

Notes on the aquatic habitats of macrohydrophytes
and associated algae in various regions in Egypt.
3- Governorates of Giza, Cairo, Qalyubia and Sharkia

by

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Introduction

Abou El-Kheir and Ismail (1980) and Abou El-Kheir et al. (1986) studied the association between algae and macrohydrophytes in various regions in Egypt including; Fayum, Ismailiya and neighbouring places. In these two mentioned publications the authors reviewed relevant earlier works on the relationship between algae, macrohydrophytes and other organisms. The present study represents the third part on the same subject and is concerned with the regions: Giza, Cairo, Qalyubia and Sharkia.

Material and Methods

Thirty-six samples, were taken from 16 sites, at Giza, Maadi, Delta Barrage and Benha-Zagazig road (see Fig. 1). The samples were collected from irrigation streams, irrigation canals, drains and River Nile (see table 1). Some physical factors were measured such as pH, water temperature and water current velocity (table 1). Chemical analysis of the 36 water

samples have been done and data are given in table 2. Algal taxa present in all samples were investigated and identified. Natural photos of 21 of these algal taxa are given on plates 1 and 2. The numbers given to the sites and samples in the tables are their registration numbers given to them at the time of collection.

Results and Observations

Description of habitats, characters of macrohydrophyte communities, the main associated algal flora in the studied sites are presented in table 1. It is clear from this table that:

- 1- Giza region: Maryotia canal (site 28) showed slow flowing water and dominance of Potamogeton nodosus at middle with some common phytoplankton (Cyclotella ocellata, Cocconeis placentula, Melosira granulata and Synedra ulna splendens), while at edge Typha domingensis and Lemma gibba dominated with some of the previously noted phytoplanktons. Eichhornia crassipes and Potamogeton nodosus extended to 10 km. from site 28c, and were also associated with the same planktoner Synedra ulna splendens. Gizawia irrigation canal (site 33) with faster flow at middle than Maryotia canal did not show dominance of macrohydrophytes or algae at middle of the canal, while Eichhornia crassipes and Panicum repens dominated inner to canal side.

Four drains in the region (sites 29-32) showed dominance of Lemna gibba and Ceratophyllum demersum associated with dominant Oedogonium capilliforme. In addition to this association some diatoms were found common in the two drains (sites 29 & 30) with moderately flowing water but none in the two drains (sites 31 & 32) with almost quiet water.

2- Maadi region (Cairo Governorate): River Nile at Maadi (site 35) showed dominance of Eichhornia crassipes in a 10 meter belt at bank, and Phragmites australis at bankside, while the river showed a wide open water surface inwards, with fast flowing water. No dominant algal taxa associated the macrohydrophytes.

Khashab irrigation canal (site 34) showed, however, Cladophora glomerata as dominant and Cyclotella ocellata and Oscillatoria tenuis as common with macrohydrophytes.

A drain near Torra (site 36) showed dominance of macrohydrophytes: Eichhornia crassipes, Typha domingensis and Phragmites australis but no dominant algal taxa were encountered.

3- Delta Barrage region: An irrigation canal in Barrage region showed domination of Phragmites australis and Panicum repens with slight association of algae at site 37. While under Lemna gibba and Ceratophyllum demersum association of Rhopalodia gibba was observed at site 38.

Table (1) : Habitats, Macrohydrophyte communities and main algal flocca.

Site No.	Date of collection	Habitats & locality	Flowing velocity	Temperature	pH	Macrohydrophyte plant community	Permanent and common algae
28	11/6/79	Maryotia canal east Giza Pyramids (fresh water) w/ 20 m	0.4 m/sec	25°C (11:00 a.m.)	7.8	a: <i>Potamogeton nodosus</i> b: <i>Typha domingensis</i> Bank plants: <i>Impatiens cylindrica</i> <i>Cyperus alternifolius</i> c: <i>Lemma gibba</i> d: <i>Eichhornia crassipes</i> <i>Potamogeton nodosus</i> (10 m from site 28c)	<i>Bacillariophyta</i> : <i>Cyclotella ocellata</i> <i>Cocconeis placentula</i> <i>Phaeodactylum</i> <i>Synedra ulna Splendens</i> <i>Bacillariophyta</i> : <i>Cocconeis placentula</i> <i>Synedra ulna Splendens</i> <i>Bacillariophyta</i> : <i>Synedra ulna Splendens</i>
29	"	Drain parallel to Maryotia canal east of Giza Pyramids.	0.6 m/sec.	27.5°C (11:10 a.m.)	7.8	a: <i>Lemma gibba</i> <i>Panicum repens</i> <i>Phragmites australis</i> b: <i>Cyperus alternifolius</i> c: <i>Lemma gibba</i>	<i>Bacillariophyta</i> : <i>Cyclotella ocellata</i> <i>Synedra ulna biceps</i> S. <i>ulna asphaletychnus</i>
30	"	Drain east Maryotia canal w: 40, de: 1m.	0.7m/sec.	27.5°C (11:20 a.m.)	7.0	<i>Eichhornia crassipes</i> <i>Panicum repens</i> <i>Phragmites australis</i>	<i>Chlorophyta</i> <i>Oedogonium capilliforme</i>
31	"	Drain at Fafella village. w: 1.2m	Almost quiet	28°C (11:30 a.m.)	7.8	a: <i>Lemma gibba</i> <i>Ceratophyllum demersum</i> b: <i>Panicum repens</i> <i>Phragmites australis</i> Drain side plants: <i>Impatiens cylindrica</i>	<i>Chlorophyta</i> <i>Oedogonium capilliforme</i>
32	"	Drain near Fafella village Pyramid region w: 4 m.	Almost quiet	27°C (12:10 M)	7.7	<i>Lemma gibba</i> <i>Phragmites australis</i>	

Table (1) Cont.

Site No.	Date of collection	Habitat & locality	Floating velocity	Temperature	pH	Macrohydrophyte plant community	Dominant and common algae
33	17/12/79	Giza via irrigation canal at Badrshahen, 26 km from Cairo (fresh water) (at 20m)	Almost quiet near bank and fast floating at middle (1.6m/sec.)	17°C (11:30 a.m.)	6.7	Bank plants: Polygonum salicifolium Panicum repens Eleocharis crassipes	d d d
34	17/12/79	Khashab irrigation canal Mandi's road (fresh water)	Almost quiet	15.5°C (11:30 a.m.)	6.5	Lemna gibba Ceratophyllum demersum Panicum repens Eleocharis crassipes Canal side plants: Cynodon dactylon	d d d c d
35	"	River-Nile Mandi (fresh water)	Almost quiet near bank	17°C (11:00 H)	6.9	a) Eleocharis crassipes (at 10 m. dr. 1 m) b) Panicum repens Ceratophyllum demersum Phragmites australis Bank plants: Polygonum salicifolium Open water	d d c c c d
36	"	Drain near Yorta Maadi road 1000' plant cover,	Fast floating at middle. Almost quiet	16°C (12:30 H)	6.7	Eleocharis crassipes Typha domingensis Phragmites australis Drain side plant: Imperata cylindrica.	d d d

Table (1). Cont.

Site No.	Date of collection	Habitat & locality	Flowing velocity	Temperature	pH	Macrophyte plant community	Dominant and common algae
37	26/1/80	Irrigation canal (fresh water) w: 6 m, d: 50 cm	Almost quiet	17°C (12:10 N)	6.5	Pontederaceae Phragmites australis canal side; Polygonum salicifolium	d c
38	"	The same irrigation canal (fresh water) w: 6 m, d: 50 cm 5 x from site 37	quiet	17°C (12:10 p.m.)	6.5	Lemna gibba Ceratophyllum demersum	d d
39	1/3/80	Irrigation canal (fresh water) Barcage garden w: 6 m, d: 1 m	Almost quiet	21°C (1:10 p.m.)	7.0	Nymphaea coerulea Potamogeton nodosus Eichornia crassipes Phragmites australis	d d c c
40	30/6/80		Almost quiet	29°C (1:10 p.m.)	6.5	a: Nymphaea coerulea b: Potamogeton nodosus c: Open water d: Phragmites australis e: Nymphaea coerulea f: 25 m from site 39	d d d d d d
41	9/2/80	Irrigation stream (fresh water) w: 1-1.5 m.	Almost quiet	17°C (2:10 p.m.)	6.6	Potamogeton crispus Lemna gibba Lymnaea domingensis Phragmites australis Stream side plant; Polygonum salicifolium	d c c
42	26/11/80	Irrigation stream (fresh water) w: 3m, d: 150 cm Zagazig Benha road	4.5 m, 4.4 m/sec almost quiet 47 cfm/sec	17°C (11:10 a.m.)	6.5	a: Eichornia crassipes b: Open water c: Nymphaea coerulea d: Lemna gibba e: Phragmites australis	d d d d d
43	"	Irrigation stream (fresh water) w: 2m, d: 100 cm	4.6 m/sec almost quiet b: 0.4 m/sec	17°C (11:30 a.m.)	6.5	a: Nymphaea coerulea b: Open water	d d
44	7 "	Irrigation stream (fresh water) w: 2 m, d: 150 cm	Almost quiet	17°C (12:10 N)	6.5	a: Nymphaea coerulea b: Open water c: Eichornia crassipes	d d d

Table (2): Water analysis in the thirty-six collected samples.

Site No.	MINERALS (mg/L)						
	Cl	PO ₄	NO ₃	Ca	Mg	Na	K
28a	106.5	10.0	1.3	41.0	24.0	8.2	3.5
b	183.4	9.0	4.2	75.0	37.8	11.5	10.5
c	106.5	9.2	5.5	120.0	72.0	15.4	12.4
d	136.1	6.2	1.9	69.0	29.4	11.5	4.3
29a	76.9	1.1	2.6	44.0	26.4	11.5	4.3
b	213.0	9.6	5.6	70.0	28.2	11.5	22.6
c	88.7	7.0	1.1	66.0	26.4	9.2	15.6
30	53.8	7.2	0.2	62.0	90.0	6.9	2.7
31a	153.7	3.6	0.8	33.0	7.8	11.5	3.5
b	165.7	10.0	1.4	39.0	28.2	20.7	11.3
32	76.9	6.0	7.7	50.0	8.4	4.6	7.4
33	41.4	5.6	0.3	50.0	13.8	4.6	1.1
34	82.8	11.2	0.2	69.0	11.4	6.9	3.1
35a	65.1	8.0	0.4	50.0	1.8	4.6	3.9
b	65.1	6.0	0.1	34.0	16.8	4.6	1.5
36	100.6	6.2	1.9	72.0	15.6	9.2	10.1
37	165.6	5.6	1.0	54.0	32.8	50.6	3.1
38	88.7	11.6	0.17	1.0	312.0	43.7	0.9
39	59.6	8.4	0.38	50.0	17.4	4.6	0.4
a	47.3	7.4	-	59.0	13.2	2.3	0.4
b	47.3	4.4	0.01	50.0	24.0	4.6	2.0
c	53.2	0.8	-	60.0	6.0	9.2	0.8
d	47.2	3.6	0.02	48.0	18.6	4.6	1.2
e	47.2	3.6	-	38.0	18.6	4.6	1.2
I	35.5	3.6	0.03	18.7	31.2	25.3	3.0
44	59.2	8.0	0.10	55.0	11.4	25.3	5.9
45a	59.6	12.8	-	20.0	19.2	9.2	4.2
b	106.5	16.2	0.10	54.0	18.0	4.6	0.8
c	47.3	3.0	-	40.0	15.6	6.9	1.2
d	59.6	5.6	-	43.0	10.2	4.6	8.6
e	53.2	10.0	0.02	43.0	15.0	4.6	1.2
46a	53.2	0.4	-	42.0	13.2	4.6	1.2
b	59.6	2.2	0.02	42.0	9.0	4.6	1.2
47a	59.6	3.8	0.04	45.0	15.6	4.6	1.2
b	59.6	8.4	0.05	48.0	15.0	4.6	1.8
c	56.6	8.4	0.02	48.0	15.0	4.6	1.8

Another irrigation canal in Barrage garden (site 39) showed Nymphaea coerulea and Potamogeton nodosus as dominant with rich algal flora of Cladophora glomerata, Spirogyra varians, Achnanthes minutissima as dominants and Cyclotella ocellata, Navicula cryptocephala, Nitzschia fruatulum v. perminuta and Rhopalodia gibba as common.

- 4- Benha-Zagazig road region: At site 44 (irrigation stream) Potamogeton crispus dominated and was associated with Spirogyra varians. At sites 45-47 (all irrigation streams), dominant macrohydrophytes were associated with a few algae (table 1).

Concluding Remarks

It is clear from table 1 that Phragmites australis, Eichhornia crassipes, Lemna gibba, and Typha domingensis are wide spread in the studied regions since they are present in almost all investigated regions. Potamogeton nodosus, Panicum repens and Ceratophyllum demersum were moderately spread, while Nymphaea coerulea, Potamogeton pectinatus and P. crispus showed a narrower range of distribution.

Occurrence of the macrohydrophytes is noticed to be controlled by factors of the aquatic environment including spacial and flowing characteristics. Zonation of the macrohydrophytes is a typical phenomenon. It occurs in accordance with depth of

water, along-side the banks of the water channel, stream or other habitat. In shallow waters are present swamp reeds while in deeper water submerged and free floating macrohydrophytes.

It is also noticed that with the gradual change of habitat characters with zonation, the pattern of the macrohydrophyte changes and this is simultaneously accompanied with a change in the algal flora associated with these macrohydrophytes.

A marked difference exists between quiet or stagnant waters where a lentic habitat exists, characterized by plants such as Lemna gibba and lotic water habitats with faster flowing water characterized contrastly by plants such as Nymphaea coerulea.

The most common species and varieties of diatoms that are found in association with the studied hydrophytes are: Achnanthes minutissima, Cocconeis placentula, Cyclotella ocellata, Melosira granulata, Navicula cryptocephala, Nitzschia frustulum, Rhopalodia gibba ventricosa, Synedra ulna genuina, S. ulna biceps, S. ulna amphirhynchus and S. ulna splendens.

The number of taxa of green algae was not high in almost all sites. In certain sites, however, there was an extensive growth of Cladophora glomerata, Spirogyra varians, Oedogonium capilliforme and Selenastrum gracile. The best qualitative

representation of Chlorophyceae was in the majority of the samples of the Barrage region, where Chlorophyceae comes on top of Cyanophyceae. This may be explained to be due to the relatively low pH value, and agrees with the works of Knudson (1954), Roa (1955) and Jorgensen (1957) who mentioned that water with low pH value is suitable for the growth of green algae.

Oscillatoria tenuis is the only taxon recorded dominant concerning Cyanophyceae.

The drain near Torra (site 36) showed dominance of macrohydrophytes Eichhornia crassipes, Typha domingensis and Phragmites australis with 100% plant cover which resulted in absence of dominance of algae which could be ascribed to be due to decreased illumination caused by the dense higher plant cover. Similarly El-Nayal (1935) and Talling and Rzoska (1967) noticed that high turbidity of the Nile water with the silt during the flood season decreased light penetration and consequently the algal flora decreased.

Variation in algal taxa and macrohydrophytes under the different studied habitats including fresh water of rivers, canals, drains and streams, has been noticed and this is dependent on various ecological factors of ecosystems (see Fig. 2).



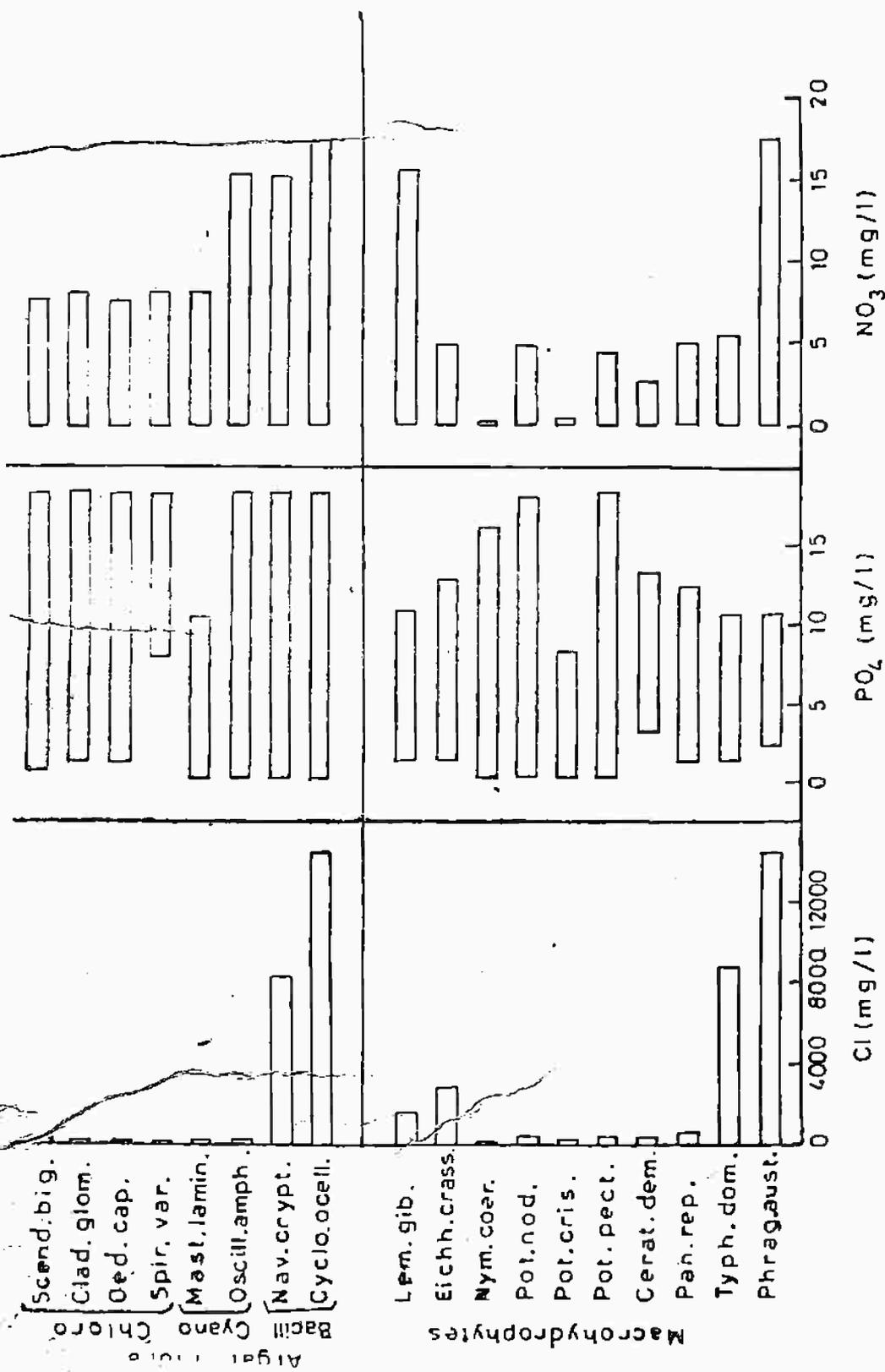


Fig. 2 . Ecological amplitude of the studied macrohydrophytes and some

It is clear from the present study on the distribution of algal flora that the diatoms contributed the greatest number of taxa. This observation agrees with the works of Luchini (1974), Harlin (1975), Ballantin and Harold (1975) and Nassar (1980). It is clear also that the abundance of algae at different sites is affected by the ecological characters including the chemical and physical properties of water.

Summary

Thirty-six samples were collected from 16 sites at Giza, Maadi, Qalyubia and Sharkia. The association between algae and macrohydrophytes was studied in the 36 collected samples. The study revealed certain associations between some algae and the common macrohydrophytes. Reduced algal flora was noticed under dense water plant cover and in fast flowing waters. A marked difference exists between lentic habitat (quiet or stagnant waters) and lotic ones (fast flowing water).

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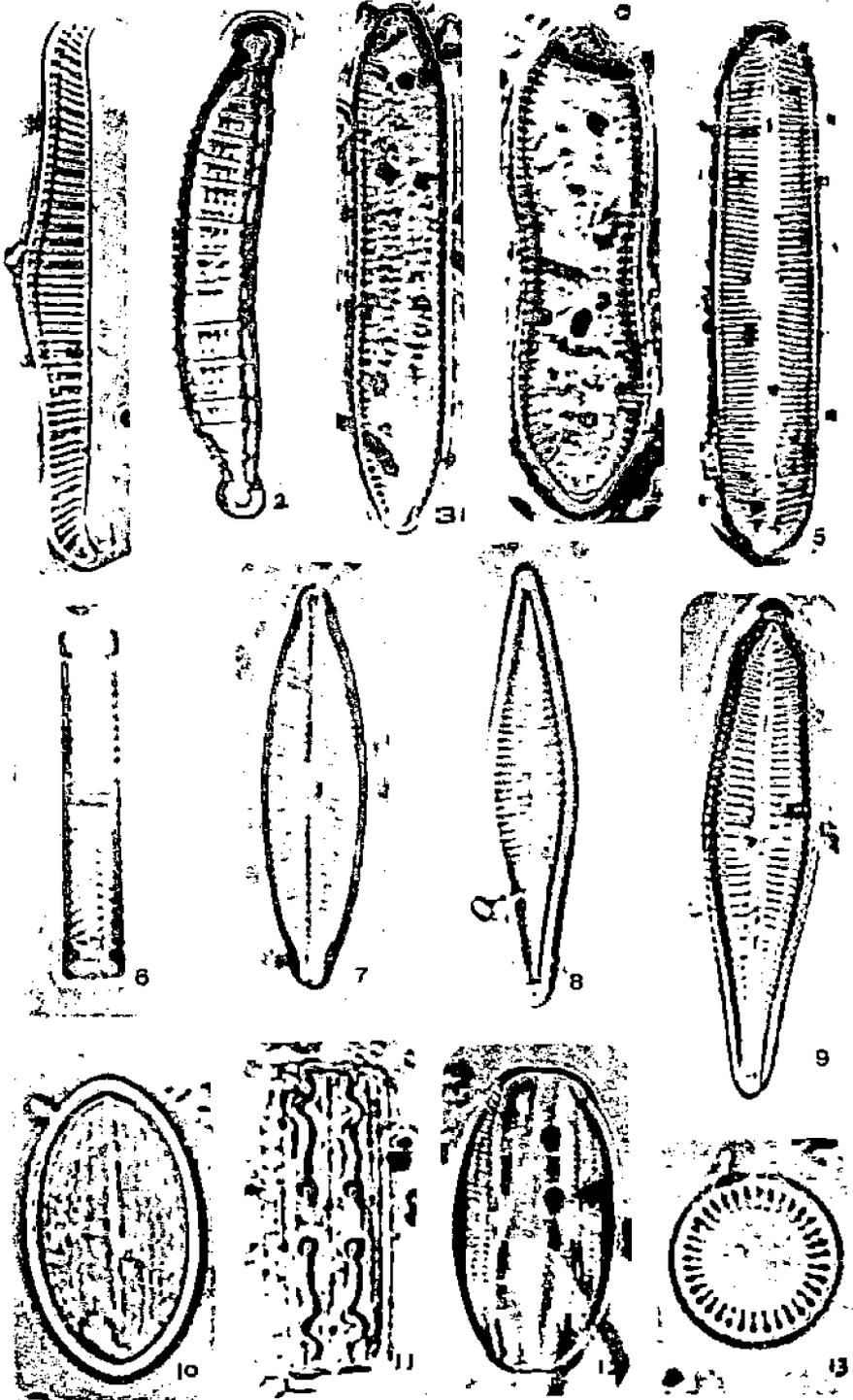
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Explanation of Plate I

- Fig. 1. *Rhopalodia gibba genuina* X 1000.
- Fig. 2. *Epithemia zebra proboscidea* X 1000.
- Fig. 3. *Cymatopleura solea* X 1000.
- Fig. 4. *C. solea subconstricta* f. *minor* X 1066.
- Fig. 5. *Pinnularia viridis intermedia* X 1000.
- Fig. 6. *Melosira granulata* X 1000.
- Fig. 7. *Navicula viridula genuina* X 1000.
- Fig. 8. *Gomphonema gracile major* X 1143.
- Fig. 9. *G. montanum acuminatum* X 1143.
- Fig. 10. *Cocconeis placentula euglypta* X 1250.
- Fig. 11. *Grammatophora oceanica* X 1556.
- Fig. 12. *Amphora ovalis typica* X 1000.
- Fig. 13. *Cyclotella meneghiniana* X 1902.

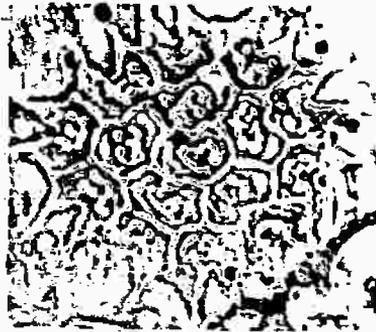
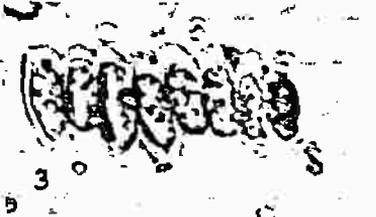
Plate 1



Explanation of Plate II

- Fig. 1. *Chlorococcum humicola* X 1250.
- Fig. 2. *Spirogyra varians* X 250.
- Fig. 3. *Scenedesmus armatus* X 1000.
- Fig. 4. *Pediastrum borganum* X 1000.
- Fig. 5. *Cosmerium laeve* X 1000.
- Fig. 6. *Tetraedron minimum* X 2727.
- Fig. 7. *Anabaena oscillaroides* X 1000.
- Fig. 8. *Spirulina subsalsa* X 1000.

Plate 2



ملاحظات على البيئات المائية للنباتات المائية
الكبيرة وما يصاحبها من نلورا طحلبية نى مناطق مختلفة
من مصر ٢ - محافظات الجيزة والقاهرة والقليوبية والشرقية

الدكتورة وفا صبحى أبو الخير - الدكتورة جهيزة عبد الحكيم اسماعيل

يهدف البحث الحالى الى دراسة الفلورا الطحلبية المصاحبة للنباتات المائية المنتشرة فى بيئاتها الطبيعية فى ٣٦ عينة جمعت من محافظة الجيزة (الجيزة) والقاهرة (المعادى) والقليوبية (القناطر الخيرية) والشرقية (منطقة الزقازيق) اتضح من الدراسة وجود مصاحبة بين بعض الطحالب والنباتات المائية فى العينات المدروسة . لوحظ نقص الفلورا الطحلبية تحت الغطاء النباتى الكثيف للنباتات المائية وفى السياه سريعة الجريان - كما لوحظ وجود اختلاف بين البيئات ذات السياه سريعة الجريان والبيئات ذات السياه الراكدة .