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THE USE OF WATER QUALITY INDESIS (CANADIAN MODEL)IN EVALUATION OF THE WATER QUALITY OF MAIN OUT FULL DRAIN TO FEED AL-HAMMAR MARSH

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ABSTRACT

Water quality index(WQI) is considered as an effective tool to categoried of water resources for its quality and suitability for different uses. The Canadian model of WQI was applied to assessed the water quality of the water of Main out fall drain and water marshes that feed it and the quality of the Euphrates River and marshes that feed it and study the extent of water marshes affected by theise sourses and determine its suitability for drinking water and aquatic organisms life and for Irrigation for the first time in the study area, was chosen tow stations to collect samples within the study area, the first station located at the Main out fall drain at Khamisia aria in district of Suq southwest Nasiriyah city, and the second station is located in the same area the first station but after mixing with water of marsh which is called locally Alsenaf Marsh.

Water samples collected from the study stations seasonaly starting from the autumn 2014 until summer 2015 . Chosen 25variables of water quality variables with the greatest influence on the water quality and determine the suitability for drinking water and aquatic organisms life and Irrigation for quantifying the WQI: water temperature , the water current velocity, electrical conductivity, total dissolved solids, salinity, turbidity, pH , electrical conductivity, dissolved oxygen , biological oxygen demand , chemical oxygen demand , total alkalinity, total hardness, reactive nitrates, reactive phosphates, sulfates, chloride, sodium, potassium, calcium, magnesium, boron , sodium adsorption ratio, lead , cadmium and fecal coliform bacteria.

The results of the current study ranged to the values of Water quality for the processing of drinking water index (PWSI) between(13.21-34.35) for all stations for the duration of the study and thus classified in the fifth category(0-44) (Poor) to guide the scale.

And it ranged from water quality index values for the purposes of the living Water quality index for aquatic organisms life (WQILA) between (19.85- 41.98)and thus classified as (0-44) (Poor) for all stations for the duration of the study. Whileranged irrigation water quality index values (IWQI)between (15.69-41.68)and thus as (0-44) (Poor).

KEYWORDS: Water quality index(WQI), Water quality & Water quality index for aquatic organisms life (WQILA)

INTRODUCTION

Water is the most important on the surface of Earth's natural resources and where there is water andfound civilizations, where three quarters of the planet covered by water, space, or about 70% of the globe,constitute fresh water about 2% of the area is one of the most important natural sources of life-sustaining (Chougule et al, 2009), and exceeded the use of water from human and agricultural purposes Statistics to industrial and civil uses broad, making it vulnerable to direct pollution and indirect, and because of that the world has witnessed a growing interest in water resources and how pollution where treatment (Hussain, 2000).

The Marshes are intermediate zones between agricultural land and water areas such as rivers, lakes and estuaries, which is a modified environment climate being one of the most consumed gas environments carbon dioxide (UNEP, 2000), and the marshes are low area covering the main portion south of the country from Mesopotamia (Al-Badran .2006), and one of the most productivity of ecosystems on Earth, and play marshlands of Mesopotamia role effective in maintaining biodiversity in the region because of the wide area and the large number of aquatic plants as well as the relative isolation (Al-Saad et al., 2008), has been classified United Nations Environment Programme as one of the most important biodiversity centers in the world (UNEP, 2006), and holds the marshes and other important is to absorb flood waters and groundwater recharge as well as the seizure of minutes outstanding and nutrients also represents a basin large organic carbon (Van der Valk, 2006). Marshes are an important part of the southern area of Iraq and an important source of many resources, such as fisheries and reeds agricultural and animal products, as a result of increasing human activities on Civil and progress has increased pollution in the waters of those marshes, and the lack of water supply and the drying process involving those marshes in the contract the last of the last century and so far many of the changes in the cause of environmental specifications for these areas (Jawad , 2008).

The importance of maintaining the fresh water sources of the important things in the world and requires the development of monitoring programs to protect the sources of those waters from pollution (Pesce and Wunderlin, 2000), and in general, the aquatic environments can be described as having a complex installation requires care in use to ensure the sustainability of and the continuation of the water system, as well as that the management of aquatic environments requires an understanding of the interdependence of ecosystem properties and methods that enable the human activities that change the interaction between the life and the chemical and physical processes (UNEP / GEMS, 2006). Given the importance of the Main out full drain which brings together the most important water drainage from the various agricultural land and the presence of attempts regarded as one of the sources feeding the marsh area of water so This study was conducted to determine the validity of water downstream for different uses, including the feed water marshes.

MATERIALS AND METHODES

The samples were collected from the autumn for the year (2014) up to the summer of (2015) and at a depth of about 30 cm below the surface of the water, according to standard methods. Water temperature were measured using a mercury thermometer is included up to 100˚m, either turbidity have been measured using the measuring device turbidity (Turbidometer) making HANNA Model LP 2000 company after calibration device was the unit of measurement (NTU) Nephlometric Turbidity Unit. The speed of the water flow by table tennis so it took a certain distance (15 m) using a tape measure and then tossed the ball in the water and by the time required to cut this distance and then extracted flow velocity The unit of measurement (m / s). pH of the water have been measured using a model of pH- meter (HI 8424) HANNA production company and after calibration standard intravenously (Buffer Solution) with PH, 4, 7, 9 before starting work. Measured electrical conductivity, salinity and TDS water samples for laboratory using a device (‰ NaCl, TDS, EC) type HANNA. The method described is followed by (Maiti, 2004) to measure the chemical oxygen demand and in a manner called Reflex method Open by using escalation device (Reflex apparatus). Followed the method described by (Lind, 1979) to measure the total hardness. It was measured the concentration of sodium and potassium using Flame photometer device.

It was measured the concentration boron using colorimetric method (Curcumine) and using a spectrophotometer UV-visible spectrophotometer. It was to follow the way of Ascorbic Acid Method described in (APHA, 1998) using a spectrophotometer to measure the effective phosphate. Nitrates were measured by the method of estimation UVB UltraViolet Method described in (APHA, 1998) using the spectrophotometer UV- device. SAR is the account of sodium, calcium, magnesium, as proposed by the equation concentration (Ayers & Westcot, 1985). Followed method (Riley & Talyor, 1968) to measure trace elements in the dissolved and particulat phase. Measured total alkalinity and dissolved oxygen and biological oxygen demand and chloride and calcium ion, magnesium, sulfate and expense of preparing Bacillus fecal coliform as roads clarified by the American Public Health Association (APHA, 2003).

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Has been collecting the results of water quality and arranged according to the seasons and the ocean in a matrix, then the water quality Canadian guide CCME WQI account, according to the equations described in (CCME, 2001) to calculate the range or domain (F1) and frequency (F2) and amplitude (F3) including the value of the account water quality index , according to the equation:

التراجع عن التعديلات

$$WQI = 100 - \frac{\sqrt{F_1^2 + F_2^2 + F_3^2}}{1.732}$$

Drawing reflect on the state of the water body by attaching the normal scale numerical value of the evidence, according to Table (1).

Table 1: Measure The Level of Water Quality, According to The Canadian Index(CCME, 2001)

Rating Categories	Index Value	Value Description
Excellent	95-100	Water well protected far from pollution as they approach the ideal water.
Good	80-94	Protected to a lesser extent water and rarely stray from ideal specifications Specifications
Fair	65-79	Water protected but often exposed to pollution and is sometimes away from the idealism sometimes
Marginal	45-64	Water exposed to pollution which frequently are often away from the ideal
Poor	0-44	Water pollution always repaired yet and are far from ideal at all times.

THE RESULTS

The results of the current study showed that the water temperature ranged between (9.26-30.33) ° m in the first leg of the winter of the second station in the summer in a row, and the flow velocity ranged between (0.03-0.23) m / s in the second station during the summer and the first stop during the winter respectively, and the electrical conductivity values ranged from (7803.33) in the first station during the winter and (27643.33) Microsiminz / cm in the first station during the summer, as the concentration of salinity ranged between (16.26-24.16) ‰ in the first station during Winter and second station during the autumn respectively, ranged pH between (7.3) in the second station during the autumn and(8.56) in the first station during the summer, as the current study recorded concentrations of total alkalinity between (239.66 -548) mg /L for the first station during the winter season and the second station during the autumn respectively. Also recorded a current study of dissolved oxygen values between (2.73-7.5 mg / L) in the second station during the summer and in the station itself during the spring. As the biological oxygen demand values were within the range (0.96) in the first station during the autumn and (4.40) mg /L for second station during the winter, and the values of the chemical oxygen demand between ((12.63 in the second station during the autumn (200) mg /L for second station during the winter, has water turbidity ranged between NTU (1.43) in the first station during the winter and 54 in the second station during the summer.And the concentration ranged between total soluble materials (4126.66-16645.33) mg / L in the first station during the winter and in the second station during the summer. sodium ions also recorded between (1978.66-4153) mg / L in the second station in the spring in the same station during the summer. and potassium (22.33-106) mg / L in the first station during the winter season and in the second station during summer, and ranged between chloride (1809.66-7130) mg / L in the first station during the autumn and at the same station during the summer , and ranged between calcium (285.33-672.33) mg / L in the second station during the autumn At the same station During the summer , and ranged between magnesium (369-880 mg / L) in the second station in the spring in the same station during the summer , either total hardnes ranged from (2409.66-4783.33) mg / L in the second station In the spring the first station during the summer , and sulfate inspired seen between (1534.33-3251) mg / L in the second station in the spring and in the first station during the summer in a row, and boron ranged between (0.02-2.5 mg / L) in the first station during the winter and in the station itself during the summer in a row, and nitrates ranged between (0.56-2.32) mg / L in the second station during the winter and in the first station during the spring in a row, and phosphate ranged between (0.03-0.86) mg / l in the second station through the autumn and in the first station during the summer . Was calculated as the proportion of sodium adsorption SAR ranged between (90.81-149.43) milli-equivalent / liter in the second leg through the autumn At the same station during the summer in a row. Also studied recorded a number of fecal coliform ranged between (32-2300) cell / 100 ml in the second station during the summer and in the first station during the spring, respectively. The results of the current study also showed that the concentration rate (cadmium and lead) in the dissolved phase of the water as follows: Cd (0.82-2.81) Micro g / l in the first station during the spring and in the second station during the summer in a row, and Pb (22.66-4419.66) mcg / L in the first station during the spring and in the station itself during the summer in a row ,, The concentrations of these elements rate in the particulate phase has reached Cd (336-3437.66) Micro g / g dry weight in the second station in the spring and in the first station during the summer in a row, and Pb (2171.66- 46031) Micro g / g dry weight in the first station during the autumn and in the second station during the summer in a row. Table (3)

Table 2: The Values of Water Quality Index (Pwsi, Iwqi, Wqial) and Taxonomic Categories of Stations

Study Stations	Study Season	PWSI Value	Rating Categories	WQIAL Value	Rating Categories	IWQI Value	Rating Categories
First Station	Autumn	28.19	Poor	26.9	Poor	41.68	Poor
	Winter	34.35	Poor	41.98	Poor	34.75	Poor
	Summer	29.86	Poor	37.13	Poor	40.56	Poor
	Spring	13.97	Poor	19.85	Poor	15.69	Poor
	whole year	26.59	Poor	31.46	Poor	33.17	Poor
Second Station	Autumn	25.97	Poor	28.96	Poor	41.48	Poor
	Winter	27.53	Poor	40.72	Poor	34.75	Poor
	Summer	26.45	Poor	30.90	Poor	40.79	Poor
	Spring	15.95	Poor	24.73	Poor	15.87	Poor
	whole year	23.97	Poor	31.32	Poor	33.22	Poor

Table 3: The Values of The Physical, Chemical and Biological Factors of the Water Stations Study

Factors	First Station				Second Station			
	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer
Water temperature c_o	24.40	9.26	21.56	29.73	23.70	10.66	20.60	30.33
Turbidity (NTU)	19.2	1.43	17.60	30.46	12.36	3.13	17.94	54
pH	7.40	8.23	7.56	8.56	7.30	8.20	7.60	8.53
Electrical conductivity (micro semenz/L)	12620	7803.33	9140	27643.33	12667	8859.33	8806.66	27553.33
Salinity $_o$%	24.50	16.26	17.80	21	24.16	17.40	17.60	18.33
Dissolved oxygen mg/L	5.26	5.60	6.30	3.10	5.26	7.36	7.50	2.73
Biological oxygen demand mg/L	0.96	2.16	1.83	2.20	3.13	4.40	1.38	1.33
Chemical oxygen demand mg/L	90.96	200	41.33	151.66	12.63	40.66	32.66	136
Total dissolved solids mg/L	7065.33	4126.66	4456.66	16508.66	6976.66	4406.66	4520	16645.33
Calcium mg/L	321	415.66	403.66	645	285.33	353.33	364.33	672.33
Magnesium mg/L	650.66	741	382.66	802	640.33	830.33	369	880
Total hardness mg/L	3433.33	4002.33	2520	4783.33	3293.33	4200.66	2409.66	4236.33
Total alkalinity mg/L	548	260.33	325	250.66	281	239.66	308.33	249
Phosphate mg/L	0.05	0.05	0.83	0.86	0.03	0.07	0.12	0.07
Nitrate mg/L	1.26	1.36	2.32	1.40	1.21	0.56	1.44	0.73
Sulphate mg/L	1831.33	1956	1707.33	3251	1900.33	2432.66	1534.33	2806
Chloride mg/L	1809.66	3481	2282.33	7130	1901.33	3353.66	2205.33	7038.33
Potassium mg/L	39.66	22.33	34.66	96.66	34.33	24.50	32	106
Sodium mg/L	2041.66	2981.66	2041.66	3597.00	2030	2911.33	1978.66	4153
Sodium adsorption ratio equivalent /L	92.80	124.40	107.17	136.70	90.81	120.88	104.18	149.43

Table 3: Contd.,								
Boron mg/L	0.06	0.02	0.04	2.5	0.4	0.04	0.42	2.43
Dissolved Lead microgram /L	57.33	34.33	22.66	4419.66	55.60	35	31.66	3070
Particulate lead microgram dry weight/L	1.15	0.93	0.82	2.16	1.18	1.26	1.70	2.81
Dissolved cadmium microgram /L	2171.66	6050.33	6161.33	29036	2700	3437.33	4435	46031
Particulate cadmium cadmium	3437.66	1312.66	2630.33	2831.33	1055.66	899	336	447
Fecal coliform bacteria cell /100 ml	2266	210	2300	126	441	208	218	32

DISCUSSIONS

The results of the current study showed that there is a significant change in the temperature of the water between the seasons of the year, with the highest rates recorded during the long hot summer and the lowest score during the short winter and cooler, and this is what is known about the nature of Iraq's climate in general where it is cold rainy winters and warm dry summer (Fahd, 2006). Where vary water temperature varying climatic situation (Ismail and Saadallah ,2010). Variation in the degree of heat, especially between stations may also study due to the time difference sampling. The pH recorded in current with variations quarterly and on-site study values , values fall within the baseband side, especially weak alkalinity, which is known for Iraqi waters most likely and maintains that there is a component of carbonat and bicarbonates Buffering System (Lind, 1979). It has been observed high pH value during the summer in the study stations where temperature plays an important role in the solubility of gases, some of which fit directly proportional to the pH value and this may explain the relative decline in the value of the pH during the winter. And the rise may be due to a decline in bilateral gas concentration dioxide dissolved in the water due to the high temperature of the fact that an inverse relationship between them or because consumed by plankton and aquatic plants in photosynthesis and thus the decomposition of ion bicarbonates to carbonat ion and thus increasing the alkalinity becoming more and more the value of pH.

The highest value of turbidity recorded during the summer in the second station, while the lowest was during the winter in the first station, may be due to multiple causes, including significantly lower the water level in the hot summer, which has increased the influence of boats fishermen movement of fish in the turbidity increase in This station (Show field). The electrical conductivity and salinity high very valuable in the first station due to the fact that this site represents River General downstream which is mainly trocar to collect water washing agricultural land on long salts rate significantly rises in it, either for the second station, which represent marsh were the values of conductivity is also high it represents the flow of salty water from the main out full drain to the marsh (Fahd, 2005). In general summer has the highest conductivity, salinity, possibly due to the high temperatures, which leads to the evaporation of water and increase the concentration of salts and thereby increase the electrical conductivity values (AL-Tayar,1988). The results of the current study showed that the highest value for total dissolved solids was part of the second station during the summer, has been rising during the summer season due to the solubility of the salts which are generally high temperatures increase (Awad and Millward, 1995; Wetzel, 2001). The results of the current study, high concentrations of dissolved oxygen during the winter and probably due to the low temperature which results in increased gas solubility in water the fact that the relationship counterproductive between them, and low dissolved oxygen values during the summer in The present study may be attributed to the high temperature and evaporation gases in the water with the fact that the relationship inverse solubility.

The results of the present study indicate a discrepancy in the vital oxygen demand between stations and classrooms values, also it illustrated the high bio oxygen demand in some of the cold months, which may be due to rainfall and soil erosion Tee persistent values, especially coming from agricultural land to the studied water, in addition to that deposition of air pollutants by wind and rain increases its presence in the river (Hassan et al., 2014).

Showed the results of the current study, there were no significant differences between the chemical oxygen demand values in the stations study, but in general was high may be the reason for this is the presence of solid waste in the presence of persistent organic and inorganic (Amadi et al, 2010). As for the rise in temperature at least seasons it may be due to the decline in operations of the decomposition of organic materials with low temperatures.

The highest values of total hardnes recorded in the first station during the summer, reason may be due to rise during the summer to lower amounts and water levels during this season (al-Lami and his group, 2001). Mar directly affect in the quarterly changes in the values of brackish or may revert to put human and agricultural in water(Al-saadi et al ,1998)

The results of the current study showed an increase in the alkalinity values were highest in the first station during the fall season and this may be due to the nature of the affected basic nature of the soil and rocks that surround those stations. The reason for the decrease in basal summer may return to the high temperatures that work on the deposition bicarbonates and lower values (Gabriel, 2006).

The developments in the phosphate concentration increase in some warm months may come back to liberate phosphate from the sediment in the bottom and suspended sediment resulting from the nearby river inputs (Rakocevlc, 2012). While the lack of phosphate in some seasons may be due to consumption by algae or chemical precipitation and adsorption on clay minutes (Faragallah et al., 2009).

Higher nitrate values recorded during the spring in the first station may be due to the fact that the river, contain trocar combines the next drainage water from farmland along the river during the long march where you play fertilizers used in agriculture a prominent role in increasing concentrations of nitrates, and the relative decline of winning in Nitrate concentrations values during the winter may be due to the large consumption by phytoplankton and aquatic plants .

The current study increase shown in chloride, especially in the first station of values, have registered the summer the highest values, the high values of the ion chloride in the water during the summer season can be attributed to an increase in evaporation rates in this season with a significant decline in the water level, as well as laundering or salts puncture chloride from neighboring agricultural land especially sodium chloride salt and found in large quantities in the area around the river and thus increase the chloride ion in the water lands (Awad and Mohammed, 1988).

It showed the results of the current study, a significant increase in sodium values in all stations and seasons, especially in the second station during the summer, and this may be related to low water levels dramatically, and therefore focus sodium salts in this location as it is fed from the water downstream loaded next salts of farmland surrounding it. The on-site changes and quarterly in the values of the proportion of sodium adsorption were in line with developments in the ions each of sodium, potassium and magnesium changes because it is calculated based on the concentrations of these ions, as shown by the results, the sodium adsorption ratio was very high in all the stations and the seasons. The findings show high values of boron ion in the hot season, compared with the cold seasons and this may be due to high temperature, which causes an increase in evaporation and respiration and decomposition rates and then increase boron (Butterwick et al., 1989). The percentage of boron in the water in the current study within the permitted for various uses in most chapters and border stations, except for the summer of 2015, which recorded a rise in the value of a large boron. It showed the results of the current study, a remarkable increase in the concentration of trace elements in all stations and seasons, and it was the summer is the highest proportion, as the concentration of trace elements increase in dry seasons and warm due to high temperature (Obasohan, 2008 ;; Abd and Musa 2009 ALsoltany ,2011), leading to an increase in the rates of evaporation and decomposition of organic materials, especially the dead parts of living organisms and decrease in the absorption of living organisms of these elements in addition to the reduction of most of these elements by anaerobic bacteria such as sulfur analyst bacteria, which analyzes the organic material mixed with trace elements and therefore will lead to an increase in the concentration of trace elements dissolved in water (Park et.al., 2008). Showed the results of the current study, the presence of temporal variations and spatial in the preparation of fecal coliform, as observed rise in the numbers in the fall and spring, and can be attributed to the decline in discharges and increase the concentration of pollutants resulting from asking household waste and wastewater containing large numbers of bacteria rate fecal coliform (Mumtaz et al., 2011; Baghel et al., 2005).

Water quality for the processing to drinking water stations study guide record very low values in the studied water stations for the duration of the study, classified as water quality within the fifth category (Poor) to guide scale (Table 2). It was the most summer deterioration in the directory values, where evidence depreciated in this season because of the high some input variables in the directory account for the Iraqi and global purposes of drinking standard determinants, particularly lead, turbidity, electrical conductivity and solids and total alkalinity total soluble ions of calcium, magnesium, sodium and chloride and total hardness and sulphates, boron, the total number of coliform and biological oxygen demand. When comparing the values of the quality of index for the first two and the second we find that the spatial differences between them were minor, as the second station (the marshes) fed from the downstream (first station) so they are influenced by the quality of its water. Analysis of the basic components of the program results showed PCA sequence or the order of water quality variables depending on the power of their impact on the variation made in the quality of water for the processing of drinking water index, were the order of the factors under totals proportion to their impact on the index, it was the first group (PCA1), which includes cadmium, lead, turbidity ,pH ,boron, TDS and conductivity, chloride and fecal coliform, the most important variables responsible for the variation in the quality of drinking water (because of the large on the axis of values (PCA1), followed by the second group (PCA2), which includes sodium, sulfates and total hardness, magnesium, calcium, nitrate, dissolved oxygen and total alkalinity biological oxygen demand, respectively, which is of greatest value on the axis PCA2 variables.

The results of the current study showed that the water quality index for the purpose of aquatic life located within the fifth category (Poor), was the most summer deterioration in the directory values due to the increase of the values of trace elements and the number of fecal coliform standard criteria during this season, except for the biological oxygen demand and pH effective and nitrates, which remained within the permissible limits according to the standards of living of the living. The variables that were beyond the standards large and influential concentrations in the directory are lead, chloride and turbidity, cadmium and preparation of fecal coliform exceeded these variables in most sasons, while more than temperature, phosphates, dissolved oxygen standards in some cases. The results of the analysis of the basic components PCA arranging water quality variables showed, according to the power of their impact on the changes in water quality index values for the purpose of aquatic life where incurred variables in two groups depending on their impact on the value of the index as the first group was PCA1 included cadmium, lead, pH, temperature, turbidity, boron and TDS and chloride and fecal coliform as the values was the largest on the axis PCA1 compared with values on the second axis PCA2. The second group consisted PCA2 least variables impact on the value of the index as the values was the largest on the axis PCA2 proportion to its values on the other axis PCA1 a phosphate, nitrate, dissolved oxygen and vital requirement for oxygen.

The irrigation water quality index the results showed that the studied waters fall within the category (Poor) and it turned out lower guide values in the summer and this is due to the rise in most of the variables responsible for the quality of water for irrigation purposes, such as lead, cadmium, conductivity and the proportion of sodium adsorption for high temperatures and increased concentrations of ions such as chlorine and calcium, there was a significant temporal differences, where he was most summer a deterioration in water quality index values, due to the impact of low water levels dramatically, which led to increase the concentration of all acting on the evidence the value of variables, especially chloride, electrical conductivity and the proportion of sodium adsorption as they are the most variables effect. The spatial differences there have been a simple spatial differences between the two stations first and second. The results of the analysis of the basic components PCA arranging water quality variables, according to the power of their impact on the changes in water quality for the purpose of irrigation index values as resulting from changes in the two groups depending on their impact on the value of the index as The first group included PCA1 lead, cadmium, boron and pH, electrical conductivity, chloride. The second group consisted PCA2 by sodium adsorption .

Through the results of the study is clear that he can not rely on water year downstream as an alternative source to feed the marshes, but in the case of increasing the water level dramatically in the downstream, in order to prevent low water downstream level and therefore soluble salts focus it (because of the nature of its salty waters), which adversely affects the All approved changes in the directory account.

REFFERENCES

1 Ismail, Abbas Murtaza and Saadallah, Hassan Ali Akbar (2010). Seasonal variations in biomass plant plankton in the Diyala River, Iraq**.**

2 Dyala Journal for Pure Vol 6 (2), Science. pp: 142 – 149.

3 Bahloul, Murooj Abbas (2013) . Ecological Seasonal Study by using the Water Quality Index (Canadian model) to assess the Euphrates River water within Nasiriyah / city of Iraq, Master Thesis, University of Thi Qar / College of Science**.**

4 Jibril, Nadia Mahmoud Tawfiq (2006). Environmental study of the quality of some of the groundwater for the city of Hilla. Master Thesis. Science Faculty of the University of Babylon.

5 Janabi, Zahraa Zahrao Farhan. (2010). Evidence of the quality of water in the Tigris River applications within the

city of Baghdad-Iraq. Master Thesis, College of Science for Girls, Baghdad University.

6 Jawad, Sana Talib. (2008) .Studying of some environmental characteristics and bacteriological water to the marshes of southern province of Thi Qar March.

7 Al-Soltany, Dhirgam Ali Abbas (2011). The study of bio-accumulation of some trace elements in the muscles of three types of fish and their relationship in change environmental factors in the Euphrates / central Iraq River. Master Thesis, College of Science, University of Babylon.

8 AL-Tayar, Taha Ahmed Taha (1988). "Saddam Dam impact on water quality and its impact on the efficiency of water treatment plants in the city of Mosul." Master Thesis, School of Civil Engineering Department - University of Mosul.

9 Fahd, Kamil Kazim (2005). A study of some physical and chemical properties of the Main out full Drain in the city of Nasiriyah.

10 Kanani, Hassanein Ali Abdali (2015). Qualitative characteristics of woolens factory and its impact on the Euphrates River at the city of Nasiriyah in southern Iraq Center. Master Thesis, college of Science, University of Thi Qar.

11 Mwail, Mohamed Salem. (2010) .Asses waters of the northern part of the Shatt al-Arab water quality using the quality of evidence (Canadian model). Master Thesis, college of Science, University of Basra.

12 Abd, A.K.M. and Musa, Z.J. (2009). A study of levels of trace elements in water and soil of Hamadan Canal and Its Effect on leaves fruits of Braim and Hillawi Cultivars of date palms. Marsh Bulletin, 4 (1): 85-97.

13 Amadi, A.N.; Olasehinde,P.I.; Okosun, E.A.& Yisa, J.(2010). Assessment of the Water Quality Index of Otamiri and Oramiriukwa Rivers. Physics International ,Vol. 1 (2), pp: 116-123**.**

14 APHA,American Public Health Association (2003). Standard methods for the examination of Water and Wastewater. 20thed.Washington DC, USA.

15 Baghel,V. S.;Gopal, K.; Dwivedi, S. and Tripathi, R.D.(2005). Bacterial Indicator of faecal contamination of the Gangetic river system right at its source. Ecological Indicators. 5:49-56.

16 CCME,Canadian Council of Ministers of the Environment (2001a). Canadian Water Quality Guidelines for the protection of Aquatic Life : Canadian Water Quality Index 1.0 Technical Report .In Canadian Environmental Quality Guidelines, 1999. Winnipeg : Canadian Council of Ministers of the Environment. 14pp.

17 CCME,Canadian Council of Ministers of the Environment (2001b). Canadian Water Quality Guidelines for the protection of Aquatic Life : Canadian Water Quality Index 1.0 Technical Report .In Canadian Environmental Quality Guidelines, 1999. Winnipeg : Canadian Council of Ministers of the Environment. 5pp.

18 Chougule,M.B;Wasif,A.I.and Naik,V.R.(2009).Assesment of Water Quality Index (WQI) for Monitoring Pollution of River panchganga at Ichalkaranji. Proceedings of international conference on energy and environment. 19-21 March .

19 Faragallah , H.M. ; Askar, A.I. ; Okbah, M.A. & Moustafa, H.M. (2009). Physico-chemical characteristics of the

open Mediterranean sea water far about 60 Km from Damietta harbor, Egypt. Journal of Ecology and The Natural Environment, Vol. 1(5), pp: 106-119 .

20 Lind, O.T. (1979). Hand book of Common Methods in Limnology. C. V Mosby, St. Louis. 199pp.

21 Maiti, S.K. (2004). Hand book of Methods in Environmental Studies Vol.1 : Water and Wastewater Analysis ,Second Edition , ABD publisher ,India.

22 Mumtaz, M. W,;Adnan, A. ; Mukhtar, H. ; Nawaz, K.; Raza, A.and.z.;Ahmed. (2011) . Estimation of bacteriology levels in surface water evaluate their contamination profile. Environ. Monit. samples to Assess.,172:587.

23 Obasohan, E.E. (2008). The use of heavy metal load as an indicator of the suitability of the water and fish of Ibiekuma Stream for domestic and consumption purposes. African J. of Biotechnology, 7 (23): 4345-4348.

24 Pesce, S. F.andWunderlin, D.A. (2000). Use of Water Quality Indices to Verify the Impact of Cordoba City (Argentina) on Suquia River. Water Res. 34(1): 2915-2926.

25 Rakocevic, J.(2012) Spatial and temporal distribution of phytoplankton in lake Skadar , Arch. Biol. Sci., Belgrade, 64 (2),pp: 585-595.

26 Riley, J.P. and Taylor, D.T. (1968). Chelating resins for the concentration of trace elements from sea water and their analytical use in conjuction with atomic absorption spectrophotometery. Anal. Chim. Acta., 40: 479-485.

27 UNEP/GEMS, United Nations Environment Programme Global Environment Monitoring System/Water Programme (2006). Water Quality for Ecosystem and Human Health. UN GEMS/Water Programme Office c/o National Water Research Institute 867 Lakeshore Road Burlington, Ontario, L7R 4A6 CANADAavailableon-Line. .http://www.gemswater.org/.

28 Hassan, F. M., Salman, J. M. Alkam F. A. & Jawad, H. J. (2014b). Ecological Observations on Epipelic Algae in Euphrates River at Hindiya and Manathira, Iraq. International Journal of Advanced Research , 2 (4) ,1183-1194.

29 Park, N., Kim, J. H., & Cho, J. (2008). Organic matter, anion, and metal wastewater treatment in Damyang surface-flow constructed wetlands in Korea. Ecological Engineering , Vol. 32, pp: 68–71.