International Journal of Zoology Studies

Peer Reviewed Journal, Refereed Journal, Indexed Journal

ISSN: 2455-7269, Impact Factor: RJIF 5.14

UGC Approved Journal: UGC Journal No.: 64528

Publication Certificate

This certificate confirms that **"Yaser Qureshi"** has published manuscript titled **"Contamination status and health risk assessment of heavy metals in *Oreochromis mossambicus* of Budha Sagar pond, Rajnandgaon, Chhattisgarh, India"**.

Details of Published Article as follow:

Volume	:	**2**
Issue	:	**5**
Month	:	**Sep-Oct**
Year	:	**2017**
Page Number	:	**128-131**

Certificate No.: **2-5-40**
Date: **01-09-2017**

Yours Sincerely,

Nikhil Gupta
Publisher
International Journal of Zoology Studies
www.zoologyjournals.com
Tel: +91-9999551477

Govt. College Khertha Khertha Distt. Balod Balod (C.G.)

Principal,
Govt. College, Khertha
Distt. Balod (C.G.)

International Journal of Zoology Studies
ISSN: 2455-7269
Impact Factor: RJIF 5.14
www.zoologyjournals.com
Volume 2; Issue 5; September 2017; Page No. 128-131

Contamination status and health risk assessment of heavy metals in *Oreochromis mossambicus* of Budha Sagar pond, Rajnandgaon, Chhattisgarh, India

[1] Yaser Qureshi, [2] Dr. Kanti Choubey
[1] Assistant Professor, Department of Zoology, Govt. College Khertha Distt. Balod, Chhattisgarh, India
[2] Professor & Head, Department of Zoology, Govt. V Y T. Auto. College. Durg, Chhattisgarh, India

Abstract
Heavy metals are known pollutants due to their ability of bioaccumulation in organisms. Sewage may be contaminated by presence of heavy metals in it. Sewage fed fishery is of common occurrence in urban settlements, especially in under developed municipal areas. Effects of heavy metals on fishes are still thoroughly unexplored area in state of Chhattisgarh and Rajnandgaon town in particular. Present study is conducted to throw some light on this issue. Large number of population feeds on fishes so any negative deviation in any health related parameter may cause public health threat. This study was conducted on *Oreochromis mossambicus* fish in year long duration for three season namely winter, Summer and Post monsoon season to know concentration of heavy metals Fe, Cd, Cr, Pd and Hg in fish tissues (Gill, Liver and Muscle).
For determination of quality of water and intensity of heavy metal contamination, indices like OWQI, THQ and MPI are employed. OWQI shows that budha sagar pond is in good and fair condition. THQ is used for determination of contamination due to non-carcinogen. Overall THQ is in the safe limit for all the metals investigated. Mean MPI is recorded highest in gills and lowest in muscles, so we can say gills are mostly and directly affected by heavy metals. All the investigated parameters in present study are within the safe limit but heavy metals like Cd and Hg are reported here so measures should be applied to curb the menace of heavy metals in this urban wetland.

Keywords: heavy metals, overall water quality index, target hazard quotient, metal pollution index

1. Introduction
Over exploitation of natural resources, unsustainable development, Rapid population explosion, as well as increasing urbanization and food demand on the globe combined with the use of contaminated water and food make up a potential food safety hazard. The information of nutritional intake of essential and non-essential heavy metals in India especially Chhattisgarh is inadequate. In Living systems, heavy metals are responsible to affect cellular organelles and mechanism such as cell membrane, mitochondria, lysosome, endoplasmic reticulum, nuclei, and some enzymes concerned in metabolism, detoxification, and damage repair[1].
Some metals are essential for human health. Metals are naturally occurring elements that become contaminants when their level increases above optimum level[2]. Heavy metals are classified in two main categories, essential and non-essential. Some of the essential heavy metals are Cu, Co, Zn, Fe and Mn, they required in very trace amount for the appropriate working and vital activities of organs, RBC formation and vitamin synthesis in body but metabolic disturbances are encountered in case of disturbance of optimum level[2].
Heavy metal pollution is a grave and extensive environmental concern due to their toxicity. Heavy metals enter the environment through different natural channels and human activities. They can bio accumulate in fishes and other living beings.[3] There is a growing concern that metals accumulated in different fish tissues and pose health risk, especially for populations with high fish dependence[4, 5, 6].
Heavy metals are considered harmful because of their toxicity, long persistence, bioaccumulation and bio-magnification in the food chain[8]. The extent of contamination depends on the pollutant type, fish species, sampling location, trophic level, and their mode of feeding [9]. Monitoring heavy metal contamination in freshwater systems by using fish tissues helps to assess the quality of aquatic ecosystems[10].
Fishes are used as bio-indictors and may play an important role in monitoring heavy metals pollution[11].
Heavy metals enter fish through five main routes (food, non-food particles, gills, water, and skin), then flows into the blood, and carried to either a storage point or to the hepatic cells for its transformation or storage[12].
The liver is the main site of accumulation, biotransformation, and excretion of pollutants in fish[13].

2. Material and Methods
Study area
This study was carried out in the Budhasagar pond of Rajnandgaon town it is basically sewage fed urban pond. Municipal sewage line is directly connected to this pond. Fish samples were taken in morning hours. *Oreochromis mossambicus* fish of around 100 gm weight was taken for the study. Freshly captured fishes were taken to the laboratory for analysis. Fish samples dissected to separate organs (gills, liver and muscles). The separated organs were put in oven to dry at 110°C until reaching a constant weight. The separated organs

Govt. College Khertha Khertha Distt. Balod Balod (C.G.)

Principal,
Govt. College, Khertha
Distt. Balod (C.G.)

were placed into digestion flasks and ultrapure Conc. HNO_3 and H_2O_2 (1:1 v/v) was added. The digestion flasks were heated to 130°C until dissolution, diluted with water and analyzed for heavy metal concentration using atomic absorption Spectrometer [14, 15, 16].

Health Risk assessment of Pond Water

Overall Water Quality Index (OWQI)

Singh *et al.* (2015) developed OWQI Overall to classify the surface water into five categories, viz. excellent, good, fair, poor and polluted. For this purpose, the concentration ranges have been defined on the basis of the Indian Standards (IS) and Central Pollution Control Board (CPCB) standards, also taking into account other International standards of World Health Organization (WHO) and European Commission (EC). Sixteen parameters are selected based on social and environmental impact and weights are assigned on their relative importance to impact the quality of water. The proposed index improves understanding of water quality issues by integrating complex data and generates a score which describes the status of water quality [17].

$$OWQI = \sum_{i=1}^{n} w_i \cdot Y_i$$

Where

w_i = weight of the ith water quality parameter, Y_i = sub-index value of the ith parameter

Based on the status of water quality, the index value range from 0 to 100 and is classified into five categories: heavily polluted (0-24), poor (25-49), fair (50-74), good (75-94) and excellent (95-100). The status of water corresponding to different OWQI

Health Risk Assessment for Fish Consumption

Target Hazard Quotient (THQ)

The target hazardous quotient (THQ) represents a multifaceted parameter which is developed by the US Environmental Protection Agency (EPA 1989). It is used for the assessment of the potential of non-carcinogenic threat associated with exposure to contaminants, such as heavy metals from food for instance fish. As published by USEPA (2010), if the THQ value is < 1.00 that means the exposed population is supposed to be safe; however, when THQ > 1.00 there is a potential risk related to the studied metal in the exposed population [18].

$$THQ = EF\ E_D F_{IR} C / R_{FD} W_{AB} T_A X\ 10^{-3}$$

where E_F is exposure frequency (365 days/year), E_D is the exposure duration (65 years), equivalent to the average lifetime, F_{IR} is the food ingestion rate (g/person/day) 4.73 gm/day [19], C is the metal concentration in food (mg/kg), R_{FD} is the oral reference dose (mg/kg/day) obtained from USEPA, W_{AB} is the average body weight (55kg for adults and 20 kg for children), and T_A is the averaging exposure time for non-carcinogens (365 days/year X number of exposure years, assuming 65 years in this study)

Metal Pollution Index (MPI)

Metal Pollution Index (MPI) [20] MPI shows cumulative effect of all the heavy metals investigated

$$MPI = (CF_1 x CF_2 \ldots CF_n)^{1/n}$$

where CF_n = concentration of the metal n in the sample.

3. Results and Discussion

OWQI

Water quality parameters contribute information about health of water bodies. To evaluate this we have taken five water quality parameters Tem, pH, DO, TH and TA. Singh classified water bodies in to the five classes according to contamination status of water. He gave heavily polluted, Poor, Fair, Good and Excellent. After analyzing for that we got score 71.6 for winter season it comes under the fair class, In summer season score was 65.83 and it was also of fair class and post monsoon season score was highest as 84.66 It is in good class. So we can conclude that this water body as far as above water parameters are concerned is fair and Good, Quality of water increases in post monsoon season. (Table 1, 2 and 3)

THQ

Target hazard quotient is observed both for adults and children. In adults its highest value is found 0.16 for Iron in post monsoon Liver sample and lowest value is 0.006 recorded again for same metal in winter muscle sample.

In children highest value found is 0.236 for Iron. It is found in sample of Liver in summer season and lowest as 0.006 for mercury in gill sample of post monsoon season. Although few studied metals are not found in some samples but as far as THQ is concerned for present metals we are observing that there is a tendency towards gradual increase. THQ is hazardous when its value is above 1. Its higher values are found for Iron but iron is not considered as carcinogenic element. Its increased level may cause some other abnormalities in fish itself and also on animals feeds on them. (Table 4, 5).

MPI

Metal pollution index shows cumulative effect of all the heavy metal investigated. Highest value of MPI (4.29) is found in sample of Liver in summer season. Lowest value (2.20) is also found in sample of liver of winter season. Mean MPI is found in order of Gill>Liver>Muscle. (Table 6)

Table 1: Parameters for OWQI (Figures in mg/l)

Season / Parameters	Winter	Summer	Post Monsoon
Temperature	19	27.6	23.6
pH	6.8	7.1	6.9
Dissolved Oxygen	4.6	3.9	6.2
Total Hardness	141	172	124
Total Alkalinity	221	276	179

Table 2: OWQI and corresponding class and status of water quality

Class	OWQI Value	Status of Water
Heavily Polluted	0 - 24	Unsuitable for all Purpose
Poor	25 - 49	Special Treatment Needed
Fair	50 - 74	Needs Treatment (Filtration & Disinfection)
Good	75 - 94	Acceptable
Excellent	95 - 100	Pristine Quality

Table 3: OWQI result of Budhasagar pond

Season	Score	Status Of Water
Winter	71.6	Fair
Summer	65.83	Fair
Post Monsoon	84.66	Good

Table 4: Target hazard Quotient (THQ) (Adult)

Metal	Gill			Liver			Muscle		
	Summer	Post Monsoon	Winter	Summer	Post Monsoon	Winter	Summer	Post Monsoon	Winter
Mercury (Hg)	BDL	0.021	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Lead (Pb)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Iron (Fe)	0.048	0.038	0.044	0.086	0.16	0.006	0.007	0.016	0.006
Cadmium (Cd)	BDL	BDL	BDL	BDL	0.009	BDL	BDL	BDL	BDL
Chromium (Cr)	0.072	0.075	BDL	0.059	0.065	BDL	0.030	0.075	BDL

Table 5: Target hazard Quotient (THQ) (Children)

Metal	Gill			Liver			Muscle		
	Summer	Post Monsoon	Winter	Summer	Post Monsoon	Winter	Summer	Post Monsoon	Winter
Mercury (Hg)	BDL	0.006	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Lead (Pb)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Iron (Fe)	0.132	0.105	0.121	0.236	0.441	0.017	0.020	0.045	0.018
Cadmium (Cd)	BDL	BDL	BDL	BDL	0.025	BDL	BDL	BDL	BDL
Chromium (Cr)	0.199	0.207	BDL	0.163	0.181	BDL	0.084	0.208	BDL

Table 6: Metal Pollution Index

Tissue / Season	Gill	Liver	Muscle
Summer	3.97	4.29	2.30
Post Monsoon	2.52	3.16	3.23
Winter	3.24	2.20	2.21
Mean MPI	3.24	3.21	2.58

4. Conclusion

We are living in age of pollution and contamination. We can see ill effects of pollution everywhere from new born babies to old age persons in form of diseases and deformities. Food items are badly effected by pollution, Fishes are major source of food. Fishes lives in constant contact of water and accumulate different contaminant in their life time especially heavy metals.

The present study was carried out to measure contamination of heavy metals in sewage fed pond of urban Budha Sagar pond, This pond is used for fishery purpose, regular fishing activities are carried out in this pond. *Oreochromis mossambicus* commonly known as Tilapia is a major fish procured from this pond.

So present study is the first study to measure the magnitude of heavy metals found in fishes. In this study indexing approach is employed to quantify the effects of heavy metals on consumers, Two indices Target Hazard Quotient (THQ) and Metal pollution Index (MPI) for heavy metal and another Overall Water Quality Index (OWQI) for surface water quality

THQ for studied fish is under safe limit (THQ< 1.00) both for adults and children. When we see comparative chart of THQ both for adults and children, It is observed that THQ is somewhat higher for children. MPI shows cumulative effect of heavy metals on different organs. In this study gills are the organ which shows highest metal pollution index and muscles are least affected.

OWQI gives status of water quality, it is observed for three seasons and according to it water is fair and Good.

At the end we can say that there is no immediate threat to consumers who depends on fishes procured from this pond. But we observed presence of Fe, Cr, Cd, and Hg except Pb, which was not found in any sample. Surprisingly Cr, Cd, and even Hg showed their presence although they are in very trace amount but in future their amount may increase. So it is responsibility of concerned authorities and local civil society to protect this pond from sewage and other contamination. So we can save this pond for future generation.

5. References

1. Wang S, Shi X. Molecular mechanisms of metal toxicity and carcinogenesis. Mol Cell Biochem. 2001; 222:3-9.
2. Unger. Fundamentals of Ecotoxicology, CRC Press, Second Edition 2002, 27
3. Kalay M, Canli M. Elimination of Essential (Cu, Zn) and

Non- Essential (Cd, Pb) Metals from Tissues of a Freshwater Fish Tilapia Zilli, Turk. J. Zool. 2000; 24:429-436.
4. Liao CM, Ling MP. Assessment of human health risks for arsenic bioaccumulation in tilapia (*Oreochromis mossambicus*) and large-scale mullet (*Liza macrolepis*) from black foot disease area in Taiwan. Arch. Environ. Toxicol. 2003; 45:264-272.
5. Burger J, Gochfeld M. Perceptions of the risks and benefits of fish consumption: individual choices to reduce risk and increase health benefit, Environ. Res. 2009; 109:343-349.
6. Diez S. Human health effects of methylmercury exposure. Rev. Environ. Contam. Toxicol. 2008; 198. doi:10.1007/978-0-387-09646-9,
7. Diez S, Delgado S, Aguilera I, Astray J, Perez GB, Torrent M, *et al*. Prenatal and early childhood exposure to mercury and methylmercury in Spain, a high-fish-consumer country. Arch. Environ. Contam. Toxicol. 2009; 56:615-622.
8. Yousafzai AM, Chivers DP, Khan AR, Ahmad I, Siraj M. Comparison of heavy metals burden in two freshwater fishes *Wallago attu* and *Labeo dyocheilus* with regard to their feeding habits in natural ecosystem, Pak. J Zool. 2010; 42(5):537-544.
9. Asuquo FE, Ewa-Oboho IA, Asuquo EF, Udoh PJ. Fish species used as biomarkers for heavy metals and hydrocarbon contaminations for the cross river, Nigeria, Environmentalist. 2004; 24:29-37.
10. Adam SM. Biological indicators of aquatic ecosystem stress, American Fisheries Society, Bethesda, MD. 200, 2656.
11. Authman MMN, Zaki MS, Khallaf EA, Abbas HH, Use of Fish as Bio-indicator of the Effects of Heavy Metals Pollution. J Aquac Res Development 2015; 6:328. doi:10.4172/2155-9546.1000328.
12. Jabeen F, Chaudhry AS. Environmental impacts of anthropogenic activities on the mineral uptake in *Oreochromis mossambicus* from Indus River in Pakistan, Environ. Monit. Assess. 2010; 166:641-651.
13. Shinn CA, Dauba F, Grenouillet G, Guenard G, Lek S. Temporal variation of heavy metal contamination in fish of the river lot in southern France, Ecotoxicol. Environ. Saf. 2009; 72:1957-1965.
14. Abida Begum, Harikrishna S, Irfanulla Khan. A study of Fertilizer application and irrigation effects on paddy crop fields near Cauvery River Basin, Nature Environment and pollution technology jour. 2009; 8(1).
15. Abida Begum, Harikrishna S, Irfanulla Khan, Veena K. Flouride removal studies using natural materials, Environmental pollution control Journal. 2008; 11(3):64-67. 972-1541.
16. Clesceri LS. Standard methods for the examination of water and waste water. In Collection and Preservation of Samples and Metals (eds Arnold, E. Greenbergy and Eaton, A. D.), APHA, AWWA, WEF, Washington, DC, 1998.
17. Singh S, Ghosh NC, Krishan G, Galkate R, Thomas T, Jaiswal RK. Development of an Overall Water Quality Index (OWQI) for Surface Water in Indian Context. Curr. World Environ. 2015, 10(3).
18. USEPA. Risk based Concentration Table. United State Environmental Protection Agency, Washington, DC, 2010.
19. Handbook on fisheries statistics, ministry of agriculture & farmers welfare, Govt. of India Table J, 2014.
20. Usero J, Morillo J, Gracia I. Heavy metal concentrations in molluscs from the Atlantic coast of southern Spain, Chemosphere. 2005; 59:1175-1181.

Indian J Sci Res. 13 (2): 130-134, 2017

ISSN: 0976-2876 (Print)
ISSN: 2250-0138 (Online)

UPTAKE OF HEAVY METALS BY *Oreochromis mossambicus* FROM SEWAGE FED BUDHA SAGAR POND OF RAJNANDGAON, CHHATTISGARH

YASER QURESHI[a1] AND KANTI CHOUBEY[b]

[a]Department of Zoology, Govt. College Khertha, Distt. Balod, Chhattisgarh, India
[b]Department of Zoology, Govt. V Y T. Auto. College, Durg, Chhattisgarh, India

ABSTRACT

Heavy metals have a tendency to accumulate in living system. Investigations on the bioaccumulation of heavy metals (Fe, Pb, Cr, Cd and Hg) are observed in Muscles, Gills and Liver of fish "*Oreochromis mossambicus*". The results revealed that heavy metals tend to accumulate in different tissues of fish. The accumulation is observed in tissues such as gills, liver and muscle. All the tissues investigated shows accumulation of Fe and Cr. Only one sample of gills from all tissues investigated shows presence of Hg. Their pattern of accumulation in investigated tissues was Fe > Cr > Hg > Cd. Pb did not found in any sample. Fe shows maximum tendency of accumulation. Fe accumulation is found in order of Liver > Gill >Muscle. Cr is second most abundant metal. It shows maximum tendency to accumulate in muscle than gills and after that in liver. Although Fe is found in higher concentration but except Cr other metals are found in limit prescribed by FSSAI/ FAO/ WHO.

KEYWORDS: Heavy Metals, Bioaccumulation

The pollution of the aquatic environment with heavy metals has become a worldwide concern during recent times because they are persistent and bioaccumulative in nature and have toxic effects on organisms (MacFarlane and Burchett, 2000).

Metals are omnipresent in nature and with increasing industrialization the threat of metal poisoning is increasing rapidly. A metal in trace amount less than 0.01 percent is vital and in the absence of that metal an organism is unable to sustain however the same trace metals may prove to be toxic when the concentration level exceeds the threshold limit required for proper functioning by increase in forty to two hundred times. (Venugopal and Luckey, 1975). Metals are broadly categorized as essential and non essential as far as human health is concerned. Some metals are essential for functioning biological activity of body. Heavy metals enter fish through routes like food particles, gills, water and skin, flows into the blood and are carried to either a storage point in body or to the liver for its transformation or storage.

Amid environmental pollutants, heavy metals are of particular concern, due to their possible noxious effect and ability to bioaccumulate in aquatic ecosystems (Censi *et al.*, 2006). Heavy metals in aquatic organisms, along with bioaccumulation have been extensively studied in diverse places around the globe (Amarasiri 2006; Dural 2007; Teodorovic *et al.* 2000; Yilmaz *et al.* 2007; Hamilton, 2008).

Heavy metals are present in the aquatic environment where they bio accumulate in the food chain. Accumulation occurs in the tissues of aquatic animals and may become toxic for fishes and also for people depending on them when it reaches a certain high level. An example of an environmental tragedy due to heavy metal occurred in 1952 in the vicinity of the Japanese coast of Minimata. A previously unknown Minimata disease erupted and spread rapidly and became epidemic. It was caused due to mercury compounds (Vandecasteele & Block, 1991). It was well known case where fishermen and natives from vicinity of Minimata Bay and Jintsu River died or suffered from mercury and cadmium poisoning, respectively. From this point of time understanding of heavy metals in aquatic living being particularly fishes became important for human health. (Ravera, 1979; Cid *et al.* 2001).

According to Teodorovic *et al.* (2000) and Abdullah (2008) heavy metals studies in aquatic living system give an idea that heavy metals in aquatic living system could be more reliable water quality indicator than chemical analysis of any other indicator. Fishes can be considered as one of the ideal organism in freshwater systems for the estimation of metal pollution level (Rashed, 2001). Fish is significant indicators in freshwater systems for the estimation of heavy metal pollution level because it is an important food source for human and it is organisms of high trophic level in the aquatic food chain (Abdel Baki *et al.*, 2011; Agah *et al.*, 2009; Blasco *et al.*, 1998 and Rashed 2001)

MATERIALS AND METHODS

Fish *Oreochromis mossambicus*, Mean weight 100 gm, were collected from the sewage fed pond. Procured fishes were directly kept in pre-cleaned polythene bags, sealed and stored in an ice box for further examination. The present study was conducted to investigate the accumulation of heavy metals (Fe, Cd, Hg, Cr, and Pb) in various tissues (gills, liver and muscle). The separated organs were put in petridishes to dry at 120° C until reaching a constant weight. The separated organs were placed into digestion flasks and ultrapure Conc. HNO_3 and H_2O_2 (1:1 v/v) was added. The digestion flasks were heated to 130° C until dissolution, diluted with water and analyzed for heavy metal concentration using atomic absorption Spectrometer. Heavy metals testing process was conducted at NABL recognized testing lab (Abida Begum *et al.* 2008)

RESULTS AND DISCUSSION

The aquatic environment of the sewage fed pond is subjected to many stressful factors, heavy metals are one of the pollutants that reach the aquatic habitat and also a matter of concern. For this reason, this work is projected to examine the hazardous effects of heavy metal on one of the most common fish species *Oreochromis mossambicus* in the sewage fed pond budha sagar of Rajnangaon (C.G.) In this study level of heavy metals in different tissues of *Oreochromis mossambicus* was examined.

Results of present study indicate that in general Liver was the most affected organ where maximum accumulation of heavy metals takes place followed by Gill & Muscles, amongst the heavy metals Fe accumulated in higher concentration in all tissues. Malik *et al.* (2010) evaluated heavy metal in tissues of *L. rohita* and observed accumulation of heavy metals was in the sequence liver > gills > muscles.

Chatterjee *et al.* (2006) studied *Oreochromis* spp. at East Calcutta Wetlands and observed maximum concentration of heavy metals in Liver and least accumulation in muscles. Giripunje *et al.* (2014) studied heavy metal pollution status in *Oreochromis mossambicus* of Futala, Gandhisagar and Ambazari lakes of Nagpur city and found higher level of Pb, Cd, Fe in muscles of fish.

In this study Fe was the most plentiful heavy metal in all tissues of *Oreochromis mossambicus*, its highest value was observed in liver followed by gill than muscle. (Table 1)

Shrivastava *et al.* (2003) investigated shahpura lake of Bhopal and found higher level of Fe in fish tissues. Different researchers concluded that metal concentrations were always lowest in the muscle and highest in the liver and gill. This may be due to their physiological function in fish metabolism. It has been shown that target tissues of heavy metals are metabolically active ones, like the liver and gill. Therefore, metal accumulation in these tissues occur higher level compared to other tissues like the muscle, where metabolic activity is relatively low (Heath, 1987; Langston, 1990; Roesijadi and Robinson, 1994; Canli *et al.* 1998)

Cr was the most abundant metal after Fe. Gill shows higher concentration than Liver and least in muscle but if we see individual season wise higher concentration it was high in muscle in post monsoon season. As far as higher concentration of Cr is concerned it is comparatively higher in relation to FSSAI, food safety and standards regulation given for refined sugar (20 ppb) and gelatin (10 ppb). Sample of post monsoon season of gill shows presence of Hg and sample of post monsoon season of liver shows presence of Cd except this these two metals are not found in any sample. Pb was not found in any sample. Nandi *et al.* (2012) studied accumulation of Cd & Pb in *labeo rohita* and *catla catla* of east Kolkata wetland and found higher level in liver and muscle of both fishes. Arain *et al.* (2008) studied *Oreochromis mossambicus* of polluted Manchar Lake and found higher concentration of Fe, Cr, Pb in muscles of fish. Trace amount of Cd and Hg in two samples indicate that these metals are entering in food chain. Although Cd and Hg are in trace amount and below the permissible limit but in future they may increase in concentration(Table 2& Figure 1-4).

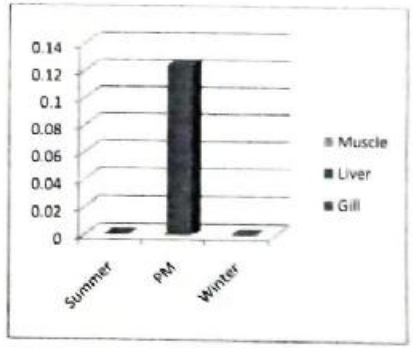

Figure 1: Hg in different Season (Con. In mg/kg)

*Corresponding author

Govt. College Khertha Distt. Balod (C.G.)

Principal,
Govt. College, Khertha
Distt. Balod (C.G.)

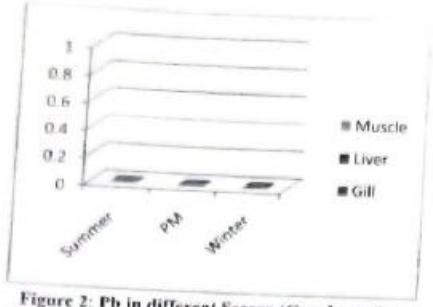

Figure 2: Pb in different Season (Con. In mg/kg)

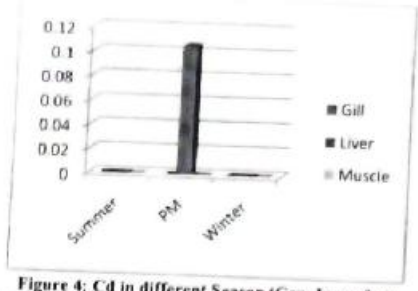

Figure 4: Cd in different Season (Con. In mg/kg)

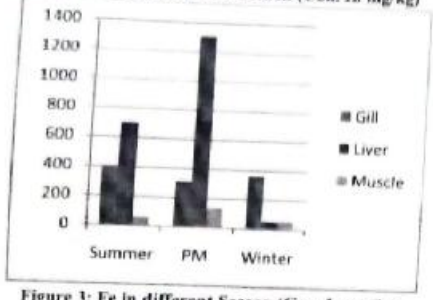

Figure 3: Fe in different Season (Con. In mg/kg)

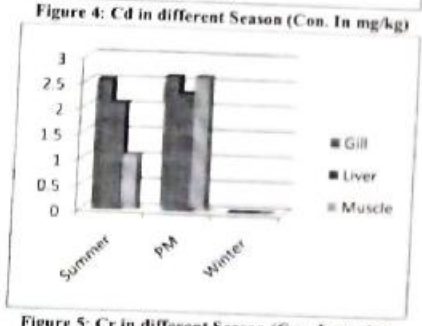

Figure 5: Cr in different Season (Con. In mg/kg)

Table 1: Heavy metal concentration in different Tissues

Metal	Gill			Liver			Muscle		
	Summer	Post Monsoon	Winter	Summer	Post Monsoon	Winter	Summer	Post Monsoon	Winter
Mercury (Hg)	BDL	0.124	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Lead (Pb)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Iron (Fe)	391	312	360	700	1308	51.8	60.6	135	53.8
Cadmium (Cd)	BDL	BDL	BDL	BDL	0.106	BDL	BDL	BDL	BDL
Chromium (Cr)	2.53	2.63	BDL	2.08	2.30	BDL	1.07	2.64	BDL

Values expressed in mg/kg=ppm, d.w, BDL- Below Detection Limit

Table 2: Mean concentration of heavy metals in different tissues

Metal	FSSAI	Codex FAO/WHO	BIS 10500 for Water Mg/l	EU	Gill	Liver	Muscle
Pb	2.5	0.3	0.01	0.30	0 ±0	0 ±0	0 ±0
Cd	1.5	2 (bivalve)	0.003	0.050	0±0	0.035±0.061	0 ±0
Hg	1.0	0.5	0.001	0.50	0.0413±0.071	0 ±0	0 ±0
Cr	10 ppb (Gelatin)	-	0.05	-	1.72 ±1.49	1.46±1.26	1.23±1.32
Fe	-	-	0.3	-	3.54E2±3.981	6.86E2±6.28E2	8.33E1±4.48 E1

Values expressed as Mean±SD,d.w., Unit mg/kg=ppm

CONCLUSION

This study was carried out to find out presence of heavy metal concentrations in *Oreochromis massambicus* from sewage fed pond, and its potential health risk for local population due to their consumption. The majority of heavy metal concentrations in the fish samples analyzed were within the permitted limits set by various authorities except Fe and Cr which are found in higher concentration and may pose health risks for the local population due to high consumption of fish.

Budha sagar pond is domestic sewage fed pond it has no connection of industrial or agriculture waste water but surprisingly, amount of non essential heavy metal Hg and Cd is seen in trace amount. Budhasagar is now shrinking in area due to encroachments and land filling. It is also polluted by sewage water so this is need of the hour to make effort to save this historical urban wetland.

REFERENCES

Abdel Baki A.S., Dkhil M.A., Al Quraishy S., 2011. Bioaccumulation of some heavy metals in tilapia fish relevant to their concentration in water and sediment of Wadi Hanifah, Saudi Arabia. Afr. J. of Biot., **10**:2541–2547.

Abdullah M.H., 2008, Heavy metals (Cd, Cu, Cr, Pb and Zn) in Meretrix meretrix roding, water and sediments from estuaries in Sabah, North Borneo. International Journal of Environmental & Science Education, **2**:69-74.

Abida Begum, Harikrishna S., Khan I. and Veena K., 2008. Flouride removal studies using natural materials, Envi. poll. con. **J., 11**(3):64-67.

Adam S.M., 2002. Biological Indicators of Aquatic Ecosystem Stress. American Fisheries Society, Bethesda: 656.

Agah H., Leermakers M., Elskens M., Fatemi S., Baeyens W., 2009. Accumulation of trace metals in the muscles and liver tissues of five fish species from the Persian Gulf. Environ Monit Assess, **157**:499–514.

Amaranemi S., 2006. Distribution of pesticides, PAHs and heavy metals in prawn ponds near Kolleru lake wetlands, India. Environment International, **32**:294-302.

Arain M.B., Kazi T.G., Jamali M.K., Jalbani N., Afridi H.I. and Shah A., 2008. Total Dissolved and Bioavailable Elements in Water and Sediment Samples and Their Accumulation in *Oreochromis mossambicus* of Polluted Manchar Lake. Chemosphere, **70**:1845–1856.

Blasco J., Rubio J.A., Forja J., Gomez Parra A. and Establier R., 1998. Heavy metals in some fishes of the mugilidae family from salt pounds of Cadiz Bay SW Spain. Ecotox Environ. Res., **1**:71–77.

Canli M. and Kalay M., 1998. Levels of heavy metals (Cd, Pb, Cu, Cr and Ni) in tissues of *Cyprinus carpio, Barbus capito* and *Chondrostoma regium* from the Seyhan River, Turkey. Turkish J. Zoology, **22**:149-157.

Censi P., Spoto S.E., Saiano F., Sprovieri M., Mazzola S., Nardone G., Di Geronimo S.I., Punturo R. and Ottonello D., 2006. Heavy metals in coastal water systems. A case study from the northwestern Gulf of Thailand. Chemosphere, **64**:1167–1176.

Chatterjee S., Chattopadhyay B. and Mukhopadhyay S.K., 2006. Trace metal distribution in tissues of cichlids (*Oreochromis niloticus* and *O. massambicus*) collected from wastewater-fed fishponds in East Calcutta Wetlands, a Ramsar site. Acta Ichthyol. Piscat., **36**(2):119-125.

Cid B.P., Boia C., Pombo L. and Rebelo E., 2001. Determination of trace metals in fish species of the Ria de Aveiro (Portugal) by electro thermal atomic absorption spectrometry. Analytical Letters, **33**(15): 3333–3341.

Dural M., G.Z., 2007. Investigation of heavy metal levels in economically important fish species captured from the Tuzla lagoon. Food Chemistry, **102**:415-421.

Giripunje S., 2014. Effect of idol immersion on water quality and Tilapia fish in Futala, Gandhisagar and Ambazari lakes of Nagpur, India. Springer Plus. **3**: 669.

Hamilton M.A., 2008. Determination and comparison of heavy metals in selected seafood, water, vegetation and sediments by inductively coupled plasma-optical emission spectrometry from an industrialized and pristine waterway in Southwest Louisiana. Microchemical Journal, **88**: 52-55.

Heath A.G., 1987. Water pollution and fish physiology. CRC press, Florida: 245.

Langston W.J., 1990. Toxic effects of metals and the incidence of marine ecosystems. In Furness RW, Rainbow PS, editors. Heavy Metals in the Marine Environment. CRC Press, New York : 256.

MacFarlane G.B. and Burchettt M.D., 2000. Cellular distribution of Cu, Pb, and Zn in the Grey Mangrove Avicemnia marina (Forsk.). Vierh Aquatic Botanic, **68**:45–59.

Malik N., Biswas A.K. and Qureshi T.A., 2010. Bioaccumulation of heavy metals in fish tissues of a freshwater lake of Bhopal. Environ Monit Assess. **160**: 267.

Nandi S., 2012. Lead and Cadmium accumulation in fresh water fishes *Labeo rohita* and *Catla catla* Journal of Environmental Research And Development, **6**(3A): 748.

Rashed M.N., 2001. Monitoring of environmental heavy metals in fish from Nasser lake. Environ Int., 27:33.

Ravera O., 1979. Biological aspects of freshwater pollution. Pergamon press, New York :129–165.

Roesijadi G. and Robinson W.E., 1994. Metal regulation in aquatic animals Mechanism of uptake, accumulation and release. In: Malins DC, Ostrander GK, editors. Aquatic Toxicology (Molecular, Biochemical and Cellular Perspectives), Lewis Publishers, London : 539.

Shrivastava P., Saxena A. and Swarup A., 2003. Heavy metal pollution in a sewage fed lake of Bhopal, (M. P.) India. Lakes & Reservoirs: Research and Management, **8**:1–4.

Teodorovic N., Djukic S., Maletin B., Miljanovic and Jugovac N., 2000. Metal pollution index: proposal for freshwater monitoring based on trace metal accumulation in fish. Tiscia, **32**: 55-60.

Vandecasteele C. and Block C.B., 1991. Modern methods for trace element determination, John Wiley & Sons Inc, New York: 259.

Venugopal B. and Luckey T.D., 1975. Toxicology of non- radioactive heavy metals and their salts In : Heavy Metal Toxicity: safety and Hormology (Eds.) Luckey T.D., Venugopal B. and Hutchenson D. Stuttgert. Thiemep. 4-73.

Yilmaz F., Ozdemir N., Demirak A. and Tuna A.L., 2007. Heavy metal levels in two fish species *Leuciscus cephalus* and *Lepmis gibbosus*. Food Chemistry, **100**:830-835.

Int. J. Pharmacol. Bio. Sci. Vol. 9 (1) 2015, 59-64
ISSN - 0973-6808

STUDY OF ICHTHYOFAUNAL BIODIVERSITY OF KHARKHARA RESERVOIR, DISTT. BALOD, CHHATTISGARH

Choubey Kanti [1]* and **Qureshi Yaser** [2]
[1] Professor & Head, Deptt. Of Zoology,
G.V.Y.T. College, **DURG** (CG)
[2] Asstt. Professor, Deptt. Of Zoology,
Govt. College, **KHERTHA**, Distt. Balod (CG)

The present study deals with the fish biodiversity of of Kharkhara reservoir distt. Balod, Chhattisgarh. The aim of the study is proper documentation of fish fauna of Kharkhara reservoir. Freshwater fish biodiversity is poorly studied. There is no proper documentation on freshwater fish resources of Central India especially Chhattisgarh state. Fishes are the unique creature of animal world. It is one of the good food source and able to combat problem of malnutrition. Balod district is geologically located at plain of Chhattisgarh. Kharkhara reservoir is constructed on Kharkhara river. Kharkhara river is tributary of Sheonath river both river comes under Mahanadi drainage system.
In this study mainly edible fished are found. Total 48 species from different sampling station were recorded. Recorded fish species were classified in 6 order, 15 families and 32 Genera. Order Cyprniformes comprised of 5 families Cyprinidae, Siluridae, Bagridae, Saccobranchidae and Clariidae were found as a dominant group. The main fishes found are Catla catla, Cirrhinus mrigala, Labeo rohita, Notopterus notopterus, Notopterus chitala, Wallago attu, Mastacembelus armatus, Puntius ticto, Ompok pabda, Mystus seenghala, Cyprinus carpio, Clarius batrachus and Oreochromis mossambicus.

INTRODUCTION

Fish exhibit the greatest biodiversity of the vertebrates with over 22,000 species. Of these, about 58 percent are marine, 41 percent are freshwater species, and 1 percent move back and forth between salt and freshwater.

India has rich biological heritage that qualifies it as one of the mega diversity nations of the World (Gadgil, 1996). The diversity within the fresh water ecosystem has a great importance in terms of the livelihood and the economic importance of the people living around it. Accordingly the relation between the biodiversity and human well-being is inter related.

Biodiversity is the degree of variation of life form within a given ecosystem. Biodiversity is essential for stabilization of ecosystem, protection of overall environmental quality for understanding intrinsic worth of all species on the earth. India is very rich in

* Corresponding Author

biodiversity India supports about 10 % of the world's biological diversity with just 2 % of world land area.
Balod district is located at 20.73 degree North and 81.2 degree East. It has an average elevation of 324 meters (1063 feet above Mean Sea Level). Balod is situated in the centre of Chhattisgarh. Total Area of Balod district is 352700 Hectares.

Kharkhara river originates from hills situated in Dalli Rajahara in the south-west of the District. This river joins Sheonath river after covering a distance of 90 K.M towards north-east. In year 1965-66, Kharkhara reservoir was constructed to fullfill the water requirement of Bhilai Steel Plant and Industry. It covers an area of 66,000 ha at 1312 msl, with a maximum depth of 49.92 m and a drawdown of 18.89 m.

Table – 1

Family wise speciescomposition

S.No.	Order	Family	No. of Fish Species	Species Composition %
1.	Clupeiformes	Clupeidae	1	2.63
		Notopteridae	2	5.26
2.	Cypriniformes	Cyprinidae	20	52.63
		Siluridae	3	7.89
		Bagridae	6	15.78
		Saccobranchidae	1	2.63
		Clariidae	1	2.63
3.	Beloniformes	Belonidae	1	2.63
4.	Ophiocephaliformes	Ophiocephalidae	4	10.52
5.	Perciformes	Centropomidae	2	5.26
		Nandidae	1	2.63
		Anabantidae	1	2.63
		Gobiidae	1	2.63
		Cichlidae	1	2.63
6.	Mastacembeleformes	Mastacembelidae	3	7.8

Table – 2

Abundance of Fishes in Kharkhara Reservoir

S.No.	Family	Genus & Species	IUCN Status
Order – Beloniformes			
1.	Belonidae	Xenentodon cancila	LC
Order – Perciformes			
2.	Centropomidae	Chanda nama	LC
3.	Centropomidae	Chanda ranga	LC
4.	Nandidae	Nandus nandus	LC
5.	Anabantidae	Anabas testudineus	DD
6.	Gobiidae	Glossogobius giuris	LC
7.	Cichlidae	Oreochromis mossambicus	NT
Order – Cypriniformes			
8.	Cyprinidae	Aspidoparia morar	LC
9.	Cyprinidae	Catla catla	LC
10.	Cyprinidae	Cirrhinus mrigala	LC
11.	Cyprinidae	Cirrhinus reba	LC
12.	Cyprinidae	Danio devario	LC
13.	Cyprinidae	Garra gotyla	LC
14.	Cyprinidae	Labeo bata	LC
15.	Cyprinidae	Labeo calbasu	LC
16.	Cyprinidae	Labeo rohita	LC
17.	Cyprinidae	Osteobrama cotio	LC
18.	Cyprinidae	Oxygaster ba	LC
19.	Cyprinidae	Puntius sara	LC
20.	Cyprinidae	Puntius sp	LC
21.	Cyprinidae	Puntius t	LC

22.	Cyprinidae	Barbora daniconius	LC
23.	Cyprinidae	Tor tor	NT
24.	Cyprinidae	Hypophthalmichthys molitrix	NT
25.	Cyprinidae	Cyprinus carpio	VU
26.	Cyprinidae	Cyprinus specularis	VU
27.	Cyprinidae	Ctenopharyngodon idella	NE
28.	Siluridae	Ompok bimaculatus	NT
29.	Siluridae	Ompok pabda	NT
30.	Siluridae	Wallago attu	NT
31.	Bagridae	Mystus cavasius	LC
32.	Bagridae	Mystus vittatus	LC
33.	Bagridae	Mystus sp	LC
34.	Bagridae	Mystus seenghala	NE
35.	Bagridae	Rita rita	LC
36.	Bagridae	Bagarius bagarius	NT
37.	Saccobranchidae	Heteropneustes fossilis	LC
38.	Clariidae	Clarias batrachus	LC
Order – Ophiocephaliformes			
39.	Ophiocephalidae	Channa gachua	LC
40.	Ophiocephalidae	Channa marulius	LC
41.	Ophiocephalidae	Channa punctatus	LC
42.	Ophiocephalidae	Channa striatus	LC
Order – Clupeiformes			
43.	Clupeidae	Gudusia chapra	LC
44.	Notopteridae	Notopterus notopterus	LC
45.	Notopteridae	Notopterus chitala	LC
Order – Mastacembeleiformes			
46.	Mastacembelidae	Macrognathus aculeatus	NE
47.	Mastacembelidae	Mastacembelus pancalus	LC
48.	Mastacembelidae	Mastacembelus armatus	LC

Abbreviations: IUCN- International Union for Conservation of Nature, DD- Data Deficient, LC- Least Concern, VU- Vulnerable, NT- Nearly Threatened, NE- Not Evaluated

MATERIAL AND METHODS

The fishes were collected from Kharkhara reservoir and from local fisherman operating in this area. Fisherman generally uses many types of nets like gill nets, cast net, drag net etc.

Fishes were preserved in 10 % formalin solution and identified with the help of standard keys and books (Day 1978, Jayaram 1999, Talwar & Jhingran 1991, Shrivastava, G. J 1968).

Study period : This study was conducted between Nov. 2013 to Oct. 2014.

RESULTS AND DISCUSSION

Here fish species are facing tremendous stress due to over and indiscriminate fishing methods like small mesh sized net, use of dynamite and catching juvenile stage of fishes. It may leads to destruction of biodiversity in this area.

The scarcity of information of fish fauna is major drawback in preservation of fish biodiversity in particular area thus there is a need of knowing fish fauna of freshwater habitat which will help in planning scientific method for there effective exploitation of fish production (Srikanth *et al.*).

Some common species are found to be distributed all along the rivers like Rasbora spp., Puntius spp., Danio spp. (Bhat 2003). Much has been stated about declining fish biodiversity and its conservation issues in Indian River Systems (Menon, 1989; Dubey, 1994; Anon, 1995; Kapoor et al., 1998). Fish fauna of Chhattisgarh is scarcely studied and needed to be thoroughly studied.

During the entire study period, total of 48 fish species belonging to 15 families and 32 Genera were recorded. Cyprinidae was the largest dominant family contributing 20 species (52.63%). Bagridae formed the subdominant family contributing 6 species (15.78%) and the rest of the families followed order of abundance.

As far as IUCN conservation status is concerned 35 species (72.91 %) comes under Least Concern (LC) category, 7 species (14.58 %) are Nearly Threatened (NT), 2 species (4.16 %) are Vulnerable (VU), and 3species (6.25 %) are Not Evaluated (NE) and 1 species data deficient (DD)

CONCLUSION

The result of this study shows that Kharkhara reservoir is prosperous in biodiversity of fishes. The Kharkhara reservoir is manmade water body mainly constructed for irrigation purpose fish culture is its byproduct. It may yield high production of fishes if fish culture is properly done in this reservoir. If this water body is properly utilized for the fish culture it may become poverty eradication tool for local fisherman community. So it is the need of the hour to focus proper attention to this types of water bodies. It may be a fourfold effect on society viz. irrigation, water recharging, poverty eradication and combating problem of malnutrition.

ACKNOWLEDGEMENT

We are thankful to local fisherman community of adjoining areas of Kharkhara reservoir who helped us.

REFERENCES

Sustaining America's Aquatic Biodiversity Freshwater Fish Biodiversity and Conservation, virginia cooperative extension publication, 420-525 (2009)

Ehrlich P.R. and Wilson E.O. Biodiversity studies science and policy, *Science* 253, 758-762 (1991)

Day F., Fishes of India, Willium Dawson's, London U. K. reprint edition, Today and Tomorrow Book agency, Delhi, 1(2) (1878)

Shrivastava G.J., Fishes of Eastern Uttar Pradesh, Vishwavidyalaya Prakashan, Varanasi (1968)

Talwar P.K. and Jhingran K.C., Inland fishes of India and adjacent countries, 3 (1 and 2) Oxford and IBH Co. Pvt. Ltd, New Delhi (1991)

Srikanth K., Ramu G., Benarjee G., The study of fish diversity of Rammappa Lake, Warangal district, Andhra Pradesh, India. *J. Aqua. Biol.* 24(2), 1-4 (2009)

Bhat A., Diversity and composition of freshwater fishes in the river systems of Central Western Ghats, India. *Environmental Biology of Fishes* 68, 25–38 (2003)

Menon AGK, Conservation of Ichthyofauna of India, Conservation and Management of Inland Capture Fisheries Resources of India (Editors: Jhingran AG, Sugunan VV eds.) The Inland Fisheries Society of India. pp. 25-33 (1989)

Dubey GP, Endangered, Vulnerable and Rare Fishes of West Coast River Systems of India, In Threatened Fishes of India. NATCON, 4, 77-95 (1994)

Anon Perspective Plan of NBFGR (Indian Council of Agriculture Research) (1995)

Kapoor D, Mahanta PC, Pande AK Ichthyodiversity of India, Status and Conserv tion, *In Fish Gen. Biodiversity Conserv. Nat. Pub.*, pp. 47-53 (1998)

Hora S.L.,Notes on fishes in the Indian Museum, On a collection of fish Bailad range, Bastar State, *Central Provinces, Record of Indian Museum*, 40(3), 237-241 (8)

Hora S.L., 1940. On a collection of fish from the head waters of the Mahanadi Riv Raipur district, C.P. Record of Indian Museum, 42(2), 365-375 (1940)

Sen, T.K., Fauna of Indravati Tiger Reserve, Conservation Area Series, Zoologic Survey of India, 6, 61-70 (1995)

Sharma, H.S., Freshwater Fishes. In Fauna of Madhya Pradesh (including Chhat sgarh), State Fauna Series, 15(1): 147-244 (Published by Director, Zool. Surv. India, Kolkata (2007)

www.fishbase.org, Fish base organization (2004)

International Research Journal of Biological Sciences ISSN 2278-3202
Vol. 2(2), 21-24, February (2013) Int. Res. J. Biological Sci

Study of Ichthyofaunal Biodiversity of Rajnandgaon town, CG, India

Choubey K.[1] and Qureshi Y.[2]
[1]Deptt. of Zoology, G V Y T. College, Durg, CG, INDIA
[2]Deptt. of Zoology, Govt. College, Khertha, Distt. Balod, CG, INDIA

Available online at: www.isca.in
Received 8th November 2012, revised 19th November 2012, accepted 2nd December 2012

Abstract

Freshwater fish biodiversity is poorly studied. There is no proper documentation on freshwater fish resources of Rajnandgaon. This study aims to prepare database of fishes found in Rajnandgaon town. Fishes are the unique creature of animal world. It is one of the good food source and is able to combat problem of malnutrition. Rajnandgaon district is basically a tribal district. This is the first study to catalogue species of fishes found in Rajnandgaon town. Rajnandgaon is centrally situated in Chhattisgarh state. Sheonath river is major river of Chhattisgarh having its origin in Rajnandgaon district. Total 45 species from different sampling station were recorded. Recorded fish species were classified in 6 order, 15 families and 32 Genera. Order Cypriniformes comprised of 5 families Cyprinidae, Siluridae, Bagridae, Saccobranchidae and Clariidae were found as a dominant group. The main fishes found are Catla catla, Cirrhinus mrigala, Labeo rohita, Cyprinus carpio, Clarius batrachus and Oreochromis mossambicus

Keywords: Biodiversity, sheonath river, malnutrition, freshwater.

Introduction

Biodiversity is the degree of variation of life form within a given ecosystem. Biodiversity is essential for stabilization of ecosystem, protection of overall environmental quality for understanding intrinsic worth of all species on the earth[1]. India is very rich in Biodiversity India supports about 10 % of the world's biological diversity with just 2% of world land area.

Fishes are the important group of animals world contributing to the biodiversity of animals. Primarily fishes are used as a food source. Many vital vitamins and fatty acids are found in fishes so sometimes it is referred by doctors as a good food source.

Rajnandgaon district is situated between 20.07" North to 22.2"9 North latitude and 80.2 East to 81.2"4 East longitude. Sheonath river which is major river of Chhattisgarh is originated from Panabaras hills of Mohla tehsil of Rajnandgaon district. Major part of Rajnandgaon district is connected with Mahanadi river system flowing towards east to bay of Bengal. Sheonath river is major tributary of Mahanadi river. It is longest river of Chhattisgarh, total length is 290 K.M. It confluences with Mahanadi river at sonlaharsi of Distt Janjgir Champa.

Material and Methods

The fishes were collected from Sheonath river at mohara station and from local fisherman and also from local cooperative societies operating in different ponds of Rajnandgaon town. Fisherman generally use many types of nets like gill nets, cast net, drag net etc.

Fishes were preserved in 10 % formalin solution and identified with the help of standard keys and books[2-4].

Study period: This study was conducted between Oct. 2011 to Sep. 2012.

Results and Discussion

As per the available records no scientific study on the Fish fauna availability has been conducted here so far. In India, few studies have been initiated to document the fish diversity and assemblage[5]. Much has been stated about declining fish biodiversity and its conservation issues in Indian River systems[6-9]. Fish fauna of Chhattisgarh is scarcely studied and needed to be thoroughly studied[10-15].

During the entire study period, total of 45 fish species belonging to 15 families and 32 Genera were recorded, Cyprinidae was the largest dominant family contributing 20 species (44.44%); Bagridae formed the subdominant family contributing 5 species (11.11%) and the rest of the families followed order of abundance (table-1 and table-2).

As far as IUCN conservation status[14] is concerned 34 species (75.5 %) comes under least concern (LC) category, 6 species (13.33 %) are nearly threatened (NT), 2 species (4.44 %) are vulnerable (VU) and 2 species are (4.44 %) not evaluated (NE).

Conclusion

The result of this study shows that Rajnandgaon town is prosperous in biodiversity of fishes. Fish culture is mainly carried out by the cooperative fisheries societies. Carps are the major group which is cultivated, practice of composite culture of Labeo rohita, Cirrhinus mrigala and Catla catla is generally followed. Fish culture is only source of income generation for the local fisherman. They lack scientific knowledge of fish culture. if proper scientific knowledge is implemented problem of unemployment and malnutrition will be eradicated from this area.

Table – 1
Family wise species composition

S. No.	Order	Family	No. of Fish Species	Species Composition %
1.	Clupeiformes	Clupeidae	1	2.22
		Notopteridae	2	4.44
2.	Cypriniformes	Cyprinidae	20	44.44
		Siluridae	2	4.44
		Bagridae	5	11.11
		Saccobranchidae	1	2.22
		Clariidae	1	2.22
3.	Beloniformes	Belonidae	1	2.22
4.	Ophiocephaliformes	Ophiocephalidae	4	8.88
5.	Perciformes	Centropomidae	2	4.44
		Nandidae	1	2.22
		Anabantidae	1	2.22
		Gobiidae	1	2.22
		Cichlidae	1	2.22
6.	Mastacembeleformes	Mastacembelidae	2	4.44

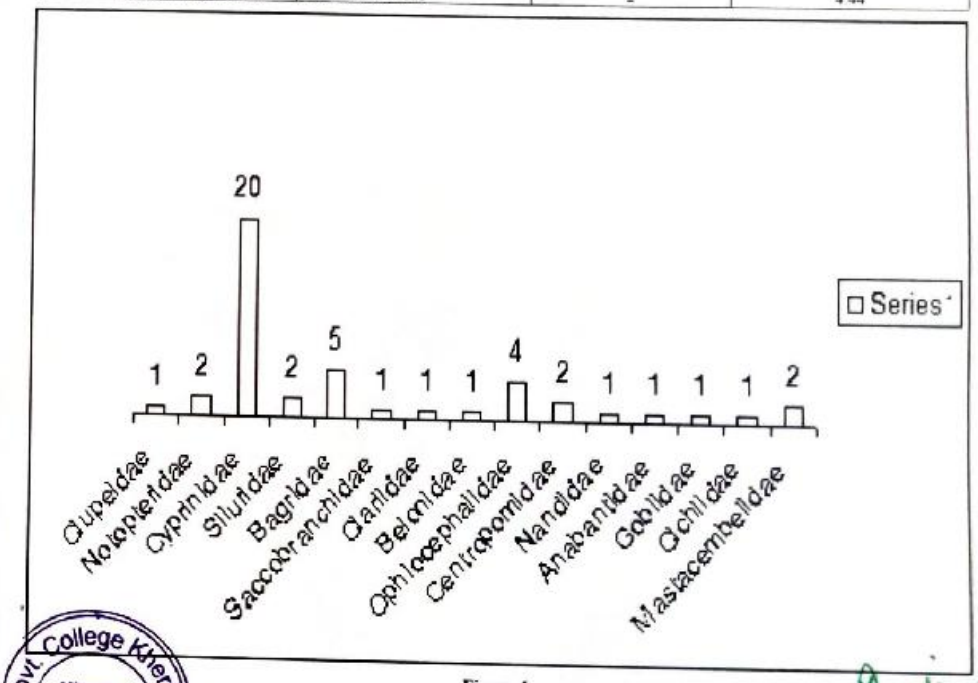

Figure-1
Family wise species diversity and abundance of fishes

International Research Journal of Biological Sciences ISSN 2278-3202
Vol. 2(2), 21-24, February (2013) Int. Res. J. Biological Sci

Govt. College Khertha Khertha Distt. Balod Balod (C.G.)
Principal, Govt. College, Khertha Distt. Balod (C.G.)

IJESRT

ISSN: 2277-9655
Impact Factor: 4.116

CERTIFICATE OF ACHIEVEMENT

This certificate is issued on behalf of publication of your manuscript at IJESRT Volume 6 Issue 2, February 2017

This is to certify that "Dr. (Smt.) Rubina Alvi" has published manuscript at

"International Journal of Engineering Sciences & Research Technology"

Manuscript title:

"SELECTIVE EXTRACTION AND SPECTROPHOTOMETRIC DETERMINATION OF MOLYBDENUM (v) WITH N-HYDROXY – N (2-METHYL) PHENYL N' (2- FLUORO) BENZAMIDINE HYDROCHLORIDE AND THIOCYANATE."

Date Issued: 10-02-2017

Authorized Signature

Website: http://www.ijesrt.com

Mail to editor@ijesrt.com

THOMSON REUTERS
ENDNOTE

Principal,
Govt. College, Khertha
Distt. Balod (C.G.)