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Trace Metals Content in the Ecosystem of Al-Garaf River in Al-Nassiriya City, South of Iraq

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Abstract:-

The distribution and concentration of five trace metals Cd, Cu, Ni , Pb , and Zn have been determined in dissolved and particulate phases of water , exchangeable and residual phases of sediment and different organs like (gill,liver,ovaries and muscle) of female fish *Silurus triostegus*, as were collected from Al-Garaf river north center of Al-Nassiriya city .The study was from May up to Septemper ,2008. Sediment texture and total organic carbon (TOC) were measuered in the sediment of the study area as a percentage .The results showed that the concentration of the studied metals in particulate phase were much higher than its concentrations in dissolved phase of water , while their mean concentration in dissolved (µg/l)and particulate (µg/gm) dry weight in the study area were : (0.2,8.9) Cd, (1.20,57.3) Cu, (0.27 , 25.83) Ni , (0.36,37.83) Pb and (3.0 ,63.9) Zn respectively. The total organic carbon in the sediment revealed higher content in all study stations specially at St2 ,while sediment texture was silt clay in all study stations . For sediment , trace metals was recorded higher concentrations in the residual phase than its concentration in exchangeable phase with exception for Cd and Pb at all stations during the study period, whereas the mean concentration of studied metals in the exchangeable and residual phase in the study area were, (1.14,0.47) Cd, (11.1,15.1) Cu, (8.75,20.3) Ni, (13.36,8.56) Pb and (15.03,24.34) Zn µg/gm dry weight respectively.The significant correlation $P<0.05$ were observed between TOC and all studied metals in the sediment ; also a significant correlation observed between metals concentration in sediment and their concentration in a particulate phase of water .The trace metals showed diffirent concentrations in different studied organs of the fish and followed the trend Gill> Liver >ovaries > muscle ,while the mean concentration µg/gm dry weight in the muscle were , Cd (ND) , Cu (0.03), Ni(0.51±0.01), Pb(ND) and Zn(7.7±0.8) . The present study showed that the sediment and water specially at St2 and St3 were affected by anthropgenic sources for trace metals, such as the untreated domestic wastes and surrounding human activites, muscle of the studied fish were concentreated lower amount for trace metals, so it can be safely consumed, while all studied metals was concentrated in gill and liver. .

Key word :- Aquatic ecosystem, fish ,sediment ,trace metals

Introduction :-

It is well known that trace metals are dangerous environmental materials , so the investigation of the distribution and concentration of its in sediment , water and organisms is fundamental to study the environmental pollution ,(4). Many heavy metals, even if present in minute quantities, are toxic to plants and animals,thus their release to aquatic environments from either natural or anthropogenic sources has an adverse effect upon ecosystem health (23) .Trace metals in aqueous solution is seldom found as free ions but exist as ionic complex utilized by variety of organisms in organic and hydrated legends which affected mobility ,reactivity and solubility (6). Cupper, Zinc , Iron, Manganes and partly Nickel are essential to natural organisms in low concentration, whereas Cadmium and lead are biologically inessential elements and they are toxic even at low concentration (30). As a result of direct discharges of wastes containing trace metals to the environment ,their levels increased in water column ,while sediments acts as archeive for many pollutants(21).As a part of the aquatic environment,fish can accumulate trace metals and act as indicators for pollution (7).Fish species *Silurus triostegus*, has a greate economic value(25).Except the study of (18),there is no published study found to take into consideration the levels of trace metals in water,sediment and fish in detail; so the present study aim at determining concentration and distribution of five trace metals (Cd,Cu,Ni,Pb, and Zn) in water , sediment and different organs from the femal of catfish species *Siluruns triostegus*, in Al-Gharaf river, to the north of Al-Nassiriya city, which can be used as a baseline for comparative levels and distribution of trace metals by other researchers.

Study Area :

The Tigirs river is a branch passing through Kut Dam and flowing into two major branches;the former flows towards Mysan province and the latter is penetrating Thi-Qar governorate and going towards Al-Gharaf district. The river is distinguished at this location ,with low gradient and sluggishly moving current creating considerable loads of sediment, (18). To conduct this study ,three stations were selected near Al-Gharaf district(Fig.1).The first (St1) was 5km to the north of the above district,the second (St2) was on the river bank when it crosses the district, while the third(St3) was to the south of the St2, the distance between each station was about 5km.The study stations specially St2 and in less degree St3 were influenced by the domestic sewage, waste from land cultivation and some private factories,while the northern station (st1) was situated to the south of Al-Shatra. The river width and depth in the study area were (30 and 5)m respectively.Few aquatic plants were deployed in St1, including *Vallisineria spiralis,Phragmites australis ,Typha Sp.Potomogeton* Sp. And *Ceratophyllum demersum* , while only *Ceratophylum demersum* live in St2 and st3 (18).

Materials and Methods:

Water and sediment samples were collected from each station in the study area,while fish specimen catfish *Silurus triostegus* were captured around the study area from St1 up to St3, Fig.1, The study extended from May to septemper,2008. Water samples 10Lwere collected in acid washed polyethylene bottles held just below the surface from each station . The samples have been suction filtered through prewashed preweighed 0.45µm Millipore membrance filters. Materials passing through the filters were considered as dissolved while those returned as particulate .The dissolved trace

metals were concentrated by using Chelex-100 resin following procedure described by [26]with some modifications .Sediment were obtained by means of a Van Veen grab sampler from representitive sites of the river, the surface sediment about 5 cm was used for the present study .Trace metals analyses were performed on the <63 µm fraction of the sediment which had been separated by sieving after oven drying and grinding .The determination of trace metals in the exchangeable fraction of the sediment was done following the procedure described by (15), whereas those in the residual fraction of the sediment and the particulate phase of water were determined following the procedure described by (29). Triplicates samples for trace metals analyses have been analysed by mean of flame Atomic Absorption Spectrophotometry(AAS) type Pye unicum model SP.9.Sediment texture was analysed and the percentage of three size fractions (Sand, Silt and clay) were calculated according to (28) and (20) .The total organic carbon (TOC) content in the sediment samples were determined according to (17), by using exothermic heating and oxidation of 0.5gm grind dry sample with chromic acid.Fish specimen about 60 femal of, catfish *Silurus triostegus* were captured during sampling period using gil nets 25 x 25mm mesh size . The captured fish were placed in plastic bags and frozen until we reached the laboratory . In the lab, fish were thawed , rinsed with deionized water standard length was measured to the nearst 0.1cm and the abdominal cavity was then opened and the organs gill, liver , ovary were separated , whereas edible muscle was taken from the left posterior side of each fish.The tissues were, then, dried in electric oven in 60°c for 12hr, ground and sieved by 0.5mm mesh nylon sieve.The tissues were digested by acid mixture following the procedure of (27).The trace metals were determined by the mentioned AAS. Acids used were ultapure and water was deionized .SPSS program was used for statistical analyses for comparsion between the mean values .

Results and Disscusion:

The result of analyses for Cd,Cu,Ni,Pb and Zn in water (dissolved and particulate phases)are shown in Table 1 .The particulate of metals between dissolved and suspended particulate matter determines their ultimat fate in the aquatic environment. Concentration of the studied trace metals was higher in particulate phase than its concentration in dissolved phase for all studied stations .The mean concentration of the mentiond metals in dissolved phase at the study station (1,2 and 3) was as follow;Cd(011,0.26,0.22) Cu(0.28,1.22,2.11), Ni (0.18,0.32,0.31) ,Pb(0.26,0.41,0.25) and Zn (25,3.7,2.8) µg/l respectively, whereas their concentrations in the particulate phase were,Cd(3.1,12.6,10.5), Cu(38.2,75.3,58.4), Ni(22.3,26.7,28.5), Pb (28.11,46.7,38.7) and Zn (49.1,60.1,82.5) µg/gm dry weight respectively . Metals concentration in St2 were higher than their concentration in station1 and 3 ; this may be due to high population density near this station and the municipal waste was directly discharged to the river by the main pipes without treatment .The effluents of municipal and industrial waste contain trace metals among their constituent (5) . The particulate load at the studied stations were (0.8, 1.2 and 0.71) gm/l respectively(Table.1) ,a higher content of particulate load was observed at station 2 this may reflect the high mixing between river water and wastewater which was discharged by the main pipes in the Urban area, whereas the lower content of particulate load at station (1and 3) indicated that the situation of the mentiond stations were far from the discharge of wastewater pipes and the population density . As we know, the particulate load composed of two

types of components are biotic and abiotic particulate the former mostly zoo and phyto plankton , while the latter were mostly sand , silt and clay , so the high concentration of trace metals in a particulate phase was due to these components . (13) has indicated that planktonic organisms tend to concentrated trace metals as higher as 10^6 times than their levels in the surrounding water, also the concentration of the trace metals in aquatic environment depends on many factors such as water discharge of the river , seasonal variations in quantitive and qualitative of plankton and suspended material load of the river (24) .Sediments are usually regarded as the ultimate sink for trace metals discharged into the environment; therefore, the analyses of these metals in sediment present a more convenient and more accurate means of detecting and assessing the degree of pollution (19) .The means concentration of the studied metals in the exchangablle phase of the sediment in the studied stations (1,2 and 3) were (0.26,5.59,0.57) Cd, (8.6,13.5,11.2) Cu , (6.66 , 11.3 , 8.3) Ni , (11.6, 15.4, 13.1) Pb and (7.3, 28.1,9.7) respectively,whereas its concentrations in residual phase were (0.18,0.98,0.26) Cd,(19.5,21.3,14.7) Cu, (16.5,26.7,17.7) Ni , (6.7,10.1,8.9) Pb and (18.2, 29.51,25.3) Zn µg/gm dry weight respectively , Table 2 . With the exception of Cd andPb the mean concentration of all studied metals were higher in residual phase than its concentration in exchangeable phase , this may be attributed to the anthropogenic sources. Many factors such as TOC. content and sediment texture were affected upon the metal concentration in the sediment;so the mean TOC% in the sediment from the study stations were (1.20,3.30 and 2.11)% respectively Fig.2. While sediment texture description was siltclay for all the study stations, Fig 3. TOC% showed significant correlation $p<0.05$ with all studied metals in the sediment . The source of the TOC in the study area was municipal waste effluents especially at St2 and in less degree at stations 1 and 3. The high concentration of Pb in sediment may be due to many sources such as organic substances discharged with wastewater from the Urban area , erosion of the pavement materials specially from bitumen, also from the heavy traffic density of the automobiles near the region (22).In addition to their existing in wastewater, Cu and Ni may come from the algale blooming by the eutrophication phenomenon during the study period , so they recorded higher concentrations in the study area . Also the concentration of elements found in the sediment could be mainly attributed to geological sources (23).In comparsion, the concentration values of the studied metals in the present study with other values elsewhere ,Table 3 revealed that although of the higher concentrations of the studied metalswere recorded in the present study but they did not surpassor excceded the world wide range (10).So, its concentration were at an acceptable level. Fish accumulated trace metals from their environment ;they are excellent organism for the study of some long-term changes of trace metals in the environment (31). Table 4 shows the means and ranges of concentrations of studied metals in the different organs from the studied species of fish . The means concentration of the mentioned metals in Gil, Liver, Ovary and muscle were , (0.07,0.02,ND,ND) Cd, (1.2,3.4,0.03,0.03) Cu , (1.3,2.7,1.77,0.51) Ni,(1.71,0.2,ND,ND) Pb and (1.91,3.11,2.2,7.7) Zn µg/gm dry weight respectively . The concentration of the mentioned metals varied among the organs of the studied species, this may be due to the species –specific mechanisms. (16) indicated that the differences in accumulation metals patterns in the organs of the fish species interdependency of the uptake and elimination rates of metals . Gill and Liver concentrated all the studied metals. This may be due to the fact that the gill is the first organ to which is exposed to the metals was found among the mentioned organs , and

this organ was more exposed to these metals through the respiration process, while the liver is an important organ which convert the food after transmission the latter from the gut . The present study showed that the concentration of the studied metals are as follows; Cd and Cu are in gill , Cu and Ni in liver , while Zn isin muscle ;with the exception of Zn muscle which concentrated trace metal in less degree in comparsion with the other studied organs .The present values of metals concentration in the muscle of the studied species in comparison with other species from the seam environment are inTable,5 whic showsthat the concentration of the studied metals in the muscle is in the acceptable range in comparsion with world wide studies (14).

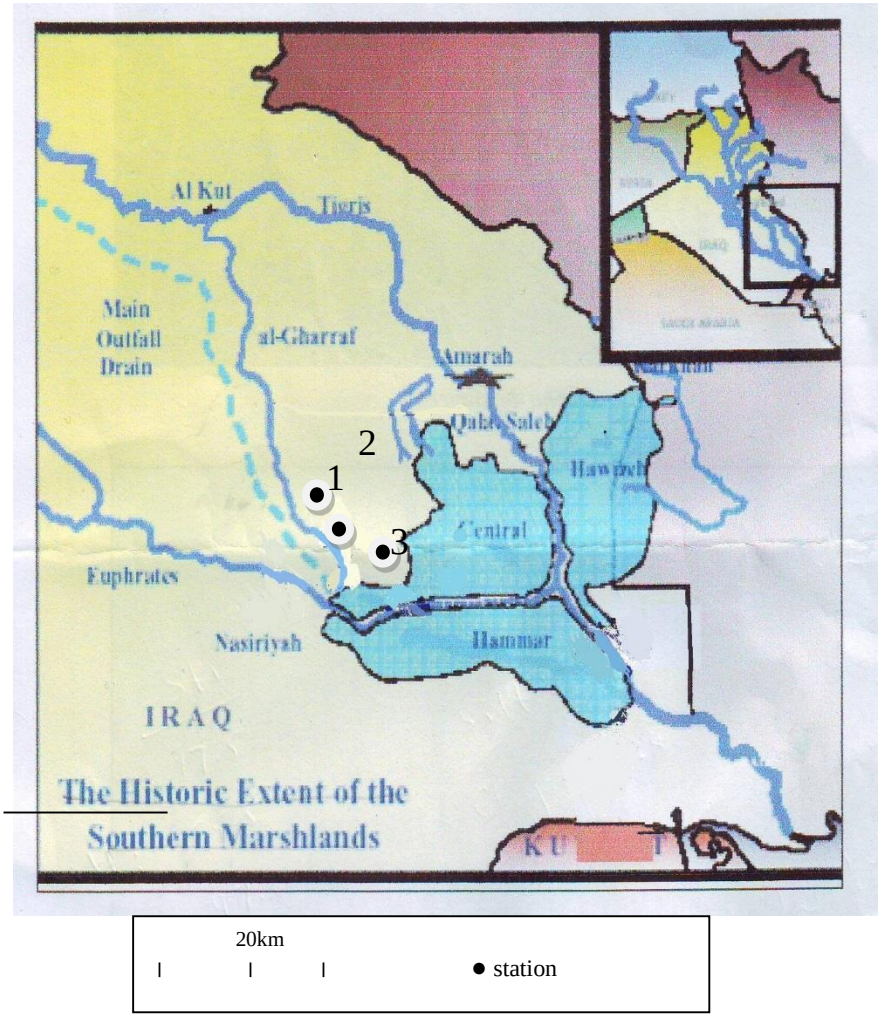

Fig. 1: Map of the study stations

Table (1): Concentration of Trace metals mean±SD and range in water (Dissolved µg/l and particulate µg/gm) dry weight and particulate load gm/l dry weight in the study stations

Station	Phase	Cd	Cu	Ni	Pb	Zn	Part load	No. of sample

							gm/l	
1	Diss. Parti.	a 0.11±0.01 (0.09-0.14) a 3.1±0.03 (2.3-5.2)	a 0.28±0.03 (0.25-0.31) a 38.2±1.6 (35.2-43.1)	a 0.18±0.01 (0.11-0.22) a 22.3±1.5 (18.3-30.7)	a 0.26±0.02 (0.18-0.32) a 28.11±1.3 (24.5-32.1)	a 2.5±0.02 (1.22-3.66) a 49.1±2.7 (47.2-51.1)	0.8	15
2	Diss. Parti..	b 0.26±0.02 (0.20-0.31) b 12.6±1.4 (9.5-15.4)	b 1.22±0.02 (0.78-2.5) b 75.3±2.7 (58.1-83.2)	b 0.32±0.01 (0.25-0.41) b 26.7±1.2 (18.9-29.5)	b 0.41±0.01 (0.39-0.45) b 46.7±0.4 (42.0-48.2)	b 3.7±0.2 (2.1-4.5) b 60.1±1.7 (55.3-64.2)	1.2	15
3	Diss. Parti	b 0.22±0.02 (0.18-0.28) b 10.5±1.3 (8.3-13.2)	c 2.11±0.1 (1.5-4.2) c 58.4±1.3 (44.5-70.1)	b 0.31±0.01 (0.23-0.35) b 28.5±1.37 (25.4-34.5)	c 0.25±0.01 (0.18-0.29) c 38.7±0.4 (29.5-38.2)	a 2.8±0.13 (1.7-4.5) c 82.5±6.2 (79.7-85.1)	0.71	15
Regional Concentration	Diss.	0.20	1.20	0.27	0.36	3.0	0.9	
	Parti.	8.9	57.3	25.83	37.83	63.9		

Different letters mean significant differences (P<0.05 , n=15)
Diss : Dissolved
Parti : Particulate

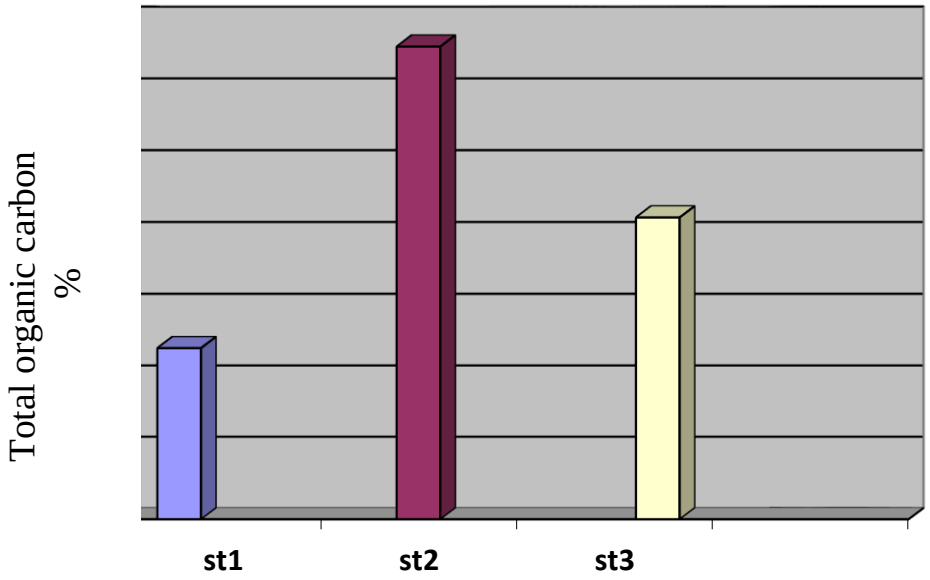

Fig. 2 : Total organic carbon % content in the sediment of the study area

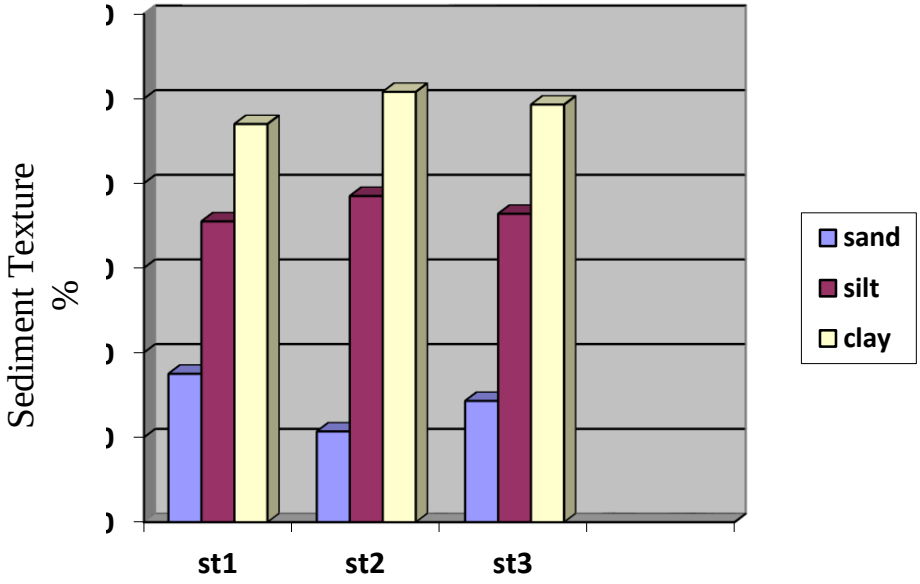

Fig 3: Sediment texture of the study area

Table (2): Concentration of trace metals mean ± SD and range (µg/gm) dry weight in the sediment (exchangable and residual) phases in the study area

Station	Phase	Cd	Cu	Ni	Pb	Zn	No. of sample
1	Exch.	a 0.26±0.03 (0.09-0.14)	a 8.6±1.2 (6.4-12.2)	a 6.66±0.3 (4.1-8.2)	a 11.6±0.7 (8.4-14.2)	a 7.3±0.31 (5.1-9.3)	15
	Resid.	a 0.18±0.02 (0.14-0.22)	a 19.5±1.6 (1.1-2.3)	a 16.5±1.2 (13.2-18.3)	a 6.7±0.22 (3.9-8.9)	a 18.2±1.2 (15.6-22.8)	
2	Exch.	b 2.59±0.1 (1.66-2.83)	b 13.5±0. 2 (10.2-16.1)	b 11.3±1.2 (6.2-18.7)	b 15.4±0.2 (12.5-17.2)	b 28.1±0.26 (22.7-33.2)	15
	Resid.	b 0.98±0.2 (0.62-1.4)	a 21.3±0.7 (17.3-26.1)	b 26.7±1.5 (24.4-30.5)	b 10.1±0.3 (8.2-12.7)	b 29.51±1.3 (26.5-33.1)	
3	Exch.	a 0.57±0.01 (0.38-0.69)	a 11.2±0.7 (9.5-14.5)	a 8.3±0.2 (6.5-12.3)	c 13.1±0.11 (10.7-15.2)	a 9.7±0.5 (6.5-12.2)	15
	Resid.	a 0.26±0.02 (0.18-0.33)	b 14.7±1.2 (10.5-18.6)	17.7±1.2 (14.5-20.2)	8.9±0.24 (6.8-10.2)	b 25.3±1.22 (20.5-28.3)	
Regional Concentration		1.14 0.47	11.1 15.1	8.72 20.3	13.36 8. 56	15.03 24.34	45

Different letter mean significant differences (P<0.05)
Exch : Exchangable
Resid : Residual

Table(3) : Comparison between concentration (µg/gm) dry weight of trace metals in the sediment from the study area with other values

Location	Cd	Cu	Ni	Pb	Zn	Reference
Al-Garaf river	1.61	26.1	29.05	21.92	39.37	Present study
Shatt Al-Arab river	0.03	39.6	-----	19.0	25.8	[1]
Shatt Al-Arab Estuary	0.27	29.24	104.20	17.74	31.99	[7]
Al-Garaf river	1.07	13.94	56.72	-----	89.06	[18]
Iraqi Wetllands	13.79	12.44	46.55	32.60	194.96	[6]
Al-Hawizah Marsh	88	397	------	1244	330	[11]
Al-Hammar Marsh	125	527	-----	2233	241	[11]
Kuwait Bay (*Un polluted*)	1.8	24	101	26	83	[10]

Table (4) : Concentration of trace metals range and (mean ± SD) µg/gm dry weight in the different organs of *Silurus triostegus* length range(45-58)cm with mean =50±1cm .

Organ	Cd	Cu	Ni	Pb	Zn	No. of sample
Gill	(0.05-0.11) 0.07±0.01	(0.8-1.8) 1.2±0.02	(0.81-1.75) 1.3±0.01	(1.21-2.5) 1.71±0.2	(1.5-2.7) 1.91±0.02	60
Liver	(ND-0.08) 0.02±0.0	(2.5-5.7) 3.4±0.02	(1.3-3.5) 2.7±0.02)	(ND-0.9) 0.2±0.01	(2.2-4.5) 3.11±0.01	60
Ovary	ND	(ND-0.05) 0.03±0.0	(0.8-2.8) 1.77±0.21	ND	(1.3-3.5) 2.2±0.01	60
Muscle	ND	(0.02-0.06) 0.03±0.0	(0.2-0.7) 0.51±0.02	ND	(5.1-9.2) 7.7±0.2	60

ND = Not Detected

Table (5) : Comparison mean concentration (µg/gm dry weight) of the trace metals in the muscle of *Silurus triostegus* in the present study with the other speciese

Species	Location	Cd	Cu	Ni	Pb	Zn	Reference
Silurus triostegus	Al-Garaf river	ND	0.03	0.51	ND	7.7	Present study
Nematolosa nasus	Shatt Al-Arab river	0.04	10.5	4.0	0.09	107	[2]
Mullet	Khor . Al-Zuber	-----	6.5	------	-----	33.0	[3]
Cyprinus carpio	Shatt Al-Arab estuary	ND	0.6	2.8	0.38	8.7	[8]
Tenualosa ilisha	=	ND	ND	0.36	0.05	5.7	
Acanthopagrus latus	=	ND	ND	0.61	ND	2.5	
Mugil cephalus	Iskenderuna	-----	1.45	1.22	7.75	38.23	[12]
Trachurus Mediterranens	Bay =	-----	1.29	0.94	1.03	19.55	
Carasobarbus luteus	Euphrates river	ND	0.07	0.08	ND	3.7	[8]
World Wide		0.2	3.0	1.55	3.0	8.6	[14]

ND = Not detected
-= Not measured/

Conclusions

- Higher concentration of trace metals was found in particulate more than in dissolved phase of water and untreated municipal waste as a main source of the trace metals in the study area .
- TOC and sediment texture play an important role in the concentration of the studied trace metals in the sediment .
- Trace metals concentration in a clear form in gill and liver , while its concentration in the muscle was in less degree .
- Fish under the study can be safely consumed as food for human without any danger

References:-

1. Abaychi,J.K. and DouAbul, A.A.Z.(1985) Trace metals in Shatt Al-Arab river Iraq .water Res.
19 (4):457-462 .
2. Abaychi,J.K. and Al-Saad,H.T.(1988) Trace elements in fish from the Arabian Gulf and the Shatt Al- Arab river . Iraq . Bull. Environ . C.contam. Toxical . , 40:226-232 .
3. Abdulah,A.A.M. and Abdul-Hassan , J.K.(1994) Distribution of Zine and copper in the tissues of some marine fishes around the coast of FAO . south Iraq.J.Basrah Res.,10(1):17-23.
4. Abu-Hilal, Ahmad , H. and Badran , Mohammad , M.(1990) Effect of pollution sources on metal concentration in sediment cores from the Gulf of Aqaba(Redsea.Marine pollution) Bulletin , vol21(4):190-197
5. Al-Imarah, Faris.J.M.;Al-Khafaji , Basim Y.D. and Mohamed A.R.M.(1998) Trace metals in waters sediment and fishes from north west Arabian Gulf. Bull. Nat . Inst . of occanogr . fish vol 24:403-416 .
6. Al-Imarah, F.J.M.;Mahamood , A.A. and Al-Mayah , A.R.A. (2007). Level and distribution of trace metals in the southern wetlands of Iraq. Marsh Bulletin , 2(2) :155-170 .
7. Al-Khafaji ,B.Y.(1996) Trace metals in water , sediment and fishes from Shatt Al-Arab estuary and NW Arabian Gulf. Ph.D. Thesis University of Basrah .
8. Al-Khafaji, B.Y. (2005) Metal content in sediment , water and fishes from the Vicimity of oil processing regions in Shatt Al-Arab . J. of Thi-Qar University Vol. 1(2):2-11 .
9. Al-Khafaji, B.Y.(2006) Preliminary survey of selected trace elements in the Euphrates river near Al- Narririya city southern part of Iraq . Vol 3(1) :25-36 .
10. Ander lini, V.V., Mohammed , O.S.; Zarba , H.A. and Omar , N.(1982) Assessment of trace metals pollution in Kuwait Vol.1 final report of the trace element and bacterial pollution project :EEs- 31A.KISR .
11. Awad , N.A.N.;Abdul Sahib , H.T. and Jaleel , A.A. (2008) Concentration of trace metals in aquatic plants and sediment of the southern marshes of Iraq (Al-Hawizah and Al-Hammar) marsh Bulletin , 3(1) :57-66 .

12. Ayse , Bahar yilmaz(2003) level of heavy metals (Fe , Cu , Ni , Cr, Pb and Zn) in tissues of mugil Cephalus and Trachurns mediterranens from IsKenrua Bay , Turkey . Environmental research , Vol, 92(3):277-287
13. Bown, H.J.M. (1966) Trace elements in biochemistry Academic press , Ine New York 241PP .
14. Bryan , G.W.(1976) Metal concentration in the Sea. Mar . Poll . Bull . 7 : 353-356 .
15. Chester , R. and Voutsinou , F.G.(1981) The initial assessment of trace metal pollution in Costal Sediments – Mar . Poll . Bull , 12:84-91 .
16. Cross , F.A. ; Hardy , L.HA.;Jones , N.Y. and Baber , R.T. (1973) Relation between total body weight and concentration of Mn,Fe,Cu,Zn and Hg in white muscle of blutisl , abathyl –demersal fish Antimora rostrata ,J.Fish .Res .Bd .Con , 30 : 1787- 1291
17. El-Wakeel, S.K. and Riely , J.P. (1957) The determination of organic carbon in marine Mud J. Cons. Int Explor . Mer . 12;180-183 .
18. Fahad, Kamel , K. (2006) Ecological survey for southern sector of Al-Garaf River southern Iraq . Ph. D. Thesis Basrah Univ . 103 P (In Arabic) .
19. FAO. (1994) Review of pollution in the African aquatic environment CFIA Technical paper No.25 .
20. Folk , R.L.(1974) Petrology of sedimentary Rocks Hemphil Publication Co Austtin , Texas 120 P .
21. Forstner , U. and Wittman , G. T. W. (1979) Metal pollution in aquatic environment . Springer verlags New York .
22. Haal,M. ; Hodrejon, H. and Rouk , H.(2004) Heavy metals in roadside soils, proc.Estonian Acad. Sci.Chem. 53(4):182-2003 .
23. Hulya Karadede and Erhan , unlu . (2000) Concentration of some heavy metals in water , sediment and fish species from the Ataturk Dam lake (Euphrates . Turkey . Chemospher , Vol. 46(9):1371-1376.
24. Nolting , F.R. (1986) Copper , Zine , Codmium , Nikel , Iron , and Manganese in the southern Bight of the north sea water and their analyfical use in conjuction with atomic absorption spectrophotometry . Analytic chim , Acta . 40 :479-485 .
25. Oymak , S.A.. Solak , K. and ONLO , E. (2001) Some biological characteristics of silurus triostegus Heckel 1843 from Ataturk Dam lake (Turkey) J.Zool . 25: 139-148 .
26. Riely , J.P. and Taylor , D(1968) chelating resins for the concentration of trace elements from sea water and their analytical use in conjuction with atomic absorption spectoophotometry Anal. Chera . Acta , 40 :479-485 .
27. ROPME(1982) Manual of Occanographic observation and pollutant analysis methods . ROPME. P. O. BOX26388. 13124 safat , Kuwait .
28. Shepand , E. (1954) Nemenculture based on sand –silt-clay ration J.of. sediment pefrology :151-158 .

29. Sturgcon , R.E. ; Desaulnicrs , J.A. ; Berman , S.S. and Russell, D.S. (1982). Determination of trace metals in estuarian sediment by graphite furnace atomic absorption spectrophotometry . And. Chem . Acta, 134:288-291 .

30. Wood, J.M.(1989) Transport , bioaccumulation and toxicity of elements in micro organisms under environmental stress . 7th International conference

on heavy metals in environment (Ed.J.P.vernal:CEP consultants Hd, Edinburgh, U.K.1 :5-9 .

31. Lucas,H.F.;J.R. and David , N.E.(1970) Concentration of trace elements in careat lakes fished : J.Fish . Res. Bor. Of . Canda ., 17(4). 677-684 .

محتوى المعادن النزرة في النظام البيئي لنهر الغراف في مدينة الناصرية جنوب العراق

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الخلاصة:-

قيست تراكيز وتوزيع خمسة من المعادن النزره (الكادميوم والنحاس والنيكل والرصاص والخارصين) في الماء بجزئية الذائب والعالق والرواسب بجزيئها المتبادل والمتبقي واعضاء مختلفة مثل (الغلاصم والكبد والمبايض والعضلات) من انثى سمكة الجري الاسيوي *Silurus triostegus* جمعت من نهر الغراف شمال مركز مدينة الناصرية خلال الفترة من ايار ولغاية ايلول /2008 . كذلك تم قياس محتوى الكاربون العضوي الكلي في الرواسب وتم تحديد نسجة الرواسب وعبر عن الناتج كنسبة مئوية . اظهرت النتائج ان تركيز المعادن المدروسه في الجزء العالق اعلى مما هو عليها في الجزء الذائب للماء ، في حين بلغ معدل تراكيزها في الجزئين المذكورين في منطقة الدراسة كالاتي :- (8.9,0.2) كادميوم ، (57.3,1.20) نحاس ، (25.83,0.27) نيكل ، (37.83,0.36) رصاص ، (63.9,3.0) خارصين ميكغم /لتر ، ميكغم/غم وزن جاف على التوالي

اظهر محتوى الكاربون العضوي الكلي في الرواسب محتوى عال في جميع محطات الدراسة وبشكل خاص في المحطة الثانية . في حين كانت نسبة التربة طينية غرينية في جميع المحطات . سجلت المعادن النزرة بأستثناء الكادميوم والرصاص تراكيزاً عالية في الطور المتبقي اعلى مما هو عليه في الطور المتبادل للرواسب ولجميع محطات الدراسة في حين بلغ معدل تراكيز المعادن المدروسة في الجزء المتبادل والجزء المتبقي في منطقة الدراسه كالاتي : الكادميوم (0.47,1.14) ، النحاس (15.1,11.1) ، النيكل (20.3,8.75) ، الرصاص (8.56,13.36) ، الخارصين (24.34,15.03) ميكغم/غرام وزن جاف على التوالي . اظهر التحليل الاحصائي وجود ارتباطات معنوية عند مستوى احتمال ($P<0.05$) بين محتوى الكاربون العضوي الكلي ومحتوى جميع المعادن في الرواسب ، كذلك علاقات معنوية بين تراكيز المعادن في الرواسب وتراكيزها في الجزء العالق للماء . في الاسماك اظهرت المعادن تراكيز مختلفة في الاعضاء المدروسة واخذت الاعضاء من حيث تراكيزها للمعادن الترتيب التالي : الغلاصم > الكبد > المبايض > العضلات .في حين اظهرت العناصر المدروسة اوطىء التراكيز ميكغم/غرام وزن جاف في عضلات النوع المدروس وكما يأتي :-الكادميوم (ND) والنحاس (0.03) والنيكل (0.01±0.5) والرصاص (ND) والخارصين (0.8±7.7) . اوضحت الدراسة الحالية ان تركيز المعادن قيد الدراسه في الماء والرواسب وبشكل رئيسي في المحطة 2 كان مصدرها النشاطات البشرية المحيطة بالمنطقة ،ركز كل من الكبد والغلاصم جميع المعادن قيد الدراسه في حين سجلت التراكيز المنخفضة لتلك المعادن في عضلات الاسماك وبذلك يمكن ان تستهلك كغذاء وبأمان. في حين ركز كل من الكبد والغلاصم جميع المعادن قيد الدراسة .

كلمات مفتاحية :- النظام البيئي المائي ، اسماك ، رواسب ، معادن نزرة .