

Studies on algal floras inhabiting  
different water sources in Egypt.

3- Waste-water bodies (drains and swamps)  
by

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Introduction

Publications dealing with the Egyptian marine algal flora are: Ghazzawi (1939), Aleem (1948, 58, 78a, b, 80 and 81), Nasr and Aleem (1949), Mohamed and Halim (1952), Salah (1960), Kaleafah (1964), Motwalli (1966), Nasr et al. (65-66), Nasr and Ibrahim (67 & 68), Abdel Fattah and Hussein (1970), Nasr and Bekheet (1970), Nosseir and Abou El-Kheir (1970a), Mohsen and Shaalan (1971a & b), Salem et al. (1971), Abdel Fattah and Edress (1977), Kobbia (1981), Shaaban et al. (1983), Abou El-Kheir and Mekkey (1986a). However, a few studies had been carried out on the Egyptian fresh and brackish algal floras: El-Nayal (1931, 35 & 37), Abdin (1948 a & b), Nosseir and Abou El-Kheir (1970b, c & 1972), Abou El-Kheir and El-Shimi (1976), Ramadan et al. (1976), El-Naggar (1977), Nassar (1980), Shaaban and El-Habibi (1978), Shaaban et al. (1980a, b, c & 82), Abou El-Kheir and Ismail (1986), Abou El-Kheir et al. (1986) and Abou El-Kheir and Mekkey (1986b).

In Egypt most of the work in the field of water algal ecology, whether marine, fresh or brackish, is related to lakes,

seas, springs, rivers, irrigation canals, ponds, pools and ditches. The present investigation is aimed to extend the algal survey (see Abou El-Kheir and Mekkey, 1986a & b) to some other water sources namely drains and swamps. Physical and chemical properties of the water were determined, to find out their effect on the algal flora.

#### Material and Methods

Excursions were made to three localities; Helwan, Maadi and Ismailia, during the period 9/3/79-17/12/79. Fourteen brackish water samples were collected: 7 from Helwan, 4 from Maadi and 3 from Ismailiya (Table 1). The chlorides content of the samples ranged between 150-250mg/L. Temperature and pH of water were measured. Determination of dissolved nutrients (Table 2) was carried out by different methods (see Mekkey, 1984). Identification of algal taxa in the 14 samples was done using the inverted microscope. Natural photographs of some algal taxa are shown on plates 1 and 2.

Table (1) Details concerning Region, kind and source of water, date of collection and the number of samples taken.

Region	Date of collection	Source & Kind of water	No. of samples taken
Helwan	9/3/1979	Brackish water:	
		stagnant swamps	2
		a running swamp	1
		running drains	3
		& stagnant drain	1
Ismailia	30/3/1979	Brackish water: drains	3
Maadi	17/12/1979	Brackish water:	
		drains	3
		a swamp	1

Table (2) Values of pH, temperature and nutrients in the three localities of collection.  
Values of nutrients are given as p.p.m.

Locality	Sample No.	pH	Temp. °C	No <sub>3</sub>	PO <sub>4</sub>	Cl	Na	Ca	Mg	K	CO <sub>3</sub>	HCO <sub>3</sub>
Helwan	S 1	7.5	23	4.0	0.8	1495	1725	2.4	1.1	46.8	-	213
	S 2	9	16	-	1.4	11168	1150	10.1	6.2	23.4	-	15
	S 3	7.3	17	-	1.6	1663	2530	2.3	0.9	39	-	172
	S 4	7	26	-	-	2345	552	2.2	1.5	107	-	203
	S 5	7	27	-	1.3	1867	1897	2.6	1.3	46.8	-	71
	D 6	10	22	0.7	5.5	292	676	0.2	0.5	42.9	30	772
	D 7	7.8	22	4.0	-	1619	285	1.2	1.4	23.4	-	38
Madi	S 8	7	16	13.4	2.8	168	184	0.5	0.2	23.4	-	244
	S 9	6.7	16.5	0.7	4.6	168	172	0.8	0.4	31.2	-	305
	D 10	6.8	16	2.0	2.8	221	213	0.6	0.4	54.6	-	213
	D 11	6.5	16	-	12.2	5549	161	3.7	5.6	74.1	-	167
Iscailia	D 12	5.8	22	1.3	1.2	201	253	0.5	0.3	3.9	-	406
	D 13	6	24	66.5	7.5	247	696	0.6	1.0	31.2	-	30
	D 14	6.5	26	102.5	26.6	442	28.7	1.1	0.3	21.4	-	111

S = Swamp    D = Drain

## Results

Table 3 shows that members belonging to Bacillariophyceae occur in the 14 studied samples, collected from 10 drains and 4 swamps. The number of taxa representing Bacillariophyceae is 138, Chlorophyceae: 24, Cyanophyceae: 19, Euglenophyceae: 2 and Xanthophyceae: 2. Although the samples were taken from similar sources of stagnant waste water, yet, Bacillariophyceae was best represented in Ismailia, Chlorophyceae in Maadi and Cyanophyceae in Helwan. Tolerant diatom species existing in both drains and swamps in the three localities are Achnanthes brevipes intermedia, Cyclotella meneghiniana genuina, Melosira feunoscandica, Navicula cryptocephala subsalina, N. cryptocephala exilis, Nitzschia apiculata, Gomphonema parvulum genuina and G. exillissium. While those representing Cyanophyceae also in the three localities are Oscillatoria amphibia, O. elegans and O. tenuis. Although Chlorophyceae did not exhibit such tolerance, yet some of its members were predominant or dominant in certain samples of a single locality. Thus Enteromorpha flexuosa and Mougeotia sp. were predominant in 3 samples in Helwan, Cladophora sp. and Spirogyra sp. were predominant and dominant respectively in 2 samples in Maadi and Arkistrodesmus spirales fasciculatus was dominant in one sample in Ismailia.

The highest values of  $\text{NO}_3$  and  $\text{PO}_4$  were recorded in sample no. 14 from Ismailia and of chlorides in sample no. 2 from Helwan (see table 2).



	Algal taxa													
	H.													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
14														
15	+		+	+										
16			+	+										
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														

14 Achnanthes brevipes angustata (Grev.) Cl.

15 A. brevipes intermedia Kz.

16 A. brevipes parvula Kz.

17 A. exigua heterovalvate Kraske.

18 A. lanceolata genuina May.

19 Amphora acutiuscula Kz.

20 A. coffaeiformis boraelis.

21 A. coffaeiformis salina (W. Sm.) A.Cl.

22 A. libyca typica A.Cl.

23 A. maxicana major (Cl.) A.Cl.

24 Bacillaria paradoxa Gerl.

25 Caloneis amphibaena fenzlii (Grun.) Cl.

26 C. amphibaena genuina A.Cl.

27 C. permagna (Bail.) Cl.

28 C. sillicula limosa diminuta A.Cl.

























## Discussion

In 1935 El-Nayal mentioned that Hydrodictyon sometimes forms extensive growths in drains, and it is generally associated with Cladophora. He stated also that they may form intricate masses that block the drains and hinder their courses. In the present study Cladophora was found predominant in one sample taken from a drain at Maadi, while Hydrodictyon did not show up in any of the 10 drain samples.

Paul (1977) stated that the accumulation of important quantities of fertilizers (nitrates and phosphates) in lake Geneva has resulted in a considerable increase of phytoplankton, with appearance of species not formerly reported from the lake. Similar results were obtained here since, samples 13 and 14 collected from Ismailia, were rich in nutrients especially nitrate and phosphates and contained the largest number of diatom taxa. However, no obvious effects of either  $\text{NO}_3$  or  $\text{PO}_4$  or both were observed in the present study, except in these two mentioned samples.

Prescott (1969) stated that planktonic blue-greens and diatoms are abundant in water with high pH (7.4-9.0). Durrell (1964) and Nassar (1980) as well found that diatoms and blue-greens were more characteristic to alkaline waters. Similar results were obtained here concerning blue-greens; members of which were numerous and well represented in alkaline water.

samples (pH 7-10) from Helwan. However, concerning diatoms they were found flourishing in alkaline water samples (pH 7-10, Helwan) as well as in acidic ones (pH 5.8-6.5, Ismailia).

It may be said in conclusion that, although, the samples were all collected from brackish waters (brackish drains and brackish swamps) yet it has been found that the samples from Helwan (drains and swamps) were generally characterised by the presence of copious masses of blue-greens followed by diatoms. At Maadi (drains and a swamp) greens were best represented followed by blue-greens, while at Ismailia (drains) diatoms were dominant whereas greens and blue-greens were poorly represented. These results seem to be correlated with pH since it ranged from 7.0-10.0 in Helwan samples, from 6.5-7.0 in Maadi samples and from 5.8-6.5 in Ismailia samples. It must be mentioned also that differences concerning elements of the algal floras are more pronounced between localities than between sources of water, being drains or swamps (see table 3). In other words each of the three localities has its distinct algal flora for example concerning diatoms, only 35 out of 138 recorded taxa occur in more than one locality. This observation holds also true for blue-greens and greens (see table 3). Again this may be explained as due most probably to pH.

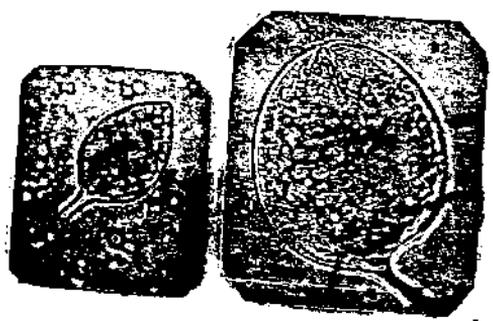
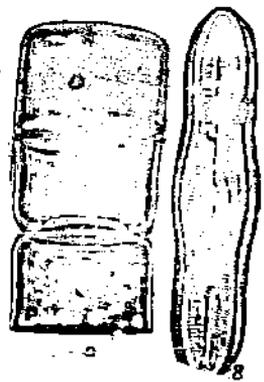
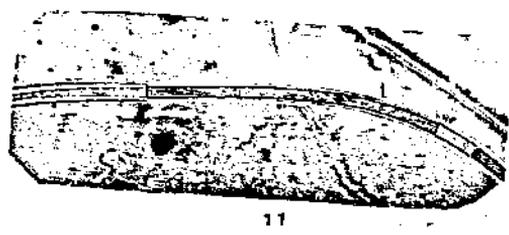
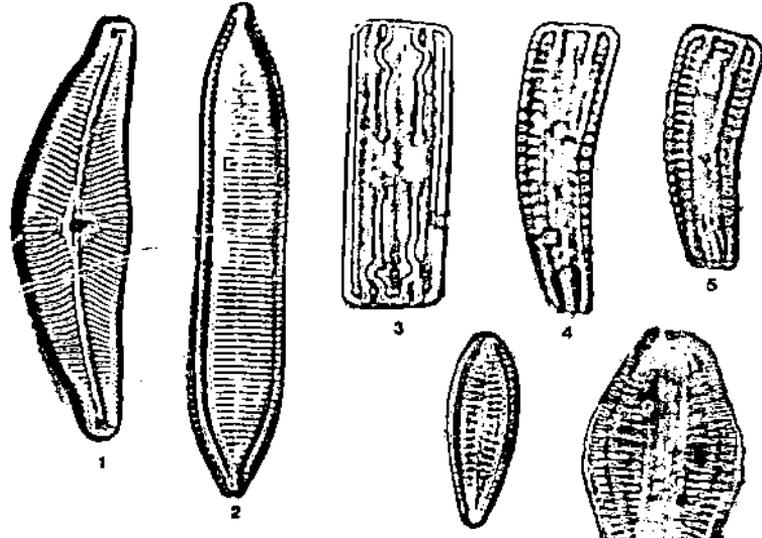
### Summary

Excursions were made to three localities: Helwan, Maadi, and Ismailia. Fourteen brackish water samples were collected from 10 drains and 4 swamps. 185 algal taxa belonging to Bacillariophyceae, Chlorophyceae, Cyanophyceae, Xanthophyceae and Euglenophyceae were identified. Blue greens were best represented in Helwan, greens in Maadi, while diatoms in Ismailia. These results seem to be correlated with pH. No obvious effects of  $\text{No}_3$  or  $\text{Po}_4$  were observed.

Explanation of Plate I

- Fig. 1. *Cymbella cistula hepetata* X 1077.
- Fig. 2. *Fragilaria virescens genuina* X 1093.
- Fig. 3. *Grammatophora marina* X 1120.
- Fig. 4. *Rhoicosphenia curvata fracta* X 1714.
- Fig. 5. *Rhoicosphenia curvata marina* X 1809.
- Fig. 6. *Rhopalodia gibbaventricosa* X 1050.
- Fig. 7. *Gomphonema parvulum exilissimum* X 1330.
- Fig. 8. *Caloneis silicula limosa genuina* X 938.
- Fig. 9. *Melosira varians* X 900.
- Fig. 10. *Lyngbya majuscula* X 1000.
- Fig. 11. *Lyngbya martensiana* X 1000.
- Fig. 12. *Phacus curvicauda* X 1000.
- Fig. 13. *Phacus* sp. X 1000.
- Fig. 14. *Scenedesmus abundans* X 1000.

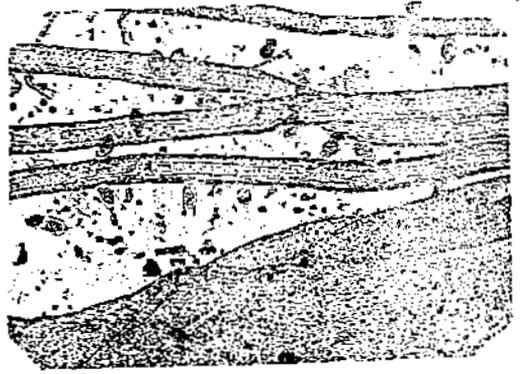
# Plate 1



Explanation of Plate II

- Fig. 1. *Enteromorpha flexuosa* X 1000.
- Fig. 2. *Oedogonium* sp. X 1000.
- Fig. 3. *Cladophora* sp. X 1000.
- Fig. 4. *Spirogyra* sp. X 1000.
- Fig. 5. *Staurostrum gracile* X 1000.
- Fig. 6. *Vaucheria sessilis*. X 1000.
- Fig. 7. *Oedogonium* sp. X 1000.

# Plate 2



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دراسات على الفلورا الطحلبية التي تعيش في مصادر  
مياه مختلفة في مصر ٣ - المياه المهملة ( مصارف ومستنقعات )

للدكتورة وفا\* صبحى أبو الخير - والمجستير ليلي الحسينى مكى

يهدف البحث الحالى الى دراسة الفلورا الطحلبية في مياه المصارف والمستنقعات ومدى  
تأثر تلك الفلورا بالعوامل الكيميائية والطبيعية المختلفة . تم جمع ١٤ عينة من عشرة مصارف  
وأربعة مستنقعات من أماكن مختلفة في حلوان والمعادي والاسماعيلية . وقد تم التعرف على  
١٨٥ وحدة تصنيفية ( تاكسون ) من الطحالب تنتمي الى الدياتومات والطحالب  
الخضراء والخضراء المزرق والصفراء واليوجلينية . وقد أزدهرت الطحالب العنصرية  
( الدياتومات ) في الاسماعيلية والخضراء المزرق في حلوان والخضراء في المعادي . ويبدو  
أن تلك النتائج ترتبط بالرقم الايدروجيني في تلك الأماكن . أظهرت النتائج عدم أهمية  
النترات والفوسفات للفلورا الطحلبية في تلك المصادر .