Marsh Bulletin 1(1)(2006) 19-31

MARSH BULLETIN

Amaricf_Basra office@yahoo.com
abdulalwan@yahoo.com
marshbulletin@yahoo.com

Vertical distribution of phytoplankton in Habbaniya lake , Iraq

T. I.Kassim[a], H. A.Al-Saadi[b] and R. K.Farhan[a]

[a]*Ministry of Science and Technology , Directorate of Water Treatment Technology , Water Research Center P.O.Box 765,Baghdad , Iraq*

[b]*Biology Department , College of Science for Women, Univ. of Baghdad,Iraq*

Abstract

The study includes the distribution of phytoplankton in water column of Habbaniya lake during 1996 and 1997 . A total of 116 taxa of phytoplankton were identified. The diatoms were the dominated by 70 taxa represented 60.3% of the total identified species . Followed by green algae (chlorophyta) of 30 taxa 25.8% , and then blue-green algae (cyanophyta) of 12 taxa 10.3% . Little increasing of cells count was recorded at 10 meter depth and without regular seasonal variation .Few species were dominated during the most studied period such as *Aulacosiera granulate* , *Cyclotella ocellata* , *Navicula cryptocephala* and *Nitzschia palea* .

Keywords : Vertical distribution, phytoplankton, lake

1.Introduction

Little attention was acquired for the phytoplankton in lakes and reservoirs during the last two decades in Iraq. Number of studies were published on south marsh of Iraq (Maulood et al.1981; Al-Saadi & Al-Lami 1992; Al-Mousawi et al.1994; Al-Saadi et al .1996) .While, one study only was on Samarra impoundment (Sabri et al.1989); two studies were on Rhazzazah lake (Anon 1983a ; Al-Ghafily 1992); Therthar reservoir (Anon 1983b); Habbaniya lake (Al-Kaisi 1967; Anon 1983c; Kassim et al.2001); Dokan reservoir in north Iraq (Shaban 1980); Qadisia lake (Kassim et al.1999) and Hemrin reservoir (Salman et al.2002). Only three of the above studies were concerned on phytoplankton population in

water column (Shaban 1980;Sabri et al.1989; Kassim et al.1999)

Habbaniya lake, with storage capacity of 3.26×10^9 m^3 at 51 meter above sea level, located on the south-east part of Ramadi city. It obtain its water from Euphrates River through Warar canal. The outflow from the lake is through Majara canal to Razzazah lake and through Theban canal again to the river (Fig.1).

The present work deals with the qualitative and quantitative seasonal variation of phytoplankton in water column of Habbaniya lake.

2.Materials and Methods

Seasonal water samples were collected from the mid of the lake for two years (1996 and 1997).Extra four water samples represent depths (1,3,5,10 meter) as well as the surface were collected using Van Dorn water sampler to filter 10 liters of water (from each depth) in phytoplankton net (20 µm mesh size). Lugol's iodine solution was used for fixation. Sedimentation was used for quantitative study (Furet & Benson- Evans 1982). The diatoms were cleaned by hot nitric acid for identification and counted by microtransect method. The nondiatoms algae were counted by Haemocytometer method (Martinez et al .1975). The identification of algae was done according to Hustedt (1930); Desikachary (1959); Prescott (1975); Germain (1981).

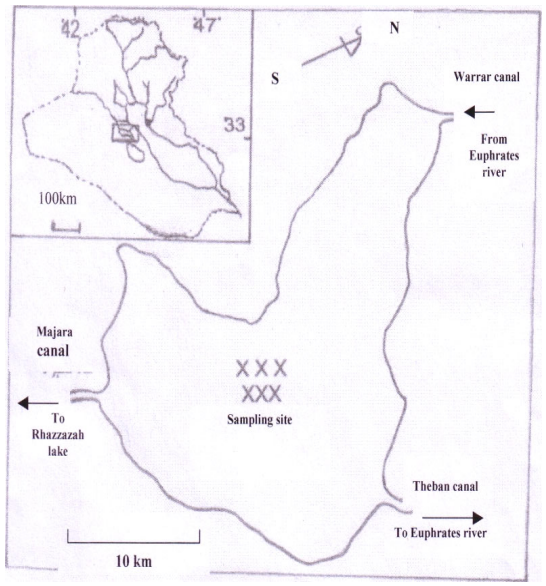

Fig. (1): Map of Habbaniya lake showing the sampling site .

3.Results

The study revealed with identification of 116 taxa of phytoplankton in difference depths of the lake during the study period (Table 1) .Out of that 53, 64,65,69,and 60 taxa were identified in the surface and depths 1,3,5,10 meter, respectively. It was found that the number of algal taxa were almost similar along the water column especially during summer and autumn. A total of 22 taxa (18.9% of the total number) to be found among all depths. Most of them was represented of diatoms (15 taxa, 12.9% of the total number), followed by blue –green algae (4 taxa, 3.4%) and green algae (3 taxa, 2.6%).

In the whole depths, Bacillariophyta was the most dominant group (60.3%) with 70 taxa. The majority of them belonged to pennales (53.4%), and 6.9% to the centrales, followed by Chlorophyta (25.8%) with 30 taxa, Cyanophyta (10.3%) with 12 taxa, Pyrrophyta (1.7%) with 2 taxa and one taxa of Chrysophyta (Table 2).

Few genera were represented by the highest species number such as *Nitzschia* (15 species), *Navicula* (7 species), *Cymbella*(6 species) and 5 species of *Cyclotella* . On the other hand, some species to be found during all the study period (four seasons) and along the water column which are *Nitzschia palea, Cyclotella ocellata, Aulacosiera granulata* and *Navicula cryptocephala,* all these species were of diatoms (Table2).

Only six species were identified at the surface water, namely *Arthrospira spirulinoides, Chroococcus minor, Pediastrum boryanum, Amphora* sp.*, Gomphonies olivacea, Navicula* sp. and *Rhopalodia gibba.* While, three species (*Tetraedron caidatum , Surirella biseriata* and *Surirella* sp.) only were identified at 10 meters depth. Some of the identified species were originated from benthic forms.

Table (1):

List of phytoplankton taxa and cells number (cell $\times 10^3$ / l) identified in different depths of Habbaniyah lake and No. of appearance during 1996 and 1997 .+taxon present in net sample only.

Taxa	Depths (meter)					No.of appearance
	Surface	1	3	5	10	
CYANOPHYTA						
Anabaena sp .	11.3	11.3	13.6	19.3	13.6	5
Aphanocapsa sp .	+	+	-	-	-	3
Arthrospira spirulinoides Slizenberger	5.6	-	-	-	-	4
Chroococcus minor (Kütz.) Naegeli	7.9	-	-	-	-	5
Chroococcus sp.	-	3.4	-	-	1.1	4
Lyngbya limnetica Lemm .	26	26	55.4	61	21.5	5
Merismopedia elegans A.B r .	5.7	-	8	17	1.1	6
Nostoc sp .	-	-	1.1	5.7	6.8	6
Oscillatoria limnetica Lemm .	-	1.1	45	59	30.1	4
O . tenuis C .A . Ag .	3.4	2.2	7	14.7	1.1	3
Oscillatoria sp .	270	20.4	91	15.9	11.4	6
Raphidiopsis indica S .R . N .	5.7	9	20.5	2.3	-	4
CHLOROPHYTA						
Ankistrodesmus falcatus (Corda) Raifs.	-	2.3	-	1.1	-	5
Carteria sp .	-	-	-	+	-	3
Cerasterias staurastroides West & West	-	36.2	27.2	73	-	5
Chlamydomonas sp .	2.3	1.1	3.4	-	-	4
Closterium sp .	10.2	5.7	12.4	7.9	10.2	6
Coelastrum astroideum De . Not	-	-	2.3	-	-	3
Cosmarium sp .	4.5	2.3	2.3	-	-	5
Crucignia sp .	-	-	-	9	-	3
Chlorella vulgaris Beyerinek	6.7	-	3.4	1.1	-	5
Dicteospherium sp.	-	-	+	+	+	5
Golenkina paucispina West & West	-	-	1.1	-	-	2

Lagerheimia citriformis(Snow) & M . Smith	1.1	-	-	1.1	-	3
Micractinium pusillum Fresenius	-	-	2.3	-	-	2
Monoraphidium sp .	6.8	6.8	10.2	4.5	5.7	4

Taxa	Depths (meter)					No.of appearance
	surface	1	3	5	10	
Oocystis elliptica West & West	-	4.5	-	8.4	-	2
O. parva West & West	-	-	-	1.1	-	4
O. pusilla Hansgirg	-	3.4	-	9.1	4.5	3
*Oocysti*s sp.	6.7	12.5	11.4	9.1	-	6
Pediastrum boryanum (Turp .) Mene	3.4	-	-	-	-	3
P. duplex Meyen	+	+	+	+	-	5
P. integrum Naegeli	-	-	+	+	+	2
P.simplex (Meyen) Lemm .	-	-	1.1	-		4
Scenedesmus acuminatus (Lag.) Chodat	1.1	1.1	-	1.1	-	3
S. bijuga (Turp .) Lagerheim	3.4	2.3	5.7	2.3	-	5
S. quadricauda (Turp .) de Berb.	2.3	4.5	9.1	1.1	2.3	5
S. dimorphus (Turp .) Kütz.	-	-	9.1	-	-	3
Staurastrum natator West	-	2.3	5.7	3.4	-	3
S. staurastroides	-	4.6	-	2.3	4.5	2
Tetraedron minium (A. Braun) Hans	-	1.1	1.1	-	1.1	3
T. caidatum (Corda) Hansgirg	-	-	-	-	+	3
PYHRROPHYTA						
Ceratium hirundinella (O.F. Mull.)	-	4.5	3.4	5.7	3.4	3
Peridinium cinctum (Muell.) Her.	1.1	-	-	2.25	1	3
CHRYSOPHYTA						
Dinobryon divergens lmhof	-	4.5	3.4	4.5	1.1	3
BACILARIOPHYTA						
Centrales						
Aulacosiera granulata (E hr.) Ralfs	82	152	118	247	284	8
Coscinodiscus lacustris Grun.	-	2.2	-	-	-	4
Cyclotella comta Ehr. Kütz.	-	6.5	16	3.9	31.4	3
C. *kuetzingiana* Thwaites	-	1.2	-	-	-	4
C. meneghiniana Kütz .	34	298	158	163	58.6	6
C. ocellata Pantocksek	40	162	101	165	259	8
C. stelligera C1. et Grun .	-	-	-	+	-	3

Stephanodiscus astrea (E hr.) Grun.	-	5.5	3.1	11.3	197	6

Taxa	Depths (meter)					No.of appearance
	Surface	1	3	5	10	
Pennales						
Achnanthes clevei Grun.	-	+	-	-	-	3
A. lanceolata de Breb.	1.4	-	-	3.3	-	5
A. minutissima Kütz .	6.8	6.3	5.8	25.7	17.2	6
Amphora coffeaeformis Agardh	-	5.2	-	-	-	5
A. ovalis Kütz.	-	1.1	1.1	-	-	6
A. veneta Kütz.	3.3	8.8	4.5	6.6	9.5	5
Amphora sp .	11	-	-	-	-	4
Anomoeoneis exilis (Kütz.) C l.	-	-	-	+	1.8	3
Bacillaria paxillifer (Muller) Hendey	-	+	-	+	-	2
Caloneis ventricausa E hr. Meister	-	+	+	-	-	3
Caloneis sp.	1.1	_	-	-	2.4	2
Cocconeis pediculus E hr.	1.1	_	-	-	2.6	3
C. placentula E hr.	1.2	_	-	-	1.1	5
C. placentula var . *euglypta* (E hr.)C leve	2.1	2.4	3.4	6.9	6.7	6
C. placentula var . *lineata* (E hr.) C l.	2.6	6	3.4	6	5.4	5
Cymbella affinis Kütz .	2.3	2.6	1.1	3.2	1.1	6
C. cistula (Hemprich) Grun .	-	-	1.8	-	1.1	5
C. microcephala Grun .	3.6		1.25	3.3	4.2	6
C. obtusuicula (Kütz.) Grun .	1.1	9		1.1	1.4	3
C. pusilla Grun .	-	+	+	-	-	4
C. ventricosa Kütz.	-	1.1	-	1.1	-	3
Diatoma elongatum (Lyngbye) Agardh	10	11.8	3.7	5.5	3.6	2
D. vulgare Bory	2.2	-	-	1.1	-	4
Diploneis pseudovalis	-	-	1.9	2.4	-	3
Fragilaria acus Kütz.	34	35	16.7	64.6	151	6
F.ulna (Nitzsche) E hr.	2.3	16.3	-	-	6.5	6
F. vaucheria Kütz .	6.6	7.9	2.4	4.4	1.4	6
Frustulia sp.	-	-	1.25	5.5	-	2
Gomphoneis olivacea (Lyngbye) Dawson	1	-	-	-	-	3
Gomphonema angustatum Kütz.	1.2	-	1.9	-	4.9	6

G. constrictum Ehr .	-	-	-	1.25	-	3
G. parvulum (Kütz .) Grun.	-	-	+	-	-	3
Gomphonema sp.	-	+	-	-	-	3

Taxa	Depths (meter)					No.of appearance
	surface	1	3	5	10	
Hantzschia amphioxys (E hr.) Grun .	-	-	-	4.5	-	3
Mastogloia smithii Thwaites	-	1.1	-	-	3.5	3
Navicula anglica Ralfs	-	3.3	-	-	-	2
N. cryptocephala Kütz .	3.7	1.1	10.7	12.9	14.3	7
N. cryptocephala var . *veneta* Kütz . Grun.	5.5	13.4	2.5	15.4	12.2	5
N. gracilis E hr .	-	5.2	-	-	1.8	4
N. parva (Mene) Cleve	1.1	-	1.1	8.9	9.7	5
N. radiosa Kütz.	-	5.3	1.1	-	3.6	5
Navicula sp .	3	-	-	-	-	6
Nitzschia acicularis W. Smith	8.8	-	1.1	2.4	5.3	6
N. apiculata (Gregory) Grun .	-	-	-	3.6	-	4
N. amphibia Grun.	-	+	-	+	-	4
N. angustata (W. Sm.) Gurn.	-	-	+	-	-	5
N. dissipata (Kütz.) Grun .	-	-	11.1	-	1.8	4
N. frustulm (Kütz.) Rabh	8.3	7.7	2.4	7.9	3.6	6
N. granulata Grun .	-	-	-	2.4	-	4
N. hungarica Grun.	-	2.6	-	-	-	2
N. microcephala Gurn .	-	-	1.1	-	-	2
N. longissima Grun.	-	-	-	1.3	1.15	3
N. palea (Kütz.) W . Smith	21.3	26.3	14.4	33.3	34	7
N. punctata (W . Smith) Grun .	-	4.3	4.5	46.2	62.7	6
N. romana Grun .	1.1	3	1.25	-	2.3	6
N. sigmoidea E hr .	-	1.4	-	-	1.4	5
N. tryblionella Hantzsch .	-	-	1.1	1.1	8.7	6
Rhoicosphenia curvata (Kütz.) Grun.	-	-	+	-	+	3
Rhopalodia gibba (E hr.) O. Muller	4.4	-	-	-	-	3
Surirella biseriata Hustedt	-	-	-	-	+	2
S. ovata Kütz.	-	-	-	+	-	3
Surirella sp.	-	-	-	-	1.8	2

Table (2):
Number of phytoplankton species and genera recorded in different depths of Habbaniyah lake during 1996 and 1997. Sp.=species , G = Genera.

Algal division	Depths (meter)											
	Surface		1		3		5		10		Total	
	G	sp	G	sp	G	sp	G	sp	G	Sp	sp	%
Cyanophyta	8	9	6	8	6	8	6	8	6	8	12	10.3
Chlorophyta	9	12	11	16	15	19	13	20	8	9	30	25.8
Pyhrrophyta	1	1	1	1	1	1	2	2	2	2	2	1.7
Chrysophyta	-	-	1	1	1	1	1	1	1	1	1	0.85
Bacillariophyta	14	31	16	37	16	36	18	38	17	40	70	60.3
Centrales	2	3	4	7	3	5	3	6	3	5	8	6.89
Pennales	12	28	12	31	13	31	15	32	14	35	62	53.4
Total	32	53	35	64	39	65	40	69	34	60	116	100

High total cells number of algae (1621.4 × 10^3 cell /l) were recorded at 10 meters depth, followed by 1208.6 × 10^3 cell /l, 988.7 × 10^3 cell /l, 868.2 × 10^3 cell/l and 703.3 × 10^3 cell /l at the depths 5,1,3 and the surface, respectively, dominated by diatoms in all depths without regular seasonal variations (Table 3). The Bacillariophyta were dominated all other groups of algae along the water column. Such pattern was the case of the total cell number, followed by Chlorophyta and Cyanophyta. Pyrrophyta and Chrysophyta were recorded in a little number and didn't effect the total cell count.Two peaks of total cells number and Bacillariophyta were observed during summer and autumn.The peak of other main groups were fluctuated during the study period.

The seasonal variation of the main species (*Aulacosiera granulata*, *Cyclotella ocellata, Nitzschia palea and Navicula cryptocephala)* are shown in Table (4). Four diatoms species were found to be dominated in almost all the samples, but the seasonal variation are not clear.

Aulacosiera granulata was recorded in higher number during summer and autumn along the water column and in some depths in other seasons.

Table (3):

Seasonal distribution of the total cells number and the main divisions of phytoplankton (cell×10^3 /l) in different depths of Habbaniyah lake during 1996 (upper line) and 1997 (lower line)

		Depths(meter)				
Division	Season	0	1	3	5	10
Cyanophyta	winter	---	9.5	---	---	---
		---	---	---	37	---
	spring	---	---	---	---	---
		36.3	86	---	77	---
	summer	402	383	508	617	287
		2028	112	824	856	851
	autumn	8.5	40.8	219	39	9.5
		200	192	93	101	120
Chlorophyta	winter	90.6	187	322	83	92
		---	10	64	45	53
	spring	82	103	105	261	67
		72	81	78	211	42
	summer	28	74	48	---	9.6
		109	87	78	215	88
	autumn	4.7	38	104	---	46
		9.8	48	23	77	---
Bacillariophyta	winter	678	1007	65	906	903
		98	508	90	500	712
	spring	81	76	92	99	362
		507	3004	2000	1879	5110
	summer	722	915	921	1009	781
		828	215	227	792	84
	autumn	48	903	814	2062	3043
		861	870	676	893	2291
Total	winter	820	1016	822	1004	1003
		97	607	106	685	853
	spring	280	292	298	347	351
		581	3072	2032	2044	4093
	summer	903	1007	2008	267	812
		8087	488	923	2026	936

	autumn	27	4018	2042	4080	8029
		876	941	631	1092	2038

Table(4) :

Seasonal distribution of dominant species of phytoplankton (cell×10^3 /l*)* in different depths of Habbaniyah lake during 1996 (upper line) and 1997 (lower line).

		Depths(meter)				
Species	season	0	1	3	5	10
Aulacosiera	winter	---	56	---	50	40
granulate		---	572	42	10	---
	spring	---	---	---	41	---
		---	52	37	30	1005
	summer	903	1004	975	2051	852
		51	53	62	107	---
	autumn	---	---	---	854	553
		302	854	651	806	2004
Cyclotella	winter	105	406	84	76	102
ocellata		45	57	44	204	315
	spring	12.5	11	16	16.2	16
		---	10.5	56	34	---
	summer	---	50	63	32	32.5
		112	47	73	74	9.5
	autumn	---	920	604	933	2010
		61	52	70.5	84	55
Navicula	winter	9.1	---	61	50.5	82
cryptocephala		---	---	---	---	---
	spring	---	---	---	---	---
		---	8.2	8.5	---	---
	summer	---	---	36	16	37
		41	---	---	40.5	45
	autumn	---	---	9.5	---	---
		---	---	9.5	32	---
Nitzschia	winter	58	81	10.5	84	36
palea		---	---	9.6	9.3	10
	spring	64	---	---	---	---
		27	---	23	10.5	49.5
	summer	36	43	56	26	11
		---	---	---	---	---

autumn	---	42	49	9.3	70
	68	81	8.2	206	2.2

Cyclotella ocellata was found in greater number during autumn. In the mean time, it's observed in the most depths.

Navicula cryptocephala was observed in greater number during winter . Greatest number recorded at 10 meters depth and fluctuated in their appearance during other seasons.

Nitzschia palea was appeared during all the seasons expect at summer 1997. The cells number were fluctuated along the water column.

4.Discussion

The water in Habbaniya lake characterized as alkaline, very hard, calcium ion concentration more than magnesium and water considered as oligohalin . The lake was well aerated and showed several over saturation values during the study period . The variation whithin the water column was not pronounced (Al-Saadi et al.2001) .

The dominated of diatoms in algal community was recorded in all Iraqi lakes , Samarra lake (Sabri et al.1989) , Habbaniya lake(Al-Kaisi 1976;Anon 1983c;Al-Lami et al.1998 ; Kassim et al.2001) , Therthar lake (Anon 1983_b) , Razzazah lake (Anona 1983a ;Al-Ghafily 1992;Al-Saadi et al. 1995) , marsh areas (Al-Saadi & Al-Lami 1992 ;Al-Saadi et al.1996) , Qadisia lake (Kassim et al.1999) and Hemrin lake (Salman et al.2002) . The diatoms were also the dominant group (65.2%) of the total identified taxa in the upper region of Euphrates river (Al-Saadi et al.2000) , which are suppling the studied lake .

Little higher number of algal taxa in 5 meters depth may be related to the increased of temperature and light intensity in the surface layer during warmer seasons (summer and autumn). Alternatively , to avoidance of these two factors (Wetzel 1975).

Some of the genera contributed several species such as *Nitzschia , Navicula , Cymbella and Cyclotella* . Similarly , these genera were found in several species also in other lakes of Iraq , such as Samarra lake (Al-Lami et al.1997) and Hemrin reservoir (Salman et al.2002). Maulood et al.(1993) reported the importance of these genera in Iraqi waters .

In the present investigation , the little highest cells number were recorded at 10 meters depth and followed by 5 meters depth . These increasing was appropriated with depth increasing during summer and autumn seasons , when the temperature and light intensity were high in temperate region .

On the other hand little quantity of suspended solids was observed previously by Al-Lami et al .(1998) . Similar phenomena was showed in Samarra lake (Sabri et al. 1989). They recorded 30000×10^3 cell\l at 5 meters depth . In general , the algal seasonal variation was not clear along the water column. Many environmental factors such as temperature,light intensity and plant nutrients concentration affected the blooming and succession of the

algae (Bennion 1994;Al-Lami et al.1997; Kassim et al.1999; Salman et al.2002).

The dominance of diatoms in their cells number through the water column in the present study was recorded in all Iraqi lakes and reservoirs (Al-Kaisi 1976; Shaban 1980;Sabri et al.1989 ;Al-Lami et al.1997 ;Kassim et al.1999 & 2000 ;Salman et al.2002).

The most dominant algal species in cells number were also *Aulacosiera granulata* , *Cyclotella ocellata* , *Navicula cryptocephala* and *Nitzschia palea* . All of these species were diatoms.

Aulacosiera granulata : The genus *Aulacosiera* is very common in Tigris and Euphrates rivers in Iraq . Seventeen species and variety were recorded in Iraqi waters (Maulood et al.1993). Lowe (1974) suggested that this diatom found in great number in alkalin water (pH 8.4-8.8).

Cyclotella ocellata : A total of 34 species and variety were recorded for the genus *Cyclotella* in Iraq (Maulood et al.1993). This species was observed in water characterize as alkalin (pH 7.9-8.2) , eutrophic and oligo-mesosaprobic . The habitate is lakes , ponds and rivers , as well as it's euplankton (Lowe 1974).

Navicula cryptocephala :The genus *Navicula* is one of the most common genera in the Iraqi waters with a total of 109 species and variety were recorded previously (Maulood et al.,1993) ,six of them are observed in the studied lake .Lowe (1974) postulated that this diatom tolerate of prod saprobien spectrum .

Nitzschia palea : A total of 90 species and variety were recorded in different water systems of Iraq . Fifteen species were observed during the present study . Lowe (1974) mensioned that this diatom had a wide tolerance rang of nutrients , temperature and saprobien .

Both two species *Cyclotella ocellata* and *Nitzschia palea* were dominant in Qadisia lake (Kassim et al.1999) and Hemerin reservoire (Salman et al.2002) . While, *Aulacosiera granulata* and *Navicula cryptocephala* dominated in Razzazah lake (Al-Ghafily 19992; Al-Saadi et al.1995 ; Hassan 1998). All of these four species dominated also in upper region of Euphrates river (Al-Saadi et al.2000). Kohler (1994) suggested that the succession of algae in lake correlated with river system.

In conclusion there was little difference in algal taxa and total cells count along the water column .The diatoms were the dominant group , especially the pennate once in all the depths . Two peaks of the cells count were recorded during summer and autumn .

5-References

Al-Ghafily AK (1992) Ecological study on phytoplankton in Razzazah lake, Iraq.M.Sc.Thesis, Univ. Baghdad, Iraq (in Arabic).

Al-Kaisi KA(1976)Contribution the algal flora of the rice-fields in southern Iraq.*Nova Hedwigia*. 27:813-827.

Al-Lami AA, Al-Saadi HA, Kassim TI, Al-Dulymi AA & Al-Aubaidi KH(1997) Seasonal variation of the limnological characters in Qadisia lake, Iraq. Mu' tah J. for Research and Studies, 12(1): 383-414.

Al-Lami AA, Kassim TI, Muften FS& Al-Dulymi AA (1998) An ecological study on

Habbaniya reservoir .*J. Coll. Educ. for Women*, Univ. Baghdad, 9(2): 209-216.

Al-Mousawi AH, Al-Saadi HA& Hassan FM(1994)Spatial and seasonal variations of phytoplankton population and related environment in Al-Hammar marsh areas in southern Iraq. Basrah.J.Sci. 12(1) : 9-20.

Al-Saadi HA& Al-Lami AA(1992) Seasonal variation of phytoplankton in some marsh areas in southern Iraq. *J. Coll.Educ. for Women*. Univ.,Baghdad ,3:56-61.

Al-Saadi HA& Al-Lami AA& Al-Dylumi AA (2001) Physico – chemical properties among water column in Habbaniya lake Iraq. Ibn Al-Haitham .*J.for Pure Appl. Sci*., 14 (4c) :21-33.

Al-Saadi HA, Kassim TI&Al-Lami AA(1996)Algal ecology and composition in Garmat–Ali river, Iraq. *Regulated Rivers*.12(1): 27-38.

Al-Saadi HA, Kassim TI, Al-Lami AA, Salman SK(2000) Spatial and seasonal variation of phytoplankton populations in the upper region of the Euphrates River,Iraq. *Limnologica* 30:83-90.

Al-Saadi HA, Al-Tamimi AA & Al-Ghafily AA(1995) Diurnal variation of phytoplankton and related ecological parameters in Razzazah lake, Iraq. *Basrah.J.Sci*.,13(1) :41-48.

Anon(1983_a)State and prospection of fisheries in Razzazah lake.Final report. Poleservioce Cons . Engin. Warsaw-Poland .State Fisheries Organization Baghdad,Iraq.

Anon(1983_b)State and prospection of fisheries in Therthar lake.Final report. Poleservioce Cons . Engin. Warsaw-Poland .State Fisheries Organization Baghdad,Iraq.

Anon(1983_c)State and prospection of fisheries in Habbaniya lake.Final report. Poleservice Cons . Engin. Warsaw-Poland .State Fisheries Organization Baghdad,Iraq.

Bennion H(1994)A diatom – phosphorus transfer shallow eutrophic ponds in southeast England .*Hydrobiol* .275/276: 391-410.

Deskikachary TV(1959) Cyanophyta. Indian Council of Agricultural Research.

Furet JE & Benson-Evans K(1982) An evaluation of the time required to obtain complete sedimentation of fixed algal particles prior to enumeration .*Br.Phycol*. J.17:253-258.

Germain H(1981)Flora des Diatomes .Diatomophyceaes eau douces et saumatres du Massif Armoricion et des counters voisines d Europe occidental. Societe Nouvelle des Edittion oubee,Paris.

Hassan FM(1998) Evaluation of the trophical level of Razzazah lake by using algae.Ph.D.Dissertation ,Univ.Babylon ,Iraq.(in Arabic).

Hustedt F(1930) Bacillariopyta .Dr.A.Pascher : DieSusswassar - flora Mitteleuropas Heft 10.

Kassim TI, Al-Saadi HA, Al-Lami AA & Farhan RK(1999) Spatial and seasonal variation of phytoplankton in Qadisia lake,Iraq.*Sci .J. of Iraqi Atomic Energy Commission*.1:99-111.

Kassim TI, Al-Saadi HA, Salman SK& Farhan RK(2001) Species composition and seasonal variation of phytoplankton in Habbaniya lake,Iraq.*Iraqi J.of Biology*. 1(1), 23-34.

Kohler J(1994) Origin and succession of phytoplankton in a river-lake system (Spree,Germany). *Hydrobiol*. 289:72-83.

Lowe RL (1974) Environmental requirements and pollution tolerance of freshwater diatoms.U.S.Environmental Protection, Agency, Cincinnati, Ohio.

Martinez MR, Chakroff RP& Pantastico JB(1975)Note on direct phytoplankton counting technique using the heamocytometer.*Phi.Agric*.59: 1-12.

Maulood BK, Hadi RAM, Saadallh HA, Kassim TI, Al-Lami AA(1993)Check list of algae in Iraq. *Marina Mesopotamica*, Suppl. No.1: 128 pp.

Maulood BK, Hinton GC, Whitton BA & Al-Saadi HA(1981) On the algal ecology of the low land Iraqi marshes . *Hydrobiol.* 80:269-276.

Prescott GW(1973)Algal of the western Great lakes. William C.Brown Co.Pub.,Dubuque , Iowa.

Sabri AW, Ali ZH, Thejar LA, Shawkat SF & Kassim TI(1989)Vertical distribution of zooplankton species in Samarra impoundment, Iraq.*5th Sci.Conf.,Res.Coun*,5(2) 235-264.

Salman SK, Kassim TI, Al-Saadi HA(2002) Seasonal and spatial variations of phytoplankton in Hemrin lake,Iraq. *J.Coll.Educ.for Women* Univ.Baghdad, 13(3) : 521-525.

Shaban AA (1980) An ecological study on the phytoplankton of Dokan lake.M.Sc.Thesis, Univ.Sulaimaniyah, Iraq (in Arabic).

Wetzel RG(1983) Limnology .2nd ed. Saunders College Publishing,Philadelphia.

التوزيع العمودي للهائمات النباتية في بحيرة الحبانية، العراق

ثائر إبراهيم قاسم و حسين علي السعدي* و رشا خليل فرحان****

***وزارة العلوم والتكنولوجيا – دائرة تكنولوجيا معالجة المياه – مركز بحوث المياه, ص . ب 765 , بغداد , العراق*

**قسم علوم الحياة , كلية العلوم للبنات , جامعة بغداد , بغداد , العراق*

الخلاصة

تضمنت الدراسة الحالية بيئة الهائمات النباتية لأعماق مختلفة من عمود الماء في بحيرة الحبانية خلال عامي 1996 - 1997. سجل خلال الدراسة 116 نوع من الهائمات النباتية كانت الطحالب العصوية (الديتومات) هي السائدة بـ 70 نوع مكونة 60.3% من عدد الأنواع تلتها الطحالب الخضر (30 نوع ، 25.8 %) ثم الطحالب الخضر المزرقة (12 نوع ، 10.3 %) وظهر نمطين من الزيادة الفصلية خلال الصيف والخريف للكتلة الحية ممثلة بالعدد الكلي للخلايا سجلت أعلى كثافة في عمق 10 متر وكان لبعض الأنواع السيادة خلال فترة الدراسة وهي *Aulacosiera granulata* و*Nitzschia palea* و*Navicula cryptocephala* و*Cyclotella ocellata*