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Variation of non-diatom algae in a martyr monument lake under different climate factors

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Abstract. The current study was conducted in the environment of the Martyr Monument Lake in the city center of Baghdad during 2019 to monitor the impact of climatic conditions such as drought, water shortage, high temperatures in the environment of the city and the lack of water flow during the years 2015 to 2018 and their effects on some of the physical and chemical factors of water and the dynamics of the phytoplankton community in the lake environment. Heterogeneity of some studied environmental factors, including air and water temperature, permeability, water depth, pH, DO, BOD5, nutrients, nitrate, NO₃, and phosphates were found. The results showed the effect of climate change and the presence of organic pollution in addition to the influence of the nature of sites. Sampling on the studied characteristics, which in turn affected the phytoplankton community. The results showed the fluctuations in the rates of air and water temperature, which were between 17 - 41 ° C and 10 - 32 ° C, respectively, as well as the fluctuation of light transmittance rates and water depth according to the different stations and seasons, as they ranged between 0.12-57.02 cm and 120.5- 289.30cm. The pond water was characterized by being neutral and tilted to alkaline in terms of pH 7.0-9.1. The values of dissolved oxygen and vital oxygen requirement rise in winter and gradually decreased in spring and autumn, and the lowest values in summer were 2.4-15.13 mg / liter 0.4-10.6 mg / liter, respectively. The changes in nitrate values rise in winter and decreased in summer in all locations, where they ranged between 2.2 - 12.4 mg, in contrast to phosphate, it increased in the summer winter 0.0033 - 0.5 mg / liter. The qualitative study of phytoplankton identified 125 species belonging to 46 genera. It belongs to 5 classes in which the class of green algae prevailed with 69 species, followed by blue-green algae (39 species), while Euglenophyta and Pyrrophyta recorded 7 species each, while the Cryptophyta algae recorded only 3 types. The study showed that the decrease in the water level and the fluctuation of temperature led to an increase in blue-green algae in areas of organic pollution in which some species such as *Microcystis aeruginosa* and *Oscillatoria* spp. Causing the appearance of unpleasant odors and the secretion of deadly toxins to the aqueous medium.

Keywords: Lake, phytoplankton, climatic change, blue-green algae. *Microcystis* sp.

1. Introduction:

The city of Baghdad is characterized by many tourist facilities and the most of these areas of the residence for the entertainment is the water and the most of the most important in Baghdad [1] including the Tourist Island, the city of Isaan, the Tahida and the Lazir, the Martyr Isa, the is the martyr of the sacred architectural features of Baghdad, the artistic and the artistic name of Saman Esad Kamal and the artistic elegant Esmail Fatah Al Truke [2] The artistic and the most important restaurants of attractions to the district of the Libra, the most of the types of fish, males, the knees, and as well as the types of migratory birds that are notice of some of the seasons of the year. The distance of the diverse vegetarians; the most of the distant vegetarian and the plants of the *Ceratophyllum demersum* and *Phragmites australis*. The presence of watercourses within cities helps to air the air especially when he rowing the grades of the evil, which increases the evaporation rate [3] and the difference of temperatures, there and the increasingness of the years helped differentiate in the diversity of water algae, especially the lentic water . [4]



The evaluation of water quality of the use of plant diligence is an assessment of water quality and its impact on physical and chemical changes from environmental changes, human activities and water uses of causing the various pollution of water permits [5]. There is a relationship between algae and water polluting of organic evenings (the Wastewater). The algae vary in its species, numbers and Genus according to the salon of pollution and the difference of water Some of them live in the water and contrast in the fresh water and some other can be adopted as evidence of the quality of water and biomonetry. [6]

2. Materials and methods of work:

2.1. Study site:

The martyr monument pool is a closed water system in the center of Baghdad on lines $20^{\circ}35.52' E44^{\circ} 26'46.1868, N33$. The pond surrounds the monument at a small distance from the south side and a greater distance from the northern side, its borders are the Army Channel and the City of Games in the east, Palestine Street to the west (Figure 1). The approximate depth of the pond is 3-5 meters [7]. The water reaching the pond is delivered through a pipe with a diameter of 30 cm with a pump from the Army Canal through the Zayouna water station, and it has no outlet to drain the water, so it is a closed ecosystem, so it is considered an artificial pool. Five sites were selected to collect water and algae samples per month from Al-Shaheed Monument Lake within Baghdad Governorate from January to December of 2019, the location of the Martyr Monument was determined within the longitude using the Geographic Information System (GIS) and the symbols St.5, St. 4, St.3, St.2, 1. St (fig.1). Surface water was collected at a depth of 30 cm by sterile 2-liter polyethylene containers to measure some of the water's physiochemical parameters based on [8].

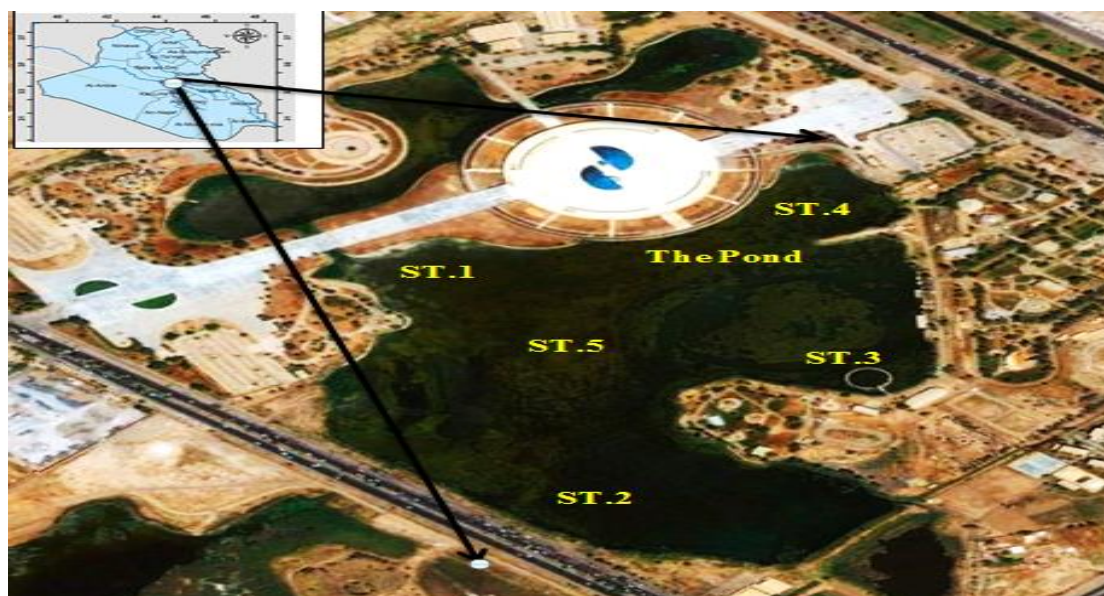


Figure 1, A map showing the selected sites on Martyr Monument Lake.

From the surface water 30 cm depth. The samples of the Phytoplankton algae were collected by using a special net with a diameter of 20 μm . [6] which capacity 250 ml and was preserved by Logal solution. In the laboratory Non Diatom algae were diagnosed with temporary slides and examined in light microscope by using magnified bower 100x, 400x, 1000x based on the available classification sources. [9,10,11,12,13,14,15,16,17]

3. Results and discussion

Closed water systems are exposed to many environmental factors and are affected more than open water systems, and this effect depends on the morphology and geology of the water body and climatic changes in addition to human activities, and this in turn affects the physical

and chemical properties of stagnant water and the quality and distribution of algae [18,19] Table (1) shows the results of the factors that were studied in all sites.

Table 1: Average of Physiochemical Factors in the Water for the Study seasons. (First Line and Range - Second Line

Seasons Factor	Winter	Spring	Autumn	Summer
Temp. air (C°)	18.5 17-20	24.8 21-27	23.8 22-26	41 39-41
Temp. water (C°)	12.8 10-15	16.3 20-11	21 20-22	29.5 28-31
Depth (m)	126.5 125-130	233.3 214-289	130.5 120-141	156.8 133-198
Permeability (cm)	37.8 25-57	33.3 20-45	24.8 12-37	26.3 15-38
pH	7.5 7-8	8.3 7.5-8.9	8.3 8.1-8.4	8.3 8.2-8.5
D.O. (mg/l)	13.3 12.2-14.6	10.9 7.13-15.13	9.7 9.13-10.26	8.3 6.11-9.43
BOD)5 (mg/l)	6.6 4.8-8.4	4.1 2.8-5.34	3.2 1.6-5.6	5.2 3.95-6.42
NO ₃ (mg/l)	7.8 3.5-12.1	6.2 5.6-7.1	8.1 5.2-12.4	5.4 2.2-7.2
Po ₄ (mg/l)	0.067 0.004-0.13	0.021 0.011-0.031	0.065 0.063-0.067	0.88 0.5-0.18

The temperature greatly affects the closed water systems as it is related to the physical and chemical factors and affects the properties of the water, as well as the change of the biological activity and the speed of chemical reactions and growth and determines the type of organisms present in the pond [1] and we find that the general rate of air temperature ranged between 41 ° C during summer 18.5 ° C during winter and this is similar to the water temperature, as the highest rate was recorded during the summer 29.5 ° C and the lowest value during the winter is 12.8 ° C. We find that the temperature of the studied lake increased with the progress of the years as its rates were higher than what was recorded in previous studies [1][6].

The rate of evaporation increases with the increase in temperature, which leads to a decrease in water in the summer months, while its levels rise in the spring months as a result of increased rain and melting snow at the sources of rivers [20].and this is what was observed in the current study. The water depth is between the highest average of 233.3 cm during the spring and the lowest average of 110.5 cm during the summer, Table (1). The light enters the water gradually and the permeability depends on many factors, the most important of which is the degree of purity of the water and its content of algae and organic matter [21]. The transparency values ranged between the highest average of 37.8 cm during the summer and the lowest value of 24.8 cm during the winter The increase in the number of algae and the fall of the rain causes an increase in the suspended materials within the water column and thus decrease during the winter and spring and rise in the summer due to the lack of suspended materials, the decrease in water levels and the lack of depth and this is in agreement with the researchers' mention [21,3,10].

The pH rates are close and the base tends to be at the highest rate of 8.3 in most of the school seasons. The lowest is 7.0 during the winter. The pH values increase when the drainage is low and also when the plankton density is high as the photosynthesis process is activated and the consumption of carbon dioxide increases, which leads to an increase in the pH values. PH, and the pH is one of the important factors in the aquatic environment, as most

aquatic organisms and algae tend to be present in a light base, and this was confirmed by researchers [22].

Dissolved oxygen is an important factor in the ecosystem as it is used to control the quality and purity of water and the density of plant mass, especially algae [23]. The results indicated the presence of high concentrations of Do during winter 3. 13 mg / L and a minimum of 8.3 mg / L During summer, increased dissolved oxygen values may be due to an increase in the density of plants (algae) in the pond water. Our current results are consistent with the findings of [24] when they studied Lake Habbaniyah .As for the BOD rates of 6.6 mg / liter, they were during the winter and the lowest rate was 3.2 mg / liter during the spring. Untreated waste is thrown into the pond in the second site and the tourist city of Sindbad on the western side of the lake and the effect, quality and quantity of microorganisms and their recovery factors in most of the studied sites, especially during rainfall and the change of pH values, which played an important role in changing its values, was observed higher recording Winter value for lower temperatures, and this is consistent with [25,26 ,27].

Nutrients increase and decrease depending on the wastes and human activities near the lake. The results showed clear seasonal changes in nitrate values as they increased during the winter and decreased during the summer (8.1 - 5.4) mg / liter in all sites, in contrast to phosphate, which increased during the summer and decreased during the winter (0.88). - 0.021) mg / liter, that rainwater and the residues it carries on the edges of the lake increase the nitrate through the water column, especially in shallow water, and that any movement helps to raise the organic matter sediment at the bottom and this increases the nitrate within the water column (), as The lake is characterized by high organic pollution throughout the seasons of the year, and our current results are consistent with [27]. The high phosphate values during the summer may be due to the density of washing wastes discharged to the station from restaurants near the lake as well as the use of lake water for swimming before A number of workers in restaurants (field note) as well as increased organic decomposition and higher temperatures [13], Our results are consistent with [24]. Phosphate values are characterized by low concentrations, and this is in agreement with what was reported by[28]. as low phosphorous concentrations were recorded in Mariut Lake in Egypt, which is due to the lack of phosphate entering and phosphate consumption by root plants and phytoplankton. Also, phosphate adsorbs on substances. Organic, mineral and lake bottom sediments [29].

The present study identified 125 species belonging to 46 non-diatomaceous algae genus (Table 2 and Figure 2) distributed among 69 species (25 Genus) of Chlorophyta, 39 species (14 Genus) Cyanophyta, while the Euglenophyta and Pyrrophyta algae were recorded 7 types (3 Genus) for each of them. Cryptophyta 3 species (2 Genus), and the percentages of the species were as follows (2,6,6,31,55%), respectively.

Through the results, we find an increase in the number of species over the number of species, which indicates that the water of the pond is of moderate pollution [27], and this is consistent with what [30] indicated that the availability of nutrients such as nitrogen, phosphate and dissolved oxygen make water bodies of biological high diversity

Table 2: presence of phytoplankton algae diagnosed in sufficient study sites in martyr monument lake for all seasons of the year (2019).

Taxa	S1	S2	S3	S4	S5	
Division: Cyanophyta						
1	<i>Anabaena circinalis</i> Rabenhorst.	+	-	-	+	+
2	<i>Anabaena sp.</i>	+	+	+	+	+
3	<i>Aphanocapsa pulchra</i> (Kuetz) Rabenhorst.	+	-	-	-	+
4	<i>Aphanothece saxicola</i> Naegeli	+	-	+	-	+
5	<i>A. nidulans</i> P. Richter.	+	-	-	-	+
6	<i>Aphauocapsa rivularis</i> Nagelia	+	+	-	-	+
7	<i>Chroococcus dispersus</i> var. <i>minor</i> . G. M. Smith	+	+	-	+	+
8	<i>Chroococcus limneticus</i> var. <i>elegans</i>	+				+

9	<i>Chrococcus limneticus</i> var. <i>distans</i> G. M. Smith.	+	+	+	+	+
10	<i>Chrococcus limneticus</i> var. <i>subsalsus</i> Lemmermann.	+	-	+	-	+
11	<i>Chrococcus minor</i> (KTZ) Naegeli.	+	+	-	+	+
12	<i>Chrococcus minutus</i> (Kuetz.) Naegeli	+	+	-	+	+
13	<i>Chrococcus pallidus</i> Naegeil.	+	-	-	-	+
14	<i>Chrococcus prescottii</i> Drout & Daily.	+	+	+		+
15	<i>Chrococcus turgidus</i>	+	+	+	+	+
16	<i>Cyanarcus hamiformis pascher</i>	+	-	-	-	+
17	<i>Gleocapsa aerugenosa</i>	+	+	-	+	+
18	<i>Gleocapsa rupestris</i> Kuetzing	+	-	-	-	+
19	<i>Lyngbua nordgardhii</i> Wille.	+	-	-	-	+
20	<i>Lyngbua aerugineo-Caerulea</i>	+	-	-	-	+
21	<i>Merismopedia convolute</i> de	-	+	-	+	-
22	<i>Merismopedia elegans</i> A. Braum	+	+	+	+	+
23	<i>Merismopedia elegans</i> var. <i>major</i> . G. M. Smith.	+	-	-	+	+
24	<i>Merismopedia galica</i>	+	+	-	-	+
25	<i>Merismopedia glauca</i> (Ehr) Naegeli	+	+	+	+	+
26	<i>Merismopedia minima</i>	+	+	+	+	+
27	<i>Merismopedia punctatus</i>	+	-	-	+	+
28	<i>Merismopedia tenuissima</i> Lammer Mann	-	-	-	+	-
29	<i>Microcystis aeruginosa</i> Kuetz.	+	+	+	-	+
30	<i>Microcystis incerta</i> Lemwer maun.	+	+	-	-	+
31	<i>Nostoc</i> sp.	-	-	+	+	-
32	<i>Nostoc sphaericum</i> Vaucher.	+	-	-	-	+
33	<i>Oscillatoria hametii</i> Fremy.	+	-	-	-	+
34	<i>Oscillatoria prolifica</i> (Grev.) Gomout	+	+	-	-	+
35	<i>Oscillatoria teuuis</i> var. <i>tergestina</i> (Kuetz) Rabenhust	+	+	-	-	+
36	<i>Phormidium</i> sp.	+	+	-	-	+
37	<i>Phormidium ambiguuum</i>	+	-	-	-	+
38	<i>Pseudoanabaena</i>	-	-	-	+	-
39	<i>Rhabdoderma gorskii</i> Woloszynska	-	-	+	-	-
Division: Chlorophyta						
1	<i>Ankistrodesmus falcatus</i> (Corda) Ralfs	+	-	-	-	+
2	<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Br.)	+	+	-	-	+
3	<i>Ankistrodesmus falcatus</i> var. <i>mirabilis</i> (West & West) G. M. West.	+	-	-	-	+
4	<i>Asterococcus spinosus</i> Prescott	-	-	-	+	-
5	<i>Botryococcus brannii</i> Kuetzing	+	+	-	+	+
6	<i>Botryococcus protuberans</i> var. <i>minor</i>	+	+	+	+	+
7	<i>Botryococcus sudeticus</i> lemmermann	+	-	+	-	+
8	<i>Carteria cordiformis</i>	-	+	-	-	-
9	<i>Chlamydomona anguloa</i>	+	-	-	-	+
10	<i>Chlamydomonas epiphytica</i> G. M. Smith.	+	+	+	+	+
11	<i>Chlamydomonas globosa</i>	+	-	-	-	+
12	<i>Chlamydomonas snowii</i>	+	-	-	-	+
13	<i>Chlorella vulgaris</i>	+	+	+	+	+

14	<i>Chlorociccum humicola</i>	+	+	+	-	+
15	<i>Closteriopsis longissima</i> Lemmer mann	+	+	-	-	+
16	<i>Closterium</i> sp.				+	
17	<i>Closterium acutum</i>	-	-	-	+	-
18	<i>Cosmarium gracilles</i>	+	+	+	-	+
19	<i>Cosmarium meneghinil</i>	-	-	+	+	-
20	<i>Cosmarium subcontratum.</i>	-	+	-	+	-
21	<i>Cosmarium tumidum</i>	-	-	-	+	-
22	<i>Crucigenia irregularis</i>	-	+	-	-	+
23	<i>Crucigenia rectangularis</i>	-	+	-	+	-
24	<i>Crucigenia tetrapedia</i>	-	-	-	+	-
25	<i>Crucigenus quadrata</i>	-	+	-	-	-
26	<i>Dactyosphaerium ehrenbergianum</i>	+	-	-	+	+
27	<i>Dactyosphaerium pulchellum</i> Wood	+	-	-	-	+
28	<i>Dispora crucigenioides</i> Printz	-	-	-	+	-
29	<i>Dispora</i> sp.	-	+	+		-
30	<i>Gamphosphaeria aponina</i> var. <i>delicatula</i> Virieux	+	-	-	-	+
31	<i>Gleocystis versiculosa</i> Naegeli	+	-	+	-	+
32	<i>Gomphosphaeria aponina</i> Kuetzing	+	-	-	-	+
33	<i>Gomphosphaeria aponina</i> var. <i>delicatula</i> viriux	+	-	-	-	+
34	<i>Gomphosphaeria lacustrics</i> var. <i>compacta.</i>	+	+	-	-	+
35	<i>Gomphosphaeria lacustris</i> Chodat.	+	-	-	-	+
36	<i>Gonatozygon kinahanii</i> (Archi.) Rabenh	-	+	-	-	-
37	<i>Gomphosphaeria</i> sp.	-	-	-	+	-
38	<i>Kirchnerietla</i> sp.	+	-	-	-	+
39	<i>Kirchnerietla lunaris</i>	+	-	-	+	+
40	<i>Kirchnerietla obesa</i> var. <i>aperta</i>	+	-	-	-	+
41	<i>Kirchneritla contrat</i> Schmidle Bohlin	+	+	-	-	-
42	<i>Kirchneritla elongata</i> G. M. Smith	+	-	-	-	+
43	<i>Lagerheimia quadriseta</i> (Lemm.) G.M.Smith			+	+	-
44	<i>Oocystis borgei</i> snow	+	-	-	+	
45	<i>Oocystis crassa</i> Wittrock.	+	+	-	+	-
46	<i>Oocystis elliptica</i> W. West	-	-	-	+	+
47	<i>Oocystis gigas</i> Archer.	+	+	+	+	-
48	<i>Oocystis parva</i>	+	-	-	+	+
49	<i>Oocystis pusilla</i> Hansgirk.	+	+	+	+	-
50	<i>Pandorina morum</i>	+	+	-	-	+
51	<i>Pandorina</i> sp.	+	-	-	+	+
52	<i>Planktosphaeria gelatinosa</i>	+	+	-	-	-
53	<i>Scendesmus abundans</i> (Kirch.)	+	-	+	-	+
54	<i>Scendesmus abundans</i> var. <i>brevicauda</i> G. M. Smith.	+	+	-	-	-
55	<i>Scendesmus acutiformis</i>	-	-	+	-	+
56	<i>Scendesmus bundans</i>	-	+	-	-	-
57	<i>Scendesmus dimorphus</i>	-	+	-	+	-
58	<i>Scendesmus incrassatulus</i>	-	-	-	+	-
59	<i>Scendesmus juga</i> (Turp.) Lagerheim.	+	+	+	+	+
60	<i>Scendesmus obliquus</i>	-	-	-	+	-

61	<i>Scendesmus quadricauda</i> var. <i>longispina</i> (Chod)	-	+	-	+	-
62	<i>Sceudesmus peroratus</i>	+	-	-	-	+
63	<i>Selenastrum minema</i>	-	-	-	+	-
64	<i>Tetradron duospinum</i> Ackley	-	+	-	-	-
65	<i>Tetraedron caudatum</i>	+	-	-	-	+
66	<i>Tetraedron minimum</i>	+	+	+	+	+
67	<i>Trebouxia</i> sp.	-	+	-	-	-
68	<i>Trochiscia reticularis</i> (Reinsch) Hansg.	+	+	-	+	+
69	<i>Westella botryoides</i> (W. West)	-	-	+	-	-
Division: Cryptophyta						
1	<i>Cryptomonas erosa</i>	+	+	+	+	+
2	<i>Cryptomonas ovate</i>	-	+	-	+	-
3	<i>Chroomonas nordstedtii</i> Hansgirg	+	+	+	-	+
Division: Euglenophyceae						
1	<i>Euglena gracilles</i>	+	+	-	+	+
2	<i>Euglena oxyuris</i> Var minor priscott	-	+	-	-	-
3	<i>Lepocinclis playfairiana</i> Detander	-	+	-	-	-
4	<i>Phacus acuminalus</i> Stoken	+	-	+	-	+
5	<i>Phacus caudeta</i> Var. ovalies	-	+	-	-	-
6	<i>Phacus chloroplastes</i> var. <i>incisaprecoth</i>	-	+	+		-
7	<i>Phacus curvicauda</i>	-	+	+		-
Division: Pyrophyceae						
1	<i>Glenodinium pulvisculus</i> (Ehr.) Stein	+	-	-	+	+
2	<i>Glenodinium</i> sp.	-	+	-	+	-
3	<i>Glenodinium borgei</i>	+	+	+	+	+
4	<i>Glenodinium quardidens</i>	+	+	+	-	+
5	<i>Peridinium pusillum</i> (Penard) Lemmer..	+	+	+	-	+
6	<i>Perdinium inconspicuam</i> Lemmer mann.	+	-	-	-	+
7	<i>Peridinium gatunense</i> Nugaard	+	-	-	-	-

The large number of species recorded is due to the Chlorophyta, as they are mobile and most of them are unicellular and easy to attach to the water column. What helps them in this is the lack of flow inside the lake and the lack of depth, and their homogeneous distribution within the water column [14] tends to be green algae. Blueness leads to adhesion to bodies inside the water stick and on the bottom in lakes with less lushness, which makes their numbers less compared to green algae. Therefore, more numbers are found in areas with high organic pollution, as most of its types are evidence of organic pollution, and some of them have the ability to secrete toxins such as Moss Microcystis [31].

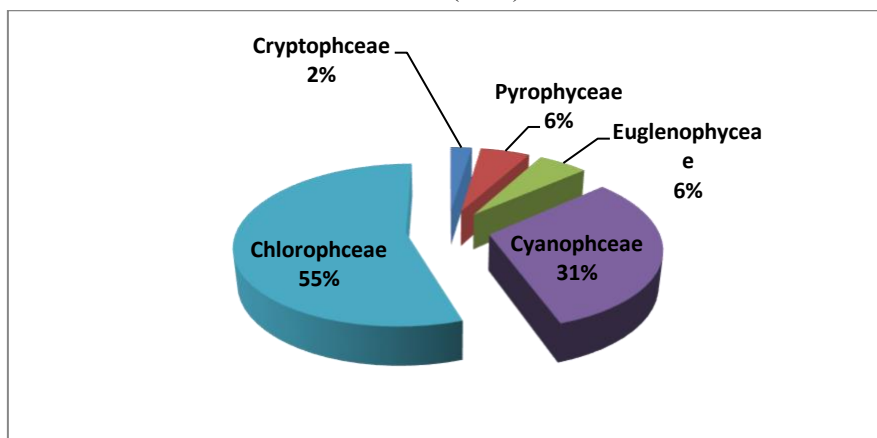


Figure 2: Percentages of Algae Groups Diagnosed in the lake of Al-Shaheed Monument During the Study Period and in All Locations

Climate changes affect the ecological environment through temperature changes, which in turn affect all the properties of water, which leads to pressure on biological diversity, as races decrease and individuals increase in certain types [32]. The types of blue-green algae increase in the spring and summer compared with the rest. The seasons (Fig.3) as they withstand climatic changes and high temperatures, which makes them give unwanted odors, and some types of them secrete deadly toxins to aquatic organisms [3]. The high numbers of species are also associated with a high concentration of nutrients, phosphates and nitrates (Table 1). This agreement with [3,33]. This is in addition to an increase in rotating algae with moderation and high temperature, as some of its species have a toxic effect on fish [34]. The most abundant species is Chroococcus and Oscillatoria, among the most abundant blue-green algae, as it prefers.

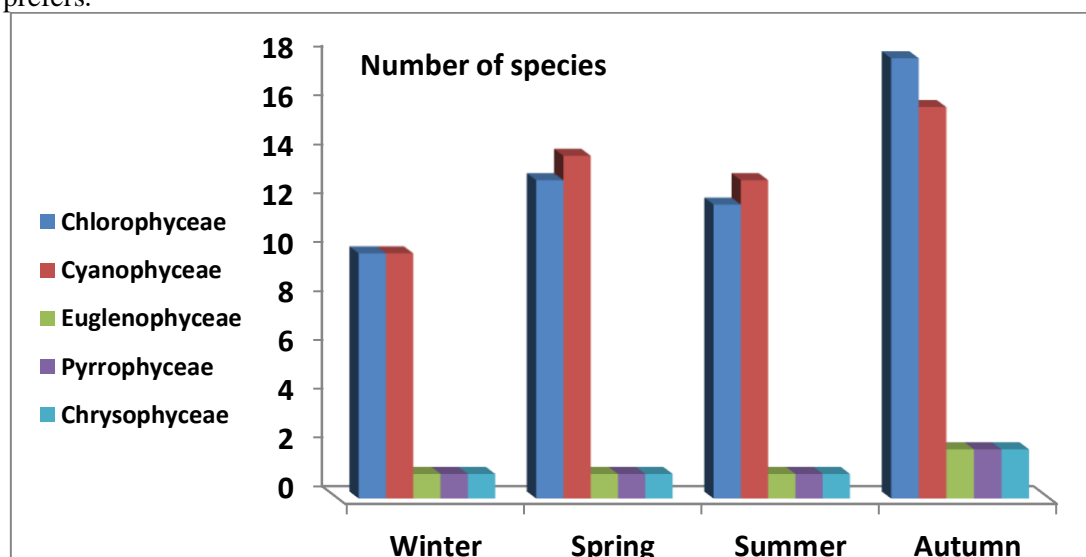


Figure 3: Species distribution rates among the detected algae classes during the seasons.

4. Conclusion: from the current study, the following can be concluded.

- Climatic changes are pressing for several years (2015-2018) before conducting the study, especially the increase in temperature and drought, led to pressure on biological diversity of algae as races decrease and individuals of certain species increase at the expense of other species.
- The blue-green algae tend to stick to the bodies inside the water stick and on the bottom of the lakes, which makes their numbers less compared to the green algae. Therefore, more numbers are present in areas with high organic pollution, and some of them have the ability to secretion of toxins such as Microcystis algae.

- There was a distinct increase in the species of blue-green algae in spring and Autumn, compared with the rest of the seasons. While dinoflagellates algae achieved an increase in Autumn.
- The most common species are Chroococcus and Oscillatoria, among the most abundant blue-green algae.

References

- [1] Al Tayiy, M.N. (2018). An Ecological Study on Phytoplankton Community In The Pond of The Martyr Monument In Baghdad, for the A Thesis, College of Education (Ibn Al-Haitham University of Baghdad)
- [1] Al Tayiy MN 2018 An Ecological Study on Phytoplankton Community in The Pond of The Martyr Monument In Baghdad, for the A Thesis, College of Education (Ibn Al-Haitham University of Baghdad).
- [2] Darraji K A H 2015. Use of plant doubtful evidence of evaluation of the impact of human activities on water quality (Beit Zawina) River in Diyala Province, Master of Faculty of Fatal Francness of the Hahamnap, Baghdad University: 122 pages.
- [3] Al Husseini KH and Al-Salman A I M 2020 quarterly variation and their impact on phytoplankton dynamics in the Gharaf river environment in southern Iraq. plant archives 20 (1):1354-60 pp.
- [4] Moss B 2010. Ecology of Fresh Waters: A View for the Twenty-First Century, 4th ed. Wiley-Blackwell Publishing
- [5] Fukumori K E, Yoshizaki N T and Kadoya T 2016 Detritivore diversity promotes a relative contribution rate of detritus to the diet of predators in ponds. Ecosphere 7(3): e01211. 10.1002/ecs2.1211
- [6] András A, Maria L, Stanković I, Borics G, Várbíró G and Judit Padišák J 2012. A large river (River Loire, France) survey to compare phytoplankton functional approaches: Do they display river zones in similar ways? Ecological Indicators, 21: p 11-22..
- [7] Abdul Ali H A Z 2014. An environmental (for educational) for some physicist factors in the soaked of the martyr's monument and its effects on the cyprinus coopina figures. Master of Mullah, Faculty of Basic Education, Consultation University, Baghdad, Iraq: 186 pages.
- [8] APHA 2018. Standards and Methods for the Examination of Water and Waste water, 28th ed., Washington, 759 PP
- [9] Desikachary TV 1959 Cyanophyta. (New Delhi: Indian Council of Agric, Resea), 686..
- [10] Perscott GW 1973. Algae of the western Great Lake Area. William, C. Brow, Co., publishers, Dubuque, Iowa. M 977 .
- [11] Hinton GCE and Maulood BK 1982 Contribution of the algal flora of Iraq: the non-diatoms flora of southern Marshes. Nova Hedwigia., 37: 49-63
- [12] Wehr JD and Sheath RG 2003 Fresh water algae of North America: Ecology and classification. Academic press., 910pp.
- [13] Patrick R and Reimer CW 1975 The diatom of the United States. 2., part 1, Philadelphia, Monograph., 13: 213.
- [14] Aboal M, Sánchez JC and Ector L 2003 Diatom Monographs Andrzej Witkowski., 4: 657.
- [15] Munir M, Qureshi R, Arshad M, Chaudhry A and Laghari MK 2012 Taxonomy study of Bacilariophyta from Kallar Kahar lake Chakwal, Punjab, Pakistan. Pak. J. Bot., 44(5): 1805-14
- [16] Hassan FM, Hadi RA, Kassim TI and Al-Hassany JS 2012. Systematic study of epiphytic algae after restoration of Al-Hawizah marshes southern of Iraq. Internat. Aqu. Sci 3(1): 37-57.
- [17] Al-Hassany JS and Hassan FM 2014. Taxonomy Study of some Epiphytic Diatoms on aquatic plants from ALHawizah marshes, southern of Iraq. Asian J. Nat. and Appl. Sci., 3(1): 1-12.
- [18] Prabhakar C, Saleshrani K and Tharmaraj K 2011. Hydro biological investigations on the planktonic diversity of Vellar River, Vellar Estuary and Portonovo coastal waters, South East Coast of India. Int. J. Pharm. Biol. Arch., 2(6): 1699-704..
- [19] Breuer F, Janz P, Farrelly E, and Ebke K 2017. Environmental and structural factors influencing algal communities in small streams and ditches in central Germany Journal of Freshwater Ecology 1 (3):65-83.
- [20] Kim DK, Jeong KS, Whigham P A and Joo G J 2007. Winter diatom blooms in a regulated river in South Korea: explanations based on evolutionary computation. Freshwater Biology, 1-21.
- [21] Al-Muthnani A S M and AL Salman I M 2009 Environmental System, First Edition, Sabha University Publications, Libya: 552

- [22] [34] Sabri A W, Maulood B K and Suleiman N I 1989. Limnological studies, on river Tigris: some physical and chemical characters. *Biol. So.*, 20 (3): 565 – 79
- [23] Darraji K A H 2015. Use of plant doubtful evidence of evaluation of the impact of human activities on water quality (Beit Zawina) River in Diyala Province, Master of Faculty of Fatal Francness of the Hahamnap, Baghdad University: 122 pages.
- [24] Al-Gafali A K and Al-Tamimi AN A M 2009 Daily change of plant pronunciation and its relationship with some environmental factors in one of the sake of Lake Ha'aniyah. *Jabulh Ibn Al-Haytham for pure and applied sciences*, 22 (2):1.10.
- [25] Hamad A A and AL Salman I M A 2013. A humanitarian study for some physical agents of the water of a bill and a hunting level with the level of bacterial pollution, the World Fifth World Environmental Science Forty-December 1, University of Babel-Iraq. Special number / conference facts: 293-283 page.
- [26] Abdel Amir SH 2013 A study of the algae adjustable clay in the Digration River within Baghdad, Iraq. Message Master, College of Science, Baghdad University.
- [27] AL Magdamy B H 2016 Study the community of Algae (Diatoms) in river Tigris between Baghdad and Al- Dujail. Theses College of Education for Pure Sciences / Ibn Al-Haitham University of Baghdad .275pp.
- [28] Bizsei, N.; Benli, H.A. and Bizsei, K.C. (2001). A synoptic study on the phosphate and phytoplankton relationship in the hyper eutrophicated Izmir bay (Aegean sea), *Turk J. Engine Environ. Sci.* 25: 89-99
- [29] Saad MAH 1973 Distribution of phosphates in lake mariut, Aheavily polluted lake in Egypt, water, Air, and Soil pollution 2: 515-22.
- [30] Prescott G W 1968 *The algae: A review.* (Boston: Houghton Mifflin Comp).
- [31] Al-Atify A M 2016 Environmental Civic for some algae in the water environment. Assiut for environmental studies, Issue III and Four.
- [32] Houssani SA 2017 Report of the environment in the Abu Dubi Principles, Climate Change. *The Environmental Commission Abu Dubi.* 11pp.
- [33] Kasim M 2011. Correlation of environmental factors and Diatom assemblages in Akkeshi-Ko estuary system. *J. Coastal. Devel.*, 14(3): 242-54.
- [34] Avaria SP,1979). Red tides of the coast of Chile. In Taylor, D.L., Seliger, H.H Eds. *Toxic Dinoflagellate Blooms.* Elsevier/North Holland, *New York* pp. 161- 164.