INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 16, No. 3, p. 144-156, 2020

RESEARCH PAPER OPEN ACCESS

Accumulation of heavy metals and feeding habits in *Cyprinidae* fishes of water bodies of Khuzdar, Balochistan, Pakistan

Lawang Gurganari, Ghulam Dastagir*, Rahana Mushtaq

Department of Zoology, University of Balochistan (UOB), Quetta, Pakistan

Key words: Khuzdar River, Heavy metal concentration, Cyprinid fish, Fish dietary habit.

http://dx.doi.org/10.12692/ijb/16.3.144-156 Article published on March 18, 2020

Abstract

The research area is at Khuzdar district, we evaluate heavy metals concentration in water bodies and fish organs *cyprinid* fish (*Cyprinus carpio,Cirinus mirigla,Tor putitora, Labeorohuta and Catlacatla*). We discuss the water quality, physio-chemical changes and nutritional behavior of fishes. The heavy metals i.e. Fe, Cd, Pb, and Cr were identified by Atomic Absorption Spectroscopy (AAS) method. Metal concentration similar as well varied over four stations such, Zedi, Wangoo, Mola Chtook, and Wadh Poralli. Metals absorption followed the order: Fe > Cr >Pb> Cd. Gills and liver showed comparatively highest heavy metals concentration. Consequently, all *cyprinid* fishes presented statically important variations in all organs. Gut analysis of C.*mirigla,* gut examination by preponderance grade by volume of food content green algae, detritus, earth worm, mud, miscellaneous, phytoplankton, and zooplankton. *L. rohita* however, showed grade green algae, detritus, mud, earth worm, miscellaneous, zooplankton, and phytoplankton. *C. carpio*green algae, mud, detritus, miscellaneous, earth worm, phytoplankton, and zooplankton. *T. putitora* earth worm, green algae, mud, detritus, miscellaneous, phytoplankton, zooplankton, however in *C. catla* miscellaneous, mud, green algae, earth worm, detritus, phytoplankton, and zooplankton. The Fe concentration highest in all kinds of fishes, Cr showed Pb second highest accumulation two kinds, while Cd least in all fishes. Only Fe which is above the prescribed limit of WHO that can pose severe health risk to population of nation.

* **Corresponding Author:** Ghulam Dastagir ✉ dastagir76@gmail.com

Introduction

Entire Freshwater the family Cyprinidaeis diverse family of fishes among the globe, almost 3,000 species only 1,270 remain extant (Eschmeyer and Fong, 2015). Such fishes have a great economic value owing to large quantity of proteins in their body (Zheng *et al.,* 2010).

Heavy metal is a collective term that refers to a group of metals and metalloids of atomic density greater than 4 g / cm^3 or 5 times or more than water. (Nriagu J.O, and Pacyna J, 1988; Lenntech. H, 2004). The absorption of heavy metals depends upon physiological behavior of fishes and further varied from fish's tissues present in their organs **(**Zhang H, 2006: Has Hschön *et al*., 2008**).**

The feeding habit of fish is subject of current study, and their nutritional characteristics have relationship with their productivity.Hynes (1950) and Pillay (1952) analyzed the multiple techniques involved with critical calculation. Alp *et al*., 2008; Guruge and Amarasinghe (2008) identified the use of food resources in shallow water bodies in south-eastern Sri Lanka of three co-occurring carnivorous fish species. Noor *et al.* (2011) explored the culture system and its impact on quality of flesh on fried fish. Current study is designed to determine heavy metals concentration and gut analysis in cyprinid fishes of water bodies of District Khuzdar, Balochistan Province, Pakistan. Present work discusses the water quality, physio-chemical changes and nutritional behavior of fishes in the Khuzdar water bodies.

The District Khuzdar (research area), is the second-largest district of Balochistan Province and considered as central Balochistan and link with Quetta-Karachi by RCD highway. It is situated approximately 300 km from capital city of Quetta and 400 km from Karachi with an area of about 31,100 km^2. It ranges from 25 to 28 Northern Longitude to 65 to 67 East Longitude. It is the top of the narrow valley at 1,237 m (4000 feet), an arid environment with low and erratic rainfall (District Gazetteer Balochistan,2018). The water bodies present in the Khuzdar district are composed of rivers; i.e. Zedi, Wangoo, Molachtook, and Wadh Poralli. These water bodies are big source of food (fishes) for local population, and it is mandatory to study dietary habits of fishes and heavy metals concentration in both water and fishes and their implications on human health and fish ecosystem. However, there is no published descriptions are available for the dietary habits and metal concentrations of fishes in water bodies of District Khuzdar. Therefore, this is first attempt in which we present detail description of gut analysis, metal concentration and water chemistry to constraints the healthy habits of fishes in water bodies of District Khuzdar.

Materials and methods

Study area

For the purpose of gut analysis or feeding habit of 106 *Cyprinid* fishes of different water bodies of District Khuzdar *Labeorohuta* 18 *Cirrhinusmrigala* 30 *Cyprinus carpio* 10 *Tor putitora,* 40 and *Catlacatla* 8 were gutted to analyze the feeding habit .

Identification of fishes

The collected samples of fishes were identified by using keys and diagrams (Talwar and Jhingaran, 1991; Jayaram, 1999).

50 ml plastic bottles of Water samples were collected in triplicate from four stations (Zedi, Wangoo, Molachtook, and Wadh Poralli) of water bodies of Poralli River. About 10% $HNO_3$was added in all sampling bottles. Water samples were brought for metal detection in Laboratory of Zoology University of Balochistan, Quetta. Fish samples were composed from selected stations of District Khuzdar and identified as family Cyprinidae i.e. *Cyprinuscarpio ,Cirinusmirigla,Tor putitora, Labeorohuta, , and Catlacatla* were dissected to expose their different organs (gills, liver muscles, and heart)for downstream investigation of heavy metals concentration in different tissues of all fish. The dissected organs of fish were oven dried at 150^oC for three hours. The dried organs were kept atroom temperaturefor 28hours and were prevented from

moisture and sun light. The dried organs were grinded independently with the help of PestelandMorter. The analysis of metal concentration was carried out for each one of 12 samples according to a described method of (Iqbal *et al.*, 2016).Fish sample were collected in a flask briefly for digestion, 01g for of each powdered Samples, 4.0 mL of concentrated HNO_3, 2.5 ml of concentrated H_2SO_4 and were added. The mixtures ware slightly heated on a hot plate after adding five to six drops of H_2O_2. These steps were repeated several times for solution clarification. Than mixture was heated for an additional 20 minutes at 150°C and allowed to cool at room temperature. Furthermore, the solutions of metals were filtered up to 50 ml with volumetric flask and diluted with deionized water up to the mark. A solar Atomic Absorption Spectrophotometer (Model 3100) was used to measure concentrations of heavy metal in water samples and fishes.

Study of dietary habit

The collected fish was preserved in 70 percent ethanol organized with a few drops of glycerin, in order to study of fish's dietary habits, and they were exposed by dissection to their guts.

Gut categories, content, estimation: and analysis of occurrence

Gut was categorized into different stages and their contents were placed in petri dishes and examined by a binocular microscope (Nikon Eclipse E200) using possible taxon identification keys provided by different researcher (Sangpradub and Boonsoong, 2006).

The volume of gut content was distinguished by the frequency of occurrence of the Hynes (1950) method and the point volumetric method of Pillay (1952).

$$\text{Point volumetric method} = \frac{\text{No of points allocated to component}}{\text{Total points allocated to sub-sample}} \times 100$$

P= Percentage occurrence of every gut item

b= No of samples of fish particular food item

$$P = \frac{b}{a} \times 100$$

a= Total No of observed fish with feeding in stomach (Natarajan and Jhingran, 1961), formulated the formula of index of preponderance for relative significance of all gut content.

I = Index preponderance

VI = Volume percentage

Oi = Occurrence percentage

∑ = Summation

Sampling of water stations and the physico-chemical Parameters

Water samples were collected from water bodies of district khuzdar from four stations of (Zedikhudar, wangoo, Molachtook, and WadhPoralli) on monthly basis.Initially, sampling bottles (15 ml Soda bottle) were soaked in 6% HCL, was washed with excess distilled water and desiccated before sampling. After inspecting the bottles, they were taken for examination to the Department of Zoology for examining. The pH of the water pH meter (Jenway Model No. 3305) was used, while the temperature was determined using a mercury thermometer (Co). Oxygen meter (Jenway) for Dissolved Oxygen (DO) Calculation. Total solid dissolve (TDS) and salinity to water (ppt). Secchi disk was used for water transparency.

Determination of different traits

Portable digital thermometer was used to determine a ir temperature and the amount and content of DO was discussed by Jenway Model No. 9500) Using complete solids, dissolve and salinity, of the above parameters were calculated. pH meter (Jenway Model No. 3305) of (fixed in beakers having water samplesas per equipment's of APHA (1980; 2005) and Seechi Disc (Boyd1990) was used to measure water transparency fixed in beakers having water samples and readings were documented as per equipment's of APHA (1980; 2005).

Statistical analysis

Using ANOVA, a value level of 0.05 addressed on essential modifications. Different static compression tests of SPSS 15.00 bundled software and variance

analysis were used after hoc to assess statistical differences between different parameters Steel *et al.*,(1996).

Results and discussion

Concentration of heavy metals in water samples

The study conducted from months March to December 2018 for the detection of heavy metals concentration in the several fish of family *Cypirinidae* from several water bodies of District Khuzdar. The concentration of heavy metals in water bodies are similar as wall varied from station to station (i.e. Zedi, Wangoo, Molachtook, and Wadh Poralli). In Table 1 present the average metal concentration in water bodies, whereas, the average concentration of Fe ranged between 0.27 to 0.43 ,Pb 0.03 to 0.60,Cd 0.012to 0.6, Cr0.09 to 0.78,the accumulation of Fe was recorded highest.

Table 1. Water stations of Dist. Khuzdar.

Main station	Sub station	Fe Conc	pb Conc	cd Conc	cr Conc
Zedikhudar	Average	0.38	0.08	0.012	0.783
Wangoo	Average	0.27	.038	.013	0.25
Molachtook	Average	0.36	.060	0.093	0.28
WadhPorall	Average	0.43	0.03	0.6	0.09
WHO Limit (ppm)		1	1.5	0.2	0.5

The concentration of Metals followed the following order; Fe>Cr>Pb>Cd, which systematically shows resemblance and variations from metals concentration of Indus river: Zn> Cu> Pb> Cr (Jabeen and Chaudhry, 2010). Comparatively, the presence of herbs depends on the flow of water; the abundance of herbs presents high whereas the water flow is slow. On the other side, the presence of herbs is lower where the water depth is higher and fast. The accumulation of selected metals were below WHO thresholds. Fe and Cr showed statically significant difference with other heavy metals (Table 1).

Table 2. Heavy metals concentrations (µg/g) in organs of *Cirinusmrigala* from District Khuzdar.

Organ	Stations	Fe Conc	pb Conc	cd Conc	cr Conc
Gills	Average	18.6	1.2	0.5	0.5
Muscle	Average	2.4	1.2	0.12	0.6
Liver	Average	7.01	1.3	0.13	0.25
Heart	Average	1.9	0.96	0.13	0.54
WHO Limit (ppm)		1	1	1.5	0.2

Metal accumulation in several organs of fish species

In Table 2, the mean concentrations of fourheavy metals in several tissues of *Cyprinid* fish of different water bodies of Khuzdar river i.e.*Cirrhinusmrigala* (mori), *Labeorohita* (rahu*), Cyprinus carpio*(Gulfam),*Tor putitora(*masher) and *Catlacatla* (thaila) presented in following Tables 2-5. The mean of Fe concentration in Labeorohita (µgg–1) fluctuated between 1.6 to 3.7while, Pb was 0.2-0.42, Cd 0.05-0.30, Cr 0.26-0.24**.** Heavy metals concentration followed the order: Fe >Pb >Cr >Cd in all investigated fishes.

Table 3. Concentrations (µg/g) of heavy metals in organs of *Labeorohita* from District khuzdar.

Organ	Stations	Fe Conc	pb Conc	cd Conc	cr Conc
Gills	Average	3.3	0.42	0.06	0.26
Muscle	Average	2.6	0.24	0.30	0.4
Liver	Average	3.7	0.3	0.07	0.3
Heart	Average	1.6	0.2	0.05	0.2
WHO Limit (ppm)		1	1	1.5	0.2

The concentration of metals showed statistically significant in organs of investigated fishes.*Cirrhinusmrigala* average metal concentration preceded the order, Gills' 0.5-18.6 Muscle 0.12-2.4Liver 0.13 7.01 Heart 0.13-1.9, Metal concentration is usually the highest in gills and liver, current study shows dissimilarity with noted worker (Kargin ,1996; YIlmaz, 2003) that inmuscle and gonad the accumulation are lowest in all fish species. Except Fe all noted heavy metals were under the threshold list of WHO. The concentration of each heavy metals in *Cirrhinusmirigla* organ of showed significant difference.

Table 4. Heavy metals concentrations (µg/g) in organs of *Cyprinus carpio* from District Khuzdar.

Organ	Stations	Fe Conc	pb Conc	cd Conc	cr Conc
Gills	Average	7.8	1.2	1.2	1.9
Muscle	Average	7.3	1.7	1.6	0.06
Liver	Average	2.2	0.02	1.2	2.2
Heart	Average	1.32	1.2	0.9	1.05
WHO Limit (ppm)		1	1	1.5	0.2

From Table 3, *Labeorohita, t*he association of heavy metals among organs gills showed highest metal concentration then liver, muscle and heart was listed in least concentration organ in the fishes of *Labeorohita*. It was supported by different researcher that the tissue of liver is highly vigorous in the storage and uptake of heavy metals. It is ratified that the metallothionein induction occurs largely in the tissue of fish liver. (Heath , 1987**;** Langston, 1990). From Table 4, Cyprinus carpio Gills' average metal concentration preceded the order, 1.2-7.8 Muscle 0.06- 7.3 Liver 0.02-2.2 and Heart 0.9- 1.32. Fe and cr showed the highest ratio then of who and pb and cd was under limit.Current study supported by noted researcher that the least heavy metal organs was muscle Malik *et al*. (2017) were found in fish muscles.

There was a statically significant difference in the concentration of each heavy metal in the Cyprinus carpio organ. Current study supported by noted researcher that fish muscles were found the least heavy metal storing organs Malik (2017).

Table 5. Heavy metals concentrations (µg/g) in organs of *catlacatla* from Dist. Khuzdar.

Organ	Stations	Fe Conc	pb Conc	cd Conc	cr Conc
Gills	Average	7.3	2.35	1.4	1.8
Muscle	Average	6.8	1	1.18	1.8
Liver	Average	4.2	2.07	2.2	1.77
Heart	Average	1.7	.19	0.7	1.85
WHO Limit (ppm)		1	1	1.5	0.2

The average metal concentration of Catlacatla Gills followed the order in gills 1.4- 7.3 Muscle 1-6.8 Liver 2.07-4.2 Heart .19-1.85 (Table 5). The ratio of Fe and Cr showed highest whilePb and cd were underthe prescribed limit of WHO. Fe was found in a highest quantity in the heart and its value was above the prescribed list Malik (2017) Current study supported by noted researcher that the heart also stored fe concentration organ that was above the threshold list of who.

Gut analysis

All the 106 samples of *Cyprinid* fish30of *Cirrhinusmirigla*,18 *Labeorohita,* 10 of *Cyprinus Carpio*, 40 of *tor pitituraand* 10*Catlacatla* were cut open to examine the gut contents and to determine the feeding habits of cyprinid fishes fish. Table 6 shows the result of gut contents of *Cirrhinusmirigla* which shows great variations in food items. Green Algae by Volume29and by Occurrence 24,Detritus by Volume19.2 and by occurrence17.6, earth worm by

volume 18.9and by occurrence 07, mud by volume 11.4and by Occurrence 10,miscellaneousby volume 5.2 and by Occurrence 9.1, phytoplankton by Volume7.6oand by Occurrence 05, zooplankton by volume 8.3 and by occurrence 03 . Khan and Sadique (1973) also discussed that the dominant food of *Cirrhinusmirigla* and *Labeo* was zooplankton, while (Achakzai, 2014) strongly supported the contemporary work. The food and feeding habit of *Cirrhinusmrigala* are mostly algae, detritus, plant mud, phytoplankton, and zooplankton and plant matter respectively.

Table 6. Dietary habits of *Cirrhinusmirigla*from Khuzdar River.

S.No	Food items	% composition of food items		ViOi	Index of preponderance $I = \frac{ViOi \times 100}{\Sigma ViOi}$	Grade By Volume
		Volume (Vi)	Occurrence (Oi)			
1	Green Algae	29	24	696	50.05	I
2	Detritus	19.2	17.6	337.9	240.0	II
3	Earth worm	18.9	07	132.3	9.5	III
4	Mud	11.4	10	114	8.2	IV
5	Miscellaneous	5.2	9.1	47.3	3.4	V
6	Phytoplankton	7.6	05	38	2.7	VI
7	Zooplankton	8.3	03	24.9	1.8	VII
				∑ViOi = 1564.75		

Table 7 shows the result of gut contents of *Labeo rohuta* which shows great variations in food items. Green Algae by volume25.9 and by occurrence 20,detritus by volume24.4and by occurrence14, earth worm by volume 16.8and by occurrence 10, mud by volume 12.9and by occurrence 07,miscellaneous by volume 3.1 and by occurrence 9.1, phytoplankton by volume7.3and by occurrence 03, zooplankton by volume 9.6 and by occurrence 05.In the stomach of *Labeorohuta* the dominant food was green algaepresent study strongly supported by (Yahya Bakhtiyar *et al.*,2017) in early stage algae was major food item in the gut of *Labeorohuta* .Detritus,mud, earthand zoo-and phytoplankton worm alsonoted in present study which was strongly supported by the various researcher (Dewan *et al.*,1979; Miah *et al* .,1984; El Moghraby and El Rahman, 1984;Wahab *et al.*,1994) such as algae, herbivore, zoo-and phytoplankton, bottom feeder detritus and mud.

The variation in preponderance of food items of *L.rohuta* that collected from different environment.

Table 7. Dietary habits of *Labeorohuta* of Khuzdar River.

S.No	Food items	% composition of food items		ViOi	Index of preponderance $I = \frac{ViOi \times 100}{\Sigma ViOi}$	Grade By Volume
		Volume (Vi)	Occurrence (Oi)			
1	Green Algae	25.9	20	518	42.80	I
2	Detritus	24.4	14	341.6	28.88	II
3	Mud	16.8	10	168	14.20	III
4	Earth worm	12.9	07	90.3	7.6	IV
5	Miscellaneous	3.1	9.1	28.2	2.3	V
6	zooplankton	7.3	03	21.9	1.8	VI
7	Phytoplankton	9.6	05	14.6	1.2	VII
				∑ViOi = 1182.6		

Table 8 shows the result of gut contents of Cyprinus carpio which shows great variations in food items. Green algae by volume 27.3 and by occurrence 6 ,mud by volume 19.3 and by occurrence 10, detritus by volume 12.4 and by occurrence 9 , miscellaneous by volume 10.5 and by occurrence 09,earth worm by volume 22.4 and by occurrence 04 , phytoplankton by volume 4.2 and by occurrence 03, zooplankton by

volume 3.9 and by occurrence 0. In line of reports that Strongly supported the present work (Hoogenboezem, 1991; Maitland,2003, Kassahun Assaminew, 2005, Saikia and Das, 2009) that is benthic organisms ,plants and detritus ,benthic animals, phytoplankton, insects , zooplankton, nematodes, fish scales ,fish eggs and mud. The variation in preponderance of food items of Cyprinus carpio that collected from different environment.

Table 8. Dietary habits of *Cyprinuscarpio* of Khuzdar River.

S.No	Food items	% composition of food items		ViOi	Index of preponderance $I = \frac{ViOi \times 100}{\Sigma ViOi}$	Grade By Volume
		Volume (Vi)	Occurrence (Oi)			
1	Green Algae	27.3	6	163.8	24.4	I
2	Mud	19.3	10	193	28.28	II
3	Detritus	12.4	9	111.6	16.6	III
4	Miscellaneous	10.5	09	94.5	14.0	IV
5	Earth worm	22.4	04	89.6	13.4	V
6	Phytoplankton	4.2	03	12.6	1.9	VI
7	zooplankton	3.9	0	0	00	VII
				∑ViOi = 670.5		

Table 9 shows the result of gut contents of *Tor pitutura* show great variations in food items. Earth worm by volume 34.9 and by occurrence 28, Green Algae by volume 30.4 and by occurrence 32 , mud by volume 18.7 and by occurrence 16 detritus by volume 18.4 and by occurrence 16 miscellaneous by volume 4.1 and by occurrence 10 phytoplankton by volume 1.8 and by occurrence 00 , zooplankton by volume 1.7 and by occurrence 00. Present study was strongly supported the research of Kishor *et al.* (1998) reported the gut of adult *Tor pitutura* contains 60 % plant stuff , about 30 % stuff of animal, 9 % of miscellaneous food and 1 % of sand. The variation in preponderance of food items of *Tor pitutura* that collected from different environment.

Table 9. Dietary habits *Tor putitora*from Khuzdar River.

S.No	Food items	% composition of food items		ViOi	Index of preponderance $I = \frac{ViOi \times 100}{\Sigma ViOi}$	Grade By Volume
		Volume (Vi)	Occurrence (Oi)			
1	Earth worm	34.9	28	977.2	41.7	I
2	Green Algae	30.4	32	972.8	41.6	II
3	Mud	18.7	16	299.2	12.8	III
4	Detritus	8.4	06	50.4	2.15	IV
5	Miscellaneous	4.1	10	41	1.8	V
6	Phytoplankton	1.8	00	00	00	VI
7	Zooplankton	1.7	00	00	00	VII
				∑ViOi = 747.8		

Table 10 shows the result of gut contents of *Catlacatla* which show great variations in food itemsmiscellaneous by volume 19.2 and by occurrence 10, mud by volume 15.4 and by occurrence 11, earth worm by volume 27.2 and by occurrence 06. Green Algae by volume12.8and by occurrence 10detritus by

volume 11.9and by occurrence 08. Phytoplankton by volume 10.2 and by occurrence00, zooplankton by volume 10.9 and by occurrence 00 different researcher have strongly supported the present work .(Hora and Pillay, 1962; Yadav, 1997)assigned *Catlacatla* as a detritus feeder , algae, plankton ,crustaceans, zooplankton and phytoplankton, The Variation in preponderance of food items of *Catlacatla* that collected from different environment.

Table 10. Dietary habits *Catlacatla* from Khuzdar River.

S.No	Food items	% composition of food items		ViOi	Index of preponderance $I = \frac{ViOi \times 100}{\Sigma ViOi}$	Grade By Volume
		Volume (Vi)	Occurrence (Oi)			
1	Miscellaneous	19.2	10	192	25.7	I
2	Mud	15.4	11	169.4	22.7	II
3	Green Algae	27.2	06	163.2	21.8	III
4	Earth worm	12.8	10	128	17.1	IV
5	Detritus	11.9	08	95.2	12.7	V
6	Phytoplankton	10.2	00	00	00	VI
7	zooplankton	10.9	00	00	00	VII
				∑ViOi = 747.8		

Physico-chemical parameter of Khuzdar river

The physio-chemical parameter TDS (Total Dissolved Solids), DO (Dissolved Oxygen), pH, Salinity and Transparency of water bodies of District Khuzdar were studied in four seasons winter, summer, autumn, spring at four different stations of District Khuzdar (Table. 11). The analysis of mean concentration of TDS were extended between 67.-84.08 mg/L. it started to increase in March while in June the highest were recorded. Comparable findings were supported by several researchers (Islam *et al.*, 2004; Mishra *et al.*, 2008; Lashari *et al.*, 2009 and Sipaúba- Tavares *et al.*, 2016). In hotter months the higher values of (TDS) were observed.

Table 11. Physico-Chemical Parameter of water bodies of District Khuzdar.

Season	Date	TTDS Mean	DO Mean	pH Mean	S SALINITY Mean	Transparency Mean
Winter	14-12-2018	67	8.35	8.7	0.25	18.77
Summer	20-06-2018	84.07	5.32	6.4	0.57	17.7
Autumn	19-09-2018	71.25	5.32	7.25	0.32	16.67
Spring	13-03-2018	68.52	4.62	6.7	0.47	32.37

The mean DO concentration extended from 4.62-08.35 mg / L. similar results were reported by (Dulic *et al.* 2010. and Shil *et al.*, 2013. Nonetheless Effendy *et al.* (2016) published contrary findings. The higher absorption of DO, however, was due to increased oxygen solubility in water during winter, and low solubility through summer. The median pH concentration extended from 6.04 to 8.07 mol / l. The pH level began to rise from March through June but fell in September and December. The drop in pH may have been attributed to Bolan River's coming summer water.

Araoye (2009) and Shil *et al.* (2013) published similar results, however, Chughtai and Mahmood (2012) reported higher pH in the semi intensive carp cultivation system. Comparison of pH in four different District Khuzdar water Bodies. The mean salinity concentration ranged from 0.25- 0.57 ppt. same results also reported by Bera *et al.*, (2014).

During winter salinity was low but slowly increased with temperature. The decrease in salinity was connected to low evaporation and running water dilution factor. Effendy *et al.* (2016) reported contradictory results. Salinity Comparison in 4 different sectors water bodies of district khuzdar. The mean transparency rate was 16.67. 32.37. Similar, results are published by Nazi and Mateen (2011) mean 12.9-19.9 cm controlled by Shil *et al.* (2013) 18-26 cm, respectively. Contrary findings however published in Gupta and Dey (2013); and Bera *et al.* (1994). Published the low transparency of the consequences of the rainy season through slit and organic matter runoff. Comparison of transparency in 4 different sectors of District Khuzdar water bodies.

Iron is essential to most types of life, and to ordinary people's physiology. Iron is an essential component of proteins in humans Dallman (1986) which carries oxygen from the lungs to the tissues. It's also essential to regulate cell Growth and differentiation Andrews (1986). Blood needed O_2 and iron, the essential protein metal in hemoglobin and respiration processes. Different researchers noted the highest concentration of Cr and suggested that high levels of concentrated chromium fish that pose a risk to the safety of kidney failure and lung cancer (Oguzie, 2003; Oze *et al.*, 2006; Obasohan *et al.*, 2007). High Cr levels were observed (0.97 to 33.7 mg / kg) Increased levels of metal in fish tissues have been reported at each trophic stage by bio magnification and higher levels of metal are concentrated by carnivorous bottom feeders (Forstner and Wittmann ,1981). Consequently, can pose a threat to lung cancer and renal failure. Cadmium is widely recognized as an extremely toxic nonessential heavy metal and has no part to play inbiological processes in living organisms. Therefore, even at its low concentration (Tsui and Wang, 2004). Cadmium could be harmful to living organisms the findings of present study concentration of Pb were below the WHO limit (FEPA and WHO, 2003).Subsequently, it could be proposed that due to the absence of human operations facilitating environmental contamination such as vehicle exhausts, car washing due to less populated area, the water eco system is not polluted. Fish consumption is saving consumers from health hazards.

Conclusion

This study present the concentrations of several heavy metals in water bodies of khuzdar river and different tissues of *Cirrhinusmrigala*, *Labeorohita* ,*Cyprinus carpio* and *Catlacatla*collected from different areas (Zedi, wangoo, Molachtook, and Wadh Poralli) of water bodies of District Khuzdar. The mean average of Fe concentration was highest in all selected fishes. Cr showed second highest accumulation in *C.carpio* and *C.catla* and Pb was second highest in C.mrigala and *L.rohita*while Cd least in all fishes. Fe which is above the prescribed limit of WHO that can pose severe health risk to population of nation. Other all were below prescribed limit, might in future they would crossedthe threshold limit due to anthropogenic activities. Therefore, it is advised that the above ranged metals should be monitored *Cirrhinusmirigla*, gut examination by preponderance grade by volume of food content green algae, detritus, earth worm, mud, miscellaneous, phytoplankton, zooplankton.*Labeorohita* however, showed Grade green algae, detritus, mud, earth worm, Miscellaneous, zooplankton, phytoplankton. *Cyprinuscarpio*green algae, mud, detritus, miscellaneous, earth worm, phytoplankton, zooplankton.*Tor putitora* Earth worm, Green Algae, mud, detritus, miscellaneous, phytoplankton, zooplankton, however in *Catlacatla* miscellaneous, mud, green Algae,earth worm, detritus, phytoplankton, zooplankton.

Acknowledgements

The paper has benefited from fruitful discussion with Mr. Inayat Ullah and Mr. Asmat Ullah. We are thankful to local people of District Khuzdar and their hospitality during fieldwork.

References

Alp A, Yeğen V, ApaydinYağci M, Uysal R. Biçen E, Yağci A. 2008. Diet composition and preyselection of the pike, Esoxlucius, in Civril Lake, Turkey. Journal of Applied Ichthyology **24(6),** p 670-677.

Andrews NC, Baltimore D. 1986. Purification of a terminal uridylyl transferase that acts as host factor in the in vitro poliovirus replicase reaction. Proceedings of the National Academy of Sciences **83(2),** p 221-225.

Andrews NC. 1999. Disorders of iron metabolism. New England Journal of Medicine, **341(26),** p 1986-1995.

Araoye PA. 2009. The seasonal variation of pH and dissolved oxygen (DO2) concentration in Asa lake Ilorin, Nigeria. International Journal of Physical Sciences **4(5),** p 271-274.

Balochistan GG. 2018. Published by the authority Government of Balochistan, Quetta Wednesday June **27**, p 249.

Bakhtiyar Y, Langer S, Karlopia SK, Chalotra RK. 2017. Studies on the feeding habits of Labeorohita (Ham.) from Gho-Manhasa fish ponds, Jammu, North India. Journal of Ecophysiology and Occupational Health **17(1-2),** 40-49.

Chughtai MI, Mahmood K. 2012. Semi-intensive carp culture in saline water-logged area: A multi-location study in Shorkot (District Jhang), Pakistan. Pakistan Journal of Zoology **44(4),** 1065-1072.

Dallman PR. 1986. Biochemical basis for the manifestations of iron deficiency. Annual review of nutrition **6(1),** p 13-40.

Dewan S, Miah JU, Sarker AL, Saha SN. 1979. Seasonal patterns of feeding of juvenile major carp, Labeorohita (Ham.) in a Bangladesh pond. Journal of Fish Biology **14(6),** 511-515.

Dulic Z, Subakov-Simic G, Ciric M, Relic R, Lakic N, Stankovic M, Markovic Z. 2010. Water quality in semi-intensive carp production system using three different feeds. Bulgaria Journal of Agriculture Science **16(3),** p 266-274.

Effendy I, Al Deen S, Chithambaran S. 2016. Semi Intensive and Semi Biofloc Methods for the Culture of Indian White Prawn, Fenneropenaeus indicus in High-density Polyethylene Liner Ponds. HAYATI Journal of Biosciences **23(3),** p 106-110.

El Moghraby AI, el Rahman AA. 1984. Food and feeding habits of Labeoniloticus (Pisces, Cyprinidae) in Jebel Aulia Reservoir, Sudan. In Limnology and Marine Biology in the Sudan Springer, Dordrecht p 327-332.

Eschmeyer WN, Fong JD. 2015. Species by family/subfamily in the Catalog of Fishes. San Francisco, CA: California Academy of Sciences.

Förstner U, Wittmann GTW. 1981. Heavy metals in the aquatic environment.

Gupta T, Dey M. 2013. Hydro biological characteristics of some semi-intensive fish culture ponds of Lumding town of Nagaon district, Assam. Current World Environment **8(1),** p.107.

Guruge WAHP, Amarasinghe NJ, De S. 2008. Reported the food resource utilization of three co-occuring carnivorous fish species sin shallow lowland reservoir in South Eastern Sri Lanka: Approach to minimize competition. Proceeding of Taala 2007: The 12th World Lake Conference: 141-148.

Has-Schön E, Bogut I, Kralik G, Bogut S, Horvatić J, Čačić I. 2008. Heavy metal concentration in fish tissues inhabiting waters of "BuškoBlato" reservoar (Bosnia and Herzegovina). Environmental monitoring and assessment **144(1-3),** p 15-22.

Heath AG. 1987. Behavior and nervous system function. Water pollution and fish physiology, p 181-196.

Hora SL, Pillay TV R. 1962. Hand book of fish

culture in the Indo-Pacific region, Food and Agriculture Organization of the United Nations. Biology Branch, Fisheries Division p 204.

Hynes HBN. 1950. The food of fresh-water sticklebacks (Gasterosteus aculeatus and Pygosteuspungitius), with a review of methods used in studies of the food of fishes. The Journal of Animal Ecology, p 36-58.

Iqbal A, Tabinda AB, Ahmad F, Yasar A, Siddique S. 2016. Temporal Metal Bioaccumulation in Tissues of Labeorohita and Cyprinus carpio from Indus River, Pakistan. Asian Journal of Chemistry **28(5),** p.1069.

Islam ML, Alam MJ, Rheman S, Ahmed SU. Mazid MA. 2004. Water quality, nutrient dynamics and sediment profile in shrimp farms of the Sundarbans mangrove forest, Bangladesh.Indian journal of Marine Sciences **33(2),** 170-176.

Jabeen F, Chaudhry AS. 2010. Environmental impacts of anthropogenic activities on the mineral uptake in Oreochromis mossambicus from Indus River in Pakistan. Environmental monitoring and assessment **166(1-4),** p641-651.

Kargin F. 1996**.** Seasonal changes in levels of heavy metals in tissues of Mullus barbatus and Sparus aurata collected from Iskenderun Gulf (Turkey). Water, Air, and Soil Pollution **90(3-4),** p 557-562.

Kassahun AD. 2005. Distribution, abundance and feeding biology of fish species in Koka reservoir and the associated Awash River flood plain, Ethiopia. (unpublished Thesis Master of Science, UNESCO-IHE Institute for Water Education), p 123.

Khan RA, Siddiqui AQ. 1973. Food selection by Labeorohita (Ham.) and its feeding relationship with other major carps. Hydrobiologia, **43(3-4),** 429-442.

Kishor B, Bhatt JP, Rawat VS, Nautiyal P, 1998. Variations in food habit of the Himalayan mahseer—Tor putitora (Ham.) inhabiting the Ganga river system in Garhwal region. Indian J Fish, **45(1),** p 113-118.

Langston WJ. 1990. Toxic effects of metals and the incidence of metal pollution in marine ecosystems. Heavy metals in the marine environment, p 101-122.

Lashari KH, Korai AL, Sahato GA, Kazi TG. (2009). Limnological studies of keenjhar lake, district, Thatta, Sindh, Pakistan. Pakistan Journal of Analytical and Environmental Chemistry, **10(1-2),** p 39-47.

Lenntech H. 2004. Lenntech Water Treatment and Air Purification. Water Treatment. Rotterdamseweg, Netherlands, p lo.

Malik Y, Achakzai WM, Muhammad S, Mustafa S, Saddozai S, Qadir A, Ahmad N. and Baloch IA. 2017. Determination of heavy metal concentrations in six species of fresh water fish sold in Quetta city, Pakistan. Pure and Applied Biology **6(1),** p 79.

Miah MJU, Dewan S, Wahiduzzaman M. 1984. Studies on the type and amount of food taken by the silver carp, Hypophthalmichthys molitrix (val) and its diel patterns of feeding in a Bangladesh pond. Bangladesh Journal of Fisheries (Bangladesh).

Mishra MK, Mishra N, Pandey DN. 2013. An assessment of the physicochemical characteristics of Bhamka pond, Hanumana, Rewa district, India. International Journal of Innovative Research in Science, Engineering and Technology **2(5),** p 1781-1788.

Mishra RR, Rath B, Thatoi H. 2008. Water quality assessment of aquaculture ponds located in Bhitarkanika mangrove ecosystem, Orissa, India. Turkish Journal of Fisheries and Aquatic Sciences **8(1),** p 71-77.

Nazish N, Mateen A. 2011. Winter growth of carps under different semi-intensive culture conditions. Pakistan Veterinary Journal **31(2),** p 134-136.

Noor K, Naureen AQ, Nasir M, Fayyaz R, Khalid JI. 2011. Effect of artificial diet and culture systems on sensory quality of fried Fish flesh of Indian major carps. Pakistan journal of zoology, **43(6),** p 1177-1182.

Nriagu JO, Pacyna JM. 1988. Quantitative assessment of worldwide contamination of air, water and soils by trace metals. Nature **333(6169),** p 134.

Obasohan EE. 2007. Heavy metals concentrations in the offal, gill, muscle and liver of a freshwater mudfish (Parachanna obscura) from Ogba River, Benin city, Nigeria. African Journal of Biotechnology **6(22).**

Obasohan EE, Oronsaye JAO, Obano EE, 2006. Heavy metal concentrations in Malapteruruselectricus and Chrysichthysnigrodigitatus from Ogba River in Benin City, Nigeria. African Journal of Biotechnology **5(10),**

Oguzie FA. 2003. Heavy metals in water and sediment of the lower Ikpoba River, Benin City, Nigeria. Pakistan Journal of Scientific and Industrial Research (Pakistan).

Oze G, Oze R, Anunuso C, Ogukwe C, Nwanjo H, Okorie K. 2006. Heavy metal pollution of fish of Qua-Iboe river estuary: Possible implications for neurotoxicity. International Journal of Toxicology **3,** p 56-59.

Pillay TVR. 1952. A Critique of the methods of study of food of fishes. Journal of Zoology Society.

Saikia SK, Das DN. 2009. Feeding ecology of common carp (Cyprinus carpio L.) in a rice–fish culture system of the Apatani plateau (Arunachal Pradesh, India). Aquatic Ecology **43(2),** 559-568.

Saikia SK, Das DN. 2009. Feeding ecology of common carp (Cyprinus carpio L.) in a rice–fish culture system of the Apatani plateau (Arunachal Pradesh, India). Aquatic Ecology **43(2),** 559-568.

Sangpradub N, Boonsoong B, Mekong River Commission Vientiane (Lao PDR). 2006. Identification of freshwater invertebrates of the Mekong River and its tributaries. Mekong River Commission- Freshwater invertebrates – p 274.

Shi PS, Wang Q, Zhu YT, Gu QH, Xiong BX, 2013. Comparative study on muscle nutritional composition of juvenile bighead carp (Aristichthysnobilis) and paddlefish (Polyodonspathula) fed live feed. Turkish Journal of Zoology **37(3),** p 321-328.

Sipaúba-Tavares LH, Millan RN, Milstein A. 2016. Limnology of an integrated cage-pond aquaculture farm. Acta Limnologica Brasiliensia, 28.

Steel RGD, Torrie JH, Dickey DA. 1996. Principles and procedures of statistics A biometrical approach 3rd ed McGraw Hill Book Company Inc. New York, USA p, 334-381.

Talwar PK, Jhingran AG. 1991. Inland fisheries of India and adjacent countries. **1(2),** p1-1158.

Talwar PK. 1991. Inland fishes of India and adjacent countries **(2),** CRC Press.

Tsui MT, Wang WX. 2004. Uptake and elimination routes of inorganic mercury and methylmercury in Daphnia magna. Environmental science & technology **38(3),** p 808-816.

Wahab MA. 1994. Compatibility of silver carp in the polyculture of cyprinid fishes. Progress Agric, **5,** 221-227.

WALI MA. 2014. Post super flood studies on vertebrate biodiversity and production in manchar lake, District Jamshoro.

World Health Organization. 2003. Nitrate and nitrite in drinking-water: Background document for development of WHO Guidelines for Drinking-water Quality (No. WHO/SDE/WSH/04.03/56). World Health Organization.

Yilmaz AB. 2003. Levels of heavy metals (Fe, Cu, Ni, Cr, Pb, and Zn) in tissue of Mugil cephalus and Trachurusmediterraneus from Iskenderun Bay, Turkey. Environmental research, **92(3),** p 277-281.

Zhang H. 2006. Leaching behavior of Pb and Zn in air pollution control residues and their modeling prediction. Journal of Environmental Sciences, **18(3),** p 583-586.

Zheng LP, Yang JX, Chen XY, Wang WY. 2010. Phylogenetic relationships of the Chinese Labeoninae (Teleostei, Cypriniformes) derived from two nuclear and three mitochondrial genes. Zoologica Scripta **39(6),** p 559-571.