Tikrit Journal of Eng. Sciences/Vol.15/No.4/December 2008, (45-62)

SOME ENVIRONMENTAL FEATURES OF PHYTOPLANKTON IN MOSUL DAM LAKE

Taha A. Al-Tayyar Abdulmuhsin S. Shihab May Abd A. Al-Allaf
Environment & Pollution Control Research Center
University of Mousl

ABSTRACT

To define the biological features of phytoplankton in Mosul Dam Lake, monthly samples were collected along a year from September 2003 to August 2004. Consisting thermal stratification and turn over periods from four locations in the main lake and another location in the regulating lake. Total numbers of algae reached 2300 cell/ml in the main lake and 1100cell/ml in the regulating lake. Bacillariophyta were dominant with a maximum number of 1400 cell/ml in autumn. Chlorophyta were dominant in autumn also with 550 cell/ml. Ten genus of Chlorophyta were appeared in this water body: Cosmarium, Chlorella, Spirogyra, Scendesmus, Pediastrum, Tetraedron, Quadrigula, Ankiseradosm, Pandorina, and Straurastrum. Seven genus of Bacillariophyta were noticeable. Some genus of Cyanophyta was recorded as Aphanocapsa. In addition some Euglenophyta spp. were occurred in the main lake and the regulating lake also.

On the basis of these algae abundance, the lake is undergoing cultural Eutrophication. It has passed in mesotrophic state (the middle trophic state of Eutrophication). Some genera which were appeared are the indication of eutrophic state.

Total plate count bacteria ranged from 400-1700 cell/ ml in the main lake and 200-950 cell/ml in the regulating lake were also recorded. Coliform bacteria were founded with most probable number reached 460 cell/100ml in the main lake and 150 cell/100ml in the regulating lake. Therefore, the lake water is classified as moderate pure and considering a good source of raw water supply with all treatment units and safe for swimming and recreational uses.

KEY WORDS: Algae, Eutrophication, Environmental

INTRODUCTION

Impounded lakes or reservoirs are subjected to natural degradation processes in water quality, as they stimulate the algal growth. Depending on the availability of nutrients, lakes are classified according to trophic status into oligotrophic, mesotrophic and eutrophic. The progression in the trophic state is a normal aging process that results from recycling and accumulation of nutrients over long period of time. However, human activities increase the rate of the process. Biological features are one of the objects which can be used to denote the progression in the trophic status of the lake.

Mosul Dam Lake was formed as a result of impoundment of Tigris river water north of Mosul city in Iraq. The lake received nutrients from human activities as the wastes of Dohok government are discharged in the lake without any treatment. Additionally the runoff from the agricultural activities, which used phosphorous and nitrogenous fertilizers along the lake banks, enrich the lake with nutrients.

Many authors studied the biological abundance of lakes and reservoirs. In Yodigoller lake in Turkey. which is a same environmental conditions among the lake under study, Sahin[1], recorded the main four divisions of algae qualitatively; *Bacillariophyta* was predominant with 43 species, *Chlorophyta* counting 33 species, *Cyanophyta* counting 11 species and *Euglenophyta* with 3 species due to the heavy fertilizations of agricultural lands were discharging in the reservoir. Clare, et al.,[2] defined the repetitions cycle of algal types in Lake Erie a eutrophic lake. A surge of diatoms normally occurs at spring and autumn. Green algae became dominant at June and July. Blue-green algae appeared at the end of July counting more than 100/ml.

According to Saha, et al.,[3] total bacteria and total Coliform bacteria revealed distinct seasonal variations of their populations during summer and winter. Bacteria density was accompanied with population of phytoplankton and zooplankton, indicating their common source of occurrence. Ksoll, et al.[4] in their study of the presence of Coliform and Fecal Coliform bacteria in the lake water and discussed their concentration increased from spring to summer when more

phytoplankton, zooplankton and animals are present, then decreased toward winter.

The more comprehensive study in this lake was conducted by Al-Tayyar[5]. His study included describing some of physical, chemical and biological characteristics of main lake and regulating lake water. According to the nutrients and algae counts, the main lake was developed from Oligotrophic to beginning of Mesotrophic state through few years of age. The total numbers of algae reached 600 cell/ml in October, with an annual average of 220cell/ml, while its numbers decreased to 60cell/ml in January. The latest study was conducted on the regulating lake by Al-Mandeel[6] and concluded that the lake is classified as Diacmic Lake with two peaks in numbers of algae. The rate numbers for all samples reach 1700 cell/mL.

Al-Hassan[7] studied the quality of water in the regulating lake of Mosul dam and concluded that the nutrients concentrations (phosphate and nitrate) increased to become the controlling factors for algae growth and reached the lake to eutrophic state. Consisting of Mosul Dam Lake reflected on the quality of water through the lake and at Tigris River below. The new quality is suitable for algae blooming, as a result , numbers and species are increased fastly. These results concluded by AL-Neema, et al.[8]. The development of a life without the interest with the environment make it burden on the environment.

The environmental appearance for Mosul Dam Lake guided us to implement this study. It will illustrate the trophic state of the lake and provide a description of the environmental features of the main and regulating lakes, algal numbers and genus levels with seasonal variation. Also total plate counts bacteria will be considered.

STUDY AREA

Mosul Dam Lake is one of the largest artificial water reservoirs in Iraq. It is located on Tigris River about 60 km North of Mosul city, Fig (1). The surface area of the lake is about 385 km^2 at the maximum operation level (330 meter above sea level) with a maximum storage volume of 13.13 $*10^9$ m^3 and a maximum water depth of 80 m. The drainage area is about 4200 km^2 which is locating within the Iraqi lands[9]. Rainfall intensity ranged between (450-850)

mm/year. The main source of lake inflow is Tigris River which flows and enters the lake near Iraqi-Turkish border. The discharge enters the lake ranged between 60 to 5000 m^3/sec and the outflow ranged between 100 to 1000 m^3/sec in the study period [10]. According to the thermal stratification phenomena which leads to chemical stratification and fast depression in water quality and algae blooming. The lake is classified as **(**warm monomictic) with single turn over, it extended four months from November to March and thermal stratification extended another eight months of the year[11].

MATERIALS AND METHODS

Monthly sampling in the 1st week from the main and regulating lakes of Mosul Dam were carried out for one year, from September 2003 to August 2004. The locations of sampling are shown in Fig. 1. The sites were five kilometers apart from each other along the lake toward the mouth of the valleys and . The fourth location was 2.5 km from reservoir outlet. The regulating lake comprises a bridge, which provides a sampling station.

Water samples were collected from one foot below surface for algal count using water sampler, type Watanbe Keiki. Centrifuged certain amount of sample to concentrate and examined under the microscope [12]. Other method was used to duplicate the samples and its results according to Hinton, et al., [13] by filtering 100 ml of sample through Millipore filter paper of 0.45µm and counting the number of algae at certain area of slides . Bacterial test samples were collected in sterilize glass bottles. Total number of bacteria was determined using standard plate count method for 24hr incubation at 35°C.

RESULTS AND DISCUSSION

Algae in most of the lakes are subjected to strong seasonal variations, as there is a great contrast between year seasons. Algae respond to physical and chemical structure of their environment that leads to population fluctuation.

A wide variation in the total algal number during different months in each location is represented in Fig.2. There was a marked autumn maximum in all locations with a peak value of 2300 cell/ml in the 4th location in October for

the main lake, and 1100 cell/ml in the regulating lake at the same time also. As a result of declining in sun light intensity, duration and water temperature, algal number declined in winter and reaches a minimum value of 162 cell/ml at 4th location and 210 cell/ml in the 1st location, while it recorded 120 cell/ml in the regulating lake in March. However, algae increased with the increase in the intensity of sunlight and water temperature and count 675 cell/ml in June at 4th location.

The average numbers of algae along the study period was 927 cell/ml in 4th location, 550 cell/ml in 3rd location, 448 cell/ml in 2nd location and 343 cell/ml at 1st location, while, it reached 550 cell/ml in the regulating lake. It is clear that algal numbers is inversely proportional with distance from reservoir outlet in the main lake. However, the regulating lake has lower number, because of its feeding is from the dark bottom layers of the lake (hypolimnion layer) [5].

Algae are increased fastly, due to the suitable environment for growth and there is nothing to protect this water body toward Eutrophication phenomena. The total numbers of algae reached 600 cell/ml with the average of 220 cell/ml through few years of lake age (from 1984-1988), the main Divisions were *Chlorophyta* and *Bacillariophyta*[5]. Through this period and up to this study, algae abundant in there types and numbers. It reaches 2300 cell/ml in the main lake with an average of 927cell/ml, Fig.3. The yearly increment exceeded 25% through this period. The main four Divisions with different species were appeared.

Bacillariophyta (Diatoms) and *Chlorophyta* (green algae) were the dominant for most of times during the study period at all locations (Fig.4). The highest number of diatoms of 1400 cell/ml was recorded at autumn and 550 cell/ml of green algae in 4th location. In addition, a maximum number of *Cyanophyta* (blue-green algae) of 190 cell/ml was recorded in October. Although water temperature decreased to 8°C in winter and the turn over continued to March, small counts of *Bacillariophyta* (90 cell/ml) and *Chlorophyta* (40 cell/ml) were recorded.

In spring as air and water temperature increased, lake water stratified, therefore, the algae was stimulated. At summer (June), *diatoms*

become abundant 420 cell/ml at 4th location. However, green algae were also boom and counted 118 cell/ml, as the environment is suitable for algae growth and water temperature increased to 25°C and more [5].

Additionally *Euglenophyta* species ranged from 20-110cell/ml. It appeared throughout studying period in the 3rd location and varied from few individuals to 250cell/ml, Fig.4. Its presence is related with the organic pollution [14].

No dominant genus of *Chlorophyta* was found along the study period (Fig.5). *Cosmarium* spp. constituted 14 to 32 % of the green algae in the main and regulating lake locations. It predominated in autumn, and reached a maximum number of 65cell/ml at November in the 1st and 2nd locations. In winter, *Cosmarium* diminished then appeared in spring as growth initiated with sunlight increase. The appearance of *Cosmarium* is due to fairly high concentration of calcium ions from (20-38) mg/1 [7]. Tigris water is enriched with calcium ion which exceeds 100 mg/l [15].

The maximum percent of *Chlorella* spp. was 22.9% and recorded at 2nd and 3rd locations with a number of 76 cell/ml during October and November. *Chlorella* spp. became abundant at the beginning of summer (June), with 43 cell/ml at 3rd location and 22 cell/ml at 2nd and regulating lake locations, as the temperature falls within the range of optimum growth from 20-25°C. [14].

Spirogyra spp. was present in all locations. It constituted 9.9-13% of green algae genus in the main lake and 18.9 % in the regulation lake .It started in November with a maximum number of 52 cell/ml at 3rd location and diminished in December, then appeared in small numbers 16-22 cell/ml, from January to late March. In the regulation Lake *Spirogyra* reached 20-30 cell/ml. The reservoir discharge to the regulating lake is from the dark stagnant reservoir zone.

Scendesmus spp. (green algae) occurred at 4th location and other locations. It counted 15 cell/ml in December in 4th location. However, it counted 37 cell/ml in the 2nd location, more *Scendesmus* spp. were found and counted 44 cell/ml at November in the 1st location few cells were found in the regulating lake, 15 cell/ml in November.

It constituted 10.5% of green algae in the 2nd location and 14 % in the 1st location. *Pediastrum*, green algae genus, was found at 4th and 3rd locations only. It counted 42 cell/ml and 25cell/ml in October respectively. It constituted 10.5% of green algae. Few cells were found in the regulating lake. These two genuses may be abundant in eutrophic water like *Cosmarium*[3]. This indicates that this lake has passed the mesotrophic to eutrophic state, i.e. the lake is undergoing cultural Eutrophication.

Furthermore, *Tetraedron* spp. was occurred in the 3rd, 4th and in the regulating lake from 10 to 38 cell/ml. It appeared in spring, autumn and disappeared in winter. Also it may be abundant in eutrophic water. It constituted 4.4 to 8.7 % of the green algae in the main lake and 12.75 % in the regulating lake.

Another genus of *Chlorophyta* which appeared in the main lake was *Quadrigula*. It appeared in the 3rd and 4th locations at the start of summer and early autumn, it formed 5.7% of the green algae. It ranged from 12 cell/ml in June to 32 cell/ml in September and October.

On the other hand, some species of *Chlorophyta* appeared in small percentage, like *Ankistrodesmus*. It formed 5.3% of the green algae in the lake. This genus of green algae occurred in the stagnant zone [12]. Other genera with small percentage also appeared as *Pandorina* and *Staurastrum.*

The *Bacillariophyta* species also appeared in the water samples of all locations with a percentage of 50-63% of the total cell numbers of algae Fig.4. Seven genuses of diatoms were fixed in 3rd, 4th and regulating lake locations, but the higher numbers of *Bacillariophyta* genus found in the 4th location. *Cyclotella* constituted 17% of Diatoms and reached 212 cell/ml in October. While *Melosira* represented 22% at a maximum cells No. of 278/ml in the 4th location. Other genus was noticeable also, with 10% to 15% as *Cocconeis*, *Stephanodicus* and *Nitzschia*. They prosper in last summer and reached 162 cell/ml. *Synedra* and *Naviaculla* counted a maximum cell numbers of 230/ml in October. While it does not appear in winter. The variation of *Bacillariophyta* species with time at different locations is shown in Fig.6.

Cyanophyta, the blue-green algae is also present in the lakes and rivers. It become abundant in warm, undisturbed surface water that receives a lot of sunlight and pollutants. Therefore, the presence of *Cyanophyta* in a lake is often the first obvious sign of cultural Eutrophication[16]. Some species of *Cyanophyta* were recorded as *Aphanocapsa* 100 cell/ml, *Chroococcus* 40 cell/ml and *Oscillatoria* with 50 cell/ml at 2nd and 3rd locations in October. Lower density of 36 cell/ml of *Cyanophyta* appeared in April in the same locations. In the regulating lake, *Cyanophyta* cells numbers recorded 74 cell/ ml in May and increased to 96 cell/ml in late October. Some of its spices like *Oscillatoria* form blooms and produce toxins that could pose a health risk to people and animals [16].

Although, the bad effects of algae on water quality, many species are useful indicators of trophic conditions in lakes. *Ankistrodesmus, Chlorella, Euglena, Nitzschia, Oscillatoria, Pandorina, Pediastrum, Scendesmus,* and *Synedra* are bad indicator species of water pollution [1]and[17]. In addition to these species of polluted water quality indication, the increment in total numbers of 25% from AL-Tayyar study [5], make the lake is undergoing Eutrophic state within few years.

Bacteria are found in any culture and environment and consisted of part of the environmental system, when its numbers and species increased to some limit, it will form a source of pollution. The results of total plate count bacterial analysis (TPC) are shown in Fig. 7. Its cells number ranged from 400 to 1700 cell/ml in the main lake and 200 to 950 cell/ml in the regulating lake.

At the beginning of rainfall season with suitable temperature to growth, TPC increased to the maximum and recorded 1700 cell/ ml in October. The rainfall runoff and the turn over enriched the reservoir with nutrients, organic matter and bacteria. These reasons are confirmed with TPC density in the regulating lake, as it reached 950 cell/ml.

In February, TPC was at their lowest levels along the study period. In the main lake locations, TPC ranged from 400 to 520 cell/ ml. Although polluted streams discharged to the lake like Dohok, Fayda and Al- Bakak valleys, but the lower temperature (Fig.9) and the dilution in the lake water

decreased their numbers. In the regulating lake, TPC was within lowest values also. It recorded 300cell/ml, since deep layers reservoir contributed all of the regulating lake flow with the lower temperature. These results coincided with the finding of McGauhey [18]and Nathanson,et al[19] .

An increase in bacterial density was observed in June, as the water temperature rises to 25°C. Its numbers ranged between 980-1400 cell/ml in the main lake and 820 cell/ml in the regulating lake. The average cell numbers per ml was 1020 cell/ml in the 4th location, 788 cell/ml in the 3rd location, 725 cell/ml in the 2nd location and 680 cell/ml in the 1st location, while its numbers decreased to 540 cell/ml in the regulating lake location.

Total Coliform Bacteria (TCB) are a good indicator of water pollution, naturally by waterflow and animal wastes or by human activities. Therefore, it was increased in summer as the environmental conditions are suitable to growth. Its Most Probable Number (MPN) reached in July 460 cell/100ml and 150 cell/ml in the main and regulating lakes respectively. As other microorganisms (algae and total bacteria) Coliform bacteria affected and reflected the environmental conditions[20], therefore, the maximum number recorded in October with 460 cell/100ml, while the minimum numbers occurred in February with 28 cell/ml.

Based on bacteriological results, these locations are classified as moderately pure water (TPC less than 1000 cell/ml) and (TCB greater than 100cell/100ml) (ASCE standard), although the results of the 4th location in some time reached 1700 cell/ml. These locations are suitable source for raw water supply from bacteriological point of view and require total units of classic treatment plant. The TPC results indicate that the water of this lake meets the generally accepted U.S. standard of 100000 cell/100 ml for bathing and swimming [18].

CONCLUSIONS

1. Mosul dam lake is classified as Diamic Lake according to the two climaxes of total numbers of algae. The first in autumn with a maximum numbers in October, while the other in mid spring in May. The number is inversely proportional with the distance from outlet reservoir.

2. The regulating lake has lower numbers of algae than the main lake, as its feeding are from dark deep layers in Mosul Dam Lake.
3. *Bacillariophyta* and *Chlorophyta* species were dominated in Mosul Dam Lake. However, *Cyanophyta* and *Euglenophyta* species were appeared for some times and for small numbers.
4. Ten species of *Chlorophyta* were the dominant. Some of its present species occurred in mesotrophic and eutrophic lake waters.
5. Seven species of *Bacillariophyta* were also dominant. They formed more than 60 percent of the total numbers of algae.
6. This lake is undergoing cultural Eutrophication with the appearance of some species for the main four divisions. Some of their species are indicators of water pollution and causes the Eutrophic state. Especially the numbers of algae are increased also.
7. According to the fast acceleration of algae booms, the lake is classified (Fast Biological Activities).
8. From the bacteriological point of view, the lake in the present time is classified as pure to moderately pure water and considered good source of raw water supply and safe for swimming and bathing.

RECOMMENDATIONS

1. Continuous monitoring for the environmental condition of the lake, to evaluate the development in the biological activities, in addition to the physical and chemical properties.
2. Evaluate the pollutants of the valleys discharged in the lake, especially, Dohok valley to minimize the pollutants reached the lake.
3. According to the lake water quality, treatment plants must be of the complete units involving pre and post disinfection.
4. These facts will be very important for further studies to monitor and control the progression of Eutrophication phenomena in the lake.

REFERENCES

1. Sahin, B., "Epipelic and Epilithic Algae of the Yedigoller Lakes, Erzurum-Turkey" Turkish Jour of Biology, Vol.26, 221-226 pp. (2002).

2. Clare L. G. and Hopson N. E., "Algae Problems in Eastern Lake Erie" Jour. AWWA, Vol.67, No.3,131-134 pp. (1975).
3. Saha T., Roy A., and Ghosh P. B.," Ecology of Bacterioplankton in a Nationally Important Lake, Rabindra Sarobar in Kolkata" Jour. Micro-Bio Biotechno Environmental Science, Vol.7, No. 4, 717-722 pp. (2005).
4. Ksoll W. B., Ishii S. and Hicks R., "Presence and Sources of Fecal Coliform Bacteria in Epilithic Periphton Communities of Lake Superior" Jour. Applied and Environmental Microbiology, Vol. 73, No. 12, 3771-3778 pp. June (2007).
5. Al-Tayyar T. A., "Effect of Saddam Dam Construction on Water Quality and Water Treatment Plants "M.Sc. thesis, College of engineering, University of Mosul, (1988).
6. Al-Mandel, F.A., "An Environmental -Limnological Study on The Regulating Lakes Phytoplankton of Mosul Dam" M.Sc. thesis, College of science, University of Mosul, (2005).
7. Al-Hassan F. Ibrahim, "The Increment of Algae in Tigris River due to The Impoundment and The Reflection on the Water Treatment Plants in Mosul" M.Sc. thesis, college of engineering, University of Mosul, (2001).
8. Al-Neema B., Nasory K., and Al-Dabbagh A., "Effect of Less Rain-full on The Quality of Tigris River Within Nineveh district" Jour. of Al-Rafidan Science,Vol.2, No. 2, 79- 93 pp. (2000).
9. AL-Taiee T. M., and Sulaiman Y. I., "Preliminary Water Balance of Saddam Dam Lake", Proceeding of the Second Scientific Conference of SDRC, 121-134 pp.(1990).
10. AL-Obaydy F. Mahmmod, "Hydrological Study for The Stage and Discharge of Tigris River", M.Sc. thesis, College of Engineering, University of Mosul, (1996).
11. Al-Layla M.A., and Al-Tayyar T.A., "Thermal Stratification in Large Water Body/Iraq" The Jordanian Conference on Civil Engineering, 2-4 June, 847-858 pp. (1992).
12. Prescott G. W., "Algae of The Western Great Lakes Area" Revised

Edition, WM. C. Brown Co. Publishers USA, 977 p. (1962).

13. Hinton G.F., and Maulood B.K., "Modified Method for The Enumeration of Either Marine or Freshwater Phytoplankton Concentrated on Membrane Filter " Jour. Tropical Ecology, Vol. 20, No.2, 192-194 pp. (1979).
14. Goldman C. R., and Horne A. J., "Limnology" McGraw-Hill Book Company, Japan Ltd., 464 p. (1983).
15. Al-Singary M. Fathel, "Environmental Study on Tigris River in Mosul City" M.Sc. thesis, College of Science, University of Mosul, (2001).
16. Steidinger K. A., "Florida Harmful Algal Bloom Task Force: History and Focus" Proceedings of health effects of exposure to Cyanobacteria toxins: State of the science, August 13-14, USA., 6-15 pp. (2002).
17. Kumar S.S., and Ramakrishnan N., "Algae Diversity and Indicators of Pollution in Freshwater Pond at Tiruvannamalia" Jour. of Ecobiology, Vol. 16, No. 3, 207-212 pp. (2004).
18 .McGauhey P. H., "Engineering Management of Water Quality" McGraw Hill Book Co., New York, 295 p. (1968).
19. Nathanson,J.A. and PE,Ms., "Basic Environmental Technology, Water Supply, Waste Management, and Pollution Control "Pearson Prentice Hall Co. Publishers, Fifth Edition, 534p.,(2008).
20. Ashesh T., and Chauhan S., "Seasonal Phytoplanktonic Diversity of Kitham Lake Agra" Jour. of Environmental Biology, Vol. 27, No.1, 38-45 pp. (2006)

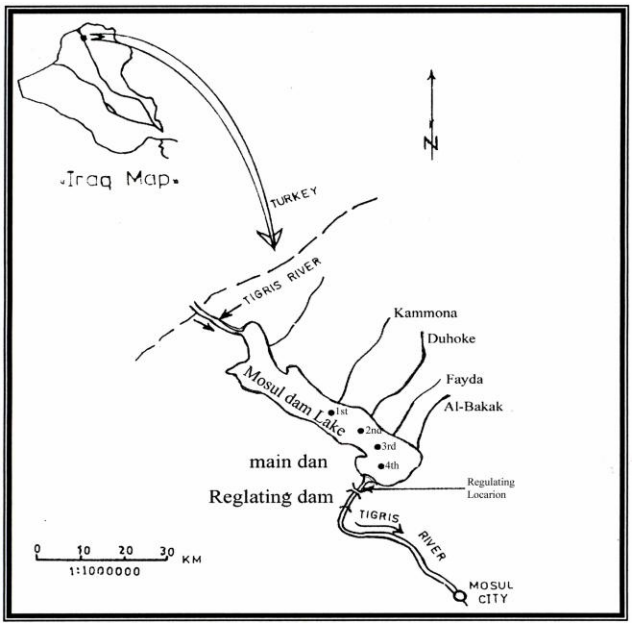

Fig.1 Mosul dam lake locations and Tigris river including polluted valleys, sampling locations, 1st Kammona valley,2nd Dohoke valley,3rd Fayda valley,4th Al bakak valley and regulating lake .

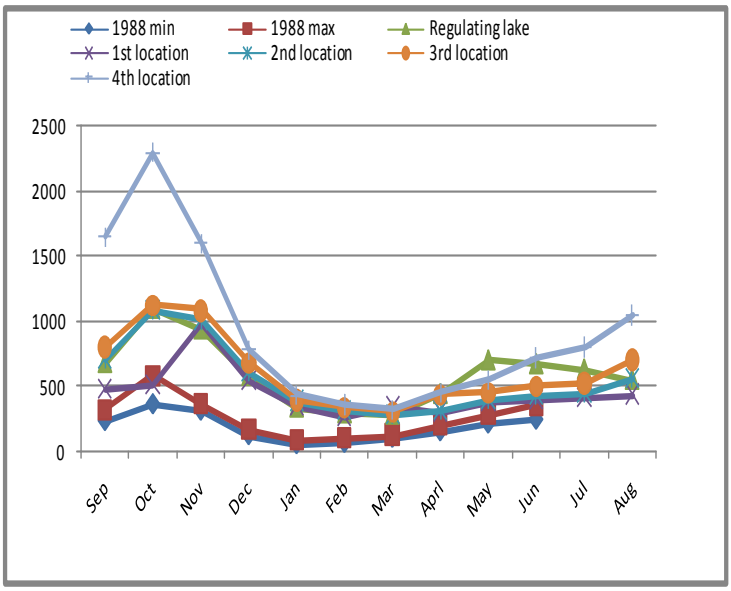

Fig.3 Monthly variations of the Total No.s of algae in Mosul dam lake through 1988 year up to 2003 year . 1ST loc. Kammona valley, 2nd loc. Dohoke valley, 3rd loc. Fayda valley, 4th loc. Al-Bakak valley, Regulating lake loc.

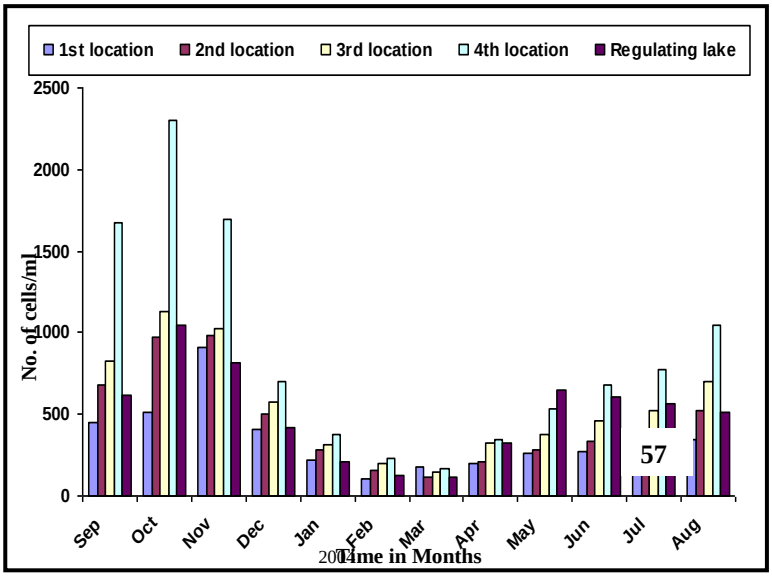

Fig.2 Monthly variations of the Total No.s of algae in Mosul dam lake 1ST loc. Kammona valley, 2nd loc. Dohoke valley, 3rd loc. Fayda valley, 4th loc. Al-Bakak valley, Regulating lake loc.

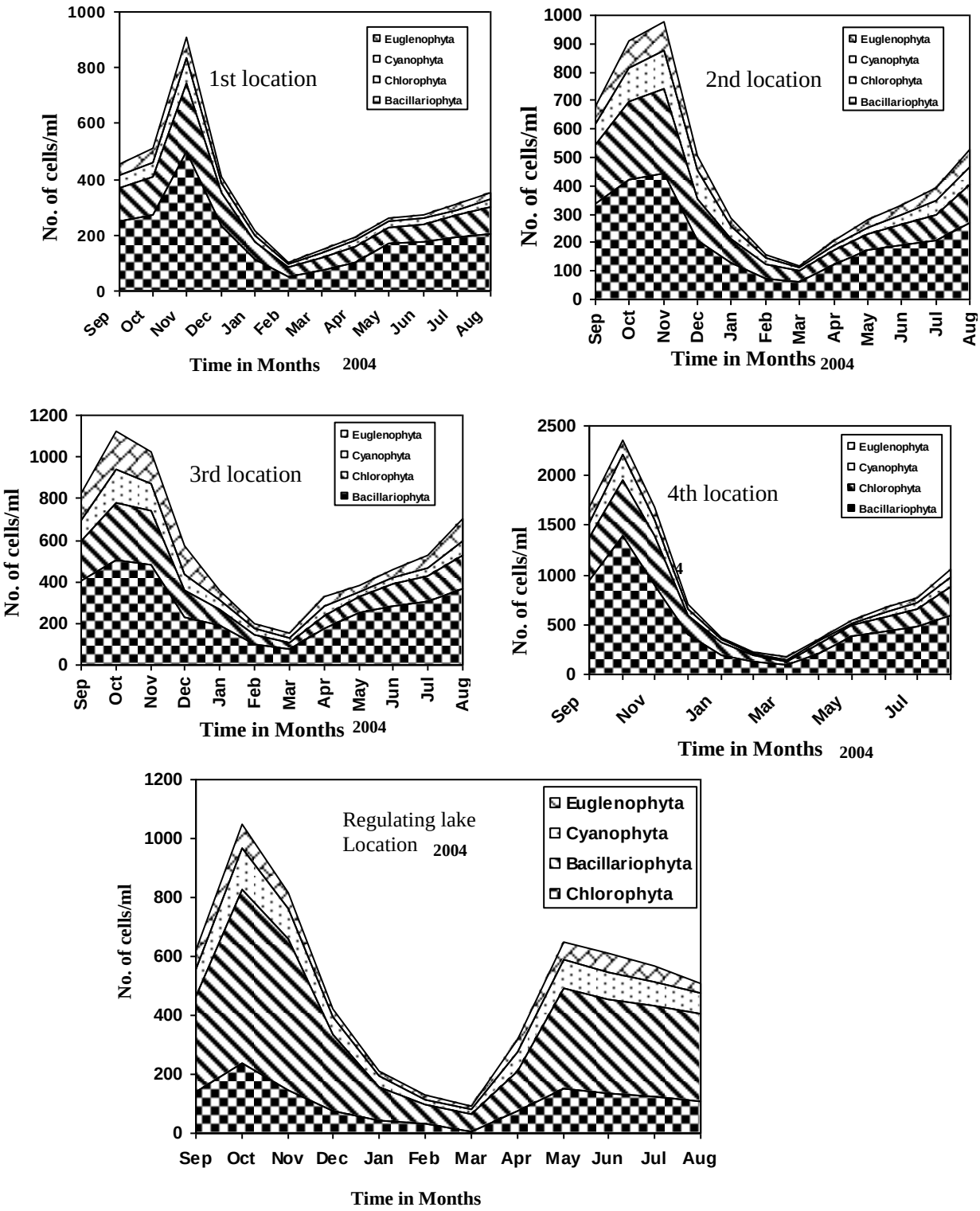

Fig.4 Monthly variations in the Nos. of algal cells which are belong to different divisions in Mosul dam lake
1ST loc. Kammona valley, 2nd loc. Dohoke valley, 3rd loc. Fayda valley, 4th loc. Al-Bakak valley, Regulating lake loc.

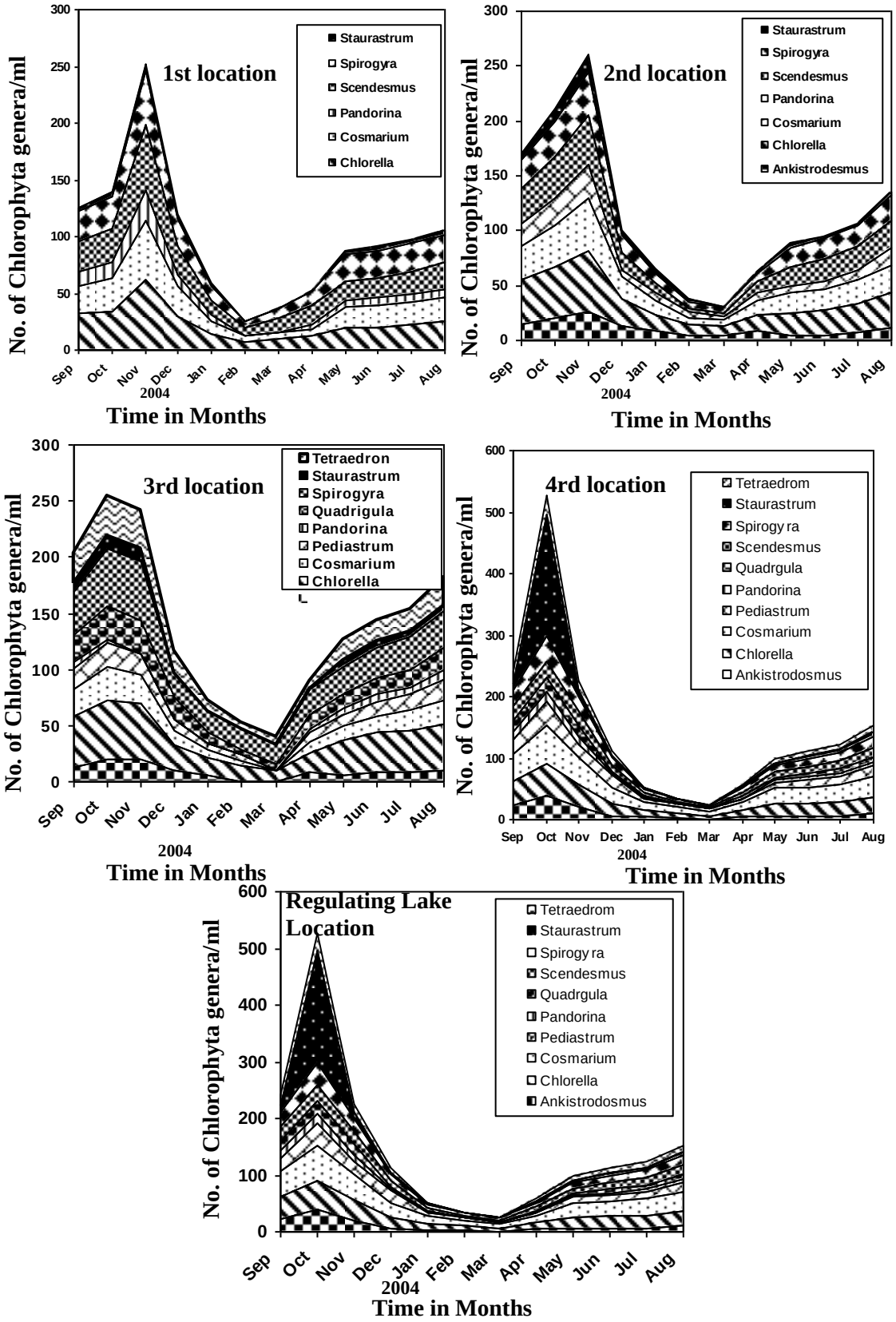

Fig.5 Monthly variations in the Nos. of algal cells which are belong to genera of *Chlorophyta* division in Mosul dam lake 1STloc. Kammona valley, 2ndloc. Dohoke valley, 3rd loc. Fayda valley, 4thloc. Al-Bakak valley, Regulating lake loc.

Tikrit Journal of Eng. Sciences/Vol.15/No.4/December 2008, (45-62)

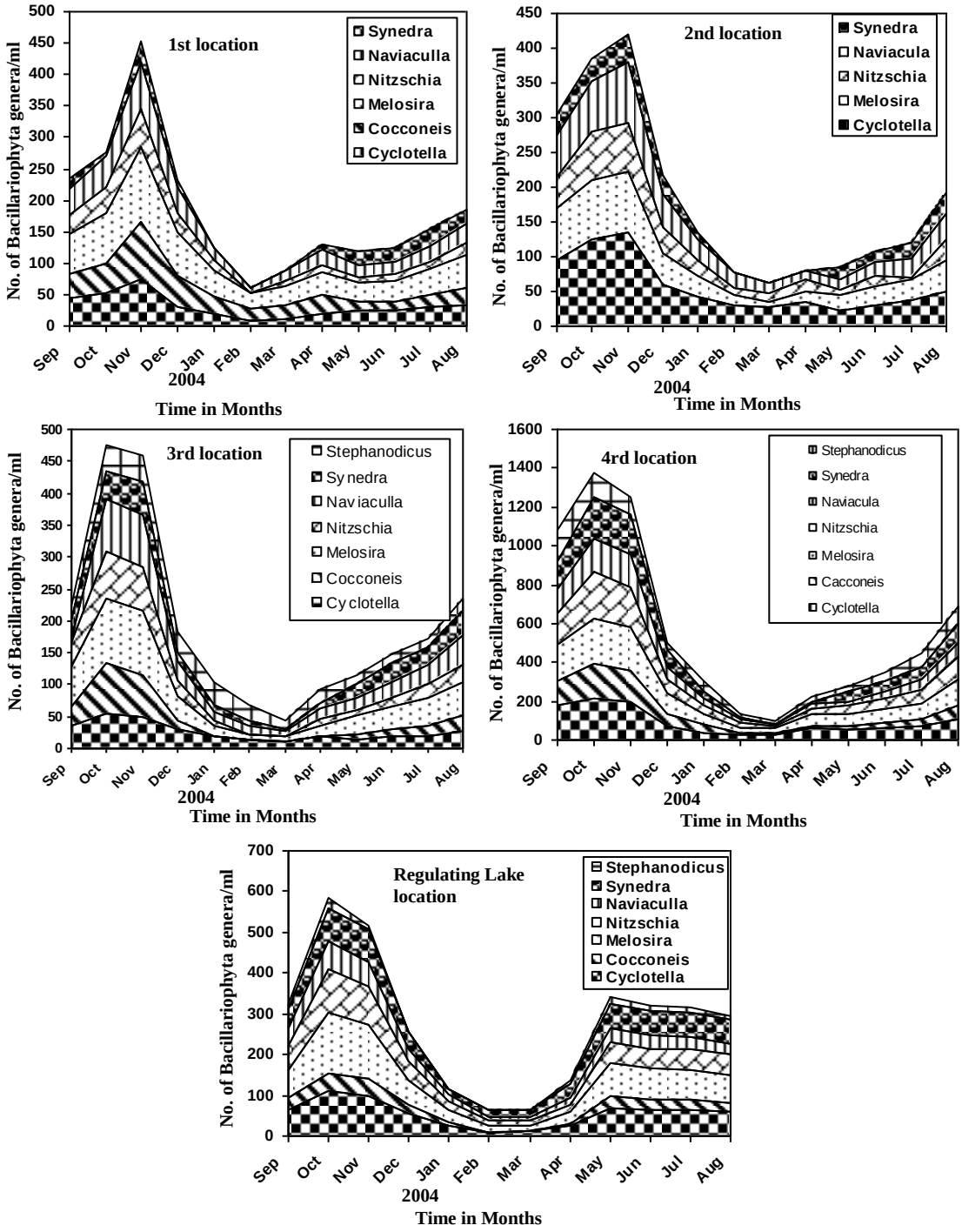

Fig.6 Monthly variations in the Nos. of algae cells which are belong to genera of *Bacillariophyta* division in Mosul dam lake
1STloc. Kammona valley, 2ndloc. Dohoke valley, 3rd loc. Fayda valley, 4thloc. Al-Bakak valley, Regulating lake loc.

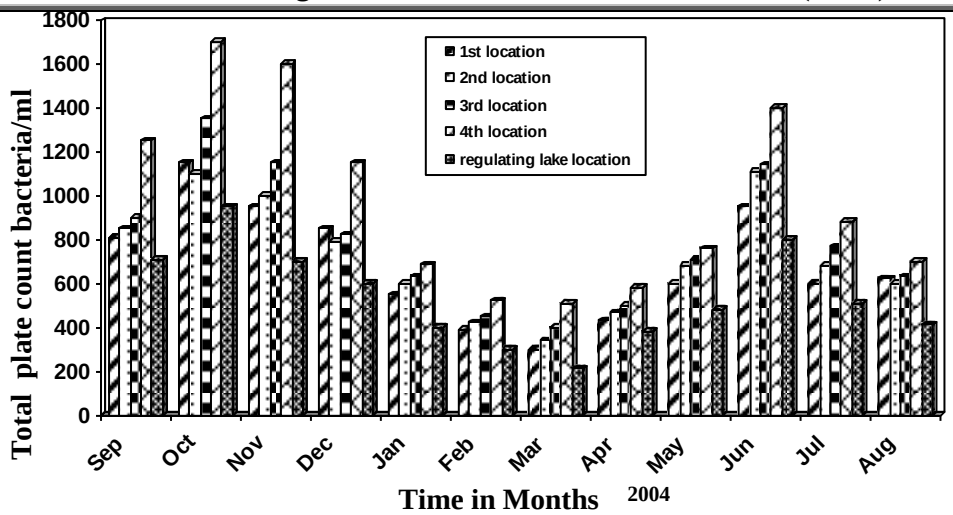

Fig.7 Monthly variations in Total plate count bacteria in Mosul dam lake 1ST loc. Kammona valley, 2nd loc. Dohoke valley, 3rd loc. Fayda valley, 4th loc. Al-Bakak valley, Regulating lake loc.

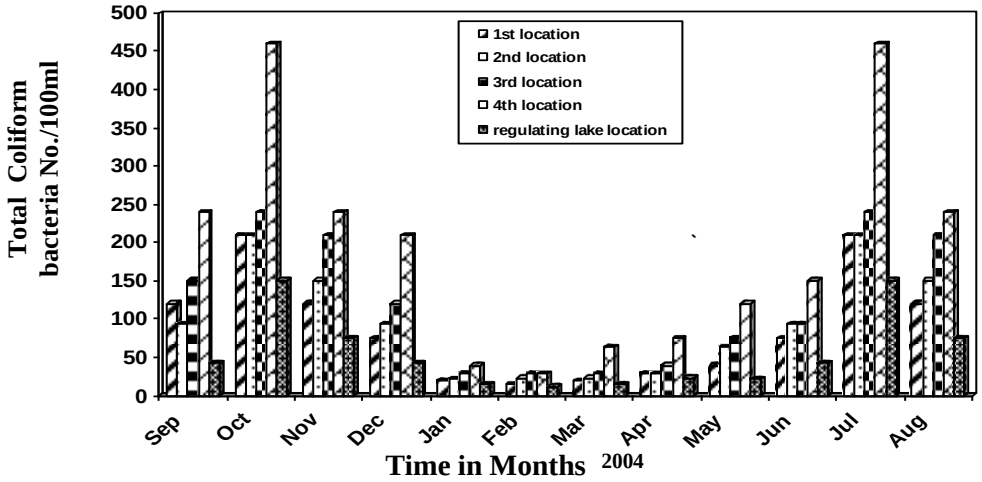

Fig.8 Monthly variations in Total Coliform bacteria in Mosul dam lake 1ST loc. Kammona valley, 2nd loc. Dohoke valley, 3rd loc. Fayda valley, 4th loc. Al-Bakak valley, Regulating lake loc.

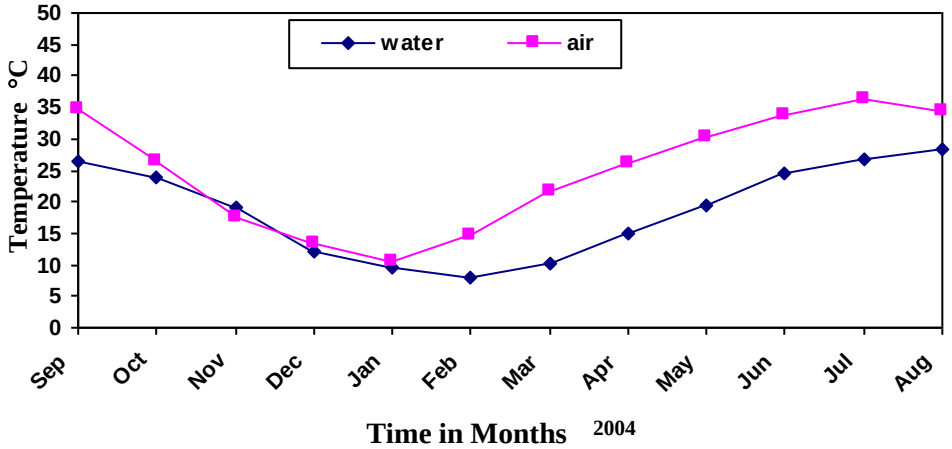

Fig.9 Variations of water and air temperature ^{o}C in Mosul dam lake

Tikrit Journal of Eng. Sciences/Vol.15/No.4/December 2008, (45-62)

بعض المظاهر البيئية للهائمات النباتية في بحيرة سد الموصل

طه احمد الطيار عبد المحسن سعد الله شهاب مي عبد الحافظ العلاف

مركز بحوث البيئة والسيطرة على التلوث

جامعه الموصل

الخلاصة

تضمن البحث وصف بعض الخصائص البيولوجية لبحيرة سد الموصل المتكونة نتيجة حصر مياه نهر دجلة شمال مدينة الموصل للتعرف على حالة الإثراء الغذائي للبحيرة. تم جمع نماذج شهرية ولمدة سنه كاملة ابتداء من شهر أيلول 2003 ولغاية شهر آب 2004 ،مُتضمنا فترة التطبق الحراري وفترة الانقلاب الخريفي ومن أربعة مواقع في البحيرة الرئيسية وموقع خامس في البحيرة التنظيمية. أظهرت النتائج أن أعداد الطحالب الكلية بلغ 2300 نبته/ مللتر في البحيرة الرئيسية و1100 نبته/ مللتر في البحيرة التنظيمية. وكانت الدايوتومات والطحالب الخضر هي السائدة خلال فترة الدراسة ، حيث وصلت أعداد الدايوتومات إلى أقصاها في فصل الخريف 1400 نبته/مللتر. وأعداد الطحالب الخضر إلى 550 نبته/ مللتر في فصل الخريف أيضا. تم ملاحظة عشرة أجناس من الطحالب الخضـــــــــــــر: Cosmarium، Chlorella، Spirogyra، Scenedesmus،Pediastrum،Tetraedron، Quadrigula ، Ankiseradosm ، Pandorina ، Straurastrum ولم يكن أي منها سائدة. تم تشخيص سبعة أجناس من الدايوتومات ، كما تم ملاحظة بعض أجناس الطحالب الخضر المزوقة في البحيرة الرئيسية والبحيرة التنظيمية، وشُخصّت أجناس من النوع Euglenophyta في مواقع الدراسة المختلفة. إن بعض أجناس الطحالب التي شُخصت توجد في ألمياه ألملوثه، مما يدل على تدهور حالة البحيرة بيولوجيا. وبالاستناد إلى أنواع الطحالب الموجودة في البحيرة الرئيسية والبحيرة التنظيمية فأن البحيرة تتقدم في عملية الإثراء الغذائي Mesotrophic. تراوحت أعداد البكتريا الكلية بين 400 إلى1700خليه/مللتر في مياه البحيرة الرئيسية وما بين 200 الى 950خليه/مللتر في مياه البحيرة التنظيمية، فضلا عن تشخيص بكتيريا الكوليفورم بأعداد بلغت 460 خليه/100 مللتر في مياه البحيرة ألرئيسيه و150خليه/100مللتر في مياه البحيرة التنظيمية، وهو ما يصنف مياهها على إنها متوسطة النقاوة. ويجعلها صالحة كمصدر للمياه الخام في محطات الإسالة التي تتطلب مراحل التصفية التقليدية الكاملة كما ويجعلها صالحة للسقي و للسباحة في الوقت الحاضر.

الكلمات الدالة: الطحالب، الإثراء الغذائي، التلوث البيئي.

.