Icthyodiversity and Conservation Aspects in a Lake and River Ecosystems in Bhandara District of Maharashtra, India: A Comprehensive Study of Surface Water Bodies.

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Abstract

During the study period 63 species are collected of 8 orders and 17 families, from the water bodies located in Bhandara district. Harvested data indicates the dominance of species family cyprinidae > Ophiocephalidae > Bagaridae > Siluridae>Notopteridae = Ambassidae = Claridae>Nandidae = anabantidae = Osphronemidae = Gobidae = Cichlidae = Anguillidae = Saccobranchidae = Pangasiidae = Sisoridae = Belonidae

Mostly human interference in the lakes and rivers are mainly responsible for the less distribution of fishes, pollution load and intense hot climatic conditions affects the growth and distribution fishes. Pollution load during the months of summer turns the fish species to develop certain adaptations. The species having more adaptive capabilities showed more in quantities; however some fish fauna is going on the way of scrub down from the study area.

Careless management of some lakes and river and agricultural practices in lakes and river basins pollutes the water which creates hazards for eggs and fries to grow up in the adult fishes. Use of certain manures and insecticides in the lake water harms the fish fauna.

KEYWORDS : Exploration, Habitat study, Conservation, Fish species, Physico-chemical.

INTRODUCTION :

Icthyo diversity refers to variety of fish species depending on context and scale, it could refers to alleles or genotypes within Piscean population, to species or life forms across aqua regimes (Burton et al, 1992). Fishes exhibit enormous diversity in shape size, biology and in the habitats they occupy. It is believed that out of 4000 species of vertebrate recognized world and over 22000 are the fish species of which 8411 are fresh water fishes. In india 2163 species of finfish have been recorded of which 611 fresh water species have been recorded in India. Due to certain factors such as, overexploitation, habitat loss, exotic species and mainly contamination of surface waters, the fish (biodiversity) is greatly threatened. Ecosystems and species are important for sustaining human life on earth. In order to preserve the biodiversity and fishes it is necessary to conserve the surface water bodies. In gereral aquatic conservation strategies and watch of diverse species should support the sustainable development by protecting biological resources. The overall study of problem of destruction of habitats and species over the broad study area may provide the present status of habitat ecology and diversity of fish species.

Wasternghat is the richest region in India with respect to endemic freshwater fishes. Out of 450 freshwater warm freshwater fishes, roughly 40 families represented in India. Fresh water fishes are most poorly studied group since incomplete information is available. (Thirumala.S. et al, 2011). Since last decades only 39 species freshwater fish species are reported in Bhandara district, while the present status of aquatic habitats is not available even though the lot of economy have been spent on the conservation strategies. No doubt the statistical study of area of lake, status of contamination by taking various aquatic parameters etc. are the major factors to conserve the surface waters. But in thorough study of aquatic habitats the only factor that affects the distribution of fish species is sources of water contamination. Identification of sources and extent of contamination by particular pollution sources affects the fish diversity of lakes and rivers.

Inland water resources are diversified, as they are plentiful. Reservoirs, Dams, lakes and rivers are the fishery resources in terms of size and production potential. Fish fauna of reservoirs, lakes and pond basically represents the fish diversity and their abundance. Surface waters in Bhandara district preserve a rich variety of fish species, which supports to the commercial fisheries in the region. Objective of the present study were to document the fish species in relation to physico-chemical characteristics of water and condition of habitats and possible management strategies.

MATERIAL AND METHODS :

Study Area : For the study of fish diversity and their habitat studies, Bhandara district area of Maharashtra India is selected. The district of Bhandara is the North Eastern estreme of the Nagpur division of Maharashtra state, lies between 20o 39' to 21o 38' North Latitudes and 79o 27' to 80o 42' east longitudes covering an area of 3890 sq. kms. The river Wainganga and tributaries Bagh and Bawanthari rivers form the northen boundary of the district. It is the rice bowl of the state and have innumerable water bodies including ponds, lakes, reservoirs and dams and streams. Total 1518 wetlands and mapped including 477 small wetlands(<2.25 ha), with 20469 ha area. The district is dominated by manmade wetlands with 697 pond/tanks, reservoir and barrages with 1523 ha area, and rivers and streams.

To explore the fish diversity the lakes at the outer border of district at every 40 Kms are selected with some of lying in middle region. However the Various stations are explored from major river (Wainganga river) and tributaries Bagh and Bawanthari rivers. Some part of Chulband river is attached to district is also explored to collect the fish specimens and habitat study. Fish species are identified by using the literature provided by Day, Jairam and Dattamunshi etc. Fishes are collected and preserved in 10% formaldehyde solution in glass jars.

In habitat study mainly sources of water contamination and status of contamination is considered in present attempt. The sampling of water is done by standard methods portable water analysis kit is used to measure the parameters such as Tempt, pH,DO,BOD,TDS, Conductivity, time to time accuracy of kit is examined in laboratory with standard methods of APHA (1998).

RESULTS AND DISCUSSION :

Fish diversity depends up on the biotic and abiotic factors, and age of water body, mean depth, fluctuation of water levels, contamination levels etc. Amongst 60 lake/ponds and 13 sites of rivers, 63 different fish species are collected. In which common carps such as *Catla catla*, *Labeo rohita, Cirrhinus mrigala, Cyprinus* species and catfishes *Clarias batrachus* are abundantly distributed in the study area. **(3)**

According to IUCN red data book *Thynnichthys sandkhol* and *Tor khudree* species are in worldwide endangered condition in which *Thynichthys sandkhol* is moderately abundant and *Tor khudree* is recorded as a rare distribution in Bhandara district during present study. Two vulnerable listed species *Cirrhinus cirrhosa and cyprinus carpio* showed abundant distribution. However *Bagarius bagarius,, Ompak bimaculatus, Ompak pabda, Oreochromis and Wallogo attu* are near to threatened species listed, in the red data book during 2013. These species are abundantly distributed in the study area except *Bagarius bagarius* which rarely observed in the lotic waters of the district.

Accoding to NBFGR list of threatened Indian fresh water fish species 9 species such as, *Bagarius bagarius, Cirrhinus cirrhosa, Clarias batrachus, Heterupneustus fossilis, Ompak Pabda, Pangasius, pangasius, Puntius sarana, P. sarana and Tor khudree* are abundantly distributed in the study area except rare *Tor khudree* species. (**14**)

River wainganga is largest water body, flows through the study area, and it is fish mega diversity zone in the district. Recently constructed Gosikhurd dam on the river is a largest water body. The wastewater of Nagpur city flows in the upstream flow of river through its Kanhan river tributary. The waste water accumulates in the dam and hurting the fishes on war level. According to one view dams and reservoirs are the main cause of destruction of fish diversity, as the heavy fish caught reduce the number and types of fishes. **(8), (13)**

Collected data during the year 2012-14, throws light on the conditions of lake ecosystems in study area. Deflection of habitats conditions of lentic water bodies, is the result of human activities such as Bathing, Cloth washing, Cattle activities, river basin agriculture. In most of villages in study area, source of water for cattle is only the lakes and ponds. But drinking water activities are associated with cattle washing, which, is responsible to increase nutrients in the lakes and pond and increase of weed plants. Most of the water bodies are observed in just to eutrophic conditions. During the present study, 20 water bodies are found in mesotrophic conditions, 24 lakes and ponds are found covered by weeds, and tend to be eutrophic. Only 14 large lakes located in the remote area showed the favorable conditions for fish diversity.

River basin agriculture is one of the common practices observed the study area. The fisherman communities use dry places located inside the basin of river, for plantation of muskmelon and watermelon plants, for their economy. In these river basin fields the use of manures like urea, cattle dung etc deteriorate the quality of water. Smaller water currents, in the river basin, turned and flown through agricultural fields, which mixes the manures in river water and spread in the downstream water. Moreover, production of Water chest nut (*Trapa natum*) in the lakes and use of urea

and ashes as manure, with use of certain insecticides over it destructs fish diversity in ponds and small lakes every year.

Table -1 shows the biodiversity status and abundance of fish species in Bhandara district. During the study period 63 species are collected of 8 orders and 17 families, from the waterbodies located in Bhandara district. Harvested data indicates the dominance of species family cyprinidae >Ophiocephalidae>Bagaridae> Siluridae>Notopteridae= Ambassidae = Claridae>Nandidae =anabantidae=Osphronemidae=Gobidae=Cichlidae=Anguillidae=Saccobranchidae= Pangasiidae=Sisoridae=Belonidae **(9),(4),(12)**

The water quality parameters of surface waters from study area. The overall study of water quality showed the contamination of water bodies with organic wastes. However the pH deflects from 7.1 to 7.6, DO 2.9 to 5.4 mg/l, BOD 5.3 to 18.6 mg/l, Temperature 18^oC to29^oC, TDS 123 mg/l to 189 mg/l, Conductivity 426 to 543 umoh/cm.

As fish diversity conservation is concerned in study area, it requires to stop the over fishing practices or selected fishing in the lakes and river. A minimum requirement to protect lake and pond ecosystems is only to stop contamination and erosion of water bodies. The soil and decaying organic matters enters in most of the rural and urban lakes to pollute and lowers the depth of water bodies, which may be prevented by appropriate managements by concerned authorities. At least the binding of rural village and town management to protect the lake and rivers, by co-operative movements in the localities at the cost of sanctioning the grants of various purposes may help to solve the problem on certain levels. Strengthening of pollution control machineries in rural and urban areas, is need of the present day to manage and convey the water and waste water sources far from the water bodies. Wildlife protection departments and boards located in the nearby areas should think more to stop the erosion of lakes and ponds. Certain type of barrages are very essential in the way of catchment areas to stop the erosion and pollution of lakes. Now the times reach to enclose all water bodies inside the wall or wire fencings to avoid the cattle activities on the bank of water bodies. It also requires the constant watch on the fishing practices and the fish markets to avoid over exploitation of particular species. In Bhandara district *Bagarius bagarius* species of fish became rare due to is over use among the localities. Regular campaining about the conservation of precious water bodies, in the localities, schools, colleges may protect the natural habitats the fish population.

REFERENCES :

1] A.S. Kumar Naik, Jitendra ZKumar, V. Mahesh, S. Benakappa, (2013),” Assessment of Fish Diversity of Tunga River, Karnataka, India.”, Nature and Science, 11(2). 82:87.

2] B.R.Kiran (2011), “ Diversity, Distribution and Abundance of Murrels and Catfish Resources in Sone Wetlands of Karnataka, India.”, Asian J. Exp. Biol. Sci., Vol 2 (2), 349:353.

3] Chintaman Khume, (2012), “ Icthyofaulan Diversity of Chulbandh Reservoir District Gondia, (M.S.) India”., Bionano Frontier ISSN 0974-0678, ECO REVOLUTION 2012 COLOMBO SHRILANKA. 109:111.

4] Devendra Pandey, (2012), “ Environmental Vulneravbility of Bhandara and Gondia Districts of Maharashtra State, India”., Int. J. LifeSc. Bt. & Pharm. Res. Vol. 1 (2) IJLBPR. 20:30.

5] Devashish Kar, A.V. Nagarathna, T.V. Ramachandra and S.C. Dey (2006), “Fish Diversity And Conservation Aspects In An Aquatic Ecosystem In NorthEastern India.”, ZOO’s Print Journal 21(7), 2308:2315.

6] Joshi P.S, Tantarpale V.T. and K.M. Kulkarni (2013),” Fishing methods commonly employed in Buldhana district and neighborhood, Maharashtra state, India.”, Bioscience Discovery, 4 (1) : 54-57.

7] Karl D.A. Huchzermeyer, Benjamin C.W. van der Wall. (2012),“Epizootic ulcerative syndrome: exotic fish disease threatens Africa’s aquatic ecosystems (2012), Open assess- Journal Of The South African Veterinary Association, http://www.jsava.co.za

8] Pathak et al (2010) ,”Reiverine Ecology and Fisheries, vis a vis hydrodynamic alterations : Impacts and Remedial measures.” CIFRI 2010.

9] Sandeep Rathod and Sunil E. Shinde (2012), “ Fish Diversity Status of Wainganga River At Pauni, Dist. Bhandara(M.S.) India”., Bionano Frontier Vol 5 (2), ISSN 0974-0678, 256:258.

10] Sanjay Deosthale, Anant Shinde, Pratibha Rohankar, Dinesh Dabhadkar, (2012),” Study of Seasonal Representation of Fishes in Arunavati Reservoir, Digras, District Yavatmal, Maharashtra State.”, Multilogic in Science, Voll II, (II), 58:60.

11] S.B.Ubharhande and Sonwane S.R. (2012), “ Study of Freshwater Fish Fauna and Water Quality at Paintakli dam From Buldhana District (M.S.) India.”, Journal of Experimental Sciences, 3 (7), 4:8. ISSN. 2218-1768.

12] Shubhangi Kalbande, Privin Telkhade and Suresh Zade, (2012),” Fish Diversity of Rawanwadi Lake of Bhandara District Maharashtra, India.”, ABHINAV Reff. Jour. Of Sci and Tech. Vol.2, (2), ISSN. 2277-1174.

13] Thirumala S.Kiran B.R., and Kantaraj G.S. , (2011), "Fish diversity in relation to physic-chemical characteristics of Bhadra reservoir of Karnataka, India"., Advances in Applied Research 2011, Pelagia Research Library, 2(5), 34:47.

14] W.S.Lakra, U.K.Sarkar, A. Gopalkrishnan, A.Kathirvelpandian, (2010), "Threatened Freshwater Fishes in India.", NBGFR Publication, ISBN- 978-81-905540-5-3.

Tabel – 1
Biodiversity status, abundance and habitat of fishes in Bhandara district, (M.S.) India

Order	Sub-order	Family	Genus
Osteoglossiformes	Notoptreroidei	Notopteridae	*Notopterus chitala* (Hamilton, 1822)
			Notopterus notopterus (Pallas, 1769)
Perciformes	Percoidei	Ambassidae	*Ambassis nama* (Hamilton, 1822)
			Ambassis ranga (Hamilton, 1822)
		Nandidae	*Nandus nandus* (Hamilton, 1822)
	Anabantoidei	Anabantidae	*Anabas testudineus* (Bloch, 1792)
		Osphronemidae	*Colisa fasciatus* (Bloch & Schneider,
	Gobioidei	Gobiidae	*Glossogobius giuris* (Hamilton, 1822)
	Percoidei	Cichlidae	*Oreochromis mossambicus* (Peters,
Anguilliformes	Anguilloidei	Anguillidae	*Anguilla bengalensis* (Gray, 1831)
Cypriniformes	Cyprinoidei	Cyprinidae	*Catla catla* (Hamilton, 1822)
			Rasbora daniconius (Hamilton, 1822)
			Rasbora rasbora (Hamilton, 1822)
			Tor khudree (Sykes, 1839)
			Puntius sarana (Hamilton, 1822)
			Puntius sophore (Hamilton, 1822)
			Puntius amphibious (Valenciennes
			Puntius ticto (Hamilton, 1822)
			Puntius chola (Hamilton, 1822)
			Cirrhinus cirrhosa (Bloch, 1795)
			Cirrhinus mrigala (Hamilton, 1822)
			Cirrhinus reba (Hamilton, 1822)
			Labeo bata (Hamilton, 1822)
			Labeo boggut (Sykes, 1839)
			Labeo calbasu (Hamilton, 1822)
			Labeo dero (Hamilton, 1822)
			Labeo fimbriatus (Bloch, 1795)
			Labeo gonius (Hamilton, 1822)
			Labeo rohita (Hamilton, 1822)
			Garra mullya (Sykes, 1839)
			Discognathus modestus (Day, 1870)
			Cyprinus carpio (Linnaeus, 1758)
			Cyprinus carpio var.communis (L)
			Salmophasia clupeoides (Bloch, 1795)
			Salmophasia bacaila (Hamilton, 1822)
			Osteobrama vigorsii (Sykes, 1839)
			Ctenopharyngodon idella (Valenciennes
			Oxygaster bacaila(Hamilton, 1822)
			Thynnichthys sandkhol (Sykes, 1839)
		Cobitidae	*Nemacheilius botia* (Hamilton, 1822)
		Nemachelidae	*Nemachelius savona* (Hamilton, 1822)
			Lepidocephalichthys guntea(Hamilton,
		Siluridae	*Ompok bimaculatus* (Bloch, 1794)
			Ompok pabda (Hamilton, 1822)
			Wallago attu (Bloch & Schneider, 1801)
		Heteropneustidae	*Heteropneustes fossilis* (Bloch, 1794)
		Claridae	*Clarius batracus* (Linnaeus, 1758)

			Clarius gariepinus (Burchell, 1822)
Siluriformes	Siluroidei	Bagridae	*Mystus bleekeri* (Day, 1857)
			Mystus cavasius (Hamilton, 1822)
			Mystus seenghala (Sykes, 1839)
			Mystus vittatus (Bloch, 1794)
			Rita pavimentata (Valenciennes 1840)
		Pangasiidae	*Pangasius pangasius* (Hamilton, 1822)
		Sisoridae	*Bagarius bagarius* (Hamilton, 1822)
Beloniformes	Scomberesocoi	Belonidae	*Xenentodon cancila* (Hamilton, 1822)
Ophiocephaliformes		Ophiocehalidae	*Channa gachua* (Hamilton, 1822)
			Channa marulius (Hamilton, 1822)
			Channa punctatus (Bloch, 1793)
			Channa striatus (Bloch, 1795)
Mastocembeliformes		Mastocembelidae	*Macrognathus aculeatus* (Bloch, 1786)
			Macrognathus pancalus (Hamilton,
			Mastacembelus aramatus (Lacepede,

Table-2
Biodiversity status, abundance and habitat of fishes in Bhandara district, (M.S.)
India
(NBFGR)

	Genus	**Local Name**	**Biodiversity status (NBFGR) 2010**	**Biodiversity status (IUCN) 2013**	**Abundance**	**Habitat**
1	*Ambassis nama*	**Chandi**			R	LE
2	*Ambassis ranga*	Zanjadi			R	LE
3	*Anabas testudineus*	**Koi**			M	LO/LE
4	*Anguilla bengalensis*	**Tamboo**			M	LO
5	*Bagarius bagarius*	**Bodh**	VU	NT	M	LO/LE
6	*Catla catla*	Cathla			A	LOTIC
7	*Channa gachua*	**Dhok**			M	LE
8	*Channa marulius*	Phal, maral			A	LO/LE
9	*Channa punctatus*	Botri			A	LE
10	*Channa striatus*	Murrel	NA		A	LO/LE
11	*Cirrhinus cirrhosa*		VU	VU	M	LE
12	*Cirrhinus mrigala*	Mrigal			A	LE/LO
13	*Cirrhinus reba*	Reba			M	LE
14	*Clarius batracus*	**Wagur**	VU		A	LO
15	*Clarius garipinus*	Gaorani wagur			A	LO/LE

16	*Colisa fascinatus*				R	LE
17	Ctenopharyngodon idella	Grass carp			M	LE
18	*Cyprinus carpio*	Ciprinus		VU	A	LENTIC
19	*Cyprinus carpio var.communis*	ciprinus			M	LE
20	*Dicognathus modestus*	Rengsa			R	LO
21	*Gara mullya*	Malaga			M	LO
22	*Glossogobius guris*	**Chastra, Goby**			M	LO
23	*Heteropneustus fossilis*	**Shingur**	VU		M	LO
24	*Labeo bata*	Nawari			A	LO/LE
25	*Labeo boggut*	Gohria			A	LE/LO
26	*Labeo calbasu*	Kanoshi			M	LE/LO
27	*Labeo dero*				A	LE/LO
28	*Labeo fimbriata*	Tanbir	NA		M	LO/LE
29	*Labeo gonius*				A	LO
30	*Labeo rohita*	Rohu			A	LO/LE
31	*Lepidocephalichthys guntea*	**Muri, Gurgutchi**			M	LO
32	*Mastocembalus aramatus*	**Wair, Bam**	LRnt		M	LO
33	*Macrognathus acculeatus*	Waur			M	LO/LE
34	*Macrognathus pancalus*	Vam			M	LO
35	*Mystus bleekeri*				A	LO
36	*Mystus cavasius*				M	LO/LE
37	*Mystus seenghala*	Shingta			A	LO
38	*Mystus vitatus*	Katwa, Katarna			A	LO
39	*Nandus nandus*	**Dukkar**			M	LE/LO
40	*Nemachelius botia*	**Teli**			M	LE/LO
41	*Nemachelius savona*	Gurma			M	LE/LO
42	*Notopterus chitala*	**Chital**			M	LE
43	*Notopterus notopterus*	Bhadar			M	LO/LE
44	*Ompok bimaculatus*	Gungara		NT	A	LO/LE
45	*Ompak pabda*	**Pabda**	VU	NT	M	LO
46	*Oreochromis mosssambicus*	**Tilapia**		NT	M	LO/LE

47	*Osteobrama vigorsii*	Koli			M	LO
48	*Oxygasteer bacaila*				R	LO
49	*Pangasius pangasius*		VU		M	LO
50	*Puntius sarana*	**Poshti,**	VU		M	LO
51	*Puntius sophore*	Sopor, Tepli			A	LO
52	*Punctius amphibious*	**khavli**			M	LO
53	*Punctius ticto*	**Karvari**			A	LO
54	*Punctius chola*		VU		M	LO
55	*Rasbora daniconius*	Kanheri			R	LO
56	*Rabora rasbora*				R	LO
57	*Rita pavimentata*	Ghagar			R	LO
58	*Salmostoma bacaila*	Sarangi			R	LO
59	*Salmophasia clupeoides*	Persi			M	LO
60	*Thynnichthys sandkhol*	Silver		EN	M	LO
61	*Tor khudree*	Gani	VU===	EN	R	LO
62	*Wallago attu*	**Shivda**		NT	M	LO/LE
63	*Xenentodon cancila*	**Chacha**			M	LO/LE

VU- Vulnarable, A-Abundant, M- Moderate abundance, R- Rare, Lo-Lotic, Le-Lentic.
NT: Near threatened, EN endangered
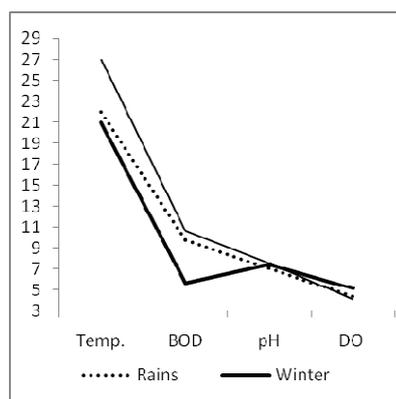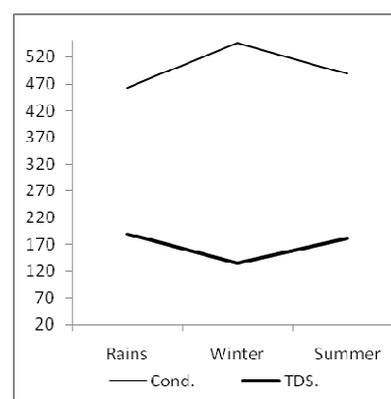
(A)   (B)

Figure- (A),(B)- Average level of physicochemical parameters in lentic water bodies in study area
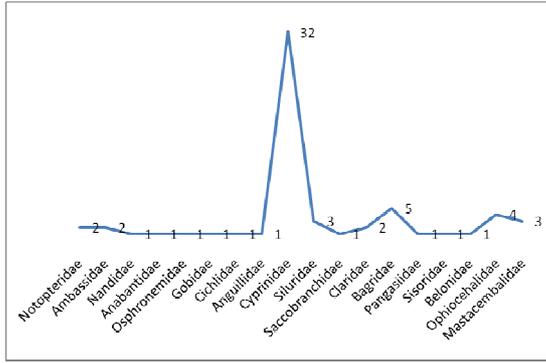
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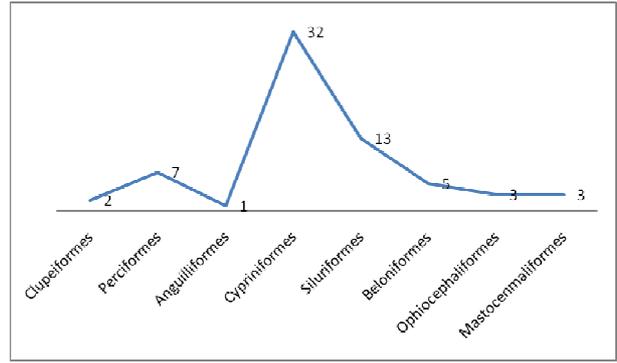
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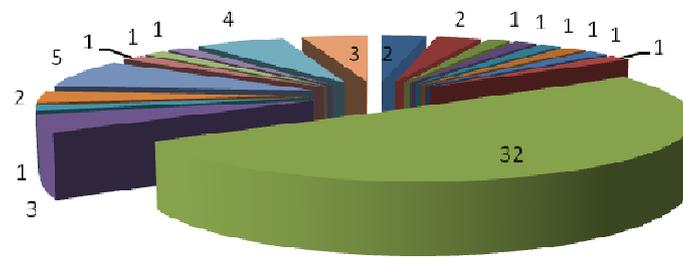
(E)

Figure (C), (D) & (E) – Taxonomic distribution of fish species in study area.
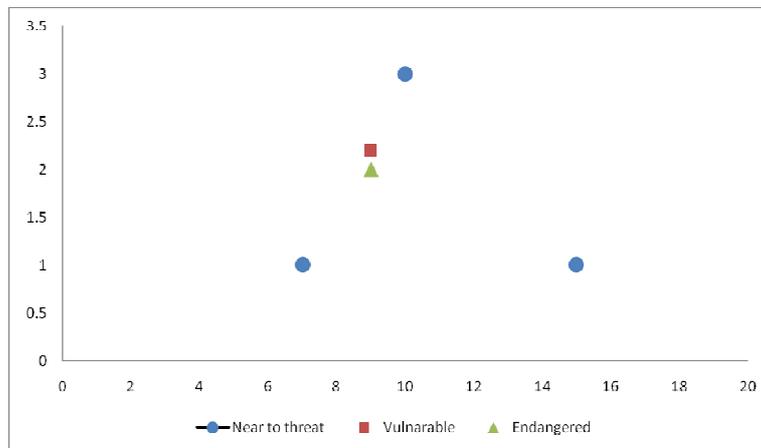

Figure-(F)- Distribution of IUCN listed threatened species in study area.

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