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Research Article

Net Planktonic Diatom (Bacillariophyceae) Composition of Lake Abant (Bolu)

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Abstract: The diatom flora of Lake Abant was studied monthly for 2 years (June 2003-June 2005) from 3 littoral and 2 vertical stations. A total of 123 diatom taxa were identified. Some species (*Asterionella formosa* Hassall, *Cymbella silesiaca* Bleisch, *C. cistula Kirchner*, *Fragilaria biceps* (Kützing) Lange-Bertalot, *F. dilata* (Brebisson) Lange-Bertalot, *Navicula radiosa* Kützing, and *Rhopalodia gibba* Müller) showed frequent occurrence in each month at all stations. Numbers of diatoms were increased in certain months in autumn, i.e. November (83 taxa) and December (68 taxa) 2003, and August (65 taxa) and September (76 taxa) 2004.

Key Words: Lake Abant, Diatom, Systematics

Abant Gölü Net Planktonik Diyatom (Bacillariophyceae) Komposizyonu

Özet: Abant Gölü diyatom florası üç kıyısal ve iki vertikal istasyonda aylık olarak iki yıl boyunca (Haziran 2003-Haziran 2005) çalışılmıştır. Toplam 123 diyatome taksonu tanımlanılmıştır. Bazı türler (*Asterionella formosa* Hassall, *Cymbella silesiaca* Bleisch, *C. cistula* Kirchner, *Fragilaria biceps* (Kützing) Lange-Bertalot, *F. dilata* (Brebisson) Lange-Bertalot, *Navicula radiosa* Kützing ve *Rhopalodia gibba* Müller) bütün istasyonlarda her ay sıklıkla görülmüştür. Diyatome tür sayısı Kasım (83 takson) ve Aralık (68 takson) 2003, Ağustos (65 takson) ve Eylül (76 takson) 2004 sonbahar mevsiminin bazı aylarında artmıştır.

Anahtar Sözcükler: Abant Gölü, Diyatom, Sistematik

Introduction

Diatoms are distributed in a variety of environments from freshwater to marine water over the world, where environmental conditions in terms of some of the major factors (e.g., light, temperature, and chemical components) are suitable (Hutchinson, 1967; Stoermer & Smol, 1999). Diatoms are unicellular algae whose cell walls are composed of silicon dioxide. The diatoms' valves are highly ornamented, reflecting taxonomic diversity. These structures are found in both living and fossil forms, reflecting the effects of different environmental conditions. Therefore, they not only provide important knowledge on the reconstruction of the history of an area (Patrick & Reimer, 1966; Round, 1981; Wehr & Sheath, 2003) but also are a useful tool to determine the current status of habitats.

In recent years, studies concerning freshwater diatoms in Turkey have gained momentum, but they have not reached an acceptable level. Studies have been carried out in Turkey such as in northern parts (Gönülol & Obalı, 1998; Şahin, 2003), in eastern parts (Çetin & Şen, 1998; Akbay et al., 1999; Kılınç & Sıvacı, 2001), and in parts of Central Anatolia (Obalı & Elmacı, 1998; Akbulut, 2003). Additionally, several investigations on the diversity of phytoplankton have been performed in different aquatic bodies in western (Aysel et al., 2002; Dere et al., 2002) and south-western Anatolia (Ertan & Morkoyunlu, 1998). Based on studies from previous decades, which have made a great contribution to our understanding of the floral richness of Turkey, one can interpret that the species richness of Turkey is much higher than that estimated before. The aim of the present study was to determine the diatom composition in Lake Abant (Bolu) and to contribute to the knowledge of the algal flora of Turkey.

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Materials and Methods

Lake Abant (31°, 16' E, 40°, 36' N) (Figure 1), which is about 30 km south-west of Bolu (Turkey), is a natural lake within Lake Abant Nature Park. It is located at about 1340 m elevation with a surface area of 125 ha (Akşıray, 1959; Erinç et al., 1961). The maximum depth is 18 m and the average depth is 9-10 m. The lake is known for its natural beauty and is surrounded by a rich flora and fauna. Therefore, it is a well-known tourist site in Turkey.

The net diatom sampling was carried out using a plankton net (45 µm mesh size, 20 cm diameter). Samples were collected monthly from 3 littoral and 2 vertical stations at the lake between June 2003 and June 2005. Vertical samplings were performed with a Zodiac boat when samples from open water (surface, 4, 7, and 10 m) were collected with a 2.5-l Van Dorn bottle from different depths. The geographical data (elevation, latitude and longitude) were recorded with a geographical positioning system (GARMIN, GPS 45 XL model).

Lake water collected from sampling stations for composite plankton samples were preserved with acetic lugol-glycerol solution in polyethylene bottles. After concentrated samples were brought to the laboratory, temporary and permanent slides of phytoplankton were made for species identification under a light microscope at 400X, 800X, and 1000X magnification. Organic constituents of diatoms were removed from the debris to observe the details and ornamentations of the valves. Diatom samples were boiled in a mixture of concentrated hydrochloric acid and potassium permanganate. The diatomaceous remains were then washed in distilled water until the valves were acid-free (Simonsen, 1974). The shapes of some diatoms were photographed with the attachment of a BX 51 Olympus microscope camera.

The systematic classification of Krammer & Lange-Bertalot (1991a, 1991b, 1999a, 1999b) was followed to determine diatom taxa. At the same time several taxonomic books were also used for classification of diatoms (Patrick & Reimer, 1966, 1975; Round et al., 1990; Wehr & Sheath, 2003). The cell size and shape, and ornamentation on the cell wall (raphe, spin, number of costae and striae per 10 µm in valves) were generally used during identification of taxa. All material is kept at the Hydrobiology Laboratory of Abant İzzet Baysal University.

Results

Composition of Diatoms

A total of 123 diatom taxa were determined, belonging to 4 genera and 11 taxa of Centrales, and 29 genera and 112 taxa of the order Pennales, respectively. Descriptive information about each diatom includes size range, costae and striae counts for specimens. Measurements from taxonomic books are given in brackets. All measurements were in micrometres unless otherwise indicated.

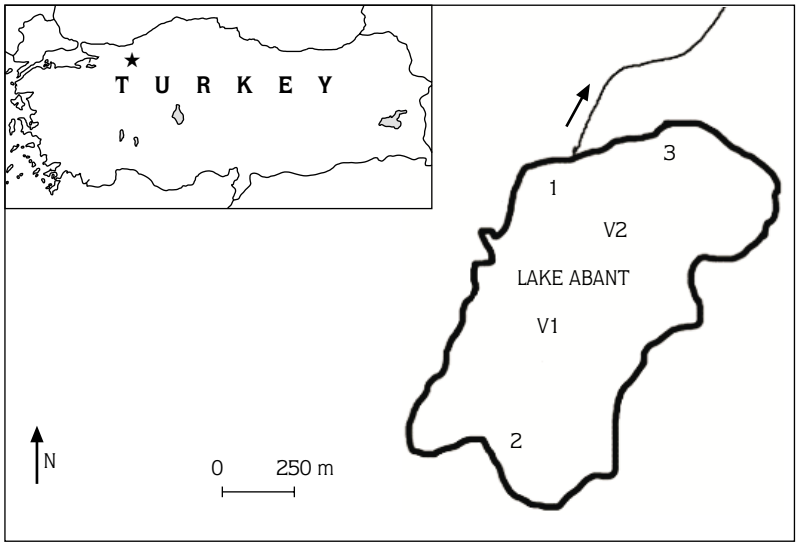

Figure 1. Five sampling stations (2 vertical (V1, V2) and 3 littoral (1-3) are shown in Lake Abant.

BACILLARIOPHYCEAE

CENTRALES

Thalassiosiraceae Hasle 1973

Aulacoseira Thwaites 1848

A. granulata (Ehrenberg) Simonsen 1979 (Figure 2a-b).

Valves 12.5-16 µm (5-24 µm) in length and 7-10 µm (4-30 µm) in diameter, 6 (5-9) puncta per 10 µm (Krammer & Lange-Bertalot, 1991 a, Figure 16: 1, 2; 17: 1-10; 18: 1-14).

A. islandica (O.Müller) Simonsen 1979.

Valves 15-20 µm (4-21 µm) in length and 7-9 µm (3-28 µm) in diameter, 11-12 (12-18) puncta 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 22: 1-12).

Cyclotella (Kützing) Brebisson 1838.

C. bodanica Grunow 1878 (Figure 2c).

Valves 21-57.5 µm (20-80 µm) in diameter, valves are discoid-shaped (Krammer & Lange-Bertalot, 1991a, Figure 53: 1-6; 54: 1-4b; 55: 1-7b; 56: 3a-5; 57: 1-5; 58: 1-6; 61: 1-5b).

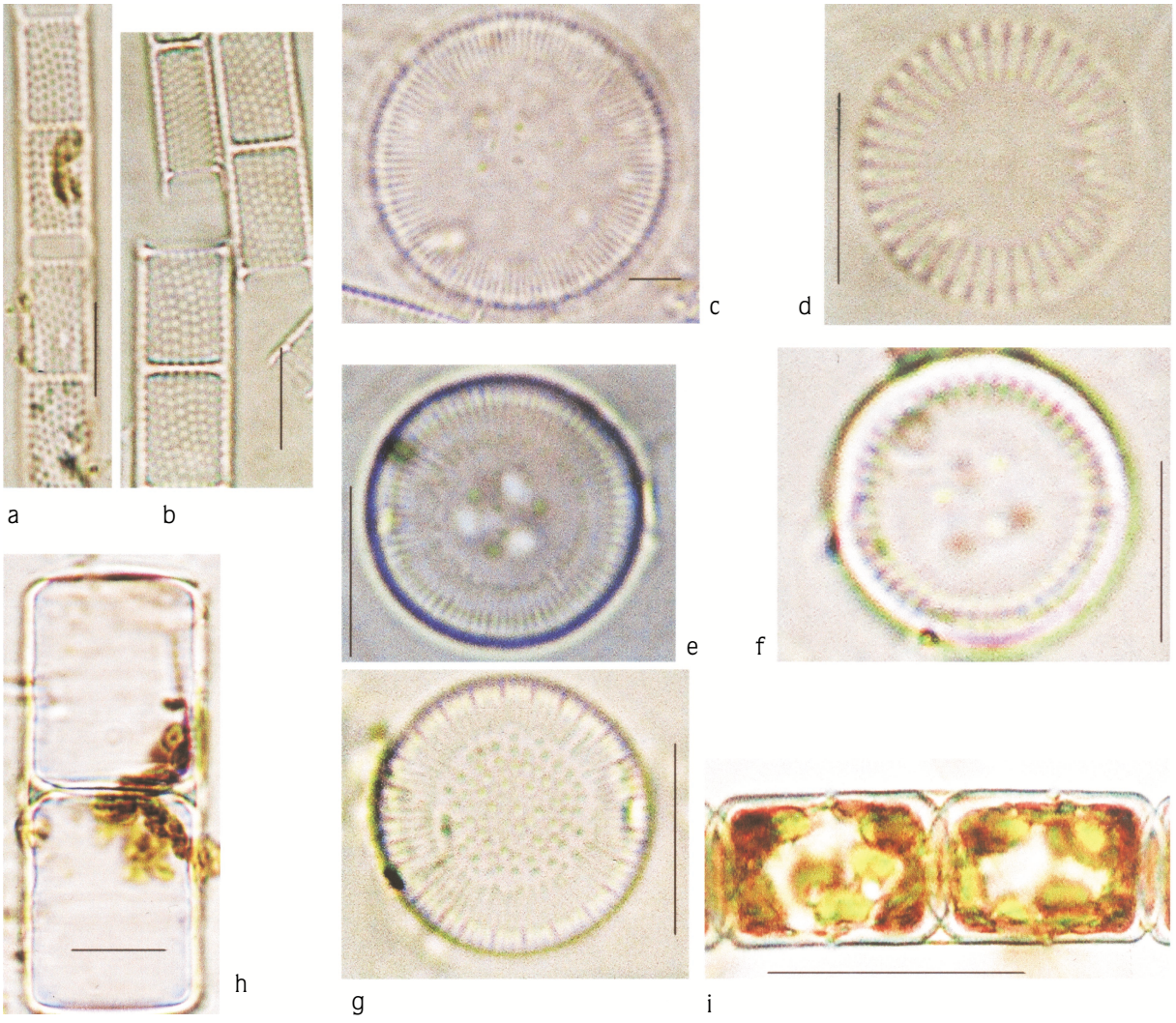

Figure 2. a, b) *Aulacoseria granulata*, c) *Cyclotella bodanica*, d) *C. meneghiniana*, e, f) *C. ocellata*, g) *C. praetermisa*, h) *Melosira lineata*, i) *Melosira varians* (Scale 10 µm).

C. meneghiniana Kützing 1844 (Figure 2d).

Valves 17.5 µm (10-20 µm) in diameter, valve circular (Krammer & Lange-Bertalot, 1991a, Figure 44: 1-10).

C. ocellata Pantocsek 1901 (Figure 2e-f).

Valves 15 µm (6-25 µm) in diameter, the outer of valves is slightly flat circular (Krammer & Lange-Bertalot, 1991a, Figure 50: 1-11, 13, 14; 51: 1-5).

C. praetermisa Lund 1951 (Figure 2g).

Valves 15-17.5 µm (8-25 µm) in diameter, valves are discoid-shaped, 12-14 (13-19) striae in 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 60: 7-10).

Ellerbeckia Crawford 1988.

E. arenaria Crawd 1988.

Valves 57.5 µm (38-135 µm) in diameter and 10-12 µm (10-15 µm) in length (Krammer & Lange-Bertalot, 1991a, Figure 3: 6; 14:1-5; 15:1-5).

Stephanodiscus Ehrenberg 1846

S. alpinus Husted 1942

Valves 14-16 µm (10-32 µm) in diameter, valves are discoid-shaped, 17-18 (18-29) areola in 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 72: 3a-4).

Melosiraceae Kützing 1844

Melosira Agardh 1827

M. dickiei (Thwaites) Kützing 1849.

Valves 8.5 µm (7-10 µm) in length and 11 µm (10-20 µm) in diameter (Krammer & Lange-Bertalot, 1991a, Figure 9: 1-13).

M. lineata Agardh 1824 (Figure 2h).

Valves 20 µm (13-23 µm) in length and 25 µm (6-40 µm) in diameter (Krammer & Lange-Bertalot, 1991a, Figure 7: 1-9).

M. varians Agardh 1827 (Figure 2i).

Valves 12-13 µm (4-14 µm) in length and 10 µm (8-35 µm) in diameter (Krammer & Lange-Bertalot, 1991a, Figure 3: 8; 4: 1-8).

PENNALES

Araphidineae

Fragilariceae Hustedt 1930

Asterionella Hassall 1850

A. formosa Hassall 1850.

Valves 85-115 µm (30-160 µm) in length and 2.5-4.75 µm (1.3-6 µm) in width, 23-26 (24-28) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 103: 1-9; 104; 9, 10).

Diatoma Borry 1824

D. tenuis Agardh 1812 (Figure 3a).

Valves 27-74 µm (22-120 µm) in length and 3-4 µm (2-5 µm) in width, 7-8 (6-10) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 96: 1-9, 10).

D. vulgaris Borry 1824 (Figure 3b).

Valves 32-45 µm (8-75 µm) in length and 12.5-15 µm (7-18 µm) in width, 8 (5-12) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 91: 2, 3; 93: 1-12; 94: 1-13; 95: 1-7; 97: 3-5).

Fragilaria Lyngbye 1819

F. biceps (Kützing) Lange-Bertalot 1991 (Figure 3c).

Valves 292.5-370 µm (160-750 µm) in length and 8 µm (7-10 µm) in width, 7-10 (7-9) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 121: 1-5).

F. brevistriata Grunow 1885.

Valves 12 µm (5-42 µm) in length and 4 µm (3-7 µm) in width, 13 (12-17) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 130. 9-16; 131: 7).

F. capucina Desmazieres 1925 (Figure 3d).

Valves 25 µm (10-100 µm) in length and 3.75-4.4 µm (2-6.5 µm) in width, 9-11 (9-22) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 108: 1-8).

F. capucina Desmazieres var. *mesolepta* (Rabenhorst) Rabenhorst 1864, (Figure 3e).

Valves 26 µm (10-100 µm) in length and 4 µm (2-6.5 µm) in width, 12-16 (9-22) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 110: 14-21, 23, 24).

F. capucina Desmazieres var. *vaucheriae* (Kützing) Lange-Bertalot 1980.

Valves 24 µm in length and 4 µm (4-5 µm) in width, 9-10 (9-14) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 108: 10-15).

F. construens (Ehrenberg) Grunow 1862.

Valves 17-18 µm (4-35 µm) in length and 4-5 µm (2-12 µm) in width, 13-15 (12-20) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 132: 1- 34; 129: 21-27; 131: 5).

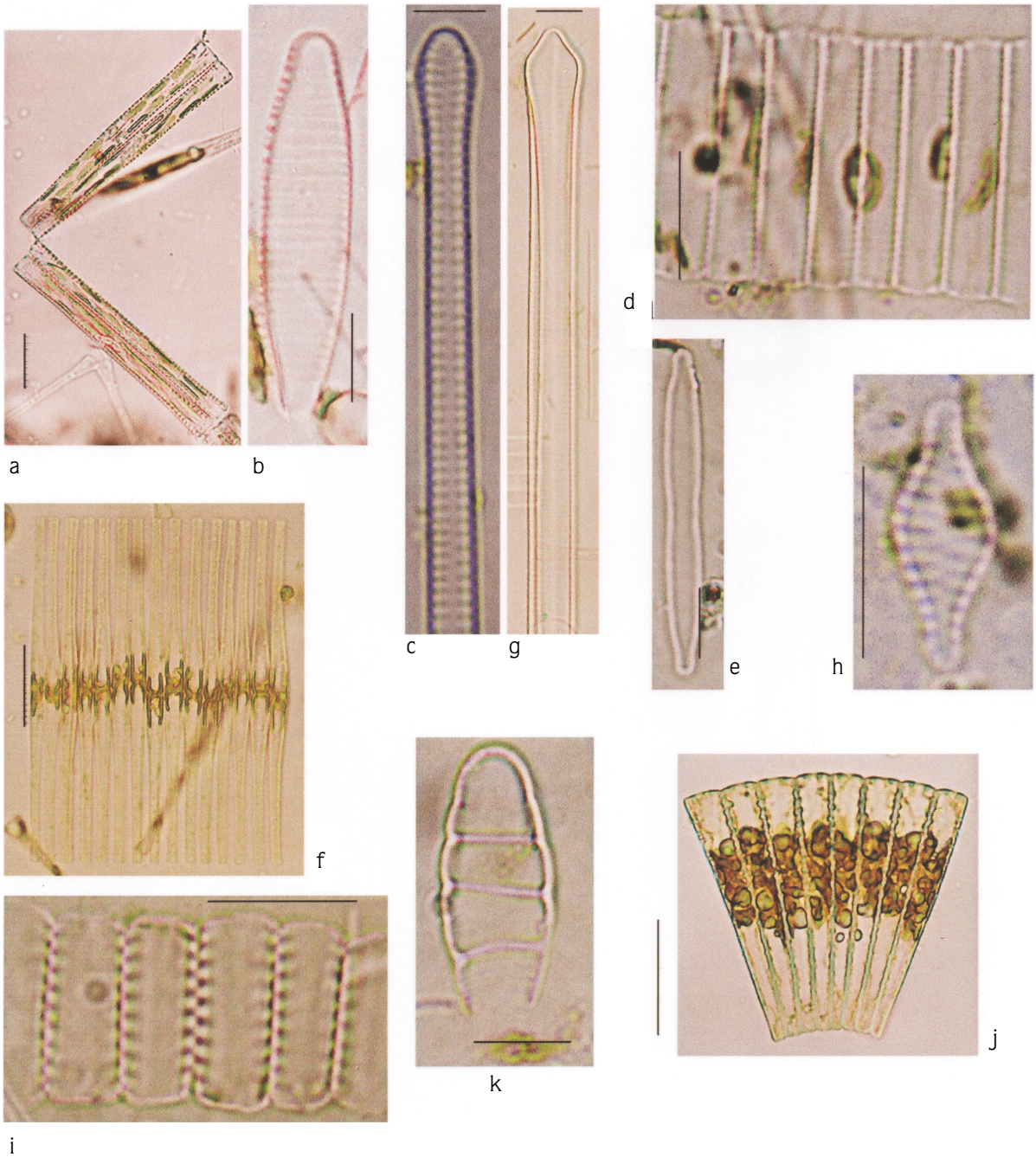

Figure 3. a) *Diatoma tenuis*, b) *Diatoma vulgaris*, c) *Fragilaria biceps*, d) *F. capucina*, e) *F. capucina* var. *mesolepta*, f) *F. crotonensis*, g) *F. dilata*, h-i) *F. pinnata*, j) *Meridion cirqulare*, k) *Tetracylus rubestris* (Scale 10 µm).

F. crotonensis Kitton 1869 (Figure 3f).

Valves 31-59 µm (40-170 µm) in length and 3-4 µm (2-5 µm) in width, 16 (15-18) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 116: 1-4).

F. dilata (Brebisson) Lange-Bertalot 1986 (Figure 3g).

Valves 124-375 µm (120-500 µm) in length and 7.5-8.5 µm (7-10 µm) in width, 7 (6-11) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 123: 1-3).

F. lapponica Grunow 1881.

Valves 17-21 µm (10-40 µm) in length and 3.5-4.5 µm (3-6 µm) in width, 7-8 (6-10) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 134: 1-8).

F. pinnata Ehrenberg 1843 (Figure 3h-i).

Valves 15 µm (3-60 µm) in length and 7 µm (2-8 µm) in width, 7-9 (5-12) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 112: 15, 16; 117: 3; 131: 3, 4).

Fragilaria sp.

Valves 13 µm in length and 3.7-4 µm in width, 15-17 striae 10 µm.

F. ulna (Nitzsch) Lange-Bertalot 1980.

Valves 98-475 µm (27-600 µm) in length and 3-7.5 µm (1.5-9 µm) in width, 8-9 (7-15) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 119-122).

F. ulna (Nitzsch) Lange-Bertalot var. *danica* (Kützing) Lange-Bertalot 1980.

Valves 178-210 µm in length and 3.5-4.75 µm in width, 11-12 striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 122: 9).

F. ulna (Nitzsch) Lange-Bertalot var. *acus* (Kützing) Lange-Bertalot 1980.

Valves 185-235 µm in length and 3-4 µm in width, 11 striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 122: 9).

F. virescens Ralfs 1843.

Valves 15-23 µm (10-120 µm) in length and 7-8 µm (6-10 µm) in width, 14-15 (13-19) striae 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 119-122).

Meridion Agardh 1824

M. circulare (Greville) C.A.Agardh 1831 (Figure 3j).

Valves 32 µm (10-82 µm) in length and 5 µm (4-8 µm) in width, 3 (2-5) costae in 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 100: 1-3; 101:1-14; 102: 1-3).

Tetracyclus Ralfs 1843

T. rupestris (Braun) Grunow 1881 (Figure 3l).

Valves 23 µm (4-30 µm) in length and 9 µm (3-12 µm) in width, 3 (3-5) costae in 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 89: 8-20).

Raphidineae

Achnanthaceae Kützing 1844

Achnanthes Bory 1822

A. minutissima var. *minutissima* Kützing 1833.

Valves 8-13 µm (5-25 µm) in length and 3-3.5 µm (2.5-4 µm) in width, 24-26 (20-30) striae in 10 µm, (Krammer & Lange-Bertalot, 1991a, Figure 32: 1-24; 35: 1, 2).

Cocconeis Ehrenberg 1838

C. fluviatilis Wallace.

Valves 17-18 µm (15-34 µm) in length and 9-11 µm (9-19 µm) in width, 15 (16) striae 10 µm in axial area, 11-12 (12) striae 10 µm in margins of valves (Patrick and Reimer, 1966, Figure 15: 11-12).

C. pediculus Ehrenberg 1838 (Figure 4a).

Valves 17-23 µm (12-54 µm) in length and 15-18 µm (7-37 µm) in width, 18-20 (16-24) striae 10 µm and 21 (18-23) puncta 10 µm (Krammer & Lange-Bertalot, 1991b, Figure 55: 1-8).

C. placentula Ehrenberg 1838.

Valves 33-37 µm (7.5-98 µm) in length and 17-24 µm (8-40 µm) in width, 16-18 (14-23) striae 10 µm and 17 (15-20) puncta 10 µm (Krammer & Lange-Bertalot, 1991b, Figure 49: 1-4; 50: 1, 2, 5; 51: 1-9; 52: 1-13; 53: 1-19; 54: 1-12).

C. placentula Ehrenberg var. *euglypta* Grunow 1884

Valves 27 µm (10-46 µm) in length and 23-26 µm in width, 19-20 (19-22) striae 10 µm (Krammer & Lange-Bertalot, 1991b, Figure 49: 3; 50: 1; 53: 1-19).

C. placentula Ehrenberg var. *lineata* Grunow 1884 (Figure 4b).

Valves 28 µm (10-80 µm) in length and 16 µm in width, 18-20 (18-23) striae 10 µm (Krammer & Lange-Bertalot, 1991b, Figure 49: 1; 50: 1-13).

C. rugosa Sovereing 1960.

Valves 33-37 µm (18-63 µm) in length and 23-26 µm (12-52 µm) in width, 14-15 (14-16) striae 10 µm and 16 (15-20) puncta 10 µm (Patrick and Reimer, 1966, Figure 15: 13-14).

Eunotiaceae Kützing 1844

Eunotia Ehrenberg 1837

E. bilunaris (Ehrenberg) Mills 1934 (Figure 4c)

Valves 91-110 µm (10-150 µm) in length and 4 µm (1.9-6 µm) in width, 19-24 (11-28) striae in 10 µm, (Krammer & Lange-Bertalot, 1991a, Figure 137; 138: 10-24).

E. paralella Ehrenberg 1843.

Valves 51-123 µm (30-200 µm) in length and 7-11 µm (5-15 µm) in width, 9-10 (8-16) striae in 10 µm (Krammer & Lange-Bertalot, 1991a, Figure 152: 1-7).

Naviculaceae Kützing 1844

Amphora Ehrenberg in Kützing 1844

A. aequalis Krammer 1980.

Valves 21-25 µm (18-37 µm) in length and 4.5-5 µm (4.7-5.5 µm) in width, 15 (15-17) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 150: 18-22; 13:6; 18: 2).

A. ovalis (Kützing) Kützing 1844 (Figure 5a)

Valves 31-42 µm (30-105 µm) in length and 18-21 µm (17-50 µm) in width, 11-12 (10-13) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 149: 1, 2; 2: 7-9; 7: 7, 8).

Caloneis Cleve 1894

C. alpestris (Grunow) Cleve 1894.

Valves 47-58 µm (45-92 µm) in length and 7-12 µm (6-15 µm) in width, 19-22 (19-24) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 170: 3-7).

C. silicula (Ehrenberg) Cleve1894.

Valves 45 µm (13-120 µm) in length and 8.7-9 µm (5-20 µm) in width, 16-17 (15-20) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 172: 1-13; 7: 6; 9: 3).

Cymbella Agardh 1830

C. affinis Kützing 1844 (Figure 5b).

Valves 47-54 µm (20-70 µm) in length and 8-11 µm (7-16 µm) in width, 8-10 (9-11) mid-dorsal and end 12-13 (12-14) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 125: 1-22; 10: 1).

C. amphicephala Naegeli 1849 (Figure 5c).

Valves 26-28 µm (16-40 µm) in length and 8-9 µm (6-9 µm) in width, 13 (12-15) mid-dorsal and end 19 (17-20) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 142: 3-21).

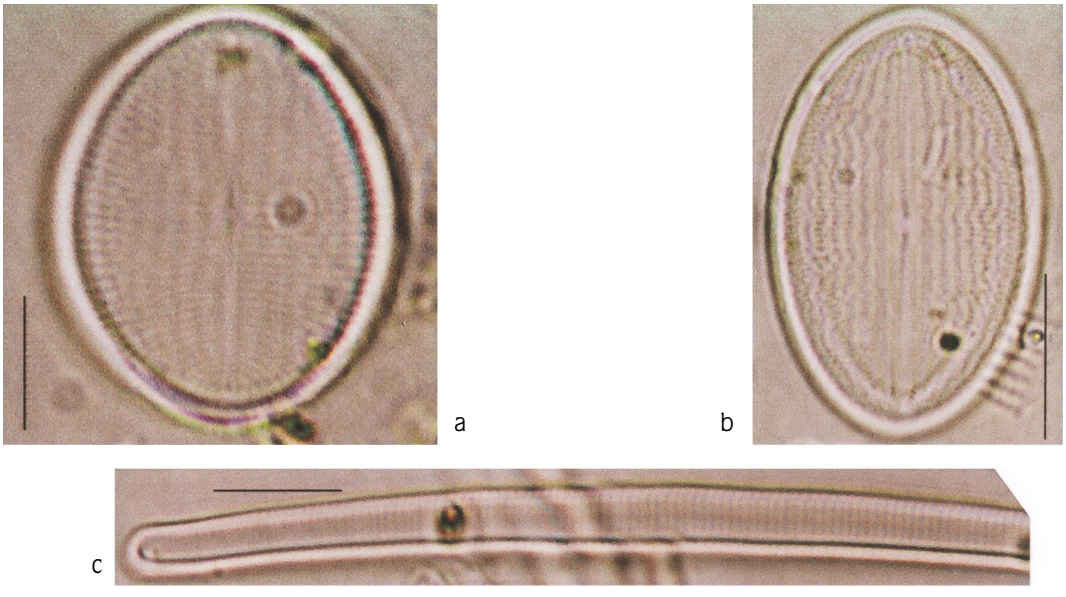

Figure 4. a) *Cocconeis pediculus*, b) *C. placentula* var. *lineata*, c) *Eunotia bilunaris* (Scale 10 µm).

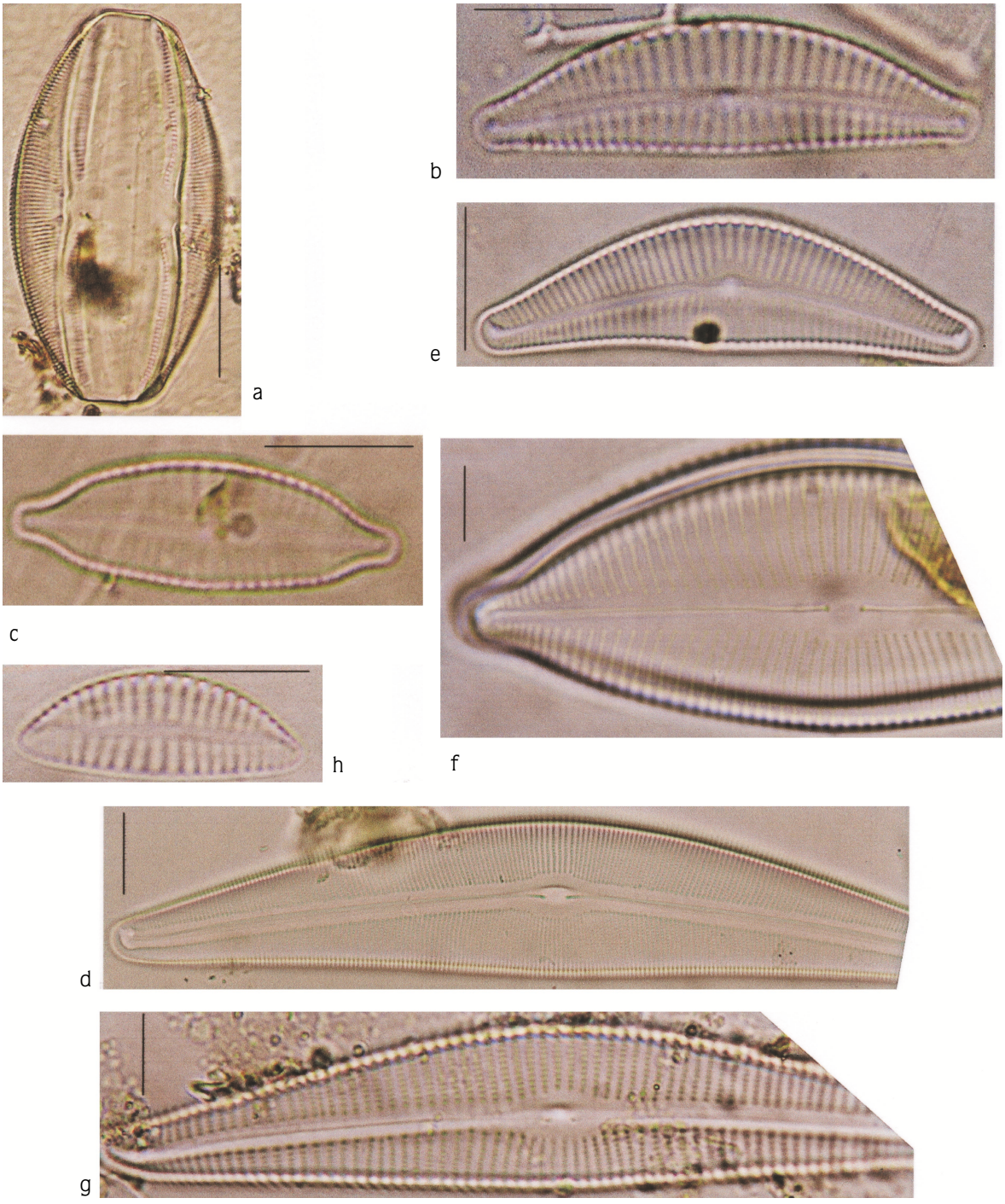

Figure 5. a) *Amphora ovalis*, b) *Cymbella affinis*, c) *C. amphicephala*, d) *C. aspera*, e) *C. cistula*, f) *C. ehrenbergi*, g) *C. helvetica*, h) *C. leptoceros* (Scale 10 µm).

C. aspera (Ehrenberg) Peragallo 1849 (Figure 5d).

Valves 94-135 µm (70-265 µm) in length and 21-25 µm (20-48 µm) in width, 8-9 (7-10) mid-dorsal and end 11 (11-12) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 131: 1; 7: 1; 8: 2; 11: 5).

C. cistula (Ehrenberg) Kirchner 1878 (Figure 5e).

Valves 62-100 µm (35-120 µm) in length and 15-17.5 µm (13-25 µm) in width, 8-9 (7-10) mid-dorsal and end 12 (12-14) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 127: 8-11; 128. 1-6; 10: 5).

C. cuspidata Kützing 1844.

Valves 33-42 µm (28-66 µm) in length and 13-17 µm (14-20 µm) in width, 10-11 (8-12) mid-dorsal striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 146: 1-4).

C. cymbiformis Agardh 1830.

Valves 33-38 µm (25-95 µm) in length and 13-14 µm (8-15 µm) in width, 9 (8-10) mid-dorsal and end 11 (11-15) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 129: 2-9; 5: 5; 12: 5).

C. ehrenbergii Kützing 1844 (Figure 5f)

Valves 100-112 µm (50-225 µm) in length and 33.5-36 µm (19-50 µm) in width, 6 (6-9) mid-dorsal and end 10 (10-12) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 144. 1-6; 8, 4).

C. gracilis (Ehrenberg) Kützing 1844.

Valves 23-28 µm (22-57 µm) in length and 5-6.5 µm (4.5-9 µm) in width, 10-11 (9-14) mid-dorsal striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 120: 1-16; 12: 3 b; 13: 3).

C. helvetica Kützing 1844 (Figure 5g).

Valves 70-107 µm (22-170 µm) in length and 11-20 µm (8-27 µm) in width, 9 (8-12) mid-dorsal and end striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 132: 2-4; 133: 1-8).

C. leptoceros (Ehrenberg) Kützing 1844 (Figure 5h).

Valves 17-25 µm (15-60 µm) in length and 8-11 µm (7-13 µm) in width, 9-11 (9-13) mid-dorsal striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 143: 1-13).

C. lanceolata (Ehrenberg) Kirchner 1878.

Valves 67-97 µm (60-220 µm) in length and 19-23 µm (18-32 µm) in width, 9 (9-10) mid-dorsal and 13-14 (13-16) end striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 124: 1-8).

C. minuta Hilse ex Rabenhorst 1862.

Valves 17-23 µm (7-32 µm) in length and 4-6.5 µm (3.9-7 µm) in width 11-13 (10.5-15) mid-dorsal striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 119: 1-13; 16: 4).

C. proxima Reimer 1975.

Valves 41-68 µm (38-128 µm) in length and 19-24 µm (14-26 µm) in width, 8-9 (7-10) mid-dorsal and 9 (7-14) end striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 128: 9; 129: 1).

C. silesiaca Bleisch 1864.

Valves 18-23 µm (15-46 µm) in length and 8.5-11 µm (6.5-14.2 µm) in width, 11-12 (10.5-15) mid-dorsal and 15 (14-20) end striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 117: 1-24).

C. schimanskii Krammer 1982.

Valves 153-162 µm (145-175 µm) in length and 31-32 µm (29-35 µm) in width, 8 (7-8) mid-dorsal and 9-10 (10-11) end striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 132: 1).

Diploneis Ehrenberg 1844

D. elliptica (Kützing) Cleve 1891 (Figure 6a).

Valves 34 µm (20-130 µm) in length and 16.5 µm (10-60 µm) in width, 11 (8-14) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 108: 1-6).

D. pseudovalis Hustedt 1930.

Valves 19-22 µm (16-31 µm) in length and 10-12 µm (9-14 µm) in width, 11 (8-12) striae 10 µm, and 19 (18-22) puncta 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 108: 11-13).

D. puella (Schumann) Cleve 1894.

Valves 15-16 µm (13-25 µm) in length and 8-11 µm (8-14 µm) in width, 13 (13-18) striae 10 µm, and 17 (16-20) puncta 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 109: 15, 16).

Gomphonema Ehrenberg 1832

G. acuminatum Ehrenberg 1832 (Figure 6b, c).

Valves 30-58 µm (20-120 µm) in length and 5-12.5 µm (5-17 µm) in width, 12 (8-13) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 160: 1-12).

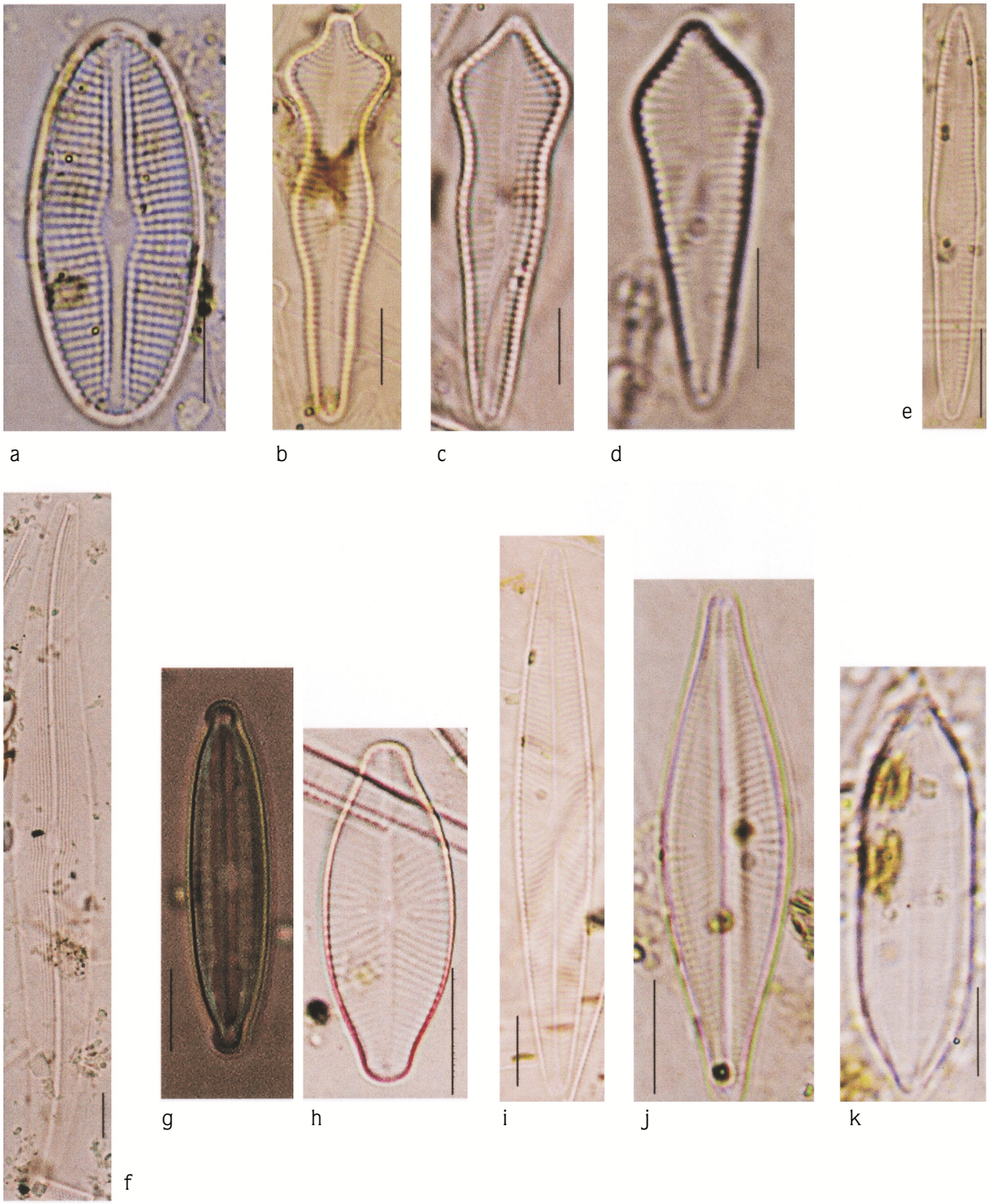

Figure 6. a) *Diploneis elliptica* b-c) *G. acuminatum*, d) *G. augur*, e) *G. hebridense*, f) *Gyrosigma attenuatum*, g) *Mastogloia smithii*, h) *Navicula gastrum,* i) *N. radiosa*, j) *N. trivialis*, k) *Nedium dubium* (Scale 10 µm).

G. angustum Agardh 1831.

Valves 65 µm (12-130 µm) in length and 7 µm (3-12 µm) in width, 7-8 striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 155: 1-21).

G. augur Ehrenberg 1840 (Figure 6d).

Valves 32 µm (17-130 µm) in length and 8-11 µm (8-20 µm) in width, 8 (7-15) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 157: 1-8; 158: 1-6).

G. clavatum Ehrenberg 1832.

Valves 23-27 µm (20-95 µm) in length and 7-11 µm (6-14 µm) in width, 11-12 (9-15) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 163: 1-12).

G. gracile Ehrenberg 1838.

Valves 37-45 µm (20-100 µm) in length and 4.5-6 µm (4-8 µm) in width, 8-9 (4-11) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 156: 1-11; 154: 26, 27).

G. hebridense Ehrenberg 1832 (Figure 6e).

Valves 39-48 µm (30-60 µm) in length and 5-7 µm (4-8 µm) in width, 11-12 (10-14) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 156: 12-14).

G. olivaceum (Hornemann) Brebisson 1838.

Valves 18 µm (8-45 µm) in length and 4.5 µm (3.5-13 µm) in width, 10 (9-16) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 165: 1-18).

G. parvulum (Kützing) Kützing 1849.

Valves 16-24 µm (10-36 µm) in length and 4-7 µm (4-8 µm) in width, 8-12 (7-20) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 154: 1-25).

G. subtile Ehrenberg 1843.

Valves 27-32 µm (24-50 µm) in length and 4-6.5 µm (3.5-8 µm) in width, 12 (10-14) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 162: 10-13).

G. truncatum Ehrenberg 1832.

Valves 18-29 µm (13-75 µm) in length and 8-13 µm (7-17 µm) in width, 10 (9-12) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 159: 11-18).

Gyrosigma Hassall 1843

G. acuminatum (Kützing) Rabenhorst 1853.

Valves 78-148 µm (60-180 µm) in length and 12-16 µm (11-18 µm) in width, 17-18 (16-22) median striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 114: 4, 8).

G. attenuatum (Kützing) Rabenhorst 1853 (Figure 6f).

Valves 215-260 µm (150-240 µm) in length and 25 µm (23-26 µm) in width, 13-14 (14-16) median striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 114: 5, 7, 9; 4: 5, 6; 15: 3; 16: 2, 6).

Mastogloia Thwaites 1856

M. elliptica (Agardh) Cleve 1893.

Valves 37-48 µm (20-80 µm) in length and 11-14 µm (9-18 µm) in width, 16 (15-18) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 201: 10-14; 202: 1, 2; 20: 1).

M. smithii Thwaites 1856 (Figure 6g).

Valves 31-42 µm (20-60 µm) in length and 8-10 µm (8-14 µm) in width, 17 (15-20) mid striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 201: 1,6).

Navicula Borry 1822

N. crytocephala Kützing 1844.

Valves 24-29 µm (20-40 µm) in length and 5-6 µm (5-7 µm) in width, 15-16 (14-17) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 31: 8-14).

N. cuspidata (Kützing) Kützing 1844.

Valves 43-74 µm (30-150 µm) in length and 25-31 µm (13-44 µm) in width, 12 (11-19) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 43: 1-8).

N. gastrum (Ehrenberg) Kützing 1844 (Figure 6h).

Valves 22-31 µm (20-60 µm) in length and 12-14 µm (10-20 µm) in width, 11 (8-13) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 49: 4-9).

N. radiosa Kützing 1844 (Figure 6i).

Valves 72-100 µm (40-120 µm) in length and 11-12 µm (7.5-15 µm) in width, 10-11 (10-12) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 29: 1-4).

N. reinhardtii (Grunow) Grunow 1877

Valves 47-58 µm (35-70 µm) in length and 14-16 µm (11-18 µm) in width, 8-9 (7-9) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 40: 1, 2).

N. rhynchocephala Kützing 1844.

Valves 46-61 µm (35-80 µm) in length and 11-13 µm (9-14 µm) in width, 10-11 (7-12) striae 10 µm

(Krammer & Lange-Bertalot, 1999a, Figure 30: 5-8; 31: 1, 2).

N. trivialis Lange-Bertalot 1980 (Figure 6j).

Valves 40-48.5 µm (25-65 µm) in length and 10-12 µm (8-12.5 µm) in width, 11-12 (11-13) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 35: 1-4).

Nedium Pfitzer 1871

N. dubium (Ehrenberg) Cleve 1894 (Figure 6k).

Valves 38 µm (30-58 µm) in length and 10 µm (10-16 µm) in width, 18 (16-24) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 99: 1-7).

Pinnularia Ehrenberg 1843

P. divergens Smith 1853.

Valves 84-137 µm (50-160 µm) in length and 17-28 µm (13-30 µm) in width, 9-10 (8-12) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 179: 3-8).

P. gibba Ehrenberg 1841.

Valves 63-98 µm (50-140 µm) in length and 8-11 µm (7-13 µm) in width, 9-11 (9-12) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 99: 1-7).

P. interrupta Smith 1853 (Figure 7a).

Valves 48 µm (26-80 µm) in length and 10 µm (6.7-16 µm) in width, 11 (9-15) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 99: 1-7).

P. legumen (Ehrenberg) Ehrenberg 1843.

Valves 72-97 µm (60-130 µm) in length and 17-21 µm (15-23 µm) in width, 8-10 (8-12) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 184: 1-4).

P. maior (Kützing) Rabenhorst 1853.

Valves 156-245 µm (140-340 µm) in length and 28-37 µm (25-42 µm) in width, 5-6 (5-7) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 196: 1-4; 7: 3-4; 13: 7).

P. microstauron (Ehrenberg) Cleve 1891 (Figure 7b, c).

Valves 42 µm (20-90 µm) in length and 10 µm (7-11 µm) in width, 10-12 (10-13) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 191. 7-9).

P. rubestris (Ehrenberg) W.Smith 1856.

Valves 48-63 µm (40-75 µm) in length and 8-10 µm (7-11 µm) in width, 8-9 (7-11) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 181: 4-10; 18: 4).

P. viridis (Nitzsch) Ehrenberg 1843.

Valves 69-156 µm (50-170 µm) in length and 12-23 µm (10-30 µm) in width, 7-9 (6-12) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 194: 1-4; 195: 1-6; 2: 4-6).

Rhoicophenia Grunow 1860.

R. abbreviata (Agardh) Lange-Bertalot 1980b.

Valves 22.5 µm (10-75 µm) in length and 7.6 µm (3-8 µm) in width, 16 (15-20) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 91: 20-28).

Stauroneis Ehrenberg 1843

S. anceps Ehrenberg 1843.

Valves 38-98 µm (20-130 µm) in length and 8-16 µm (6-18 µm) in width, 22-24 (20-33) striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 87: 3-9; 88: 1-4).

S. phoenicenteron Ehrenberg 1843

Valves 198-227 µm (70-360 µm) in length and 39-54 µm (16-53 µm) in width, 12 (12-20) mid-dorsal striae 10 µm (Krammer & Lange-Bertalot, 1999a, Figure 6: 7-8; 8: 3; 15: 2; 18:1-3).

Bacillariaceae Ehrenberg 1840

Hantzschia Grunow 1877

H. amphioxys (Ehrenberg) Grunow 1880 (Figure 7d).

Valves 49-76 µm (20-300 µm) in length and 7-21 µm (5-25 µm) in width, 11-15 (11-28) striae 10 µm, 8 (4-11) fibula 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 88: 1-7).

Nitzschia Hassall 1845

N. angustata (Smith) Grunow 1880.

Valves 47-94 µm (20-180 µm) in length and 6.5-9 µm (4-12 µm) in width, 12 (11-18) striae 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 36: 1-5).

N. palea (Kützing) Smith 1856.

Valves 21-37 µm (15-70 µm) in length and 3-4 µm (2.5-5 µm) in width, 27-29 (28-40) striae 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 59: 1-24; 60: 1-7).

N. recta Hantzsch 1861.

Valves 49-112 µm (35-130 µm) in length and 4-7 µm (3.5-8 µm) in width, 29 (28-32) striae 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 12: 1-11).

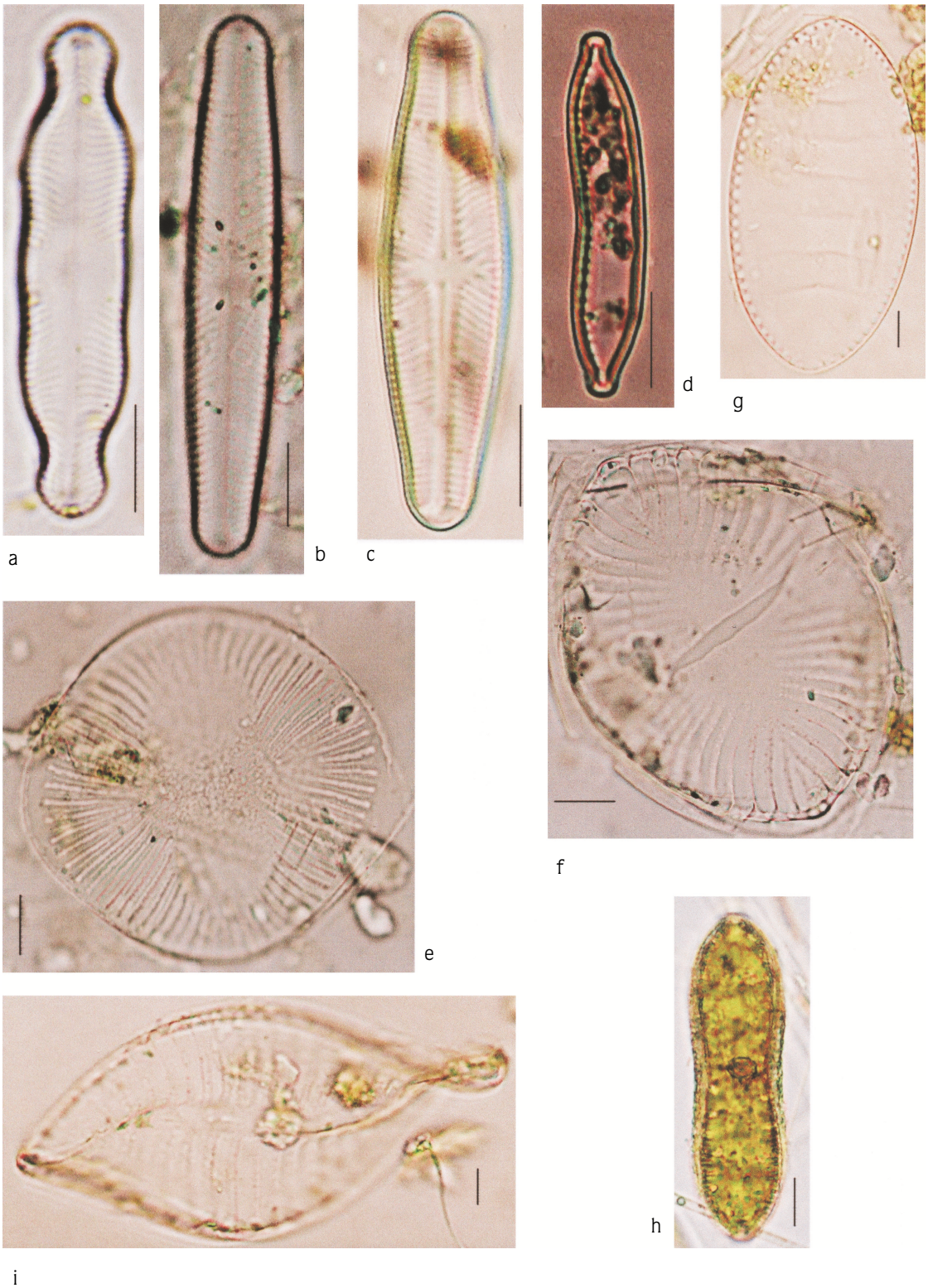

Figure 7. a) *Pinnularia interrupta*, b, c) *P. microstauron*, d) *Hantzschia amphioxys*, e) *Campylodiscus hibernicus*, f) *C. noricus*, g) *Cymatopleura elliptica*, h) *C. solea* var. *apiculata* i) *Surirella spiralis* (Scale 10 µm).

N. sigma (Kützing) Smith 1853.

Valves 57-189 µm (35-1000 µm) in length and 8-23 µm (4-26 µm) in width, 16-18 (15-38) striae 10 µm, 4-6 (3-12) fibula 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 23: 1-9).

N. sigmoidea (Nitzsch) Smith 1853.

Valves 245 µm (90-500 µm) in length and 10 µm (8-15 µm) in width, 23 (21-27) striae 10 µm, 5 (5-7) fibula 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 4: 1, 2; 5: 1-5).

N. vermicularis (Kützing) Hantzsch 1860.

Valves 87-156 µm (75-250 µm) in length and 4-6.5 µm (3.5-7 µm) in width, 29-32 (30-40) striae 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 4: 4, 5; 7: 1-7; 8: 1, 2).

N. wuellerstorffii Lange-Bertalot 1987.

Valves 161-214 µm (140-250 µm) in length and 8 µm (8-8.5 µm) in width, 30 (30-31.5) striae 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 4: 3; 6: 1-6).

Epithemiaceae Karsten 1928

Denticula Kützing 1844

D. elegans Kützing 1844

Valves 24-28 µm (15-45 µm) in length and 4-6 µm (4-8 µm) in width, 16 (15-18) striae 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 94: 1, 2; 96: 10-33; 97: 1-5).

Epithemia Brebisson 1844

E. argus (Ehrenberg) Kützing 1844.

Valves 27-39 µm (20-130 µm) in length and 6-9 µm (4-18 µm) in width, 9-11 (8-14) striae 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 102: 1-9; 103: 1-5).

E. adnata (Kützing) Brebisson 1838.

Valves 57.5-117.5 µm (15-150 µm) in length and 7.5-14 µm (7-14 µm) in width, 9-11 (11-14) striae 10 µm, 48 (20-80) fibula 100 µm (Krammer & Lange-Bertalot, 1999b, Figure 107: 1-11; 108: 1-3).

E. goeppertiana Hilse 1860.

Valves 43-76 µm (40-120 µm) in length and 13-15 µm (12-18 µm) in width, 10 (10-12) striae 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 103: 6-9).

E. sorex Kützing 1844.

Valves 27.5-31 µm (8-70 µm) in length and 7.5-16 µm (6.5-16 µm) in width, 11 (10-15) striae 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 106. 1-14).

E. turgida (Ehrenberg) Kützing 1844

Valves 170 µm (45-200 µm) in length and 20 µm (13-35 µm) in width, 7 (7-9) striae 10 µm, 35 (30-50) fibula 100 µm (Krammer & Lange-Bertalot, 1999b, Figure 108: 4-8; 109: 1-7).

Rhopalodia Müller 1895

R. gibba Müller 1895.

Valves 92.5-245 µm (22-300 µm) in length and 25 µm (18-30 µm) in width, 54 (50-80) fibula 100 µm, and 12 (12-17) inter fibula 10 µm (Krammer & Lange-Bertalot, 1999b, Figure 110: 1; 111: 1-13; 111A: 1-7).

Surirellaceae Kützing 1844

Campylodiscus Ehrenberg 1840

C. hibernicus Ehrenberg 1845 (Figure 7e).

Valves 55-57 µm (25-150 µm) in diameter, 12 (10-20) fibula 100 µm (Krammer & Lange-Bertalot, 1999b, Figure 175: 5; 179: 1-4; 180: 1-7; 181: 1-3)

C. noricus Ehrenberg 1840 (Figure 7f).

Valves 62-113 µm (60-150 µm) in diameter, 23-25 (20-30) fibula 100 µm (Krammer & Lange-Bertalot, 1999b, Figure 182: 1-5)

Cymatopleura Smith 1851

C. elliptica Smith 1851 (Figure 7g).

Valves 82.5-90 µm (60-280 µm) in length and 42.5-47.5 µm (30-90 µm) in width, 4 (2.5-6) fibula 10 µm, 15-17 (15-20) striae 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 119: 1-4; 120: 1-6; 121: 1-3; 122: 3).

C. solea Smith 1851

Valves 87 µm (30-300 µm) in length and 22.5 µm (10-45 µm) in width, 6 (6-9) fibula 10 µm, 26-28 (25-32) striae 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 116:1- 4; 117: 1-5; 118: 1-8; 122: 4).

C. solea W. Smith var. *apiculata* Ralfs 1861 (Figure 7h).

Valves 67.5 µm in length and 16 µm in width, 5-6 fibula 10 µm, 23-27 (25-32) striae 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 118: 2, 4-8).

Stenopterobia Brebisson 1878

S. curvula (Smith) Krammer 1987.

Valves 110 µm (70-280 µm) in length and 6.5 µm (6-9 µm) in width, 34 (30-60) fibula 100 µm, 22 (22-24) striae 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 170: 1, 2; 171: 5-9; 172: 1-3).

Surirella Turpin 1828

S. angusta Kützing 1844.

Valves 21-41 µm (18-70 µm) in length and 7-13 µm (6-15 µm) in width, 1:3-1:4 (1:3-1:5) length:width ratio, 21-24 (20-28) striae 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 133: 6-13; 134: 1, 6-10).

S. biseriata Brebisson 1836.

Valves 87-317 µm (80-400 µm) in length and 33-79 µm (30-90 µm) in width, 14 (10-20) striae 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 141: 1-3; 142: 1-5; 143: 1-9; 144: 1-3; 145: 1).

S. ovalis Brebisson 1838.

Valves 27-53 µm (16-120 µm) in length and 15-36 µm (12-45 µm) in width, 1:1.5-1:3 (1:3-1:1) length: width ratio, 17 (16-19) striae 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 125: 1-7; 126: 1).

S. robusta Ehrenberg 1841.

Valves 178-359 µm (150-400 µm) in length and 67-114 µm (50-150 µm) in width, 7-8 (7-12) canal 100 µm, (Krammer & Lange-Bertalot, 1999b, Figure 156: 1-5; 157: 1-4).

S. spiralis Kützing 1844 (Figure 7i).

Valves 91-126 µm (40-220 µm) in length and 58-64 µm (50-80 µm) in width, 24-25 (25) striae 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 168: 1-7).

S. subsalsa Smith 1853.

Valves 17-24 µm (15-48 µm) in length and 9-11 µm (8-16 µm) in width, 10-11 (10-13) striae 10 µm, (Krammer & Lange-Bertalot, 1999b, Figure 128: 1-10).

Surirella sp.

Valves 37-52 µm in length and 16-24 µm in width, 15-17 striae 10 µm.

Discussion

In the present study, 123 diatom taxa were identified from Lake Abant. Eleven taxa with 5 genera in Centrales, and 112 taxa with 29 genera in the order Pennales were described. The diatom flora of the lake was dominated by members of the Naviculaceae at about 45% abundance, including 55 taxa in 12 genera. In a previous study on Lake Abant, Obalı et al. (2002) reported 83 algae taxa, of which only 34 belonged to the Bacillariophyceae. In contrast, our study over 2 years reports much higher numbers of diatom species. Such differences are possibly because of different sampling times and different numbers of stations sampled. These differences affected the results. Indeed, these authors reported some genera with lower taxa such as 5, 4, and 3 taxa belonging to *Navicula, Cymbella*, and *Gomphonema*, respectively. In the present study, however, *Navicula* had 7 taxa, *Cymbella* 14, and *Gomphonema* 10. Moreover, *Fragilaria* and *Pinnularia* had 15 and 9 taxa, respectively. An average of 53 taxa occurred per month during our study. Numbers of species were increased in some months (e.g., November (83 taxa) and December (68 taxa)) from 2003 to (e.g., August (65 taxa) and September (76 taxa)) the second year 2004. In addition, the lowest number of species was detected in September 2003 with 33 taxa. These results clearly show the importance of long-term monthly (or even weekly) sampling.

Most of the members of Bacillariophyceae collected from Lake Abant have a wide distribution; they were already reported in earlier studies from different parts of Turkey (Gönülol et al., 1996). For example, some species including *A. formosa, C. silesiaca, C. cistula, F. biceps, F. dilata, N. radiosa*, and *R. gibba* were reported in almost every month from each station. These diatoms are already known to be commonly distributed in different parts of Turkey. However, some species such as *C. praetermisa, S. alpinus, T. rupestris, N. gastrum*, and *C. solea* var. *apiculata* found in Lake Abant were rarely reported in the aquatic ecosystem of Turkey (Gönülol et al., 1996). One of the critical similarities among the previous reports and the results of the present study is that most of the diatoms described are known to prefer nutrient-rich environments (Patrick and Reimer 1966, 1975; Krammer & Lange-Bertalot 1991a, 1991b, 1999a, 1999b). This may suggest changes in the water quality of Lake Abant.

A. formosa, which was the most common diatom in Lake Abant during spring (especially in April 2004 and 2005), has been reported as the dominant species in mesotrophic lakes and is also found in eutrophic lakes

(Nygaard, 1949; Round, 1981). This species is not only commonly distributed in European lakes, but is also generally found in almost all types of water bodies such as lakes, marshes, and ponds (Çetin & Şen, 1998; Gönülol & Obalı, 1998; Obalı et al., 2002; Akbulut, 2003). Horne & Goldman (1994) and Wetzel (1975) have already reported that *Asterionella* is a common diatom in the spring bloom of temperate lakes throughout the world. Furthermore, in a current study, Çelekli & Külköylüoğlu (in press) stated that *A. formosa* was dominant from April to May 2004, when phosphate concentrations of the spring water were the greatest in a karstic spring called Akkaya Spring (Bolu, Turkey). Similarly, Hutchinson (1967) stated that in productive lakes *Melosira* can be an abundant species in winter, and following *Asterionella* reached a high level during spring. In our study, *A. granulata* was commonly encountered except for in a few months in the summer. The genus *Fragilaria* consisted of 15 taxa. Some of them such as *F. biceps, F. dilata,* and *F. pinnata* were identified in almost every month from each station. These taxa were followed by *F. crotonensis*, which was observed sometimes in some months in the autumn. Many species such as *A. formosa* as well as *F. crotonensis* and *M. granulata* were characterised as eutrophic diatom plankton. Since these taxa have wide ranges of tolerance to environmental changes, they can also be found from oligotrophic to eutrophic conditions (Hutchinson, 1967; Wetzel, 1975; Round, 1981).

Many members of *Fragilaria* (the most common genus in the present study) were distributed in all sampling stations during the study period. Many species of this genus were commonly found in different parts of Turkey (Gönülol et al., 1996). Similar to *Asterionella* species, many species of *Fragilaria* also prefer nutrient-rich environments, and so they can be found especially in meso-eutrophic waters (Hutchinson, 1967; Round, 1981). Obalı et al. (2002) underlined that some species identified previously from Lake Abant with mesotrophic characteristics were indicator species of polluted water. This finding was also supported in the present study.

Some species of *Navicula* such as *N. radiosa* and *N. trivialis* were also reported from different lakes with special ecological characteristic in Turkey (Gönülol et al., 1996). Similarly, these taxa were commonly found in Lake Abant. *N. cryptocephala* and *F. ulna*, which were found at moderate levels in Lake Abant, are known to have a broad distribution in Turkey (Gönülol et al., 1996) and Europe (Kitner & Poulickova, 2003).

The genus Gomphonema was represented by 10 taxa in Lake Abant, among which *G. acuminatun, G. truncatum*, and *G. gracile* were common species in almost all stations. Patrick & Reimer (1975) stated that *G. acuminatun* and *G. truncatum* were found from oligotrophic to mesotrophic waters. The genera *Gomphonema* and *Nitzschia* distributed commonly in temperate lakes have wide tolerances to organic pollution (Round, 1981). *Nitzschia*, with 7 taxa, is an important part of the diatom composition of Lake Abant. Some species such as *N. sigmoidae* and *N. vermicularis* were identified in some months. Round (1981) reported that members of this genus generally prefer organic-rich environments and high alkalinity waters. Overall, the results of this study indicate that there are some kinds of changes in the water quality of Lake Abant reflected by the diatom composition during our study.

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