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Advances in Applied Science Research, 2013, 4(5):99-106

Advances in Applied Science Research
Pelagia Research Library
ISSN: 0976-8610
CODEN (USA): AASRFC

Ornamental fish conservation in the flood plain wetlands of lower Brahmaputra Basin

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ABSTRACT

In lower Brahmaputra basin the flood plain wetlands are one of the most productive ecosystem of Assam. The weed infested, shallow and nutritionally rich habitats offer a variety of microhabitats for many colorful ornamental fishes. Of these, Badis badis, Botia dario, Esomus dandricus, Chaca Chaca, Chana barca, Nandus nandus, Chanda species etc. are widely acclaimed species and fetches high prices in overseas market. As such these fishes have been taken away by the traders and the entire demand of export met through wild collection. The ornamental fish population are decreasing gradually in the wetlands of Assam due to unsustainable exploitation, habitat degradation and growing human interventions on wetlands. The present communication highlights the current conservation status and diversity of ornamental fishes in the beels of lower Brahmaputra Basin and also suggests some measures for conservation of the ornamental fishes.

Key words: Ornamental fish, Wetland, Unsustainable exploitation, Conservation

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INTRODUCTION

The wetlands associated with floodplains of rivers (floodplain wetland) are the biologically sensitive habitats that play a vital role in the recruitment of fish population in the riverine ecosystems and provide nursery grounds for commercially important fishes. They are extremely rich in plant nutrition and therefore have biological productivity. These important inland aquatic resources of India (area: 0.20 million ha) deserve special monitoring in NE India (0.12 million ha) and Assam in particular (0.10 million ha) [12] .They constitute about 93% of the total fish prone area of the state and play a vital role in the socio economic development of this region. These floodplain wetlands, locally known as *beels* (both open and close type) provides an ideal habitat for many ornamental fishes [1] .

Ornamental fishes are the tiny attractive colorful fishes and sometimes with particular mode of movement and peculiar mode of food taking. They are kept as pets in confined space of aquarium or a garden pool for fun and fancy. Keeping aquarium has emerged as the second most popular hobby in the recent years, next to photography. The ever increasing demand for aquarium fishes gradually paved the avenue towards the global trade of ornamental fishes. The world trade of ornamental fish is valued at about US$427.29 million [FAO,2001]. India's overall trade presently is over Rs. 150 million and lion's share of which is contributed from North Eastern region [3].

But, it has been observed that the trade of indigenous ornamental fishes in the state is highly unorganized and mainly based on natural collection. The fishes are collected by local fishermen and marketed by traders who

actually control the activities. Besides these, indiscrimination exploitation from natural sources leads to extinction of some of the rare varieties of some indigenous ornamental fishes and declination in number of others.

Therefore, in the present study an attempt has been made to record the ornamental fish diversity along with their endemic and conservation status in the flood plain wetlands of lower Brahmaputra basin. Special emphasis has been given on sustainable use of ornamental fishes for agribusiness opportunities of ornamental fishes in Assam and North Eastern region during the study period.

MATERIALS AND MENTHODS

LOCATION OF STUDY AREA—
The study was carried out during the period of Feb' 2011 to March' 2012 in eight (8) flood plain lakes of lower Brahmaputra basin of lower Assam, India (longitude 90^0-93^0 E and latitude 26^0-27^0 N). The studied *beels* belongs to seven [7] districts namely Dhuburi (Hakama), Kokrajhar(Piperjar), Bangaigaon (Tamranga *beel*), Barpeta (Kapla beel), Nalbari (Barbila, Gageli), Kamrup (Deepor beel) and Darang (Batha *beel*) of Assam in NE India.

METHODS---
Fishes were collected from different sites of the different *beels* and from also the landing sites and markets in the vicinity of the *beels* and preserved in 4 % formalin. The collected fish specimen were recorded and identified following Talwar and Jhingran [11] while nomenclature is based on Fishbase [httpt://www.Fishbase.com]. Current conservation status were evaluated by Conservation Assessment and Management Plan [2].

For collection of secondary data discussions were held with the fishermen, fish farmers, collectors, traders, local hobby shop owners, exporters and fishery scientists in this region. Relevant secondary data were collected from NEDFi (North Eastern Development Finance Corporation Ltd) publications and various research bulletins also.

RESULTS AND DISCUSSION

During the present investigation a total of 62 ornamental fish species belonging to 41 genera, 18 families and 7 orders were recorded. Table 1 shows the detailed of the recorded fishes with their scientific names and conservation status [9] . Family cyrinidae represented the highest 19 species followed by Channidae (6 spp.), Bagridae (6spp.), Cobitidae (5 spp.) and Belontidae (4spp.). The families Siluridae, Mastacembelidae, Nandidae are represented with 3 species each, Schilbeidae, Ambassidae, Notopteridae with 2 each and other families like Clupeidae, Sisoridae, Chacidae, Belonidae, Gobiidae, Anabantidae and Tetradintidae are represented with a single species. Frequency of occurence of the recorded fishes were observed from very common to occasional and rare in the studied *beels*. According to criteria as per CAMP,1998 4 species were assessed as endangered(EN), 9 species vulnerable (VU) , 20 lower risk near threatened(LRnt), 6 lower risk least concern (LRlc) , 2 data deficient (DD) and 21 species were not evaluated (NE). Poisoning, over exploitation, habitat destruction and erosion were found as the major threats to not only ornamental fish species but also for other fish fauna in these areas.

During the present investigation no organized trade of ornamental fishes from this region was recorded. Only a very few people are supplying these fishes to the exporters in places like Kolkata and Chennai which is totally based on wild collection. Since, they are not directly involved in exporting they are always deprived of the actual price prevailing in the global market. The study revealed that about 20 different varieties of ornamental fish of this region are exported annually. The price of native ornamental fishes varied from Rs. 3 to Rs. 50 per piece across the domestic market.

DISCUSSION

The Brahmaputra drainage system in North East India is one of the largest hydrographic basin in South east Asia and sustains a very rich and diverse aquatic gene pool, particularly fishes [6]. The floodplain wetlands or *beels* are seasonally inundated by the overspill from main river channel and thus they become the hotspots of commercially important ichthyofaunal diversity. Bhattacharya *et.al*.,[1] recorded 217 fish species from Assam of which 50 species have potential ornamental value. Sharma *et al*., [10] recorded 61 ornamental fish species from central Brahmaputra valley zone. Das and Biswas [4] recorded 62 ornamental fish species in the flood plain wetlands of upper Brahmaputra basin. And the present investigation recoded 62 ornamental fishes including both classified and non

classified ornamental fishes from flood plain wetlands of lower Brahmaputra basin. The lotic water fishes recorded in the survey period are *Rita rita, Ompok spp., Osteobrama cotio, Barilius spp., Aspidoparia spp., Gangata cenia, Chitala chitala* that enters into the open *beels* during the monsoon period. Out of the 62 species of ornamental fish recorded, about 79% are commercially important . Among these, *Botia Dario, Gangata cenia, Nemacheilus botia, Rasbora sp., Monopterus cuchia, Ompok sp.* are highly priced fishes. Almost all the recorded ornamental fish species have food value except a few species like *Badis badis, Tetradon cutcutia and Aplocheilus panchax.*

Conservation status of the recorded ornamental fish species in relation to CAMP , 1998 showed that 32.26% belongs to Lower risk near threatened category(LRnt), 9.68 % belongs to Lower risk least concern (LRlc), 14.516% to Vulnerable(VU), 6.45% Endangered(EN) and 33.87% are still not evaluated. Among the threatened categories the vulnerable species are more and though they have sufficient population at the present time but population is decreasing fast due to overexploitation and depleting habitat condition in the last few years and if the present situation continues they will be enlisted in the endangered category within a short period of time. Similarly, the 4 endangered species have very rare occurrence in the natural habitat and receives a high demand in the market. Considering their potential, artificial breeding can be practiced which have manifold advantages like conservation states can be achieved and helps in employment generation through development of low cost enterprise like aquarium fish breeding and selling center. Remaining 32.26% assessed near to threatened category though risk to their status is at lower level at the present time. But during the study period it was observed that various natural and anthropogenic factors causes disturbances of ecological condition of the *beels*. The *beels* are facing many problems like shrinkage of area, siltation, eutrophication, introduction of exotic fishes, growth of water hyacinth and other macrophytes, human settlement, agricultural runoff from nearby paddy fields leads to gradual decline of most of the ornamental fishes in the last few years. The feeding canal of the *beels* which form the only avenue for fish migration from adjacent river is dangerously blocking day by day by siltation and thereby leading to decreasing in diversity of the ornamental fishes in the concerned *beels.* Siltation also increase the turbidity of the water systems. The turbidity not only disturb the spawning and breeding ground of the fishes but also have a negative impact on pigmentation of ornamental fishes. The introduction of chemical pesticides from nearby agricultural fields possess threats to water quality which may lead to extinction of many ornamental fishes in the near future if the present scenario continues.
The demand of ornamental fish is gradually increasing day by day. The recent value of world trade for ornamental fish has been estimated to be about 4.5 billion US dollar and has been an annual growth rate approximately 8%. India's overall trade presently is over Rs. 150 million. About 80% of ornamental fishes from India to International market are exported via Kolkata Airport, of which more than 80% is contributed from North Eastern region [4]. Presence of diverse natural water bodies contributes to an added advantage for the abundance of ornamental fishes in this zone. However, there is vast unexplored potential for indigenous ornamental fishes in Assam. Scientific and systemic exploration of this potential will definitely ensure a significant place for our state in the global market, besides employment generation and earning foreign exchange.

It is significant to note that the court in India evolved the concept of ' sustainable development' in order to make a balance between the ecology and development by reading Articles 21,47, 48-A and 51-A(g) of the constitution together. The ' Precautionary principle' and ' the polluter pays' principles were held, the part of environment law of the country as an essential feature of sustainable development. Similarly The Indian Patent Act, 1970; The Wildlife Protection Act, 1972; National Wildlife Acton Plan, 1983; Biodiversity Act, 2002 were also formulated for sustainable use and conservation of biodiversity. Albeit, there is a need for people to adopt practices against unsustainable consumption habit on a host of cultural, economical, social and physiological factors. Knowledge and understanding through environmental education may create awareness and sensitivity among the people about the environment and participation for mitigating the environment challenges.

Researchers from various organizations like Central Inland Fisheries Research Institute (CIFRI), Gauhati University, Dibrugarh University, Assam University, College of Fisheries (Assam Agricultural University) etc. have done some pioneering work on indigenous ornamental fishes of North eastern region including cataloging of potential species, methods of collection from wild, conditioning of wild fishes and rearing etc. Recently, considering the potential of ornamental fishes, a few species have been short listed for research on captive breeding under a National Agricultural Technology project in the Assam Agricultural University at college of Fisheries, Raha. In order to develop ornamental fish sector in Assam National Bank for Agriculture and Rural Development (NABARD), North Eastern Development Financial Institution (NEDFi) are taking keen interest for promoting the development of culture of ornamental fishes. Directorate of Fisheries, Assam is continuously trying to create awareness among the

mass about the tremendous potential and utility of these living jwels. Under this department , one officer has in each district to coordinate the activities in the field level.

Inspite of all these, diverse efforts in this field, progress in this regard needs considerable improvement . Large scale ornamental fish production programmed with the help of mass culture is hoped to be the best measures for conservation of habitat and threatened species besides being creating job opportunities for the locals.

Table:1 Shows the recorded ornamental fish species from flood plain wetlands of lower Brahmaputra basin and their current conservation (CAMP) status

Order	Family	Scientific name of species	CAMP status	Relative abundance
Order1:Osteoglossiformes.	Notopteridae	*1.Notopterus notopterus (Pallas)*	LRnt	O
		2.Chitala chitala(Hamilton)	EN	R
Order2:Clupifor-mes	Clupeidae	*3.Gudusia chapra (Hamilton)*	LRlc	O
Order3:Cyprinif-ormes	Cyprinidae	4.Puntius conchonius *(Hamilton)*	VU	C
		5.P. gelius (Hamilton)	NE	R
		6. P. sophore(Hamilton)	LRnt	C
		7.P. ticto(Hamilton)	LRnt	C
		8.*Amblypharyngodon mola (Hamilton)*	LRlc	C
		9.*Aspidoparia jaya (Hamilton)*	VU	O
		10.*A. morar (Hamilton)*	LRnt	O
		11. *Barilius barila (Hamilton)*	VU	O
		12. B. barna (Hamilton)	LRnt	O
		13.*Laubuca laubuca (Hamilton)*	LRlc	C
		14. *Cirrhinus reba (Hamilton)*	VU	O
		15. Devario devario (Hamilton)	LRnt	C
		16. Esomus dandricus (Hamilton)	LRlc	O
		17. Megarasbora elanga (Hamilton)	DD	R
		18.*Oreichthys sp.*	NE	R
		19. *Ostreobrama cotio cotio(Hamilton)*	LRnt	C
		20.Parluciosoma dandriconius *(Hamilton)*	LRnt	O
		21. *Rasbora rasbora (Hamilton)*	NE	R
		22. Salmophasia bacaila (Hamilton)	LRlc	C
	Cobitidae	*23. Acanthocobitis botia* (Hamilton)	DD	O
		24. *Botia dario* (Hamilton)	NE	O
		25. *B. rostrata*(Gunther)	NE	O
			LRnt	O
		26. *Canthophrys gongota* (Hamilton)		
		27. *Lepidocephalichthys guntea* (Hamilton)	NE	C
Order4:Silurifor-mes	Bagridae	28.*Hemibagrus menoda* (Hamilton)	NE	R
		29. *Mystus bleekeri (* Day)	VU	O
		30. *M. Cavasius* (Hamilton)	LRnt	R
		31. *M tengara* (Hamilton)	NE	R
		32.*M. vitatus* (Bloch)	VU	O
		33. *Rita rita* (Hamilton)	LRnt	R
	Siluridae	34.*Ompok bimaculatus*(Bloch)	EN	O
		35. *O. Pabda* (Hamilton)	EN	O
		36. *O. Pabo* (Hamilton)	NE	O
	Schilbeidae	37. *Alia coila* (Hamilton)	VU	O
		38. *Neotropius atherinoides* (Bloch)	EN	C
	Sisoridae	39. *Gangata centia* (Hamilton)	NE	O
	Chacidae	40. *Chaca chaca* (Hamilton)	NE	R
Order5: Syprinodontifo-rmes	Belonidae	41. *Xenentedon cancila* (Hamilton)	LRnt	C
	Mastacembelidae	42. Macrognathus oral (Bloch and Schneider)	LRnt	C
		43. M. pancalus(Hamilton-Buchanan)	LRnt	C
Order6:Percifo-rmes		44. *Mastacembelus armatus* (Lacepede)	NE	O
	Ambassidae	45. *Chanda nama* (Hamilton)	NE	C
		46. *Pseudambassis baculis* (Hamilton)	NE	C
	Nandidae	47. *Badis assamensis* (Ahl)	NE	R
		48. *B. badis* (Hamilton)	NE	O
		49. *Nandus nandus* (Hamilton)	LRnt	O
	Gobiidae	50. *Glossogobiua giuris* (Hamilton)	LRnt	O
	Anababtidae	51. *Anabas testudineus* (Bloch)	VU	O
	Belontiidae	52. *Polycanthus fasciatus* (Schneider)	LRnt	C
		53. *P. Labiosus* (Day)	NE	O
		54. *P.lalia* (Hamilton)	NE	C
		55. *P. Sota* (Hamilton)	NE	C

	Channidae	56. *Channa aurantimaculata* (Musikasinthorn)	NE	O
		57. *C. Barca* (Hamilton)	NE	O
		58. C. Gachua (Bloch and Schneider)	VU	O
		59. *C. Marulius* (Hamilton)	LRnt	C
		60. *C. Punctata* (Bloch)	LRnt	C
		61. C. Strita (Bloch)	LRlc	C
Order7:Tetradontiformes	Tetradontidae	62. *Tetradon cutcutia* (Hamilton)	Lrnt	C

CAMP STATUS:
EN= Endangered, VU=Vulnerable, LRnt=Lower risk near threatened, LRlc=Lower Risk least concern, DD= Data deficient, NE= Not evaluated
Relative abundance:
O= occasional, R=rare, C= Common

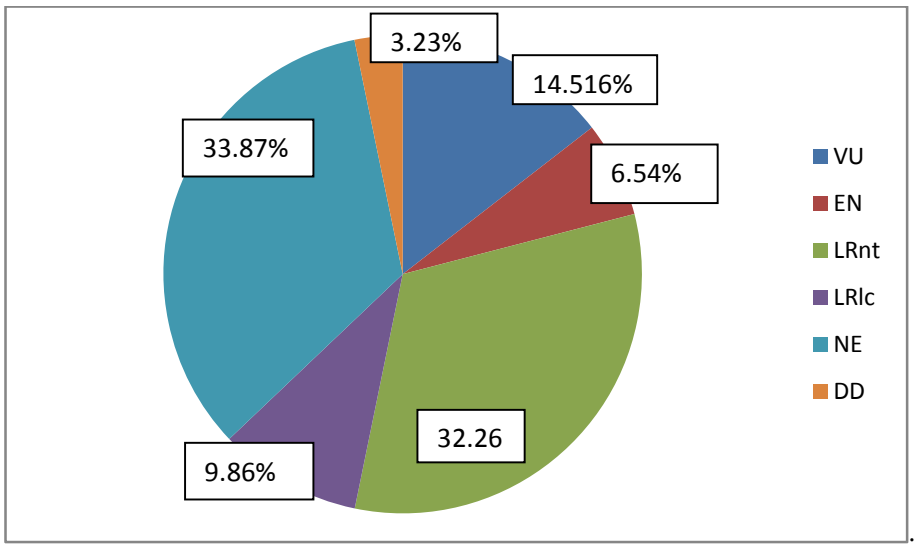
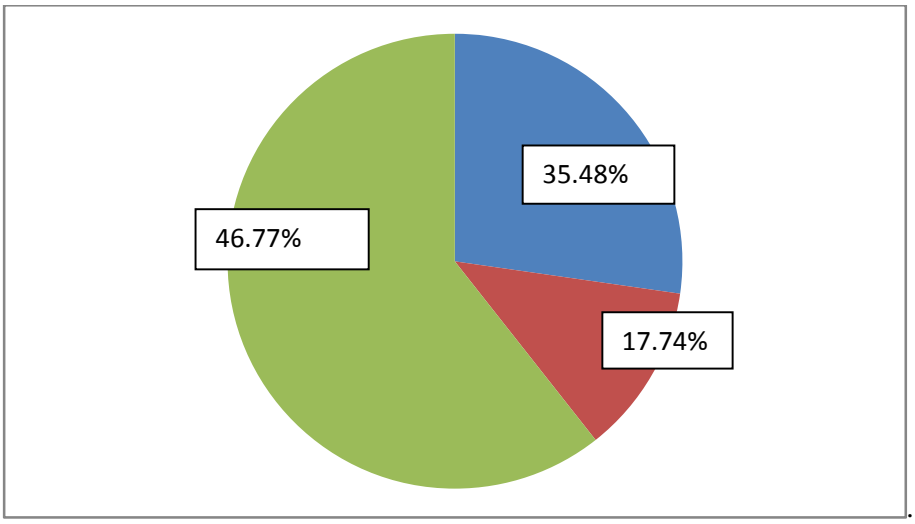


Fig: 1 Shows the percentage of conservation (CAMP) status of the recorded fishes



R=17.74%, C=35.48%, O=46.77%
Fig: 2 Shows the percentage of relative abundance of the recorded ornamental fishes in the studied *beels*

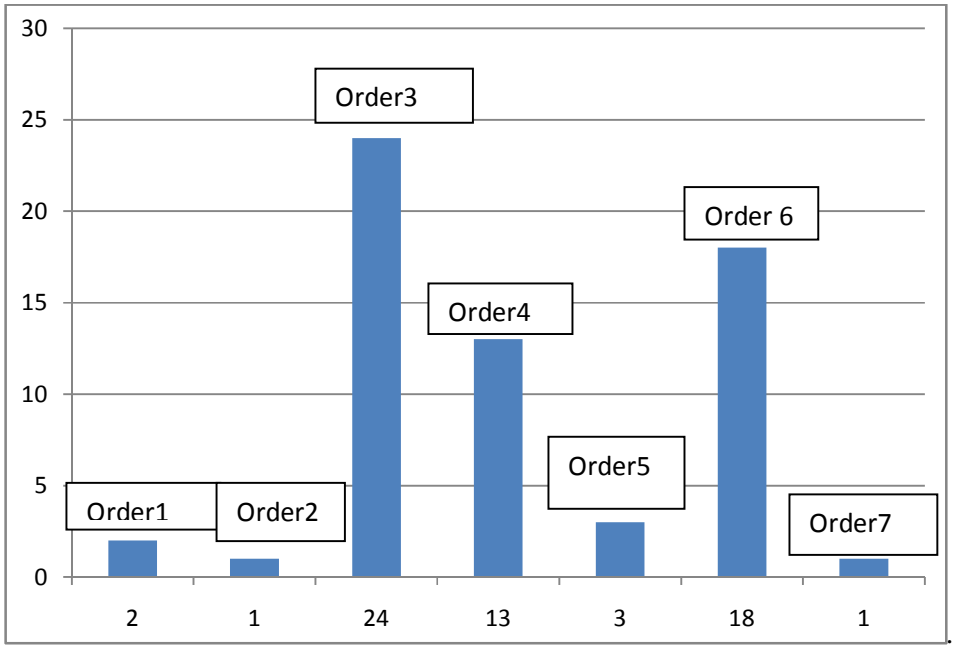
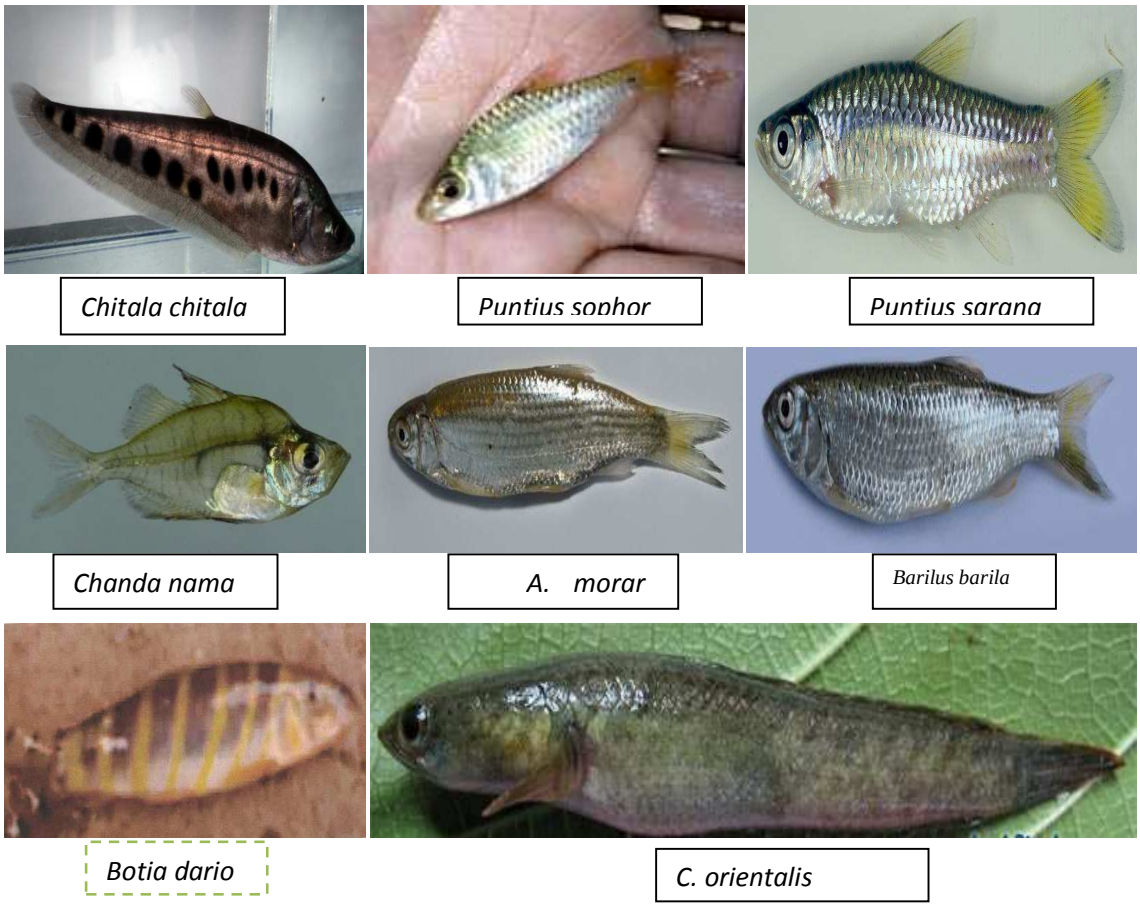


Fig:3 Shows the number of recorded ornamental fishes belonging to different order



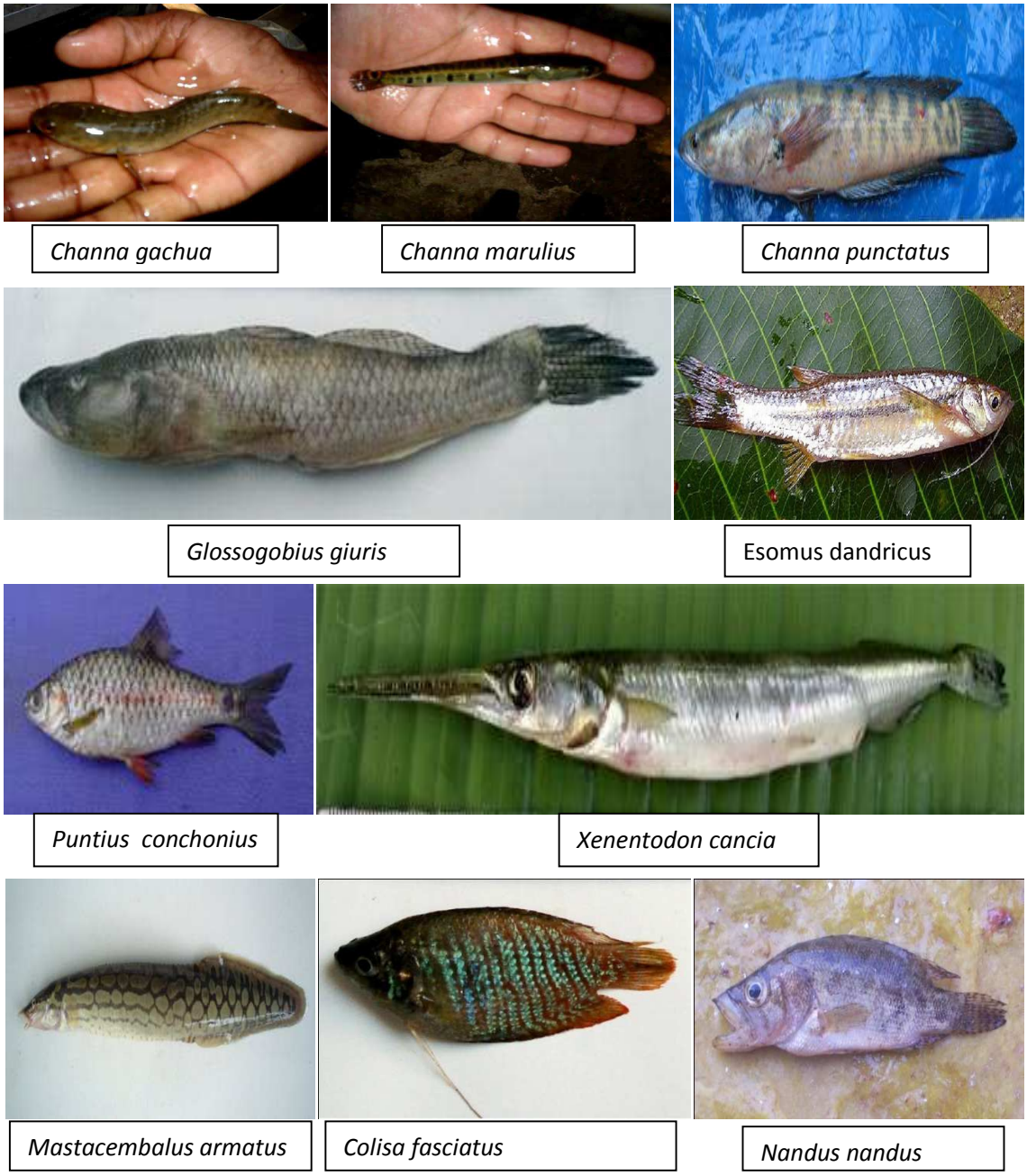


Fig:4Photographs shows different ornamental fishes recorded during the study period

CONCLUSION

The ornamental fish industry is heavily dependent on the supply of native ornamental fishes from North East India. Since almost the entire collection is done from natural aquatic resource of North East region there is a big sustainability threat to the natural resources. This requires an urgent attention on formulating sound ecological and economic strategies. With the concerted efforts, of all stakeholders, the ornamental fisheries can be developed substantially in the region, which in turn, will gain a larger share in the world market making this sector more vibrant and remunerative.

Acknowledgements
The authors are thankful to the Head of Zoology Department, Gauhati University and Principal, Tihu College, Tihu for giving permission to carry out this research work and for providing all the necessary laboratory facilities. The authors are also thankful to the villagers and fishermen who helped during this study.

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