

## Ornamental Fish Potentials of Floodplain Lakes of North Bihar, India

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Received : 27<sup>th</sup> January, 2022 ; Accepted : 5<sup>th</sup> March, 2022

### ABSTRACT

North Bihar has extensive flood plain wetlands in form of ox-bow lakes (*manus*), tectonic lakes (*chours*) or old channels (*dhars*) which offers ideal habitats for many colorful ornamental fishes. The present study was carried out in two flood plain lakes, namely Ambhobasa chaur and Doura chaur of Madhepura district of North Bihar. Fishes were collected monthly during July, 2020 to June, 2021. The study recorded 50 species, out of these, 28 species belonging to 5 orders and 13 families and 17 genera were identified as ornamental fishes. Family Cyprinidae contributing the highest number of potential ornamental fish with 9 species followed by Cobitidae with 4 species, Bagridae, Chandidae, Belontidae and Channidae with 2 species each, Clupeidae, Balitoridae, Clariidae, Schilbeidae, Heteropneustidae, Anabantidae and Tetradontidae with a single species each. Abundant and attractive indigenous ornamental fishes were *Puntius* sp., *Barilius barila*, *Chela laubuca*, *Lepidocephalus* sp., *Mystus vittatus*, *Ailia coila*, *Chanda nama*, *Chanda ranga*, *Anabas testudineus*, *Colisa fasciatus* and *Channa marulius*. Indigenous ornamental fishes found in the studied lakes have enormous potential to support domestic and international ornamental fish trade from North Bihar. But these fishes were not popular among ornamental fish hobbyists and indiscriminately exploited as food fishes. Density of fish population shows a declining trend. Conservation status of indigenous ornamental fish assessed as 1 species belonging to endangered category and 9 species vulnerable, 8 species low risk near threatened, 2 species low risk least concern and 8 species not evaluated. Many species of ornamental fishes have outstanding trade value.

**Key Words** - Gahari nadi, Physicochemical and biological parameters

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### INTRODUCTION

Keeping ornamental fishes in aquarium is amongst the most popular hobbies with millions of enthusiasts worldwide. Ornamental fish are attractive colorful fishes of various characteristics generally kept as pets in confined environment like aquarium or a garden pool for recreation. As fishes were kept in glass aquarium, thus often termed as aquarium fish and they are often called as 'living jewels' due to their brilliant color, shape, behavior etc. Ornamental fishes are the most popular pets

across the world. Ornamental fish keeping is emerging as one of the most popular hobbies in recent years, next to photography (Singh and Ahmed, 2005; Das *et al.*, 2005). High demand for ornamental fishes has gradually paved the way towards global trade of ornamental fishes and it is now an important trade at the end of 20th century (Gupta and Banerjee, 2008). Exact figure on value and trade of ornamental fishes do not exist. The value of ornamental fishes imported into different

countries worldwide is US \$278 million (FAO, 1996-2005) with annual growth rate of 8%. In world trade, whole sale value of ornamental fish is estimated to be US \$1 Billion and retail value is US \$6 Billion. India's share in ornamental fish trade is estimated to be less than 1% in the global trade. Major share of this is contributed from the North-Eastern states (Kalita and Deka, 2013). Growth of ornamental fish trade is considerably encouraging. Indian domestic trade in ornamental fish is estimated at Rs. 10 crores and it is growing at the rate of 20 percent per annum. Meanwhile, demand for ornamental fishes is higher than supply. However, it has a potential to earn US \$30 million annually (Swain and Jena, 2002).

Floodplain wetlands are integral components of large river systems of India especially of Ganga and Brahmaputra River basin covering an area of 0.2 million ha (Vass, 2006). Extensive works has been carried out on potential ornamental fish in the floodplain wetlands of different parts of the country (Pandey *et al.*, 1998; Mahapatra *et al.*, 2005; Suresh *et al.*, 2005; Das and Bordoloi, 2012; Basu *et al.*, 2012; Kalita and Deka, 2013). Floodplain wetlands occur in abundance mainly in the northern part of the state of Bihar, which include ox-bow lakes (*mauns*), tectonic lakes (*chaurs*) or old channels (*dhars*) and together form an area of more than 40,000 ha (Sugunan and Bhattacharjya, 2000). These wetlands constitute important fishery resources of the state and thousands of local fishermen and people are dependent on floodplain wetlands for livelihood. Floodplain wetlands provide an ideal habitat for many indigenous ornamental fishes which is not popular among the ornamental fish hobbyists (Singh and Ahmad, 2005; Singh *et al.*, 2006). The knowledge on the indigenous ornamental fishes of such wetlands is still incomplete. Considering the importance of ornamental fisheries, in the present study an attempt has been made to record the ornamental fish diversity and conservation status from the floodplain lakes of Madhepura district of North Bihar.

## MATERIALS AND METHODS

The study was conducted on ornamental fish diversity in two floodplain lakes, locally known as Ambhobasa chaur and Doura chaur of Madhepura district of North Bihar. Geographical location of the studied floodplain lakes is shown in Fig. 1. Sampling was done monthly from July 2019 to June 2020. Studied chaurs were inundated by rain and floodwater in every year. After flooding both lakes were colonized by abundant and diverse population of freshwater indigenous fishes.

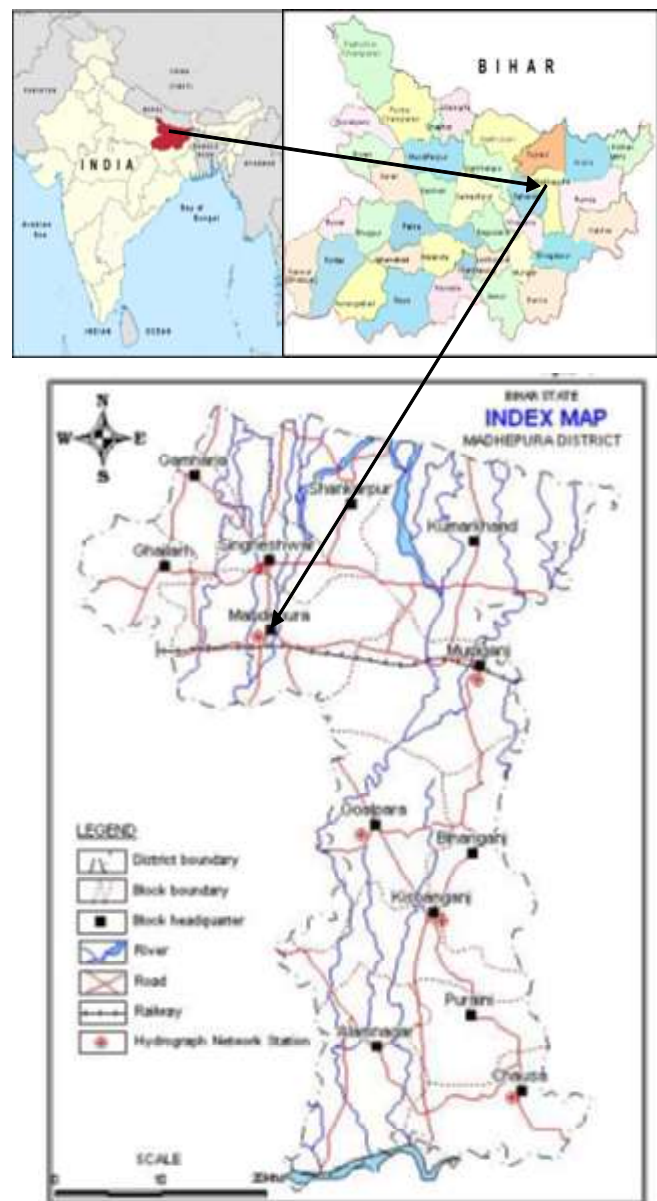


Fig. 1: Geographical location of Madhepura district (sampling sites).

Ambhobasa chaur is located at 25°34'48" N latitude and 86°52'28" E longitude covering an area of 6 sq. km., depth ranges from 1.0 m to 2.7 m, lowest in summer and highest during monsoon. Doura chaur lies at 25°30'59"N latitude and 86°56'32" E longitude covering an area of 10 sq. km., depth varies from 1.7 m to 6.2 m during the summer and monsoon, respectively. Fishermen families and local people use both floodplain lakes for capturing fish, irrigation, its marginal area for grazing cattle and various agricultural activities. Floodplain lakes harbor several fishes of high ornamental value. Fishing is the prime source of livelihood of fishermen.

Fishes were collected from different sites of the floodplain lakes using fishing gears, such as cast net, drag net, chati jal and indigenous traps (rectangular trap of bamboo split) with help of local fishermen. Collected fish specimens were preserved in 10% formalin solution and brought to the laboratory. Fishes were identified up to species level following the standard keys of taxonomy (Jayaram, 1981; Talwar and Jhingran, 1991; Dey, 1996; Menon, 1999), nomenclature based on Fishbase (<http://www.Fishbase.com>). CAMP report (1998) was consulted to assign conservation status of recorded fishes. All the reliable information, like abundance and scarcity of fish were recorded from local fishermen.

## RESULTS AND DISCUSSION

Altogether 50 fish species belonging to 8 orders, 20 families and 37 genera were collected and identified during this study from floodplain lakes (chaurs) of North Bihar. Fish resources of the studied lakes are shown in Table 1 along with their local name and conservation status. The lakes support a heterogeneous fish community dominated by the riverine species and endemic species. Same results were reported by many workers (Khan, 2002; Sarma *et al.*, 2004; Singh and Ahmad, 2005; Singh *et al.*, 2006; Mondal *et al.*, 2010). Variety of fishes enters into floodplain lakes from nearby river during highest floods. Fishes used the lakes for food, shelters, spawning and nursery ground. These

fishes have good demand as food fish in local market though many species have high ornamental value.

### Ornamental fish

The previous studies have clearly emphasized that the occurrence of potential ornamental fishes in the floodplain wetlands of India is quite high. Ornamental fishes have been mostly represented by miscellaneous and weed fishes besides carp, loaches, barb, snakeheads and catfish. Pandey *et al.* (1998) reported 32 ornamental fish species from districts of Jorhat, Sibsaga, Dibrugarh and Tinsukia of Assam. Sarma *et al.* (2004) recorded 61 ornamental fish species from Brahmaputra valley of Assam. Mahapatra *et al.* (2005) reported 187 species of ornamental fish from the North Eastern Hill states. Singh and Ahmad (2005) recorded 52 indigenous ornamental fish species from floodplain wetlands of North Bihar. Das and Biswas (2005) noted 70 potential ornamental fish species from beels of Assam. Singh *et al.* (2006) reported 62 species of ornamental fish from floodplain wetlands of North Bihar. Das and Biswas (2009) recorded 62 indigenous ornamental fish species from floodplain wetlands of upper Brahmaputra basin. Das and Bordoloi (2012) reported 62 species of ornamental fish from river island Majuli of Assam. Basu *et al.* (2012) recorded 70 indigenous ornamental fish species from different freshwater bodies of West Bengal. Kalita and Deka (2013) enlisted 62 species of ornamental fish from floodplain lakes of lower Brahmaputra basin. Sheikh and Goswami (2014) reported 42 species of potential ornamental fish from Chandakhola wetland of Assam. Baruah and Sharma (2013) noted 24 species of ornamental fish from Silsakho wetland of Assam. Occurrence of potential ornamental fish is much higher in the studied floodplain lakes. During the present study, in total, 50 indigenous fish species were recorded (Table 1). Among the collected fishes, 28 species belonging to 5 orders, 10 families and 19 genera shared status of ornamental fish due to their attractive colors, peculiar morphological characteristics (body shape, prolonged fin or tail etc.) and swimming behaviors. In this study, the ornamental fishes recorded were

belonging to order Clupeiformes (1 species) Cypriniformes (14 species), Siluriformes (5 species), Perciformes (7 species) and Tetradontiformes (1 species). The number of ornamental fish species belonging to different orders is shown in Fig. 2. The results revealed that family Cyprinidae contributing

highest number of ornamental fish with 9 species followed by Cobitidae (4 species), Bagridae, Chandidae, Belontidae and Channidae (2 species each) and Balitoridae, Clupeidae, Schilbeidae, Clariidae, Anabantidae, Heteropneustidae and Tetradontidae (a single species each).

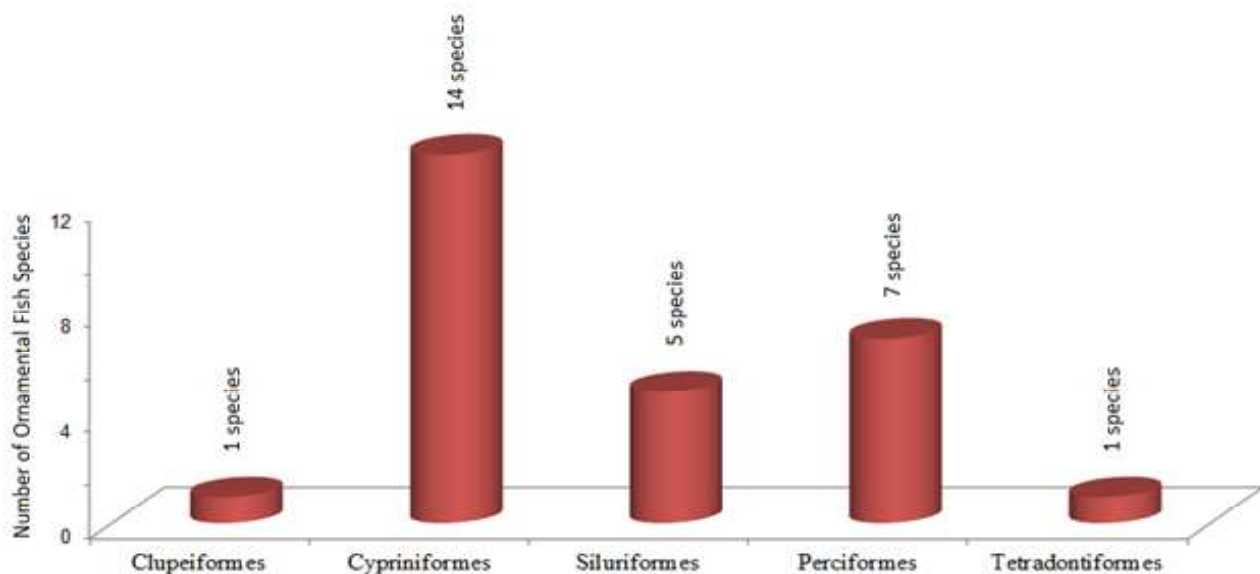


Fig. 2: Number of ornamental fish species belonging to different orders.

Indigenous ornamental fishes have now gained popularity and have high market demand both in India and abroad. Among the collected ornamental fish, *Puntius sp.*, *Ailia coila*, *Chanda ranga*, *Chanda nama*, *Mystus vittatus*, *Lepidocephalus guntea*, *Barilius barila*, *Colisa fasciatus*, *Channa marulius*, *Anabas testudineus* and *Chela laubuca* have good export market. They have currently occupied status of ornamental fish species with high demand in global trade (Singh and Ahmad, 2005). Earlier study has reported 52 ornamental fish species from north-eastern part of country have worldwide demand (Swain *et al.*, 2003). In recent times, *Heteropneustes fossilis* got status of ornamental fish in Assam (Das and Bordoloi, 2012). Other than these fishes, *Botia lohachata*, *Mystus vittatus* and *Colisa lalius* have high demand in international market. Among the fishes like *Puntius sophore*, *Puntius ticto*, *Danio dangila*, *Nemacheilus botia*, *Mastacembelus pancalus* and *Macrognathus aculeatus* have an excellent ornamental value but they sold as food

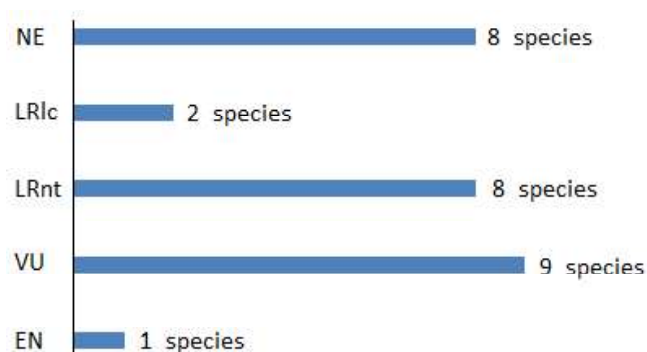
fishes in the local market. Fishes like *Amblypharyngodon mola*, *Gudusia chapra*, *Barilius barila*, *Anabas testudineus*, *Channa gachua*, *Channa murulius* and *Channa punctatus* have been also frequently used as food fish, however they hold tremendous ornamental qualities (Singh and Ahmad, 2005). Besides, some fishes like *Labeo calbasu*, *Catla catla* and *Lepidocephali chthys sp.* can be kept in aquarium only in their juvenile stage. All *Channa sp.* Regarded as an excellent ornamental fish but fails to attract attention of ornamental fish hobbyists. All the recorded potential ornamental fishes have good food value except a few trash fishes like *Chaca chaca* and *Tetradon cutcutia*.

#### Status of ornamental fish

Over the last few decades, floodplain wetlands in India are facing many problems, like shrinkage of area due to siltation, eutrophication, weed infestations, run-off from agricultural fields, human settlement and indiscriminate fishing throughout the year leading to result in the depletion of fish



diversity. Status of potential ornamental fishes in different floodplain wetlands of India has been reported by several workers. Sarma *et al.* (2004) reported 3 species of potential ornamental fish as endangered and 10 vulnerable from central Brahmaputra valley zone. Suresh *et al.* (2005) recorded 3 ornamental fish species as critically endangered, 18 endangered and 27 vulnerable from various freshwater bodies of Manipur. Singh *et al.* (2006) recorded 7 species of potential ornamental fish as endangered, 10 vulnerable, 17 low risk near threatened and 6 low risk least concern from floodplain wetlands of North Bihar. Das and Bordoloi (2012) reported 4 species of indigenous ornamental fish as endangered, 12 vulnerable, 22 near threatened, 5 least concern, 1 data deficient and 18 not evaluated from river Majuli Island of Assam. Kalita and Deka (2013) recorded 4 species of ornamental fish as endangered, 9 vulnerable, 20 near threatened, 6 least concern, 2 data deficient and 21 not evaluated from floodplain lakes of Brahmaputra basin. Sheikh and Goswami (2014) reported 4 indigenous ornamental fish species as endangered and 7 vulnerable from *beels* of Assam. Conservation status of the studied ornamental fish is depicted in Fig. 3. While assessing status of ornamental fishes according to CAMP report (1998)



**Fig. 3: Status of ornamental fish species in floodplain lakes (EN- Endangered, VU- Vulnerable, LRnt- Lower Risk near threatened, LRlc- Lower Risk least concern, NE- Not Evaluated).**

species belonging to Endangered (EN) category facing very high risk of extinction, 9 species Vulnerable (VU) facing risk of extinction however may become endangered within a short period of times, 8 species Low risk near threatened (LRnt) occur most frequently but population may decline soon due to over exploitations, 2 species Low Risk least concern (LRlc) its dominance is significantly observed in all samples and 8 species not evaluated (NE) as threat to fish is not known (Table 1).

**Table 1: Conservation status of fish fauna in the studied wetlands**

Species	Local name	CAMP status	Commercial status
<b>Order 1: OSTEOGLOSSIFORMES</b>			
<b>Family 1: Notopteridae</b>			
1. <i>Notopterus notopterus</i> (Pallas, 1769)	Bhuna/Patra	LRnt	F
2. <i>Chitala chitala</i> (Hamilton, 1822)	Chital/Moya	EN	F
<b>Order 2: CLUPEIFORMES</b>			
<b>Family 2: Clupeidae</b>			
3. <i>Gudusia chapra</i> (Hamilton, 1822)	Suhia	LRlc	F,O
<b>Order 3: CYPRINIFORMES</b>			
<b>Family 3: Cyprinidae</b>			
4. <i>Amblypharyngodon mola</i> (Hamilton, 1822)	Madwa	LRlc	F
5. <i>Esomus danricus</i> (Hamilton, 1822)	Dedwa	LRnt	F
6. <i>Labeo rohita</i> (Hamilton, 1822)	Rohu	LRnt	F,O
7. <i>Labeo calbasu</i> (Hamilton, 1822)	Basrahi	LRnt	F,O
8. <i>Puntius ticto</i> (Hamilton, 1822)	Pothia	VU	F,O
9. <i>Puntius conchoniis</i> (Hamilton, 1822)	Pothia	VU	F,O
10. <i>Puntius chola</i> (Hamilton, 1822)	Pothia	LRnt	F,O
11. <i>Puntius sophore</i> (Hamilton, 1822)	Sidhari	VU	F

12. <i>Cirrihinus reba</i> (Hamilton,1822)	Rewa	VU	F
13. <i>Catla catla</i> (Hamilton,1822)	Bhakura/Catla	VU	F,O
14. <i>Barilius barila</i> (Hamilton,1822)	Baril	NE	F,O
15. <i>Danio (danio) dangila</i> (Hamilton,1822)	Bashpata	LRnt	F,O
16. <i>Danio (danio) devario</i> (Hamilton,1822)	Patukari	LRlc	F
17. <i>Chela laubuca</i> (Hamilton,1822)	Dendula	LRlc	F,O
<b>Family 4:Balitoridae</b>			
18. <i>Nemacheilus botia</i> (Hamilton,1822)	Natwa	EN	F,O
<b>Family 5:Cobitidae</b>			
19. <i>Botia Dario</i> (Hamilton,1822)	Necktie	NE	F,O
20. <i>Botia lohachata</i> Chaudhuri, 1912	Lohachata	NE	F,O
21. <i>Lepidocephalus thermalis</i> (Valenciennes, 1846)	Baluari	LRnt	F,O
22. <i>Lepidocephalus guntea</i> (Hamilton,1822)	Nakati	NE	F,O
<b>Order 4: SILURIFORMES</b>			
<b>Family 6:Bagridae</b>			
23. <i>Mystus vittatus</i> (Bloch,1794)	Palwa/Tengra	VU	F,O
24. <i>Mystus tengara</i> (Hamilton,1822)	Tengra	NE	F,O
25. <i>Rita rita</i> (Hamilton,1822)	Rita	NE	F
<b>Family 7:Siluridae</b>			
26. <i>Wallago attu</i> (Bloch & Schneider,1801)	Boyari	LRnt	F
27. <i>Ompok bimaculatus</i> (Bloach,1794)	Jalkapoor	EN	F
28. <i>Ompok pabda</i> (Hamilton,1822)	Checr	EN	F
<b>Family 8:Schilbeidae</b>			
29. <i>Ailia coila</i> (Hamilton, 1822)	Patasi	VU	F,O
30. <i>Eutropiichthys vacha</i> (Hamilton,1822)	Bachawa	EN	F
<b>Family 9:Sisoridae</b>			
31. <i>Bagarius bagarius</i> (Hamilton,1822)	Pangus	VU	F
<b>Family 10:Clariidae</b>			
32. <i>Clarias batrachus</i> (Linnaeus,1758)	Mangur	VU	F,O
<b>Family 11:Heteropneustidae</b>			
33. <i>Heteropneustes fossilis</i> (Bloch,1794)	Singhi	VU	F,O
<b>Family 12:Chacidae</b>			
34. <i>Chaca chaca</i> (Hamilton,1822)	Chakawa	EN	X
<b>Order 5: BELONIFORMES</b>			
<b>Family 13: Belonidae</b>			
35. <i>Xenentodon cancila</i> (Hamilton,1822)	Kauwamachli	LRnt	F
<b>Order 6: SYMBRANCHIFORMES</b>			
<b>Family 14:Mastacembelidae</b>			
36. <i>Mastacembelus armatus</i> (Lacepede,1800)	Baami	NE	F
37. <i>Macragnathus pancalus</i> (Hamilton,1822)	Gaichi	LRnt	F
38. <i>Macragnathus aral</i> (Bloch & Schneider,1801)	Pateya	LRnt	F
<b>Order 7: PERCIFORMES</b>			
<b>Family 15:Chandidae</b>			
39. <i>Chanda nama</i> (Hamilton, 1822)	Chamwa	NE	F,O
40. <i>Chanda ranga</i> (Hamilton, 1822)	Chanari	NE	F,O
<b>Family 16:Gobiidae</b>			
41. <i>Glossogobius giuris</i> (Hamilton,1822)	Bulla	NE	F

<b>Family 17:</b> Anabantidae			
42. <i>Anabas testudineus</i> (Bloch,1792)	Kawai/Koi	VU	F,O
<b>Family 18:</b> Belontiidae			
43. <i>Colisa fasciatus</i> (Bloch & Schneider,1801)	Kotra	LRnt	F,O
44. <i>Colisa chuna</i> (Hamilton,1822)	Kholisa	NE	F
45. <i>Colisa lalius</i> (Hamilton,1822)	Khosti	NE	F,O
<b>Family 19:</b> Channidae			
46. <i>Channa punctatus</i> (Bloch,1793)	Latta	LRnt	F
47. <i>Channa marulius</i> (Hamilton,1822)	Saurathi	LRnt	F,O
48. <i>Channa gachua</i> (Hamilton,1822)	Chanaga	VU	F,O
49. <i>Channa striatus</i> (Bloch,1793)	Sauri	LRlc	F
<b>Order 8:</b> TETRADONTIFORMES			
<b>Family 20:</b> Tetradontidae			
50. <i>Tetradon cutcutia</i> (Hamilton,1822)	Galphuliani	LRnt	X,O

**Note:** EN- Endangered, VU- Vulnerable, LRnt- Lower Risk near threatened, LRlc- Lower Risk least concern, NE- Not Evaluated, F- Food Fish, O- Ornamental and X- No food value.

O= 28 belonging to **Families**– 13 **Genera** - 19

**Order 1:** Clupeiformes- 1

**Order 3:** Cypriniformes – 14

**Order 4:** Siluriformes – 5

**Order 5:** BELONIFORMES = 0

**Order 6:** SYMBRANCHIFORMES =0

**Order 7:** Perciformes - 7

**Order 8:** Tetradontiformes- 1

**Family 2:** Clupeidae -1

**Family 3:** Cyprinidae-9

**Family 4:**Balitoridae -1

**Family 5:**Cobitidae -4

**Family 6:** Bagridae-2

**Family 8:** Schilbeidae-1

**Family 10:** Clariidae-1

**Family 11:** Heteropneustidae-1

**Family 15:** Chandidae-2

**Family 17:** Anabantidae-1

**Family 18:** Belontiidae-2

**Family 19:** Channidae-2

**Family 20:** Tetradontidae-1

EN-1

VU-9

LRnt- 8

LRlc- 2

NE-8

## CONCLUSION

The present study attempts to explore indigenous ornamental fish potentials of Ambhobasa chaur and Goura chaur of Madhepura district of North Bihar. The investigated floodplain lakes were rich in indigenous ornamental fishes which have good demand in export and domestic market. However, most of the potential ornamental fish facing very high risk of extinction due to habitat destruction, overfishing and pollution. Some possible ornamental fishes which are once common in the floodplain lakes have now become very rare and could not be seen in the lakes. Thus, an effective management strategy and measures needs to be undertaken to conserve these valuable biotic resources, particularly endangered and threatened species of ornamental fishes.

## ACKNOWLEDGEMENTS

Authors are thankful to Head, Department of Zoology, B.N. Mandal University, Madhepura, Bihar, for providing all necessary facilities for conducting this study. Authors are also thankful to Dr. A.K. Singh, University Department of Zoology, Patliputra University, Patna, for valuable comments and suggestions.

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