

Epipellic and Epilithic Algae of Dağbaşı Lake (Rize-TURKEY)

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Abstract: Epipellic and epilithic algae of Dağbaşı lake were studied qualitatively between June and September 1988. The algal flora was found to consist of 103 species, 53 belonging to *Bacillariophyta*, 31 to *Chlorophyta*, 15 to *Cyanophyta* and 4 to *Euglenophyta*.

Key Words: Epipellic, Epilithic, Algal Community, Dağbaşı Lake

Dağbaşı Gölü'nün (Rize-Türkiye) Epipelik ve Epilitik Algleri

Özet: Dağbaşı gölünün epipelik ve epilitik alg florası 1988 yılının Haziran- Eylül ayları arasında kalitatif olarak incelendi. Florada *Bacillariophyta* (53), *Chlorophyta* (31), *Cyanophyta* (15) ve *Euglenophyta* (4) 'ya ait olmak üzere toplam 103 tür bulundu.

Anahtar Sözcükler: Epipelik, Epilitik, Alg Topluluğu, Dağbaşı Gölü

Introduction

This is the first study on the freshwater algae of Rize, which has several freshwater bodies. One of them is Dağbaşı lake. It is a glacier lake, situated 2721 m above sea level and located at 40° 37' 30" latitude, 40° 45' 00" longitude. The lake has an area of 3.125 km² and a maximum depth of 10 m.

The purpose of the present study was to determine the composition of epipellic and epilithic algae of Dağbaşı lake and to contribute to the algal flora of Turkey.

Materials and Methods

To study the epipellic and epilithic algae of Dağbaşı lake, six sampling stations were chosen. Collections were made during the snow-free period from June to September 1988. The samples were taken on a monthly basis, and collected from stations of 20-30 cm depth, 50-100 cm offshore. Vascular plants were absent at all stations in the lake. Epipellic and epilithic algae were collected. The methods of sampling and laboratory

examination were similar to those outlined in Round (1953) and Sladeckova (1962).

At the time of sampling, water temperature and pH were measured using a mercury thermometer and WTW Digi 88 model pH meter. Dissolved oxygen concentration was measured according to the method of Winkler (Yaramaz, 1988).

Taxonomic identifications were made according to Hustedt (1930, 1985), Patrick and Reimer (1966, 1975), Huber-Pestalozzi (1938, 1982), Prescott (1973), Lind and Brook (1980), Dillard (1991, 1993) and Hardley (1997). The main species of the flora were photographed with an Olympus BH-2 research microscope.

Results

Environmental conditions

The water temperature varied from 11 to 16°C (\bar{X} =13.5°C). Low temperatures generally prevailed during June, and the highest temperature was found in

August. The pH fluctuated between 7.10 and 7.28 ($\bar{X}=7.19$), indicating circum-alkaline character of the water body. The dissolved oxygen fluctuated between 11 and 9.56 mg/l ($\bar{X}=10.28$ mg/l).

Algal flora

A total of 103 species and varieties of algae were recorded from Dağbaşı lake. *Bacillariophyta* was predominant, accounting for 53 species, followed in importance by *Chlorophyta* with 31 species, *Cyanophyta* with 15 species and *Euglenophyta* with 4 species (Table 1).

Epipellic algae

A total of 83 taxa were recorded from the epipellic community, of which 42 belonged to *Bacillariophyta*, 24 to *Chlorophyta*, 13 to *Cyanophyta* and 4 to *Euglenophyta* (Table 1).

Ceratoneis arcus Kütz. was the most abundant and *Navicula radiosa* Kütz. was the second in significance in the lake. Other common epipellic diatoms included *Cymbella minuta* Hilse ex Rabh., *Didymosphenia geminata* (Lyng.) M. Schmidt, *Gyrosigma acuminatum* (Kütz.) Rabh. and *Navicula cryptocephala* var. *intermedia* Grun.

Filamentous *Chlorophyta* was represented by *Microspora* sp., of which the reproductive organs could not be observed and therefore were not identified. This species was abundant on sediment, where it formed free-floating masses. The members of *Desmidiaceae* were the most encountered unicellular *Chlorophyta* species. The most common species were *Cosmarium subcostatum* Nordst. var. *subcostatum* and *C. subcostatum* var. *minus* (W. & G.S. West) Först. Common *Cyanophyta* included *Oscillatoria formosa* Bory while the members of *Euglenophyta* were not important in the epipellic flora.

Epilithic algae

There were at least 43 species found in the epilithic communities, the majority of which belonged to *Bacillariophyta*. There were also 13 species of *Chlorophyta* and 3 of *Cyanophyta* (Table 1). The most common diatoms were *Ceratoneis arcus* and *Cymbella minuta*.

Filamentous *Chlorophyta* were represented by several species, including *Ulothrix* Kuetzing, *Bulbochaete* C. A. Agardh, *Oedogonium* Link, *Spirogyra* Link and *Zygnema* C. A. Agardh, some of which were sterile and could not be identified. The most common unicellular *Chlorophyta*

was *Cosmarium subcostatum* var. *minus* while *Oscillatoria* spp. were the most frequently encountered *Cyanophyta* species.

Conclusion

The epipellic and epilithic algal flora identified in Dağbaşı lake were almost identical to those of Çakırgöl (Şahin, 1998), Aygır and Balıklı (Şahin, 2000) lakes. The reason for this can be explained by the environmental conditions among the lakes. The elevation, photoperiod and weather conditions are approximately the same. Furthermore, the stations were located at the same depth of water (20-30 cm) and 50-100 cm from shore. In addition, the average values of dissolved oxygen, pH and temperature were almost identical (Table 2).

The predominant species in these lakes have some similarities as well as differences. For example, while in all the lakes *Cymbella* spp. (especially *C. minuta* and *C. cistula*) were common, *Surirella robusta* var. *splendida* and *Pinnularia maior* were predominant in Çakırgöl, Aygır and Balıklı lakes. Also, *Ceratoneis arcus* and *Navicula radiosa* were the most encountered species in Uzungöl (Şahin, 1998) and Dağbaşı lakes. Other common species included *Amphora ovalis* (in Uzungöl lake), *Didymosphenia geminata* (in Aygır, Balıklı and Dağbaşı lakes), *Gomphonema constrictum* (in Aygır and Balıklı lakes), *Gyrosigma acuminatum*, *Navicula cryptocephala* var. *intermedia* (in Dağbaşı lake) and *N. cryptocephala* var. *veneta* (in Uzungöl lake).

Except diatoms, the members of *Desmidiaceae* and *Oscillatoriales* were the most encountered species, while *Euglenophyta* was found very rarely in all of the lakes.

As a result, in order to learn the characteristics of the lake, it is necessary to carry out physical and chemical analyses of water and the phytoplankton composition of the lake.

Table 2. Some parameters of the lakes.

Parameters	Dağbaşı L.	Çakırgöl L.	Aygır L.	Balıklı L.
Elevation (m)	2721	2533	2700	2600
Dis. Ox. (mg/l)	10.28	10.75	10.17	10.22
Temp. (°C)	13.5	9.5	13.1	12.75
pH	7.19	7.17	7.11	7.08

Table 1. List of epipellic and epilithic algae collected from Dağbaşı lake (1: Epipellic, 2: Epilithic).

Taxa	1	2	Taxa	1	2
Divisio : BACILLARIOPHYTA			Pediastrum boryanum (Trup.) Meneghini	+	+
Classis : Centrobacillariophyceae			Ordo : Ulotrichales		
Ordo : Centrales			Ulothrix variabilis Kuetzing (Fig. 4a)		+
Aulacosira italica (Ehr.) Simenson (Fig. 2a)	+	+	U. sp. (Fig. 4b)		+
Classis : Pennatibacillariophyceae			Ordo : Microsporales		
Ordo : Pennales			Microspora sp. (Fig. 4c)	+	
Amphora ovalis Kütz.			Classis : Oedogoniophyceae		
Ceratoneis arcus Kütz. (Fig. 2b)	+	+	Ordo : Oedogoniales		
C. arcus var. amphioxys Rabh.	+	+	Bulbochaete sp.		+
C. arcus var. linearis Holmboe (Fig. 2c)	+	+	Oedogonium fennicum (Tiff.) Tiffany (Fig. 4d)		+
Caloneis silicula (Ehr.) Cleve		+	O. sp. (Fig. 4e)		+
C. silicula var. truncatula Grun. (Fig. 2d)	+		Classis : Conjugatophyceae		
Cymbella affinis Kütz.		+	Ordo : Mesotaeniales		
C. amphicephala var. intermedia A. Cl. (Fig. 2e)	+	+	Cylindrocystis brebissonii Meneght (Fig. 4f)	+	
C. cistula (Hemprich) Grun.		+	Ordo : Desmidiiales		
C. lata Grun.	+		Actinotaenium cruciferum (Debary) Teiling	+	
C. minuta Hilse ex Rabh. (Fig. 2f)	+	+	Closterium littorale Gay.	+	
Diatoma anceps (Ehr.) Grun		+	C. parvulum Nag var. parvulum	+	
D. vulgare var. brevis Grun. (Fig. 2g)		+	Cosmarium blyttii Wille var. blyttii	+	
Diploneis elliptica (Kütz.) Cleve (Fig. 2h)	+	+	C. botrytis Meneg. ex Ralfs (Fig. 4g)	+	+
D. puella (Schumann) Cleve	+	+	C. laeve Rabenh. var. laeve (Fig. 4h)	+	+
Didymosphenia geminata (Lyngb.) M. Schmidt (Fig. 2.i)	+	+	C. mansangense W. & G.S. West	+	
Eunotia diodon Ehr. (Fig. 2i)	+		C. subcostatum Nordst. var. subcostatum (Fig. 4i)	+	
E. gracilis (Ehr.) Rabh. (Fig. 2j)	+		C. subcostatum var. minus (W. & G.S. West) Först	+	+
E. pectinalis var. minor (Kütz.) Rabh.	+		C. variolatum (Debary) Teiling	+	
E. praeurupta Ehr. (Fig. 2k)	+		C. sp. (Fig. 4i)	+	+
E. praeurupta var. inflata Grun. (Fig. 2l)	+		Euastrum binale var. gutwinskii (Sch.) Krieger	+	
E. robusta Ralfs (Fig. 2m)	+		E. luetkemulleri var. carniolicum (Luet.) Kriger	+	
E. tenella (Grun.) Hust.		+	E. luetkemulleri var. floridanum Scott & Groenblad	+	
E. valida Hust.	+		E. obesum Joshua	+	
Epithemia argus Kütz.	+	+	Penium polymorphum (Perty) Perty	+	
Fragilaria constricta Ehr. (Fig. 2n)	+		Pleurotaenium trabecula (Ehrenb.) ex Nag var. trabecula	+	+
Gyrosigma acuminatum (Kütz.) Rabh.	+	+	Staurastrum pilosum (Naeg.) Arch.	+	
Gomphonema acuminatum Ehr.	+	+	S. punctulatum Breb. (Fig. 4j)	+	
G. constrictum Ehr.	+	+	S. sp.	+	
G. olivaceum (Lyngb.) Kütz.		+	Ordo : Zygnemales		
G. truncatum var. capitatum Patr. nom. nov.		+	Spirogyra Weberi Kuetzing (Fig. 4k)		+
Hantzschia amphioxys (Ehr.) Grun. (Fig. 2.o)	+	+	Zygnema sp. (Fig. 4l)		+
Meridion circulare var. constricta (Ralfs) Van Heurck	+		Division: CYANOPHYTA		
Navicula cryptocephala Kütz.	+		Classis : Cyanophyceae		
N. crtptocephala var. intermedia Grun.	+		Ordo : Chroococcales		
N. radiosa Kütz. (Fig. 2ö)	+	+	Merismopedia elegans A. Braun (Fig. 5a)	+	
N. radiosa var. parva Wallace (Fig. 2p)	+		M. glauca (Ehrenb.) Naeegeli (Fig. 5b)		+
N. rhynchocephala Kütz.	+		Microcystis aeruginosa Kuetz. (Fig. 5c)		+
Neidium temperei Reim.	+		Ordo : Hormogonales		
Nitzschia thermalis Kütz.		+	Anabaena augstumalis var. incrassata (Nyg.) Geitl. (Fig. 5d)	+	
Pinnularia abaujensis var. linearis (Hust.)			A. flos-aquae (Lyngb.) De Brebisson (Fig. 5f)	+	
Patr. comb. nov. (Fig. 3a)	+		A. spp. (Fig. 5e-g)	+	
P. borealis Ehr.	+	+	Nostoc spp. (Fig. 5h-i)	+	
P. maior (Kütz.) Cleve. (Fig. 3b)	+	+	Oscillatoria amoena (Kuetz.) Gomont (Fig. 5i)	+	
Stauroneis anceps ehr. (Fig. 3c)	+	+	O. formosa Bory	+	+
Surirella angustata Kütz. (Fig. 3d)	+		O. granulata Gardner	+	
S. capronii Brebisson (Fig. 3e)	+		O. limosa (Roth.) C. A. Agardh (Fig. 5j)	+	
S. ovalis Brebisson	+		O. subbrevis Schmidle	+	
S. robusta Ehr. (Fig. 3f)	+		O. tenuis C. A. Agardh	+	
S. robusta var. splendida (Ehr.) Van Heurck	+		Spirulina sp. (Fig. 5k)	+	
S. spiralis Kütz. (Fig. 3g)	+		Divisio : EUGLENOPHYTA		
S. tenera Gregory	+	+	Classis : Euglenophyceae		
Synedra ulna (Nitzsch) Ehr. (Fig. 3h)	+		Ordo : Euglenales		
Divisio : CHLOROPHYTA			Euglena sp. (Fig. 5l)	+	
Classis : Chlorophyceae			Phacus agilis Skuja	+	
Ordo : Chlorococcales			Trachelomonas sp. (Fig. 5m)	+	
Ankistrodesmus falcatus (Corda) Ralfs	+		T. sp.	+	

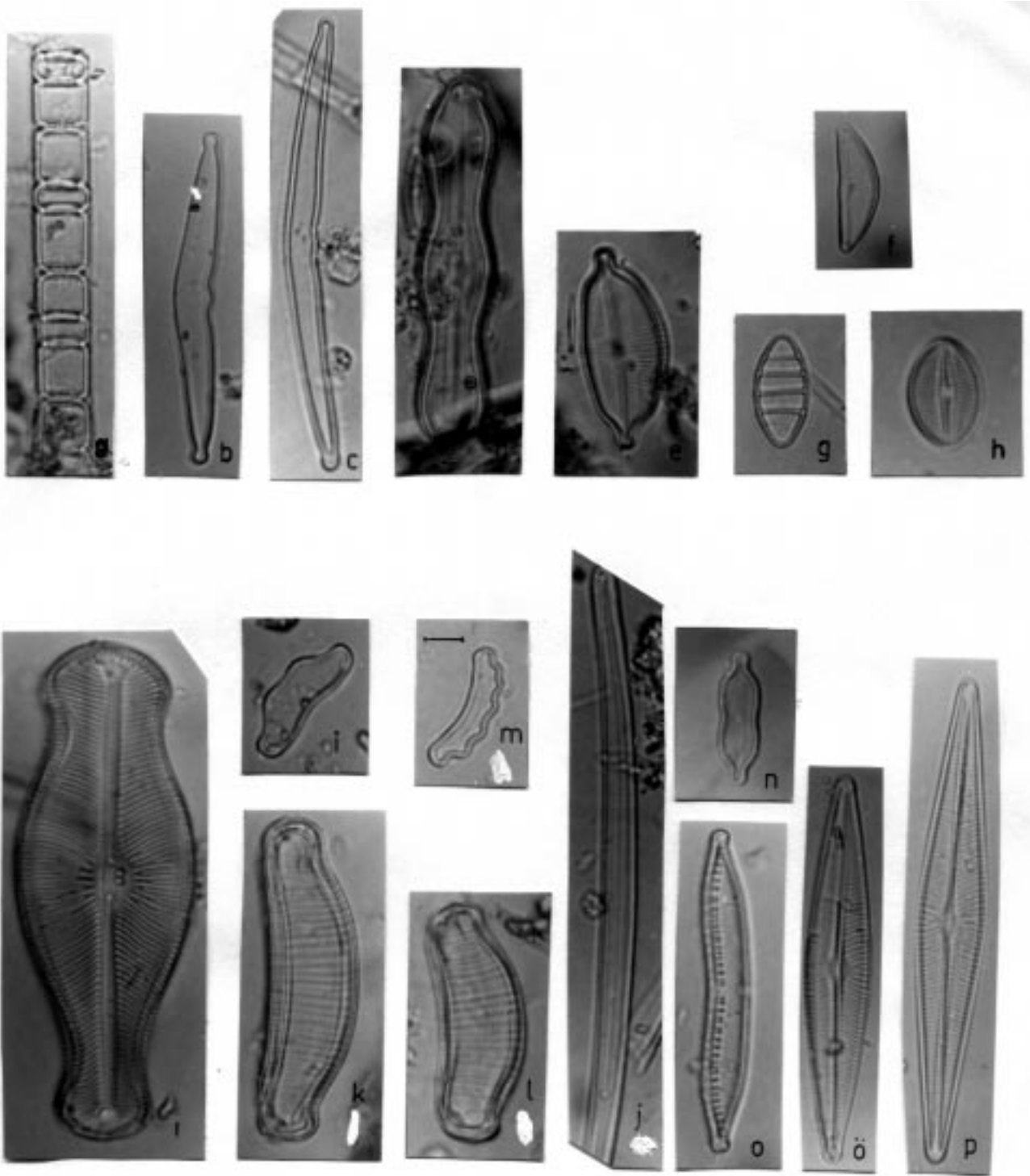


Figure 1. a. *Aulacosira italica*, b. *Ceratoneis arcus*, c. *C. arcus* var. *linearis*, d. *Caloneis silicula* var. *truncatula*, e. *Cymbella amphicephala* var. *intermedia*, f. *C. minuta*, g. *Diatoma vulgare* var. *brevis*, h. *Diploneis elliptica*, i. *Didymosphenia geminata*, j. *Eunotia diodon*, j. *E. gracilis*, k. *E. praeupta*, l. *E. praeupta* var. *inflata*, m. *E. robusta*, n. *Fragilaria constricta*, o. *Hantzschia amphioxys*, ö. *Navicula radiosa*, p. *N. radiosa* var. *parva* (Scale: 10 µ).

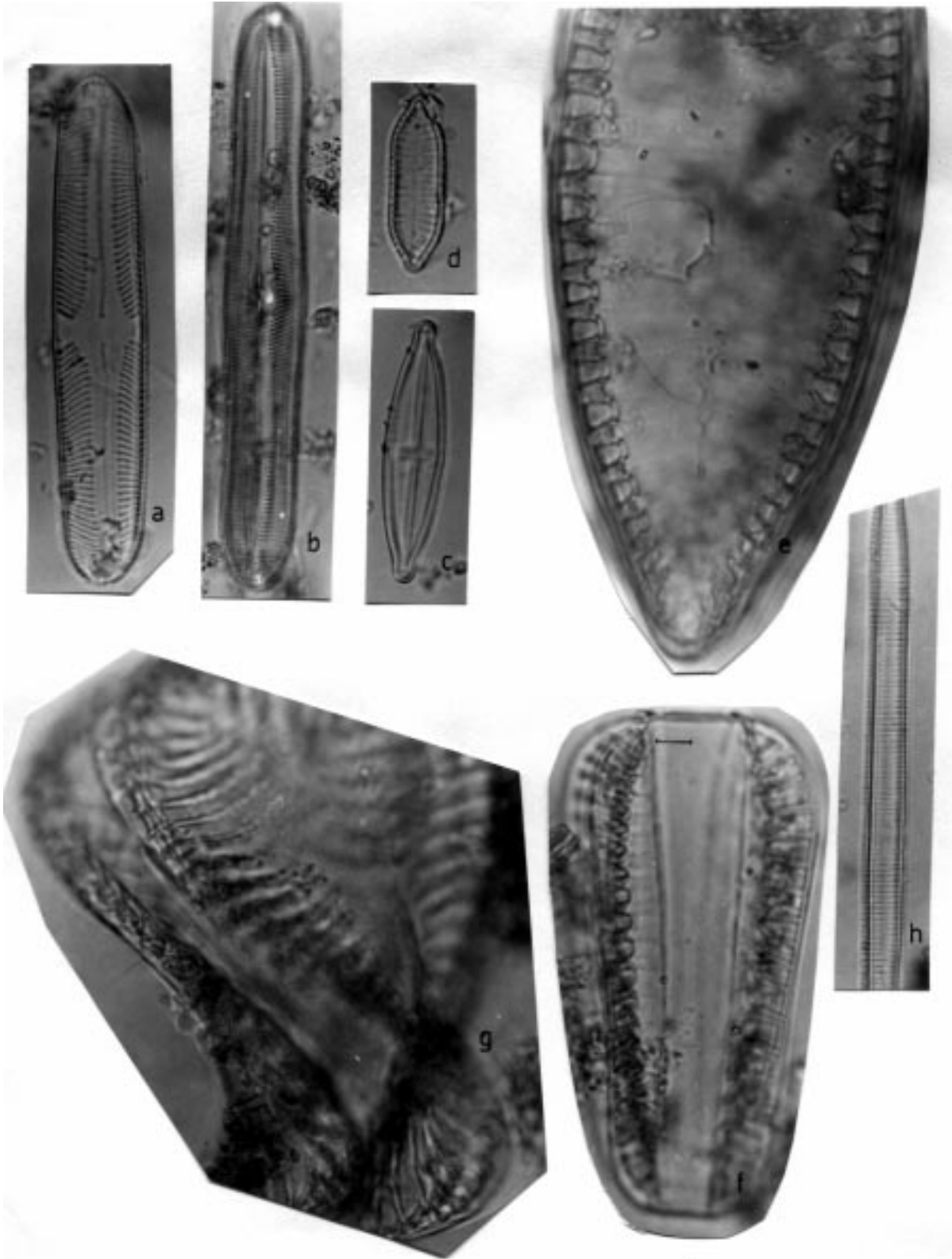


Figure 2. a. *Pinnularia abaujensis* var. *linearis*, b. *P. major*, c. *Stauroneis anceps*, d. *Surirella angustata*, e. *S. capronii*, f. *S. robusta*, g. *S. spiralis*, h. *Synedra ulna* (Scale 10 μ).

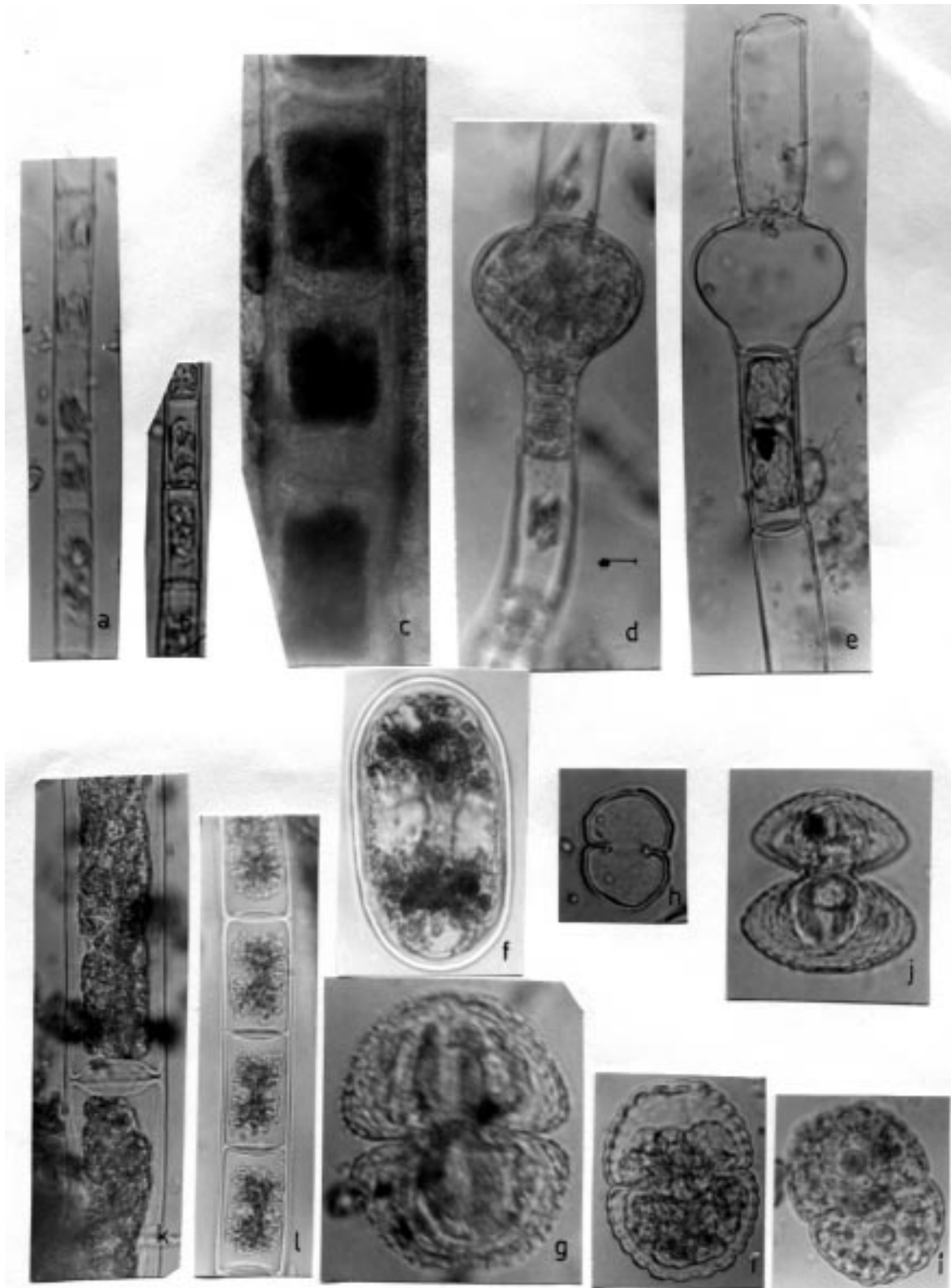


Figure 3. a. *Ulothrix variabilis*, b. *U. sp.*, c. *Microspora sp.*, d. *Oedogonium fennicum*, e. *O. sp.*, f. *Cylindrocystis brebissoni*, g. *C. botrytis*, h. *C. laeve* var. *laeve*, i. *C. subcostatum* var. *subcostatum*, j. *Staurostrum punctulatum*, k. *Spirogyra Weberi*, l. *Zygnema sp.* (Scale 10 μ).



Figure 4. a. *Merismopedia elegans*, b. *M. glauca*, c. *Microcystis aeruginosa*, d. *Anabaena augstumalis* var. *incrassata* e. *A. sp.*, f. *a. flos-aquae*, g. *A. sp.*, h. *Nostoc sp.*, i. *N. sp.*, j. *Oscillatoria amonea*, k. *O. limosa*, l. *Spirulina sp.*, m. *Euglena sp.*, n. *Trachelomonas sp.* (Scale 10 µ).

References

- Dillard EG (1991). *Freshwater Algae of the Southeastern United States, Part 4: Chlorophyceae, Zygnematales, Desmidiaceae* (Sec. 2). Berlin and Stuttgart.
- Dillard EG (1993). *Freshwater Algae of the Southeastern United States, Part 6: Chlorophyceae, Zygnematales, Desmidiaceae* (Sec. 4). Berlin and Stuttgart.
- Hustedt F (1930). *Bacillariophyta* (Diatome) Heft: 10 in *Pascher Die Susswasser Flora Mitteleuropas*. Jena: Gustav Fisher Pub.
- Hustedt F (1985). *The Pennate Diatoms*. Koenigstein: Koeltz Sci. Books.
- Huber-Pestalozzi G (1938). *Das Phytoplankton des Susswasser* Teil 1. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung (Ervin Nagele).
- Huber-Pestalozzi G (1982). *Das Phytoplankton des Susswasser* Teil 8. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung (Ervin Nagele).
- Hardley B (1997). *An Atlas of British Diatoms*. Biopress Limited, England.
- Lind EM, Brook AJ (1980). *Desmids of the English Lake District*. Freshwater Biological Assoc. Sci. Pub. No:42.
- Patrick R, Reimer CW (1966). *The Diatoms of the United States*. Monogr. Acad. Nat. Sci. Philadelphia.
- Patrick R, Reimer CW (1975). *The Diatoms of the United States*. Monogr. Acad. Nat. Sci. Philadelphia.
- Prescott GW (1973). *Algae of the Western Great Lake Area*. Dubuque: W.M.C. Brown Comp. Pub., Dubuque.
- Round FE (1953). An Investigation of Two Benthic Algal Communities in Malham Tarn, Yorkshire. *J Ecol* 41:97-174.
- Sladeckova A (1962). Limnological Investigation Methods for the Periphyton (Aufwuch) Community. *Bot Rev* 28:86-350.
- Şahin B (1998). A Study on the Benthic Algae of Uzungöl (Trabzon). *Turk J Bot* 22:171-189.
- Şahin B (1998). Epipellic and Epilithic Algal Flora of Çakırgöl (Gümüşhane). In: Celikkale MS (ed.) *First International Symposium on Fisheries & Ecology*, September 2-4, Trabzon, Turkey, 535-538.
- Şahin B (2000). Algal Flora of Lakes Aygır and Balıklı (Trabzon, Turkey). *Turk J Bot* 24:35-45.
- Yaramaz Ö (1988). *Su Kalitesi*. Ege Üniv. Su Ürünleri Yük. Okulu No:14. Izmir.