal fin forked. Colour golden yellowish, 5-6 dark bands along dorsal surface. Fin formula-D 6; P 8; P 2. 5; A 10; C 19


**V. ORDER – BELONIFORMES**

**Family – Belonidae**

60. *Xenentodon cancila*: (Local name: Kokila) - Body elongate, compressed, cylindrical, tapering to both ends. Abdomen rounded. Head pointed. Snout sharply pointed. Mouth superior. Eyes large. Caudal fin forked. Body olive greenish in dorsally, white ventrally and white silvery laterally. Lateral line complete. Fin formula-D 18; P 10; P 2. 6; A 17; C 16

**VI. ORDER - CYPRINODONTIFORMES**

**Family – Aplocheilidae**


**VII. ORDER – SYNBRANCHIFORMES**

**Family – Synbranchidae**

62. *Monopterus cuchia*: (Local name: Cucia) - Body elongate and cylindrical. Tail compressed, tapering. Abdomen rounded. Mouth wide. Whole body is covered by scale. Eyes small. Lateral line conspicuous. Caudal fin hardly conspicuous. Body is dark brown in colour. Fin formula-D 0; P 0; P 2. 0; A 0; C 0

**Family - Mastacembelidae**

63. *Mastacembelus armatus*: (Local name: Bami) - Body elongated, compressed and pointed. Eyes small. Lips thin. Dorsal part of body is grey and brown colour. Anal and dorsal fin is spotted with black grey colour. Lateral line present and continuous. Fin formula-D 79; P 1. 24; P 2. 0; A 77; C 16

64. *Macrognathus pancalus*: (Local name: Turi) - Body eel-like elongated, long and pointed. Eyes small. Lips thin. Lateral line complete. Dorsal surface of body is olive green in colour. Ventral surface is light pale yellow in colour. Whole body is covered with numerous light black grey colour spot. Caudal fin rounded. Fin formula-D 41; P 18; P 0; A 45; C 13

65. *Macrognathus aral*: (Local name: Turi) - Body eel-like elongated, long and pointed. Eyes small. Lips thin. Lateral line complete. Two broad bands present from head to base of the caudal fin, one line is above the lateral line and another is below the lateral line. 4 small eyespots on base of dorsal fin. Fin formula-D 46; P 23; P 2. 0; A 51; C 16

**VIII. ORDER – PERCIFORMES**

**Family – Chandidae**


69. *Parambassis ranga*: (Local name: Dangor chanda) - Body elongated compressed and transparent. Abdomen rounded. Head short. Mouth large. Eyes large. Lips thin. Caudal fin forked. Lateral line complete. Body colour is light silvery white. Light black dusky spot over the body. A dark black spot near the spine of first dorsal fin. Fin formula-D 13; P 12; P 2. 5; A 12-13; C 22

**Family – Nandidae**

70. *Nandus nandus*: (Local name: Khaloivangi) - Body oblong, compressed. Abdomen rounded. Head large, compressed. Mouth large. Eyes large. Caudal fin rounded. Lateral line discontinuous. Body colour dark greenish black and brown. 3-4 vertical dark greenish black band on the body. Anal fin with 3 spines. Fin formula-D 12; P 1. 14; P 2. 7; A 8; C 16

Fin formula-D₁. 9; P₁. 13; P₂.5; A. 7; C.14


Fin formula-D₁. 9; P₁. 13; P₂.5; A. 7; C.13

Family – Gobiidae


Fin formula-D₁. 6; D₂. 9 P₁. 18; P₂.8; A. 8; C.16


Fin formula-D₁. 6; D₂. 10 P₁. 16; P₂.9; A. 8; C.15

Family – Anabantidae


Fin formula-D₁. 9; P₁. 15; P₂.5; A. 10; C.17

Family – Belontidae


Fin formula-D₁. 13; P₁. 10; P₂.1; A. 17; C.16


Fin formula-D₁. 16; P₁. 9; P₂.1; A. 15; C.15

78. *Colisa lalia*: (Local name: Ronga Kholihona) – Body oval, Compressed. Snout blunt. Mouth upturn and small. Eyes large. Lips thin. Caudal fin rounded. Lateral line present but discontinuous. It is most colorful of all other *Colisa* sp. Which are found in Assam 12 dark metallic bluish vertical bands present from base of dorsal part to base of ventral side. Dorsal, anal and caudal fins with red spots. It maximum length up to 5 cm.

Fin formula-D₁. 10; P₁. 8; P₂.1; A. 17; C.16


Fin formula-D₁. 8; P₁. 8; P₂.1; A. 12; C.15

Family – Channidae


Fin formula-D₁. 32; P₁. 14; P₂.6; A. 22; C.14


Fin formula-D₁. 54; P₁. 19; P₂.6; A. 34; C.17


Fin formula-D₁. 34; P₁. 15; P₂.6; A. 21; C.15


Fin formula-D₁. 46; P₁. 17; P₂.6; A. 26; C.17


Fin formula-D₁. 39; P₁. 17; P₂.6; A. 27; C.18

IX. ORDER – TETRAODONTIFORMES

Family – Tetraodontidae


Fin formula-D₁. 10; P₁. 21; P₂.0; A. 12; C.7
Fig 2: Chitala chitala

Fig 3: Notopterus notopterus

Fig 4: Pisodonophis boro

Fig 5: Gudusia chapra

Fig 6: Setipinna phasa

Fig 7: Amblypharyngodon mola

Fig 8: Aspidoparia jaya

Fig 9: Aspidoparia morar

Fig 10: Barilius barila

Fig 11: Barilius bendelisis

Fig 12: Brachydanio rerio

Fig 13: Esomus danricus
Fig 14: Rasbora daniconius

Fig 15: Danio dangila

Fig 16: Devario devario

Fig 17: Garra lamta

Fig 18: Garra gotyla

Fig 19: Garra nasuta

Fig 20: Labeo bata

Fig 21: Labeo calbasu

Fig 22: Labeo gonius

Fig 23: Osteobrama cotio

Fig 24: Puntius phutunio

Fig 25: Puntius conchonius
Fig 26: *Puntius sarana*

Fig 27: *Puntius gelius*

Fig 28: *Puntius sophore*

Fig 29: *Salmostoma bacaila*

Fig 30: *Securicula gora*

Fig 31: *Acanthocobitis botia*

Fig 32: *Schistura corica*

Fig 33: *Botia dario*

Fig 34: *Botia dayi*

Fig 35: *Lepidocephalichthys guntea*

Fig 36: *Mystus vittatus*

Fig 37: *Rita rita*
Fig 38: *Sperata seenghala*

Fig 39: *Ompok bimaculatus*

Fig 40: *Ompok pabo*

Fig 41: *Wallago attu*

Fig 42: *Ailia Coila*

Fig 43: *Eutropiichthys vacha*

Fig 44: *Neotropius atherinoides*

Fig 45: *Gagata cenia*

Fig 46: *Clarias batrachus*

Fig 47: *Heteropneustes fossilis*

Fig 48: *Chaca chaca*

Fig 49: *Xenentodon cancila*
Fig 50: Aplocheilus pancha

Fig 51: Macrognathus pancalus

Fig 52: Macrognathus aral

Fig 53: Mastacembelus armatus

Fig 54: Chanda nama

Fig 55: Parambassis ranga

Fig 56: Parambassis baculis

Fig 57: Parambassis lala

Fig 58: Nandus nandus

Fig 59: Badis badis

Fig 60: Trichogaster fasciata

Fig 61: Trichogaster lalia
Species like *Schistura corica*, *Pisodonophis boro*, *Garra nasuta*, *Osteobrama cotio*, *Badis assamensis* and *Glossogobius gutum* very rarely reported in lower parts of Assam. While *Amblypkeyrongodon mola*, *Barilus barna*, *Barilus bendelisis*, *Barilus vagra*, *Barilus barila*, *Danio dangyla*, *Garra gosyla*, *Puntius conchonius*, *Puntius sophore*, *Puntius ticto*, *Lepidocephalichthys guntea*, *Mystus vittatus*, *Clarias batrachus*, *Heteropneustes fossilis*, *Aplocheilus panchax*, *Macrognathus aral*, *Macrognathus pancalus*, *Channa gachua* and *Channa punctatus* are mostly found in Manas national park and its adjacent villages. Due to inadequacy of previous information on ichthyofaunal diversity from Manas national park and its adjoining areas it is not possible to appraise the rate of decline in ichthyofaunal diversity, but the present study would be useful as criterion data for any future appraisal after interlinking.

4. Conclusion

Manas National park is gifted with immense resources of nature. Above results support that Manas national park and its adjoining areas not only holding an unique indigenous fresh water ichthyofaunal diversity but also have a very good ecosystem; without a good ecosystem it is impossible to survive such a high fresh water indigenous ichthyospecies diversity under Manas National park and its adjacent villages.

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