

A Study on the Benthic Algae of Uzungöl (Trabzon)

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Abstract: The composition of the benthic algal communities and seasonal changes in the densities of the epipellic algae of Uzungöl Lake from April, 1991, to March, 1993, were studied. While the maximum density of the epipellic community was found to be 131111 cells/cm² at station I in April, 1991 the maximum density at station II in November, 1991, was 64581 cells/cm².

Bacillariophyta was dominant in the benthic algal population. The main epipellic diatoms were *Amphora ovalis* Kütz. (*Cymbellaceae*), *Ceratoneis arcus* Kütz. (*Fragilariaceae*), *Cymbella minuta* Hilse ex Rabh. (*Cymbellaceae*), *Navicula cryptocephala* var. *veneta* (Kütz.) and Grun. and *N. radiosa* Kütz. (*Naviculaceae*).

Key Words: Epipellic, Epilithic, Epiphytic, Seasonal changes, Lake.

Uzungöl'ün (Trabzon) Bentik Algleri Üzerinde Bir Araştırma

Özet: Uzungöl'ün bentik alg komunitelerinin kompozisyonu ve epipelik alglerin mevsimsel değişimi Nisan 1991-Mart 1993 tarihleri arasında incelendi. Epipelik komunitenin maksimum yoğunluğu I. istasyonda Nisan 1991 de 131111 cells/cm² iken, bu değer II. istasyonda Kasım 1991 de 64581 cells/cm² oldu.

Bacillariophyta bentik alg popülasyonlarında dominant alg grubu oldu. *Amphora ovalis* Kütz. (*Cymbellaceae*), *Ceratoneis arcus* Kütz. (*Fragilariaceae*), *Cymbella minuta* Hilse ex Rabh. (*Cymbellaceae*), *Navicula cryptocephala* var. *veneta* (Kütz.) Grun. and *N. radiosa* Kütz. (*Naviculaceae*) en yaygın epipelik taksonlar olarak tesbit edildi.

Anahtar Sözcükler: Epipelik, Epilitik, Epifitik, Mevsimsel Değişim, Göl.

Introduction

The purpose of this study was to investigate the floristic composition of epipellic and attached algae in the benthic region of Uzungöl Lake and the seasonal variation in the density of the epipellic algal flora.

Materials and Methods

Uzungöl Lake is located at 40° 36' 50"-40° 40' 45" N, 40° 16' 00"-40° 28' 40" E in Trabzon, in the Eastern Black Sea region of Turkey. The lake, measuring 1 km in length and 0.5 km in width, has a maximum depth of 15 m. Uzungöl Lake is a center of tourism in Turkey. It is a mountain lake situated 1250 m above sea-level.

Three station were chosen for investigating the algal populations of the benthic region (Fig.1).

Station I: Located in the south of the lake. The bottom is covered with a muddy sediment. Macrophytes such as *Equisetum sp.* occur abundantly.

Station II: Also located in the south of the lake, about 50 m away from the first station. The bottom is also covered with a muddy sediment.

Station III: Located in the east of the lake. *Equisetum sp.* also occurs abundantly.

The samples were collected in 30-day periods between April 1991-March 1993. Collection and laboratory examination were conducted according to the methods described in Round (1) and Sladecova (2).

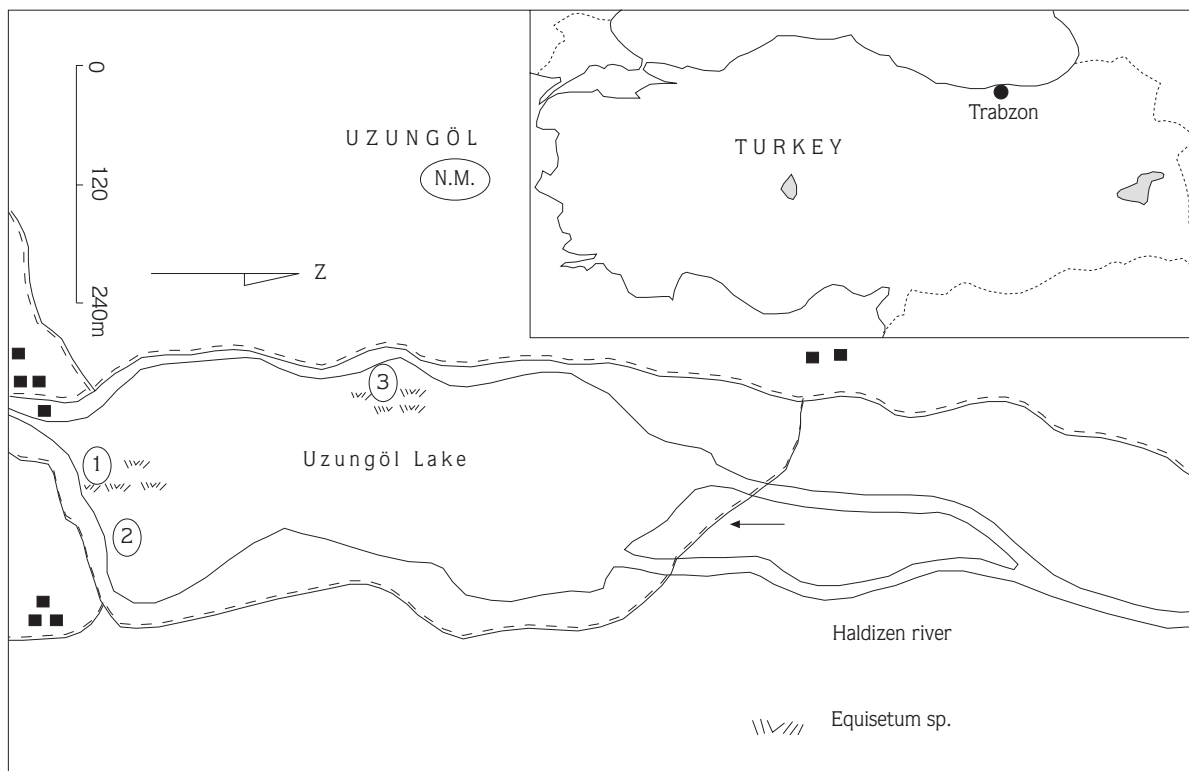


Figure 1. Sampling station in the benthic zone of Uzungöl Lake.

At the time of sampling, water temperature and pH were measured using a mercury thermometer and WTW Digi 88 model pH metre. The dissolved oxygen concentration was measured according to Winkler's method.

Taxonomic identification was carried out according to Cleve-Euler (3), Husted (4), Huber-Pestalozzi (5), Patrick and Reimer (6, 7), Prescott (8) and Ongan (9). Some algae were photographed with an Olympus BH-2 research microscope.

Results

Physical and chemical characteristics

The surface water temperature (mean monthly values) varied from 2 to 17°C ($X=9.5^{\circ}\text{C}$). Low temperatures generally prevailed during December and January, and the highest temperatures were found in July and September. The pH level fluctuated between 6.9 and 8.4 ($X=7.6$) indicating the circum-alkaline character of the water-body. Dissolved oxygen showed fluctuations between 6 and 12 mg/l ($X=9\text{mg/l}$).

Algal flora

Of a total of 359 taxa found in the benthic area, 294 belonged to *Bacillariophyta*, 34 to *Chlorophyta*, 28 to *Cyanophyta* and 3 to *Euglenophyta*. The flora is listed in the Appendix. Species of the *Bacillariophyta* were predominant in the benthic communities, forming 82% of the total algal flora.

Epipellic communities

A total of 185 species was collected from the epipellic, 161 of which were *Bacillariophyta*, 16 *Chlorophyta*, 6 *Cyanophyta* and 2 *Euglenophyta*. Higher numbers of *Bacillariophyta* were found than of other groups. The most common diatoms were *Amphora ovalis*, *Ceratoneis arcus*, *Cymbella minuta* (station I), and *Navicula cryptocephala* var. *veneta*, *N. radiosa* (station I). The prevalent *Chlorophyta* were *Spirogyra catenaeformis* (Hass.) Kütz. (*Zygnemataceae*), *S. varians* (Hass.) Kuet. (*Zygnemataceae*) and *Ulothrix zonata* (Weber, Mohr) Kütz. (*Ulotrichaceae*). The predominant *Cyanophyta* was *Oscillatoria limnetica* Lemm. (*Oscillatoriaceae*). Other members of this group were observed in low numbers. Members of *Euglenophyta* were generally found in low numbers at all stations.

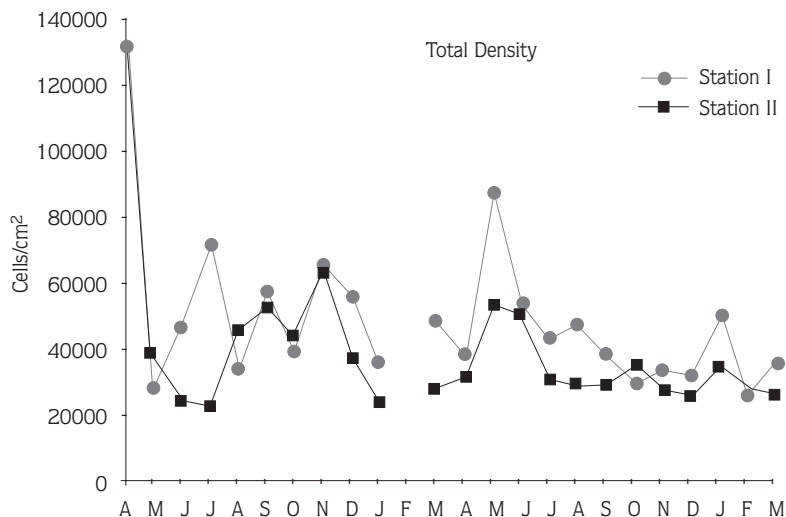


Figure 2. Seasonal changes in the total density of the epipelagic communities.

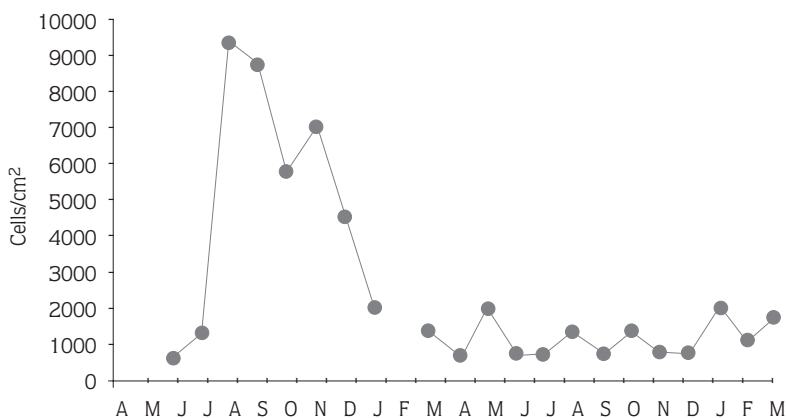


Figure 3. Seasonal changes in the density of *Amphora ovalis*.

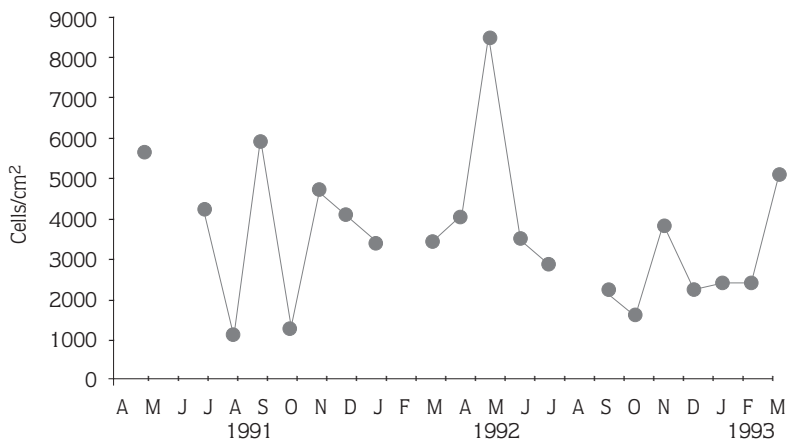


Figure 4. Seasonal changes in the density of *Ceratoneis arcus*.

The density of the epipelagic community was found to be 131111 cells/cm² at station I in April 1991. However, a considerable fall in density occurred at the same station in May 1991, to 27531 cells/cm² (Fig.2). Thereafter, the density exhibited variation from June,

1991, to April, 1992. The population expanded in May, 1992, and decreased to its lowest level in February, 1993. At station II, epipelagic density was high in May, 1991, but decreased rapidly and reached its lowest level (22062 cells/cm²) in July, 1991. The

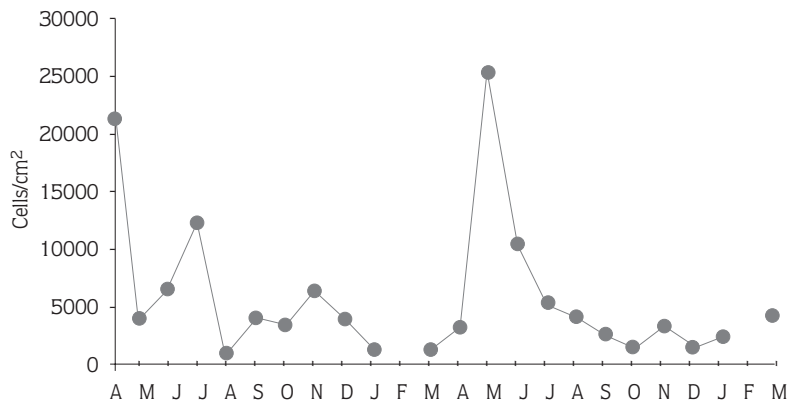


Figure 5. Seasonal changes in the density of *Cymbella minuta*.

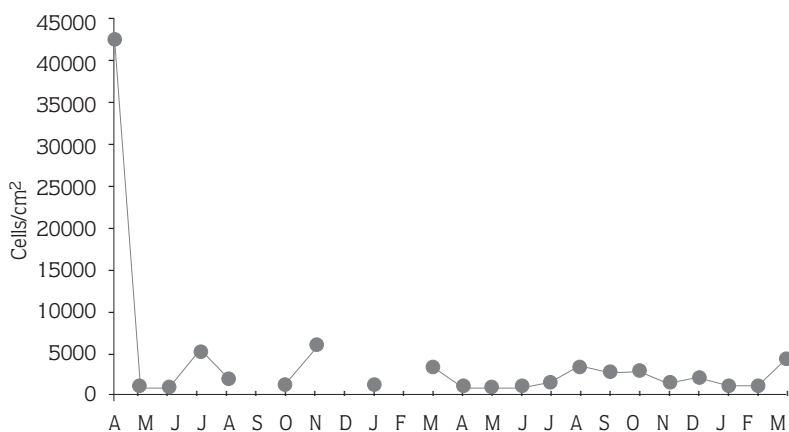


Figure 6. Seasonal changes in the density of *Navicula cryptocephala* var. *veneta*.

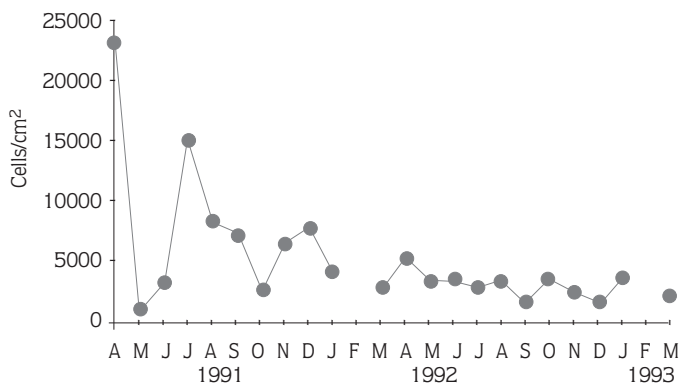


Figure 7. Seasonal changes in the density of *Navicula radiosa*.

population expanded rapidly in August, 1991, reaching its greatest abundance from 46958 to 64581 cells/cm² in November, 1991 (Fig. 2). Thereafter, the density exhibited variation from January, 1992, to March, 1993.

Most of the algal species in the epipelagic community exhibited variation during the study. *Amphora ovalis*, for example, reached its greatest abundance (9393

cells/cm²) at station II in August, 1991 (Fig. 3). The same sort of pattern was exhibited by *Ceratoneis arcus* (8363 cells/cm²) at the same station in May, 1992 (Fig. 4). *Cymbella minuta* occurred much more abundantly at station I than at station II, reaching its greatest density (25091 cells/cm²) at station I in May, 1992 (Fig. 5). *Navicula cryptocephala* var. *veneta* and *N. radiosa* also occurred much more abundantly at station I than at station II. The densities of these

Table 1. Abundances of certain epilithic diatoms at station I (The numbers indicate the numbers of species present in 100 diatoms. Diatoms found in insignificant quantities are indicated by +).

Months	20.04.1991	11.05.1991	15.06.1991	16.07.1991	17.08.1991	17.09.1991	19.10.1991	16.11.1991	14.12.1991	18.01.1992	18.02.1992	21.03.1992	18.04.1992	16.05.1992	24.06.1992	22.07.1992	09.08.1992	21.09.1992	22.10.1992	22.11.1992	19.12.1992	23.01.1993	27.02.1993	28.03.1993
Achantes minutissima			+	+				+		-	3	2		+	3	6		+			-			+
Amphora ovalis	5	+	+	2	4	2	2	5	2	8	-	5	+	2	+			7	3	5	2	-	2	2
Ceratoneis arcus	10	21	19	15	4	7	4	6	2	2	-	12	17	10	18	15	11	15	11	19	7	-	5	8
C. arcus var. amphioys	5	2	3			+	+		3		-	4	4	3	+	2	2	+	+	+	+	-	+	2
C. arcus var. linearis	5	10	9	4	2	5	6	2	3	2	-	6	8	5	14	6	23	12	13	11	18	-	19	14
Cocconeis placentula		6	+	+	10	3	3	3	7	5	-	+	+		+	+		8	+			-	2	+
Cymbella cymbiformis	7	3	+	+	2	2		+	+	+	-	4	6	4		9		3	+	+	+	-	+	
C. minuta	10	10	11	15	15	19	9	9	6	8	-	17	21	30	19	10	7	7	19	15	11	-	22	21
C. minuta var. silesiaca	8	7	18	16	10	16	15	15	7	5	-	5		4	2	7	7	5	5	3	4			
C. sinuata	3	2		+	4	2	3	5	5	5	-	8	2		3	+	3	4	+	2	8	-	6	14
Diatoma anceps	4		+	+	3	+	§	2	3	4	-		2		2	2	+	3	+			-	2	3
D. vulgare var. breis	+	2	3	6	6	+	5	7	3	+	-		5	3	5	4	7	8	6	3	2	-	3	2
Didymosphenia geminata	3		+				5	8	12	14	-	8	7	8	4	5	3	+	6	3	7	-		+
Fragilaria bicapitata				+				+	+	-	2	+		3	5	5		+	2	+	-	+	2	
Gyrosigma acuminatum	4	5		+	5	3		3	5	5	-							+	2	2	2	-	+	
Gomphonema constrictum	2		+					2	3	-	2			+	+		+	+	2	3	-		+	
G. olivaceum	5	5	3		+	+	2		3	7	-					+								
G. olivacoides	5	2		4	3	5	3	+	2		-	6	7	14	15	4	6	+	2	5	8	-	3	10
G. parvulum	5			2		+	+	6	2	3	-	4	4	3	3	3	5	4	6	5	9	-	+	3
Navicula cryptocephala	5	3	7	2	3	3	6		4	2	-	4	2		+		4	6	6	3	3	-	5	4
N. cryptocephala var. veneta		3			4	6	11	5	7	5	-	2	2			7	5	4	+	8	5	-	12	
N. radiosa	4	6	9	16	18	15	8	7	9	8	-	2	2		2	2	+	5	2	3	2	-	4	5
N. rhynchocephala	5	7	10	10	5	5	10	6	6	6	-	3			+			2	+	3	3	-	9	3
Synedra amphicephala					+			+			-	+	4	10		8	+	+		+	2	-		2
S. ulna var. amphirhynchus	4	5	+	+		+	5	7	5	5	-	+	2	4	3	3	3	+	9	3	+	-	+	+

species were found to be, respectively, 42848 and 22904 cells/cm² at station I in April, 1991 (Fig. 6, 7).

Several other less common species also showed only one period of maximum abundance: *Gyrosigma acuminatum* (Kütz.) Rabh. (*Naviculaceae*) (at station I in November, 1991), *Cymbella minuta* var. *silesiaca*

(Bleisch ex Rabh.) Reim. (*Cymbellaceae*) (at station II in May, 1991), *Didymosphenia geminata* (Lyng.) M. Schmidt (*Naviculaceae*) (at station II in December, 1991), and *Navicula cryptocephala* Kütz. (*Naviculaceae*) (at station I in July, 1991). Green algae, *Spirogyra catenaeformis* (Hass.) Kütz. (*Zygnemataceae*), increased rapidly at station I in September, 1991, comprising 52% of the total number of 4246 filamentous algae.

Table 2. Abundances of certain epilithic diatoms at station II (The numbers indicate the numbers of species present in 100 diatoms. Diatoms found in insignificant quantities are indicated by +).

Diatoms	Months																							
	20.04.1991	11.05.1991	15.06.1991	16.07.1991	17.08.1991	17.09.1991	19.10.1991	16.11.1991	14.12.1991	18.01.1992	18.02.1992	21.03.1992	18.04.1992	16.05.1992	24.06.1992	22.07.1992	09.08.1992	21.09.1992	22.10.1992	22.11.1992	19.12.1992	23.01.1993	27.02.1993	28.03.1993
<i>Amphora ovalis</i>		6	+	5	4	4	3	4	7	7	-	5	2			+	+	4	+	+	3	2	+	+
<i>Ceratoneis arcus</i>	15	18	11	9	6	3	2	4	5	4	-	5	8	14	17	21	17	17	2	12	12	6	2	19
<i>C. arcus</i> var. <i>amphioxys</i>	2	5	2	4		+	+			+	-	+	6	+					2	+	2	2		3
<i>C. arcus</i> var. <i>linearis</i>	14	18	5	8	6	4	+	+	3	3	-	+	15	13	20	17	20	16	4	9	11	14	+	14
<i>Cocconeis placentula</i>	+	4	+	3	+	+	2	+			-	+	+				+	3	7	+	+	+		
<i>Cymbella amphicephala</i>		3		4	4	4	+	+		+	-	+							+	+	+		+	+
<i>C. minuta</i>	5	6	19	6	12	8	6	2	14	5	-	10	20	17	10	8	21	12	20	11	12	24	20	15
<i>C. minuta</i> var. <i>silesiaca</i>		6	16	7	17	5	3	7	6	3	-	11	7	+	2		2				2	6	10	4
<i>C. sinuata</i>			3	5	5	3	14	10	18	15	-	7	8	2	+	5	15	6	13	5	10	8	2	
<i>Diatoma anceps</i>		+	+	4	3	6					-	+	+	+	3	+	3	9	+	+		+		+
<i>D. vulgare</i> var. <i>brevis</i>	4	3	3	5	2	2		+			-		+	4	4	5	3	+		2	2	8	14	7
<i>Didyomosphenia geminata</i>	5	2	+	2	2	6	5	5	3	5	-	3	6	8	4	10	4	2	11	2	7	4	7	3
<i>Fragilaria bicapitata</i>	2	2		3	2	2	5	+	4	6	-	6		3	+								+	+
<i>Gomphonema constrictum</i>	+		+	+	3	5	2	5	+	3	-	4	4	+	+				2	6	6	4	3	+
<i>G. olivaceum</i>	19	8	7	5	4	+	9	+	14	13	-	+			+									7
<i>G. olivaceum</i> var. <i>calcareum</i>	3	+	+	2		+	6	3	+	3	-	3	2				2	2	10	7	+			+
<i>G. olivacoides</i>	2	3	+	3	3	6	12	13		6	-	6	6	30	27	15	9	4	13	12	12	6	12	9
<i>G. parvulum</i>	3	3		2	3	3	5	7	8	3	-	9	2	+	+	+	4	8	11	6	12			7
<i>G. septentrionale</i>	5	5	2	6	4	5	3	5			-				+						3			
<i>Navicula crythocephala</i>	+		4	2	5	5	5	7	5	5	-	2	2			2	+		2	3			+	+
<i>N. crythocephala</i> var. <i>veneta</i>			2	5	2	5	5		4	6	-	+			4	+		6	+					
<i>N. radiosa</i>			+	2	6	7	+	6		+	-	+	2	+	+	+			+	3	4	+	3	+
<i>N. rhynchocephala</i>	5	3		+	+	2	6	+	+	+	-	+	+						+	+	+	6	5	
<i>Synedra amphicephala</i>	5		14	2		5		3			-	4				8	+		+		+	+		6
<i>S. ulna</i>	5		+	2		5		6	+	+	-	5	5			3				+		+		
<i>S. ulna</i> var. <i>amphirhynchus</i>	3	3	3	2	5	+	3	6	5	8	-	11	+	5	+	5	6	+	3	4	5	2	4	4

Epilithic communities

A total of 242 species were collected from the epilithic community, of which 210 belonged to *Bacillariophyta*, 19 *Chlorophyta*, 11 *Cyanophyta* and 2 *Euglenophyta*. Typical attached algae were found to be rather sparse because of sediment cover on the stones. *Bacillariophyta* members made up a large percentage of the communities attached to stones. At

all stations, the most common diatoms were *Achanthes minutissima* Kütz. (*Acanthaceae*), *Cocconeis placentula* Ehr. (*Acanthaceae*) *Cymbella amphicephala* Naegeli (*Cymbellaceae*), *C. cymbiformis* (Agardh, Kütz.) van Heurck (*Cymbellaceae*), *C. minuta*, *C. minuta* var. *silesiaca*, *Diatoma vulgare* var. *brevis* Grun (*Fragilariaceae*), and *N. crythocephala* var. *veneta*. *Chlorophyta* were represented by *Spirogyra*

Table 3. Abundances of certain epilithic diatoms at station III (The numbers indicate the numbers of species present in 100 diatoms. Diatoms found in insignificant quantities are indicated by +).

Months	20.04.1991	11.05.1991	15.06.1991	16.07.1991	17.08.1991	17.09.1991	19.10.1991	16.11.1991	14.12.1991	18.01.1992	18.02.1992	21.03.1992	18.04.1992	16.05.1992	24.06.1992	22.07.1992	09.08.1992	21.09.1992	22.10.1992	22.11.1992	19.12.1992	23.01.1993	27.02.1993	28.03.1993	
Diatoms																									
<i>Amphora ovalis</i>	+			3	+	4	5	3	7	9	-		+	+		+	2		+	2	+		9	+	
<i>Ceratoneis arcus</i>	11	10	10	3	+	8	2	3	7	14	-	8	19	19	21	28	18	12	9	5	15	7	13	16	
<i>C. arcus</i> var. <i>amphioxys</i>	2	8	3			+			+	+	-	+	5			3		+			2	2		2	
<i>C. arcus</i> var. <i>linearis</i>	16	16	14	+	2	11		3	9	+	-	4	14	27	21	13	13	18	13	8	19	8		18	
<i>Cocconeis placentula</i>		+	+	+	+	3	21	13	+	3	-	2	3	+		+		+	+	+		2		+	
<i>Cymbella amphicephala</i>						4	3	2	4		-	+		2			+	+				+	+	+	
<i>C. cymbiformis</i>	+		2	+		+		2	+		-	5	5	2		4	2	+	+		+	+	+	+	
<i>C. minuta</i>	21	16	16	30	35	10	15	14	13	14	-	9	17	19	20	7	21	17	19	8	18	26	18	17	
<i>C. minuta</i> var. <i>silesiaca</i>	18	9	9	11	7	10		6	6		-	2	+		4	2	7				2	2		2	
<i>C. sinuata</i>				+		7	21	12	5	13	-	11	+	+	+	4	2	22	7	7	+	7	4	2	
<i>Diatoma anceps</i>		12	2	5	+	3	2	+	+		-			2			3	3		+					
<i>D. vulgare</i> var. <i>brevis</i>	3	4	2			+	5	+	2	+	-		+		3	+	3		+		+	3	+	+	
<i>Didyomosphenia geminata</i>	3	+	+	4	+	2			3	2	-	+	5	+	8	6	6	4	2	6		8	+	2	
<i>Gomphonema olivaceum</i>																									
var. <i>calcareum</i>	7	+	6			5	4	5	+	3	-	8	+	+		+	+	+	2	6			6		
<i>G. olivacoides</i>		4	4	+	4	4	6	13	+	12	-	18	12	15	12	15	8	4	4	10	10	16	13	11	
<i>G. parvulum</i>		2	8	10	16	16	14	12	15	13	-	17	6	3	+		+	+	19	44	26	14	33	15	
<i>Navicula crypthocephala</i>	10	10	10	10	14	+		+		+	-	+		2		6	4	4	+	+		+			
<i>N. crypthocephala</i>																									
var. <i>veneta</i>				4	10	+	2	+	7	+	-	3				5		+	7			+			
<i>N. radiosa</i>	+		6	9	3	+		3	7	6	-	7	8	4	+	+	3	+	4		+			+	
<i>N. rhynchocephala</i>	6	5	5	5	+	+		+	+		-	+					4	4							
<i>Synedra ulna</i>																									
var. <i>amphirhynchus</i>	+	+	+	+	3	6		4	8	6	-	+	+	+	7	3	+	4	9	2	3	+		9	

catenaeformis S. *varians*, *Ulothrix subtilissima* Rabenhorst (*Ulotrichaceae*), *U. tenuissima* Kütz. (*Ulotrichaceae*), *U. variabilis* Kütz. (*Ulotrichaceae*), *U. zonata* and *Oedogonium* spp. No specimens of *Oedogonium* were identified. *Oscillatoria agardhii* Gom. (*Oscillatoriaceae*), *O. irrequa* Kg. (*Oscillatoriaceae*) and *O. subbrevis* Schmidle (*Oscillatoriaceae*) were the prevalent *Cyanophyta*, while the most abundant

Euglenophyta was *Trachelomonas volvocina* Ehr. (*Euglenaceae*).

The abundances of certain epilithic diatoms are presented in Tables 1-3.

Epiphytic communities

This community consisted of 192 species, the

Table 4. Abundances of certain epilithic diatoms at station I (The numbers indicate the numbers of species present in 100 diatoms. Diatoms found in insignificant quantities are indicated by +).

Months	20.04.1991	11.05.1991	15.06.1991	16.07.1991	17.08.1991	17.09.1991	19.10.1991	16.11.1991	14.12.1991	18.01.1992	18.02.1992	21.03.1992	18.04.1992	16.05.1992	24.06.1992	22.07.1992	09.08.1992	21.09.1992	22.10.1992	22.11.1992	19.12.1992	23.01.1993	27.02.1993	28.03.1993
Ceratoneis arcus	19	19	11	-	14	12	-	21	6	-	-	-	6	6	5	22	22	16	15		5	6	17	19
C. arcus var. linearis	+	7	5	-	2	+	-	5	2	-	-	-	8	8	7	25	20	20	7	19		3		13
Cocconeis placentula	+			-	14	50	-	52	58	-	-	-	15	+	9		+	2	2	21	+	9		
Cymbella minuta		11	13	-	10		-	3	13	-	-	-	10	6	16	9	17	16	22	21	40	24	20	26
C. minuta var. silesiaca	15	13	13	-	7	+	-	+	4	-	-	-	7	4	+	5	4		+				+	5
Diatoma anceps	2	3	-	2		-	+	2		-	-	-		3	+	+	2	6	+	+	6	+		
D. vulgarear. brevis	16	22	27	-	5	12	-	+	+	-	-	-	12	20	20	15	11	15	13	4	7	+	3	+
Didyomosphenia geminata	2			-	+		-	3	+	-	-	-	3	3	2	+	3	2	5	+	12		2	
Fragilaria virescens				-			-			-	-	-	4	40	26									
Gomphonema constrictum				-	3	+	-	+		-	-	-	+	+	6	7	8	2	+		6		+	4
G. olivacoides			3	-	2	2	-			-	-	-	10	2			2	+	14	17	8	6	6	7
G. parvulum			7	-	13	11	-		5	-	-	-	10	2			2	+	14	10	8	10	9	13
G. septentrionale	10	+	-	5	+	-				-	-	-			6	9	5				4			
Navicula cryptocephala	+			-	+	3	-	+	+	-	-	-	4				+	5	2		2	10	4	+
N. radiosa	32	26	17	-	15	6	-	10	5	-	-	-	6	3		+	+	7	2	5	+	19	20	10
N. rhynchocephala		2		-	5		-	+	+	-	-	-	4					6	+			10	16	+
Tabellaria fenestrata	+			-	+		-	+		-	-	-		+	+	5	+	+		+		+	+	

majority of which were diatoms. There were also 26 *Chlorophyta*, 18 *Cyanophyta* and 1 *Euglenophyta*. The most common species were *Cocconeis placentula*, *Cymbella cymbiformis*, *C. minuta*, *C. minuta* var. *silesiaca*, *Diatoma vulgare* var. *brevis*, *Didyomosphenia geminata*, *Gomphonema constrictum*, *G. olivaceum*, *G. parvulum*, *Navicula cryptocephala* and *N. radiosa*. *Oedogonium* ssp. *Spirogyra varians* and *Ulothrix zonata* were the prevalent *Chlorophyta*, while the main *Cyanophyta* was *Oscillatoria limnetica*. *Euglenophyta* was represented by *Trachelomonas volvocina*.

The abundances of certain epiphytic diatoms are presented in Tables 4 and 5.

Discussion

The seasonal development pattern of the epipelagic communities at all stations was generally similar to that recorded from temperate zone populations (10). The density of the population was found to be high at the start of the growing season, followed by a vernal drop in number (Fig. 2).

The development of the population was largely determined by ecological factors. Ice was the main factor regulating the populations in February. After the ice had melted, the water current and wave action also influenced algal flora. There is no doubt, however, that the continuous light and temperature contributed substantially to the development of algal flora. Algal densities were higher at station I than at

Table 5. Abundances of certain epilithic diatoms at station III (The numbers indicate the numbers of species present in 100 diatoms. Diatoms found in insignificant quantities are indicated by +).

Months	20.04.1991	11.05.1991	15.06.1991	16.07.1991	17.08.1991	17.09.1991	19.10.1991	16.11.1991	14.12.1991	18.01.1992	18.02.1992	21.03.1992	18.04.1992	16.05.1992	24.06.1992	22.07.1992	09.08.1992	21.09.1992	22.10.1992	22.11.1992	19.12.1992	23.01.1993	27.02.1993	28.03.1993	
Diatoms																									
<i>Ampohar ovalis</i>	-	-	+	2	3	3	+	-	4	-	5			+	10	14		+	5	2	+			2	
<i>Ceratoneis arcus</i>	-	-	6	+		2	4	4	-	+	-	4	9	3	3	6	10		8	5	11	6	20	16	
<i>C. arcus</i> var. <i>linearis</i>	-	-	7	2		3	5	12	-	2	-	2	9	4	+	5	4		3	9	20	5		4	
<i>Cocconeis placentula</i>	-	-	6			10	7	7	-	29	-	28	+		+	20	20		8	9		2	2	+	
<i>Cymbella minuta</i>	-	-	21	29	22	17	15	9	-	17	-	15	9	30	4	25	25	21	27	13	28	19	30	29	
<i>C. minuta</i> var. <i>silesiaca</i>	-	-	21	22		+	+	20	-	+	-	14	+	15	2	2	+				6	3		2	
<i>Diatoma vulgare</i> var. <i>brevis</i>	-	-		3		+	3	+	-	+	-	+	+	+	+	+		3	2	2	2	2	6	+	
<i>Fragilaria bicapitata</i>	-	-						4	-	+	-	3	15	+	54		10							6	
<i>Gomphonema constrictum</i>	-	-	3	5	+		2	2	-	+	-	+		+	7	8	8	+		+	3	+		+	
<i>G. intricatum</i>	-	-	2		23	§	§			-	-	+		+	10	29	10	2							
<i>G. olivaceum</i> var. <i>calcareum</i>	-	-	15	10		5		+	-	2	-	+	7	4	8	2	2	9	+	+			4	5	
<i>G. olivacoides</i>	-	-	3	4	3	3	2	2	-	5	-	3	11	12		6			7	10	10	25	6	5	
<i>G. parvulum</i>	-	-	10	10	39	24	24	9	-	23	-	10	35	18	3	13		22	29	33	14	34	20	25	
<i>Navicula cryptocephala</i>	-	-	3	13	4	4	5	3	-	3	-	6		+		+		+	9	8			2		
<i>N. radiosa</i>	-	-	2		6	20	18	15	-	5	-	3	+	6	+	+		7	+	+	+	+			
<i>Synedra ulna</i>																									
var. <i>amphircynchus</i>	-	-	+			6	10	10	-	5	-	3	+	3	4	+			4	3	3	+		4	

station II. Since temperature and light were similar at all stations, the variations in densities could not be accounted for by these factors. *Equisetum* sp. which was abundant at station I, was the main factor in this situation.

Amphora ovalis, *Navicula cryptocephala* var. *veneta* and *N. radiosa* have been reported to be the most common species in Bayındır Dam lake, Bafra-Balık lake (11, 12) and Altınapa Dam lake (13), and Beytepe and Alap Ponds (14). *Cymbella* spp. are common in Tortum lake and Tercan Dam lake (15, 16), as well as in Uzungöl Lake. According to Moore (17), these taxa have also been reported in temperate, subarctic and arctic regions. On the other hand, the most important species which was *Ceratoneis arcus*, at all stations was either acidophilic or indifferent, a reflection of the low alkalinity levels (6, 7). This taxa

was not common in the benthic regions of the other lakes of Turkey as well as in lake Uzungöl. Although *Tabellaria fenestrata* and *T. flocculosa* are recorded for the first time in Turkey, both species are abundant and widespread in the more temperate areas of North America and Europe (18). This similarity in community composition over wide geographic areas indicate that the main species can tolerate a broad range of light, temperature and other ecological factors (18).

Epilithic diatoms were also the dominant group in the other communities in lake Uzungöl, because of *Equisetum* sp. and stones present in the benthic zone covered with sediments. In lake Uzungöl, which is shallow, complete differentiation of the epilithic, epiphytic and epilithic communities or the sedimental coverage on the aquatic plants and stones is not possible. The same situation was observed in the other lakes of Turkey.

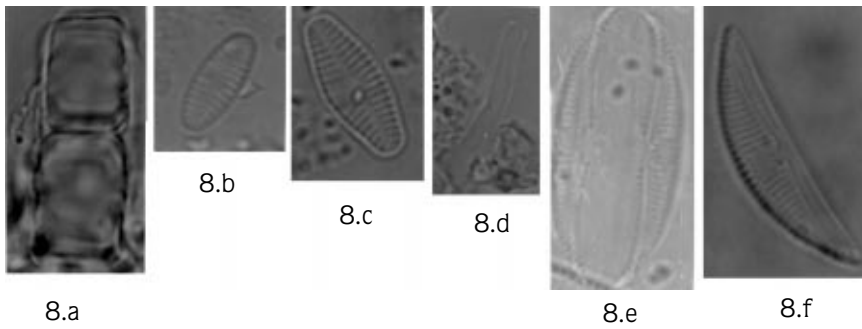


Figure 8. a. *Melosira varians*, b. *Achnanthes lanceolata*, c. *A. lanceolata* var. *genuina*, d. *A. minutissima*, e. *Amphora ovalis*, f. *A. veneta* (Scala 10 μ)

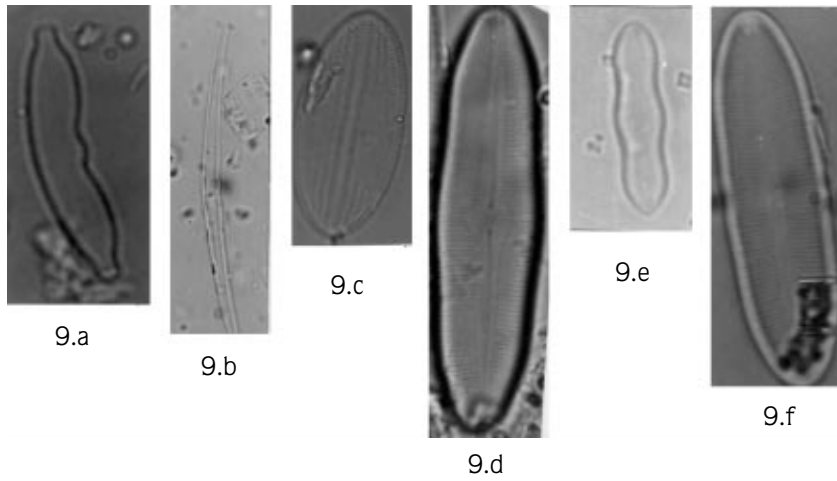


Figure 9. a. *Ceratoneis arcus* var. *amphioxys*, b. *C. arcus* var. *linearis*, c. *Cocconeis placentula* var. *euglypta*, d. *Caloneis silicula*, e. *C. silicula* var. *alpina*, f. *C. silicula* var. *truncatula* (Scala 10 μ)

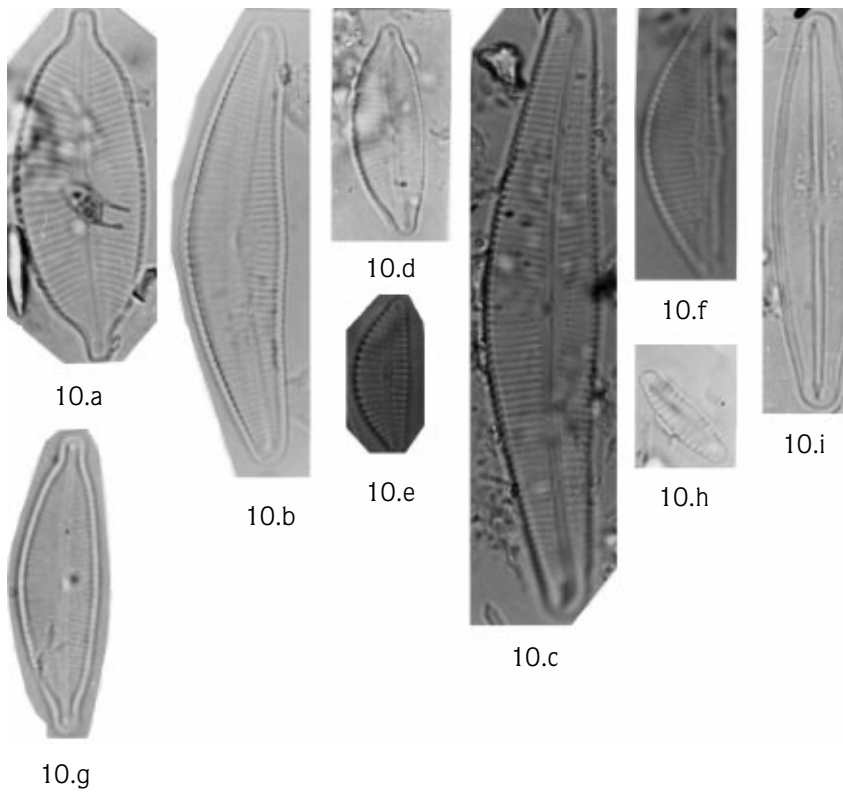


Figure 10. a. *Cymbella amphicephala* var. *intermedia*, b. *C. cymbiformis*, c. *C. helvetica*, d. *C. lata*, e. *C. minuta*, f. *C. minuta* var. *silesiaca*, g. *C. naviculiformis*, h. *C. sinuata*, i. *Frustulia vulgaris* (Scala 10 μ)

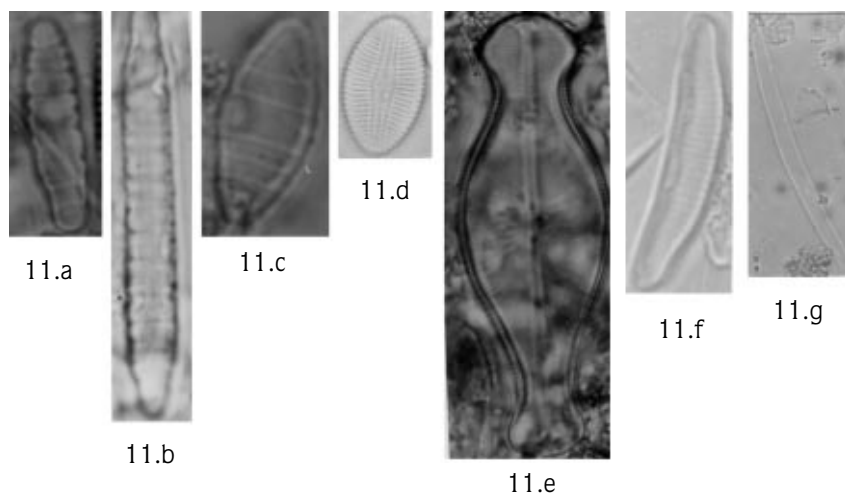


Figure11. a. *Datoma anceps*, b. *D. anceps* var. *linears*, c. *D. vulgare* var. *brevis*, d. *Diploneis decipiens* var. *tipica*, e. *Didymosphenia geminata*, f. *Eunotia pectinalis*, g. *E. valida* (Scala 10 µ).

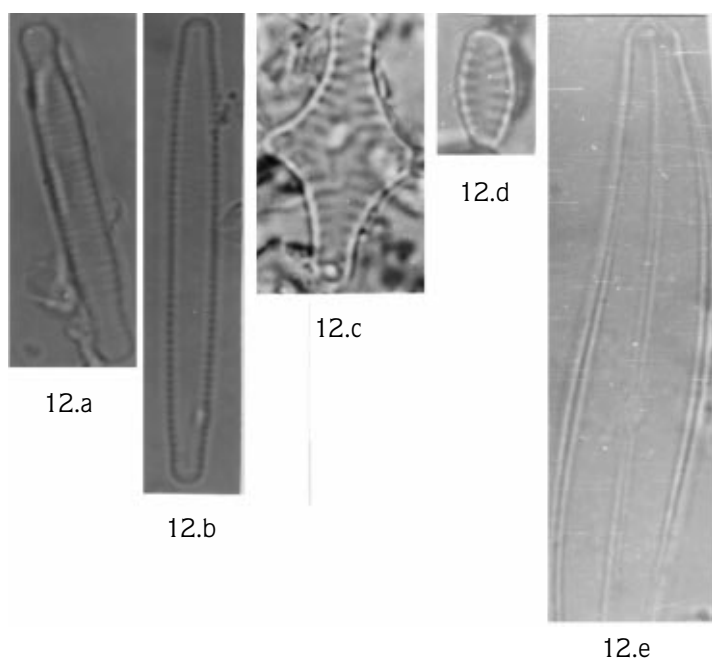


Figure12. a. *Fragilaria bicapitata*, b. *F. capucina*, c. *F. construens*, d. *F. construens* var. *venter*, e. *Gyrosigma spenceri* var. *curvula* (Scala 10 µ).

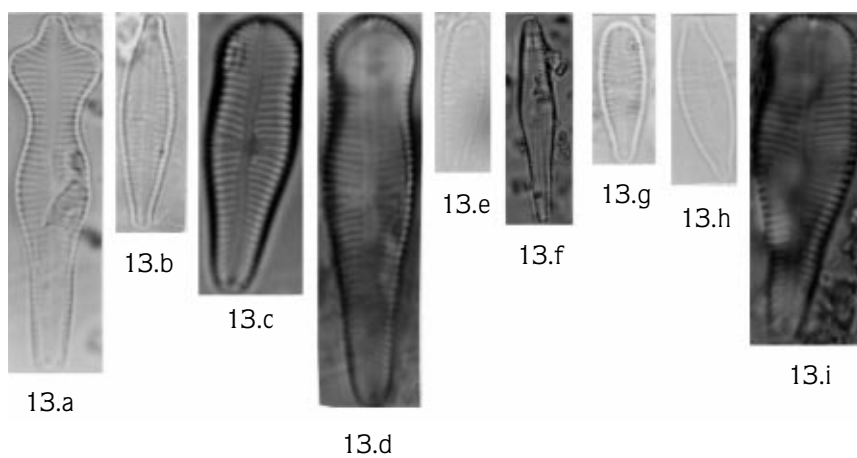


Figure 13. a. *Gomphonema acuminatum*, b. *G. angustatum*, c. *G. constrictum*, d. *G. constrictum* var. *supcapitatum*, e. *G. olivaceum*, f. *G. olivaceum* var. *calcarea*, g. *G. olivacoides*, h. *G. parvulum*, i. *G. truncatum* var. *capitatum* (Scala 10 µ).

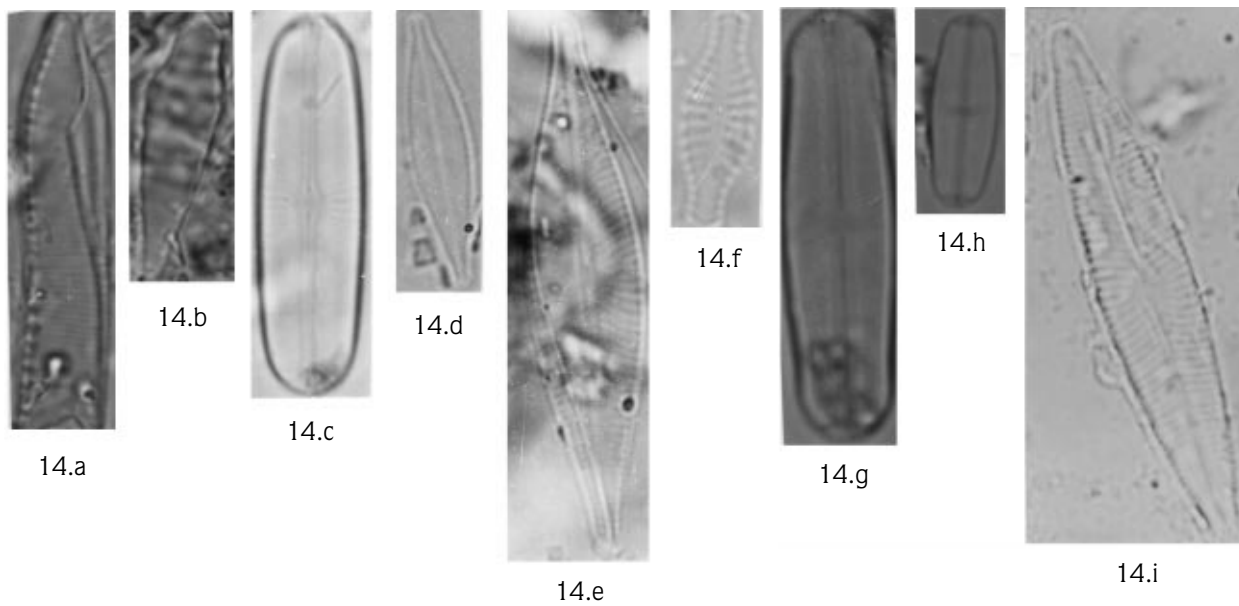


Figure 14. a. *Hantzschia amphioxys*, b. *Meridion circulare* var. *constricta*, c. *Navicula bacillum*, d. *Nitzschia cryptocephala*, e. *Nitzschia gothlandica*, f. *Nitzschia hungarica* var. *capitata*, g. *Nitzschia pupula*, h. *Nitzschia pupula* var. *capitata*, i. *Nitzschia radiosa* (Scala 10 μ).

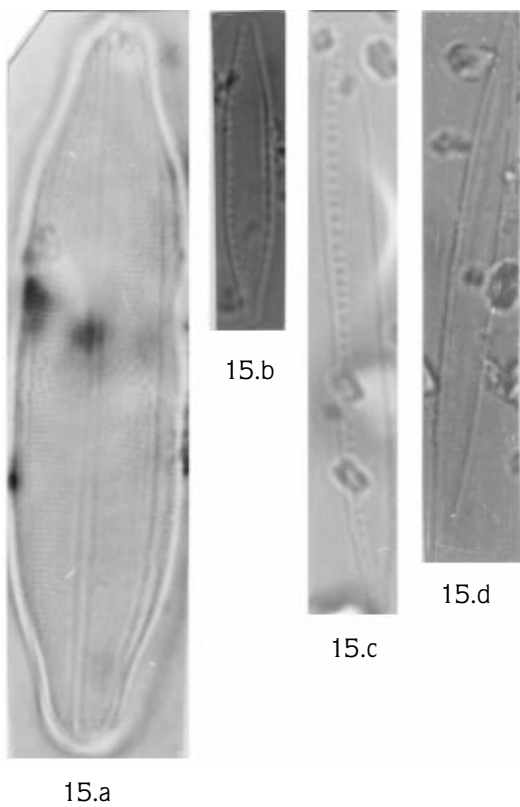


Figure 15. a. *Nedium temperei*, b. *Nitzschia palea*, c. *Nitzschia thermalis*, d. *Nitzschia sublinearis* (Scala 10 μ).

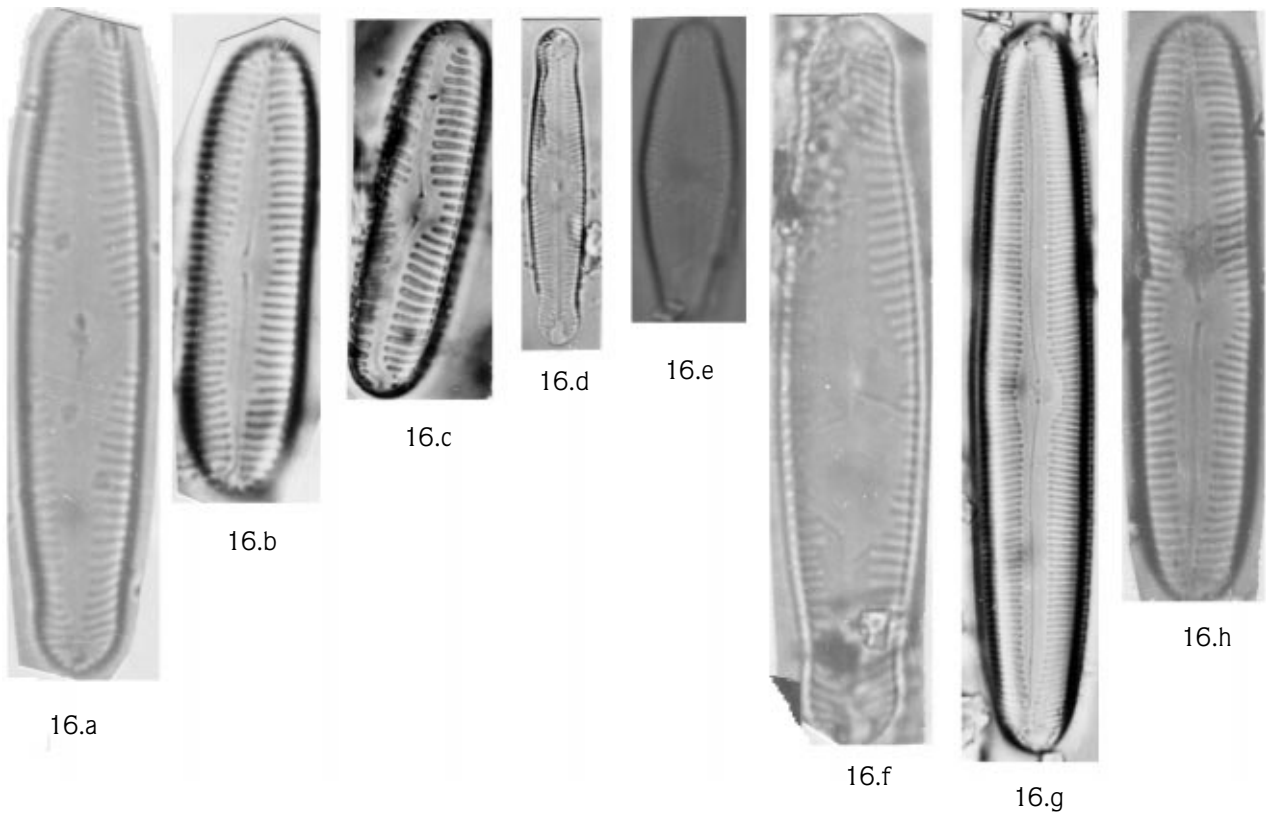


Figure 16. a. *Pinnularia abaujensis* var. *subundulata*, b. *P. acuminata* c. *P. borealis*, d. *P. braunii* var. *amphicephala*, e. *P. brebissonii* var. *hybrida* f. *P. gibba* var. *parva*, g. *P. maior*, h. *P. viridis* var. *sudetica* (Scala 10 μ)

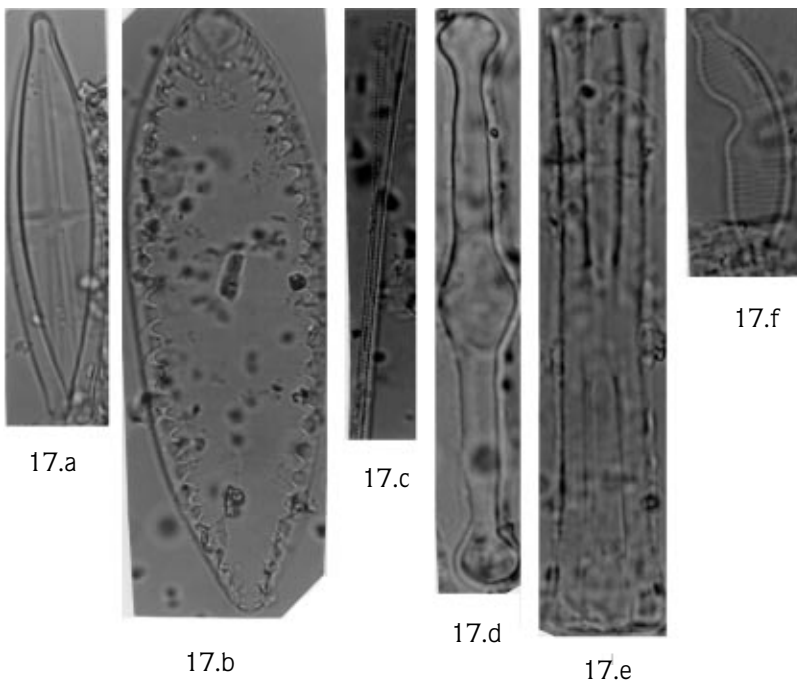


Figure 17. a. *Stauroneis anceps*, b. *Surirella capronii*, c. *Synedra rumpens*, d. *S. incisa*, e. *Tabellaria fenestrata* (Valve view), f. *T. fenestrata* (Girdle view) (Scala 10 μ).

References

1. Round, F.E., An investigation of two benthic algal communities in Malham Tarn, Yorkshire, J.Ecol., 41: 97-174, (1953).
2. Sladeckova, A., Limnological investigation methods for the periphyton (aufwuch) community, Bot. Rev., 28: 286-350 (1962).
3. Cleve-Euler, A., Die diatomen von Schweden und Finnland Stockholm, Almqvist and Wiksells Bactryckeri Ab. (1951).
4. Husted, F., Bacillariophyta (Diatome) heft:10 in a pascher die süsswasser flora Mitteleuropas, Gustav Fisher Pub., Jena, Germany (1930).
5. Huber-Pestalozzi, G., Das phytolankton des süsswasser teil VIII. E. Schweizertbart'sche verlagsbuchhandlung (Nagele U. Obermiller), Stuttgart (1982).
6. Patrick, R., C.W. Reimer, The diatoms of the United States, Monogr. Acad. Nat. Sci. Philadelphia (1966).
7. Patrick, R., C.W. Reimer, The diatoms of the United States, Monogr. Acad. Nat. Sci. Philadelphia (1975).
8. Prescott, G.W., Algae of the Western Great lake area, W.M.C. Brown Comp. Pub., Dubuque, Iowa (1973).
9. Ongan, T., Eğridir Gölü Spirogyra Türleri ve Aşırı Çoğalma Nedenleri Hakkında, İstanbul Üniv. Fen Fak. Hidrobiyoloji Arş. Enst. Yayınları, 3-23 (1970).
10. Round, F.E., Studies on bottom-living algae in some lakes of the English Lake District. IV. The seasonal cycles of the Bacillariophyceae, J. Ecol., 48: 529-547 (1960a).
11. Gönüloğlu, A., Aykulu, G., Studies on the benthic algae of Bayındır Dam Lake, Doğa Botanik Der., 11, 1: 38-55 (1993).
12. Gönüloğlu, A., Bafra Balık gölleri (Balık gölü, Uzun göl) bentik alg florası, I.Ü. Su Ürünleri Der., 1-2: 31-56 (1993).
13. Yıldız, K., Altınapa baraj gölü alg toplulukları üzerinde araştırmalar Kısım II-sedimanlar üzerinde yaşayan alg topluluğu, Doğa Biyolojisi Der., 3: 547-554 (1986).
14. Dere (Ünal), Ş., Beytepe ve Alap göletlerinde bazı bentik diyatome cins ve türlerinin mevsimsel değişimi, Doğa Biyoloji Der., 13, 1: 1-7 (1989).
15. Altuner, Z., G. Aykulu, A Study on the epipellic algal flora of flake Tortum, J. of Aquatic Products Uni. of Istanbul, 1, 1: 120-138 (1987).
16. Altuner, Z., Gürbüz, H., Tercan baraj gölü bentik alg florası üzerinde bir araştırma, Türk Botanik Der., 20: 41-51 (1996).
17. Moore, J.W., Benthic algae in littoral and profundal areas of a deep subarctic lake, Can. J. Bot., 59: 1026-1033 (1981).
18. Moore, J.W., Distribution and abundance of attached, littoral

Appendix

	CLASSIS : PENNATIBACILLARIOPHYCEAE	Grun. (efl)
	ORDO : Pennales	
The List of the Benthic Algae	Achnanthes affinis Grun. (el)	A. lanceolata var. genuina May. (ep)
DIVISIO : BACILLARIOPHYTA	A. clevei Grun. (el)	A. linearis (W. Sm.) Grun. (ep)
CLASSIS : CENTROBACILLARIOPHYCEAE	A. deflexa Reim. (ep)	A. minutissima Kütz. (epfl)
ORDO : Centrales	A. delicatula (Kütz.) Grun. (elf)	A. montana Krasske (efl)
Cyclotella catenata Brun. (epI)	A. gibberula Grun. (ep)	A. wellsiae Reim. (el)
Melosira granulata (E.) Ralfs. (epI)	A. kolbei Hust. (el)	Amphora ovalis Kütz. (epfl)
M. islandica O. Müll. (ef)	A. laevis Östr. (ep)	A. veneta Kütz. (epfl)
Stephanodiscus astraea (E.) Grun. (el)	A. lanceolata (Breb.) Grun. (epfl)	Ceratoneis arcus Kütz. (epfl)
	A. lanceolata var. elliptica	C. arcus var. amphioxys Rabh. (epfl)

epfl : Epipelik, epifitik ve epilitik alg topluluklarının her üçünde de rastlanmıştır.

epf : Epipelik ve epifitik alg topluluklarında rastlanmıştır.

epI : Epipelik ve epilitik alg topluluklarında rastlanmıştır.

efl : Epifitik ve epilitik alg topluluklarında rastlanmıştır.

ep : Epipelik alg topluluklarında rastlanmıştır.

ef : Epifitik alg topluluklarında rastlanmıştır.

el : Epilitik alg topluluklarında rastlanmıştır.

- C. arcus* var. *linearis* Homboe (epfl)
- Cocconeis hustedtii* Krasske (ef)
- C. pediculus* Ehr. (epfl)
- C. placentula* Ehr. (epfl)
- Caloneis alpestris* (Grun.) Cleve (ep)
- C. bacillum* (Grun.) Mereschowsky (el)
- C. latiuscula* var. *subholstii* Hust. (el)
- C. limosa* (Kütz.) May. (el)
- C. silicula* (Ehr.) Cleve (epfl)
- C. silicula* var. *alpina* (Kütz.) Grun. (ep)
- C. silicula* var. *truncatula* (Grun.) May. (ep)
- Cymatopleuro solea* (Breb.) W. Smith. (ef)
- Cymbella affinis* Kütz. (epfl)
- C. amphicephala* Naegeli (epfl)
- C. amphicephala* var. *intermedia* A. Cl. (ep)
- C. aspera* (Ehr.) Cleve (el)
- C. austriaca* Grun. (ep)
- C. bipartita* var. *continua* A. Cl. (ep)
- C. cistula* (Hemprich) Grun. (epfl)
- C. cuspidata* Kütz. (el)
- C. cuspidata* var. *anglica* (Lagst.) A. Cl. (ep)
- C. cymbiformis* (Agardh, Kütz.) van Heurck (epfl)
- C. cymbiformis* var. *nonpunctata* Font. (ef)
- C. diluviana* (Krasske) Florin (el)
- C. hebridica* (Gregory) Grun. (el)
- C. helvetica* Kütz. (epfl)
- C. hungarica* var. *grunowii* A. Cl. (el)
- C. hybrida* Grun. (el)
- C. laevis* Naeg. ex Kütz. (el)
- C. lanceolata* (Ehr.) Van Heurck (ep)
- C. lata* Grun. (el)
- C. minuta* Hilse ex Rabh. (epfl)
- C. minuta* var. *pseudogracilis* (Choln.) (ef) Reim.
- C. minuta* var. *silesiaca* (Bleisch ex Rabh.) Reim. (epfl)
- C. naviculiformis* Auersw. ex Heib. (ep)
- C. parva* (W. Smith) Cleve (el)
- C. prostrata* (Berkeley) Cleve (epfl)
- C. sinuata* Gregory (epfl)
- C. tumida* (Brebisson) Van Heurck (epfl)
- C. tumidula* Grun. (ef)
- C. turgida* (Gregory) Cleve (epfl)
- C. ventricosa* Kütz. (ep)
- Diatoma anceps* (Ehr.) Grun. (epfl)
- D. anceps* var. *linearis* M. Perag (el)
- D. hiemale* (Roth.) Heib. (epfl)
- D. hiemale* var. *mesodon* (Ehr.) Grun. (ef)
- D. vulgare* var. *brevis* Grun. (epfl)
- D. vulgare* var. *vulgare* Bory. (epf)
- Diploneis elliptica* (Kütz.) Cleve (ep)
- D. decipiens* var. *typica* A. Cl. (epfl)
- Didymosphenia geminata* (Lyngbye) M. Schmidt (epfl)
- Eunotia angusta* (Grun.) A. Bg. (el)
- E. diodon* Ehr. (epf)
- E. flexuosa* Kütz. (ef)
- E. grunowii* A. Bg. (ef)
- E. lunaris* (Ehr.) Grun. (epfl)
- E. lunaris* var. *capitata* Grun. (ef)
- E. pectinalis* (Kütz.) Rabh. (epfl)
- E. pectinalis* var. *minor* (Kütz.) Rabh. (ef)
- E. praemonos* var. *inflata* Grun. (ep)
- E. praemonos* var. *ingrata* A. Bg. (el)
- E. septentrionalis* Oestrup (ep)
- E. sudetica* (O. Müll.) Hust. erw. (el)
- E. valida* Hust. (ef)
- Epithemia argus* Kütz. (ef)
- E. turgida* var. *capitata* Fricke (ef)
- Frustulia rhomboides* var. *viridula* Breb. (ef)
- F. vulgaris* (Thwaites) DeT (epfl)
- F. vulgaris* var. *typica* A. Cl. (ep)
- Fragilaria alpestris* Krasske (el)
- F. bicapitata* A. Mayer (ef)
- F. bicapitata* var. *curta* May. (el)
- F. bicapitata* var. *genuina* May. (el)
- F. brevistriata* var. *genuina* May. (epfl)
- F. capucina* Desmazieres (el)
- F. capucina* var. *lanceolata* Grun. (ef)

- F. capucina* var. *mesolepta* (Rabh.) Grun. (el)
- F. construens* (Ehr.) Grun. (epfl)
- F. construens* var. *venter* (Ehr.) Grun. (epfl)
- F. gracillima* Mayer (epf)
- F. harrissonii* W. Smith (el)
- F. harrissonii* var. *dubia* Grun. (ef)
- F. intermedia* Grun. (el)
- F. lapponica* Grun. (el)
- F. pinnata* Ehr. (ep)
- F. virescens* Ralfs. (epfl)
- Gyrosigma acuminatum* (Kütz.) Rabh. (epfl)
- G. spenceri* var. *curvula* (Grun) Reim. (ef)
- Gomphonema acuminatum* Ehr. (epfl)
- G. angustatum* (Kütz.) Rabh. (epfl)
- G. clevei* Fricke (el)
- G. constrictum* Ehr. (epfl)
- G. constrictum* var. *capitatum* (E.) Cl. (epfl)
- G. constrictum* var. *supcapitatum* Grun. (epfl)
- G. dichotomum* Kütz. (epfl)
- G. gracile* Ehr. emend. V. H. (epfl)
- G. gracile* var. *intricatiforme* May. (el)
- G. hebridense* (Greg.) Her. (el)
- G. hedinii* Hust. (el)
- G. intricatum* Kütz. (epfl)
- G. intricatum* var. *pulvinatum* (A. Braun) Grun. (el)
- G. intricatum* var. *vibrio* (Ehr.) Cl. (epfl)
- G. olivaceum* (Lyngb.) Kütz. (epfl)
- G. olivaceum* var. *calcareum* (Cl.) Cl. (epfl)
- G. olivacoides* Hust. (epfl)
- G. parvulum* Kütz. (epfl)
- G. quadripunctatum* (Qstr.) Wisl. (epfl)
- G. septentrionale* Östr. (epfl)
- G. simus* Hohn, Hellerm. (epfl)
- G. subclavatum* (Grun) Grun. (epfl)
- G. subclavatum* var. *commutatatum* (Grun) A. Mayer (epfl)
- G. subclavatum* var. *mexicanum* (Grun.) Patr. (epfl)
- G. tergestinum* (Grun.) Fricke (epf)
- G. tenellum* Kütz. (ep)
- G. truncatum* Ehr. (epfl)
- G. truncatum* var. *capitatum* (Ehr.) Patr. (epfl)
- G. truncatum* var. *turgidum* (Ehr.) Patr. (epfl)
- Hantzschia amphioxys* (Ehr.) Grun. (epfl)
- Meridion circulare* Agardh. (epfl)
- M. circulare* var. *constricta* (Ralfs) Van Heurck (epfl)
- Navicula bacillum* Ehr. (epfl)
- N. bacilliformis* Grun. (ep)
- N. bicapitellata* Hust. (el)
- N. cocconeiformis* Gregory (epfl)
- N. costulata* Grun. (el)
- N. cryptocaphala* Kütz. (epfl)
- N. cryptocephala* var. *intermedia* Grun. (epfl)
- N. cryptocephala* var. *veneta* (Kütz.) Grun. (epfl)
- N. cuspidata* Kütz. (el)
- N. dicephala* (Ehr.) W. Smith. (ef)
- N. gothlandica* Grun. (epfl)
- N. gracilis* Ehr. (ep)
- N. halophila* (Grun.) Cleve (ef)
- N. hambergii* Hust. (epf)
- N. hasta* Pantocsek (epfl)
- N. helvetica* Brun. (ep)
- N. hungarica* var. *capitata* (E.) Cl. (epfl)
- N. lanceolata* (Ag.) Kütz. (epf)
- N. menisculus* Schumann (ep)
- N. mutata* var. *typica* A. Cl. (ep)
- N. pelliculosa* (Breb.) Hilse (ep)
- N. placentula* var. *rostrata* A. Mayer (ef)
- N. protracta* Grun. (ep)
- N. pupula* Kütz. (epfl)
- N. pupula* var. *capitata* Hust. (epfl)
- N. pupula* var. *minuta* V. H. (ep)
- N. radiosa* Kütz. (epfl)
- N. radiosa* var. *tenella* (Breb. ex Kütz.) Grun. (ep)
- N. radiosa* var. *parva* Wallace (ep)
- N. rhynchocephala* Kütz. (epfl)
- N. rostellata* Kütz. (epfl)
- N. salinarum* Grun. (el)
- N. simplex* Kraßke (el)
- N. tuscula* (Ehr.) Grun. (ef)
- N. viridula* Kütz. (epfl)
- Neidium affine* (Ehr.) Cleve (ep)
- N. affine* var. *humerus* Reim. (ep)
- N. bisulcatum* (Lagerstedt) Cleve (el)

- N. dilatatum* (Ehr.) Cleve (ep)
N. hercynicum var. *subrostratum* Wallace (ep)
N. productum (W. Smith) Cleve (ep)
N. temperei Reim. (ep)
Nitzschia apiculata (Greg.) Grun. (ep)
N. baccata Hust. (epfl)
N. fonticola Grun. (el)
N. frustulum (Kütz.) Grun. (ef)
N. frustulum var. *perpusilla* (Rabh.) Grun. (el)
N. gracilis Hantzsch (el)
N. hantzschiana Rabh. (ef)
N. hantzschiana var. *genuina* A. Cl. (el)
N. heufleriana var. *genuina* A. Cl. (el)
N. kützingiana Hilse (el)
N. linearis W. Smith (epfl)
N. palea (Kütz.) W. Smith (epfl)
N. philippinarum Hustedt (epfl)
N. sinuata var. *tabellaria* Grun. (epfl)
N. sublinearis Hust. (epfl)
N. thermalis Kütz. (epfl)
N. thermalis var. *minor* Hilse (epfl)
Pinnularia abaujensis var. *linearis* (Hust.) Patr. (el)
P. abaujensis var. *rostrata* (Patr.) Patr. (el)
P. abaujensis var. *subundulata* (A. Mayer e Hust.) Patr. (epfl)
P. acuminata W. Sm. (el)
P. acuminata var. *bielawskii* (Herib., Perag.) Patr. (epfl)
P. appendiculata (Agardh) Cleve (epfl)
P. appendiculata var. *budensis* Grun. (epfl)
P. biceps Greg. (el)
P. biclavata A. Cl. (ep)
P. biclavata var. *tenuis* A. Cl. (el)
P. bipectinalis var. *typica* A. Cl. (ef)
P. borealis Ehr. (epfl)
P. borealis var. *genuina* May (el)
P. borealis var. *typica* May (ep)
P. braunii var. *amphicephala* (A. Mayer) Hust. (epfl)
P. brebissonii var. *diminuta* (Grun.) Cl. (epfl)
P. brebissonii var. *hybrida* (Grun.) A. Cl. (epfl)
P. debilis var. *genuina* A. Cl. (el)
P. divergentissima (Grun.) Cleve (ef)
P. gentilis (Donkin) Cleve (ef)
P. gibba W. Sm. (epfl)
P. gibba var. *mesogongyla* (Cl.) Hust. (ep)
P. gibba var. *parva* (Ehr.) Grun. (el)
P. gibba var. *subundulata* Mayer (ep)
P. hemiptera (Kütz.) Cleve (el)
P. inflata A. Cl. (epfl)
P. interrupta W. Smith (epfl)
P. interrupta var. *minutissima* Hust. (ep)
P. islandica var. *genuina* A. Cl. (ep)
P. lata var. *minor* Grun. (ep)
P. maior (Kütz.) Cleve (epfl)
P. mesogongyla Ehr. (epfl)
P. mesolepta Ehr. (epfl)
P. mesolepta var. *angusta* Cl. (ef)
P. microstauron (Ehr.) Cleve (ef)
P. minuta (Östr.) A. Cl. (el)
P. molaris Grun. (epfl)
P. nodosa Ehr. (ef)
P. obscurra Krasske (el)
P. perpusilla Östr. (el)
P. rangoonensis var. *genuina* A. Cl. (el)
P. rapestris Hantz. (ef)
P. subcapitata Gregory (epfl)
P. subcapitata var. *hilseana* (Jan.) O. M. (ep)
P. sudetica Hilse (epfl)
P. sudetica var. *leptogonyla* (E., May.) A. Cl. (el)
P. stauoptera Grun. (ef)
P. stauoptera var. *minuta* May. (el)
P. stauoptera var. *parva* Grun. (ef)
P. stauoptera var. *subparallela* May. (el)
P. viridis (Nitzsch) Ehr. (epfl)
P. viridis var. *commutata* (Grun.) Cl. (el)
P. viridis var. *fallax* Cleve (epfl)
P. viridis var. *minor* Cl. (ef)
P. viridis var. *sudetica* Hust. (epfl)
Rhicosphenia cruvata (Kütz.) Grun. (epfl)
Stauroneis alabamiae Helden (epfl)
S. amphioxys Greg. (el)
S. anceps Ehr. (epfl)
S. anceps var. *gracilis* Rabh. (epfl)

<i>S. anceps</i> var. <i>recta</i> Cl. (el)	Kütz. (ep)	(ep)
<i>S. minor</i> (Östr.) A. Cl. (el)	<i>T. flocculosa</i> (Roth.) Kütz. (efl)	<i>C. sp.</i> (ef)
<i>S. phoenicenteron</i> Ehr. (el)	DIVISIO : CHLOROPHYTA	<i>Cosmarium blyttii</i> Wille (ep)
<i>S. phoenicenteron</i> var. <i>gracilis</i> Diphel. (epf)	CLASSIS : CLOROPHYCEAE	<i>C. botrytis</i> Menegh. ex Ralfs (efl)
<i>S. smithii</i> Grun. (epfl)	ORDO : Ulotrachales	<i>C. punctulatum</i> var. <i>subpunctulatum</i> (Nordst) epf Börgesen
<i>S. smithii</i> var. <i>insica</i> Pant. (ep)	<i>Ulothrix aequalis</i> Kütz. (efl)	<i>C. subcostatum</i> Nordst. (ep)
<i>Surirella angustata</i> Kütz. (epf)	<i>U. subconstricta</i> G. S. West. (el)	<i>Penium sp.</i> (ep)
<i>S. capronii</i> Brebisson (ep)	<i>U. subtilissima</i> Rabenhorst (efl)	ORDO : Zygnemales
<i>S. lapponica</i> A. Cl. (epfl)	<i>U. tenerrima</i> Kütz. (efl)	<i>Spriogyra catenaeformis</i> (Hass.) Kütz. (epfl)
<i>S. linearis</i> W. Smith (epf)	<i>U. tenuissima</i> Kütz. (epfl)	<i>S. crassa</i> Kütz. (epfl)
<i>S. ovata</i> Kütz. (epfl)	<i>U. variabilis</i> Kütz. (efl)	<i>S. ellipsospora</i> Transeau (epf)
<i>S. robusta</i> Ehr. (ep)	<i>U. zonata</i> (Weber, Mohr) Kütz. (epfl)	<i>S. protecta</i> Wood (epf)
<i>S. robusta</i> var. <i>splendida</i> (Ehr.) Van Heurck (epf)	ORDO : Microsporales	<i>S. tenuissima</i> (Hass.) Kütz. (epfl)
<i>S. spiralis</i> Kütz. (epf)	<i>Microspora tumidula</i> Hazen (el)	<i>S. varians</i> (Hass.) Kütz. (epfl)
<i>S. tenera</i> Gregory (ep)	ORDO : Chaetophorales	<i>S. sp.</i> (epfl)
<i>S. trugida</i> W. Smith (ef)	<i>Coleochaete orbicularis</i> Pringsheim (ef)	<i>Zygnema sp.</i> (epf)
<i>Synedra acus</i> Kütz. (ef)	<i>Cylindrocapsa conferta</i> W. West. (ef)	DIVISIO : CYANOPHYTA
<i>S. amphicephala</i> Kütz. (epfl)	<i>Draparnaldia glomerata</i> (Vauch.) C.A. (ef)	CLASSIS : CYANOPHYCEAE
<i>S. fasciculata</i> O. Müller (el)	ORDO : Chlorococcales	ORDO : Chroococcales
<i>S. minuscula</i> Grun. (epf)	<i>Pediastrum muticum</i> Kütz. (ef)	<i>Aphanothece sp.</i> (ef)
<i>S. parasitica</i> W. Smith (el)	<i>Scenedesmus bijuga</i> (Trup.) Lagerheim (ef)	<i>Dactylococcopsis sp.</i> (ef)
<i>S. parasitica</i> var. <i>subconstricta</i> Grun. (ep)	<i>S. dimorphus</i> (Trup.) Kütz. (epf)	<i>Merismopedia elegans</i> A. Braun (ef)
<i>S. rumpens</i> Kütz. (el)	<i>S. sp.</i> (el)	<i>Microcystis aeruginosa</i> Kütz. (ef)
<i>S. ulna</i> (Nitzsch) Ehr. (epfl)	CLASSIS : DEDOGONIOPHYCEAE	<i>M. flos-aquae</i> (Wittr.) Kirchen (ef)
<i>S. ulna</i> var. <i>amphirhynchus</i> (Ehr.) Grun. (epfl)	ORDO : Oedogoniales	ORDO : Hormogonales
<i>S. ulna</i> var. <i>biceps</i> Kütz. (epf)	<i>Oedogonium ssp</i> (epfl)	<i>Haplosiphon sp.</i> (ef)
<i>S. ulna</i> var. <i>danica</i> (Kütz.) Grun. (epf)	CLASSIS : CONJUGATOPHYCEAE	<i>Lyngbya epiphytica</i> Hieronymus (el)
<i>S. ulna</i> var. <i>oxyrhynchus</i> (Kütz.) Van. Heurck (efl)	ORDO : Demidiales	<i>L. largerheimia</i> (Moebius) Gom. (el)
<i>S. ulna</i> var. <i>romesi</i> (Heribaud, Peragallo) Hust. (efl)	<i>Closterium acerosum</i> (Schrank) Ehr. ex Ralfs (ef)	<i>L. nordgaardii</i> Wille (el)
<i>S. utermöhli</i> Hust. (ef)	<i>C. littorale</i> Gay. (ef)	
<i>S. vacuheria</i> Kütz. (epfl)	<i>C. pritchardianum</i> Arch. (ef)	
<i>Tabellaria fenestrata</i> (Lyngby)	<i>C. pronum</i> Breb. (nach West)	

L. versicolor (Wartmann) Gom.
(ef)
Oscillatoria agardhii Gom. (epfl)
O. amoena (Kütz.) Gom. (efl)
O. amphibia C.A. Agardh (ep)
O. articulata Gardner (el)
O. curviceps C.A. Agardh (ef)
O. formosa Bory (el)
O. lacustris (Kleb.) Geitler (ep)
O. limnetica Lemmmermann
(epfl)

O. irrequa Kg. (ef)
O. nigra Vaucher (ef)
O. princeps Vaucher (ef)
O. rubescens De Candolle (el)
O. sancta (Kütz.) Gom. (ep)
O. subbrevis Schmidle (el)
O. tenuis C.A. Agardh (epfl)
Rivularia sp. (ef)
Spirulina major Kütz. (ef)
S. sp. (ef)

DIVISIO : EUGLENOPHYTA

CLASSIS : EUGLENOPHYCEAE

ORDO : Euglenales

Lepocinclis playfairiana
Deflandre (el)

Phacus crenulata Prescott (ep)

Trachelomonas volvocina Ehr.
(epfl)