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Distribution and status of freshwater fish fauna and its habitat in the Water bodies of Kendrapara district, Odisha, India

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Abstract

A systematic checklist of fishes of Kendrapara district of Odisha, India was provided. A total of 63 species of fishes under 44 genera, 25 families and 8 orders has been recorded. Highest species diversity was observed in the Cyprinidae (33.3%) followed by Bagridae (7.9%). The fish fauna includes 49 least concern (LC), 5 near threatened (NT), 2 data deficient (DD) and 7 not assessed (NA) as per IUCN. The fish fauna is a composite of primary freshwater fishes, estuarine fishes and widely distributed forms. The present finding indicates that Kendrapara district is blessed with diverse fish fauna including numerous economically important food fishes and ornamental fishes. Fishery status shows existence of 44 species worth for capture fishery, 45 species for ornamental, 21 species for culture and 10 species worth for sports fishery. Water quality of the rivers and creek of the district are not contaminated as the value of pH and DO are within the tolerance limit of class 'D'. The water quality of the river is considered suitable for fish culture and wildlife propagation.

Key words: Fish diversity, Kendrapara, Odisha, Physico-chemical characteristics.

1. Introduction

The freshwater fish fauna of India is highly diverse in nature and constituting 1027 species (Gopi et al., 2017). Odisha constitute about 13.92% to the freshwater fish fauna of India (Dutta et al., 1993). Out of the 6 coastal districts of Odisha, Kendrapara one of them (Pati & Pati, 2008), which has a total area of 2,546 (km)2. The district lies between 20° 21'to 20° 47' N and 86° 14' to 87°.83' E. Kendrapara is surrounded by Bhadrak district in north, Cuttack district in west, jagatsinghpur district in south and Bay of Bengal in east

(Anonymous, 2010). It is blessed with numerous rivers namely Gobari, Dhani, Kapali, Reba, Kochila. Out of which Brahmani, Baitarini, Salandi, & Mahanadi is the major rivers passes through this district. The people in the sea coast area like Dangmala, Vitarkanika, Gahirmatha, Rajnagar, Rajkanika etc mainly depend on fishing for their livelihood (Anonymous, 2013).

The first over study on marine and freshwater fishes of Odisha were made by (Day, 1869). Subsequently, freshwater fishes of Odisha have been studied and described by many other (Chauhan, 1947; Jayaram and Majumdar, 1976; Datta et al., 1993; Ramakrishna et al., 2006; Pathak et al., 2007; Karmakar et al., 2008; Das, 2008; Baliarsingh et al., 2013; Nayak et al., 2013; Mishra et al., 2013; Singh et al., 2013; Baliarsingh et al., 2014; Behera and Nayak, 2014; Satpathy and Mishra, 2014; Singh, 2014; Baliarsingh et al., 2015; Dandapat, 2015; Mohanty et al., 2015; Sarkar et al., 2015; Das et al., 2016; Samal et al., 2016; Baliarsingh et al., 2020). However no details investigation has been taken up so far on the fish diversity of Kendrapara district of Odisha. In the present study a systematic check list of fishes of the district is prepared based on the research study and available literatures. Also the physico- chemical characteristics of rivers of Kendrapara district of Odisha are provided.

2. Materials and Methods

2.1 Study area

Odisha State is the one of the coastal state in India extends from 17° 49' N to 22° 34' N latitude and 81° 27' E to 87° 11" longitude the eastern part of India. Kendrapara District is situated in Central Coastal plain zone of Odisha. The District is bounded by Bhadrak District at its North, Jajpur at its North West, Jagatsinghpur District at its South, Cuttack District at its West and Bay of Bengal at its East. Kendrapad District lies in 20° 20' N to 20° 37' N Latitude and 86° 14' E to 87° 01' E Longitude. The Coastline of Kendrapara District covers 48 Km stretching from Dhamra Muhan to Batighar (Figure 1). Except the river Chitroptala (a branch of Mahanadi) the other rivers like Luna, Karandia, Gobari, Brahamani, Birupa, Kani,Hansua, Baitarani, Kharasrota & PaikaIt are the major rivers passes through Kendrapara district, generally all rivers are tributaries of Mahanadi river (GoO, 2015)

2.2 Fish Sample Collection

Fishes and water samples were collected from 6 stations namely Rajnagar, Gupti, Patamundai, Ratanpur, and Nuagaon during May 2016- April 2017 (Figure 1, Table 4) with the help of local fisher men using different types of nets namely gill net, cast net and dragnet. Some species were collected from landing centres and fish markets of Rajnagar, Gupti, Kendrapara and Ali fish market. Immediately photographs were taken, small species were preserved in 10% formalin solution where large fishes were given one incision on the abdomen before they were fixed (Jayaram, 1999), (Talwar and Jingran, 1991). The detailed identification and taxonomic analysis has been done at Zoloogical Survey of India (ZSI) Gopalpur and Kolkatta, West Bengal.

2.3 Fish Identification

The samples were identified based on keys for fishes of the Indian sub-continent and classification were carried out by consulting relevant standard literature. Fishes were preserved in 10% formalin and identified following by consulting relevant literatures (Jayaram, 1999), (Talwar and Jingran, 1991). The families have been arranged phylogenetically and species under a genus followed alphabetic sequence. Relevant information like habitat, maximum size, fishery information, and IUCN conservation status against all fish species were obtained from Fishbase (Froese and pauly, 2013); (Jayaram, 1999); (Talwar and Jingran, 1991). The list of cultivable fishes was prepared based on growth rate and maximum size of the species. The list of ornamental fishes was prepared according to Coloration pattern, shape and maximum size. Information on conservation status as per (IUCN, 2018) is shown against each species (Figure-3).

2.4 Water Sample Collection

The physico-chemical parameters were analyzed following standard methods (APHA, 1989); (Trivedy and Goel, 1986). The average of four samples for each parameters studied was considered as one reading. The water temperature (°C) was measured by sensitive mercury thermometer (1/10 0C), dissolved oxygen (mg/l), and pH measured by ph meter, were determined in the field and inorganic Phosphorus, Carbon, and Conductivity was analyzed in the research laboratory of Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar within 48 hours of collection.

3. Results

The classification of the freshwater fishes of Odisha along with their habitat, maximum size, fishery information and IUCN conservation status has been illustrated. A list of the fish fauna of the Kendrapara district of Odisha consist of 63 species of fish belonging to 44 genera and 25 families were identified in (Table 2). Highest diversity was observed in Cypriniformes (23 species, 13 genus and 3 families) followed by Perciformes (19 species, 13 genus and 11 families), Siluriformes (14 species, 11 genus and 6 families), Beloniformes and Osteoglossiformes (2 species, 2 genera and 1 family), where as Syprinidontiformes, Pluronectiformes and Synbranchiformes were represented by (1 species, 1 genus and 1 families) each (Table 3 & Figure 2). Among the family highest species diversity was observed in the Cyprinidae (33.3%) followed by Bagridae (7.9%). Fishery status of freshwater fish fauna of Kendrapara revealed that existence of 45 species worth for Ornamental fishery, followed by 44 capture (food) fishery, 21 culture fisheries and 10 sports fishery (Table 2).

The surface water temperature ranged from 20.4° to 34.0°C with an average value of 27.6°C. The pH value ranged from 7 to 8.2 with an average of 7.5. High concentration of dissolved oxygen was observed throughout the study period which ranged from 4.0 to 8.5 mg/l with an average value of 6.1 mg/l, which is within the permissible limit of (ISI, 1982). However, level of CO2 was slightly high which ranged from 2.0 to 11.0 mg/l with an average value of 7.4 mg/l. Dissolved inorganic phosphate phosphorus varied from 0.01 to 0.09 mg/l. with an average value of 0.02 mg/l, Table 3. The eutrophic nature the water bodies may be attributed to inflow of fertilizers from the surrounding agricultural fields and human inferences.

4. Discussion

The extinction of the fish species in a river conservation system and the rich variety of the species which support to the conservation. This will go a long way to protect the commercial fisheries Out of the 63 species some species namely Notopterus notopterus, Chitala chitala, Cirrhinus reba, Labeo bata, Labeo calbasu, Labeo dero, Labeo rohita, Sperata aor, Sperata seenghala, Wallago attu, Clarias batrachus, Heteropneustes fossilis, Anabas testudineus, Liza tade, Channa striata, catla catla, P. sarana,Tor tor, Cirrhinus mrigala, Cirrhinus reba are identified as commercially important food fishes which potential of culturing within the river. Danio rerio, p. ticto, p. sophore, Rasbora daniconius, Acanthocobitis botia, Lepidosephalus guntia, Chaca chaca, Apolocheilus panchax, Chanda nama, Terapon jarbua, Badis badis, Scatophagus argus, Nandus nandus, Trichogaster fasciata are identified as export value as ornamental fishes. As per (IUCN, 2018)) the fish fauna of study area includes 49 least concern, 5 near threatened, 2 data deficient and 7 not assessed (Table 2 & Figure 3). Dandapat, 2015; Mohanty et al., 2015; Sarkar et al., 2015; Das et al., 2016; reported the dominance of cyprinid fishes in south Asia.

Species under Data Deficiency are often neglected in conservation program .

(Bland et al., 2015). It is possible that the partial distribution of some of the single location species is endemic and threatened as well as DD species might be underestimated owing to limitation in available data (Bini et al., 2006). During the study four alien species like Cyprinus carpio, Clarias batrachus, Poecialia reticulate and Oreochromis mossamaicus which directly compete for food with the other indigenous species (Arun, 1999; Kurup etal., 2006).

Kendrapara is a coastal district, which harbours the brakish water species like, Scatophagus argus, Terapon Jabua, Strongylura storgylura, Cyanoglossus puncticeps, these fishes are abundantly found in Rajnagar, Gupti and Patamundai. Interestingly, hill stream forms like Acanthocobitis botia, Devario aequipinnatus, Tor tor, etc. were also recorded from Ratanpur and Nuagaon of the study area. Therefore, fauna of the district is a mixture of primary freshwater fishes, estuarine fishes and widely distributed forms. There should be need of appropriate management strategy for the threatened fishes; captive breeding, brood stock management and seed production and ranching of seed in natural water bodies might be considered in this aspect. There is a general lack of awareness of the local people for freshwater biodiversity in general (Abraham and Kelkar, 2012) Use of harmful fishing gear and methods, which is very common in coastal community (Sultan and Islam, 2016) should strictly monitor and controlled.

The water bodies of Kendrapara district of Odisha are within the tolerance limits of class 'D' water prescribed by the (ISI, 1982) for fish culture and wild life propagation. The present finding indicates that Kendrapara district is blessed with diverse fish fauna including numerous economically important food fishes. The water quality of the rivers and streams of the district are not contaminated as the value of pH and DO are within the tolerance limit of class 'D' water prescribed for fish culture and wild life propagation. Therefore, attempts may be made to introduce the in situ fish cultivation using scientific techniques for sustainable management of fish resources of the district.

5. Conclusion

The diversified freshwater fish fauna of Kendrapara is really useful for their livelihood to the coastal community. The findings of present study may use as base line information for planning a conservational management of fish and fisheries resources of Odisha in feature. Al so introduces in-situ & ex-situ cultivation techniques for conservation sustainable management of fish genetic resources.

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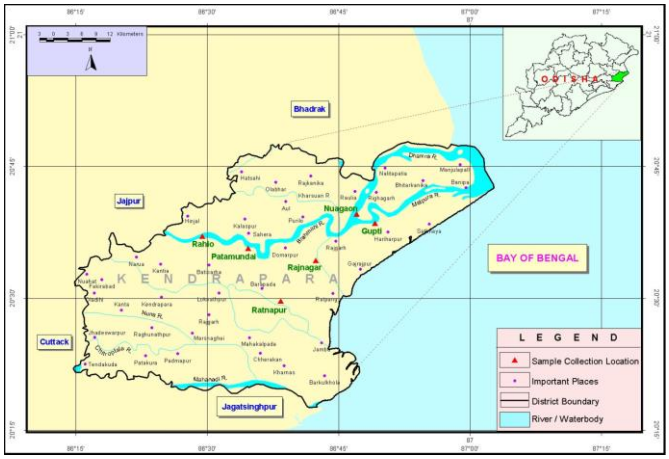

FIGURE 1 Showing sampling sites in Kendrapara district, Odisha

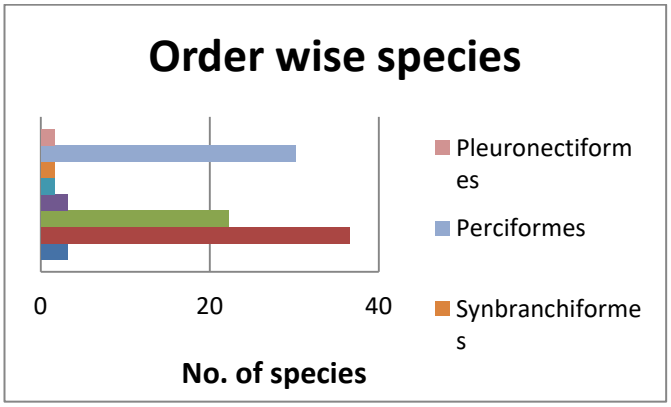

FIGURE 2 Oder wise fish species

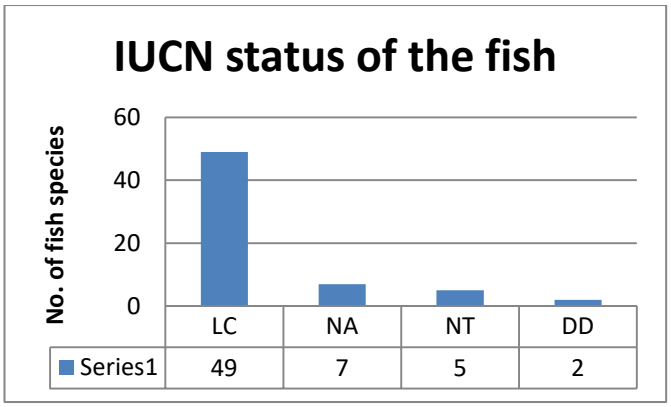

FIGURE 3 IUCN status of the fishes

Sampling sites	Position	Elevation-(t)	Habitat type
Rajnagar	20° 34' 19" N 86° 42' 24.52" E	36	Open river
Gupti	20° 37' 49.12" N 86° 49' 43.86" E	12	Open river
Patamundai	20° 34' 37.69" N 86° 34' 10.82" E	49	Canal & river
Ratanpur	20° 28' 24.53" N 86° 38' 26.28" E	71	Lake
Nuagaon	20° 39' 28.08" N 86° 46' 41.11" E	63	Open river & pond
Rohio	20° 37' 03.65" N 86°.29' 29.72" E	16	Small water bodies, canals, ponds etc

TABLE 1 Details of Sampling sites of Kendrapara district

TABLE 2 A checklist of fishes known from the Kendrapara district of Odisha

Order	Family	Genus
Osteoglossiformes	Notopteridae	2
Cypriniformes	Cyprinidae	11
	Balitoridae	1
	Cobitidae	1
Siluriformes	Bagridae	2
	Siluridae	2
	Schilbeidae	4
	Claridae	1
	Heteropneustidae	1
	Chacidae	1
Beloniformes	Belonidae	2
Cyprinidontiformes	Aplocheilidae	1
Synbranchiformes	Synbranchidae	1
Perciformes	Ambassidae	2

	Tetraponidae	1	1
	Scatophagidae	1	1
	Nandidae	1	1
	Badidae	1	1
	Mugilidae	1	1
	Gobiidae	1	1
	Anabantidae	1	2
	Belontidae	1	2
	Channidae	1	4
	Mastacembelidae	2	3
Pleuronectiformes	Cynoglossidae	1	1
N=8	N=25	N=44	N=63

TABLE 3 Diversity of freshwater fishes of Kendrapara district, Odisha