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Present Status, Abundance and Threats of Fish Diversity on Ramsar Site (East Kolkata Wetlands) of West Bengal, India

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ABSTRACT

The present study was conducted in the water bodies of East Kolkata Wetlands to generate a primary database on fish diversity of West Bengal, India. 71 indigenous fish species belonging to 27 families were identified. The family Cyprinidae represented the largest diversity accommodating 14 genera and 23 species. According to IUCN (International Union for Conservation of Nature) and CAMP (Conservation Assessment and Management Plan), the conservation status of the fishes are listed as 1 (1%) species as Critically Endangered, 4(6%) species as Endangered, 16 (22%) species as Vulnerable, 21 (30%) species as at Lower Risk Near Threatened, 21 (30%) species as Lower Risk Least Concerned, 1(1%) species as Data Deficient and 7 (10 %) species as Not Evaluated. About 59% fish species are near threats, vulnerable and endangered in this region. Among the fish diversity of East Kolkata Wetlands 58 species were indigenous species and 13 species were exotic. It is concluded, that anthropogenic pressure arising out of alterations of wetland habitats to agricultural lands, habitat destruction, over exploitation, wanton destruction, aquatic pollution, disease, exotic species introduce and overall lack of awareness of biodiversity importance, absence of proper policy are contributing much to such alarming vulnerability of the rich fish diversity in their natural habitat. Awareness programmes amongst the fisherman, strict ban on dividing of big-water bodies into fragmented small ponds, repeated drying of maturation pond, loss of natural breeding ground for endangered species, use of insecticides and pesticides in ponds to control unwanted species.

Keywords

Fish diversity, Ramsar site, East Kolkata Wetlands, threats and Conservation status

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Introduction

East Kolkata Wetlands, a complex of natural and man-made wetlands lying east of the city of Kolkata, is the only Ramsar site in West Bengal. East Kolkata Wetlands is the largest wastewater wetlands among the 26 Ramsar Sites (Ramsar, 2013) in India. It provides livelihood support to a large, economically underprivileged population of around 27,000 families which depend upon the various wetland products, primarily fish and vegetables for sustenance (National Wetland Atlas, 2010). The wetland system currently produces over 15,000 MT per annum from its 264 functioning aquaculture ponds, locally called bheries. Additionally, nearly 150 MT of vegetables are produced daily by subsistence farmers. Based on its immense ecological and socio cultural importance, East Kolkata Wetlands was designated a “Wetland of International Importance” under the Ramsar Convention on August 19, 2002 (Ramsar 2007). The East Kolkata Wetlands is located in such a low-lying region. It was once covered with salt-water marshes. Those salt-water marshes were between the River Hooghly to the west and the River Bidyadhari, a tidal channel, to the East. The mouths of some of the streams opened into the Bay of Bengal and were influenced by tidal action, which accounted for the tides and salinity of these salt-water lakes. These lakes were actually the spill-reservoirs of the tidal channel Bidyadhari which opened into the Bay of Bengal through the river Matla. At present the East Kolkata Wetlands encompasses 264 operating bheries (Shallow fresh or brackish water bodies for pisciculture). Of the total area of 12,500 ha, approximately 45.93% comprises water bodies and 38.92% is agricultural land. The remaining portion is occupied by urban and rural settlements (10.42%) and sites for garbage disposal (4.73%). East Kolkata Wetlands with rich biodiversity is under immediate threat of species extinction and

habitat destruction due to anthropogenic factors.

The few contributors on fish diversity of East Kolkata Wetlands of West Bengal were De *et al.*, (1989), Wetlands International (2008), Mahapatra and Lakra (2014) and Mahapatra *et al.*, (2015). Since the existing literatures do not give present status, abundance and threats of fish diversity of East Kolkata Wetlands. The present study, therefore, is aimed at to update the ichthyofaunal diversity in the East Kolkata Wetlands and to get a database of fish species.

Materials and Methods

The study was conducted in the ponds of East Kolkata Wetlands. The work was surveyed over a period of one year (September 2016 to August 2017) at monthly interval. Fishes were collected from different sites with the help of fishermen using different types of nets namely, gill nets, cast nets, dip nets, drag nets. The harvested fishes are then preserved in 10 % formaldehyde solution Jayaram (1999). Fish photographs were taken from fresh samples by camera (Nikon, CoolpixL24) and were identified following their general body form, morphometric and meristic characteristics according to Talwar and Jhingran (1991), Jayaram (1999), and Vishwanath *et al.*, (2011). Conservation status of fish is given as per Conservation Assessment and Management Plan (CAMP, 1998) and International Union for Conservation of Nature (IUCN, 2016).

Results and Discussion

Seventy one fish species belonging to 27 families were collected and identified from the ponds of East Kolkata Wetlands. The family-wise interpretation (Fig. 1) revealed Cyprinidae as the largest family accommodating 14 genera and 23 species. The

genus *Puntius*, ranked first among the genera with its numerical strength of 6 species. Family Bagridae with 7 species. Mastacembelidae, Channidae and Loricariidae family represented 3 species. Ambassidae, Belontiidae, Mugilidae, Notopteridae, Pangasiidae, Siluridae, Schilbeidae, Synbranchidae, Cichilidae and Clariidae showed 2 members from each family. Belonidae, Anabantidae, Aplocheilidae, Cobitidae, Badidae, Chacidae, Gobiidae, Heteropneustidae, Nandidae, Tetradontidae, Latidae and Serrasalminidae represented single member from each.

Data of above showed that 11 species such as *Puntius ticto*, *Puntius sophore*, *Mystus tengra*, *Channa punctatus*, *Channagachua*, *Channa marulius*, *Mystus vittatus*, *Heteropneustes fossilis*, *Clarius batrachus*, *Talapia mossambica* and *Puntius javanicus* were abundant in the East Kolkata Wetlands (Fig. 1).

Food fishes were dominant over the ornamental fishes. 34 species have food value and 22 species the ornamental value. 15 species have both value ornamental as well as food (Table 1). An insight into the conservation status of fishes as per CAMP (1998) and IUCN (2010) revealed, under the different categories, One species was critically 'Endangered' (CEN), 21 species are under 'Low Risk Least Concern' (LRlc), 21 species were 'Low Risk Near Threatened' (LRnt), 16 species were 'Vulnerable' (VU), 4 species were 'Endangered' (EN), one species were 'Data Deficient' (DD) and 7 fish species were 'Not Evaluated' (NE) category and (Fig. 2).

All the three types of feeding habits of fishes like carnivorous, omnivorous and herbivorous were available in this region. Forty species of fishes were carnivorous, 29 species were herbivorous and 11 species were omnivorous fish (Fig. 3).

Few authors reported fish diversity of different districts of West Bengal. Menon (1962) reported 218 species of fish from whole Himalayas, Wetlands International (2008) reported 45 fish species from East Kolkata Wetland, Roshith *et al.*, (2012) reported 155 fish species from the tidal freshwater zone of the Hooghly estuary. Sanyal *et al.*, (2012) reported 207 species from Sundarban. Mahapatra and Lakra (2012) reported 50 species from East Kolkata Wetland, among the 50 species 17 are cultured and 33 are wild species. Basu *et al.*, (2012) reported 70 Indigenous ornamental fishes of west Bengal. Patra and Saha (2013) recorded 46 species from Damodar River, Burdwan district.

Mahapatra *et al.*, (2015) reported 190 fish species from West Bengal. Acharjee and Barat (2013) reported 65 species from Teesta river, Mahapatra and Lakra (2014) reported 41 ornamental fish from East Kolkata Wetland. Mahapatra *et al.*, (2015) reported 190 native, Dey *et al.*, (2015a) reported 138 species from Kaljani river of Cooch Behar, Dey *et al.*, (2015b) reported 141 species from rivers of East Himalayan region. The present study showed that 71 species were available in the study area, 58 were indigenous species and 13 were exotic species.

East Kolkata wetlands, an ecologically important Ramsar site, located on the peri-urban interface of Kolkata City have been under continuous pressures of conversion for settlements and agriculture. These wetlands which are famous for fishery activities receive pollutants like heavy metal, oil, grease etc. through effluent of different industries like tannery, electroplating, plastic and dye industries of surroundings and alter the ecosystem. The rich fish germ plasma resources of East Kolkata wetlands have been suffering from various serious anthropogenic stress leading to not only reduced abundance but even touching the genetic threshold.

Table.1 Fish diversity of different water bodies of East Kolkata Wetlands

Sl. No.	Scientific name	Family	Conser- -vation status	Econ- omic value	Food habit
1	<i>Anabas testudineus</i> (Bloch)	Anabantidae	VU	Fd	C
2	<i>Pseudambassisranga</i> (Hamilton-Buchanan)	Ambassidae	LRnt	Or	C
3	<i>Chandanama</i> (Hamilton-Buchanan)	Ambassidae	LRnt	Or	C
4	<i>Aplocheiluspanchax</i> (Hamilton)	Aplocheilidae	LRlc	Or	O
5	<i>Mystusbleekeri</i> (Day)	Bagridae	VU	Fd/Or	C
6	<i>Mystustengara</i> (Hamilton)	Bagridae	LRlc	Fd/Or	C
7	<i>Mystusgulio</i> (Hamilton)	Bagridae	LRlc	Fd/Or	C
8	<i>Mystusvittatus</i> (Bloch)	Bagridae	VU	Fd/Or	C
9	<i>Sperataaor</i> (Hamilton)	Bagridae	VU	Fd	C
10	<i>Batasioaffinis</i> (Blyth)	Bagridae	LRnt	Fd/Or	C
11	<i>Rita rita</i> (Hamilton -Buchanan)	Bagridae	VU	Fd/Or	C
12	<i>Xenentodoncancila</i> (Hamilton)	Belonidae	LRlc	Or	C
13	<i>Badisbadis</i> (Hamilton)	Badidae	LRlc	Or	C
14	<i>Colisafasciatus</i> (Schneider)	Belontiidae	LRnt	Or	C
15	<i>Colisalalia</i> (Hamilton -Buchanan)	Belontiidae	LRlc	Or	C
16	<i>Chacachaca</i> (Hamilton-Buchanan)	Chacidae	EN	Or	C
17	<i>Channastrinata</i> (Bloch)	Channidae	LRlc	Fd	C
18	<i>Channagachua</i> (Hamilton)	Channidae	LRlc	Fd/Or	C
19	<i>Channamarulius</i> (Hamilton)	Channidae	LRnt	Fd	C
20	<i>Amblypharyngodonmola</i> (Hamilton-Buchanan)	Cyprinidae	LRlc	Fd/Or	H
21	<i>Cirrhinusreba</i> (Hamilton)	Cyprinidae	VU	Fd	O
22	<i>Raiamas bola</i> (Hamilton)	Cyprinidae	VU	Fd/Or	C
23	<i>Salmophasiabacaila</i> (Hamilton)	Cyprinidae	LRnt	Fd/Or	C
24	<i>Labeorohita</i> (Hamilton -Buchanan)	Cyprinidae	LRnt	Fd	H
25	<i>Labeocalbasu</i> (Hamilton)	Cyprinidae	LRlc	Fd	H
26	<i>Labeobata</i> (Hamilton)	Cyprinidae	LRnt	Fd	H
27	<i>Catlacatla</i> (Hamilton-Buchanan)	Cyprinidae	VU	Fd	H
28	<i>Cirrhinusmrigala</i> (Hamilton-Buchanan)	Cyprinidae	LRnt	Fd	O
29	<i>Puntiuschola</i> (Hamilton-Buchanan)	Cyprinidae	LRlc	Or	C
30	<i>Puntiusconchonius</i> (Hamilton)	Cyprinidae	LRlc	Or	C
31	<i>Puntiusarana</i> (Hamilton)	Cyprinidae	VU	Fd	C
32	<i>Puntiusophore</i> (Hamilton)	Cyprinidae	LRnt	Or	C
33	<i>Puntiussterio</i> (Hamilton)	Cyprinidae	LRnt	Or	C
34	<i>Puntiussticto</i> (Hamilton)	Cyprinidae	LRnt	Or	C
35	<i>Esomusdanricus</i> (Hamilton-Buchanan)	Cyprinidae	LRlc	Or	O
36	<i>Daniorerio</i> (Hamilton)	Cyprinidae	LRlc	Or	O

37	<i>Laubucalaubuca</i> (Hamilton)	Cyprinidae	LRlc	Or	O
38	<i>Lepidocephalusguntea</i> (Hamilton)	Cobitidae	LRlc	Or	C
39	<i>Glossogobiusgiuris</i> (Hamilton-Buchanan)	Gobiidae	LRnt	Fd	C
40	<i>Heteropneustesfossilis</i> (Bloch)	Heteropneustidae	VU	Fd	O
41	<i>Clariusbatrachus</i> (Linnaeus)	Clariidae	VU	Fd	C
42	<i>Rhinomugilcorsula</i> (Hamilton)	Mugilidae	VU	Fd/Or	H
43	<i>Macragnathusaral</i> (Bloch and Schneider)	Mastacembelidae	LRnt	Fd/Or	C
44	<i>Macragnathuspancalus</i> (Hamilton)	Mastacembelidae	LRnt	Fd/Or	C
45	<i>Mastacembelusarmatus</i> (Lacepede)	Mastacembelidae	LRlc	Fd/Or	C
46	<i>Nandusnandus</i> (Hamilton-Buchanan)	Nandidae	LRnt	Or	C
47	<i>Notopterusnotopterus</i> (Pallas)	Notopteridae	EN	Fd	O
48	<i>Notopterschitala</i> (Hamilton- Buchanan)	Notopteridae	EN	Fd	C
49	<i>Pangasiuspangasius</i> (Hamilton-Buchanan)	Pangasiidae	CEN	Fd	C
50	<i>Ompokpabda</i> (Hamilton)	Siluridae	VU	Fd	C
51	<i>Wallagoattu</i> (Schneider)	Siluridae	VU	Fd	C
52	<i>Neotropiusatherinoides</i> (Bloach)	Schilbeidae	LRlc	Fd	C
53	<i>Ailiacoila</i> (Hamilton)	Schilbeidae	VU	Fd	C
54	<i>Amphipnouscuchia</i> (Hamilton-Buchanan)	Synbranchidae	VU	Fd	C
55	<i>Ophisternonbengalense</i> (McClelland)	Synbranchidae	LRlc	Fd	C
56	<i>Tetradoncutcutia</i> (Hamilton-Buchanan)	Tetradontidae	LRnt	Or	O
57	<i>Liza parsia</i> (Forsskal)	Mugilidae	DD	Fd	C
58	<i>Latescalcarifer</i> (Bloch)	Latidae	NE	Fd	C
59	<i>Hypophthalmichthysmolitrix</i> (Valenciennes)	Cyprinidae	LRnt	Fd	H
60	<i>Cyprinuscarpio</i> (Linnaeus)	Cyprinidae	LRnt	Fd	O
61	<i>Ctenopharyngodonidella</i> (Valenciennes)	Cyprinidae	NE	Fd	H
62	<i>Hypophthalmichthysnobilis</i> (Richardson)	Cyprinidae	LRnt	Fd	O
63	<i>Talapia mossambica</i> (Peters)	Cichilidae	LRnt	Fd	C
64	<i>Oreochromisniloticus</i> (Linnaeus)	Cichilidae	NE	Fd	C
65	<i>Piaractusbrachypomus</i> (Pirapitinga)	Serrasalminidae	NE	Fd	H
66	<i>Clariasgariepinus</i> (Burchell)	Claridae	LRlc	Fd	C
67	<i>Pangasianodonhypophthalmus</i> (Sauvage)	Pangasiidae	EN	Fd/Or	C
68	<i>Puntiusjavanicus</i> (Bleeker)	Cyprinidae	LRlc	Fd	C
69	<i>Pterygoplichthysdisjunctivus</i> (Weber)	Loricariidae	NE	Or	H
70	<i>Pterygoplichthysanisitsi</i> (Eigenmann and Kennedy)	Loricariidae	NE	Or	H
71	<i>Pterygoplichthysmultiradiatus</i> (Hancock)	Loricariidae	NE	Or	H

Note: Feeding habit: O= Omnivorous, C= Carnivorous, H=Herbivorous, Economic importance: Fd= Food fish, Or= Ornamental fish. Conservation status: According to IUCN (2010) and CAMP (1998). DD= Data deficient, NE= Not evaluated, VU= Vulnerable, EN= Endangered, CEN= critically endangered, LRnt=Lower risk near threatened, LRlc=lower risk least concern.

Fig.1 Total family wise distribution of fish diversity East Kolkata Wetlands

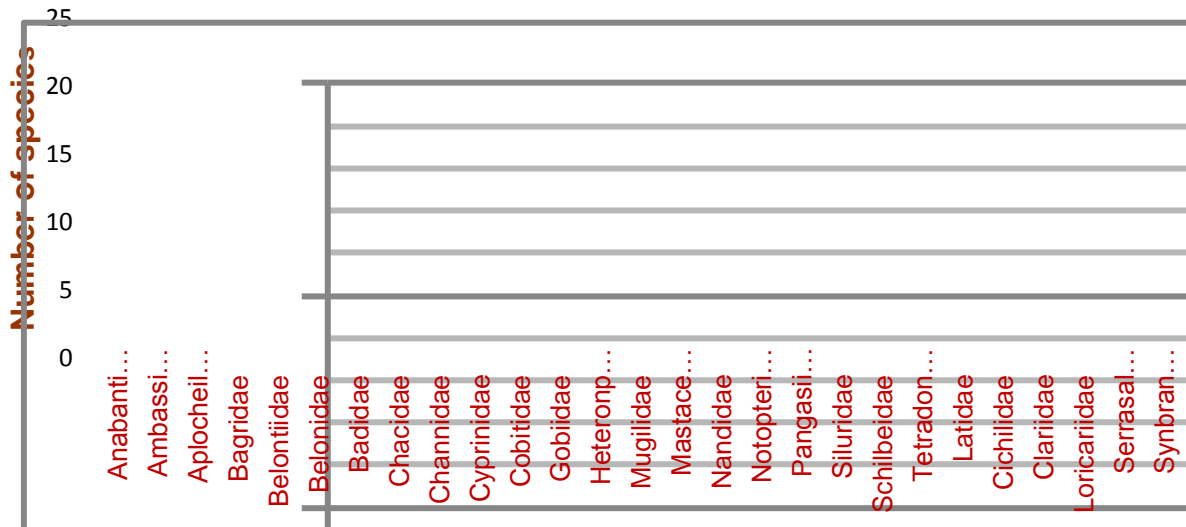


Fig.2 Bar diagram showing the present conservation status of fish in East Kolkata Wetlands

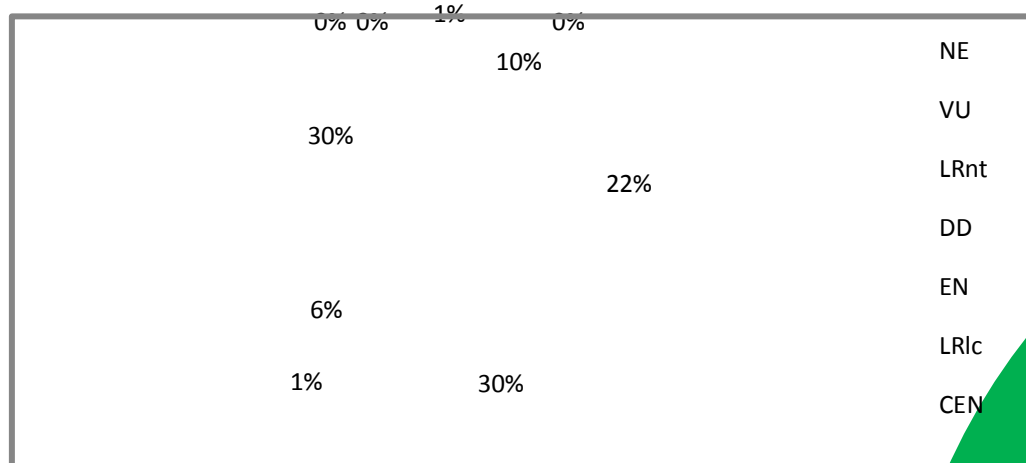
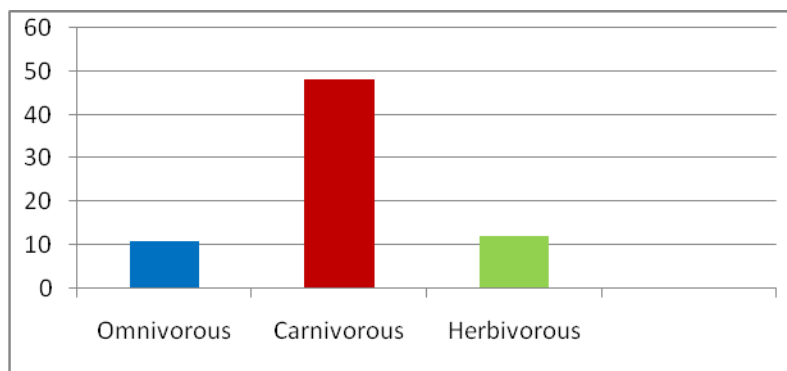


Fig.3 Bar diagram showing the numbers of available fish feeding habit of East Kolkata Wetlands



The stresses include intense encroachment stress from urban expansion, alterations of wetland habitats to agricultural lands, habitual destruction, over exploitation, wanton destruction, aquatic pollution, disease and exotic and overall lack of awareness of biodiversity importance, absence of proper policy.

Introduction of exotic fishes, as a part of aquaculture for commercial gains or accidental introduction of undesired exotic fishes are resulting loss of indigenous fish diversity in East Kolkata wetlands. Good populations of *Pterygoplichthys*, a widespread invasive fish species with strong ability to survive even in hypoxic condition, were recorded in EKW in recent time. Invasive *Pterygoplichthys*, being large and bewilderingly resilient bottom feeder species, may displace smaller or less aggressive benthic fishes and also may incidentally ingest eggs of native fishes while consuming the bottom periphyton (Hoover *et al.*, 2004). The smaller sized indigenous fishes with comparatively short life spans, low fecundity, and limited resistance to hypoxia and desiccation, would not compete with the more competitive *Pterygoplichthys* sp. established in the ecosystems (Hoover *et al.*, 2004) and thus chances of their displacement is high. Another alien fish species is *Aristichthys nobilis* (Bighead carp) which affected the population of Indian Major Carps. Over-exploitation of fishery resources due to its higher economic value has increased the vulnerability of the population in different ecosystems, *Chitala chitala*, *Ompok pabda*, *Pangasius pangasius* and so on in warm water (Mahapatra *et al.*, 2015)

East Kolkata Wetland is a classical example of natural resources of the wetland system for fisheries and agriculture through ingenuity of local communities with their traditional knowledge. It is the largest ensemble of sewage for fish ponds in one place in the world. Anthropogenic activities are resulting in the loss of wetland biodiversity and ecosystem integrity. Indigenous fish fauna of this wetlands are being

threatened due to several anthropogenic activities mainly introduction of exotic fish species, habitat degradation and pollution. Thus, awareness programmes amongst the fishers, strict ban on illegal monsoon fishing, uncontrolled introduction of exotic fishes, repeated drying of maturation pond and usage of proper mesh size nets should be involved. Besides, the protection of breeding grounds from agricultural run-offs and indiscriminate fishing of commercially important fish species should be established which would ultimately protect and conserve the endangered species. Adopting proper and balanced methodologies for enhancing fish diversity of East Kolkata Wetland without affecting socio-economic condition of East Kolkata Wetland beneficiaries is need of the hour to save this world's largest wastewater recycle region. Policy makers and implementing agencies also be educated about biodiversity importance for our world.

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