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ICHTHYODIVERSITY OF MEGHALAYA: INDIA

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Abstract: Meghalaya situated in the north-eastern region of India, is endowed with a rich variety of flora and fauna. A survey on the icthyofauna in seven districts of Meghalaya carried out from January 2008 to July 2009 has revealed 68 species belonging to 45 genera, 20 families and 6 orders. Cyprinidae were the most dominant group represented by 30 species belonging to 17 genera, followed by the family Sisoridae (4 species from 4 genera), Cobitidae (4 species from 3 genera), Bagridae (4 species from 2 genera), and Channidae (3 species from 1 genera). Diversity of fish decreased with increasing altitude and higher diversity was observed in sampling sites located between 0–100 m above sea level. Major percentage of fishes belonged to the family Cyprinidae in all the seven districts of the State. The study deals with biodiversity of fish fauna from different districts of Meghalaya and their conservation aspects.

Key words: Icthyofauna, biodiversity, water bodies, conservation
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Introduction

Meghalaya is located in the northeast region of India, and lies between 25° to 26° north latitude and 90° to 92°45' east longitude. It extends for about 300 km. in length and about 100 km. in width. The boundaries of the state are demarcated by the Gaolpara and Kamrup districts of Assam in the north, the south western part of the district of Gaolpara and a part of Rangpur district of Bangladesh in the west, the Mymensingh and Sylhet districts of Bangladesh in the south with an international boundary of about 423 km and the north Cachar and Karbi Anglong districts of Assam in the east. A compact and isolated State in the north-eastern region of India, Meghalaya extends to 22,429 sq. km of land. The landscape of Meghalaya is mostly rolling plateau with south-facing slopes being extremely steep. With the hill rising to 2,000m, the state is cool despite its proximity to tropics. The hilly state is covered with tropical, subtropical and temperate forest cover. The Meghalayan subtropical forests have been considered among the richest botanical habitats of Asia. These forests receive abundant rainfall and support a vast variety of floral and faunal biodiversity.

Meghalaya has two drainage systems namely Brahmaputra in the North and Barak in the South (Figure 1). Important rivers of Brahmaputra drainage are Umiam, Kopili, Myntang, Jingiram and Simsang, Kynshi, Umngot and Myntdu of Barak drainage. The main rivers of Meghalaya in the Garo Hills that form the northern system and flow from west to east are the Chagua, Ajagar, Kalu, Dudnai, Didram, Ringgai and Krishnai. The main rivers that form the southern system are Bhogai, Daring, Sanda, Dareng, Bandra and Simsang.

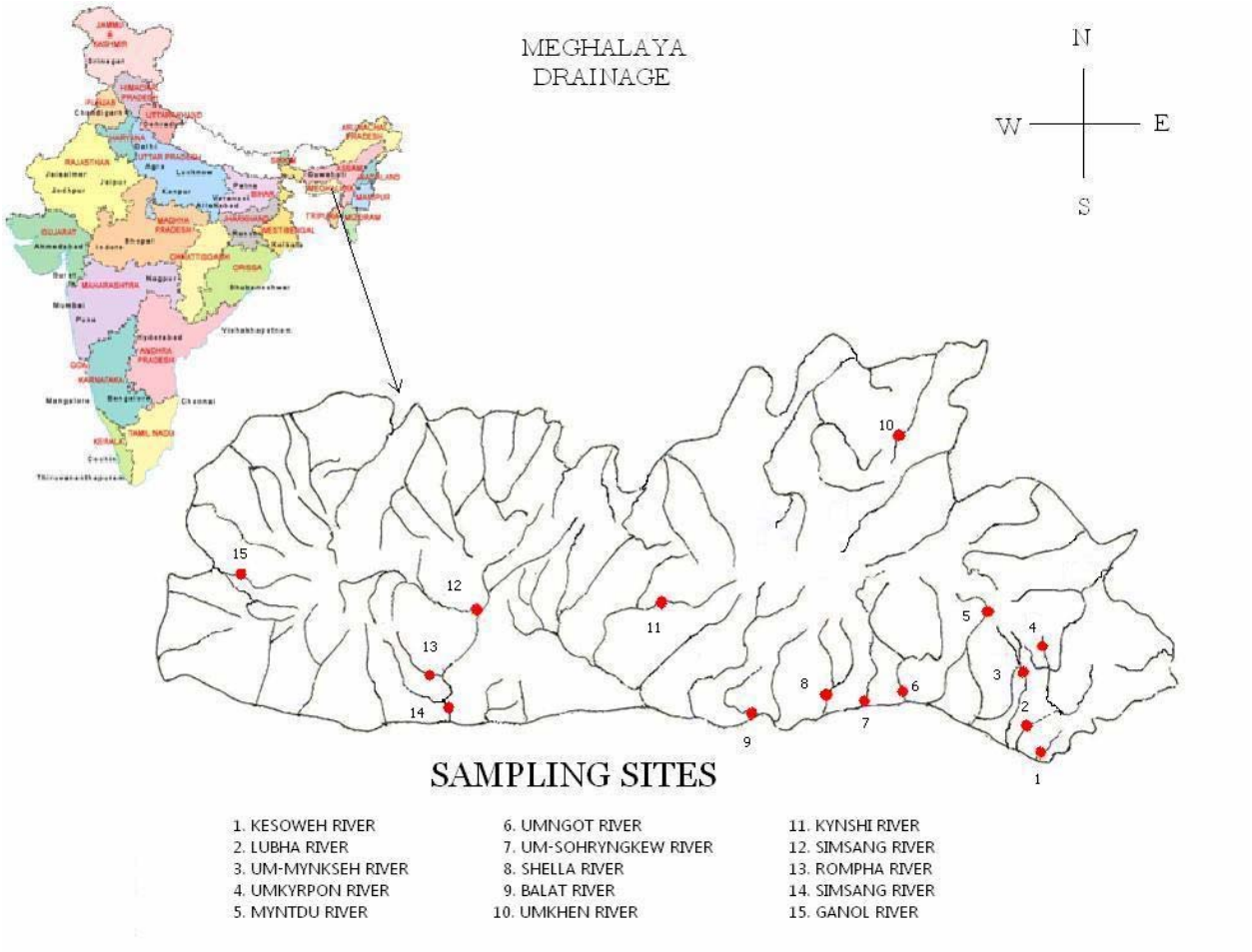

Figure 1. Drainage Map of Meghalaya

The main rivers of the eastern and central regions of Meghalaya plateau that flow towards the north are Umiam, Umkhri and Digaru and some major rivers of the eastern and central regions of Meghalaya plateau that flow towards the south are the Umiam, Mawpa, Kynchiang (or Jadukata), Myntdu and Myngot. With numerous hill streams, rivers and reservoirs, the State is enriched with fish species of both hill stream and plains.

The northeastern states of India, comprised of the eight landlocked states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura, is one of the richest regions of India in terms of biodiversity and natural resources. The North Eastern Region is enriched with many freshwater species of fish and is considered to be one of the hotspots of freshwater fish biodiversity in the world (Kottelat and Whitten, 1996). A large number of fish species have been reported by various workers such as Hora (1921, 1936), Hora and Mukherji (1935), Menon (1954, 1974), Sehgal (1955), Malhotra and Suri (1969), Dey (1975), Yazdani (1977), Sen (1977, 1995, 1998),Vishwanath and Sarojnalini (1988), Vishwanath (1993), Barman (1994), Sinha (1994), Selim and Vishwanath (1998), Nath and Dey (2000). Of approximately 806 species inhabiting freshwaters of India (Talwar and Jhingran, 1991), the Northeastern India is represented by 267 species belonging to 114 genera under 38 families and 10 orders. Review of literature indicates that there has been a wide variation in the number of fishes reported from this

region ranging from 129 to 266 (Ghosh and Lipton, 1982; Yadava and Chandra, 1994; Sinha, 1994; Sen, 2000). The rich fish diversity of the region have been attributed to many reasons, viz., the geography, which consists of hills, plateaus, and valleys and results in the formation of a variety of torrential hill streams, rivers, lakes and swamps, and drainage patterns, which include the Ganga-Brahmaputra, Koladyne, and Chindwin-Irrawady systems (Viswanath, 2002). The State of Meghalaya is found to be rich in its ichthyofaunistic diversity with 165 species so far been reported from the State belonging to 85 genera under 31 families and 9 orders (Sen, 2000; Sen, 2003). The existing literature does not give specific distribution of fish fauna in different district water bodies of the State. The present study aims to update the ichthyofaunal diversity in the streams and rivers of Meghalaya district wise and to get a total picture of the distribution of fish species in the State.

Materials and Methods

In the present study, random field surveys were conducted during January 2008 to July 2009 in different water bodies of seven districts of Meghalaya *viz*. East Khasi Hills, West Khasi Hills, Ribhoi District, Jaintia Hills, East Garo Hills, West Garo Hills and South Garo Hills. Fish samples were collected using cast nets, gill nets, drag nets, triangular scoop nets and a variety of local made traps. The different fish species were observed at most of the important fish assembling centres. The information regarding occurrence of different local species were collected from the local fishermen and fish vendors. The specimens were preserved immediately in 5% formaldehyde. Identification is done following standard literature (Jayaram, 1999; Vishwanath, 2002) and with the help of expertise available at Zoological Survey of India, Shillong. The specimens are deposited in the museum of Department of Zoology, North Eastern Hill University, Shillong. Longitude and latitude were recorded at each site using a Global Positioning System, GPS (Garmin, Germany). Water samples were analysed for physico-chemical parameters such as pH (using pH meter by Lutron Co.), conductivity (using conductivity meter by Lutron Co.), dissolved oxygen (using DO meter by Lutron Co.).

Results and Discussions

The geographical position of different water bodies surveyed is given in Table 1. It was observed that the areas surveyed includes both high altitude (above 1000 m.) and low altitude (below 1000 m) sites. Diversity of fish species was quite less in the places of higher altitude like Khleihriat, Jowai, Ladrymbai and Nongstoin as compared to low altitude sites like Balat, Dawki, Williamnagar and Baghmara. Table 2 shows the physico-chemical properties of the water samples of some rivers of Meghalaya.

The distribution and diversity of total fish fauna in the water bodies of different districts and rivers of Meghalaya are given in Tables 3, 4 and Figure 2. In the present study, 68 species have been recorded. In the district of East Khasi Hills, sixteen species have been found as compared to the West Khasi Hills which were represented by only nine species. Ten species have been recorded from Ribhoi district and thirty-eight species was found from Jaintia Hills. From the district of East Garo Hills, twelve species were collected, another twenty-one species from South Garo Hills and eleven species from West Garo Hills. Earlier work done by Zoological Survey of India reported diversity of fish fauna of State of Meghalaya (Sen, 1995; Sen, 2003), but not upto the district level. Present work gives a clear picture of the distribution of fish in district as well as river system of the State.

Table1. Details of the surveyed rivers in Meghalaya.

River	Collection site	Altitude (m)	Geographical position
Balat	Balat, EKH	9.5	N 25°11'42.12"-E 91°22'20.52"
Ganol	Garobadha,WGH	120	N 25°31'43.14"-E 90°06'33.78"
Kesoweh	Umkiang, JH	40	N 25°03'45" -E 92°23'10"
Kynshi	Nongstoin, WKH	1356	N 25°31'21.5"-E91°16'13.8"
Lubha	Sonapur, JH	28	N 25°06'36.7"-E 92°21'54.2"
Myntdu	Jowai, JH	1402	N 25°26'59.5"-E 92°12'06.2"
Rompha	Baghmara, SGH	-	-
Shella	Shella, EKH	100	N 25°10'45"-E 91°38'40"
Umkhen	Nongpoh, RD	600	N 25°54'30"-E 91°52'50"
Umkyrpon	Khliehriat, JH	1172	N 25°21'31.2"-E 92°22'11.5"
Um-Mynkseh	Ladrymbai, JH	1160	N 25°19'50"-E92°19'45"
Umngot	Dawki, JH	100	N 25°11'10"-E 92°01'25"
Um-Sohrygkew	Bholaganj, EKH	-	-
Simsang 1	Williamnagar, EGH	259	N 25°30'15. 06"-E 90°36'28.92"
Simsang 2	Baghmara, SGH	365	N 25°11'30"-E 90°38'30"

Table 2. Physico-chemical properties of the water of some rivers of Meghalaya.

Rivers/Streams &	Date of	Water	pH	DO	Conductivity
Balat, Balat	08.04.09	28	6.8	6.7	0.13
Ganol, Garobadha	26.04.09	25	6.8	5.5	0.58
Kesoweh, Umkiang	06.06.08	25	6.5	8.7	0.21
Kynshi, Nongstoin	09.03.09	14	6.2	5.0	0.10
Lubha, Sonapur	04.04.08	24	6.8	4.6	0.14
Myntdu, Jowai	05.04.09	22	5.6	4.6	0.10
Rompha, Baghmara	26.09.08	29	6.2	5.1	0.14
Shella, Shella	25.05.09	25	6.9	7.1	0.16
Umkhen, Nongpoh	15.10.08	26	6.6	10.2	0.11
Umkyrpon, Khleihriat	15.06.09	24	4.9	6.5	0.22
Um-Mynkseh, Ladrymbai	28.06.09	23	5.2	6.6	0.23
Umngot, Dawki	06.02.08	27	6.8	10.6	0.10
UmSohryngkew,Bholaganj	30.04.09	27	6.8	8.7	0.13
Simsang 1, Williamnagar	03.09.08	25	6.0	4.8	0.11
Simsang 2, Baghmara	27.09.08	30	6.3	6.2	0.12

Table 3. Distribution of fish fauna in seven districts of Meghalaya.

	Orders	Families	Genera	Species
East Khasi Hills	05	06	14	16
East Garo Hills	03	05	08	12
Jaintia Hills	06	17	29	38
Ribhoi District	02	02	08	10
South Garo Hills	04	08	17	21
West Khasi Hills	03	04	08	09
West Garo Hills	02	05	09	11

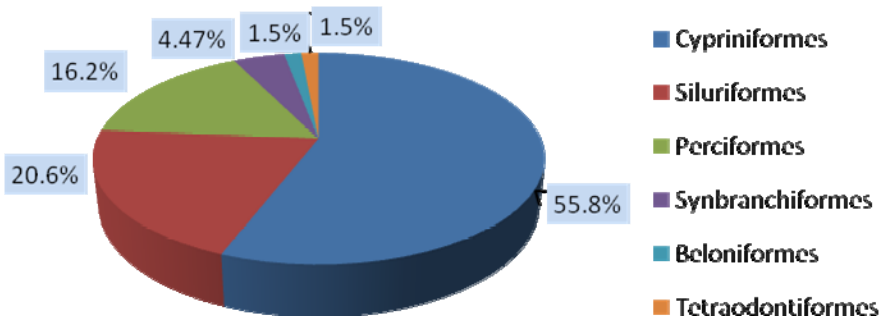

Fig. 2. Per cent distribution of different orders of fishes in water bodies of Meghalaya

This result will support to take up further studies on diversity of fish fauna in Meghalaya. Table 5 shows percent wise distribution of families in different rivers classified under seven districts of Meghalaya. It is observed that nearly 50% of the fish species collected belonged to the family Cyprinidae in all the seven districts followed by the families Chandidae and Cobitidae. This perhaps may be due to the fact that fishes which are highly adaptable in the hill streams belong to the family Cyprinidae more than any other family. Genus like *Barilius*, *Garra*, *Psilorhynchus*, *Labeo*, *Balitora*, *Crossocheilus*, *Cyprinus* are inhabitants of hill streams. Special physico-chemical and geological conditions occurring in the hill streams influence the morphology and biology of the fish fauna (Khanna and Singh, 2003). The fishes belonging to genera *Barilius* and *Neolissocheilus* exhibited high degree of diversity distributed in five of the seven districts followed by the genera *Brachydanio* and *Badis* in four of the seven districts studied. Following Sen (2003) majority of the Cyprinids fish species (ten out of thirty-eight) come under threatened category either endangered or vulnerable. Comparatively, very few species of Silurids (five out of twenty eight) are threatened.

Table 4. Diversity of fish fauna found in Meghalaya.

Districts	**JH**						**EKH**			**WKH**	**RD**	**EGH**	**SGH**		**WGH**
Species	**1 UG**	**2 MT**	**3 LB**	**4 KS**	**5 UP**	**6 UM**	**7 SH**	**8 BA**	**9 US**	**10 KY**	**11 UK**	**12 SI**	**13 SI**	**14 RP**	**15 GA**
Anabantidae															
Anabas testudineus (Bloch, 1792)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Bagridae															
Batasio batasio (Hamilton, 1822)	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Mystus bleekeri (Day, 1877)	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-
M. cavasius (Hamilton, 1822)	+	-	-	-	-	+	-	-	+	-	-	-	+	-	-
M. menoda (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Balitoridae															
Acanthocobitis botia (Hamilton, 1822)	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Balitora brucei (Gray, 1830)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Belonidae															
Xenentodon cancila (Hamilton, 1822)	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Belontidae															
Colisa fasciatus (Bloch & Schneider, 1801)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. sota (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Chacidae															
Chaca chaca (Gray, 1831)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chandidae															
Chanda nama (Hamilton, 1822)	+	-	-	-	-	-	+	-	-	-	+	-	+	+	-
P arambassis baculis (Hamilton, 1822)	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-
P. ranga (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Channidae															
Channa gachua (Hamilton, 1822)	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-
C. punctatus (Bloch, 1793)	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-
C. stewartii (Playfair, 1867)	-	+	-	-	-	-	-	-	-	+	-	+	-	-	-
Clariidae															
Clarias batrachus (Linnaeus, 1758)	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobitidae															
Botia dario (Hamilton, 1822)	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
B. rostrata (Gunther, 1868)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Canthophrys gongota (Hamilton, 1822)	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-
Lepidocephalus guntea (Hamilton, 1822)	-	+	+	-	+	+	-	+	-	-	-	-	-	-	-
Cyprinidae															
Amblypharyngodon mola (Hamilton, 1822)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Contd.

Barilius barila (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
B. bendelisis (Hamilton, 1807)	-	-	+	+	-	-	+	+	+	-	-	+	+	-	+
B. tileo (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Brachydanio rerio (Hamilton, 1822)	-	+	+	-	-	-	+	-	-	+	+	-	-	-	-
Chagunius chagunio (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Chela laubuca (Hamilton, 1822)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cirrhinus reba (Hamilton, 1822)	+	-	-	-	-	-	+	-	+	-	-	-	+	-	-
Crossocheilus latius (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
Cyprinus carpio (Linnaeus, 1758)	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-
Danio dangila (Hamilton, 1822)	-	+	+	-	-	-	-	-	-	-	+	-	-	-	-
Devario aequipinnatus (McClelland, 1839)	-	+	-	-	-	-	-	-	-	-	+	+	-	-	-
Esomus danricus (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
Garra gotyla (Gray, 1830)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G. nasuta (McClelland, 1839)	-	-	-	-	-	-	-	-	+	+	-	-	+	-	-
G. lamta (Hamilton, 1822)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Labeo boga (Hamilton, 1822)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L. calbasu (Hamilton, 1822)	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-
L. gonius (Hamilton, 1822)	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-
L. pangusia (Hamilton, 1822)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Neolissocheilus hexagonolepis (McClelland, 1839)	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+
N. hexastichus (McClelland, 1839)	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+
Puntius chola (Hamilton, 1822)	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-
P. conchonius (Hamilton, 1822)	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
P. sarana (Hamilton, 1822)	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
P. shalynius Yazdani & Talukdar, 1975	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-
P. sophore (Hamilton, 1822)	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-
Raiamas bola (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Salmostoma bacaila (Hamilton, 1822)	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-

Contd.

S. phulo (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Gobiidae															
Glossogobius giuris (Hamilton, 1822)	-	-	-	-	+	-	-	-	-	-	-	-	+	+	-
Heteropneustidae															
Heteropneustes fossilis (Bloch,1794)	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-
Mastacembelidae															
Macrognathus aral (Bloch & Schneider, 1801)	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-
M. pancalus (Hamilton, 1822)	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-
Mastacembelus armatus (Lacepede, 1800)	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-
Nandidae															
Badis badis (Hamilton, 1822)	-	+	-	+	-	-	-	-	-	-	+	+	+	-	-
Psilorhynchidae															
Psilorhynchus balitora (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
P. sucatio (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Schilbeidae															
Clupisoma garua (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Siluridae															
Ompok bimaculatus (Bloch, 1794)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
O. pabo (Hamilton, 1822)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sisoridae															
Bagarius bagarius (Hamilton, 1822)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glyptothorax striatus (McClelland,1842)	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Gogangra viridecsens (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Pseudecheneis sulcata (McClelland,1842)	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Tetraodontidae															
Tetraodon cutcutia (Hamilton, 1822)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Presence (+) and absence (-) of fish species
*EKH-East Khasi Hills; WKH-West Khasi Hills; JH-Jaintia Hills; RD-Ribhoi District; EGH-East Garo Hills; SGH-South Garo Hills; WGH-West Garo Hills
*UG-Umngot; MT-Myntdu; LB-Lubha; KS-Kesoweh; UP-Umkyrpon; UM-UmMynkseh; SH-Shella; BA-Balat; US-Umsohryngkew; KY-Kynshi; UK-Umkhen; SI-Simsang 1; SI-Simsang 2; RP-Rompha; GA-Ganol

Table 5. Percentage wise distribution of families in different rivers of Meghalaya.

Percentage of fishes in rivers of Meghalaya															
Districts	**JH**						**EKH**			**WKH**	**RD**	**EGH**	**SGH**		**WGH**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Anabantidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.09
Bagridae	5.26	-	-	-	-	12.50	-	-	42.85	-	-	-	15.00	-	-
Balitoridae	5.26	-	-	-	-	12.50	-	-	-	-	-	-	-	-	-
Belonidae	5.26	-	-	-	-	-	11.11	-	-	-	-	-	-	-	-
Belontidae	5.26	-	-	-	-	-	-	-	-	-	-	-	-	-	9.09
Chacidae	5.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chandidae	5.26	-	-	-	-	-	11.11	25.00	14.28	-	10.00	-	5.00	33.33	9.09
Channidae	-	12.50	-	25.00	-	12.50	-	-	-	11.11	-	25.00	-	-	-
Clariidae	-	12.50	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobitidae	-	12.50	25.00	-	33.33	25.00	-	50.00	-	-	-	-	5.00	-	9.09
Cyprinidae	47.36	50.00	75.00	50.00	-	25.00	77.77	25.00	42.85	44.44	80.00	41.66	35.00	33.33	63.63
Gobiidae	-	-	-	-	-	-	-	-	-	-	-	-	5.00	33.33	-
Heteropneustidae	-	-	-	-	-	12.50	-	-	-	11.11	-	-	-	-	-
Mastacembelidae	5.26	-	-	-	33.33	-	-	-	-	11.11	-	8.33	15.00	-	-
Nandidae	-	12.50	-	25.00	33.33	-	-	-	-	-	10.00	8.33	5.00	-	-
Psilorhynchidae	-	-	-	-	-	-	-	-	-	-	-	16.66	-	-	-
Schilbeidae	-	-	-	-	-	-	-	-	-	-	-	-	5.00	-	-
Siluridae	5.26	-	-	-	-	-	-	-	-	-	-	-	5.00	-	-
Sisoridae	5.26	-	-	-	-	-	-	-	-	22.22	-	-	5.00	-	-
Tetraodontidae	5.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*EKH-East Khasi Hills; WKH-West Khasi Hills; JH-Jaintia Hills; RD-Ribhoi District; EGH-East Garo Hills; SGH-South Garo Hills; WGH-West Garo Hills *UG-Umngot; MT-Myntdu; LB-Lubha; KS-Kesoweh; UP-Umkyrpon; UM-UmMynkseh; SH-Shella; BA-Balat; US-Umsohryngkew; KY-Kynshi; UK- Umkhen; SI-Simsang 1; SI-Simsang 2; RP-Rompha; GA-Ganol

Factors influencing the status of fish diversity in the State include: (i) Various destructive methods like dynamiting, poisoning by locally available herbs, chemicals like copper sulphate and lime and the freely available agricultural pesticides or insecticides were indiscriminately used for fish catching. (ii) Fishes were indiscriminately caught by gill nets, cast nets during the spawning runs. (iii) Deforestation, which brought about soil erosion, siltation and turbidity leading to degradation of natural habitat. (iv) Recently, one of the main factors which played an important role in the decline of the fish population in the rivers of Meghalaya is the pollution caused by coal mining operation in Jaintia and Garo Hill Districts. Both the districts have large rivers which sustain higher icthyodiversity. At the same time, it is seen that the drainage system affected by coal mining and cement factory effluents showed very less diversity of icthyofauna. It has been observed that only one species of fish *Brachydanio rerio* is surviving in the polluted water body adjacent coal mining operation.

The physico-chemical studies on water quality (Table 2) has shown low pH, low DO and high conductivity in the water bodies of the coal mining areas. Major rivers of the State which contributed maximum riverine fish production were heavily affected by run-off water from the coal mining areas upstream (Marwein, 2000). The water bodies are badly affected by contamination of Acid Mine Drainage (AMD) originating from mines and spoils, leaching of heavy metals, organic enrichment and silting by coal and sand particles. Pollution of the water is evidenced by the colour of the water which in most of the rivers and streams in the mining area varies from brownish to reddish orange. The primary cause of degradation of water quality and the declining trend of biodiversity in the water bodies of the mining area is attributed mainly to the AMD, which makes water highly acidic and rich in heavy metal concentration (Pentreath, 1994). Extremely low pH condition in the water accelerates weathering and dissolution of silicate and other rock minerals, thereby causing the release of other elements such as aluminum, manganese, copper, cadmium etc. into the water. Hence, water contaminated with AMD is often coloured and turbid with suspended solids, highly acidic, and contain high concentration of dissolved metals and other elements. The polluted water not only has declined the fish population but also contaminated agricultural fields, natural water resources and created scarcity of drinking water (Swer and Singh, 2003). Low pH (2-3), high conductivity, high concentration of sulphates, iron and toxic heavy metals, low dissolved oxygen (DO) characterize the degradation of water quality. Low pH, low DO, higher sulphate content and turbidity in water of coal mining areas are affecting the aquatic life and less diversity of fish fauna. It has been reported that a total of 12 taxa of algal community were recorded from AMD impacted streams as compared to 57 taxa from unimpacted stream belonging to Bacillariophyceae and a few from Chlorophyceae (Das and Ramanujam, 2009). This may be one of the causes for less food and oxygen availablity for fish in AMD impacted water bodies. Another factor which adds to the declining fish population in Jaintia Hills is due to the effluents dispose in nearby rivers from cement factories.

The possible conservation measures are: (i) Liming of water to neutralize acidic water and to keep lakes and ponds safe for aquatic life. (ii) Prevention of use of piscicides in rivers. There is an immediate need to create awareness among the users specially fishermen against use of poison. (iii) Captive breeding of few species which are either endangered or vulnerable like *Neolissocheilus hexastichus*, *Puntius shalynius, Barilius barila, Cirrhinus reba, Garra gotyla, Ompok bimaculatus, Bagarius bagarius, Clarias batrachus, Mystus bleekeri, Glyptothorax striatus, Clupisoma garua.* (iv) General awareness among the people, consumers, students, NGOs for taking up programme to conserve the fish fauna.

Most obvious causes of biodiversity loss have been habitat loss, over-exploitation, and introduction of invasive species. Despite the discovery of several new species to date, the rate of increase of pressure on this fauna is high that extinction may be expected even before discovery.

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