



A study on the diversity and present status of fish fauna in Joysagar Doloni, a wetland of Kaliabor sub-division, Assam

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Abstract

Wetlands are unique ecosystems which provide a habitat for rich diversity of flora and fauna. Conservation of those wetlands and their native species enables the sustainability of biodiversity. The present study has focused on assessing the Fish diversity and its conservation status as well as the physicochemical properties of water for Joysagar Doloni, Kaliabor, Nagaon, Assam, which is located in the central part of Kaliabor and about 6 km from NH-37. The wetland is found to be enriched with indigenous fish diversity, which comprises a total of 40 species belonging to 26 Genera, 9 Orders, and 19 families. The Order Cypriniformes is found to be the most diversified family with 16 representative species. Present study reveals that the wetland is moderately productive and suitable for commercial aquaculture. If developing initiatives are taken in the future, this wetland will support productivity and biodiversity.

Keywords: Fish Diversity, Keystone species, Wetland, Joysagar Doloni, Kaliabor, Nagaon, Assam.

1. Introduction

Wetlands can strengthen the sustainability of all life forms and can accomplish the ramification in maintaining the ecological balance. Ecologically wetlands are of great significance for an area as they support different food chains, food webs, regulate the hydrological cycle, recharge ground water, trapping of energy and shelter to large numbers of flora and fauna having great ecological and economic value (Bennet, G.W., 1962 & Oglesby, R.T., 1985). It also helps to mitigate the impression of flooding by absorbing water and reducing the current at which flood water flows. In terms of growth in fish production in India, wetlands play a significant role. Majority of fish production in the country from inland water bodies is around 61% of total production. It has increased from 0.2 million tonnes in 1950-1951 to about 5.1 million tonnes in 2010-2011 (MOA Report, 2012).

Fishes are the keystone species which determine the distribution and abundance of other organisms in

the ecosystem they represent and are good indicators of water quality and Health of the ecosystem (Moyle *et.al.*, 1992). Among habitat attributes, dissolved oxygen and pH are key habitat features and correlated with fish diversity and found as the important variables in shaping fish distribution (Shukla *et. al.*, 2013)

. The diversity of fishes mainly depends upon the biotic and abiotic factors and type of the ecosystem, age of the water body, mean depth, water level fluctuations, morphometric features and bottom have great implications. The hydro-biological features of the collection centers also play an effective role in fisheries output to a great extent (Murugan *et. al.*, 2012).

In Assam, there are about 3513 wetlands (district wise) that have been identified by Assam Remote sensing application center, Assam in which about 217 fish species have been recorded (AAU, 2012). Kaliabor, a rural sub-divisional town in Nagaon district of Assam, has an innumerable potential of freshwater wetlands (locally called Doloni, Beels etc.), marshy

tracts and seasonally flooded plains and numbers of riverine sandbars and islands. It has contained numbers of specialized freshwater fish species which are either highly threatened or highly endangered at present due to over exploitation and destruction of freshwater habitats.

2. Aim and Objective of the Study

The Joysagar Doloni is a major freshwater habitat of the region for the aquatic fauna, which includes varied types of indigenous fish species which may render one of the economic sources for the local fishermen of the nearby area. In the present study an attempt has been made to find out the actual status of fish diversity, with its present physico-chemical properties and with reference to its conservation status.

The main objectives are based on the following

criteria:

- To study the fish diversity of Joysagar Doloni.
- To study the physico-chemical properties of water of Joysagar Doloni.
- To find out their present IUCN status found in the Joysagar Doloni.

3. Materials and methods

3.1 Study area

The studied area is located on the Central part of Kaliabor Sub-Division of Nagaon District in Assam. Geographically, its location falls under latitude 26.580701° and longitude 92.942263° and covers around 5 villages. The locational map of the studied area is depicted in figure 1. The Joysagar Doloni is about 6 km from the NH 37.



Fig. 1: Locational map of Joysagar Doloni (Source: Google satellite maps)

3.2 Climate

Climate of the area is mild throughout the year with annual average temperature ranging from 9°C during winter to 38°C during summer and the area receives average annual rainfall of about 34-1161mm (theweathernetwork.com, 2022).

3.3 Data collection and analysis

The study was carried out from June 2021 to February 2022 on the Joysagar Doloni of Kaliabor Sub-

Division of Nagaon District. Data analysis was done by visiting the site itself on a Monthly basis and through questionnaires to the fishermen of the wetlands, having years of experience.

Fishes were collected from the water body using locally available fishing gears from the site. Fishing gears and Devices used during fishing operation were caste nets of various sizes, gill nets (extensively used during Monsoon period), drag nets, fish hooks of various

mesh sizes and different traps namely “*Jakoi*”, “*Polo*”, “*Sepa*”, “*Juluki*”, “*Posa*” etc. The fish species which were found were tried to identify in the spot itself.

The fish species were identified by using different keys of various standard literatures and Morphometrics study of the fishes following the references of Talwar and Jhingran (1991), Vishwanath (2000) and Jayaram (2013). The secondary data has been collected from various sources such as from various Journals, Books, articles and Govt. websites. The conservation status of the fish is determine after IUCN red list database.

Physico-chemical water properties:

The water sample was collected from the Joysagar Doloni, brought and then analyzed in the

laboratory. The time of collection of water samples was from 6am to 9am. Water samples were collected during pre-monsoon, Monsoon and post-monsoon seasons. The following physicochemical properties of water were checked, and by using following methods:

- Water temperature ($^{\circ}\text{C}$): Thermometer
- pH: Digital pH meter
- Dissolved oxygen (DO): Winkler’s Method
- Water transparency (Turbidity): Secchi Disk.
- Free Carbon dioxide (CO_2)

The outcomes of the physicochemical study of the water sample of three seasons (i.e., pre-monsoon, Monsoon and post-monsoon) were matched with the World Health Organization (2011) standard (Panigrahi and Subhasini, 2020).

Sl. No.	Parameters	Permissible Limits*
1.	Water Temperature ($^{\circ}\text{C}$)	<40
2.	pH	6.5-8.5
3.	Turbidity (Transparency) (cm)	<100
4.	Dissolved Oxygen (DO) (mg/L)	3.0-6.0
5.	Free CO_2 (mg/L)	<12

Table 1: Water quality Parameters as per World Health Organization (2011)

4. Results

4.1 Fish Diversity:

The present research work reveals altogether 40 species belonging to 26 Genera, 9

Orders, and 19 families. The collected fish fauna includes Minnows, Carps, Barbs, Murrells, and Perch. The species recorded during the survey is listed in Table 2.

Table 2: Fish diversity of Joysagar Doloni of Kaliabor sub-division of Nagaon district with its Conservation status

Sl. No.	Scientific Name	Local Name	Family	Conservation Status: IUCN
ORDER I: BELONIFORMES				
1.	<i>Xenentodon cancila</i>	Kokila	Belonidae	LC
ORDER II: CHANNIFORMES				
2.	<i>Channa marulius</i>	Sal	Channidae	LC
3.	<i>Channa gachua</i>	Sengeli	Channidae	LC
4.	<i>Channa striatus</i>	Sol	Channidae	LC
5.	<i>Channa punctatus</i>	Goroi	Channidae	LC
6.	<i>Channa orientalis</i>	Sengali	Channidae	VU
7.	<i>Glossogobius giuris</i>	Pati mutura	Gobiidae	LC
ORDER III: CYPRINIFORMES				
8.	<i>Amblypharyngodon mola</i>	Moa	Cyprinidae	LC
9.	<i>Brachydanio rerio</i>	Laopati	Cyprinidae	LC
10.	<i>Cirrhinus mrigala</i>	Mirika	Cyprinidae	LC
11.	<i>Cirrhinus reba</i>	Lasim	Cyprinidae	LC
12.	<i>Danio aequipinnatus</i>	Sal Dorikona	Cyprinidae	LC
13.	<i>Esomus danricus</i>	Dorikona	Danionidae	LC
14.	<i>Labeo calbasu</i>	Mali	Cyprinidae	LC
15.	<i>Labeo bata</i>	Naro	Cyprinidae	LC
16.	<i>Labeo gonius</i>	Kuhi	Cyprinidae	LC
17.	<i>Labeo rohita</i>	Rohu	Cyprinidae	LC
18.	<i>Noemacheilus dario</i>	Botia	Nemacheilidae	LC
19.	<i>Puntius sarana sarana</i>	Seni puthi	Cyprinidae	LC

20.	<i>Puntius sophore</i>	Sanduri puthi	Cyprinidae	LC
21.	<i>Puntius ticto</i>	Kenipotia	Cyprinidae	LC
22.	<i>Puntius conchoniis</i>	Puthi	Cyprinidae	LC
23.	<i>Rasbora daniconius</i>	Donikona	Danionidae	LC
ORDER IV: CYPRIODONTIFORMES				
24.	<i>Aplocheilus panchax</i>	Konpuna	Aplocheilidae	LC
ORDER V: OSTEOGLOSSIFORMES				
25.	<i>Notopterus notopterus</i>	Kandhuli	Notopteridae	LC
ORDER VI: PERCIFORMES				
26.	<i>Anabus testudineus</i>	Kawoi	Anabantidae	DD
27.	<i>Badis badis</i>	Dom veseli	Badidae	LC
28.	<i>Colisa sota</i>	Veseli	Osphronemidae	LC
29.	<i>Colisa lalia</i>	Lal kholisa	Osphronemidae	LC
30.	<i>Chanda nama</i>	Boga chanda	Ambassidae	LC
31.	<i>Nandus nandus</i>	Gedgedi	Nandidae	LC
32.	<i>Trichogaster fasciatus</i>	Khalihona	Osphronemidae	LC
ORDER VII: SILURIFORMES				
33.	<i>Heteropneustes fossilis</i>	Singi	Heteropneustidae	LC
34.	<i>Mystus tengara</i>	Singora	Bagridae	LC
35.	<i>Mystus bleekeri</i>	Singora	Bagridae	LC
36.	<i>Mystus vittatus</i>	Singora	Bagridae	LC
37.	<i>Clarias batrachus</i>	Magur	Clariidae	LC
ORDER VIII: SYNBRANCHIFORMES				
38.	<i>Mastacembelus pancalus</i>	Tura	Mastacembelidae	

39.	<i>Amphipnous cuchia</i>	Cuchia	Synbranchidae	LC
ORDER IX: TETRAODONTIFORMES				
40.	<i>Tetradon cutcutia</i>	Gongatop	Tetraodontidae	LC
Conservation status: LC- Least Concern, VU- Vulnerable, NT- Nearly Threatened, DD- Data Deficient				

4.2 Water Parameters

Water samples were collected during the three

seasons and following parameters were analyzed and the results were given in table 3.

Table 3: Results of Physicochemical parameters of water during three seasons.

Sl. No.	Physicochemical Parameters	Results		
		Pre-Monsoon (April-June)	Monsoon (July-Sept)	Post-Monsoon (Oct-Mar)
1.	Temperature ($^{\circ}\text{C}$)	26.5	30.08	16.20
2.	pH	8	7.5	7.1
3.	Dissolved Oxygen (mg/l)	5.16	4.08	2.88
4.	Turbidity (Transparency) (Cm)	25	22	26
5.	Free Carbon dioxide (mg/l)	8	6.11	2.79

5. Discussion

After the survey, 40 species of fishes belonging to 9 orders, 19 families and 26 genera were obtained from the Joysagar Doloni. Out of those, Cypriniformes was the most dominating order having 16 species with 40% relative abundance followed by Perciformes having 7 species with 18% relative abundance, Channiformes having 6 species with 15% relative

abundance, Siluriformes having 5 species with 13% relative abundance, Synbranchiformes having 2 species with 5% relative abundance, Beloniformes, Cypridontiformes, Osteoglossiformes and Tetraodontiformes having 1 species each with 2%, 2%, 2% & 3% relative abundance. Order wise graphical representation of relative abundance is given in the form of pie chart (Fig 2).

Orders with its Relative Abundance

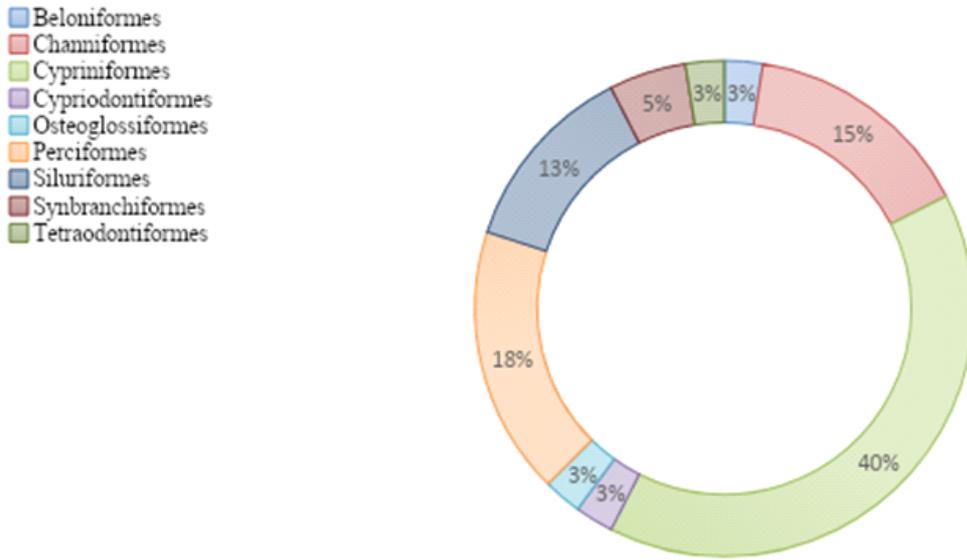


Fig 2: Order wise graphical representation with their relative abundance

19 families of fish species have been recorded during the survey. Among them, Cyprinidae family was the most dominating family having 13 species with 33% relative abundance followed by Channidae having 5 species with 13% relative abundance, Danionidae having 2 species with 5% relative abundance, Bagridae and Osphronemidae having 3 species with 8% relative abundance each, and the remaining families viz.,

Belonidae, Gobiidae, Nemacheilidae, Aplocheilidae, Notopteridae, Anabantidae, Badidae, Ambassidae, Heteropneustidae, Clariidae, Mastacembelidae, Synbranchidae, Tetraodontidae, Nandidae having 1 species with 3% relative abundance each. Family wise graphical representation of relative abundance is given in the form of pie chart (Fig 3).

Families with its Relative Abundance

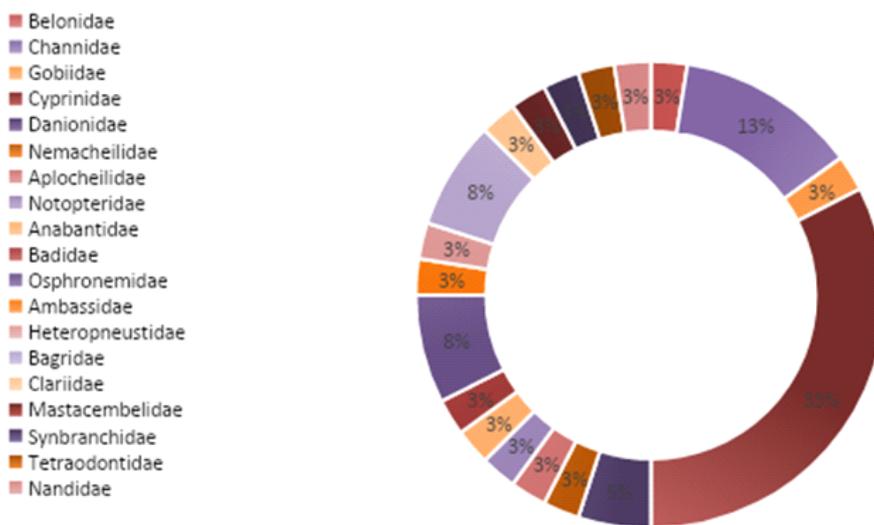


Fig 3: Family wise graphical representation with their relative abundance

Among 40 species documented during the survey, the majority of fish species (i.e., 38 Species) were found to be in Least Concern (LC), 1 species (*Channa orientalis*) from Channiformes order is found to be Vulnerable (VU) and 1 species (*Anabas*

testudineus) from Perciformes order is found to be Data Deficient (DD), evaluated according to the IUCN red list database. Graphical representation of conservation status is given in the form of pie chart (Fig 4).

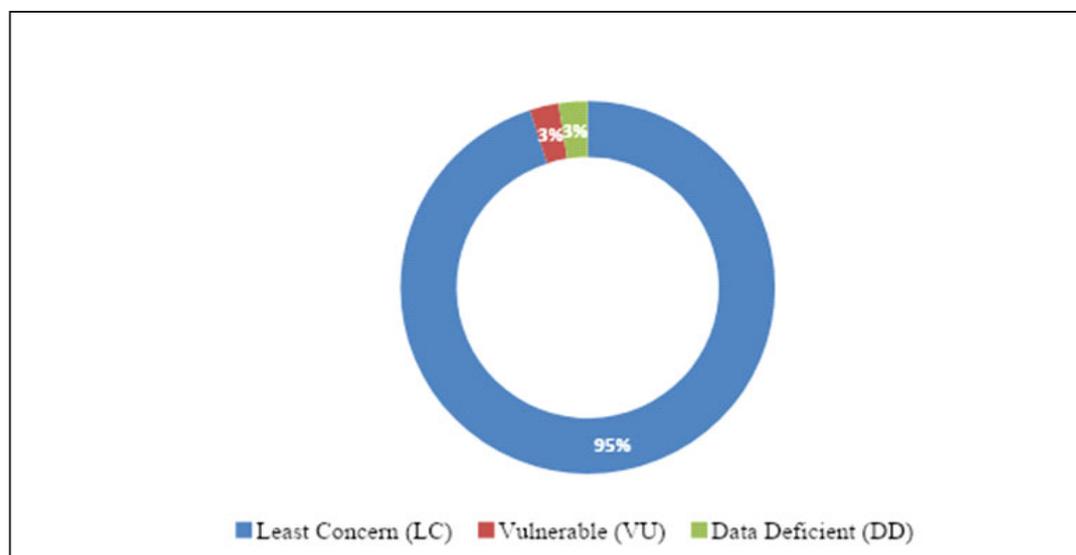


Fig 4: Graphical Representation of Conservation Status.

Seasonal variation of the physicochemical parameters of water (Water temp., pH, Turbidity, DO, and Free CO₂) of Joysagar Doloni in pre-monsoon, monsoon and post-monsoon season are shown in table 2 and was evaluated as per WHO (2011). Most of the physicochemical parameters were within the target range of water quality guidelines. Results of present study indicate that the wetland is productive and suitable for pisciculture.

6. Conclusion

The fish diversity of any regime has a great significance in assessment of that zone reference to environment and pollution as fish are the natural bioindicators, as well as it contributes necessary information to the fisheries. From the above results it indicates that the Fish Diversity of Joysagar Doloni is very rich but in due course of time it has lost many of

its indigenous native fish species and many of them are in the course of constriction. This is happening mainly due to over exploitation and human interference for economic benefit. No scientific attempt has so far been introduced to evaluate the problems and to help in increasing the fish production. If scientifically the conservation process is managed, these water bodies can play a vital role in boosting up the rural economy in addition to ground water recharge and flood control in addition it will balance the nearby ecosystem.

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References

- Bennett G.W. 1962. Management of artificial lakes and ponds. New York, USA. 283 pp.
- Chakraborty T., Chatterjee A. & Saha Nimai C. (2021). Seasonal Fluctuations in physicochemical parameters of water in relation to fish diversity: In Muragacha Beel, West Bengal India.

College of Fisheries, AAU, 2012. Manual on Ornamental Fish Breeding and trade. Chapter 4- indigenous Ornamental Fishes of N.E. India, Trinayan Deb sarmah.

IUCN: <https://www.iucnredlist.org>.

Jayaram, K.C. The freshwater fishes of the Indian region. New Delhi, Narendra Publishing House, Assam, 2013.

Malakar M. & Boruah S. (2017). Diversity and present status of fish species in three floodplain wetlands of Central Assam, India.

Ministry of Agriculture (MoA). Annual Report 2011-12. Deptt. Of Animal Husbandry, Dairying & Fisheries, MoA, Govt. of India, New Deli, 2012.

Moyle, P.B. and R.A. Leidy (1992). Loss of biodiversity in aquatic ecosystems: evidence from fish faunas. In: Fiedler, P.L. and S.K. Jain (eds.). Conservation Biology: The Theory and Practice of Nature Conservation, Preservation and Management, pp. 127- 169. Chapman and Hall, New York.

Murugan, K., Kovendan, K., Vincent S. and Barnard, D. R. 2012. Biolarvicidal and pupicidal activity of *Acalypha alnifolia* Klein ex Willd. (Family: Euphorbiaceae) leaf extract and Microbial insecticide, *Metarhizium anisopliae* (Metsch.) against malaria fever mosquito, *Anopheles stephensi* Liston. (Diptera: Culicidae). Parasitology Research, DOI 10.1007/s00436-011-2758-9.

Oglesby, R.T. 1985. Management in the lacustrine Fisheries in the tropics. Fisheries, 10(2) 16-19.

Paul N., Tamuli A.K., Teron R. & Arjun j. (2018). A survey on Analysis of Physico-Chemical parameters of flowing water of Langting Stream of Dima Hasao Assam, India.

Shukla P. & Singh A. (2013). Distribution and diversity of fresh water fishes in Aami river, Gorakhpur, India. Advances of Biological Research 7(2):26-31, 2013.

Talukdar Kishore J. & Rajbongshi Kumar M. (2018). Ichthyofaunal diversity and conservation status of puthimari beel of Barpeta, Assam, India.

Talwar PK and Jhingran AG (1991) Inland fishes of India and adjacent countries, volume two. Oxford IBH Publishing Co Pvt Ltd, New Delhi-Calcutta. pp. 543-1158.

Vishwanath, W. (2000). Fishes of North East India-A Field Guide to Species Identification. National Agricultural Technology Project, Lucknow. Pp: 195.

