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Environmental Study of the Benthic Mollusks in Euphrates River at Samawa City, Iraq

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Abstract: ***A study of the physico-chemical parameters on surface water of Euphrates River at Samawa, South Iraq, was conducted from October, 2012 to September 2013. Surface water was collected from three different stations along the river. The results were revealed that the values of air temperatures ranged between 15- 42 °C; water temperatures 15- 30°C .The pH was showed slightly alkaline trend. Electrical conductivity was ranged 3000-9000 µS/cm, Salinity values were ranged between 1.92- 5.76 ‰ , according to the classification of Reid indicated that station waters were Oligosaline during the study period. The total dissolved solids showed values ranging from 1400-6200 mg/L. Dissolved oxygen showed maximum values in winter season. However the results were showed that river water is very hard, the total hardness, Ca hardness & Mg were ranged 600-1350, 300-950, and 48.6-219.91 mg CaCO3/L, respectively. Turbidity was ranged 12.8- 130 NTU. Monthly and seasonal fluctuations in densities of freshwater Mollusca were recorded during study period. The study revealed the occurrence of 5 species of freshwater Mollusca belonging to 5 families of class Bivalva & Gastropoda. These species are: Corbiculafluminea, Uniotigridis, Melanoidestuberculate, Melanopsisnodosa and Viviparusbengalensis. The densities of the recorded Individuals varied seasonally and the general seasonal peak was recorded during Spring while the lowest density observed during Winter. Statistically, significant differences were recorded in the water parameters values and Mollusca density (P ≤ 0.05) during study months, while there have been no significant differences between stations.***

Keyword: Water quality parameters, benthic Mollusks, Euphrates River, Iraq

1. Introduction

Water is essential for the survival of life on earth. It is a most essential basic component to all living being as most of the biochemical reactions that takes place through the metabolism and growth of living organisms involve water. Water occupies 71% of the planet earth surface, out of all the available water on the earth surface only 3% constitute fresh water which is present in the form of ice caps, glaciers, rivers, lakes, ponds, streams and ground water resources. The most important and vulnerable freshwater system is the river and plays a critical role in the sustenance of all life [1].

The quality of water required to maintain ecosystem health is largely a function of natural background conditions. Some aquatic ecosystems are able to resist large changes in water quality without any detectable effects on ecosystem composition and function, whereas other ecosystems are sensitive to small changes in the physical and chemical makeup of the body of water and this can lead to degradation of ecosystem services and loss of biological diversity. The degradation of physical and chemical water quality due to human influences is often gradual, and invisible adaptations of aquatic ecosystems to these changes may not always be readily detected until a dramatic shift in ecosystem condition occurs [2].

The water quality of a River can be determined in several ways. Water quality can be compared relatively between several water sources, or can be measured absolutely. Physical, chemical and biological factors can all indicate the quality of the water.

Within the large group of animals known as mollusks, three subgroups. Snails, mussels and clams have representatives that live in freshwater. Because all freshwater mollusks have hard shells that are often washed up on shores, they are some of the most conspicuous of the freshwater invertebrates. Freshwater mollusks were an integral part of the complex web of life that supports biodiversity. Like other invertebrates, they play an important role in nutrient cycling, functioning as decomposers and as critical links in the food chain [3].

Present study was designed to Study monthly variation in water quality parameter, which could adversely affect the animals, including freshwater Mollusca. In the future, Current paper serves as a database for those interested in environmental studies and find out Mollusca diversity in the study area.

2. Materials and Methods

2.1 Study area

The study area included 3 sites of River Euphrates at Samawa city. Samawa is a town located about 270 km south of Baghdad, capital of Iraq. S1 called the Suyyagh district located in beginning of enter the river to the city center, while the second site located about 2 km from the S1in the Corniche area characterized the lack of vegetation near the river edge. S3 is located in the end of the river within the city Figure 1

2.2 Sampling Procedures

The survey was conducted monthly for Eleven months from October 2012 to September 2013. Sample sites were characterized by measuring several environmental variables, Air and water temperature (°C) and Electrical conductivity (µS/cm) were measured directly at the sampling sites [4], Salinity (‰) was calculated based on the electrical conductivity values of the water [5].Total dissolved solids (TDS), pH , Total hardness (mg CaCO3/L), Ca hardness, Mg and Dissolved oxygen (DO)

were measured depending on procedures that has been described by [6], While Turbidity (NTU) was measured by Turbidity meter type Hanna Hi 25557.

Mollusks were sampled using VavVeen Grab Sampler Monthly, during the same period of water samples collection depending on procedure that has been described by [7]. Mollusks have been identified subsequently with literature [8, 9, 10& 11] grouped by species and counted and expressed by (Individual/m^2).

2.3 Statistical analysis

Variance analyzes performed using SPSS 14.0 software at 5% were used to compare the means of physico-chemical parameters measured, and test the significance of differences. Pearson correlation coefficient (r) was used to correlate physico-chemical parameters and density of Mollusca.

Figure 1: Map Showing Sampling Site on Euphrates River

3. Results and Discussion

The overall range in Air temperature observed was 15-42 °C Figure 2 while the Water temperature was maximum 30°Cduring August in St.3 and the lowest values 15 °C were observed during December in St.1 and January in St.2 and St.3 respectively Figure 3.The results were showed significant deference ($p<0.05$) between months and show positive and negative correlation between Air & water temperatures and other parameters. The present study was showed obvious change in air and water temperatures during the seasons, while the highest values of temperature were recorded during summer and the lowest during winter, this variation was occurred because the seasonal and geographical change and the difference in time of sampling. These results have been agreed with what was reported by [7& 12].

The pH of water is important because many biological activities can occur only within a narrow range, the monthly variation in pH ranged between 5.0-8.0, the maximum value was observed during August in St.3 and minimum value in St.1 during October Figure 4.The value of pH between stations during the study did not show significant differences ($p<0.05$) and this could suggests that the water body was homogeneous in terms of pH.

The maximum Electric conductivity 9000µS/cm was observed during February in St.1 and minimum 3000 µS/cm in November Figure 5, the higher electric conductivity observed in this study may be due to increase in amount of organic material of the river. Salinity values were ranged between 1.92- 5.76‰ Figure 6.According to the classification of Reid[13] indicated that station waters were Oligosaline during the study period. The results were revealed significant deference ($p<0.05$) in values of total dissolved solid (TDS) between months were ranged from the highest value 6200 mg/L during February in St.1may be because frequent rainfall, which led to cliff of large amounts of salts of farmland, which passes the river, as well as the presence of canals that drained towards the river, to the lowest value1400 mg/L recorded during November in St.3 Figure 7. Positives and negative correlations were observed between TDS and some parameters. The maximum dissolved oxygen 12.5 mg/L was observed during November in St.1 Figure 8 and minimum value 4.1 mg/L was observed during August in St.3. Dissolved oxygen showed maximum values in winter season. It may be due to temperature variations. Dissolved oxygen showed inverse relationship with water temperature [14]. Similar type of results were observed in present study as dissolved oxygen decreased with increase in Air & water temperature, also the results were showed negative correlation between DO on one hand and air, water temperature, EC, TDS and pH. on the other.

Total hardness ranged from 600 to 1350 mg$CaCO_3$/L during the study period Figure 9. The results show significant deference ($p<0.05$) between months and positive correlation between TH and EC., TDS, Ca hardness and Mg. The maximum Calcium hardness 950 mg$CaCO_3$/L was observed during February in St.3 and minimum 300 mg$CaCO_3$/L in March Figure 10. Magnesium hardness ranged between 48.6 - 219.91mg$CaCO_3$/L. Figure 11.In general, calcium values were higher than the values of magnesium in present study may be due that the CO2 tends to larger interact with calcium compared magnesium resulting in a shift of large amounts of dissolved calcium to bicarbonate [15].

Turbidity in Freshwater is caused by presence of suspended particles such as clay, silt, finely divided organic matter, plankton and other microscopic organisms, the minimum turbidity 12.8 NTU was observed in February while maximum 130 NTU in November Figure 12.However, the observed value were higher than the permissible level recommended by Iraq for drinking water for all months, the statistical analysis showed a significant difference among all months (P<0.05).

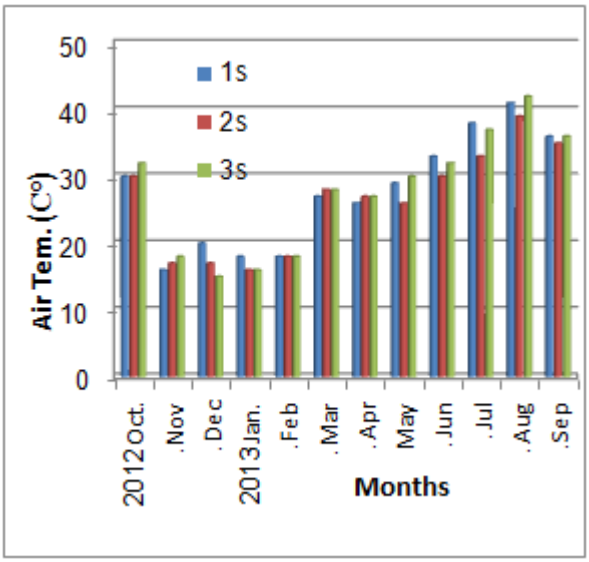

Figure 2: Months Variation in Air Temperature

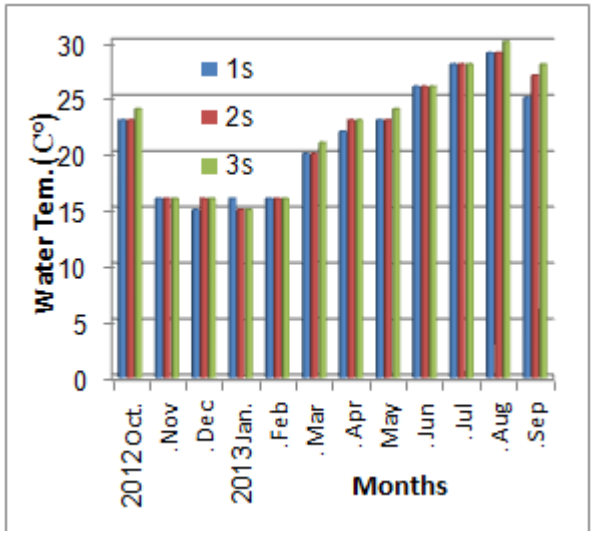

Figure 3: Months Variation in Water Temperature during study period

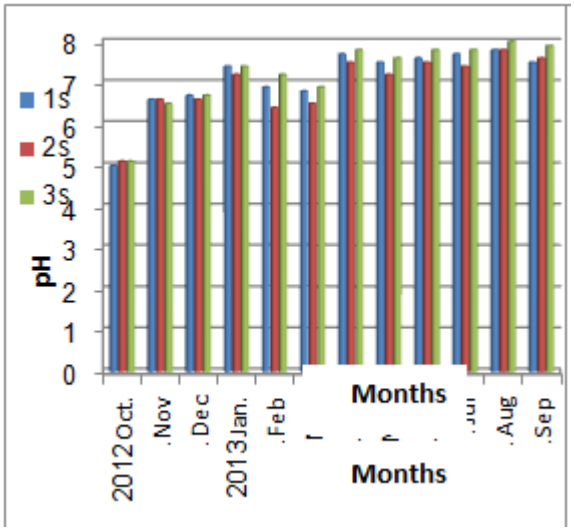

Figure 4: Months Variation in pH during study period

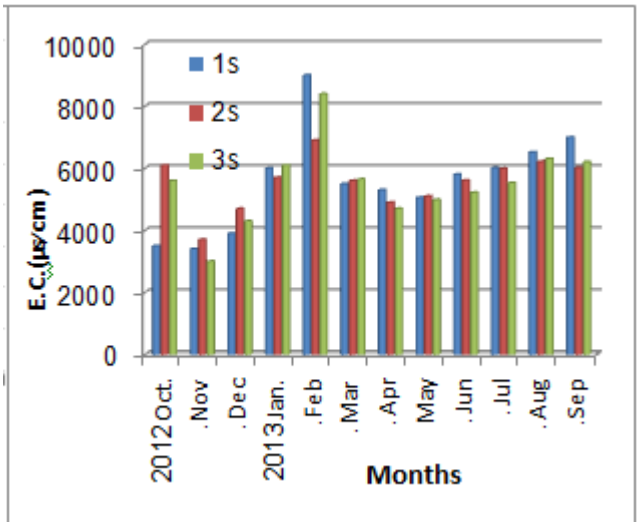

Figure 5: Months Variation in EC during study period

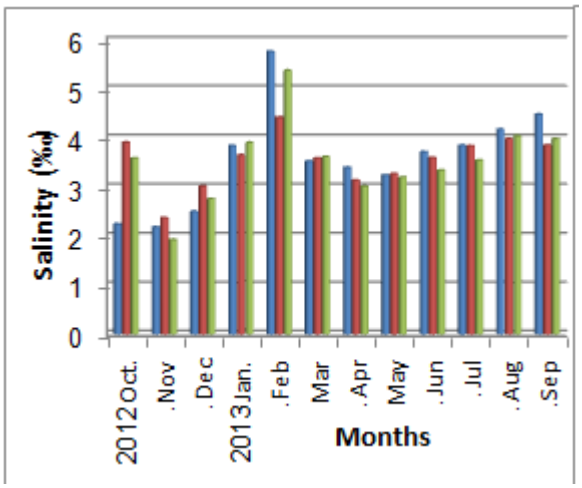

Figure 6: Months Variation in Salinity during study period

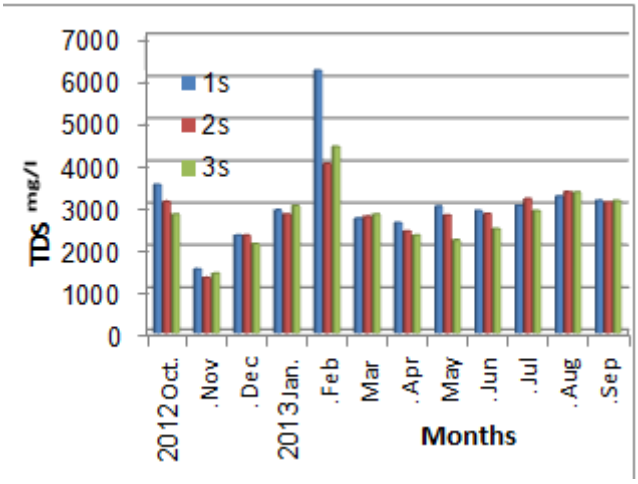

Figure 7: Months Variation in TDS during study period

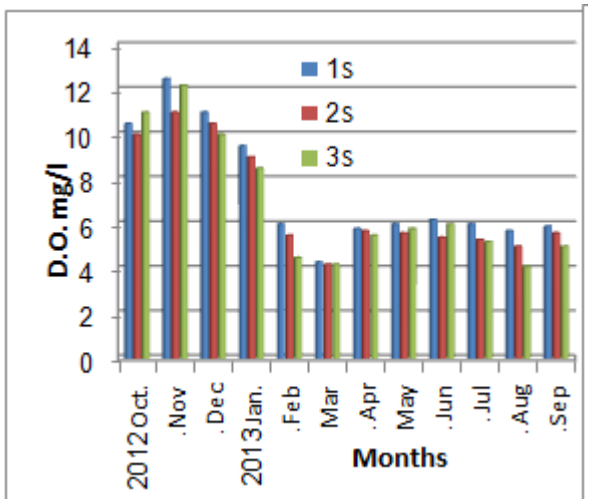

Figure 8: Months Variation in DO during study period

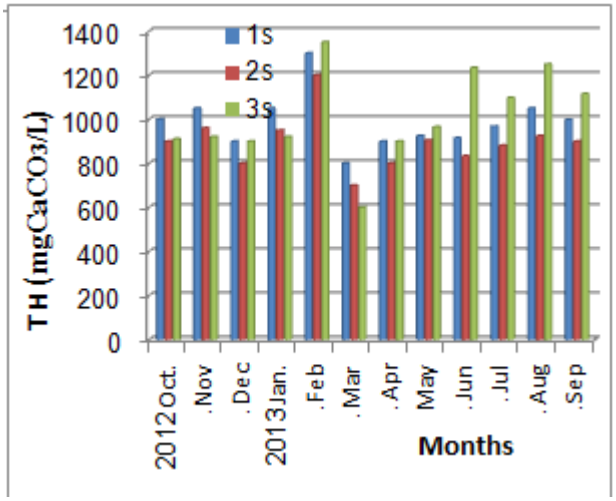

Figure 9: Months Variation in TH during study period

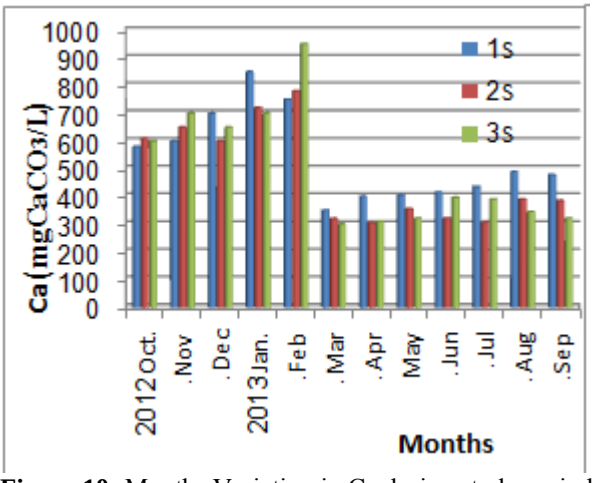

Figure 10: Months Variation in Ca during study period

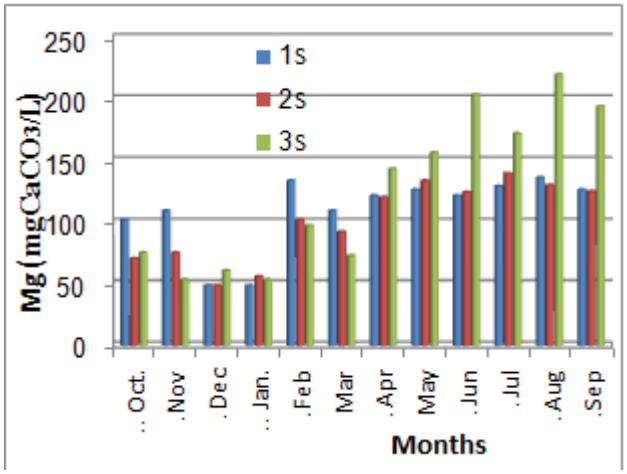

Figure 11: Months Variation in Mg during study period

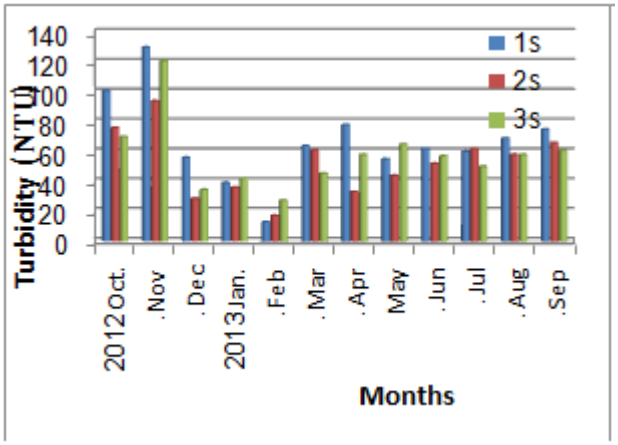

Figure 12: Months Variation in Turbidity during study sites

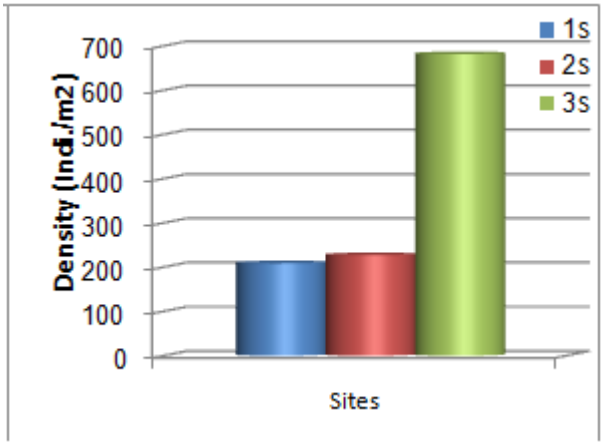

Figure 13: Total Density of Mollusksin study period

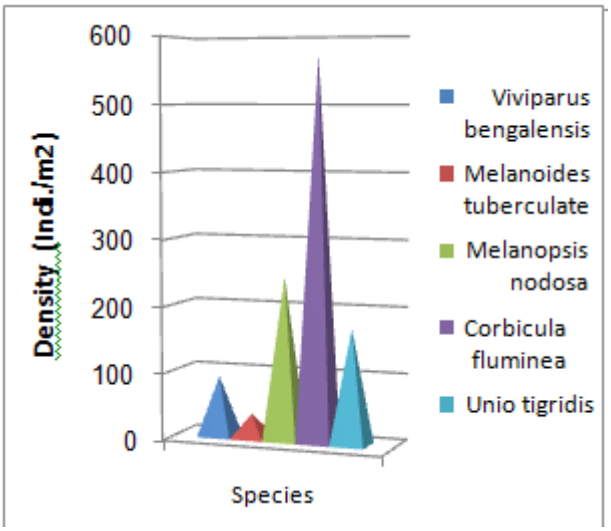

Figure 14: Total Density of Mollusca Species during Seasons

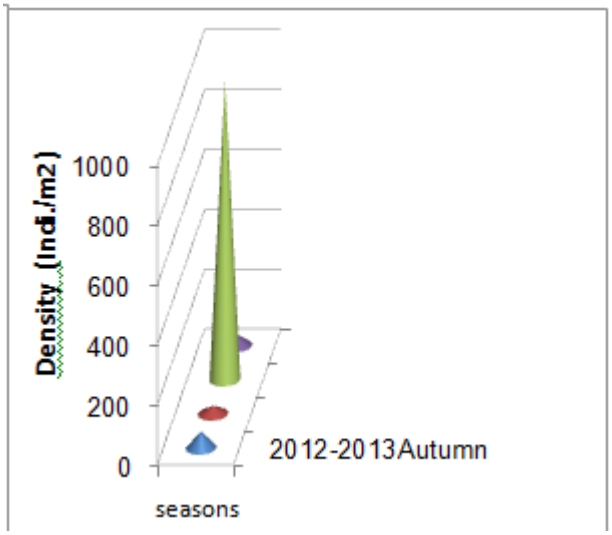

Figure 15: Total Density of Mollusca species during Study period

A total of 5 Mollusca species belonging to 5 families under class Bivalva and Gastropoda were collected from the sites of investigation during the study period. These species are: *Corbiculafluminea* (Corbiculidae), *Uniotigridis* (Unionidae), *Melanoidestuberculate* (Thiaridae), *Melanopsisnodosa* (Melanopsidae) and *Viviparusbengalensis* (Viviparidae). The total number of the collected mollusca was 1118.1 Indi /m^2 from which 209.07, 227.25, and 681.71 individuals were recorded at sites 1, 2and 3 respectively Figure 13.the results showed the highest density values in St.3 and lowest in St.1 Figure 13and showed significant deference ($p<0.05$) between months for the species *Melanoidestuberculate*, *Melanopsisnodosa*and*Uniotigridis* only, and negative correlation between the Mollusca density and Ca hardness of the study area that were presented .Calcium availability is considered to be one of the major limiting factors affecting the distribution of many freshwater aquatic organisms including mollusks [16]. Molluscs rely on calcium for growth of their shell and so are highly dependent on calcium availability for survival, demonstrating reduced growth rate, survival and reproductive output in low calcium environments [17].This was confirmed by the negative correlation in the present study.

According to the numbers of collected mollusca, the species were arranged in ascending as: *Melanoidestuberculate* (36.36 Indi /m^2),*Viviparusbengalensis*(90.09 Indi/ m^2), Uniotigridis (172.71 Indi/ m^2), *Melanopsisnodosa* (245.45 Indi/ m^2) and *Corbiculafluminea* (572.69 Indi/ m^2) Figure 14.

Seasonally, the total catch of freshwater Mollusca showed its highest value during spring, followed by autumn, then summer, whereas the least catch was recorded in Winter Figure 15.

References

[1] Smitha; Ajay, D. &Shivashankar P. **(2013)**. Physico Chemical Analysis of the Freshwater at River Kapila, Nanjangudu Industrial Area, Mysore, India. Int. Res. J. Environment Sci. Vol. 2(8), 59-65

[2] Stark, J.R.; Hanson, P.E.; Goldstein, R.M.; Fallon, J.D.; Fong, A.L.; Lee, K.E.; Kroening, S.E.; & Andrews, W.J. **(2000)**. Water Quality in the Upper Mississippi River Basin, Minnesota, Wisconsin, South Dakota, Iowa, and North Dakota, 1995-98. United States Geological Survey, Circular 1211, Reston, Virginia, 36pp.

[3] F.R. British Columbia **(2000)**.Wildlife in British Columbia at risk.BC Conservation Data Centre Ministry of Environment, Lands and Parks PO Box 9344 Stn. Prov. Govt.

[4] US EPA. **(1997)**. Volunteer Stream Monitoring: A Methods Manual, EPA 841-B-97-003. Office of Water, U.S. Environmental ProtectionAgency: Washington, D.C., USA.

[5] Mackereth, F.G.H.; Heron, J. andTalling, J.F. **(1978)**. Water analysis: some revised methods for Limnologist. Sci. Pub. Fresh water. Bio. Asso. (England). 36: 1-120.

[6] APHA (American Public Health Association). **(1999)**. StandardMethodsfor Examination of Water and Wastewater. 20th ed. WashingtonDC,USA.

[7] Al-Fanharawi, A.A. **(2010)**. Distribution and Diversity of the Benthic Macroinvertebrates in Sediments of Shatt Al-Hilla/Iraq. Master Thesis. Science College, Babylon University, Iraq. 118 p.

[8] Ahmed, M.M. **(1975)**. Systematic study on mollusca from Arabian Gulf and Shatt Al- Arab, Iraq. Center for Arab Gulf studies,Univ. Basrah., Iraq, 105p.
[9] Plaziat, J.C. & Younis, W.R. **(2005)**. The modern environments of Molluscs in southern Mesopotamia, Iraq: A guide to paleogeographical reconstructions of Quaternary fluvial, palustrine and marine deposits. CG. Notebooks on Geology-A01: 1-18.
[10] Thorp, J. & Covich, A. **(2001)**. Ecology and Classification of North American freshwater Invertebrates. 2nd Academic Press. 1073 p.
[11] Robert, L. & Michael, S. **(2003)**. Family- Level Key to the Stream Invertebrates of Maryland and Surrounding Areas. MDNR. Annapolis, Maryland 21401.
[12] Al-Fanharawi, A.A. **(2013)**.Environmental Study of the Benthic Macroinvertebrates in Sediments of Sawa Lake, Iraq. J.Muthana Pure Sci. 1 (2): 71-85.
[13] Reid, G. K. **(1961)**. Ecological of inland waters and estuaries-Rhiem hold corp, New York, 375 pp.
[14] Ali, S.S. **(1999)**. Freshwater Fishery Biology. 1st Ed. p: 108–14. Naseem Book Depot, Hyderabad, Pakistan.
[15] Munawar, M. **(1970)**. Limnological studies on Fresh water ponds of Hyderabad-India. I. The hydrobiol. 35 (1): 127-162.
[16] Briers, R. A. **(2003)**. Range size and environmental calcium requirements of British freshwater gastropods. Global. Ecol. Biogeogr. 12, 47-51.
[17] Zalizniak, L., Kefford, B. J. and Nugegoda, D. **(2009)**. Effects of different ionic compositions on survival and growth of Physaacuta. Aquat. Ecol. 43, 145-156