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THE DIATOMS OF KOBYLANKA STREAM NEAR KRAKÓW (WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND, S POLAND)

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Abstract. The diatoms of Kobylanka stream, a small watercourse near Kraków (Wyżyna Krakowsko-Częstochowska upland, S Poland), are described, illustrated with more than 1300 SEM and LM micrographs, and briefly discussed. Information on their ecology and their distribution generally, in Poland and on the Wyżyna Krakowsko-Częstochowska is provided for every taxon from Kobylanka stream. The 307 diatom taxa identified in the stream include 289 species of 64 genera, 16 varieties and two forms; 26 diatoms are identified only to genus level. The first Polish records of 27 species are reported: *Achnanthidium jackii* Rabhenhorst, *Chamaepinnularia submuscicola* (Krasske) Lange-Bertalot, *Cymbella affiniformis* Krammer, *C. lange-bertalotii* Krammer, *Cymbopleura hercynica* (A. Schmidt) Krammer, *C. inaequaliformis* Krammer, *Diatoma moniliformis* Kützing, *Diploneis fontanella* Lange-Bertalot, *Encyonema lange-bertalotii* Krammer, *Gomphonema parvulum* (Kützing) Rabenhorst var. *parvulius* Lange-Bertalot & Reichardt, *G. parvulum* var. *parvulum* f. *saprophilum* Lange-Bertalot & Reichardt, *Luticola paramutica* (Bock) D.G. Mann var. *binodis* (Bock) Van de Vijver, *L. ventriconfusa* Lange-Bertalot, *Navicula vilaplanii* (Lange-Bertalot & Sabater) Lange-Bertalot & Sabater, *Nitzschia frequens* Hustedt, *N. tubicola* Grunow, *Pinnularia frequentis* Krammer, *P. isselana* Krammer, *P. kuetzingii* Krammer, *P. subcomutata* Krammer, *Planothidium minutissimum* (Krasske) Morales, *Sellaphora nana* (Hustedt) Lange-Bertalot, *Simonsenia delognei* (Grunow) Lange-Bertalot, *Stauroneis leguminopsis* Lange-Bertalot & Krammer, *S. prominula* (Grunow) Hustedt, *S. separanda* Lange-Bertalot & Werum, *Surirella terricola* Lange-Bertalot & Alles. 47 diatoms are new to the Wyżyna Krakowsko-Częstochowska upland: *Achnanthidium eutrophilum* (Lange-Bertalot) Lange-Bertalot, *A. minutissimum* (Kützing) Czarnecki var. *inconspicua* Østrup, *Amphora inariensis* Krammer, *A. montana* Krasske, *A. veneta* Kützing, *Caloneis aerophila* Bock, *Chamaepinnularia krookiformis* (Krammer) Lange-Bertalot & Krammer, *Cocconeis pseudolineata* (Geitler) Lange-Bertalot, *Craticula accomoda* (Hustedt) D.G. Mann, *C. molestiformis* (Hustedt) D.G. Mann, *Cylindrotheca gracilis* (Brébisson) Grunow, *Cymbella proxima* Reimer, *Cymbopleura subaequalis* (Grunow) Krammer, *Encyonema caespitosum* Kützing, *Eolimna subminuscula* (Manguin) Moser, Lange-Bertalot & Metzeltin, *Eunotia incisa* Gregory, *Fragilaria austriaca* (Grunow) Lange-Bertalot, *F. bidens* Heiberg, *Gomphocymbellopsis ancyli* (Cleve) Krammer, *Gomphonema sarcophagus* Gregory, *Grunowia sinuata* Thwaites, *Luticola acidoclinata* Lange-Bertalot, *L. goeppertiana* (Bleisch) D.G. Mann, *Mayamaea atomus* var. *permitis* (Hustedt) Lange-Bertalot, *Navicula cryptotenella* Lange-Bertalot, *N. cryptotenelloides* Lange-Bertalot, *N. moskali* Metzeltin, Witkowski & Lange-Bertalot, *N. tenelloides* Hustedt, *N. upsaliensis* (Grunow) Peragallo, *Naviculadicta brockmannii* (Hustedt) Lange-Bertalot, *Nitzschia archibaldii* Lange-Bertalot, *N. constricta* (Kützing) Ralfs, *N. inconspicua* Grunow, *N. media* Hantzsch, *N. pura* Hustedt, *N. pusilla* Grunow, *N. sociabilis* Hustedt, *N. supralitorea* Lange-Bertalot, *Pinnularia obscura* Krasske, *P. septentrionalis* Krammer, *Placoneis clementis* (Grunow) Cox, *P. paraelginensis* Lange-Bertalot, *P. porifera* (Hustedt) Cox, *Stauroneis tackei* (Hustedt) Krammer, Lange-Bertalot, Kuesber & Metzeltin, *Surirella crumena* (Brébisson) Van Heurck, *Tryblionella debilis* Arnott, and *T. levidensis* W. Smith.

Key words: Bacillariophyta, small watercourses, long-term study, species richness, taxonomy, ecology, distribution

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INTRODUCTION

Diatoms are a very diverse group of algae and one of the most common producers of organic matter in streams. They are good bioindicators, as diatom assemblages quickly respond to environmental changes, due to their relatively short life spans and rapid immigration rates (e.g., Dixit *et al*. 1992; Prygiel *et al.* 1999). Diatoms can also be applied in general aquatic bioassessment, which uses species richness, composition and abundance to assess human impacts on aquatic environments, and global changes in biodiversity (Stoermer & Smol 1999). Habitat destruction and eutrophication threaten many diatom species with extinction. The most threatened taxa are believed to be those that occur only in restricted habitats and are usually found in low numbers.

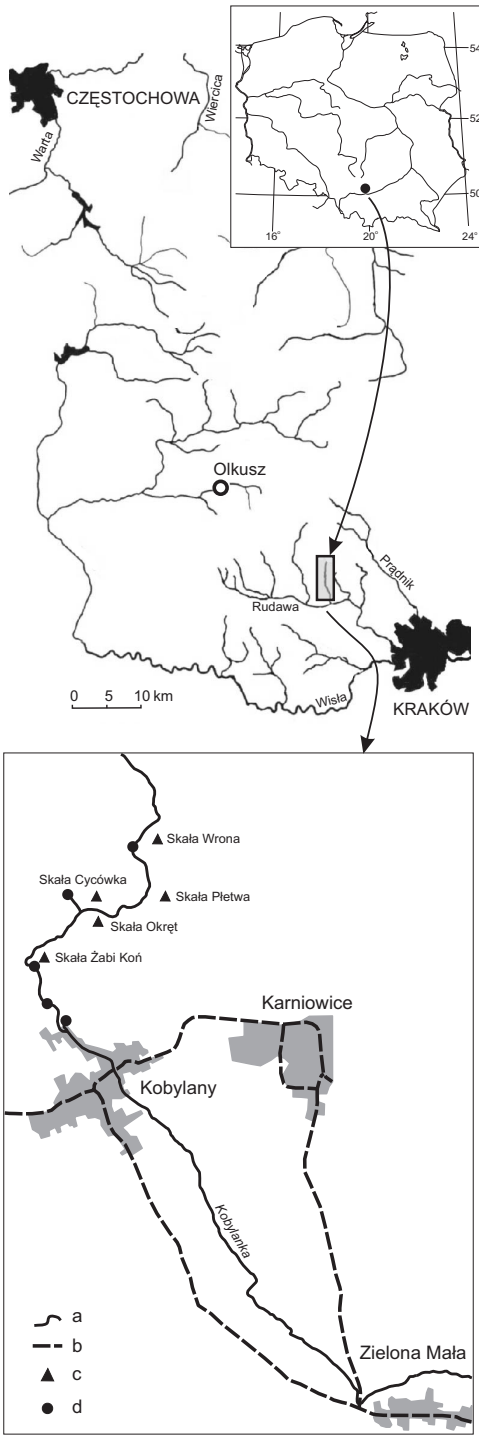


Fig. 1. Location of studied area. a – rivers, b – roads, c – rocks, d – springs.

Species richness is related to environmental conditions, habitat heterogeneity (Wetzel 1983), and it depends on the sample size (Kawecka & Eloranta 1994), and survey intensity. The diatom flora of European water systems, especially anthropogenically altered ones, are relatively simple, well-studied and predictable, reflecting environmental conditions related to the character of the water body and the water quality (Whitton & Rott 1996; Kawecka & Kwandrans 2000). The range of physical and chemical variables, and of microhabitat diversity, is much more limited for small first-order streams than for large rivers.

Diatoms, especially those in mountain watercourses, have been studied for a long time (e.g., Kawecka 1980; Reichardt 1984; Kwandrans 1986, 1993; Cantonati *et al*. 2001; Picińska-Fałtynowicz 2007), but no detailed taxonomic assessment based on long-term study has been performed for any first-order stream so far. Floristic aspects of algae of calcium-rich water environments in the Wyżyna Krakowsko-Częstochowska upland have been the subject of investigations for over 120 years. Data on over 600 taxa reported from the area can be found in more than 50 publications, but most of the records concern dominant or at least common diatoms. The diatom flora of the region's streams and springs has been the subject of many floristic studies, especially since the middle of the twentieth century (e.g., Kądziołka 1963; Stępień 1963; Skalska 1966a; Kubik 1970; Hojda 1971), including springs of Kobylanka stream (Skalna 1969). Most of those reports are not supported and validated by any documentation, simply listing species names, sometimes giving line drawings of the most important diatoms, and almost never indicating a repository where the material is deposited. Detailed investigations of Kobylanka stream in 1993–2006 unexpectedly yielded many new diatom records for the area, including several of particular interest for the Polish flora as a whole (e.g., Wojtal 2001a, b, 2003a, b, 2004b). The present work presents the astonishing species richness of the diatoms in the inconspicuous aquatic environment as the Kobylanka stream. The present work, describing the diatoms of the Kobylanka stream, demonstrates the astonishing

species richness of these organisms inhabiting such an inconspicuous aquatic environment.

Study Area

The Wyżyna Krakowsko-Częstochowska upland, covering 2650 km^2, extends from the Carpathian foothills in the vicinity of Kraków to the south, to the town of Częstochowa in the north (Figs 1a & b). It is *ca* 80 km long and *ca* 20 km wide, and rises to 350 m a.s.l. on average. Geologically it is karst formed in Upper Jurassic carbonate rock and further altered since the Cretaceous (Różkowski 1996). Tectonic activity broke the karst into a number of blocks seen in its modern morphology as deep, steep valleys. Above the valleys are mostly arable fields and only small patches of mixed acidophilous forest (*Pino-Quercetum*), and the valley slopes are overgrown by beech forest (*Dentario glandulosae-Fagetum*), mixed deciduous forest (*Tilio-Carpinetum*), xerothermic brushwood (*Peucedano cervariae-Coryletum*) and xerothermic grasslands (*Origano-Brachypodietum* and *Festucetum pallentis*). The valley bottom is overgrown mainly by riverside forests (*Alno-Padion*) and secondary fresh-hay meadows (*Molinio-Arrhenatheratea*) (e.g., Medwecka-Kornaś & Kornaś 1992; Hereźniak 1993; Towpasz 1996).

Kobylanka stream (7.3 km long, average depth 20 cm), situated *ca* 30 km northwest of Kraków (50°09′885″N, 19°45′846″E; 50°09′319″N, 19°45′354″E), is one of the typical southern Wyżyna Krakowsko-Częstochowska upland streams running through a karstic area covered by loess sediments. The Kobylanka streambed is imbricated mostly by limestone gravel, overgrown at places by *Veronica beccabunga* L. and such mosses as *Philonotis* sp. and *Cratoneuron* sp. in the valley; in Kobylany village the stone-imbricated streambed is overgrown by filamentous algae such as *Cladophora* sp. and *Vaucheria* sp., and covered by mud in places protected from current.

The first sampling site (first spring) is at 313 m a.s.l, and the last sampling site at 234 m a.s.l. The slope is 31.2‰ in the upper part of the valley, 19.3‰ in the lower part of the valley, and *ca* 6.9‰ below Kobylany village. The stream velocity ranges from 10 to 18 cm/s^{-1}. Water conductivity is moderate, in the range of 292–569 μS cm^{-1}, and pH generally fluctuates around 7 (Table 1). The upper course of Kobylanka stream, above Kobylany village (Fig. 1c), is impacted by tourism and agriculture, whereas the lower course, below the village, is additionally affected by sewage pollution and channel modifications.

Table 1. Chemical and physical characteristics of Kobylanka stream for 1993–1996 (* – single measurement).

Parameter	Dolina Kobylańska valley	Kobylany village	Zielona village
Water temperature °C	6.2–10.0	5.5–15.0	7.0–12.0
Conductivity μS cm^{-1}	292–480	400–534	410–569
Oxygen (O_2) mg l^{-1}	6.5–10.8	7.6–12.0	7.6–8.8
Phosphate (PO_4^{3+}) mg l^{-1}	0.08–0.2	0.2–0.21	–
Nitrate (NO_3^-) mg l^{-1}	15.5–20.2	19.0*	20.3*
Chlorine (Cl^-) mg l^{-1}	10.0–24.0	11.0–44.0	18.0–42.0
Sulphate (SO_4^{2-}) mg l^{-1}	3.0–16.7	20.7*	6.2*
Natrium (Na^+) mg l^{-1}	2.6*	–	8.7*
Magnesium (Mg^{2+}) mg l^{-1}	2.3*	–	10.5*
Potassium (K^+) mg l^{-1}	0.8*	–	4.8*
Calcium (Ca^{2+}) mg l^{-1}	9.0–21.4	10.0–12.5	10.4–36.6
Carbonate hardness (acid-binding capacity) mmol/l	10.4–15.1	11.2–16.0	11.2–14.3
Total hardness mmol/l	10.6–18.5	11.5–17.4	11.8–15.1

Materials and methods

This monograph presents the floristic part of studies based on material collected and used for a doctoral dissertation (Wojtal 2001c) and samples collected later in more recent studies. The data, derived from 480 samples within three projects (1993–2007), covers Kobylanka stream and its springs. The material was collected from stream springs, a section of the Dolina Kobylańska valley, Kobylany village, and diverse aquatic microhabitats below the village; collections were made every month from January 1993 to December 1994. Later, sampling was generally limited to certain periods and/or habitats. Samples were collected from a range of stream microhabitats: the epilithon, periphyton (cyanoprocariotic and filamentous algae thalli, mosses, grasses, other vascular plants), and epipelon. Samples from submerged stones were collected by scraping with a scalpel blade or brushing the upper surface of submerged stones. Stones overgrown by filamentous algae or covered by mud were avoided due to possible contamination by non-epilithic diatoms. Periphyton samples contained non-washed parts of submerged macroalgae and macrophytes. Epipelon samples were collected from the uppermost layer of mud with a spoon or pipette aspirator. Portions of the samples were preserved with 4% formaldehyde solution.

To remove carbonates, 10% HCl was added to the samples in 250 ml glass bakers and boiled for 15 min after 24 h. Then the material was washed at least fives times with distilled water, with 24 h settling time between each decanting. Then the samples were boiled in 30% H_2O_2 with small amounts of $KClO_3$, or using strong (>30%) acids (H_2SO_4, HNO_3) to remove organic matter. After washing several times with distilled water the material was air-dried on coverglasses and mounted in Naphrax resin. They were observed with a Nikon Optiphot microscope equipped with a Planchromatic 100x oil-immersion lens and differential interference contrast (DIC) optics. SEM observations used cleaned, gold-coated material. SEM micrographs were taken mainly at the Institute of Metallurgy and Materials Science (Polish Academy of Sciences) and at the Laboratory of Field Emission Microscopy, Scanning Electron Microscopy and Microanalysis (Institute of Geological Sciences of the Jagiellonian University), and additionally at Goethe University in Frankfurt and in the Natural History Museum in Budapest.

Diatom identification was mainly based on Krammer and Lange-Bertalot (1986, 1988, 1991a, b), Krammer (1997a, b, 2000, 2002, 2003), Lange-Bertalot (1993, 2001), Lange-Bertalot and Krammer (1989), Lange-Bertalot *et al.* (1996, 2003), Reichardt (1991) and a number of specialized references listed with the respective taxa. Each taxonomic description is presented with the full name and authority, followed by the most important synonyms, and morphometric data from this study. Remarks on the autecology and general distribution mainly follow Van Dam *et al.*'s (1994) classification and the references listed. Other ecological data such as habitat affinity are indicated when observed. Species composition and quantitative relationships were estimated from the slides under 1000× magnification. Species abundance was estimated on a five-degree scale as follows: rare – single valve or frustule only; sparse – up to 10% of samples; frequent – 11–50% of samples; very frequent – 51–75% of samples; common – in more than 75% of samples.

The general distribution, based on the relevant literature, is provided for every taxon found in Kobylanka stream. Data on the distribution of the species in Poland up to 1990 were obtained from references compiled for diatom names in the *Catalogue of Polish Procariotic and Eucariotic Algae* (Siemińska & Wołowski 2003), supplemented by additional literature cited. The distribution in Poland and the general distribution were estimated on a seven-degree scale as follows: very rare – 1–5 records; rare – 6–15; not frequent – 16–35; frequent – 36–50; common – 51–65; very common – more than 65. According to the new geographical division of Polish uplands, the Kraków and Vistula River are situated outside the Wyżyna Krakowsko-Częstochowska upland (Kondracki 2000). However, because the Vistula River was considered the natural border of the upland for many years and consequently taken into account in phycological surveys of the upland (e.g., Wołowski 1998; Wojtal & Kwandrans 2006), publications on diatoms from the Vistula River in Kraków (e.g., Turoboyski 1962; Uherkovich 1970) are included here with the upland literature. In the case of studies comprising large rivers crossing the Wyżyna Krakowsko-Częstochowska upland, such as the Pilica (Kadłubowska 1964a, b) and the Vistula (Starmach 1938), distribution data are provided only from sites located in the upland area.

Species and infraspecific taxa are arranged alphabetically in the text. The illustrative part is arranged roughly systematically, according to Round *et al.*'s (1990) system. In the list an asterisk (*) precedes the names of species new for the area, and a double asterisk (**) precedes species new for Poland. The material studied is deposited in the collection of the Department of Phycology, W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

Results

1. ***Achnanthes*** Bory

1. ***Achnanthes*** cf. ***brevipes*** Agardh var. ***intermedia*** (Kützing) Cleve Plate 4: 11

Achnanthes intermedia Kützing

Ref. Krammer & Lange-Bertalot 1991b (p. 3, Fig. 1: 4–8).

Dimensions. Valves 28.8–34.2 µm long and 6.8–10.0 µm wide. Sternum valve with 12.0–14.5 striae per 10 µm.

Distribution in Kobylanka stream. Rare, in epipelon sample from below Kobylany village.

Distribution in the Wyżyna Krakowsko-Częstochowska upland. Spring in Dubie (Skalska 1966a, b).

Distribution in Poland. Rare (Siemińska & Wołowski 2003). Reported from, e.g., Zatoka Gdańska (Witkowski 1994), salt spring in Pełczyska (Rakowska 1997, 2001) and Zatoka Pucka (Witak 2002). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

General distribution and ecology. Cosmopolitan, halophilous diatom (Krammer & Lange-Bertalot 1991b), euplanktonic (Denys 1991).

Remarks. Probably the species is not very rare, but usually represented by scattered individuals. The observed valve could represent a post-initial cell. For unambiguous identification further studies are necessary.

2. ***Achnanthes coarctata*** (Brébisson) Grunow *in* Cleve & Grunow Plate 4: 12

Achnanthidium coarctatum Brébisson *ex* W. Smith

Ref. Krammer & Lange-Bertalot 1991b (p. 5, Fig. 2: 1–8).

Dimensions. Valves 25.0–31.2 µm long and 6.5–8.2 µm wide. Sternum valve with 14–15 striae per 10 µm.

Distribution in Kobylanka stream. Sparse, in samples with *Vaucheria* sp. filaments.

Distribution in the Wyżyna Krakowsko-Częstochowska upland. Springs in Dubie (Skalska 1966a, b).

Distribution in Poland. Rare (Siemińska & Wołowski 2003). Reported from Zalew Szczeciński (Bąk *et al*. 2006). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

General distribution and ecology. Cosmopolitan diatom, common in mosses and other aerophytic habitats, especially common in springs (Krammer & Lange-Bertalot 1991b), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, oligo-mesotraphentic, terrestrial and fresh water diatom.

3. ***Achnanthes*** aff. ***curtissima*** Carter Plate 5: 22, 23

Achnanthes microscopica (Cholnoky) Lange-Bertalot & Krammer

Ref. Krammer & Lange-Bertalot 1991b (p. 21, Fig. 11: 1–8).

Dimensions. Valves 6.2–7.0 µm long and 5.8 µm wide. Both valves with *ca* 28 striae per 10 µm.

Distribution in Kobylanka stream. Sparse, in samples from above Kobylany village. Reported previously from the same material (Wojtal & Sobczyk 2006).

Distribution in Poland. *Achnanthes curtissima* was recently reported from various parts of Poland, e.g., lakes in Tatra Mts (Kawecka & Galas 2003), Sudety Mts. (Sienkiewicz 2006), soft-water lakes in Lasy Tucholskie (Milecka & Bogaczewicz-Adamczak 2006).

General distribution and ecology. *Achnanthes curtissima* is known in Europe from scattered, oligotrophic, circumneutral and slightly acidic waters with low conductivity (Krammer & Lange-Bertalot 1991b).

Remarks. Identified specimens differ from *A. curtissima* by having smaller, more oval valves and finer, denser striae. Valve morphology has

some features characteristic for the genus *Psammothidium*.

4. ***Achnanthes*** sp. Plate 5: 26, 27

DIMENSIONS. Valves 7.5–8.0 µm long and 4.0–4.5 µm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, with a few specimens found only in samples with mosses, from above Kobylany village.

REMARKS. The valves found in this study show some morphological resemblance to *Achnanthes lacus-vulcani* Lange-Bertalot and Krammer (Krammer & Lange-Bertalot 1991b, p. 22, Fig. 15: 3–7), but for unambiguous identification SEM studies are necessary. Valve morphology has some features characteristic for the genera *Achnanthidium* and *Psammothidium*.

2. ***Achnanthidium*** Kützing

1. ***Achnanthidium affine*** (Grunow) Czarnecki *in* Round & Bukhtiyarova Plate 4: 13–16

Achnanthes affinis Grunow; *A. minutissima* var. *affinis* (Grunow) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1991a (p. 58, Fig. 33: 13–22).

DIMENSIONS. Valves 10.4–12.8 µm long and 3.4–3.6 µm wide. Both valves with *ca* 30–32 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, mostly in the upper part of the stream.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka River (Gumiński 1947).

DISTRIBUTION IN POLAND. Common, reported as *Achnanthes affinis* (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. In Europe and Asia *A. affine* is known from oligosaprobic, calcium-rich waters, with moderate and elevated conductivity (Krammer & Lange-Bertalot 1991b). According to Van Dam *et al.* (1994), an alkaliphilous, oligosaprobous and fresh brackish water species.

2. ****Achnanthidium eutrophilum*** (Lange-Bertalot) Lange-Bertalot Plate 5: 7, 8

Achnanthes minutissima 'Sippe mit rhombisch-lanzettlichen Schalen' Krammer & Lange-Bertalot; *A. eutrophila* Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1991b (p. 61, Fig. 32: 57–61); Lange-Bertalot & Metzeltin 1996 (p. 25, Fig. 78: 29–38).

DIMENSIONS. Valves 8.0–11.5 µm long and 3.2–3.8 µm wide. On raphe and sternum valves *ca* 25 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain, probably an eutraphentic species, reported recently from Zakliczanka stream (Wojtal *et al.* 2005).

3. *****Achnanthidium jackii*** Rabenhorst Plate 5: 10a, b

Achnanthes minutissima var. *jackii* (Rabenhorst) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1991b (p. 57, Fig. 32: 31–47).

DIMENSIONS. Valves 13.9–16.8 µm long and 3.6–4.2 µm wide. Both valves with 18–25 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epilithon and periphyton.

GENERAL DISTRIBUTION AND ECOLOGY. Known from circumneutral, oligosaprobic waters with moderate and high conductivity (Krammer & Lange-Bertalot 1991b). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous and fresh brackish water species.

4. ***Achnanthidium minutissimum*** (Kützing) Czarnecki Plates 4: 27–35; 5: 9a, b; 56: 1, 8, 9; 57: 1–8

Achnanthes minutissima Kützing var. *minutissima*

Ref. Lange-Bertalot & Krammer 1989 (Fig. 51: 1–20); Krammer & Lange-Bertalot 1991b (p. 56, Fig. 32: 1–24); Round & Bukhtyarova 1996 (p. 348).

DIMENSIONS. Valves 6.6–15.0 µm long and 2.5–3.2 µm wide. Both valves with 28–31 striae per 10 µm.

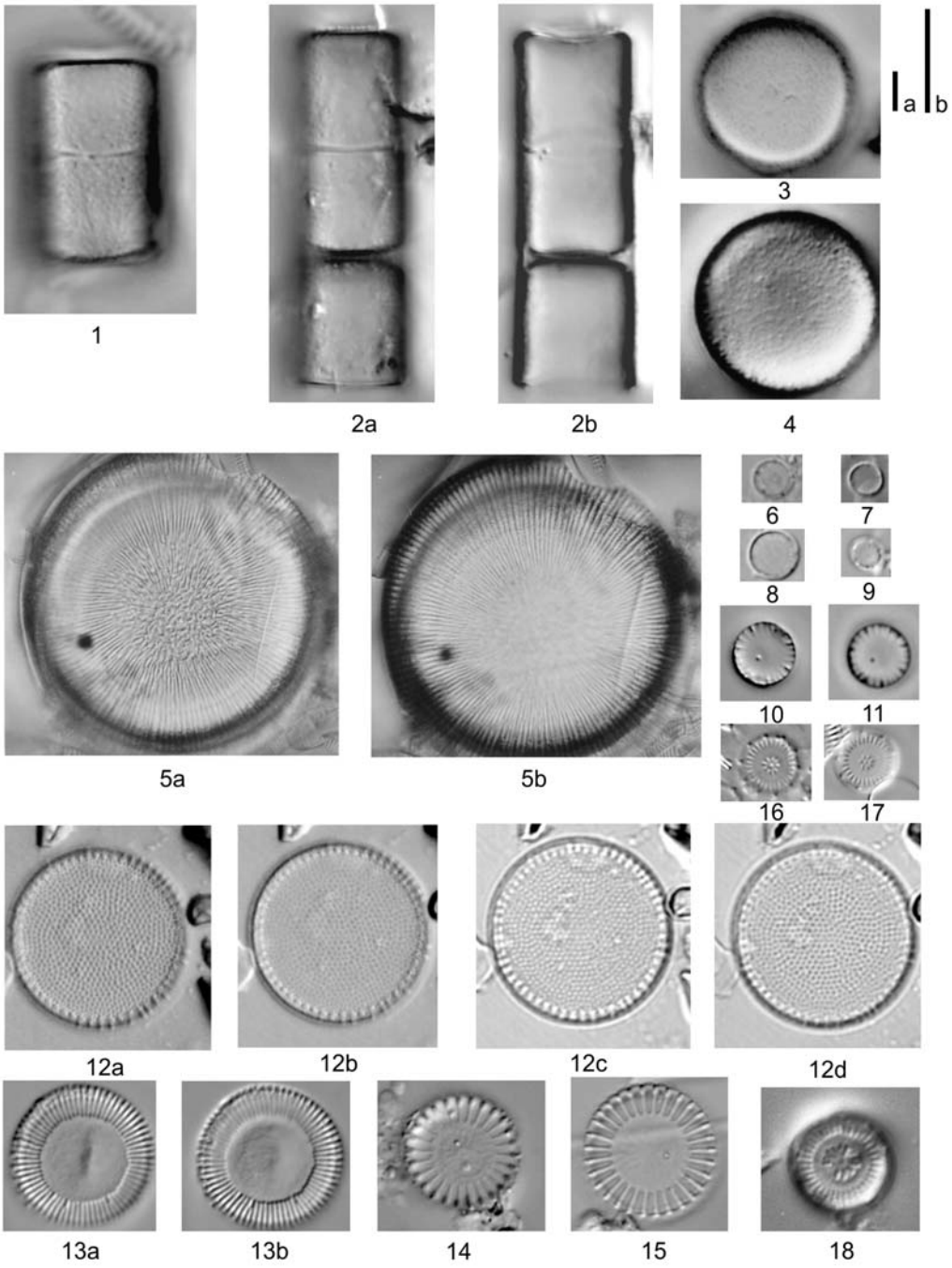


Plate 1. 1–4 – *Melosira varians* Agardh; 5a, b – *Ellerbeckia arenaria* (Moore) Crawford; 6–9 – *Thalassiosira pseudonana* Hasle & Heimdal *sensu lato*; 10, 11 – *Cyclotella atomus* Hustedt; 12a–d – *Thalassiosira duostra* Pienaar; 13a, b – *Cyclotella distinguenda* Hustedt; 14, 15 – *C. meneghiniana* Kützing; 16, 17 – *Discostella pseudostelligera* (Hustedt) Houk & Klee; 18 – *D. stelligera* (Cleve & Grunow) Houk & Klee. Figs 2a, b, 5a, b, 12a–d, 13a, b – photos of the same frustules at different focus; all LM. Scale bars = 10 µm (a – 5a, b; b – other photos scale bar).

DISTRIBUTION IN KOBYLANKA STREAM. Very frequent.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962; Pudo 1977), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964a, b), spring of Szklarka stream (Skalska 1966a, b), ponds near Kraków (Hanak-Szmagier 1967), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Biała Przemsza River (Wasylik 1985), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, with a wide ecological amplitude (Krammer & Lange-Bertalot 1991b), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, eurytraphentic and fresh brackish water species.

REMARKS. The species varied greatly in dimensions and valve outline in the material studied.

5. ****Achnanthidium minutissimum*** var. ***inconspicua*** Østrup Plate 4: 17–21

Achnanthes minutissima var. *inconspicua* Østrup

Ref. Lange-Bertalot & Krammer 1989 (p. 104, Figs 51: 46–49; 52: 3); Krammer & Lange-Bertalot 1991b (p. 58, Fig. 32: 25, 26).

DIMENSIONS. Valves 4.6–9.8 µm long and 2.3–2.5 µm wide. Both valves with *ca* 30 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom of not well known autecology (Krammer & Lange-Bertalot 1991b).

6. ***Achnanthidium pyrenaicum*** Hustedt Plates 5: 11–14; 56: 5; 57: 9–13; 58: 1, 2

Achnanthidium biasolettianum (Grunow) Round & Bukhtiyarova *pro parte*; *Achnanthes biasolettiana* Grunow *pro parte*

Ref. Krammer & Lange-Bertalot 1991b (p. 62, Fig. 36: 1–18); Round & Bukhtiyarova 1996 (p. 350).

DIMENSIONS. Valves 9.1–10.6 µm long and 3.4–4.0 µm wide. Both valves with 22.5–28.0 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Common.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sąspówka stream (Kądziołka 1963).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Common species in oligotrophic and mesotrophic, calcium-rich waters with moderate conductivity (Krammer & Lange-Bertalot 1991b). According to Van Dam *et al.* (1994), an alkaliphilous, mesotraphentic and fresh brackish water species.

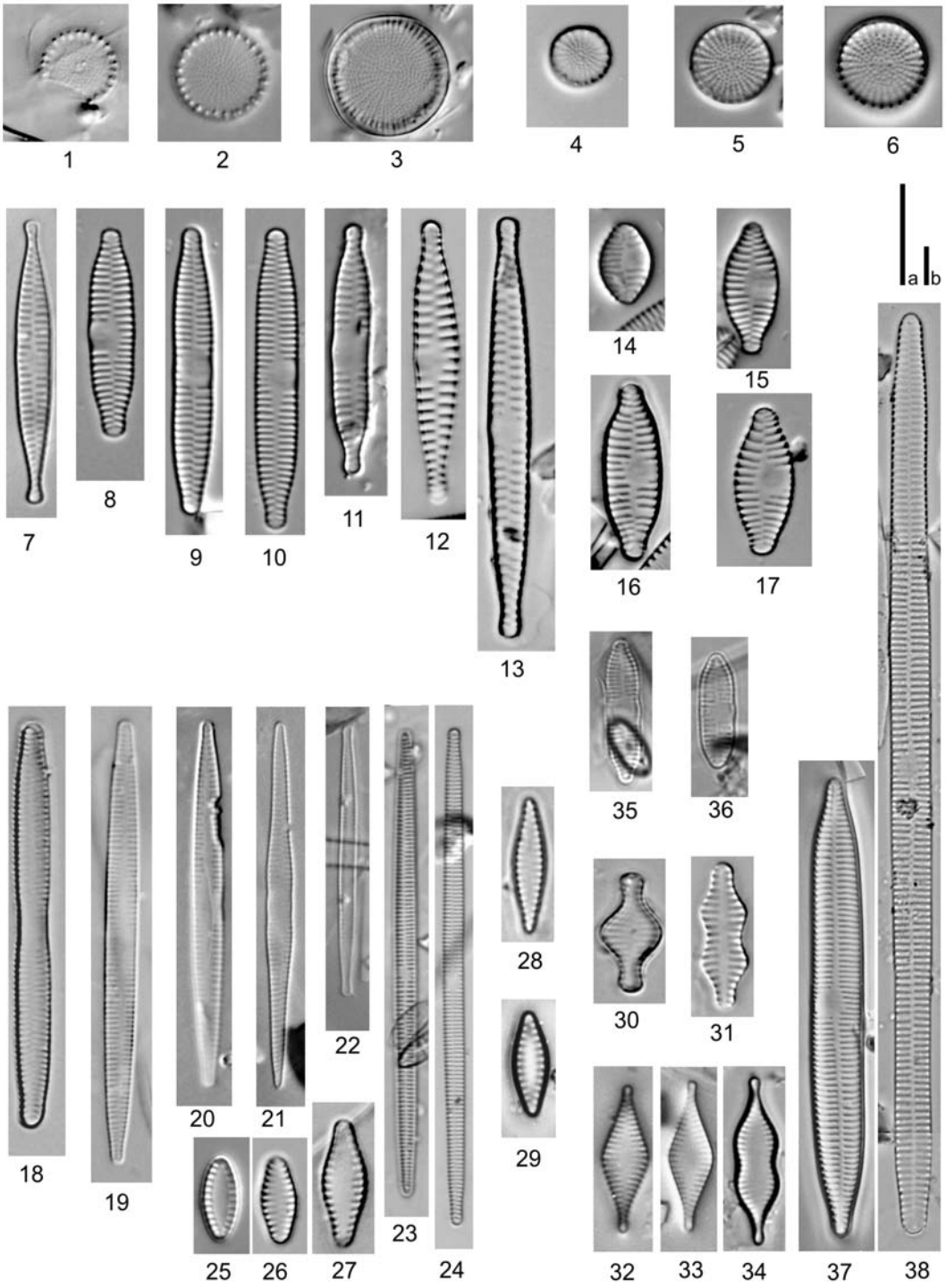
7. ***Achnanthidium*** cf. ***saprophilum*** (Kobayasi & Mayama) Round & Bukhtiyarova Plates 5: 29–31; 56: 3

Achnanthes minutissima var. *saprophila* Kobayasi & Mayama

Ref. Krammer & Lange-Bertalot 1991b (p. 59, Fig. 34: 13–19A); Kobayashi *et al*. 2006 (p. 128, Plate 161).

DIMENSIONS. Valves 7.3–13.3 µm long and

Plate 2. 1–3 – *Stephanodiscus hantzschii* Grunow; 4–6 – *S. minutulus* (Kützing) Cleve & Möller; 7 – *Fragilaria austriaca* (Grunow) Lange-Bertalot; 8–11 – *F. capucina* Desmazières; 12, 13 – *F. capucina sensu lato*; 14–17 – *F. capucina* var. *vaucheriae* (Kützing) Lange-Bertalot; 18 – *F. capucina* var. *mesolepta* (Rabenhorst) Rabenhorst; 19, 20 – *F. rumpens* (Kützing) Carlson; 21 – *Fragilaria* cf. *crotonensis* Kitton; 22 – *F. gracilis* Østrup; 23, 24 – *Fragilaria* sp. (cf. *famelica*); 25–27 – *Staurosira brevistriata* (Grunow) Williams & Round; 28, 29 – *S.* cf. *brevistriata*; 30 – *S. construens* Ehrenberg var. *construens*; 31 – *S. construens* var. *binodis* (Ehrenberg) Hamilton; 32, 33 – *Fragilaria parasitica* (W. Smith) Grunow var. *parasitica*; 34 – *F. parasitica* var. *subconstricta* Grunow; 35, 36 – *F. bidens* Heiberg; 37, 38 – *F. ulna* (Nitzsch) Lange-Bertalot; all LM. Scale bars = 10 µm (a – other photos scale bar; b – 37, 38).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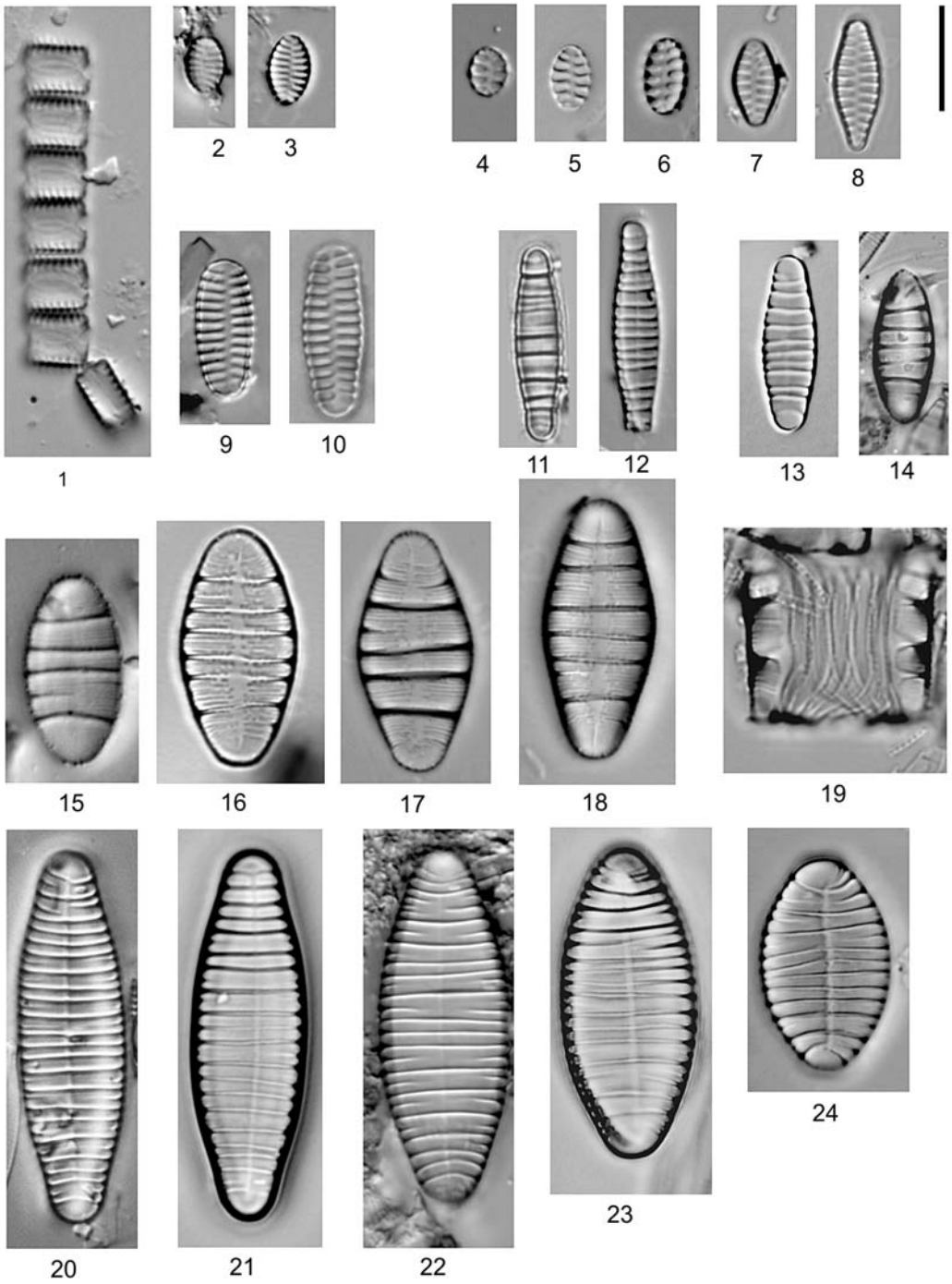


Plate 3. 1–3 – *Sturosira venter* (Ehrenberg) H. Kobayashi; 4–8 – *Staurosira pinnata* Ehrenberg; 9, 10 – *Fragilaria leptostauron* var. *dubia* (Grunow) Hustedt; 11, 12 – *Diatoma moniliformis* Kützing; 13 – *D.* cf. *moniliformis*; 14 – *Diatoma* cf. *mesodon* (Ehrenberg) Kützing; 15–19 – *D. mesodon*; 20–24 – *D. vulgaris* Bory; all LM. Scale bar = 10 μm.

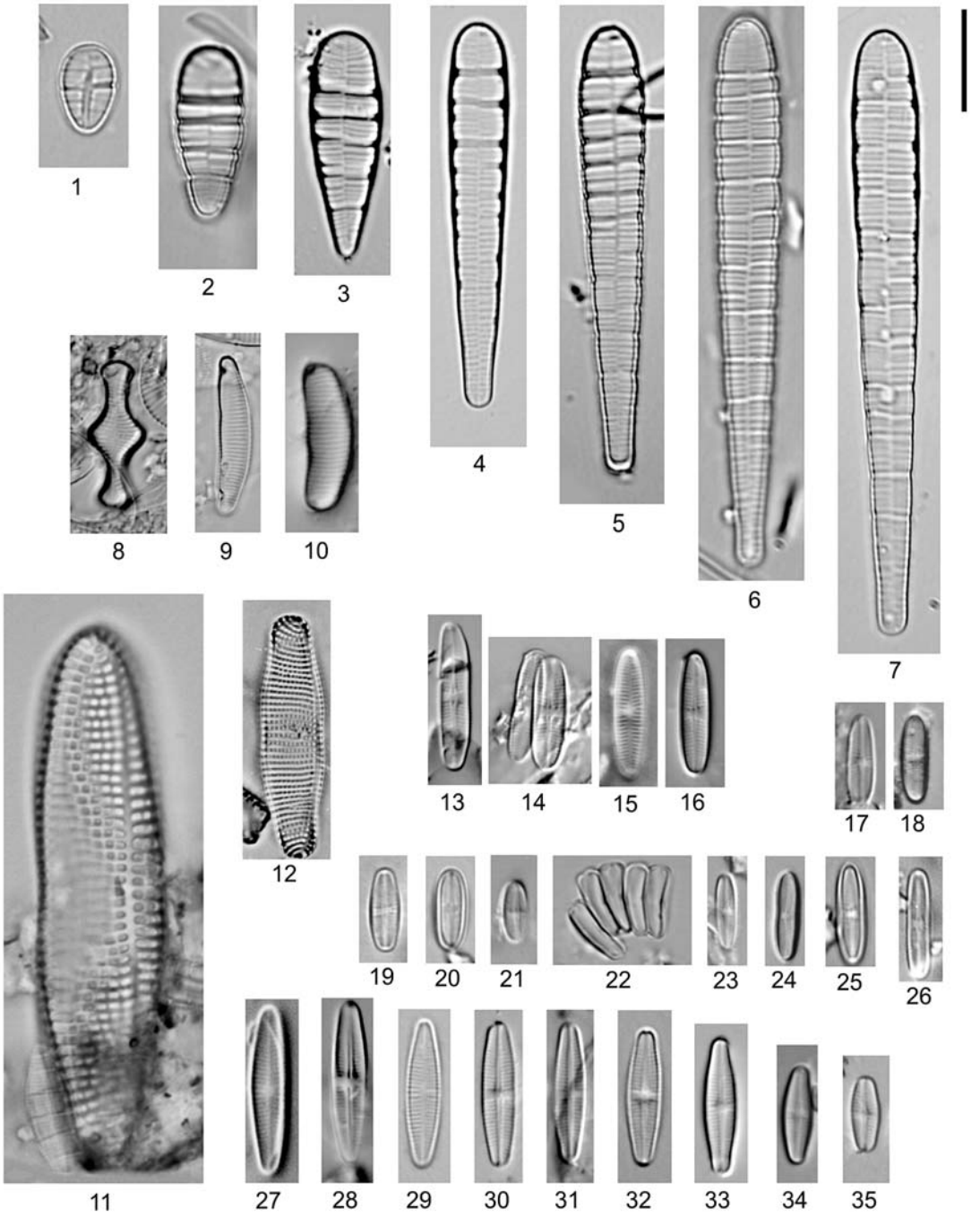


Plate 4. 1–7 – *Meridion circulare* Agardh var. *circulare*; 8 – *Tabellaria flocculosa* (Roth) Kützing; 9 – *Eunotia incisa* Gregory; 10 – *Eunotia* sp.; 11– *Achnanthes* cf. *brevipes* var. *intermedia* (Kützing) Cleve; 12 – *A. coarctata* (Brébisson) Grunow; 13–16 – *Achnanthidium affine* (Grunow) Czarnecki; 17–21 – *A. minutissimum* var. *inconspicua* Østrup; 22–26 – *Achnanthidium* sp. 1; 27–35 – *A. minutissimum* (Kützing) Czarnecki *sensu lato*; all LM. Scale bar = 10 μm.

3.1–3.9 μm wide. Raphe valve with *ca* 30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse. Reported previously from the same material (Wojtal & Sobczyk 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread, tolerating waters of high saprobity (Krammer & Lange-Bertalot 1991b).

REMARKS. Raphe valves observed by LM possessed a larger central area and less distinct striation than illustrated in references.

8. ***Achnanthidium straubianum*** (Lange-Bertalot) Lange-Bertalot Plate 5: 24, 25

Achnanthes straubiana Lange-Bertalot; *A. minutissima* var. '*Sippe mit breit-elliptischen Schalen*' Krammer & Lange-Bertalot

Ref. Lange-Bertalot & Metzeltin 1996 (p. 26, Fig. 78: 21a–b).

DIMENSIONS. Valves 6.1–10.6 μm long and 3.1–3.8 μm wide. Sternum valve with 26 striae per 10 μm, raphe valve with *ca* 30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse. Reported previously from the same material (Wojtal 2004b, Wojtal & Sobczyk 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Reported generally from mesotrophic and eutrophic calcium-rich waters (Lange-Bertalot & Metzeltin 1996).

9. ***Achnanthidium*** sp. 1 Plates 4: 22–26; 56: 4, 6, 7

DIMENSIONS. Valves 7.5–11.0 μm long and 2.0–2.4 μm wide. Raphe valve with *ca* 35 striae per 10 μm, sternum valves with *ca* 32 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epilithon above Kobylany village.

REMARKS. The valves have fine striation and linear outline. Some frustules were slightly concave in the middle portion, distinctly bent along the apical axis girdle view. They differ also from *Achnanthidium minutissimum* by having relatively equal distance between striae throughout the whole valve.

10. ***Achnanthidium*** sp. 2 Plates 5: 1–6; 56: 2

DIMENSIONS. Valves 6.5–9.0 μm long and 2.8–3.2 μm wide. Raphe valve with 17–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epilithon above Kobylany village.

REMARKS. The valves have coarser striation and a more linear-elliptic outline than *A. minutissimum*. They differ also from *A. minutissimum* var. *inconspicua* by having a broader axial area and more radiate striation than as given by Krammer and Lange-Bertalot (1991b). It remains uncertain if the specimens observed represent a separate taxon, or a life-cycle stage of other *Achnanthidium* species identified here.

11. ***Achnanthidium*** sp. 3 Plate 5: 32, 33

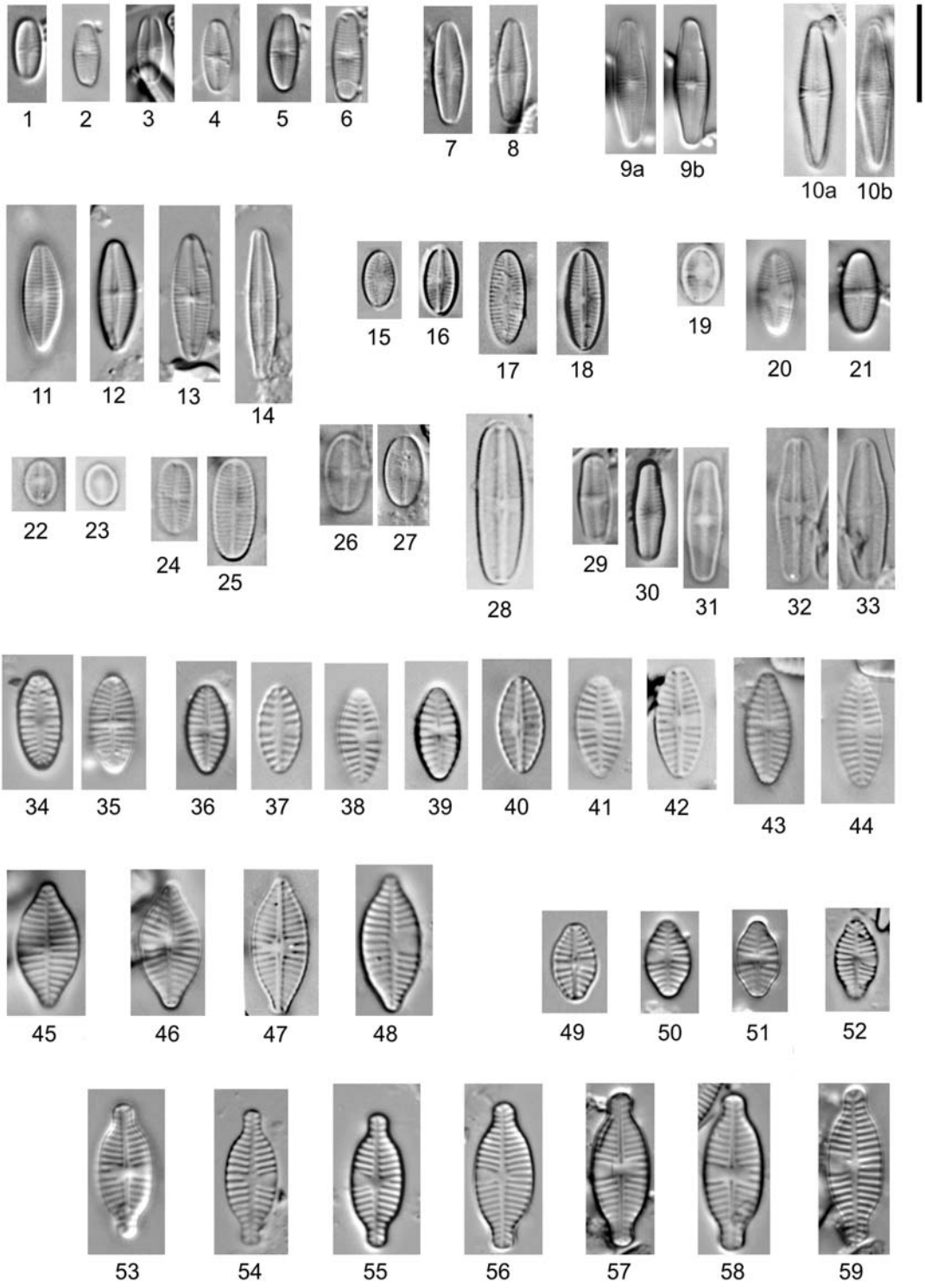
DIMENSIONS. Valves 24.0–25.5 μm long and 4.6–4.8 μm wide. Both valves with *ca* 20–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in periphyton above Kobylany village.

REMARKS. Striae slightly radiate in the middle part of the valve, axial area narrow, linear. Both valves with distinctly expanded central area, almost

→

Plate 5. 1–6 – *Achnanthidium* sp. 2; 7, 8 – *A. eutrophilum* (Lange-Bertalot) Lange-Bertalot; 9a, b – *A. minutissimum* (Kützing) Czarnecki; 10a, b – *A. jackii* Rabenhorst; 11–14 – *A. pyrenaicum* Hustedt; 15–18 – *Psammothidium grischunum* (Wuthrich) Bukhtiyarova & Round; 19–21 – *P. lauenburgianum* (Hustedt) Bukhtiyarova & Round; 22, 23 – *Achnanthes* aff. *curtissima* Carter; 24, 25 – *Achnanthidium straubianum* (Lange-Bertalot) Lange-Bertalot; 26, 27 – *Achnanthes* sp.; 28 – *Rossithidium petersenii* (Hustedt) Round & Bukhtiyarova; 29–31 – *Achnanthidium* cf. *saprophilum* (Kobayasi & Mayama) Round & Bukhtiyarova; 32, 33 – *Achnanthidium* sp. 3; 34, 35 – *Planothidium conspicuum* (A. Mayer) Morales; 36–44 – *P. minutissimum* (Krasske) Morales; 45, 46 – *P. delicatulum* (Kützing) Round & Bukhtiyarova; 47, 48 – *P. dubium* (Grunow) Round & Bukhtiyarova; 49–52 – *P.* cf. *dubium*; 53–59 – *P. reichardtii* Lange-Bertalot & Werum. Figs 10a, b; 50, 51 – photos of the same frustule at different focus; all LM. Scale bar = 10 μm.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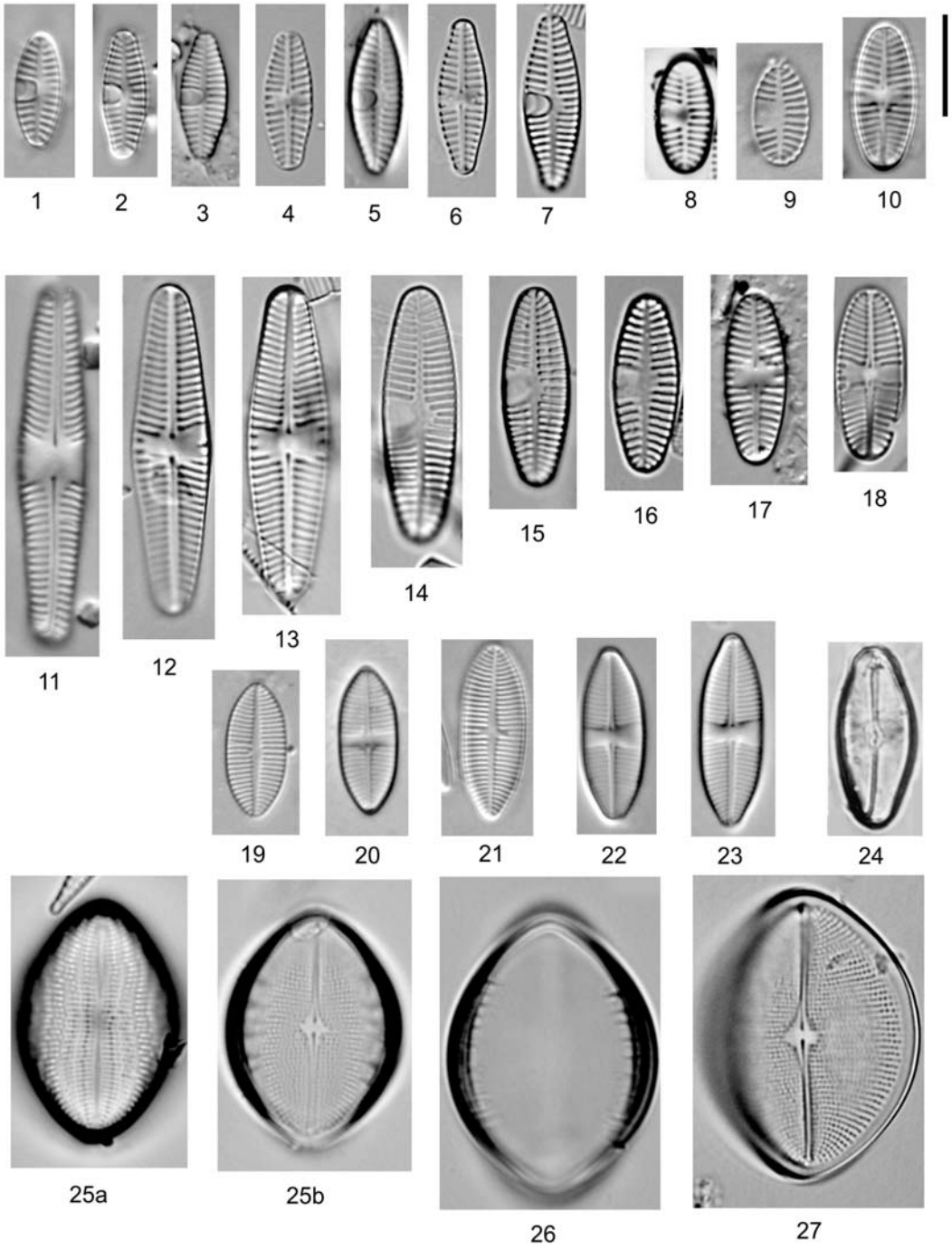


Plate 6. 1–7 – *Planothidium frequentissimum* (Lange-Bertalot) Round & Bukhtiyarova; 8–17 – *P. lanceolatum* (Brébisson) Round & Bukhtiyarova; 18 – *P.* cf. *lanceolatum*; 19–23 – *Lemnicola hungarica* (Grunow) Round & Basson; 24 – *Euccoconeis alpestris* (Brun) Lange-Bertalot; 25–27 – *Cocconeis pediculus* Ehrenberg; all LM. Figs 25a, b – photos of the same frustule at different focus. Scale bar = 10 μm.

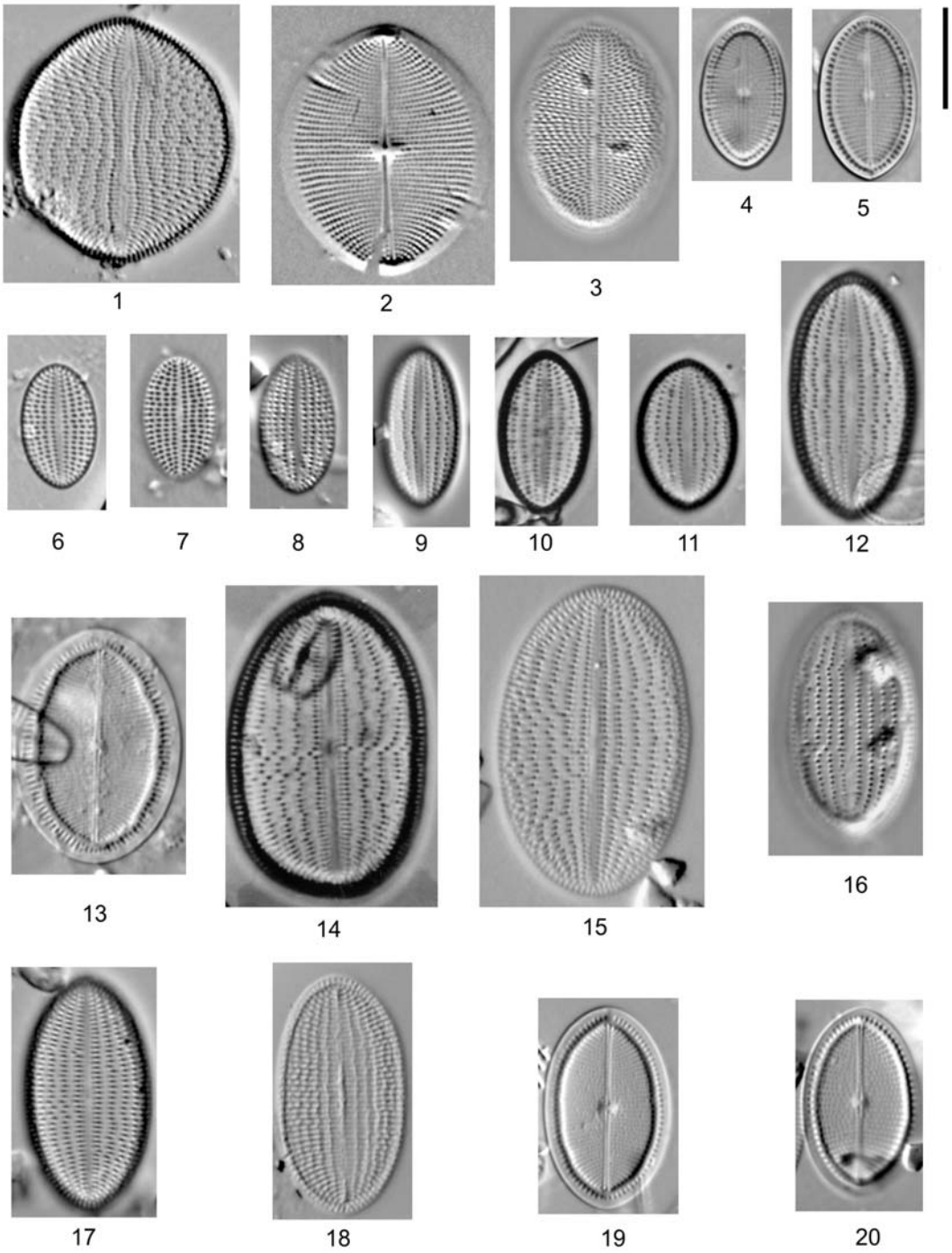


Plate 7. 1, 2 – *Cocconeis* cf. *pediculus* Ehrenberg; 3–5 – *C. placentula* Ehrenberg; 6–8 – *C. pseudolineata* (Geitler) Lange-Bertalot; 9–12 – *C.* cf. *placentula* var. *lineata* (Ehrenberg) Van Heurck; 13–16 – *C. placentula* var. *lineata*; 17–20 – *C. placentula* var. *euglypta* (Ehrenberg) Grunow; all LM. Scale bar = 10 μm.

up to the margin, where only very shortened striae were observed.

3. ***Adlafia*** Moser, Lange-Bertalot & Metzeltin

1. ***Adlafia bryophila*** (Petersen) Moser, Lange-Bertalot & Metzeltin Plate 16: 25

Navicula bryophila Petersen

Ref. Krammer & Lange-Bertalot 1986 (p. 181, Fig. 79: 1–8'); Lange-Bertalot 2001 (p. 142, Fig. 105: 22–27).

DIMENSIONS. Valves 14.2–18.2 µm long and 2.8–3.6 µm wide, with 28–30 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with mosses.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. According to Siemińska and Wołowski (2003), a very rare diatom. Known from Konin vicinity (Hustedt 1948).

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom of uncertain ecology, aerophilous (Lange-Bertalot 2001), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, mesotraphentic, terrestrial and fresh water species. Classified as in regression in Germany (Lange-Bertalot 1996).

2. ***Adlafia minuscula*** (Grunow) Lange-Bertalot Plates 16: 26; 94: 8, 9

Navicula minuscula Grunow; *Naviculadicta minuscula* (Grunow) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1986 (p. 207, Fig. 69: 18–23); Lange-Bertalot 2001 (p. 143, Figs 106: 5–8; 108: 4–10).

DIMENSIONS. Valves 10.0–11.8 µm long and 3.9–4.8 µm wide, with 34–40 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, inhabiting various aquatic environments, especially oligosaprobic (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, oligotraphentic, aerophilous and fresh water species.

4. ***Amphora*** Ehrenberg

1. ***Amphora copulata*** (Kützing) Schoeman & Archibald Plates 33: 5–7; 95: 3–5

Amphora libyca Ehrenberg; *A. ovalis* var. *libyca* (Ehrenberg) Cleve

Ref. Krammer & Lange-Bertalot 1986 (p. 345, Fig. 149: 4–11).

DIMENSIONS. Valves 16.0–45.5 µm long and 5.0–8.2 µm wide, with 13–16 (dorsal) and 17–19 (ventral) striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, but more frequent in some samples.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan and common (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic, strictly aquatic and fresh water species.

2. **Amphora inariensis* Krammer Plates 33: 14–17; 95: 6

Ref. Krammer & Lange-Bertalot 1986 (p. 345, Fig. 150: 1–6).

DIMENSIONS. Valves µm 13.7–18.0 µm long and 3.4–5.1 µm wide, dorsal and ventral part with 18–19 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in periphyton, reported previously from the same material (Wojtal 2001b).

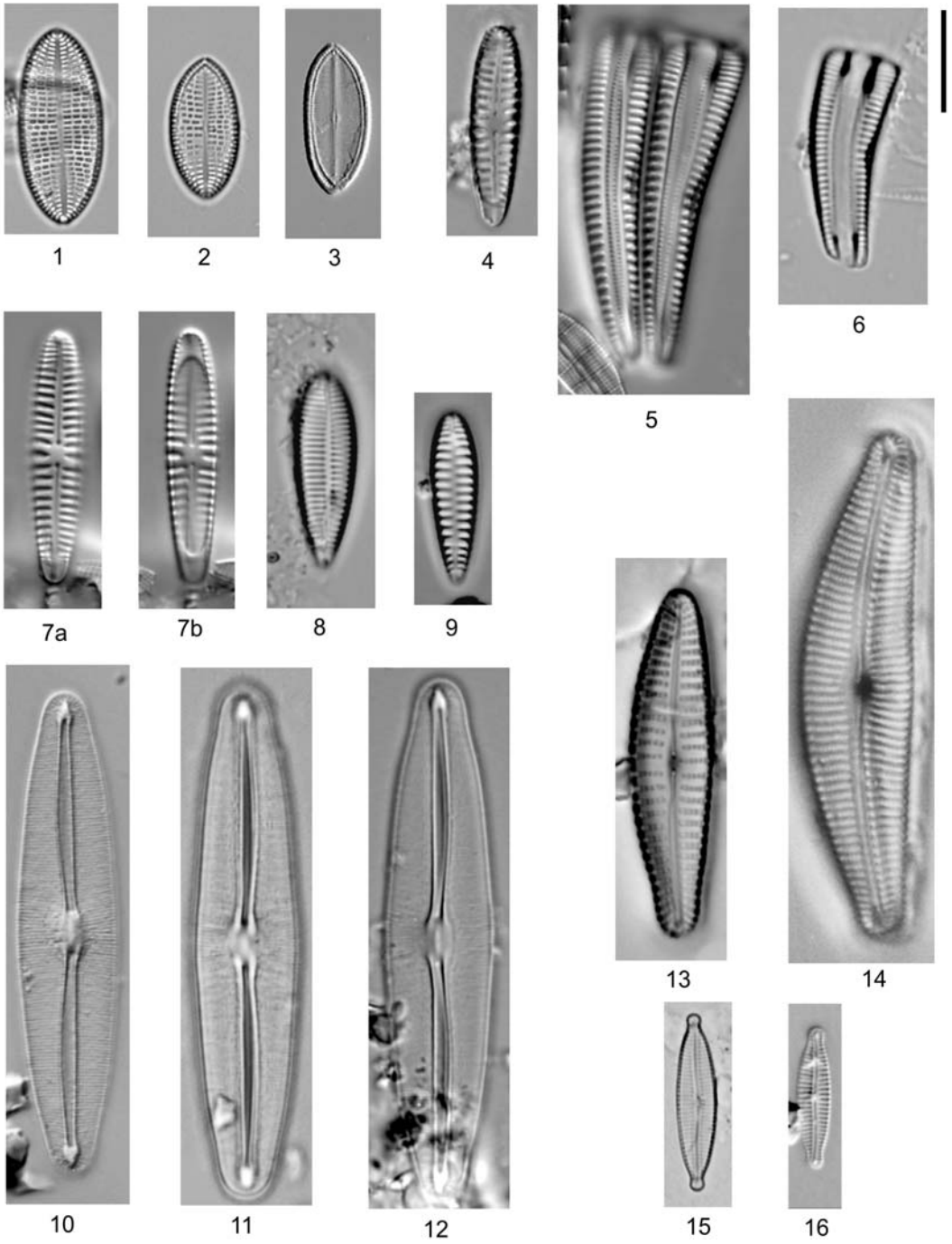


Plate 8. 1–3 – *Cocconeis neodiminuta* Krammer; 4–9 – *Rhoicosphaenia abbreviata* (Agardh) Lange-Bertalot; 10–12 – *Frustulia vulgaris* (Thwaites) De Toni; 13 – *Gomphocymbellopsis ancyli* (Cleve) Krammer; 14 – *Cymbella lange-bertalotii* Krammer; 15, 16 – *Encyonopsis microcephala* (Grunow) Krammer; all LM. Scale bar = 10 µm.

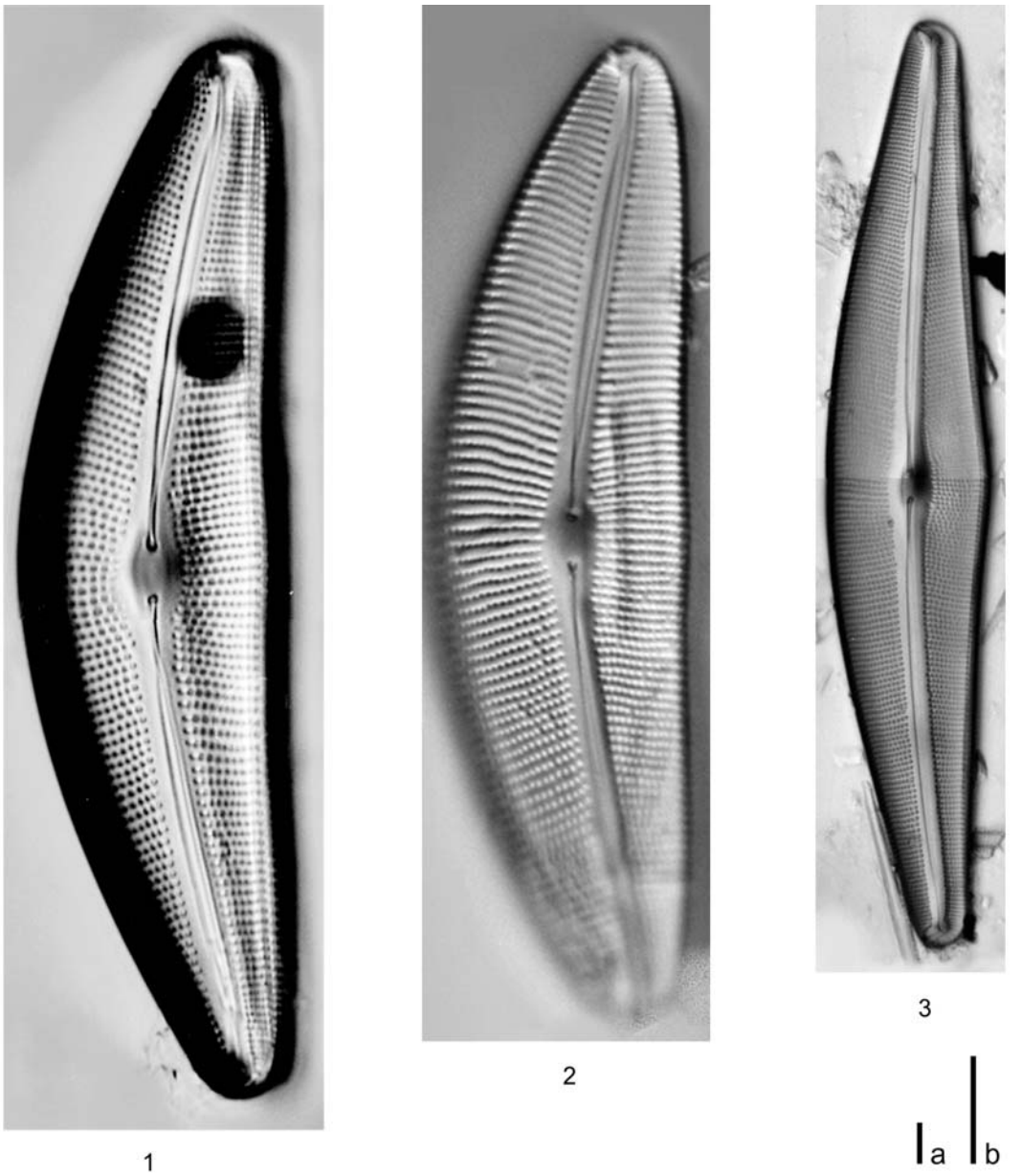


Plate 9. 1–3 – *Cymbella aspera* (Ehrenberg) Cleve; all LM. Scale bars = 10 μm (a – 3; b – 1, 2).

DISTRIBUTION IN POLAND. Zatoka Gdańska (Witkowski 1994), Mylof reservoir (Sekulska-Nalewajko 1999), Zatoka Pucka (Witak 2002), Zalew Wiślany (Jankowska *et al*. 2005), Zalew Szczeciński (Bąk *et al*. 2006), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom, preferring oligotrophic waters with low or moderate conductivity (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an oligotraphentic and fresh brackish diatom.

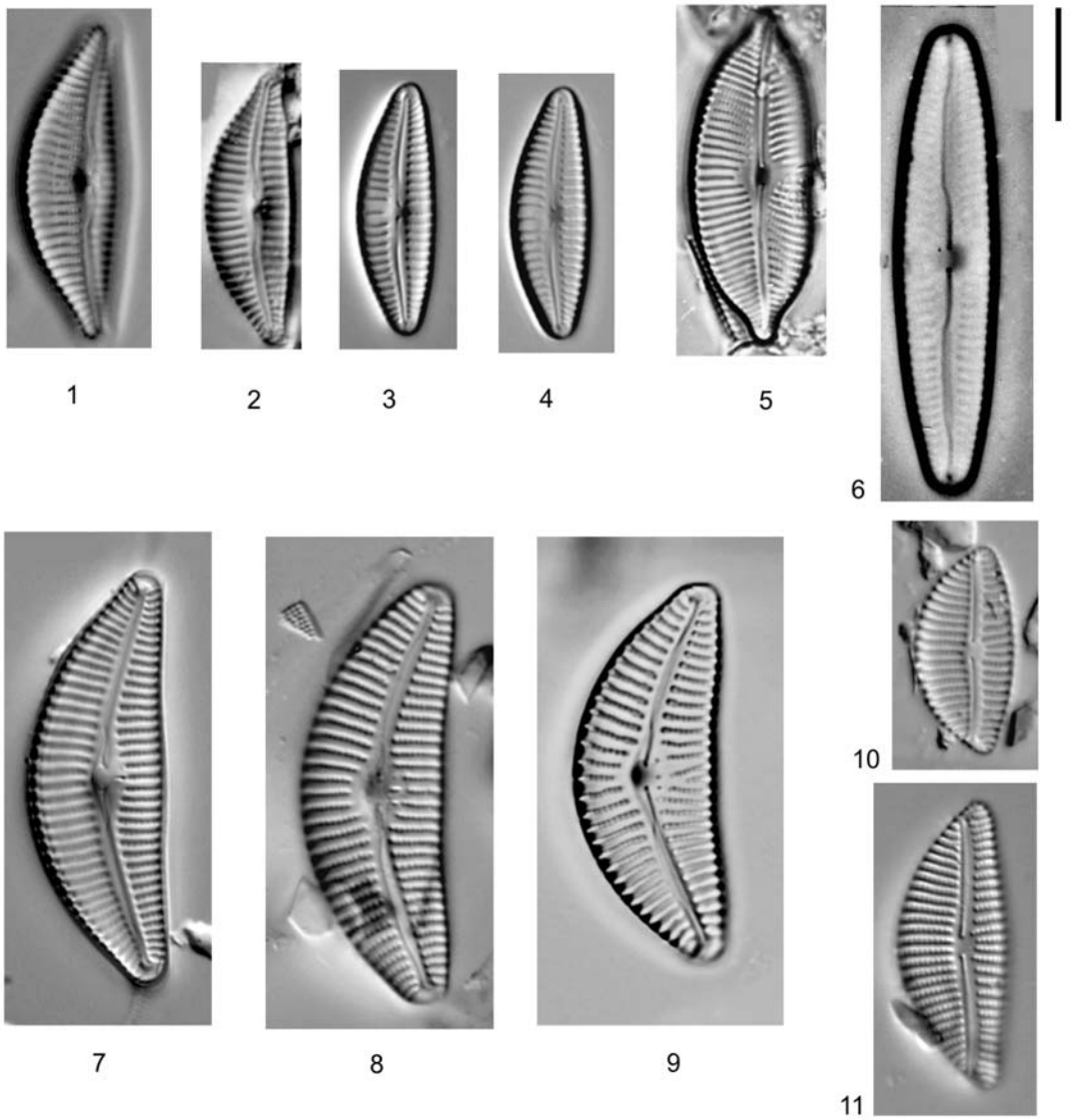


Plate 10. 1, 2 – *Cymbella affiniformis* Krammer; 3, 4 – *C.* cf. *parva* (W. Smith) Kirchner; 5 – *Cymbopleura hercynica* (A. Schmidt) Krammer; 6 – *C. subaequalis* (Grunow) Krammer; 7–9 – *Cymbella proxima* Reimer; 10, 11 – *Encyonema caespitosum* Kützing; all LM. Scale bar = 10 μm.

3. ****Amphora montana*** Krasske

Plates 33: 8–13; 96: 1–5

Ref. Krammer & Lange-Bertalot 1986 (p. 349, Fig. 151: 18–27); Lange-Bertalot *et al*. 1996b (p. 40, Fig. 37: 8, 8′).

DIMENSIONS. Valves 11.5–22.0 μm long and 7.6–9.2 μm wide.

DISTRIBUTION IN KOBYLANKA. Sparse, more abundant in samples with mosses collected from subaerial biotopes.

DISTRIBUTION IN POLAND. Central Poland (Rakowska 2001), Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, aerophilous (Krammer & Lange-

Bertalot 1986), tychoplanktonic and rheophilous (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic, aerophilous and fresh brackish water diatom.

4. ***Amphora pediculus*** (Kützing) Grunow Plates 33: 18–20; 95: 7, 8; 96: 6

Amphora ovalis var. *pediculus* (Kützing) Van Heurck

Ref. Krammer & Lange-Bertalot 1986 (p. 346, Fig. 150: 8–13).

DIMENSIONS. Valves 8.0–14.4 μm long and 2.4–4.7 μm wide, with 15–20 (dorsal side) and 16–18 (ventral side) striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Common.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Prądnik River (Stępień 1963), Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a, b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom, common in waters of moderate conductivity, up to β-α-mesosaprobic waters (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

5. ****Amphora veneta*** Kützing Plate 33: 21, 22

Ref. Krammer & Lange-Bertalot 1986 (p. 348, Fig. 151: 7–17).

DIMENSIONS. Valves 10.8–17.4 μm long and 2.8–4.0 μm wide, with 10.5–12.0 (dorsal side) and *ca* 22 (ventral side) striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, occurring in waters of elevated conductivity, from α-mesosaprobic to polysaprobic (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkalibiontic, α-meso-polysaprobous, eutraphentic and brackish fresh water species.

5. ***Anomoeoneis*** Pfitzer

1. ***Anomoeoneis sphaerophora*** (Ehrenberg) Pfitzer f. ***sphaerophora*** Plate 18: 19

Ref. Krammer & Lange-Bertalot 1986 (p. 252, Fig. 92: 1, 2).

DIMENSIONS. Valves 34.0–44.6 μm long and 12.8–14.0 μm wide, with *ca* 18–20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pilica River (Kadłubowska 1964b), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkalibiontic, α-mesosaprobous, eutraphentic and brackish fresh water species.

6. ***Brachysira*** Bory de St Vincent

1. ***Brachysira neoexilis*** Lange-Bertalot Plate 18: 20

Anomoeoneis exilis (Kützing) Cleve *sensu* Hustedt

Ref. Lange-Bertalot & Moser 1994 (p. 51, Figs 5: 1–35; 6: 1–6; 17: 7–11; 32: 27–30; 46: 19–27).

DIMENSIONS. Valves 21.4–24.0 μm long and 4.3–5.0 μm wide, with *ca* 32 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton.

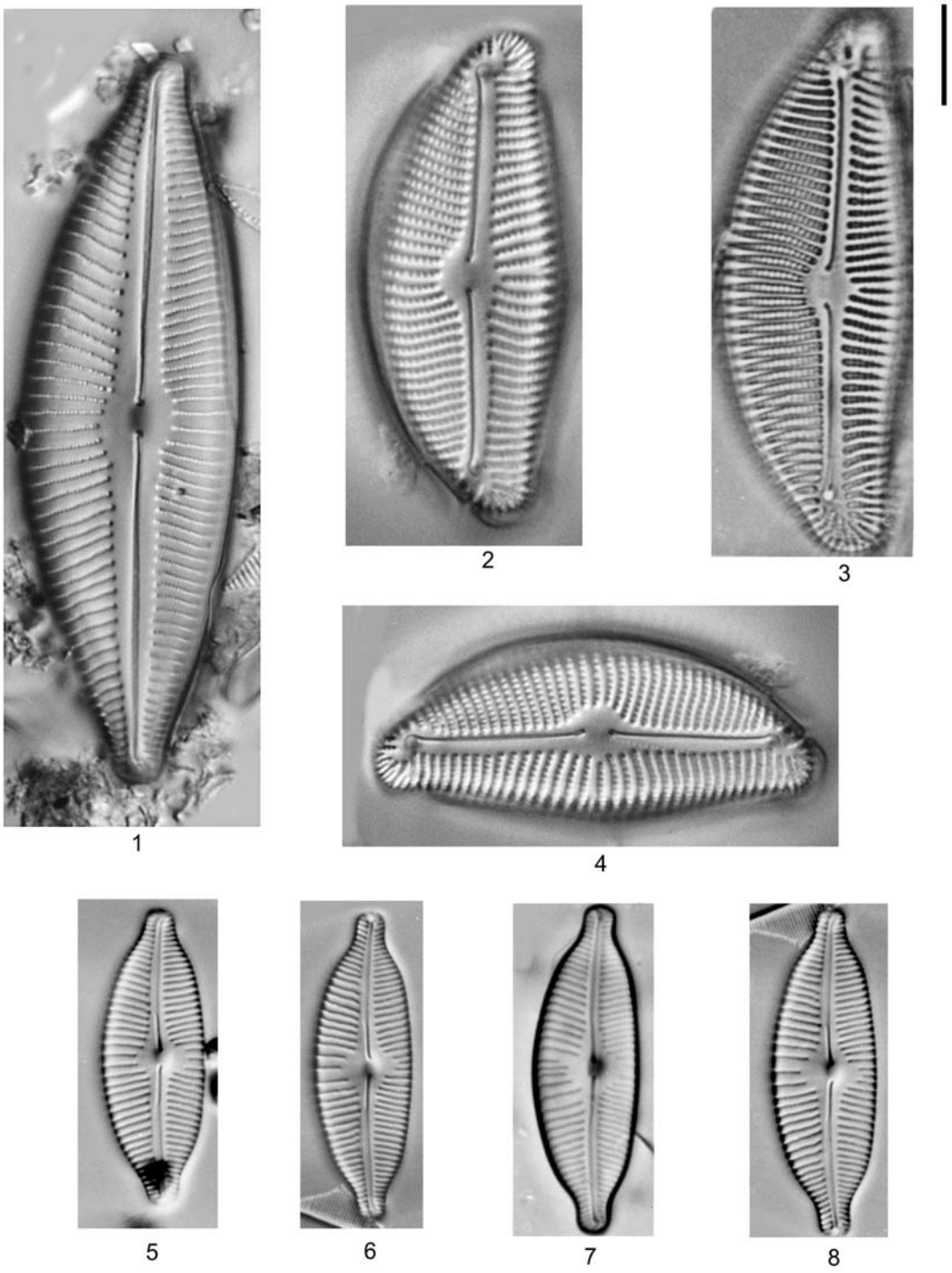


Plate 11. 1 – *Cymbopleura inaequaliformis* Krammer; 2–4 – *Encyonema prostratum* (Berkeley) Kützing; 5–8 – *Cymbopleura naviculiformis* (Auerswald) Krammer; all LM. Scale bar = 10 μm.

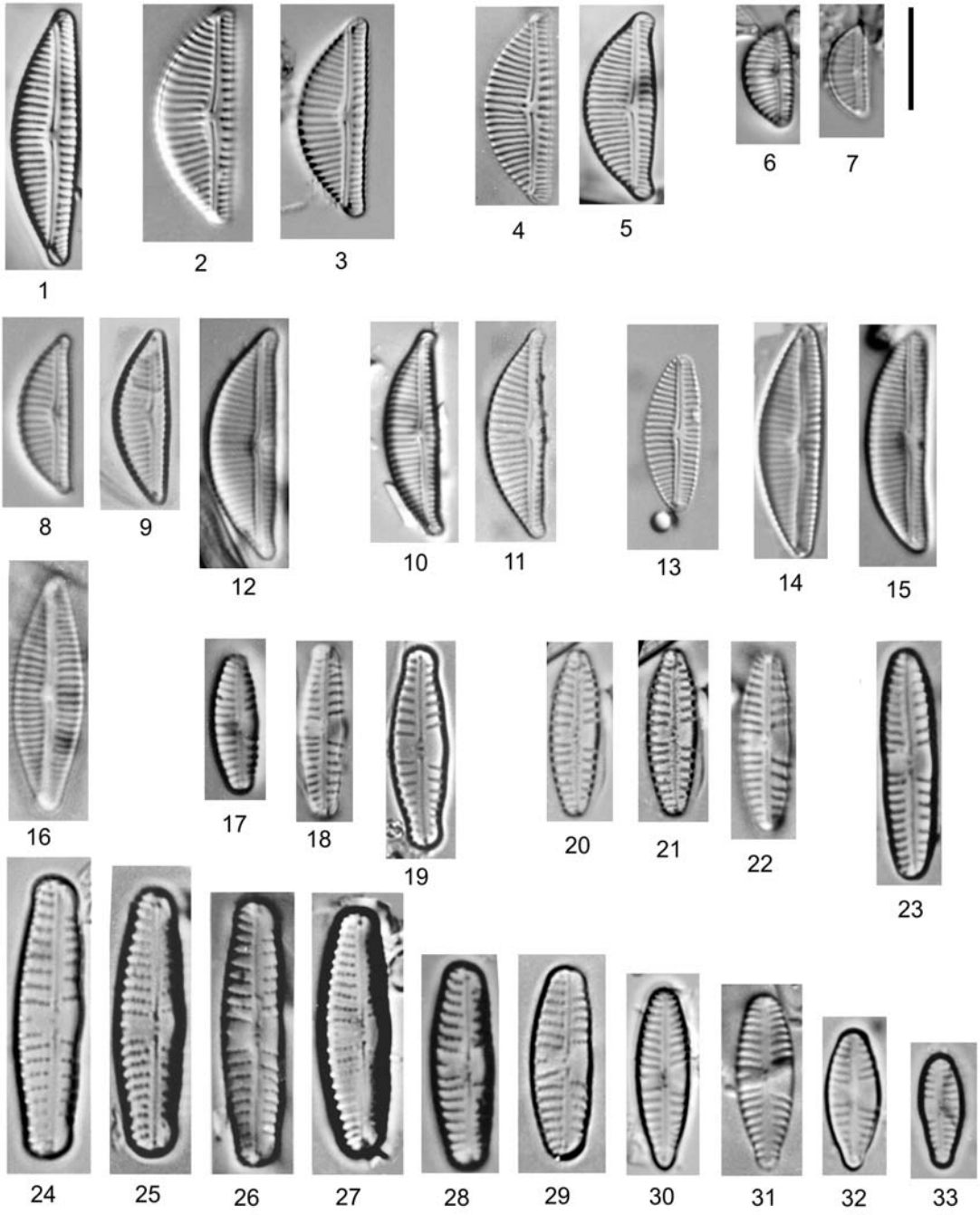


Plate 12. 1 – *Encyonema silesiacum* (Bleish *in* Rabenhorst) D.G. Mann; 2, 3 – *Encyonema* cf. *silesiacum*; 4, 5 – *E. langebertalotii* Krammer; 6, 7 – *E. minutum* (Hilse *ex* Rabenhorst) D.G. Mann; 8, 9, 12 – *E. ventricosum* (Agardh) Grunow; 10, 11 – *E. ventricosum* cf. var. *angusta* Krammer; 13–15 – *Encyonema* sp.; 16 – *Encyonopsis* sp.; 17–22 – *Reimeria sinuata* (Gregory) Kociolek & Stoermer; 23 – *Reimeria* sp.; 24–29 – *R. uniseriata* Sala, Guerrero & Ferrario; 30–33 – *Gomphonema tergestinum* (Grunow) Fricke; all LM. Scale bar = 10 μm.

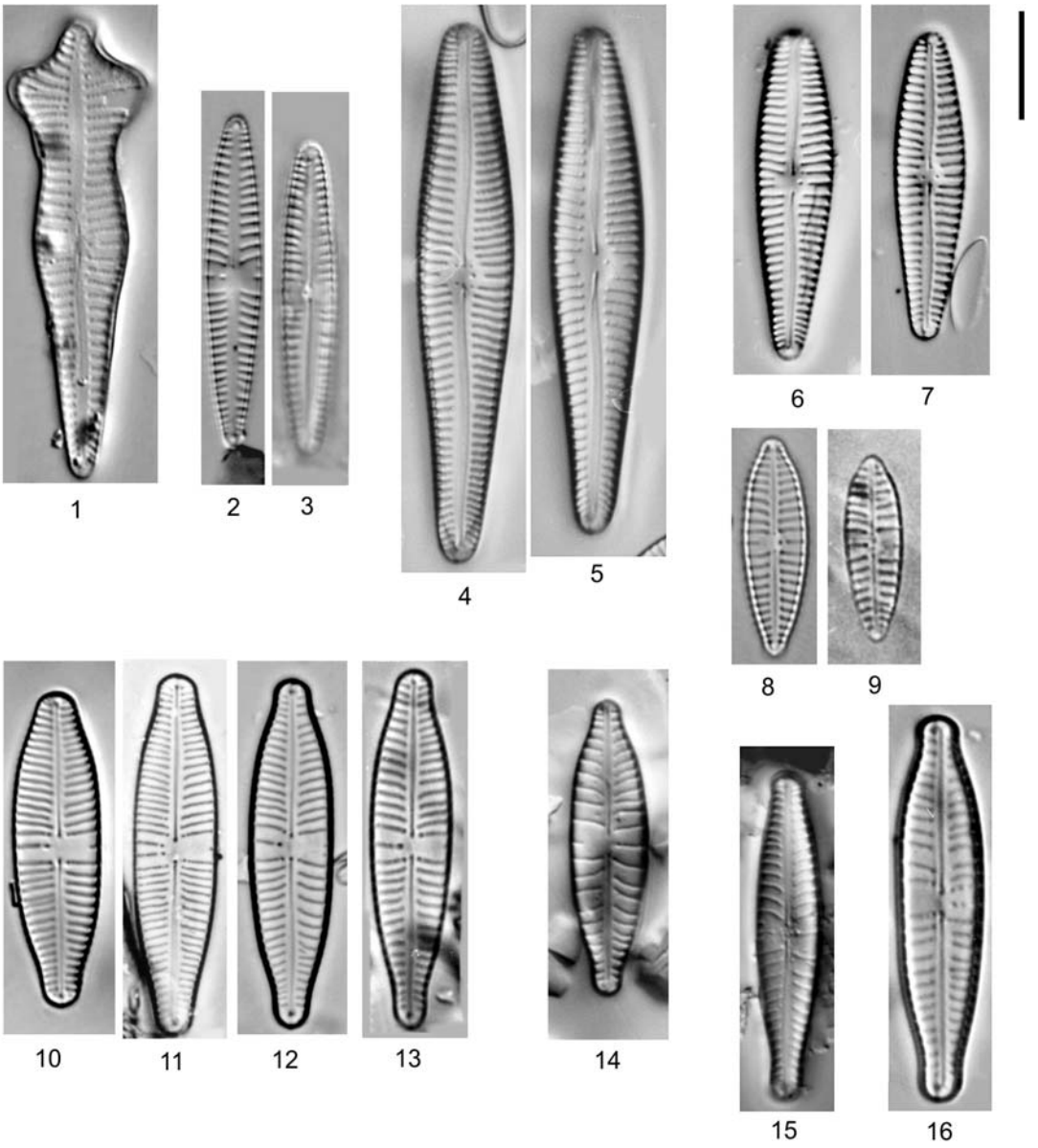


Plate 13. 1 – *Gomphonema acuminatum* Ehrenberg; 2, 3 – *G. angustatum* (Kützing) Rabenhorst *sensu lato*; 4–7 – *G. clavatum* Ehrenberg; 8, 9 – *Gomphonema* sp.; 10–13 – *G. micropus* Kützing; 14 – *G.* cf. *micropus*; 15, 16 – *G. sarcophagus* Gregory. Scale bar = 10 μm.

DISTRIBUTION IN POLAND. Not frequent, reported as *Anomoeoneis exilis* (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, oligosaprobous, oligo-mesotraphentic diatom (Lange-Bertalot & Moser 1994). According to Van Dam *et al.* (1994), an acidophilous, oligosaprobous, oligo-mesotraphentic and fresh brackish water species.

REMARKS. Reported by Wojtal (2003b) as

Brachysira microcephala var. *exilis* (Grunow) Round & D.G. Mann.

7. ***Caloneis*** Cleve

1. ****Caloneis aerophila*** Bock Plate 25: 3

Ref. Krammer & Lange-Bertalot 1986 (p. 389, Fig. 173: 4).

DIMENSIONS. Valve 16.0–17.3 μm long and 3.4–3.8 μm wide, with *ca* 25 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in periphyton above Kobylany village.

DISTRIBUTION IN POLAND. Lake Dobrogoszcz (Picińska-Fałtynowicz 1995), raised peat bog near Nowy Targ (Wojtal *et al*. 1999), Tatra Mts lakes (Kawecka & Galas 2003). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Rare, aerophilic diatom (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), a terrestrial and fresh water species.

REMARKS. Probably the species is not very rare, but usually represented by scattered individuals.

2. ***Caloneis*** cf. ***alpestris*** (Grunow) Cleve Plate 84: 8–10

Navicula alpestris Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 386, Fig. 170: 3–7).

DIMENSIONS. Valves 64.8–72.8 μm long and 12.0–13.2 μm wide, with 20–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, boreal-alpine diatom, common in calcium-rich alpine and subalpine waters (Krammer & Lange-Bertalot 1986).

REMARKS. Identification of this diatom followed the broad species concept.

3. ***Caloneis amphisbaena*** (Bory) Cleve Plates 24: 6, 7; 25: 1, 2; 82: 4–7

Ref. Krammer & Lange-Bertalot 1986 (p. 385, Fig. 168: 4).

DIMENSIONS. Valves 67.0–76.8 μm long and 23–28 μm wide, with 16–18 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, in epipelon below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962; Kyselowa & Kysela 1966; Pudo 1977), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), ponds near Kraków (Hanak-Szmagier 1967).

DISTRIBUTION IN POLAND. Very frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, in waters of moderate and high conductivity (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and brackish fresh water species.

4. ***Caloneis bacillum*** (Grunow) Cleve Plates 25: 4, 5; 82: 8–11

Ref. Krammer & Lange-Bertalot 1985 (p. 160, Fig. 15: 12–15); Krammer & Lange-Bertalot 1986 (p. 390, Fig. 173: 13–16).

DIMENSIONS. Valves 15.2–26.6 μm long and 5.0–5.8 μm wide, with 20–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, but larger populations were observed in samples from mosses, above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Prądnik River (Stępień 1963), Pilica

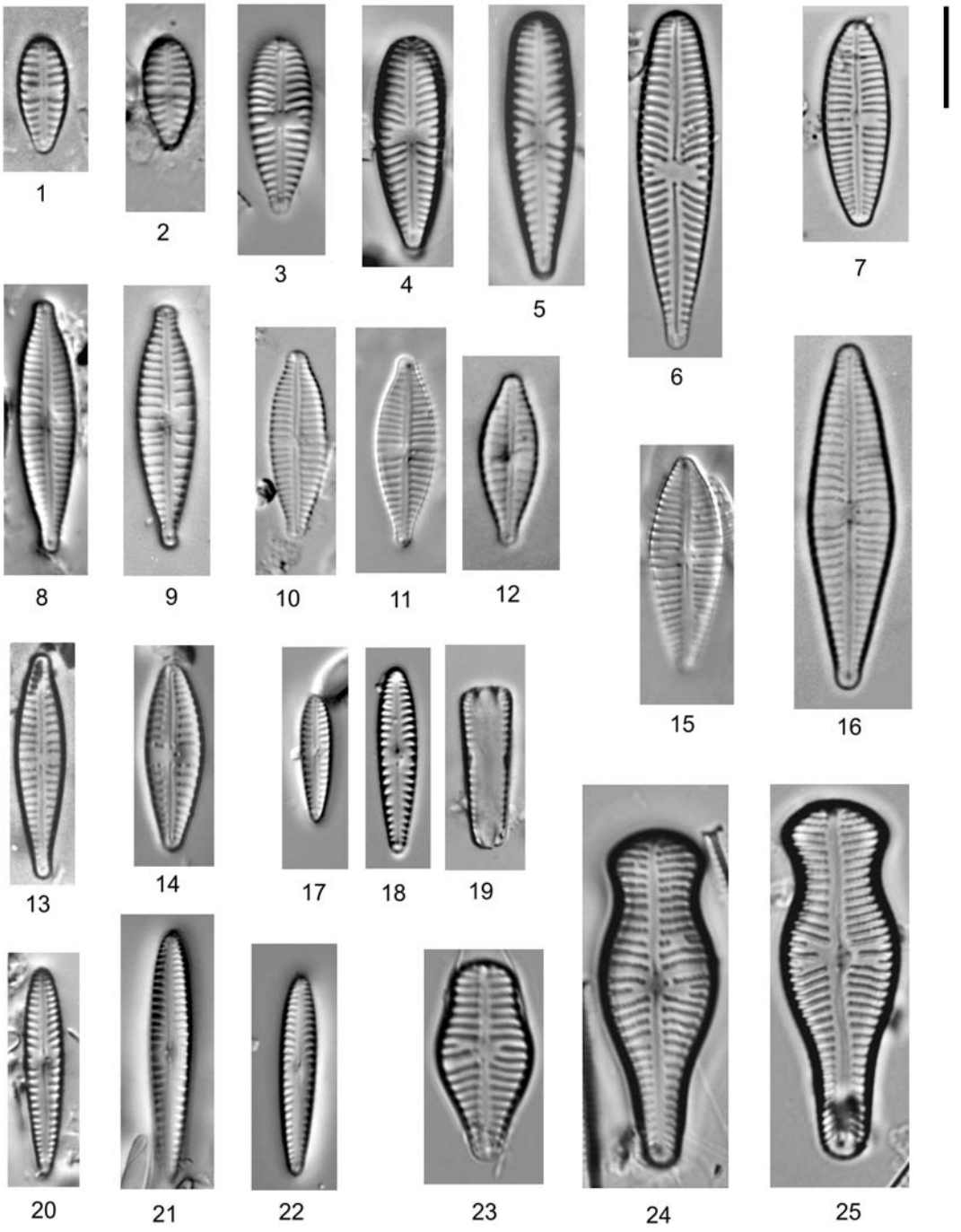


Plate 14. 1–6 – *Gomphonema olivaceum* (Hornemann) Brébisson; 7 – *G. parallelistriatum* Lange-Bertalot & Reichardt; 8–12 – *G. parvulum* (Kützing) Rabenhorst; 13 – *G. parvulum* var. *parvulius* Lange-Bertalot & Reichardt; 14 – *G. parvulum* var. *parvulum* f. *saprophilum* Lange-Bertalot & Reichardt; 15, 16 – *Gomphonema* cf. *pseudoaugur* Lange-Bertalot; 17–22 – *G. pumilum* (Grunow) Reichardt & Lange-Bertalot *sensu lato*; 23–25 – *G. truncatum* Ehrenberg *sensu lato*; all LM. Scale bar = 10 µm.

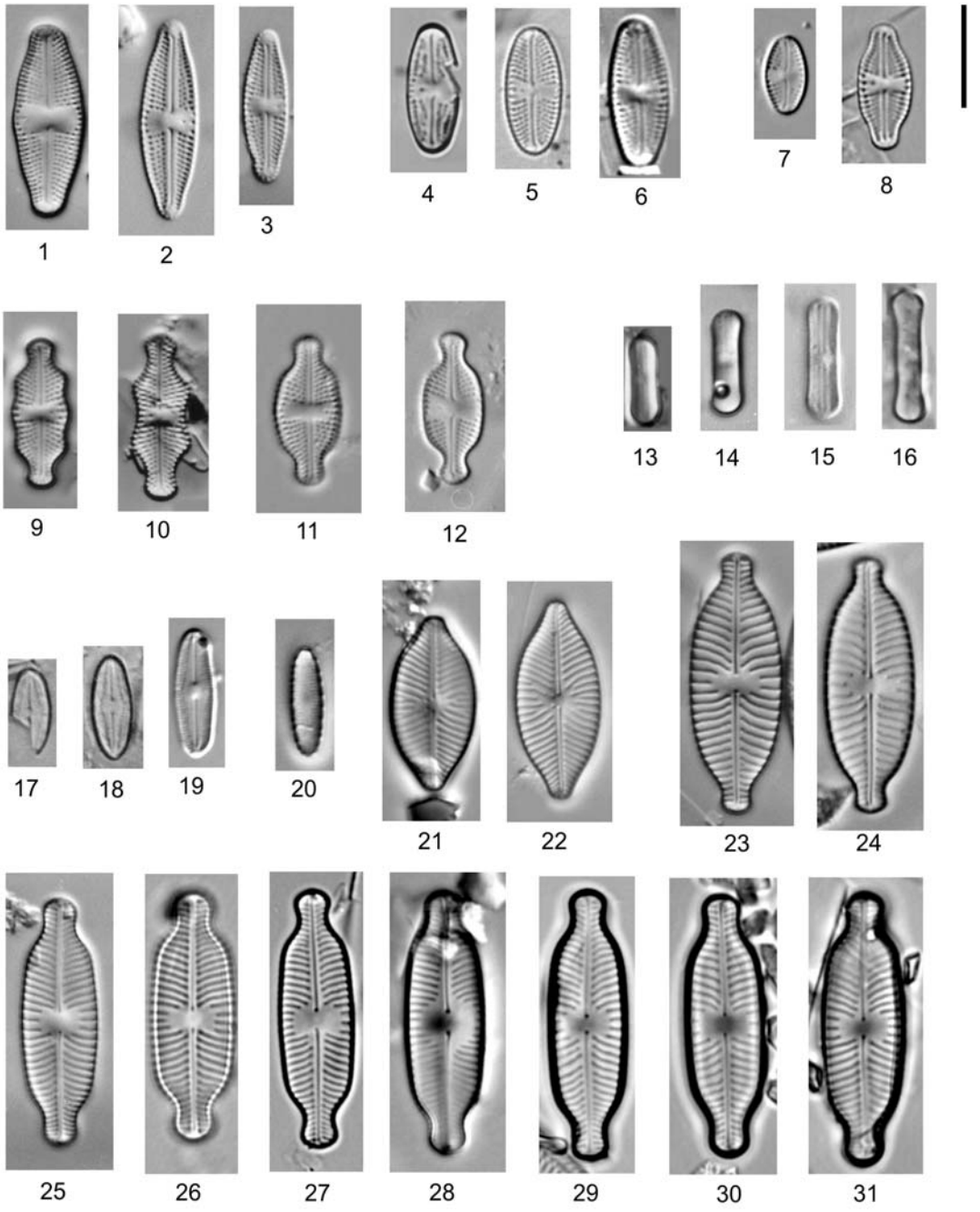


Plate 15. 1 – *Luticola acidoclinata* Lange-Bertalot; 2, 3 – *L. goeppertiana* (Bleisch) D.G. Mann; 4–7 – *L. mutica* (Kützing) D.G. Mann; 8, 12 – *L. ventricosa* (Kützing) D.G. Mann; 9 – *L. nivalis* (Ehrenberg) D.G. Mann; 10 – *L. paramutica* var. *binodis* (Bock) Van de Vijver; 11 – *L. ventriconfusa* Lange-Bertalot; 13–15 – *Diadesmis contenta* (Grunow *in* Van Heurck) D.G. Mann; 16 – *D. biceps* Arnott; 17–19 – *D. perpusilla* (Grunow) D.G. Mann; 20 – *D. gallica* W. Smith; 21, 22 – *Placoneis clementis* (Grunow) Cox; 23, 24 – *P. anglica* (Gregory) Cox; 25–31 – *P. paraelginensis* Lange-Bertalot; all LM. Scale bar = 10 μm.

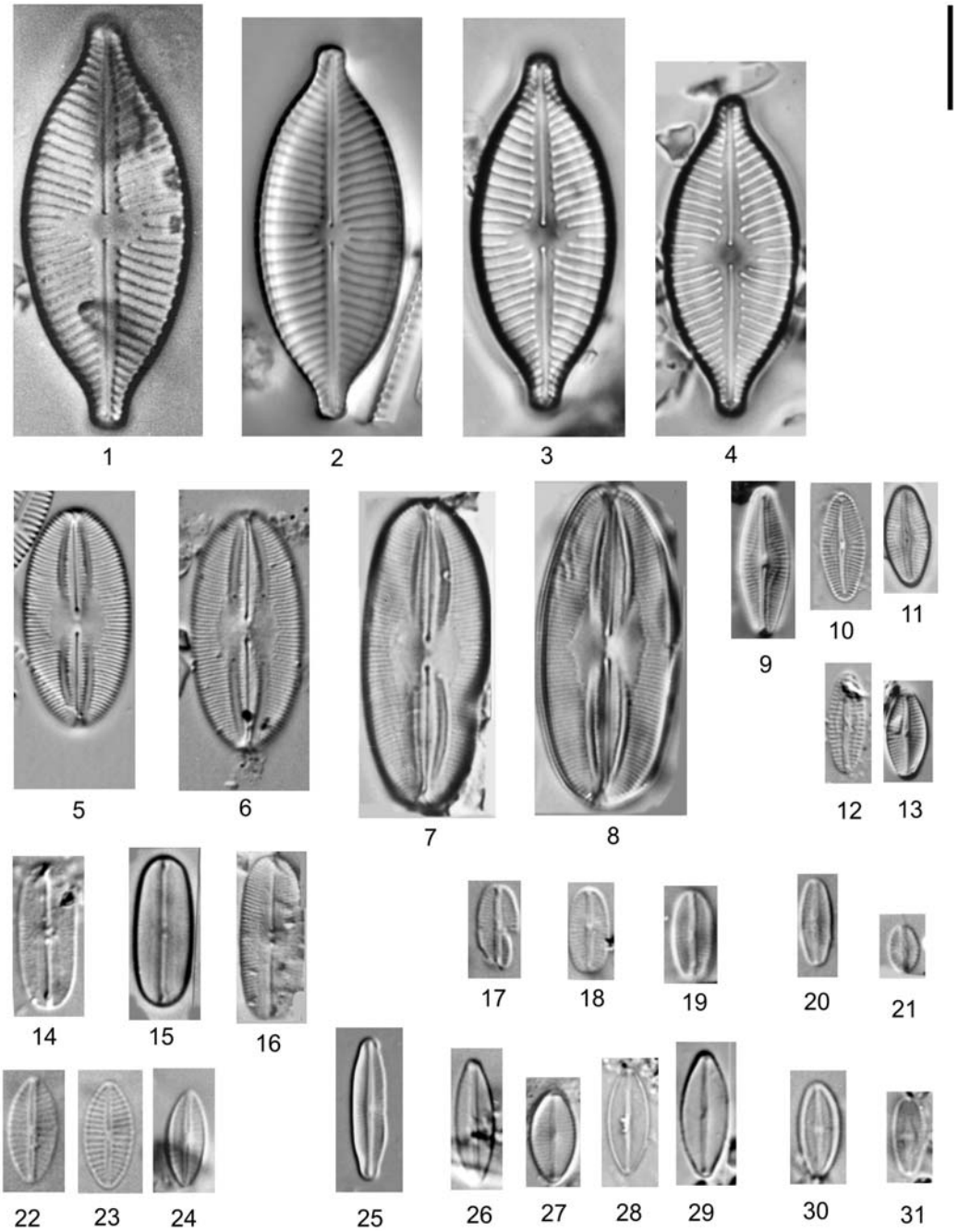


Plate 16. 1–4 – *Placoneis placentula* (Ehrenberg) Heinzerling; 5–8 – *Fallacia pygmaea* (Kützing) Stickle & D.G. Mann; 9–13 – *F. monoculata* (Hustedt) D.G. Mann; 14–16 – *F. subhamulata* (Grunow) D.G. Mann; 17–19 – *F. sublucidula* (Hustedt) D.G. Mann; 20, 21 – *Microcostatus kuelbsii* (Lange-Bertalot) Lange-Bertalot; 22–24 – *Eolimna subminuscula* (Manguin) Moser, Lange-Bertalot & Metzeltin; 25 – *Adlafia bryophila* (Petersen) Moser, Lange Bertalot & Metzeltin; 26 – *A. minuscula* (Grunow) Lange-Bertalot; 27–29 – *Craticula molestiformis* (Hustedt) D.G. Mann *sensu lato*; 30, 31 – *Naviculadicta* sp. 1; all LM. Scale bar = 10 μm.

River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a, b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Vistula River (Pudo 1977), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, especially common in sprayed mosses. Tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an alkaliphilous, β-mesosaprobous, meso-eutraphentic and fresh brackish water species.

REMARKS. The real distribution of *Caloneis bacillum* seems to be seriously overestimated, due to fit-forcing of several morphologically allied taxa.

5. ***Caloneis fontinalis*** (Grunow) Lange-Bertalot & Reichardt Plate 25: 9–14

Navicula fontinalis Grunow *in* Van Heurck 1880–1885; *Caloneis bacillum* var. *fontinalis* (Grunow) Cleve

Ref. Van Heurck 1880–1885 (p. 103, Fig. 12: 33); Lange-Bertalot & Metzeltin 1996 (p. 29, Fig. 87: 14, 15).

DIMENSIONS. Valves 13.3–16.8 μm long and 3.8–4.0 μm wide, with 25–27 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in samples with mosses, sometimes with filamentous algae from above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947).

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain.

REMARKS. Probably the occurrence of the diatom is underestimated, as it could be misidentified with *Caloneis bacillum*.

6. ***Caloneis lancettula*** (Schulz) Lange-Bertalot & Witkowski *in* Lange-Bertalot & Metzeltin Plate 25: 16–18

Caloneis aemula var. *lancettula* Schulz; *C. bacillum* var. *lancettula* (Schulz) Hustedt

Ref. Lange-Bertalot & Metzeltin 1996 (p. 29, Fig. 87: 18).

DIMENSIONS. Valves 17.2–26.6 μm long and 3.5–5.4 μm wide, with 21–26 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in samples with filamentous algae.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Springs of Będkówka stream, as *C. bacillum* var. *lancettula* (Kubik 1970).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

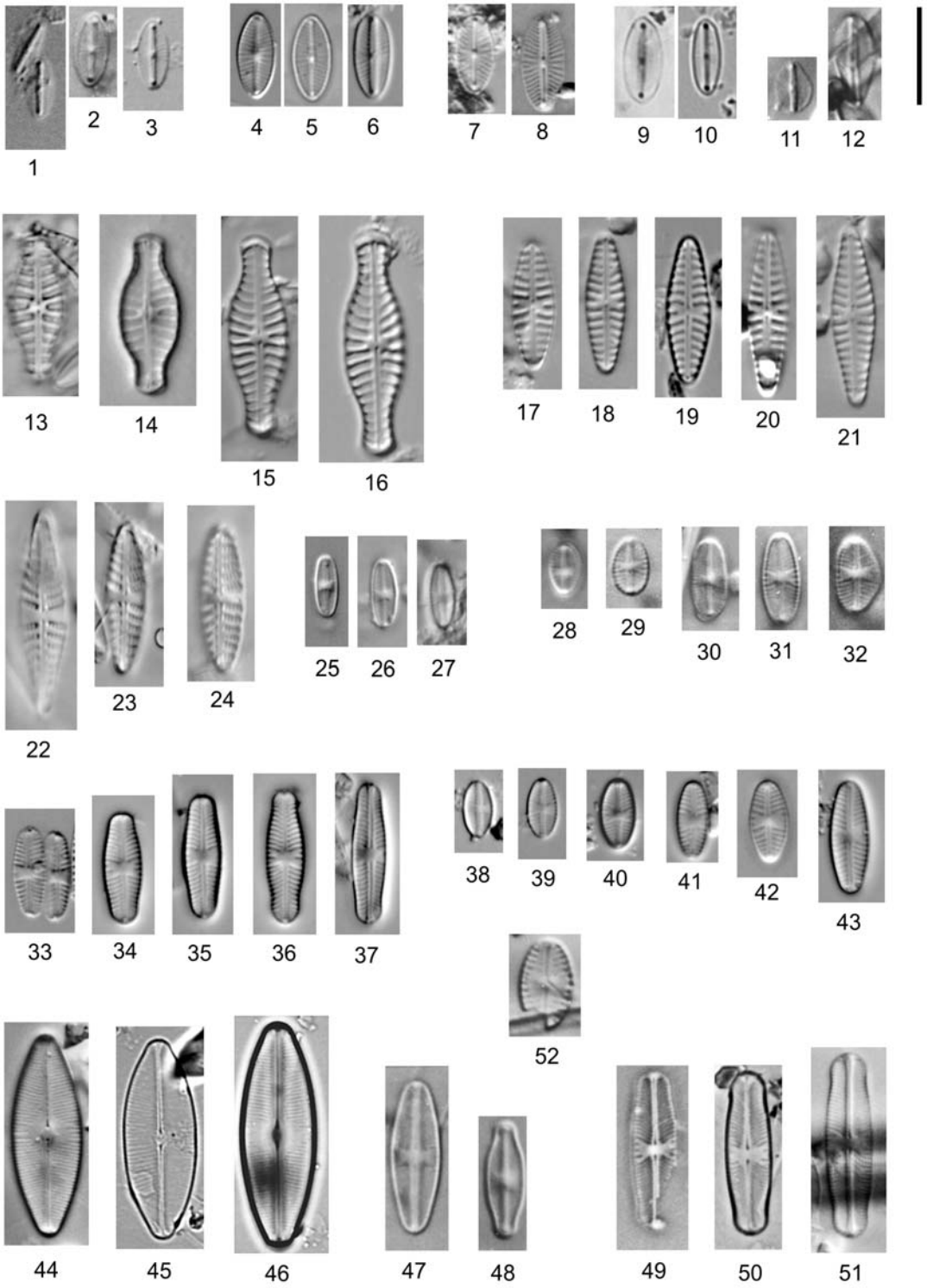
GENERAL DISTRIBUTION AND ECOLOGY. Reported mainly from α-mesotrophic to eutrophic waters (Lange-Bertalot & Metzeltin 1996).

7. ***Caloneis silicula*** (Ehrenberg) Cleve Plates 25: 19–21; 83: 1–8; 84: 1–7

Ref. Krammer & Lange-Bertalot 1986 (p. 388, Fig. 172: 2–4, 7, 10).

DIMENSIONS. Valves 31–54 μm long and 7.8–18.4 μm wide, with 19–21 striae per 10 μm.

Plate 17. 1–3, 9, 10 – *Mayamaea atomus* var. *permitis* (Hustedt) Lange-Bertalot; 4–8 – *M. atomus* (Kützing) Lange-Bertalot *sensu lato*; 11, 12 – *Mayamaea* sp.; 13–16 – *Hippodonta capitata* (Ehrenberg) Lange-Bertalot, Metzeltin & Witkowski; 17–21 – *H. hungarica* (Grunow) Lange-Bertalot, Metzeltin & Witkowski; 22–24 – *H. costulata* (Grunow) Lange-Bertalot, Metzeltin & Witkowski; 25 – *Eolimna minima* (Grunow) Lange-Bertalot; 26, 27 – *E. minima sensu lato*; 28–32 – *Naviculadicta* cf. *raederiae* Lange-Bertalot; 33–37 – *Sellaphora joubaudii* (Germain) Aboal; 38–43 – *S. seminulum* (Grunow) D.G. Mann; 44–46 – *S. bacilloides* (Hustedt) Levkov, Krstic & Nakov; 47, 48 – *S. nana* (Hustedt) Lange-Bertalot *sensu lato*; 49–51 – *S. pupula* (Kützing) Mereschkovsky *sensu lato*; 52 – *Mayamaea fossalis* (Krasske) Lange-Bertalot var. *fossalis*; all LM. Scale bar = 10 μm.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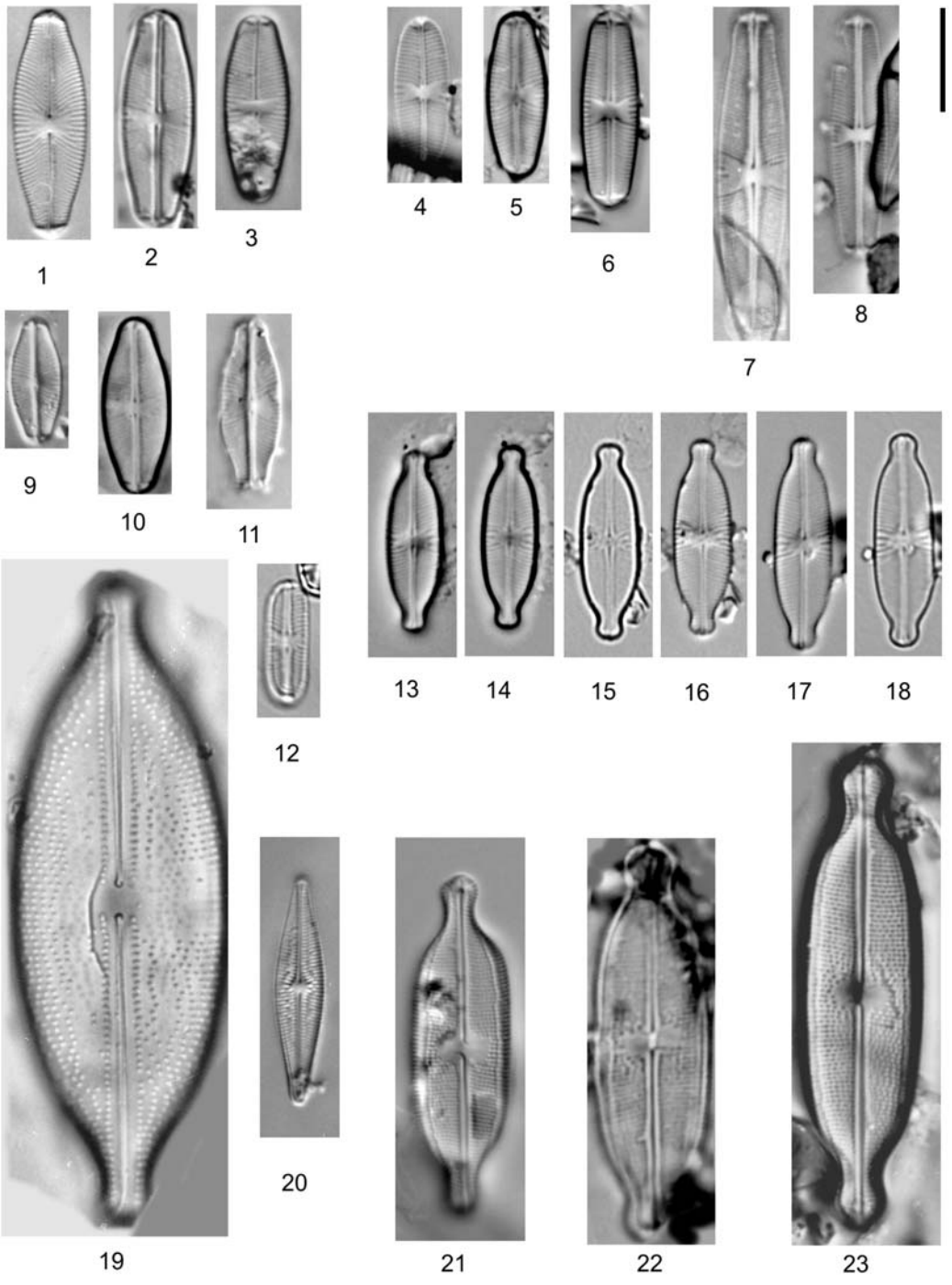


Plate 18. 1–11 – *Sellaphora pupula* (Kützing) Mereschkovsky *sensu lato*; 12 – *Sellaphora* cf. *stroemii* (Hustedt) D.G. Mann; 13–18 – *Naviculadicta brockmannii* (Hustedt) Lange-Bertalot; 19 – *Anomoeoneis sphaerophora* (Ehrenberg) Pfitzer f. *sphaerophora*; 20 – *Brachysira neoexilis* Lange-Bertalot; 21–23 – *Neidium* cf. *affine* (Ehrenberg) Pfitzer; all LM. Scale bar = 10 μm.

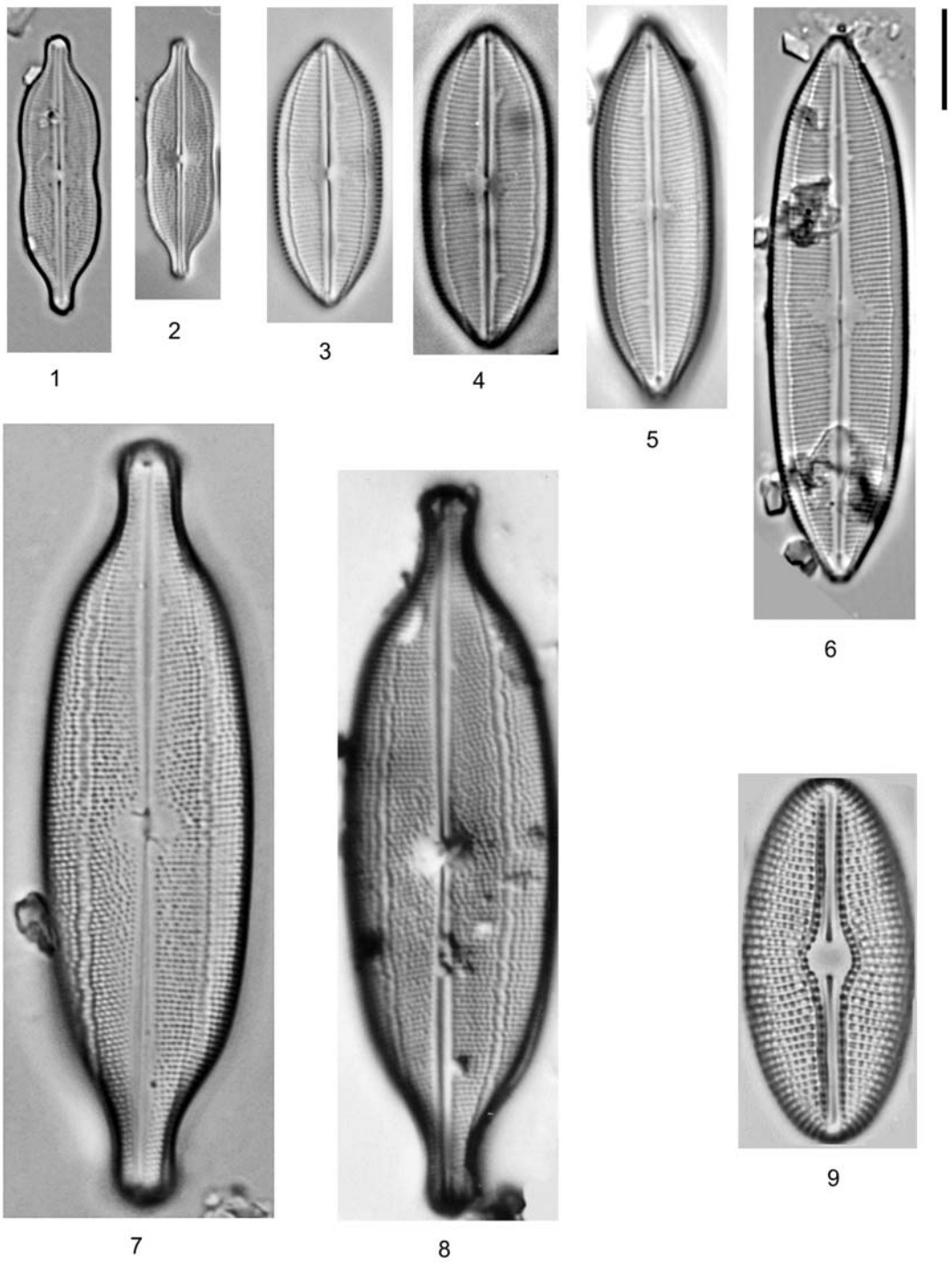


Plate 19. 1, 2 – *Neidium binodis* (Ehrenberg) Hustedt *sensu lato*; 3–6 – *N. dubium* (Ehrenberg) Cleve; 7, 8 – *N. productum* (W. Smith) Cleve; 9 – *Diploneis krammeri* Lange-Bertalot & Reichardt; all LM. Scale bar = 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962; Pudo 1977), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964a, b), spring of Szklarka stream (Skalska 1966a), ponds near Kraków, (Hanak-Szmagier 1967), springs of Kobylanka stream (Skalna 1969), caves (Mrozińska-Broda & Czerwik-Marcinkowska 2004).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, in waters of moderate conductivity (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an alkaliphilous, oligosaprobous, meso-eutraphentic, strictly aquatic and fresh brackish water species.

8. ***Caloneis*** aff. ***silicula*** (Ehrenberg) Cleve Plate 25: 6–8

DIMENSIONS. Valves 18–31 μm long and 7.0–9.2 μm wide, with 19–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton mainly above Kobylany village.

REMARKS. Identification of this diatom followed the broad species concept.

9. ***Caloneis*** sp. 1. Plate 25: 15

DIMENSIONS. Valves 37.0–38.2 μm long and 7.8–8.0 μm wide, with 20–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

REMARKS. The specimens found resemble those of *C. alpestris*, especially in middle portion of valves, but were smaller and possess less striae per 10 μm.

10. ***Caloneis*** sp. 2 Plate 26: 1, 2

DIMENSIONS. Valves 13.0–13.6 μm long and 3.9–4.0 μm wide, with 26–28 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

REMARKS. The observed specimens could represent the smallest forms of *Caloneis* cf. *fontinalis*. They differ, however, in having higher striae density, a narrow axial area and a more linear outline.

11. ***Caloneis*** sp. 3 Plate 26: 3, 4

DIMENSIONS. Valves 26.4–32.0 μm long and 5.8–6.4 μm wide, with 22–24 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA. Rare, in sample with *Cladophora* sp., below Kobylany village.

REMARKS. The specimens resemble a diatom illustrated by Werum and Lange-Bertalot (2004 Fig. 84: 37–39) and identified as *Caloneis* sp.

8. ***Campylodiscus*** Ehrenberg

1. ***Campylodiscus hibernicus*** Ehrenberg Plate 47: 1–5

Campylodiscus noricus var. *hibernica* (Ehrenberg) Grunow

Ref. Krammer & Lange-Bertalot 1988 (p. 214, Figs 175: 5; 179: 1–4; 180: 1–7; 181: 1–3).

DIMENSIONS. Valves 42.2–78.0 μm in diameter, with *ca* 15.0–18.5 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon, above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pilica River (Cabejszek 1951; Kadłubowska 1964a, b, c).

DISTRIBUTION IN POLAND. According to Siemińska and Wołowski (2003), a very common diatom.

GENERAL DISTRIBUTION AND ECOLOGY. In waters of moderate conductivity, especially common in epipelon (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkalibiontic, eutraphentic, strictly aquatic and fresh brackish water species.

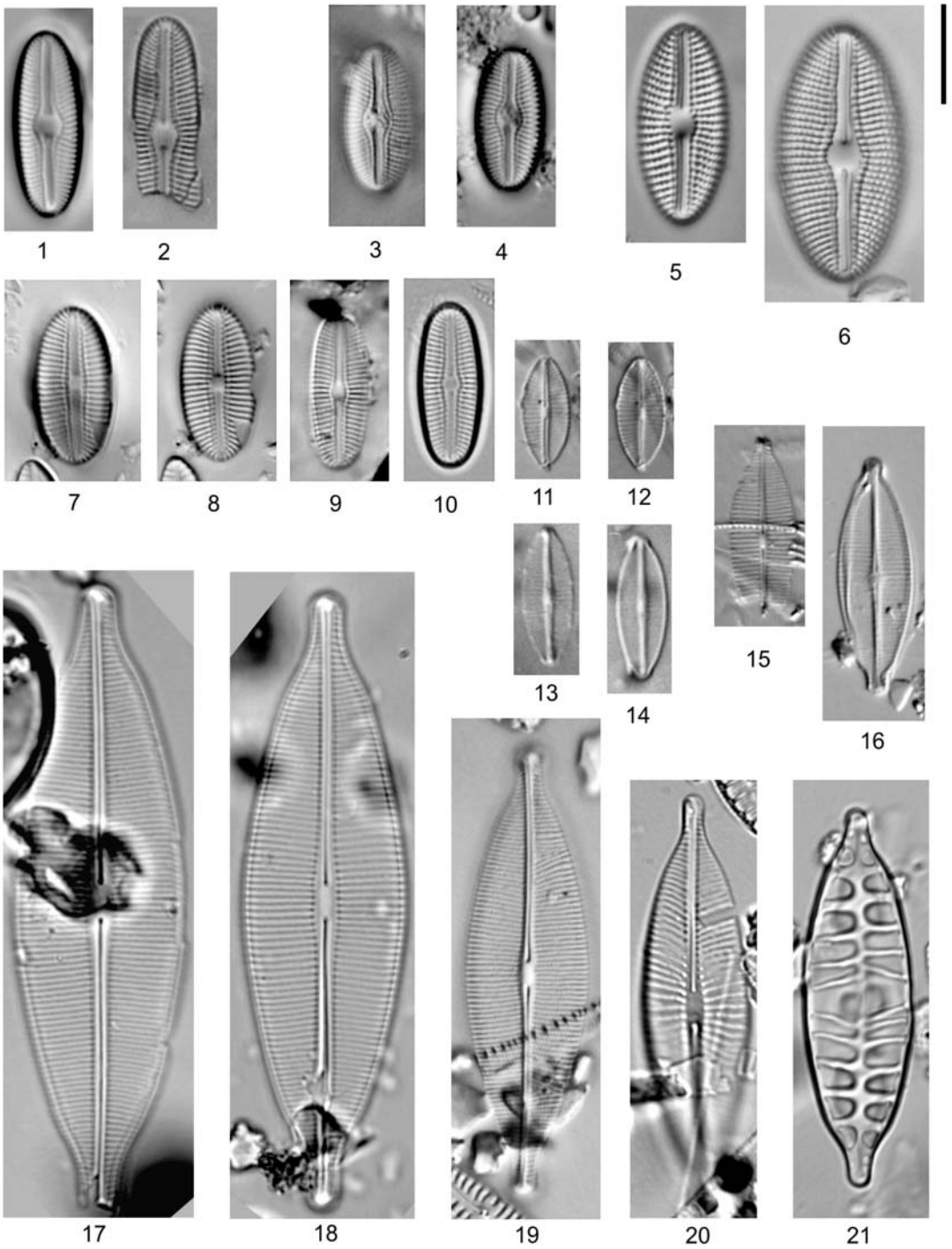


Plate 20. 1–4 – *Diploneis fontanella* Lange-Bertalot; 5, 6 – *D. krammeri* Lange-Bertalot & Reichardt; 7–10 – *D. oblongella* (Nägeli) Cleve-Euler *auct*.; 11–14 – *Craticula* cf. *minusculoides* (Hustedt) Lange-Bertalot; 15, 16 – *C. accomoda* (Hustedt) D.G. Mann; 17–21 – *C. ambigua* (Ehrenberg) D.G. Mann; all LM. Scale bar = 10 μm.

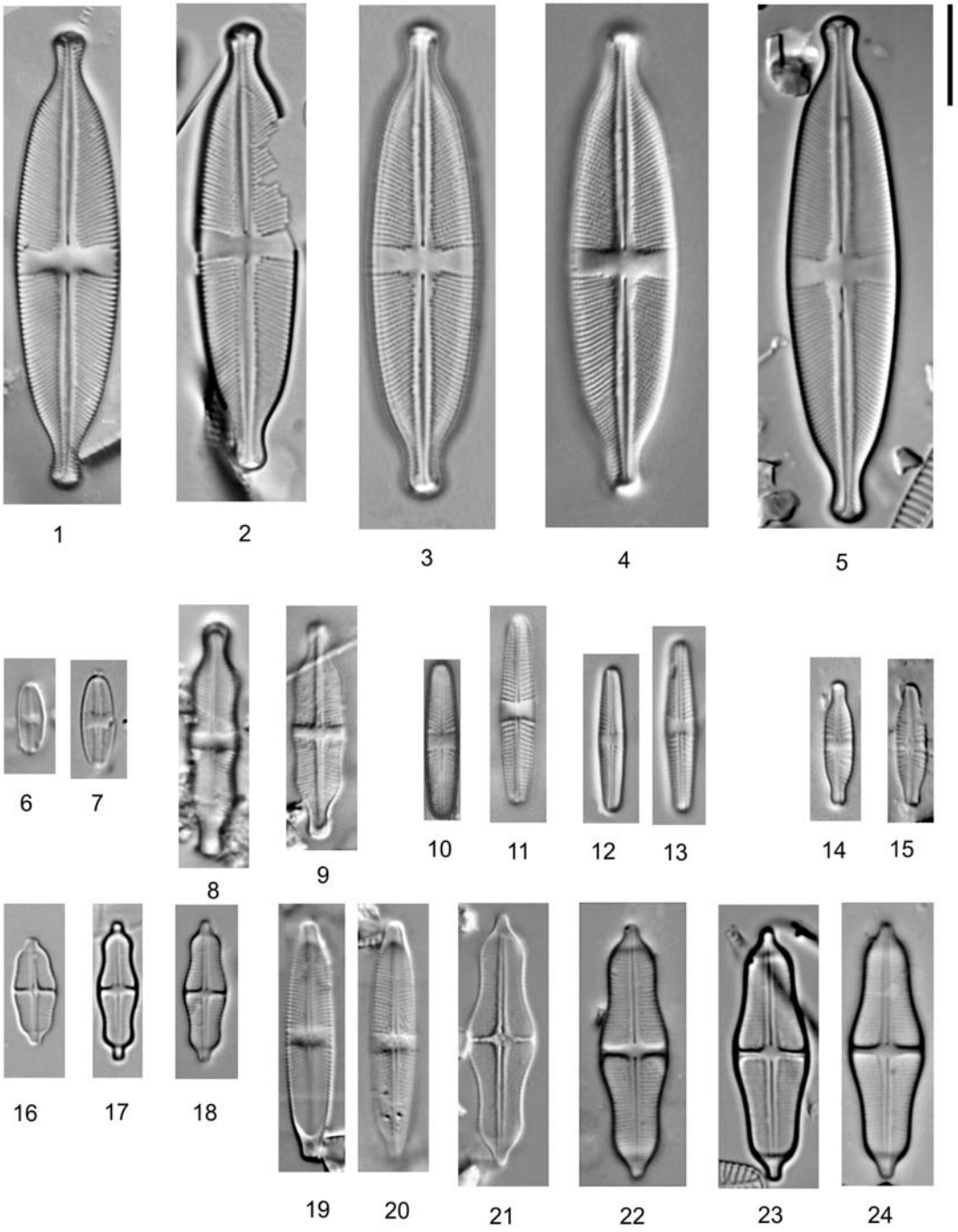


Plate 21. 1–5 – *Stauroneis anceps* Ehrenberg; 6, 7 – *Eolimna minima* (Grunow) Lange-Bertalot *sensu lato*; 8, 9 – *S. leguminopsis* Lange-Bertalot & Krammer; 10, 11 – *S.* cf. *borrichii* (Petersen) Lund; 12, 13 – *S.* cf. *montana* Krasske f. *lanceolata* Hustedt; 14, 15 – *S. thermicola* (Petersen) Lund; 16–18 – *S. separanda* Lange-Bertalot & Werum; 19, 20 – *S. prominula* (Grunow) Hustedt; 21–24 – *S. smithii* Grunow; all LM. Scale bar = 10 μm.

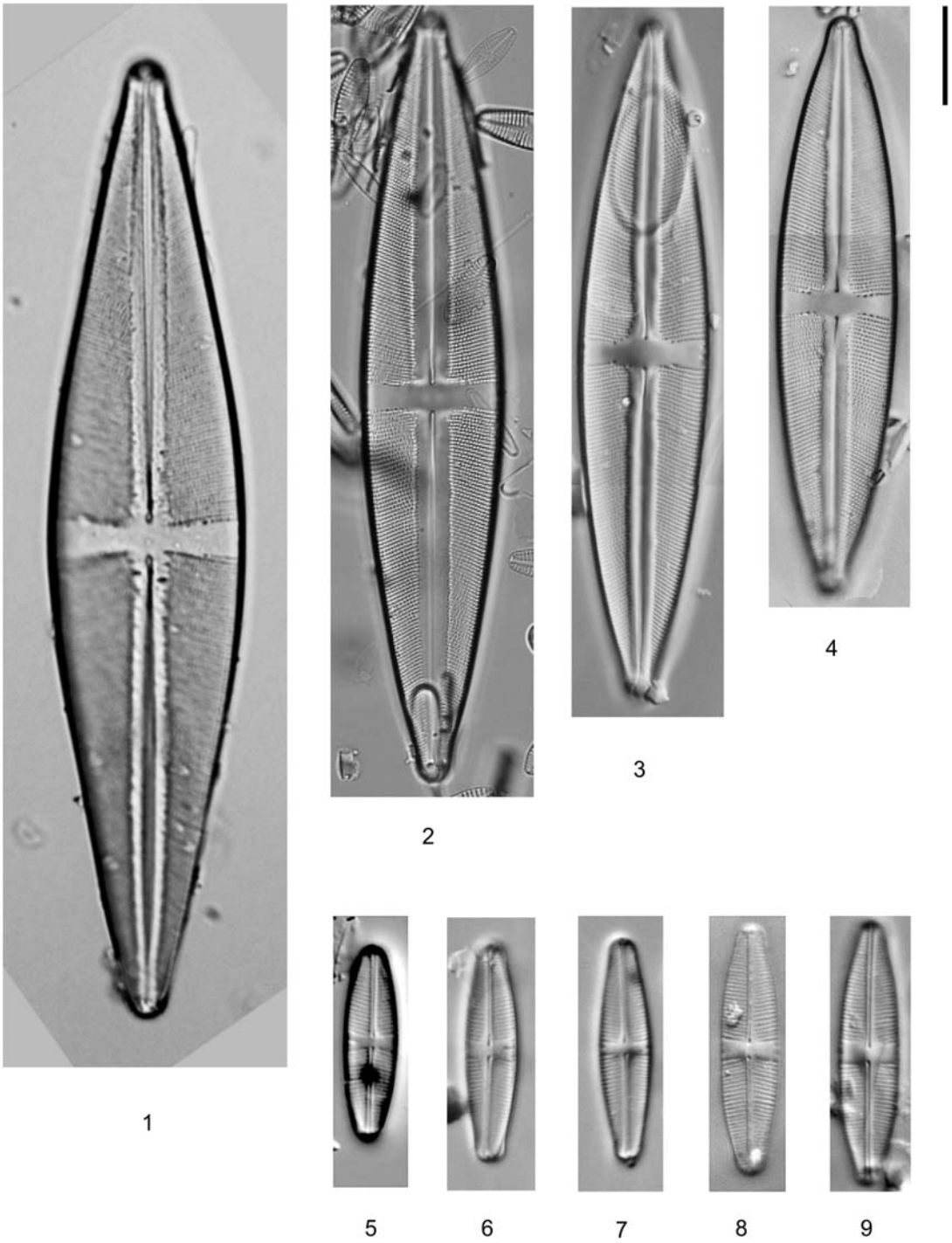


Plate 22. 1 – *Stauroneis phoenicenteron* (Nitzsch) Ehrenberg; 2–4 – *Stauroneis* sp.; 5–9 – *S. tackei* (Hustedt) Krammer, Lange-Bertalot, Kuesber & Metzeltin; all LM. Scale bar = 10 μm.

9. ***Chamaepinnularia*** Lange-Bertalot & Krammer *in* Lange-Bertalot & Metzeltin

1. **Chamaepinnularia krookiformis* (Krammer) Lange-Bertalot & Krammer Plates 26: 5; 82: 3

Pinnularia krookiformis Krammer

Ref. Krammer 1992 (p. 79, Fig. 18: 14–21); Lange-Bertalot *et al.* 1996 (Fig. 26: 9–17); Lange-Bertalot & Genkal 1999 (p. 37, Figs 45: 6–10; 47: 9–12, 16).

DIMENSIONS. Valves 18.5–20.0 μm long and 4.3–4.8 μm wide, with 19–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with mosses.

DISTRIBUTION IN POLAND. Zatoka Gdańska (Witkowski 1994), Zalew Szczeciński (Bąk *et al*. 2006). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Known from Central and Northern Europe (Krammer 1992; Lange-Bertalot & Genkal 1999). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, brackish fresh water species, in subaerophytic biotopes.

2. ***Chamaepinnularia submuscicola* (Krasske) Lange-Bertalot Plate 26: 6–9

Navicula submuscicola Krasske; *N. bremensis* Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 111, Fig. 35: 11–13); Lange-Bertalot *et al.* 1996 (p. 148, Fig. 22: 1, 2); Moser *et al.* 1998 (p. 27).

DIMENSIONS. Valves 8.6–10.2 μm long and 2.6–3.4 μm wide, with 22–24 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and samples with *Vaucheria* sp.

GENERAL DISTRIBUTION AND ECOLOGY. Rare, widespread diatom, usually found from decaying mosses (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991), aerophilous (Van Dam *et al*. 1994).

10. ***Cocconeis*** Ehrenberg

1. ***Cocconeis neodiminuta*** Krammer Plate 8: 1–3

Cocconeis diminuta Pantocsek *sensu* Hustedt 1930

Ref. Krammer & Lange-Bertalot 1991b (p. 90, Figs 55: 1–4; 56: 18–32).

DIMENSIONS. Valves 9.6–19.4 μm long and 6.5–8.0 μm wide, with *ca* 25 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epilithon and periphyton above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), spring of Szklarka stream (Skalska 1966a), springs of Kobylanka stream (Skalna 1969), Sanka stream (Hojda 1971), Vistula River (Starmach 1938).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain. According to Denys (1991), an euplanktonic diatom; according to Van Dam *et al.* (1994), a fresh brackish water species. In Germany classified as extremely rare (Lange-Bertalot 1996).

2. ***Cocconeis pediculus*** Ehrenberg Plates 6: 25–27; 7: 1, 2; 63: 1–4, 6

Ref. Krammer & Lange-Bertalot 1991b (p. 89, Figs 55: 5–8; 57: 1–4).

DIMENSIONS. Valves 20.2–30.4 μm long and 17.5–20.0 μm wide. Raphe valves with *ca* 19–23 striae per 10 μm, sternum valves with 17.5–22.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Abundant, with the largest populations observed in material collected from *Cladophora* sp., especially in Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sites with unspecified location (Gutwiński 1895), Vistula River (Turoboyski 1962; Pudo 1977), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Prądnik River (Stępień 1963), Sanka stream (Kądziołka 1963; Hojda 1971), Pilica River (Kadłubowska 1964a, b), spring of Szklarka stream (Skalska 1966a, b), Będkówka stream (Kubik 1970) and Kluczwoda stream (Nawrat 1993).

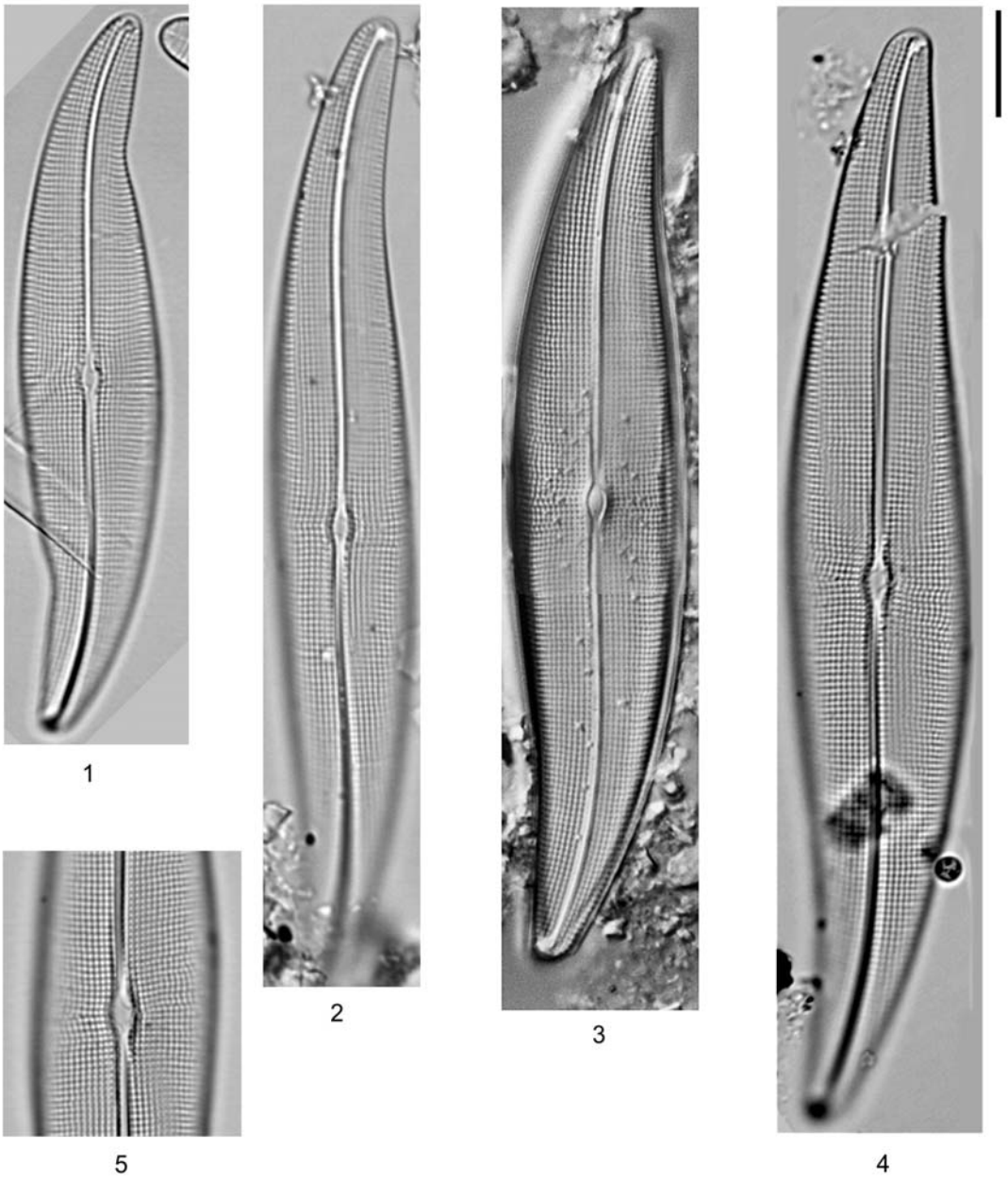


Plate 23. 1–5 – *Gyrosigma acuminatum* (Kützing) Rabenhorst; all LM. Scale bar = 10 μm.

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan periphytic diatom reported from waters of moderate and high conductivity, including brackish waters (Krammer & Lange-Bertalot 1991b), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic, strictly aquatic and brackish fresh water species.

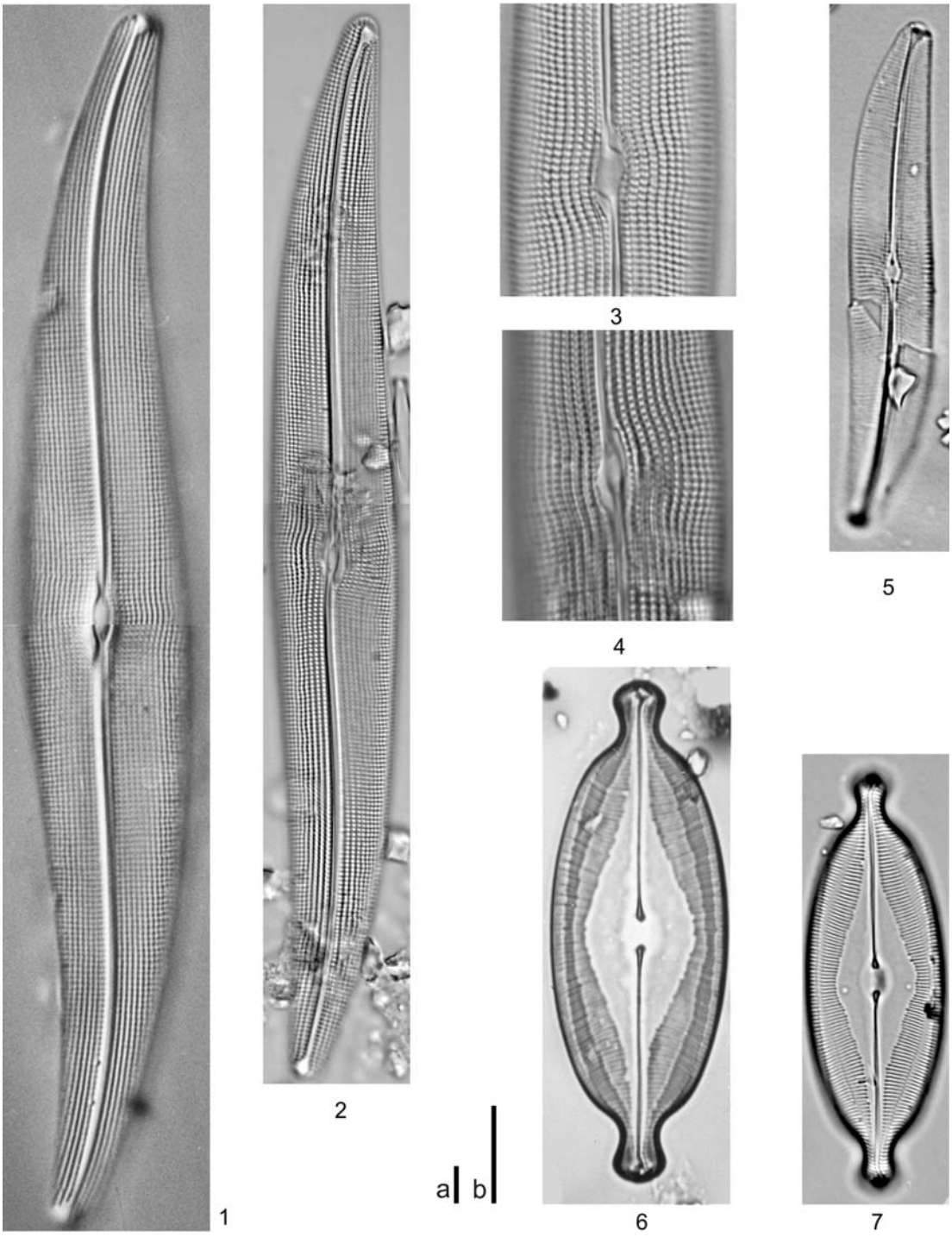


Plate 24. 1–4 – *Gyrosigma attenuatum* (Kützing) Rabenhorst; 5 – *G. scalproides* (Rabenhorst) Cleve; 6, 7 – *Caloneis amphisbaena* (Bory) Cleve; all LM. Scale bars = 10 µm (a – 1, 2; b – other photos scale bar).

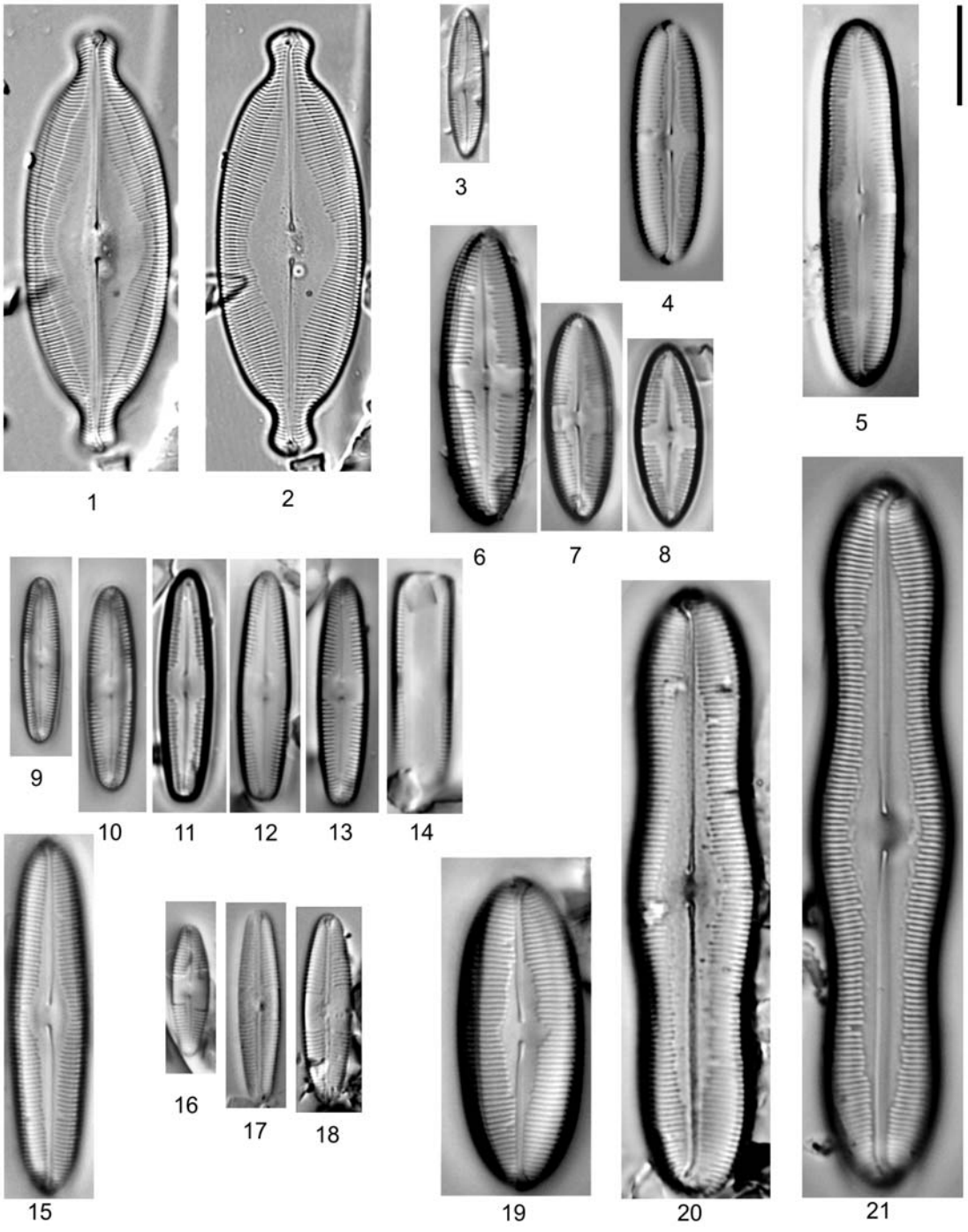


Plate 25. 1, 2 – *Caloneis amphisbaena* (Bory) Cleve; 3 – *C. aerophila* Bock; 4, 5 – *C. bacillum* (Grunow) Cleve; 6–8 – *C.* aff. *silicula* (Ehrenberg) Cleve; 9–14 – *C. fontinalis* (Grunow) Lange-Bertalot & Reichardt; 15 – *Caloneis* sp. 1; 16–18 – *C. lancettula* (Schulz) Lange-Bertalot & Witkowski; 19–21 – *C. silicula* (Ehrenberg) Cleve; all LM. Scale bar = 10 µm.

3. ***Cocconeis placentula*** Ehrenberg
Plates 7: 3–5; 63: 5, 7, 8; 64: 1, 2

Ref. Krammer & Lange-Bertalot 1991b (p. 86, Figs 49: 1–4; 50: 5; 51: 1–5).

DIMENSIONS. Valves 8.2–36.6 µm long and 7.4–23.2 µm wide, with *ca* 20–25 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Pudo 1977), fish pond in Mydlniki (Starmach 1939), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Hojda 1971), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964a, b), spring of Szklarka stream (Skalska 1966a, b), ponds near Kraków, without exact localities (Hanak-Szmagier 1967), springs of Kobylanka stream (Skalna 1969), Będkówka stream (Kubik 1970), Biała Przemsza River (Wasylik 1985).

DISTRIBUTION IN POLAND. *Cocconeis placentula* was commonly reported from Poland (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, epiphytic diatom, occurs in periphyton and epilithon (Krammer & Lange-Bertalot 1991b), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), *Cocconeis placentula* var. *placentula* is an alkaliphilous, β-mesosaprobous, eutraphentic and fresh brackish water diatom.

4. ***Cocconeis placentula*** var. ***euglypta*** (Ehrenberg) Grunow
Plate 7: 17–20

Cocconeis euglypta Ehrenberg

Ref. Krammer & Lange-Bertalot 1991b (p. 87, Figs 50: 1; 53: 1–19).

DIMENSIONS. Valves 11.0–41.2 µm long and 7.4–26.6 µm wide. Raphe valves with *ca* 20 striae per 10 µm, sternum valves with 20–22 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Very frequent, with the largest populations observed in the periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish pond in Mydlniki (Starmach 1939), Młynówka stream (Gumiński 1947), Vistula River (Turoboyski 1962; Pudo 1977), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a, b), springs of Kobylanka stream (Skalna 1969), Będkówka stream (Kubik 1970), Biała Przemsza River (Wasylik 1985), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Common cosmopolitan diatom, present in periphyton and epilithon (Krammer & Lange-Bertalot 1991b), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

5. ***Cocconeis placentula*** var. ***lineata*** (Ehrenberg) Van Heurck
Plate 7: 9–16

Cocconeis lineata Ehrenberg

Ref. Krammer & Lange-Bertalot 1991b (p. 87, Figs 49: 1; 50: 2; 52: 1–13).

DIMENSIONS. Valves 14.0–25.2 µm long and 10.5–14.0 µm wide. Raphe valves with *ca* 22.0–23.5 striae per 10 µm, sternum valves with 20–22 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Spring in Dubie (Skalska 1966a, b).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan and common (Krammer & Lange-Bertalot 1991b), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous,

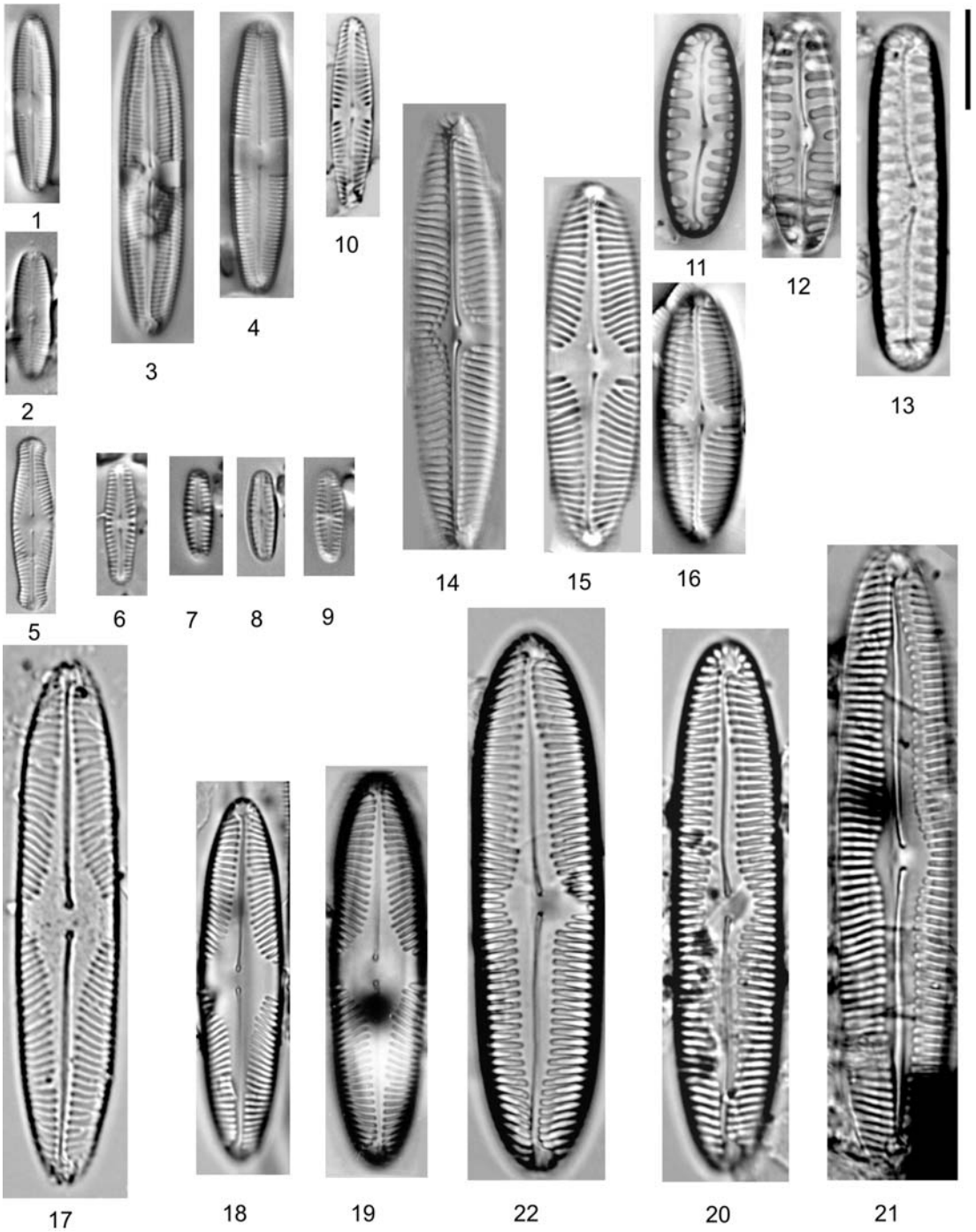


Plate 26. 1, 2 – *Caloneis* sp. 2; 3, 4 – *Caloneis* sp. 3; 5 – *Chamaepinnularia krookiformis* (Krammer) Lange-Bertalot & Krammer; 6–9 – *Ch. submuscicola* (Krasske) Lange-Bertalot; 10 – *Pinnularia appendiculata* (Agardh) Cleve; 11–13 – *P. borealis* Ehrenberg; 14 – *P. microstauron* (Ehrenberg) Cleve; 15–19 – *P. brebissonii* (Kützing) Rabenhorst; 20, 21 – *P. frequentis* Krammer; 22 – *P. subcomutata* Krammer; all LM. Scale bar = 10 μm.

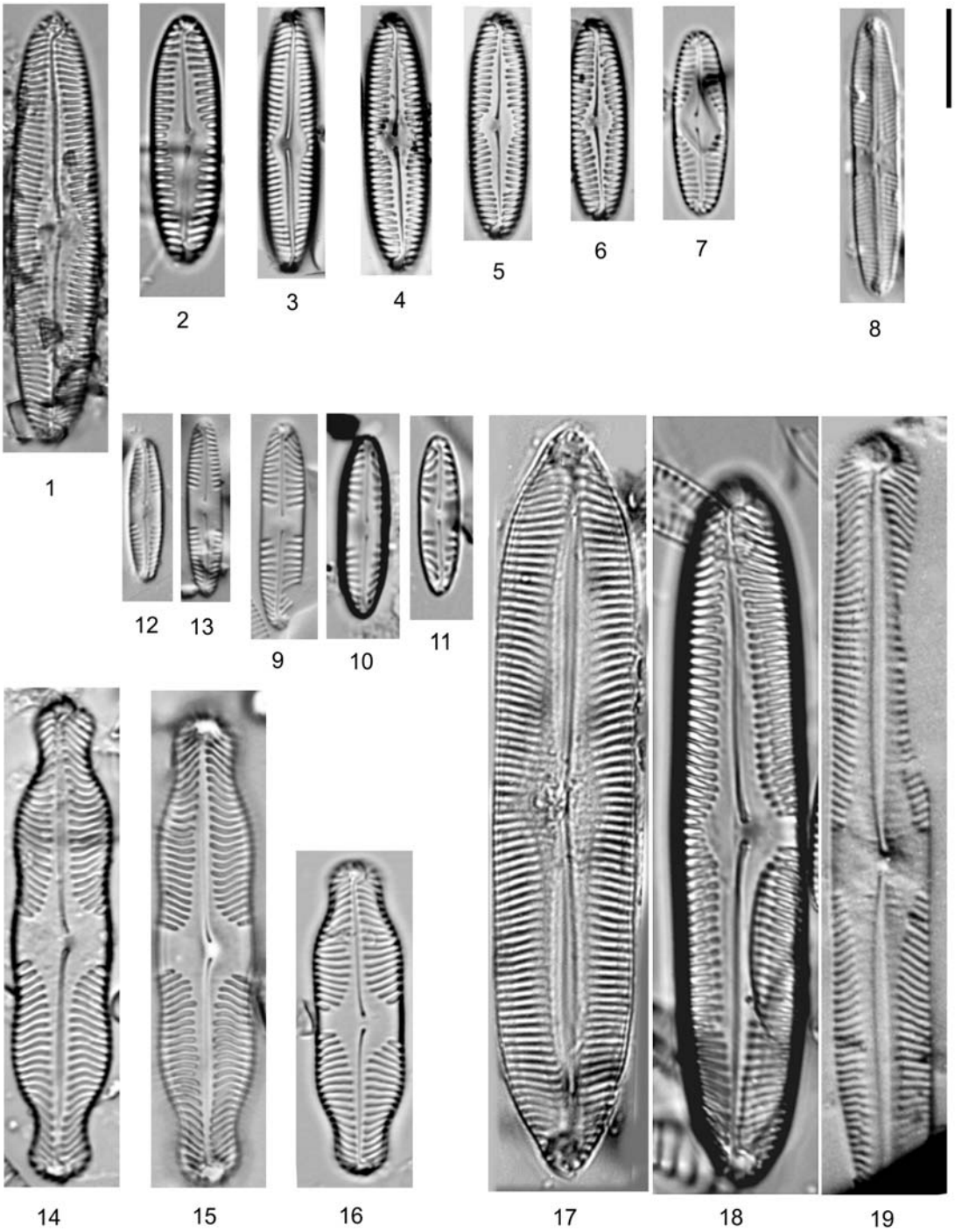


Plate 27. 1 – *Pinnularia isselana* Krammer; 2–7 – *P.* cf. *isselana*; 8 – *P. kuetzingii* Krammer; 9–11 – *P. obscura* Krasske; 12, 13 – *Pinnularia* sp. 1; 14, 15 – *P. septentrionalis* Krammer; 16 – *P. septentrionalis*, dwarf form; 17 – *P.* cf. *peracuminata* Krammer; 18 – *P. subcomutata* Krammer; 19 – *P.* cf. *subgibba* Krammer; all LM. Scale bar = 10 μm.

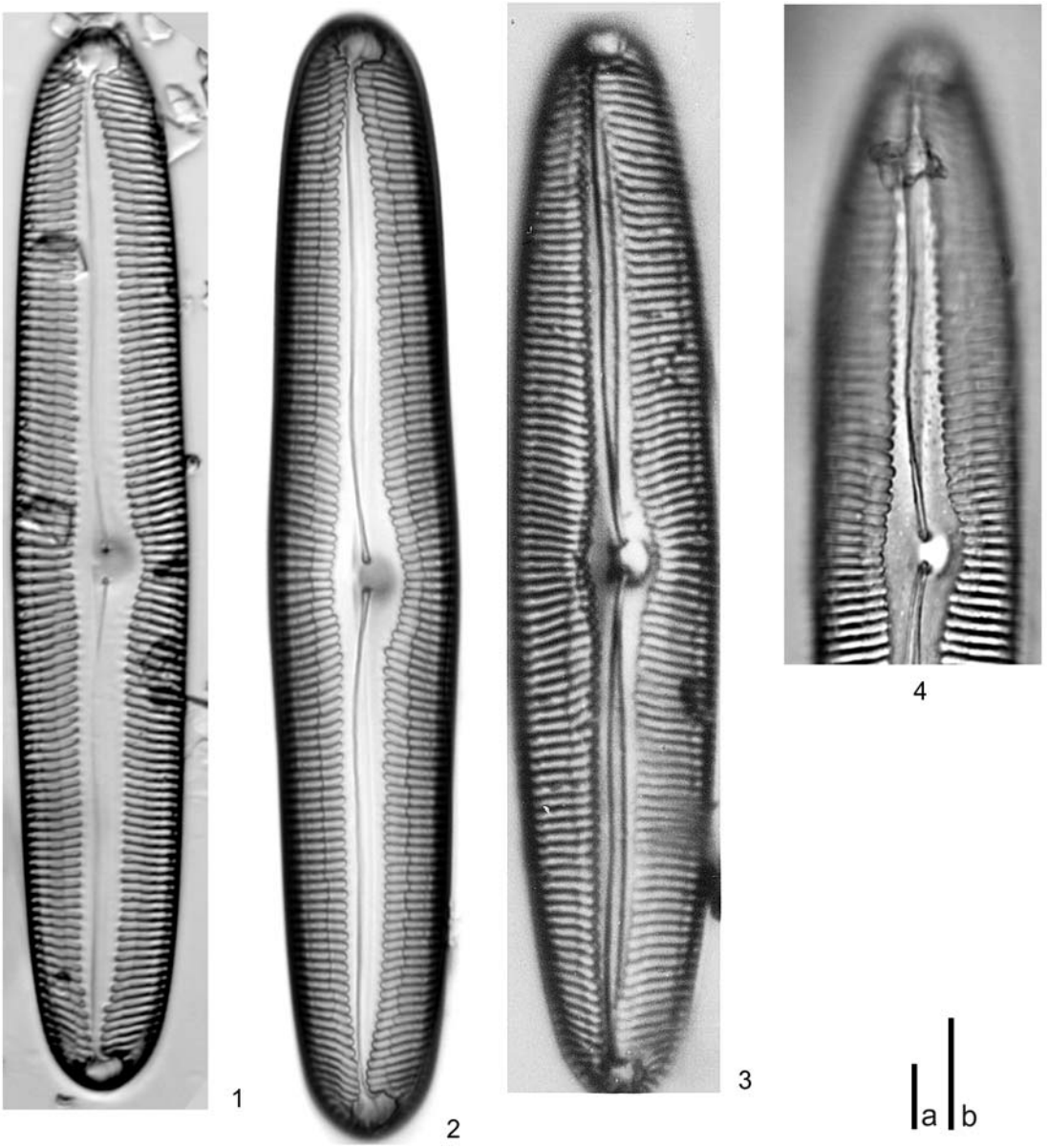


Plate 28. 1, 2 – *Pinnularia neomajor* Krammer; 3, 4 – *P. viridiformis* Krammer; all LM. Scale bars = 10 µm (a – 1, 2; b – 3, 4).

β-mesosaprobous, eutraphentic and fresh brackish water species.

6. ****Cocconeis pseudolineata*** (Geitler) Lange-Bertalot Plate 7: 6–8

Cocconeis placentula var. *pseudolineata* Geitle

Ref. Krammer & Lange-Bertalot 1991b (p. 87, Fig. 54: 3–11).

DIMENSIONS. Valves 12.5–23.0 µm long and 8–18 µm wide. Raphe valve with *ca* 23–24 striae per 10 µm, sternum valve with 13–15 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN POLAND. Reported from, e.g., Zalew Wiślany (Jankowska *et al*. 2005), Zalew Szczeciński (Bąk *et al*. 2006), Lake Raduń (Kowalska & Luścińska 2006) and spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain. Tychoplanktonic diatom (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

11. ***Craticula*** D.G. Mann

1. **Craticula accomoda*** (Hustedt) D.G. Mann Plate 20: 15, 16

Navicula accomoda Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 128, Fig. 45: 13–20); Lange-Bertalot 2001 (p. 108, Fig. 93: 1–6).

DIMENSIONS. Valves 20–25 μm long and 5–8 μm wide, with 19–25 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon below Kobylany village.

DISTRIBUTION IN POLAND. According to Siemińska and Wołowski (2003), *Navicula accomoda* is a very rare species in Poland, reported from a trickling filter of a sewage treatment plant (Wołowski 1989). Very abundant (dominant) in sewage discharge in Swarzewo (Zatoka Pucka) (A. Witkowski, personal communication).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan and common in Europe, especially in strongly organically polluted waters, but known also from oligo- to mesotrophic waters (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, polysaprobous and fresh brackish water species that occurs in hypereutrophic conditions.

2. ***Craticula ambigua*** (Ehrenberg) D.G. Mann Plates 20: 17–21, 79: 1–9, 80: 1–4

Navicula ambigua Ehrenberg; *N. cuspidata* var. *ambigua* (Ehrenberg) Cleve

Ref. Krammer & Lange-Bertalot 1986 (p. 126, Fig. 43: 2); Lange-Bertalot 2001 (p. 109, Figs 82: 4–8; 83: 3, 4; 86: 3, 4).

DIMENSIONS. Valves 38.4–65.2 μm long and 10.4–17.0 μm wide, with 15–18 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Very common. (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common in Europe, in eutrophic waters of moderate to very high conductivity, and β-α-mesosaprobic waters (Lange-Bertalot 2001).

3. ***Craticula*** cf. ***minusculoides*** (Hustedt) Lange-Bertalot Plate 20: 11–14

Navicula minusculoides Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 129, Fig. 45: 10–12); Lange-Bertalot 2001 (p. 115, Fig. 93: 7–15).

DIMENSIONS. Valves 13.5–16.5 μm long and 4.5–6.0 μm wide, with 24–26 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in samples from spring as well as the lower section of Kobylanka stream (Wojtal & Sobczyk 2006).

GENERAL DISTRIBUTION AND ECOLOGY. A diatom of uncertain distribution, known from eutrophic, electrolyte-rich, α- or β-mesosaprobic waters (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an α-meso- to polysaprobous, eutraphentic and fresh brackish water species.

REMARKS. The valves observed were generally more elliptic with lower striae density. SEM studies are needed for unambiguous identification.

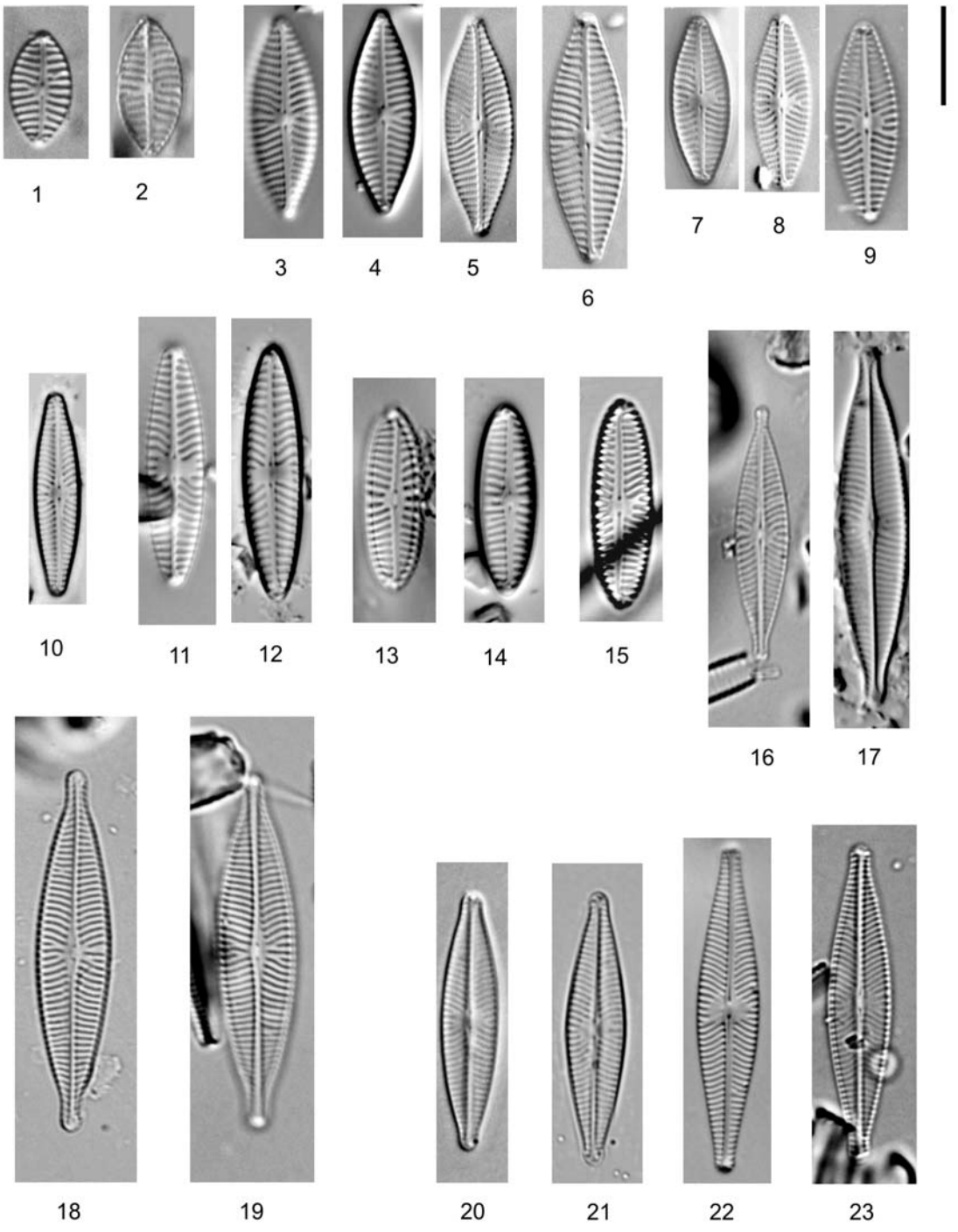


Plate 29. 1–9 – *Navicula antonii* Lange-Bertalot *sensu lato*; 10 – *N. aquaedurae* Lange-Bertalot; 11, 12 – *N. cari* Ehrenberg; 13–15 – *N. cincta* (Ehrenberg) Ralfs; 16–19 – *N. capitatoradiata* Germain; 20–23 – *N. cryptocephala* Kützing; all LM. Scale bar = 10 μm.

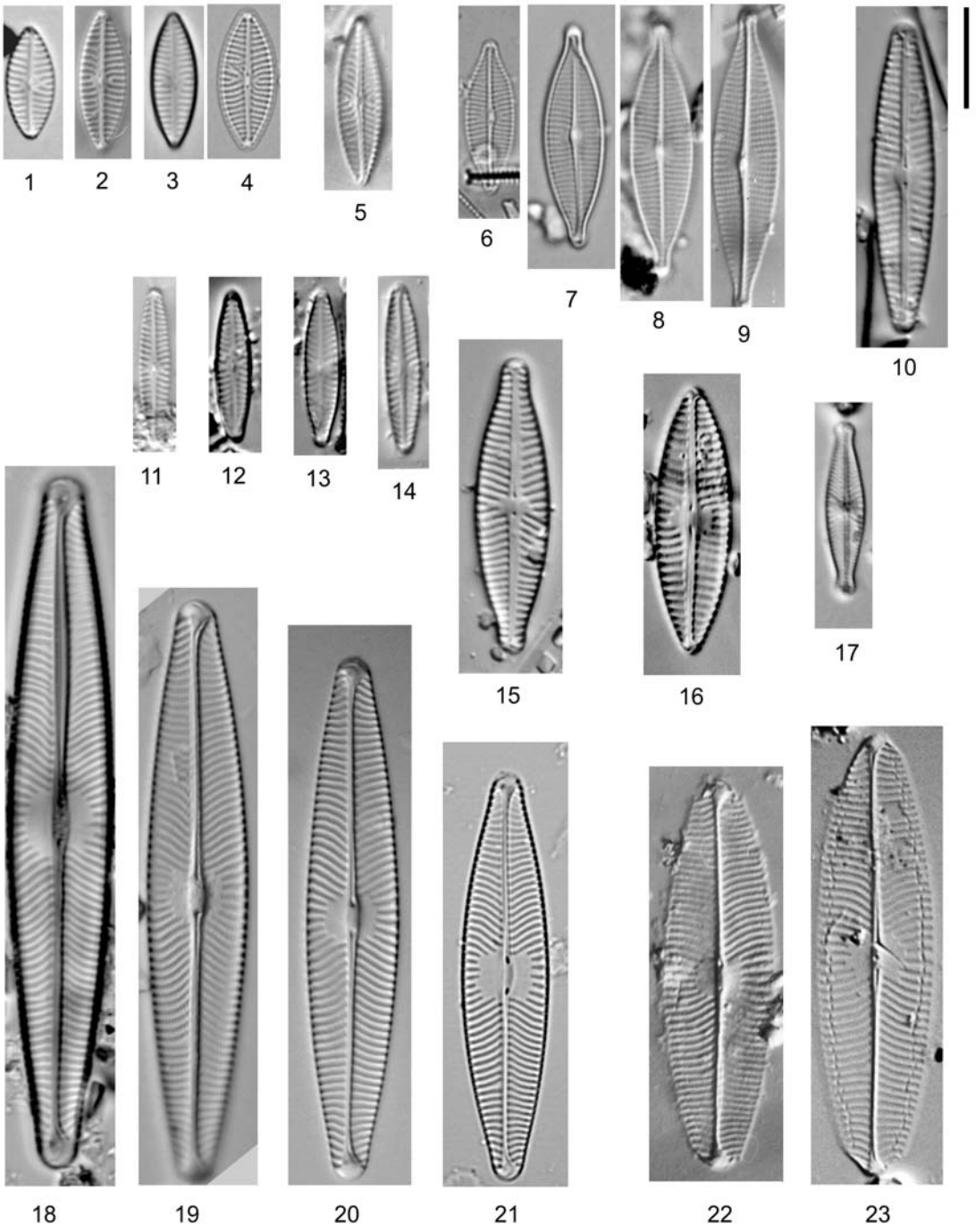


Plate 30. 1–4 – *Navicula cryptotenella* Lange-Bertalot; 5 – *N. cryptotenelloides* Lange-Bertalot; 6–9 – *N. gregaria* Donkin; 10 – *N. libonensis* Schoeman; 11–14 – *N. tenelloides* Hustedt; 15 – *N. moskali* Metzeltin, Witkowski & Lange-Bertalot; 16 – *N. menisculus* Schumann; 17 – *Sellaphora hustedtii* (Krasske) Lange-Bertalot & Werum; 18–21 – *Navicula lanceolata* (Agardh) Ehrenberg; 22, 23 – *N.* cf. *lanceolata*; all LM. Scale bar = 10 μm.

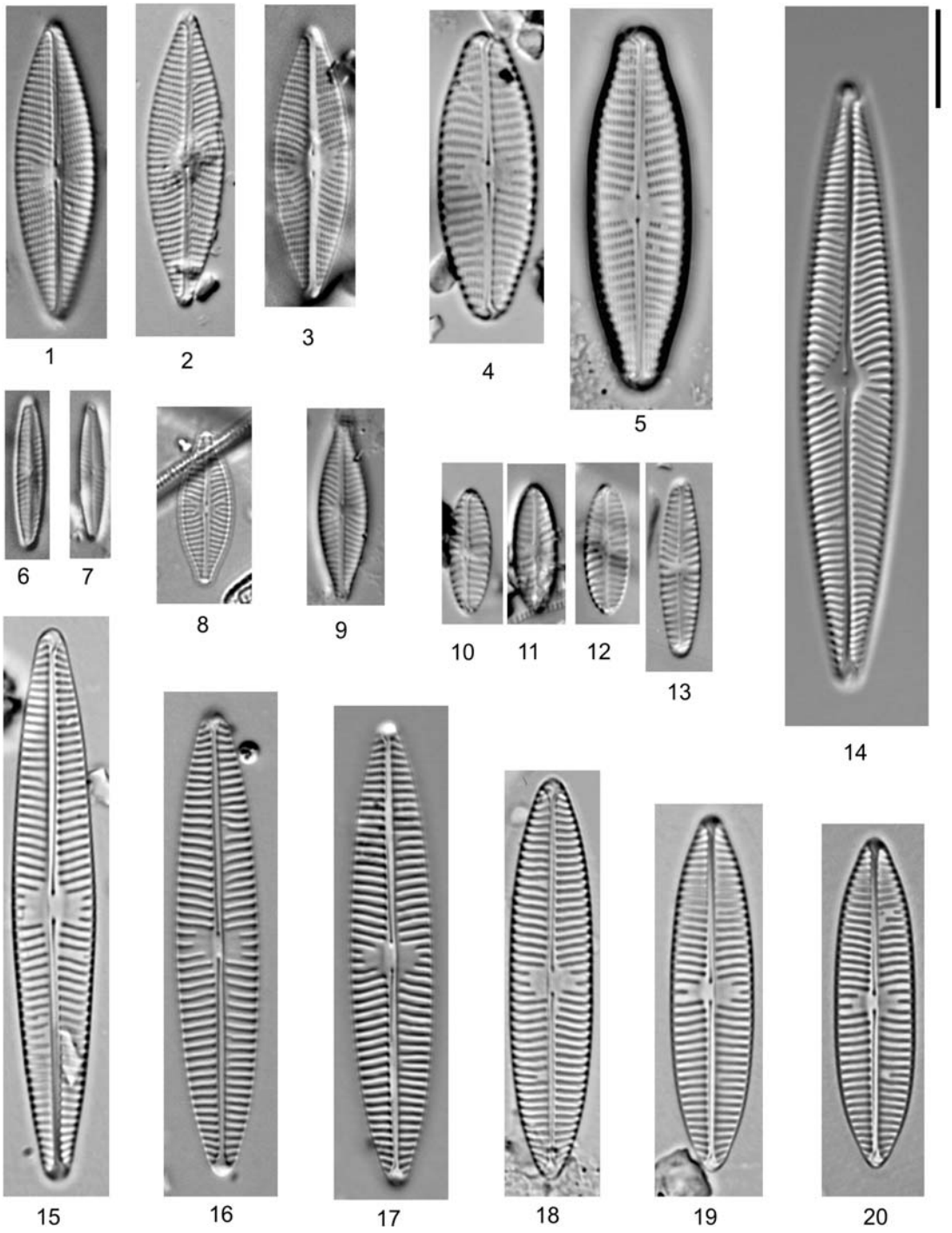


Plate 31. 1–3 – *Navicula* cf. *oligotraphenta* Lange-Bertalot & Hofmann; 4, 5 – *N. slesviscensis* Grunow; 6, 7 – *N. vilaplanii* (Lange-Bertalot & Sabater) Lange-Bertalot & Sabater; 8, 9 – *N. reichardtiana* Lange-Bertalot; 10–13 – *N. wiesnerii* Lange-Bertalot; 14 – *N. radiosa* Kützing; 15–20 – *N. tripunctata* (O. Müller) Bory; all LM. Scale bar = 10 μm.

4. **Craticula molestiformis* (Hustedt) D.G. Mann Plate 16: 27–29

Navicula molestiformis Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 130, Fig. 45: 1–9); Lange-Bertalot 2001 (p. 116, Fig. 93: 19–28).

DIMENSIONS. Valves 11.0–18.2 μm long and 4–5 μm, with 25–27 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and amongst *Vaucheria* sp. filaments.

DISTRIBUTION IN POLAND. Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, occurring in waters up to polysaprobic (Krammer & Lange-Bertalot 1986), in high-conductivity waters (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, α-meso- to polysaprobous, eutraphentic and fresh brackish water species.

12. ***Cyclotella*** Kützing

1. ***Cyclotella atomus*** Hustedt Plates 1: 10, 11; 49: 3, 7

Ref. Krammer & Lange-Bertalot 1991a (p. 53, Fig. 51: 19–21); Håkansson 2002 (p. 106, Figs 381–388).

DIMENSIONS: Valves 3.7–6.0 μm in diameter, 18–19 costae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with mud and filamentous algae from below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River in Kraków (Kawecka & Kwandrans 2000; Wojtal & Kwandrans 2006).

DISTRIBUTION IN POLAND. Zatoka Gdańska (Witkowski 1994), Zalew Wiślany (Jankowska *et al*. 2005), Zalew Szczeciński (Bąk *et al*. 2006), Vistula, Raba, Dunajec and Wisłoka Rivers (Dumnicka *et al*. 2006; Wojtal & Kwandrans 2006), several rivers in S Poland (data unpublished).

ECOLOGY & DISTRIBUTION. Cosmopolitan, nannoplanktonic probably, tolerating higher conductivity (Krammer & Lange-Bertalot 1991a), an euplanktonic diatom (Denys 1991). According to Van Dam *et al*. (1994), *C. atomus* is an alkaliphilous, α-mesosaprobous, eutraphentic, strictly aquatic and brackish fresh water species.

2. ***Cyclotella distinguenda*** Hustedt Plate 1: 13a, b

Cyclotella operculata auct., *non* (C. A. Agardh) Brébisson

Ref. Krammer & Lange-Bertalot 1991a (p. 43, Fig. 43: 1–10); Håkansson 2002 (p. 72, Figs 228, 230–237).

DIMENSIONS. Valves 10–32 μm in diameter, 12–14 costae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in mud sample from the spring. Reported previously from the same material (Wojtal & Kwandrans 2006).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River in Kraków (Raciborski 1888; Gutwiński 1895).

DISTRIBUTION IN POLAND. Reported also from Zalew Szczeciński (Bąk *et al*. 2006) and soft water lakes in Northern Poland (Milecka & Bogaczewicz-Adamczak 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, pelagic (Krammer & Lange-Bertalot 1991a); according to Denys (1991), euplanktonic. According to Van Dam *et al*. (1994), an alkaliphilous, strictly aquatic and fresh brackish water species.

3. ***Cyclotella meneghiniana*** Kützing Plates 1: 14, 15; 49: 4–6

Ref. Krammer & Lange-Bertalot 1991a (p. 44, Fig. 44: 1–10); Håkansson 2002 (p. 79, Figs 263–268).

DIMENSIONS. Valves 12.5–28.5 μm in diameter, 6–10 costae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1956, 1962), Młynówka

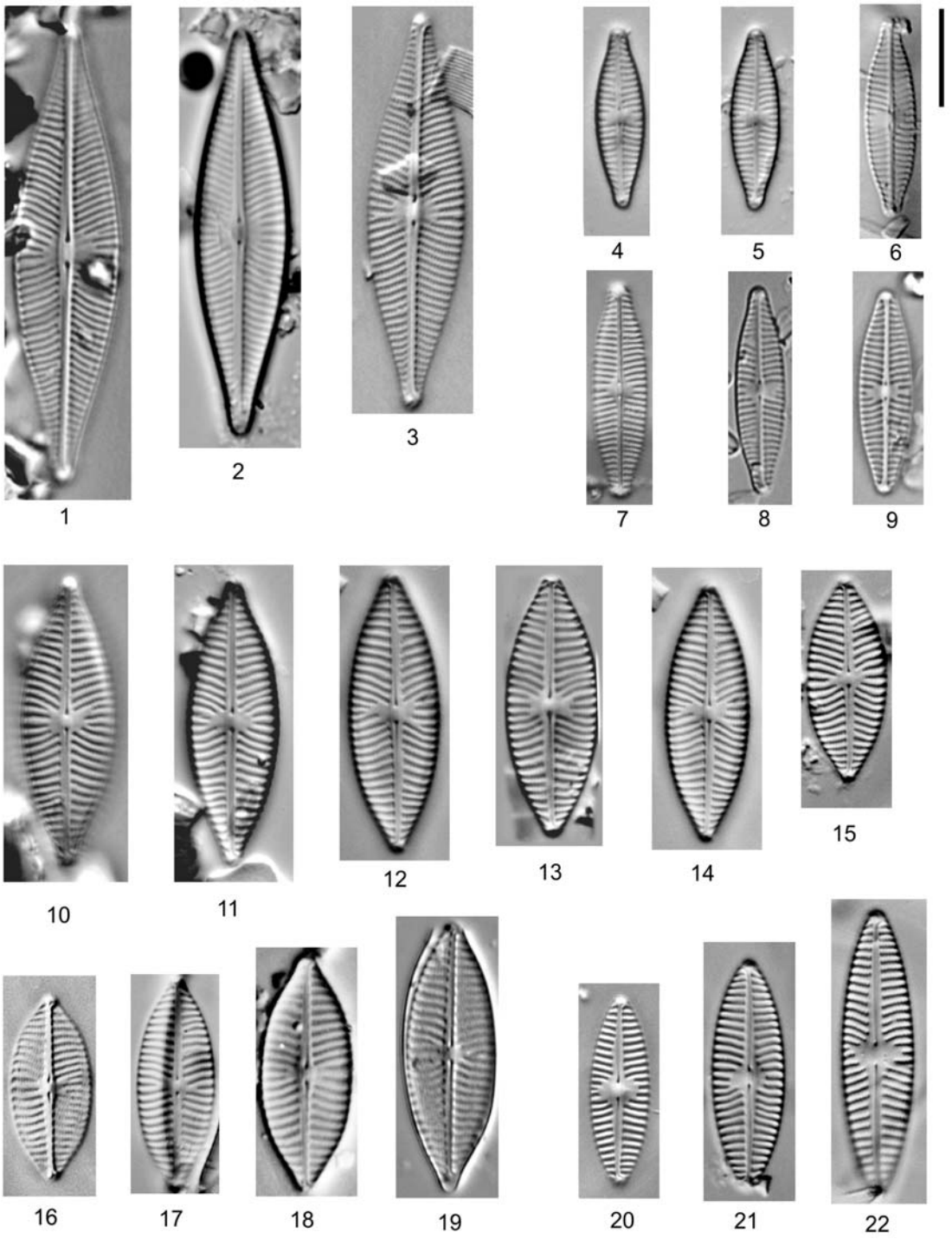


Plate 32. 1–3 – *Navicula trivialis* Lange-Bertalot; 4–9 – *N. veneta* Kützing; 10–15 – *N. upsaliensis* (Grunow) Peragallo; 16–19 – *N.* cf. *upsaliensis*; 20–22 – *Navicula* sp. 1; all LM. Scale bar = 10 μm.

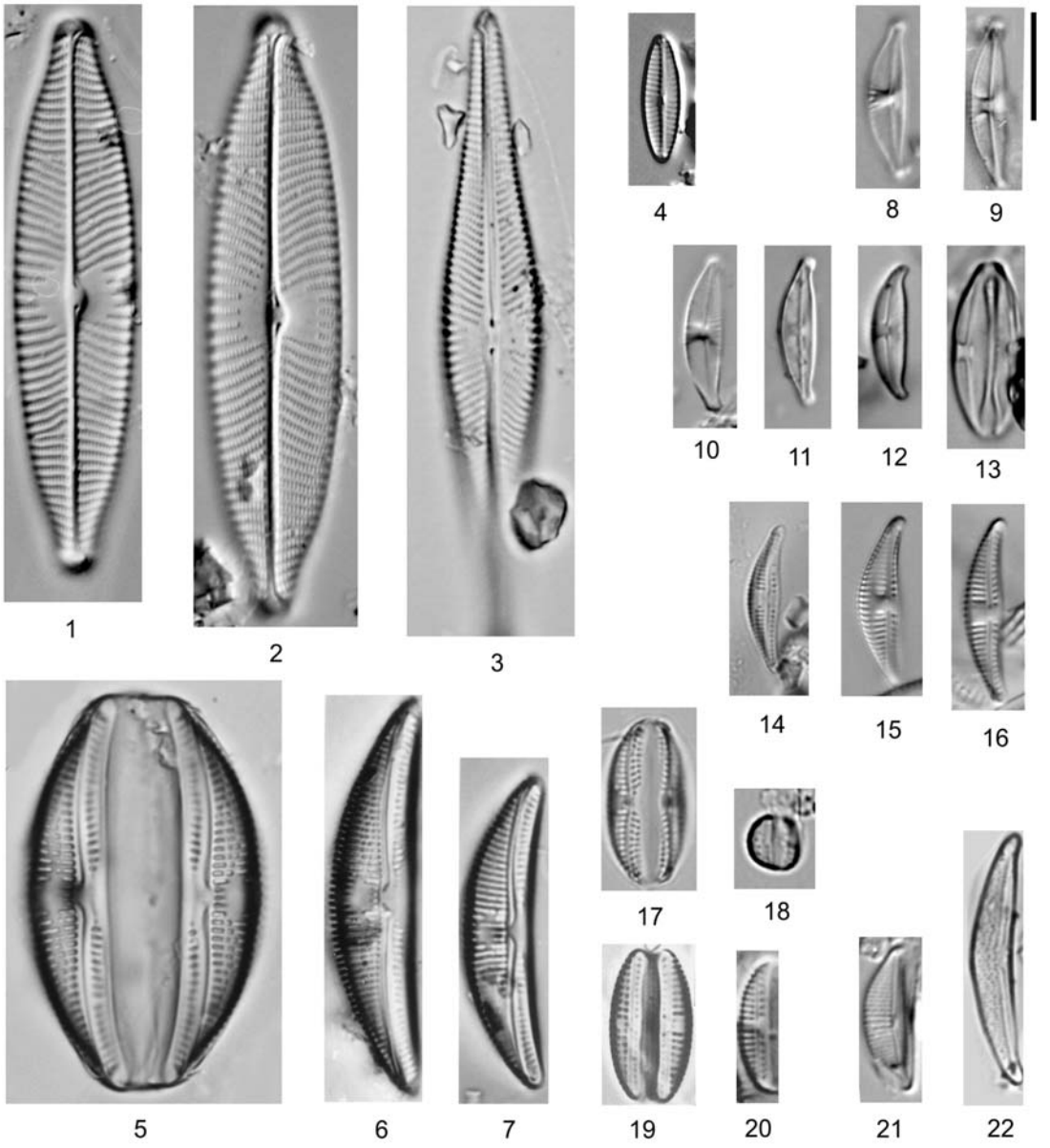


Plate 33. 1, 2 – *Navicula viridula* (Kützing) Ehrenberg; 3 – *Navicula* sp. 2; 4 – *Navicula* sp. 3; 5–7 – *Amphora copulata* (Kützing) Schoeman & Archibald; 8–13 – *A. montana* Krasske; 14–17 – *A. inariensis* Krammer; 18–20 – *A. pediculus* (Kützing) Grunow; 21 – *Amphora* cf. *veneta* Kützing; 22 – *A. veneta* Kützing; all LM. Scale bar = 10 μm.

stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), spring of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. A widespread littoral diatom, known from a broad spectrum of trophic states and conduc-

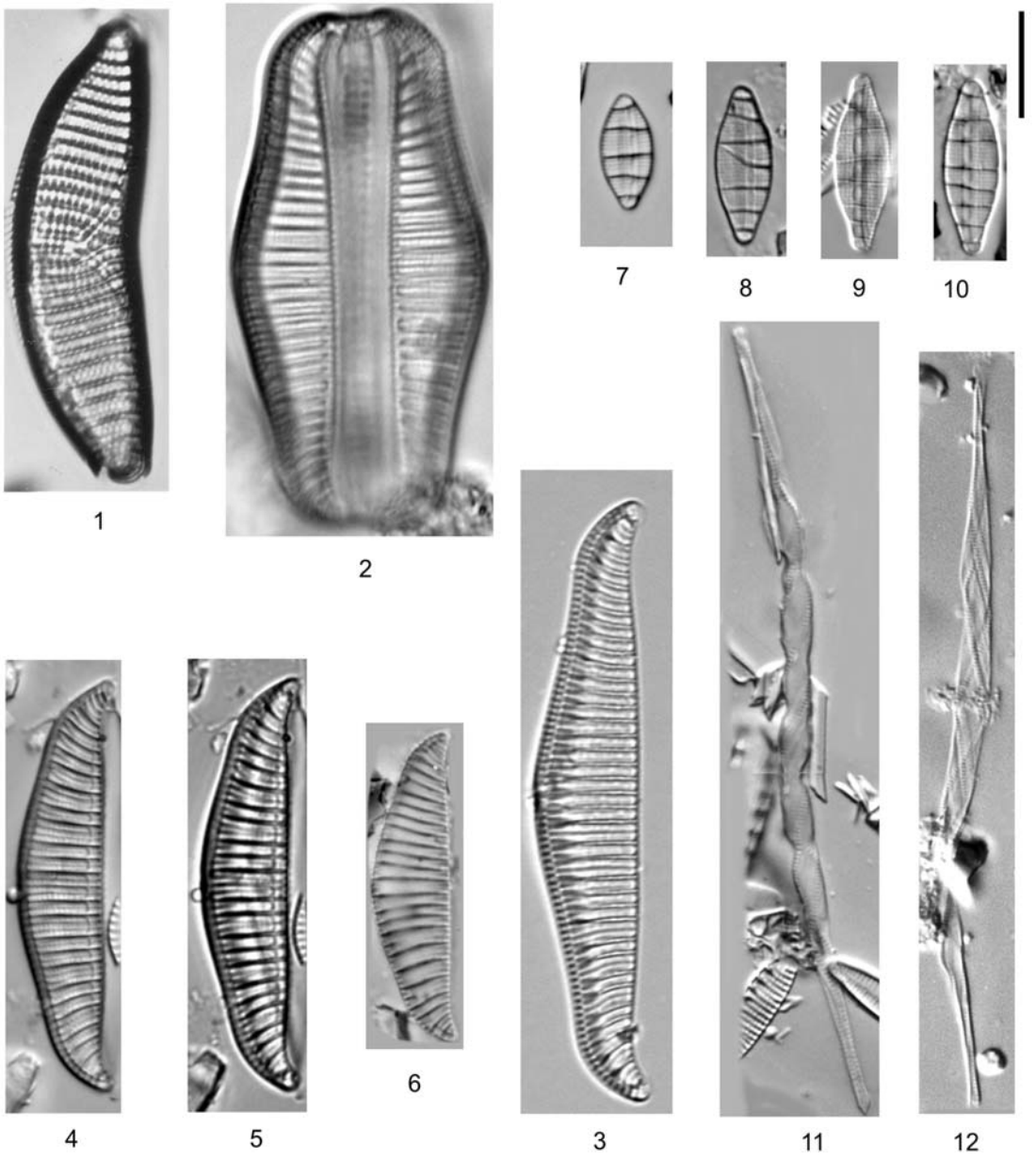


Plate 34. 1 – *Epithemia turgida* (Ehrenberg) Kützing; 2–6 – *Rhopalodia gibba* (Ehrenberg) O. Müller; 7–10 – *Denticula tenuis* Kützing; 11, 12 – *Cylindrotheca gracilis* (Brébisson) Grunow; all LM. Scale bar = 10 μm.

tivity (Krammer & Lange-Bertalot 1991a); a tychoplanktonic diatom (Denys 1991). According to Van Dam *et al*. (1994), an alkaliphilous, α-meso- to polysaprobous, eutraphentic, strictly aquatic and brackish fresh taxon.

13. ***Cylindrotheca*** Rabenhorst

1. **Cylindrotheca gracilis* (Brébisson) Grunow
Plate 34: 11, 12

Ref. Krammer & Lange-Bertalot 1988 (p. 134, Fig. 87: 3).

DIMENSIONS. Valves 68–72 μm long and 5.2–8.6 μm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, below Kobylany village.

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), up to 1990 reported only from Baltic coastal waters (Preuss 1911), Ruda River in southern Poland (Kulczycki *et al.* 1970) and central Poland (Kadłubowska *et al*. 1981).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1988), euplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a β-mesosaprobous, eutraphentic, aerophilous and brackish water species.

14. ***Cymatopleura*** W. Smith

1. ***Cymatopleura solea*** (Brébisson) W. Smith
Plates 46: 3, 4; 102: 4–6

Ref. Krammer & Lange-Bertalot 1988 (p. 168, Figs 116: 1–4; 117: 1–5; 118: 1–8; 122: 4).

DIMENSIONS. Valves 48.5–67.0 μm long and 11–14 μm wide, with *ca* 8–9 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sites with unspecified location (Raciborski 1888), Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Uherkovich 1970), pond in Mydlniki (Engelhorn 1939), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Cabejszek 1951; Kadłubowska 1964b), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), ponds near Kraków, without exact localities (Hanak-Szmagier 1967), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971), Biała Przemsza River (Wasylik 1985).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, occurring in the epipelon and periphyton of eutrophic waters of moderate and elevated conductivity (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), an alkaliphilous, β -mesosaprobous, eutraphentic and fresh brackish water species.

15. ***Cymbella*** Agardh

1. *****Cymbella affiniformis*** Krammer
Plate 10: 1, 2

Ref. Krammer 2002 (p. 45, Fig. 25: 1–8).

DIMENSIONS. Valves 25.0–29.2 μm long and 7.8–8.0 μm wide, with 11–12 striae per 10 μm in middle valve portion and 15–16 striae per 10 μm near apices.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in periphyton above Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain.

2. ***Cymbella aspera*** (Ehrenberg) Cleve
Plates 9: 1–3; 70: 1–7

Ref. Krammer & Lange-Bertalot 1986 (p. 319, Fig. 131: 1); Krammer 2002 (p. 114, Figs 62: 5; 124: 1–8; 125 1–4; 126: 1–5; 127: 7; 142: 7).

DIMENSIONS. Valves 96.0–106.8 μm long and 23–25 μm wide, with *ca* 8–9 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in upper part of stream. Population was quite large in samples with submerged mosses.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), Pilica River (Kadłubowska 1964b), spring in Dubie (Skalska 1966a, b).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003). Regarded as vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991), preferring oligotrophic waters with moderate conductivity (Krammer 2002). According to Van Dam *et al*. (1994), an alkaliphilous, oligosaprobous and fresh brackish water species.

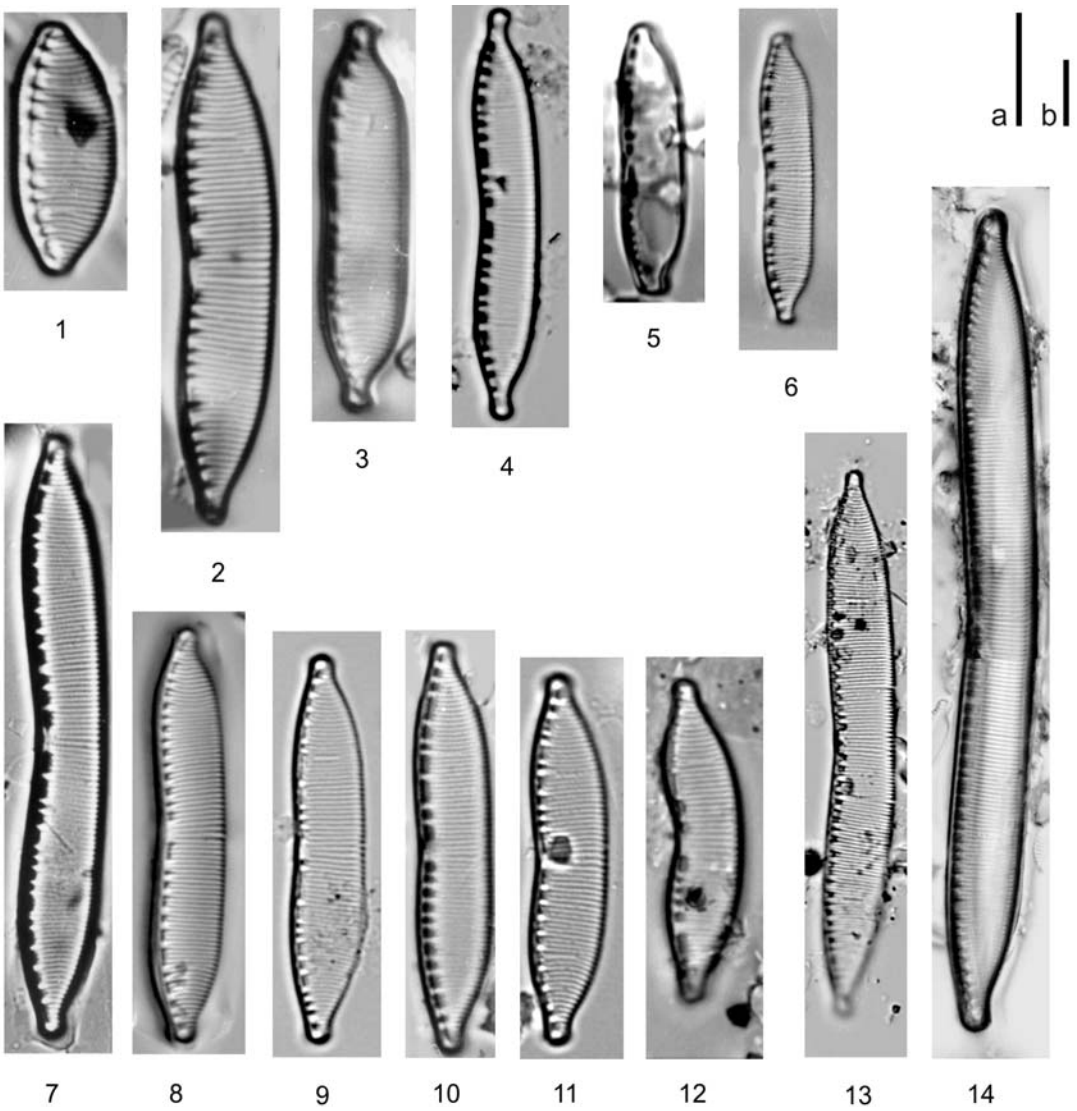


Plate 35. 1–3 – *Hantzschia abundans* Lange-Bertalot; 4–6 – *H. amphioxys* (Ehrenberg) Grunow; 7–12 – *H.* cf. *abundans*; 13, 14 – *H.* cf. *subrupestris* Lange-Bertalot; all LM. Scale bars = 10 µm (a – 1–12; b – 13, 14).

REMARKS. Presumably its occurrence is underestimated in Poland. Large populations of *C. aspera* were observed in several subaerial moss samples in southern Poland (data unpublished).

3. *****Cymbella lange-bertalotii*** Krammer

Plate 8: 14

Ref. Krammer 2002 (p. 152, Figs 179: 1–6; 180: 1–5, 8; 181: 1–6, 8; 182: 1–9).

DIMENSIONS. Valves 48.0–66.2 µm long and 10.8–11.4 µm wide, with 10–12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton above Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Probably cosmopolitan diatom, widespread in temperate zone, especially in calcium-rich oligotrophic to

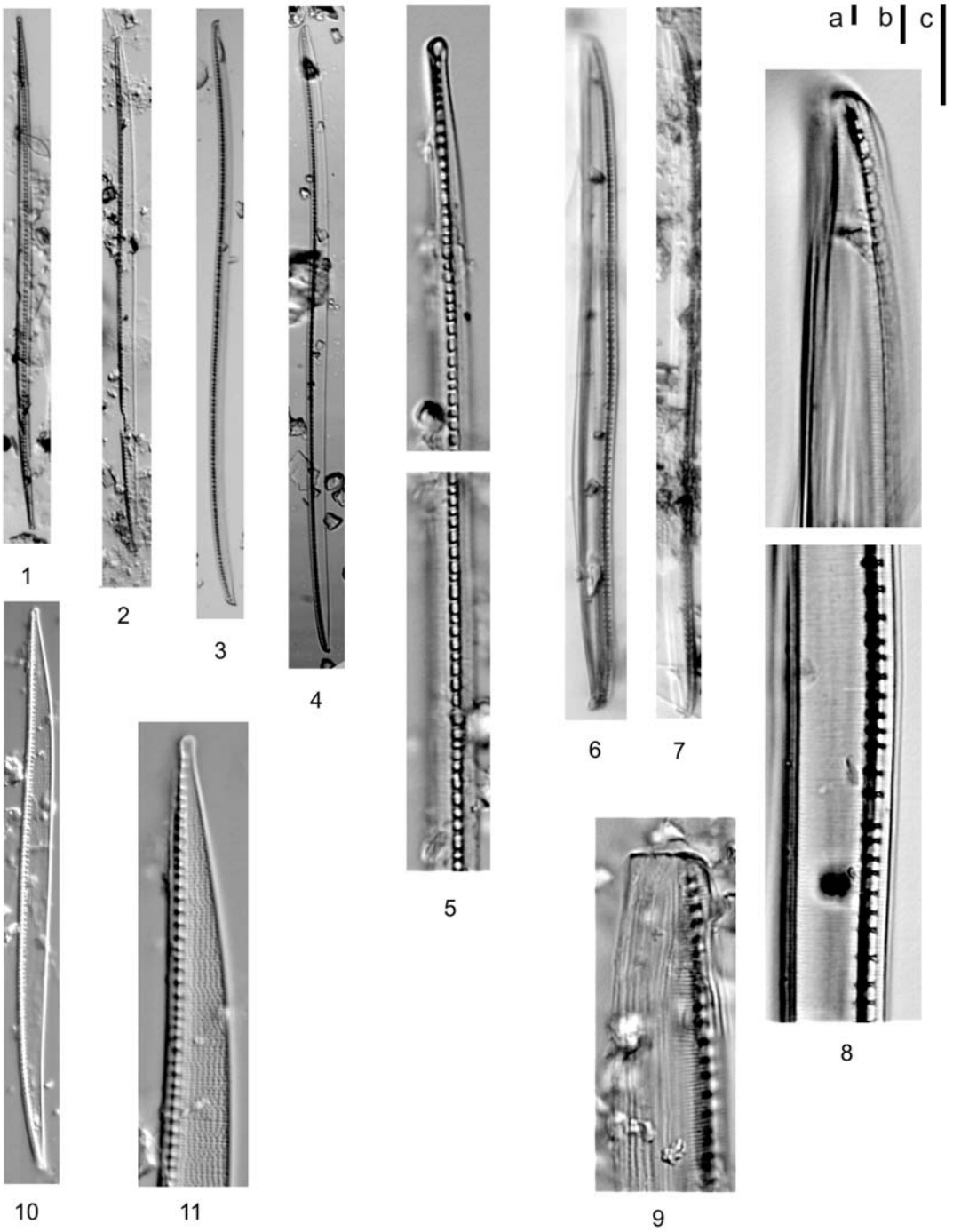


Plate 36. 1–5 – *Nitzschia vermicularis* (Kützing) Hantzsch; 6–9 – *N. sigmoidea* (Nitzsch) W. Smith; 10, 11 – *N. sigma* (Kützing) W. Smith; all LM. Scale bars = 10 μm (a – 1–4; b – 6, 7, 10; c – 5, 8, 9, 11).

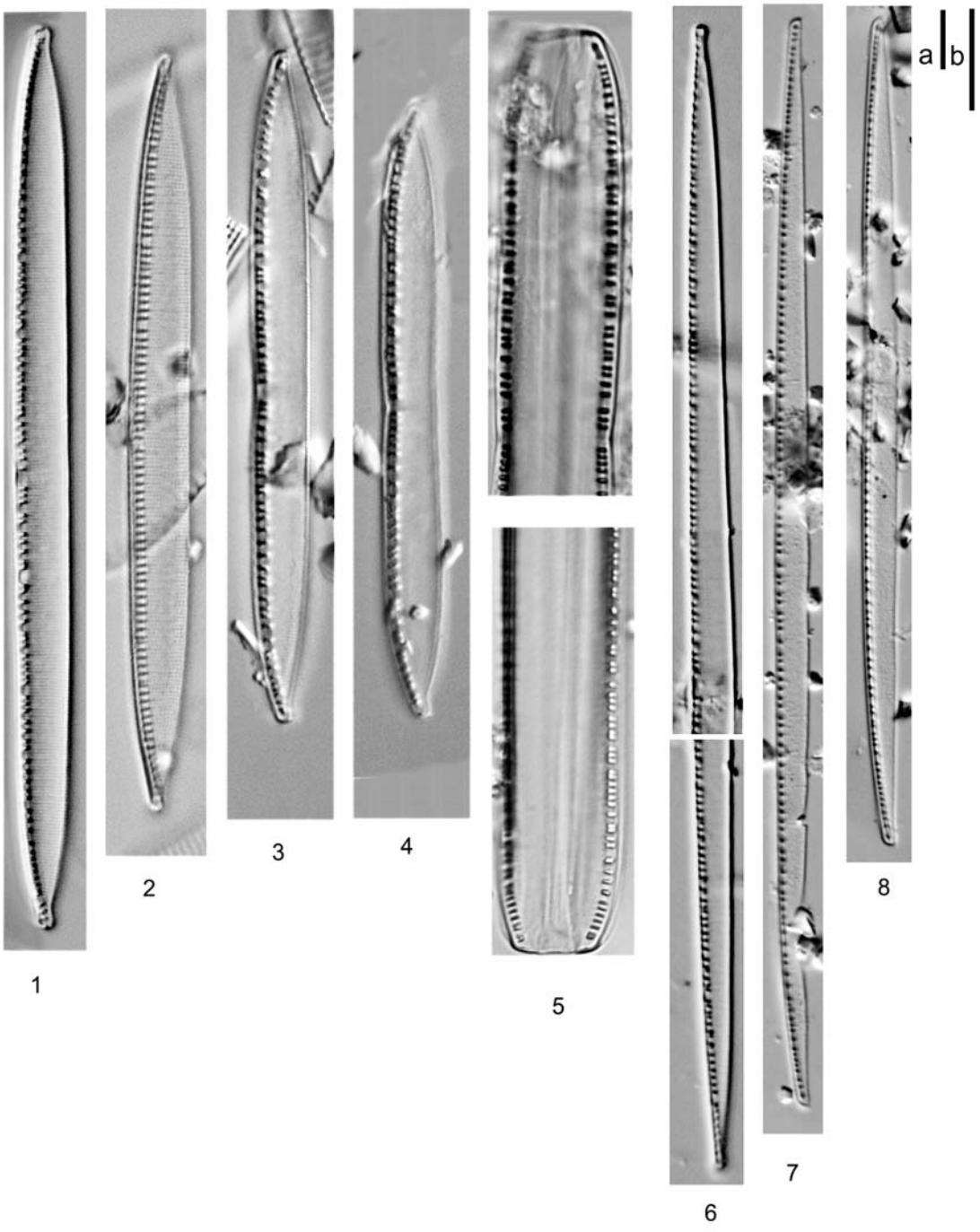


Plate 37. 1–5 – *Nitzschia linearis* (Agardh) W. Smith var. *linearis*; 6, 7 – *N. subtilis* Grunow; 8 – *N. linearis* cf. var. *tenuis* (W. Smith) Grunow; all LM. Scale bars = 10 µm (a – 1–4, 6–8; b – 5).

mesotrophic waters with low to moderate conductivity (Krammer 2002).

4. ***Cymbella*** cf. ***parva*** (W. Smith) Kirchner *in* Cohn Plate 10: 3, 4

Cocconema parvum W. Smith, *non Cymbella parva sensu* Hustedt 1930

Ref. Krammer 2002 (p. 35, Figs 16: 1–19; 17: 1–20).

DIMENSIONS. Valves 22.2–31.6 μm long and 7.0–8.5 μm wide, with 12–13 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Cladophora* sp. and *Vaucheria* sp.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pond in Kraków (Kukucz 1937), Vistula River (Starmach 1938; Turoboyski 1962).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread, especially in the Nordic alpine area, mostly in oligotrophic waters, with low to moderate conductivity (Krammer 2002).

REMARKS. The actual distribution is difficult to assess because of confusion about its identity. *Cymbella parva* was included by Hustedt (1930) in his diatom key, one of the most popular in Europe at that time. In 1955 he recognized his misidentification after studying the type material (Krammer 2002), but since his book was still very popular, further reports on the occurrence of *C. parva* have appeared. The same erroneous concept was adopted by Siemińska (1964), so literature-based distribution data are subject to question.

5. **Cymbella proxima* Reimer Plate 10: 7–9

Ref. Krammer & Lange-Bertalot 1986 (p. 317, Figs 128: 9; 129: 1).

DIMENSIONS. Valves 34.0–38.4 μm long and 12.5–13.0 μm wide, with 9–10 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in periphyton.

DISTRIBUTION IN POLAND. Zatoka Gdańska (Witak 2002), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006). Regarded as vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread in temperate zones, in oligo- to mesotrophic waters with low or moderate conductivity (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), *Cymbella proxima* is a mesotraphentic and fresh water species.

REMARKS. Observed specimens were generally shorter and narrower than as given by Lange-Bertalot and Krammer (1986).

16. ***Cymbopleura*** Krammer

1. ***Cymbopleura hercynica* (A. Schmidt) Krammer Plate 10: 5

Cymbella amphicephala var. *hercynica* (A. Schmidt) Cleve

Ref. Krammer 2003 (p. 72, Figs 96: 17, 19–21; 97: 1–4).

DIMENSIONS. Valves 30.2–36.4 μm long and 9.2–10.5 μm wide, with 12–14 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae.

GENERAL DISTRIBUTION AND ECOLOGY. Prefers waters with higher conductivity.

2. ***Cymbopleura inaequaliformis* Krammer Plate 11: 1

Cymbella ehrenbergii sensu Hustedt 1930 *pro parte*

Ref. Krammer 2003 (p. 23, Figs 25: 1–3; 26: 1–4; 27: 1–8; 28: 1–8).

DIMENSIONS. Valves 76–82 μm long and 23–24 μm wide, with 8–9 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in a sample with filamentous algae from above Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Widespread in larger alpine lakes, rarely recorded in large numbers from lowland lakes (Krammer 2003).

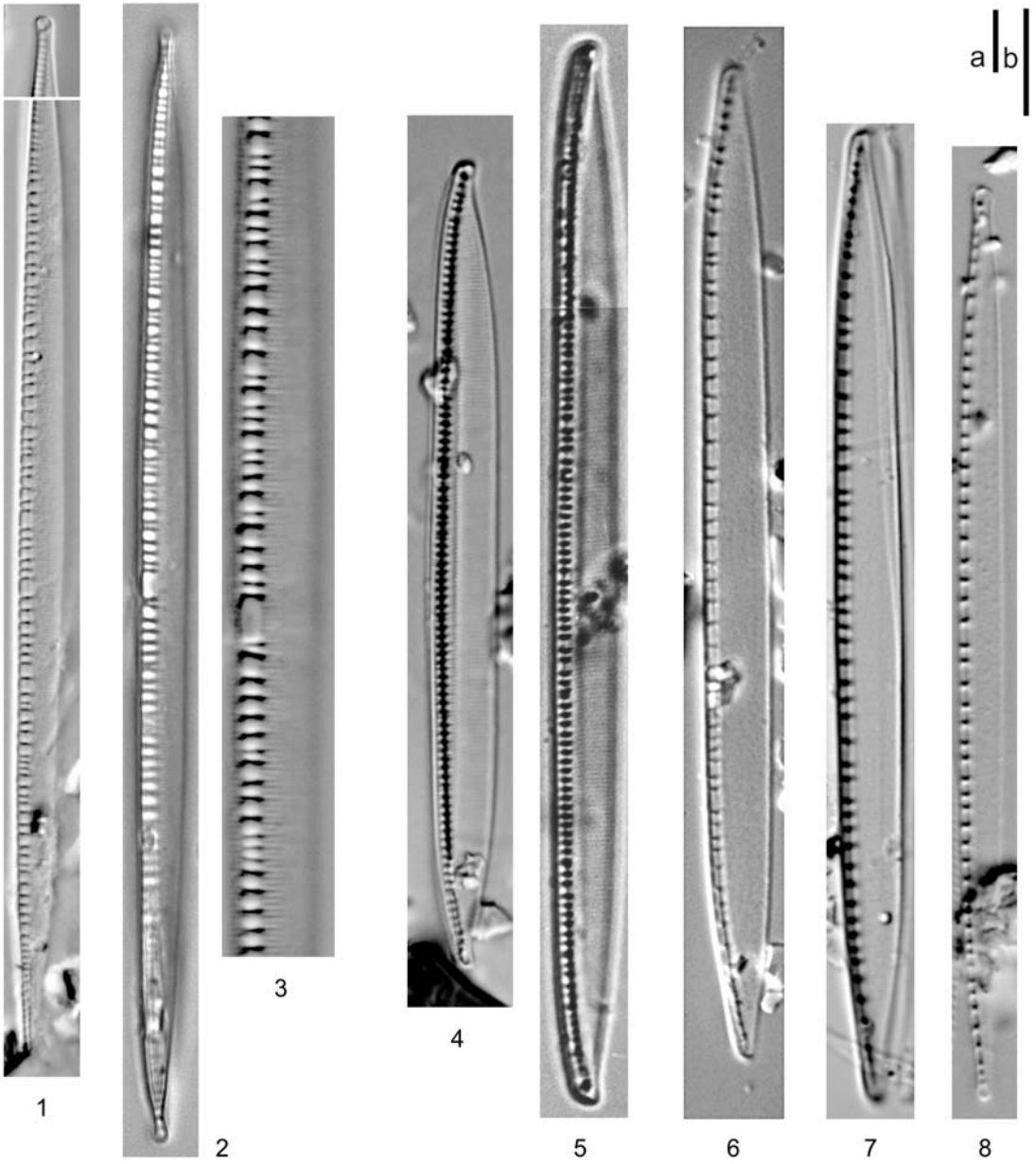


Plate 38. 1–3 – *Nitzschia linearis* (Agardh) W. Smith var. *linearis*; 4, 5 – *N.* cf. *intermedia* Hantzsch; 6–8 – *N. recta* Hantzsch; all LM. Scale bars = 10 µm (a – 1, 2; b – other photos scale bar).

3. ***Cymbopleura naviculiformis*** (Auerswald) Krammer Plates 11: 5–8; 70: 8; 71: 1–3

Cymbella naviculiformis Auerswald

Ref. Krammer 1982 (p. 40, Fig. 1127–1132); Krammer & Lange-Bertalot 1986 (p. 338, Figs 145: 6–11; 142: 22); Krammer 2003 (p. 56, Fig. 76: 1–13).

DIMENSIONS. Valves 33.0–38.2 µm long and 9–11 µm wide, with *ca* 12–16 striae per 10 µm.

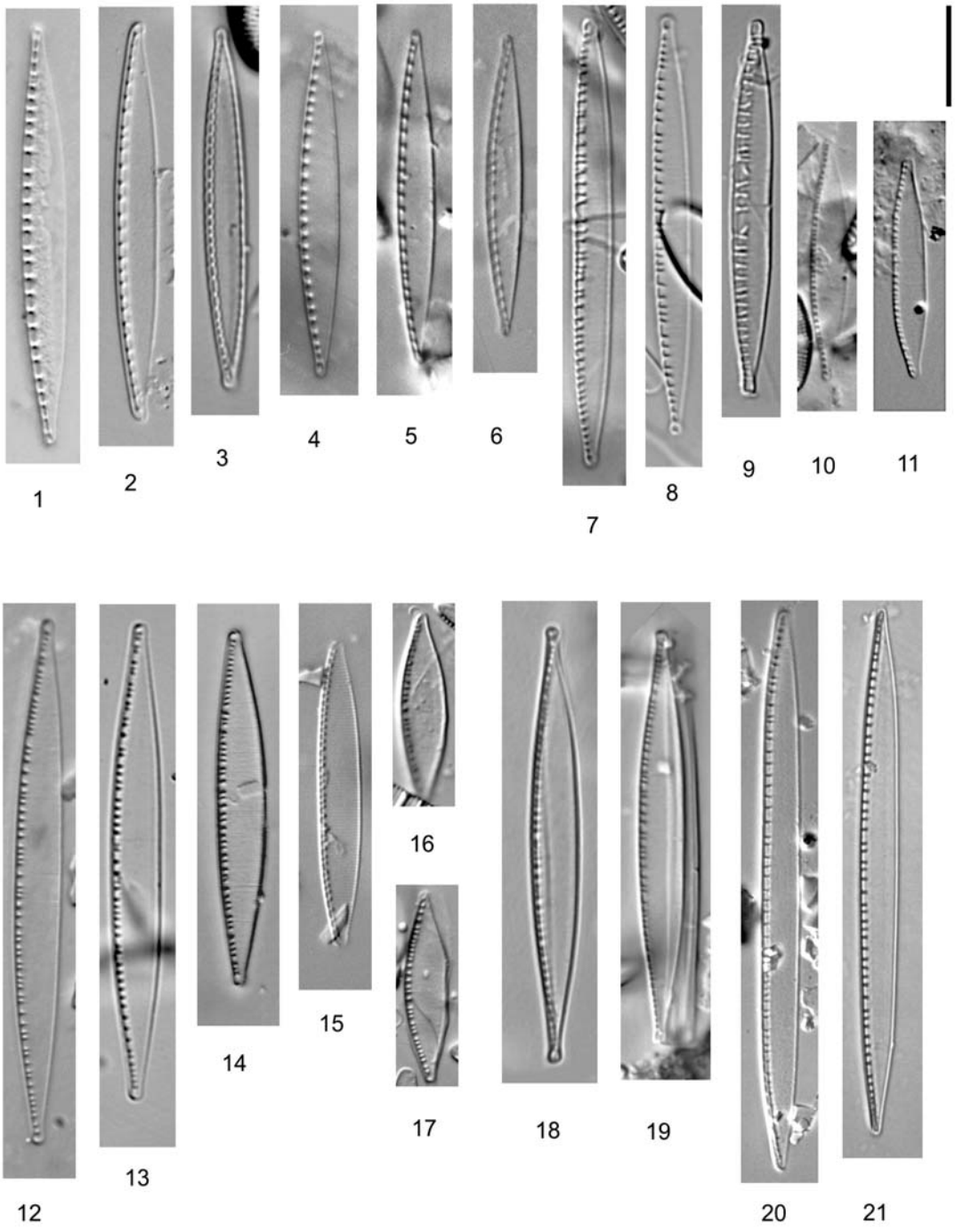


Plate 39. 1–6 – *Nitzschia sociabilis* Hustedt; 7–9 – *Nitzschia* sp.; 10, 11 – *N. palea* var. *debilis* (Kützing) Grunow; 12–15 – *N. palea* (Kützing) W. Smith *sensu lato*; 16, 17 – *N.* cf. *palea*; 18, 19 – *N. pura* Hustedt; 20, 21 – *N. sublinearis* Hustedt; all LM. Scale bar = 10 μm.

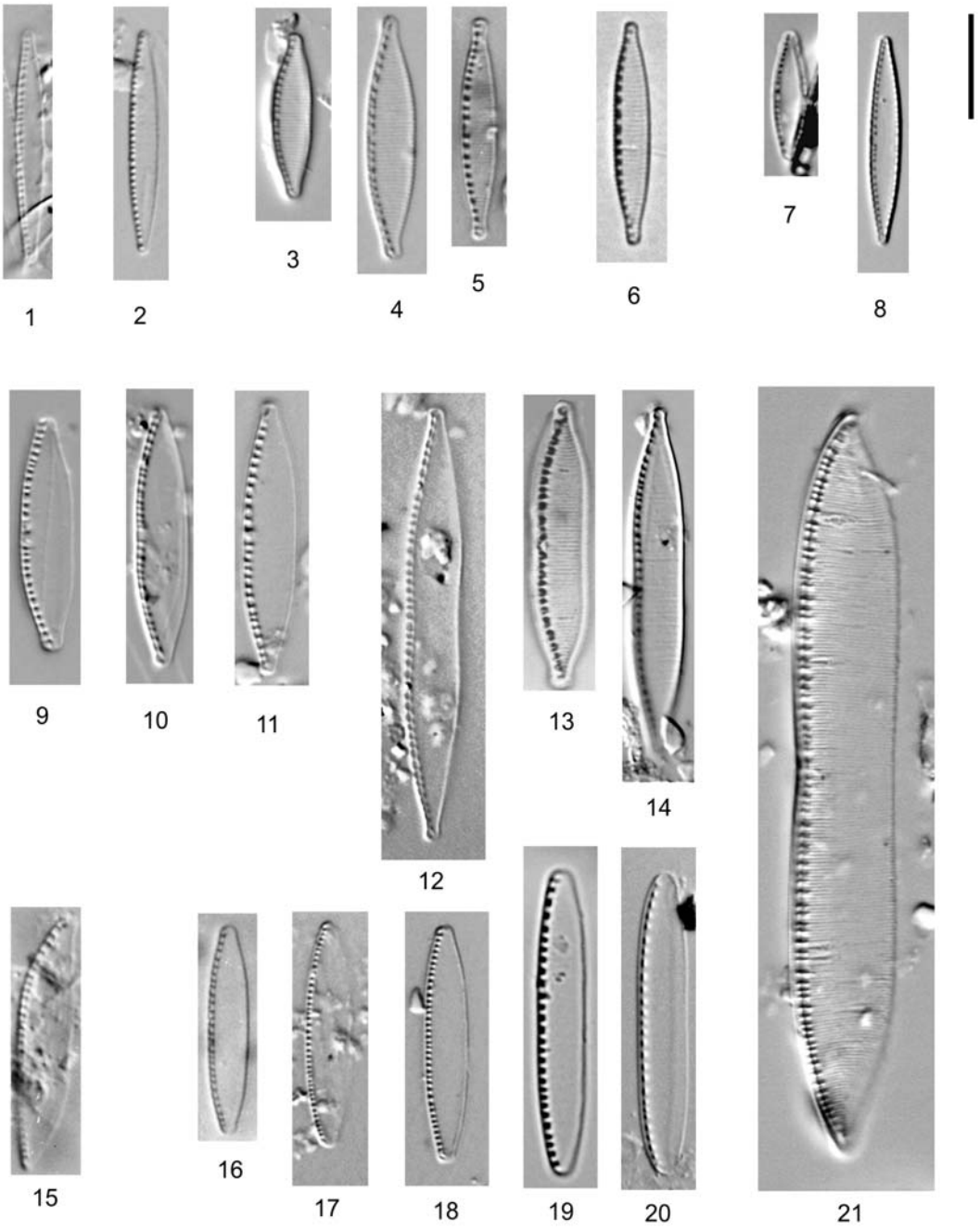


Plate 40. 1, 2 – *Nitzschia archibaldii* Lange-Bertalot; 3–5 – *N. fonticola* Grunow; 6 – *N. supralitorea* Lange-Bertalot; 7, 8 – *N.* cf. *paleacea* (Grunow) Grunow; 9–11 – *N. capitellata* Hustedt; 12 – *N. frequens* Hustedt; 13, 14 – *N. tubicola* Grunow; 15 – *N. clausii* Hantzsch; 16–18 – *N. pusilla* Grunow; 19, 20 – *N. communis* Rabenhorst; 21 – *N. dubia* W. Smith; all LM. Scale bar = 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, in epipelon and periphyton (filamentous algae).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sites with unspecified location (Raciborski 1888), Vistula River (Starmach 1938; Kyselowa & Kysela 1966), fish ponds in Mydlniki (Siemińska 1947), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), springs of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

4. * ***Cymbopleura subaequalis*** (Grunow) Krammer Plate 10: 6

Cymbella subaequalis Grunow

Ref. Krammer 2003 (p. 101, Figs 119: 1–15, 19; 120: 1–8).

DIMENSIONS. Valves 27.5–42.5 μm long and 7.0–9.5 μm wide, with 11–13 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae and mud, collected above Kobylany village.

DISTRIBUTION IN POLAND. Rare (Siemińska & Wołowski 2003). Reported from, e.g., Zatoka Pucka (Witak 2002).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom in oligo- to mesotrophic waters, with low to moderate conductivity (Krammer 2003). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, oligo-mesotraphentic and fresh water species.

17. ***Denticula*** Kützing

1. ***Denticula tenuis*** Kützing Plates 34: 7–10; 97: 1–4

Ref. Krammer & Lange-Bertalot 1988 (p. 139, Fig. 95: 9–17, 20).

DIMENSIONS. Valves 8.0–22.5 μm long and 3.5–5.2 μm wide, with 6–7 fibulae and 25–26 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in epilithon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, especially common in waters of moderate conductivity (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), an oligosaprobous, alkaliphilous, mesotraphentic and fresh water species.

18. ***Diadesmis*** Kützing

1. ***Diadesmis biceps*** Arnott Plate 15: 16

Navicula contenta var. *biceps* Arnott; *Diadesmis contenta* var. *biceps* (Grunow *in* Van Heurck) Hamilton

Ref. Cleve-Euler 1953 (p. 169, Fig. 851b); Werum & Lange-Bertalot 2004 (Fig. 61: 10–19).

DIMENSIONS. Valves 12.0–14.6 μm long and 2.6–3.0 μm wide, with *ca* 33–34 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Spring of Szklarka stream (Skalska 1966a), caves (Mrozińska-Broda & Czerwik-Marcinkowska 2004).

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), outside the upland reported from streams of the Tatra Mts (Kawecka 1971) and fossil materials from Imbramowice (Kaczmarska 1976, 1977).

GENERAL DISTRIBUTION AND ECOLOGY. Probably a widespread diatom, known, e.g., from springs in Germany (Werum & Lange-Bertalot

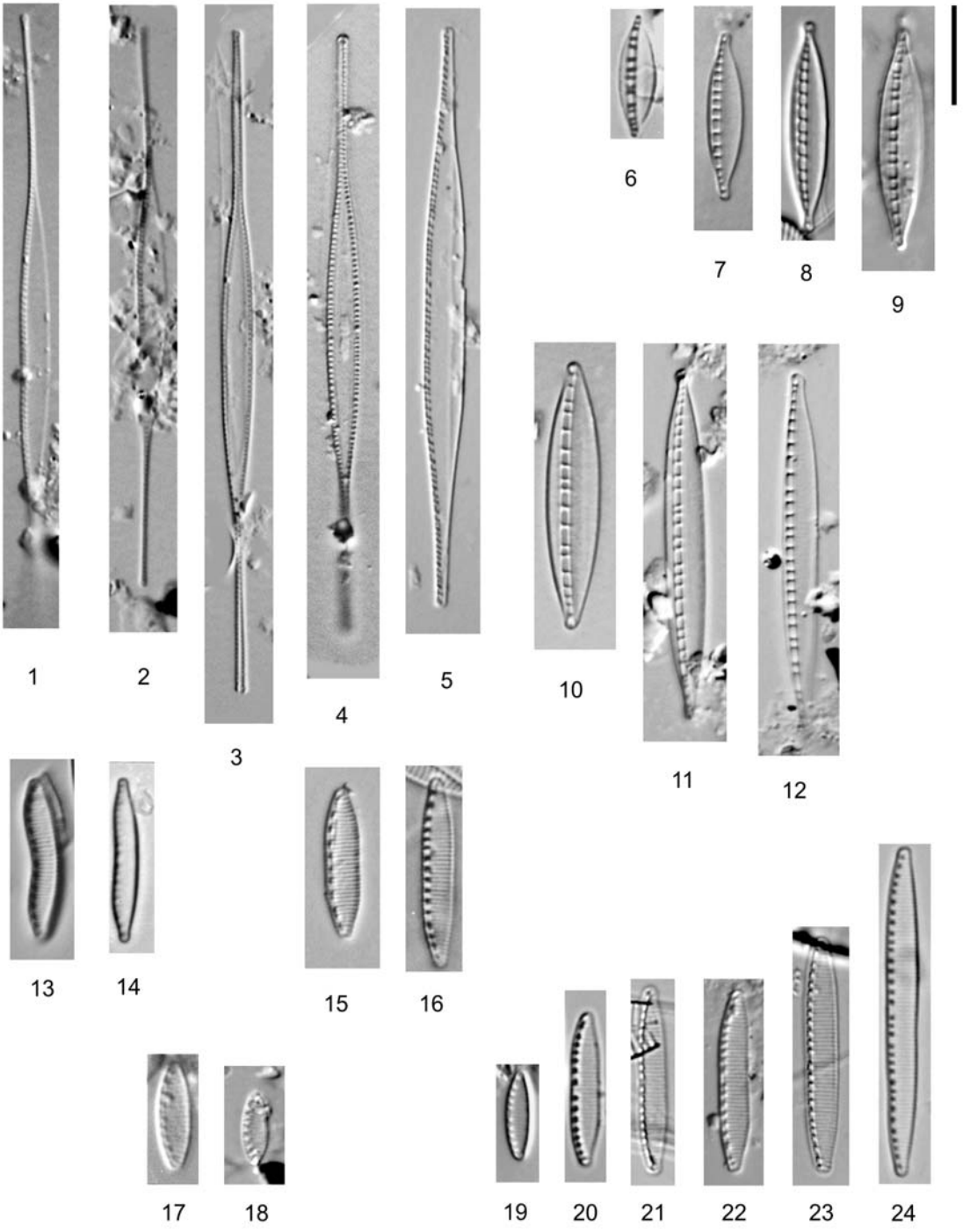


Plate 41. 1–4 – *Nitzschia acicularis* (Kützing) W. Smith; 5 – *N. gracilis* Hantzsch; 6–10 – *N. dissipata* (Kützing) Grunow; 11, 12 – *N. media* Hantzsch; 13, 14 – *N. acidoclinata* Lange-Bertalot; 15, 16 – *N.* cf. *hantzschiana* Rabenhorst; 17, 18 – *N. inconspicua* Grunow; 19–24 – *N. frustulum* (Kützing) Grunow; all LM. Scale bar = 10 µm.

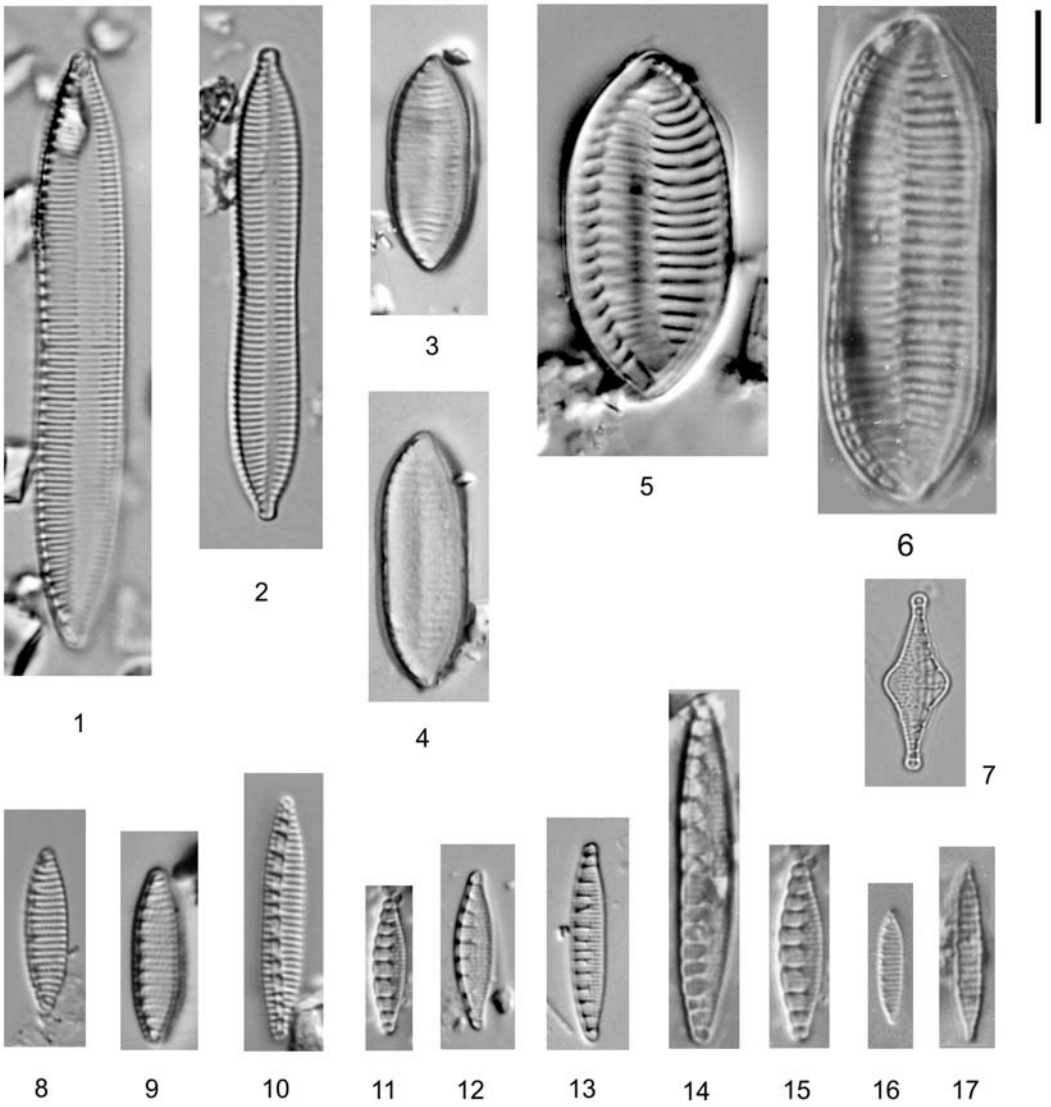


Plate 42. 1 – *Tryblionella hungarica* (Grunow) Frenguelli, 2 – *Nitzchia constricta* (Kützing) Ralfs; 3, 4 – *Tryblionella debilis* Arnott; 5, 6 – *T. levidensis* W. Smith; 7 – *Grunowia tabellaria* (Grunow) Rabenhorst; 8–10 – *Nitzschia amphibia* Grunow var. *amphibia*; 11–13 – *Grunowia solgensis* (Cleve-Euler) Aboal; 14, 15 – *G. sinuata* Thwaites; 16, 17 – *Simonsenia delognei* (Grunow) Lange-Bertalot; all LM. Scale bar = 10 μm.

2004). According to Van Dam *et al*. (1994), an alkaliphilous, β-mesosaprobous, eurytraphentic, aerophilous and fresh brackish water species.

2. ***Diadesmis contenta*** (Grunow *in* Van Heurck) D.G. Mann in Round *et al*. Plate 15: 13–15

Navicula contenta Grunow *in* Van Heurck Ref. Krammer & Lange-Bertalot 1986 (p. 219, Fig. 75: 1–5).

DIMENSIONS. Valves 7.2–8.6 μm long and 2.6 μm wide, with *ca* 28–30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

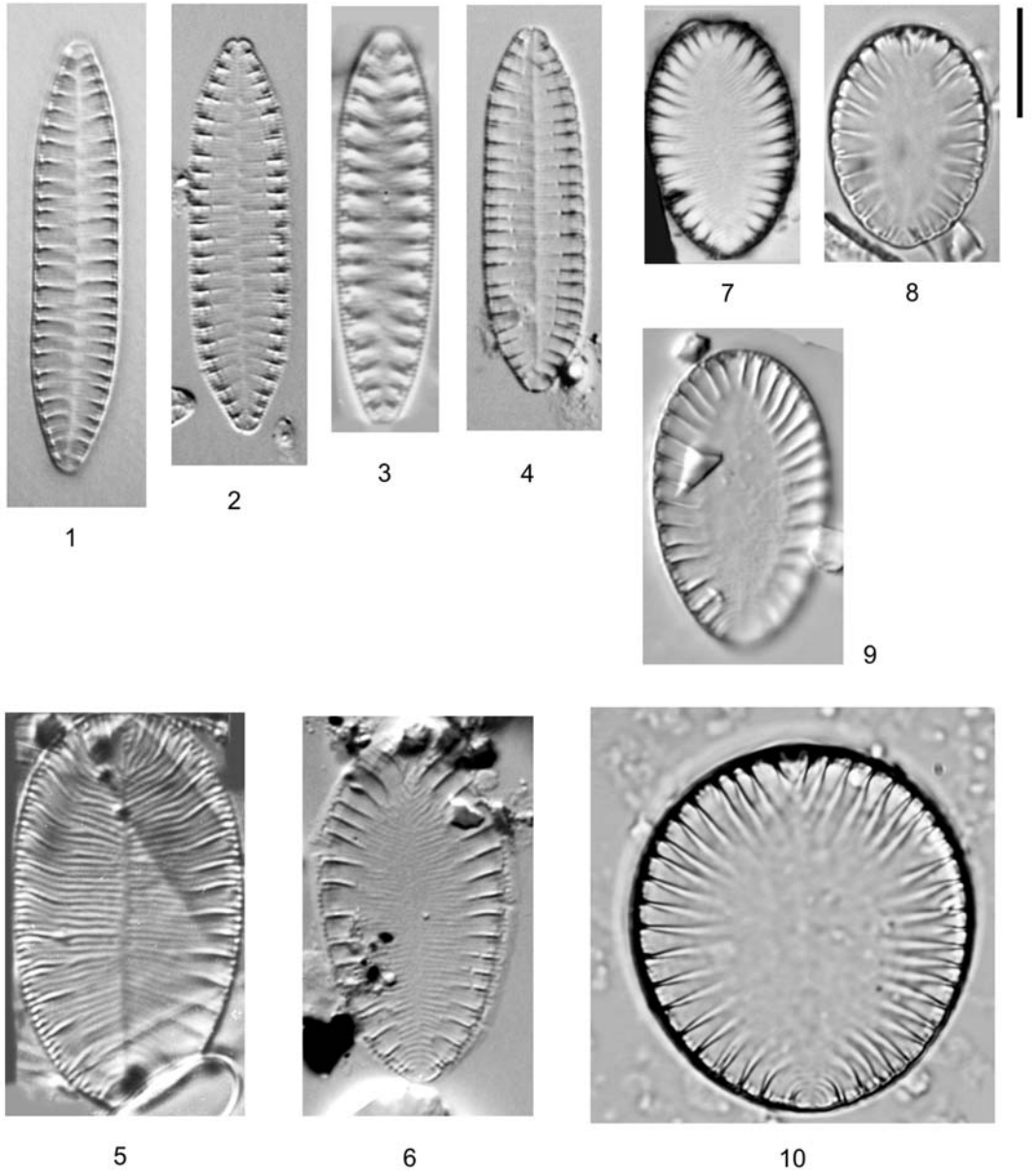


Plate 43. 1–4 – *Surirella angusta* Kützing; 5, 6 – *S. brebissonii* Krammer & Lange-Bertalot; 7–9 – *S. brebissonii* var. *kuetzingii* Krammer & Lange-Bertalot; 10 – *S. crumena* (Brébisson) Van Heurck; all LM. Scale bar = 10 µm.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Spring of Szklarka stream (Skalska 1966a).

DISTRIBUTION IN POLAND. Rare (Siemińska & Wołowski 2003), reported from, e.g., Mroga and Rawka Rivers (Rakowska 2001), Tatra Mts lakes (Kawecka & Galas 2003) and spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmo-

politan, aerophilic species (Krammer & Lange-Bertalot 1986).

3. ***Diadesmis gallica*** W. Smith Plate 15: 20

Navicula gallica (W. Smith) Lagerstedt

Ref. Krammer & Lange-Bertalot 1986 (p. 220, Fig. 75: 6–11).

DIMENSIONS. Valves 12.0–14.6 µm long and 6.6–13.4 µm wide, with *ca* 2–5 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Spring of Szklarka stream (Skalska 1966a).

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), reported from stream in Tatra Mts (Kawecka 1989), but also from, e.g., Central Poland (Rakowska 2001).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, aerophilic species (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), a terrestrial diatom.

4. ***Diadesmis perpusilla*** (Grunow) D.G. Mann Plate 15: 17–19

Navicula gallica var. *perpusilla* (Grunow) Lange-Bertalot; *N. perpusilla* Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 220, Fig. 75: 12–17).

DIMENSIONS. Valves 9.0–13.6 µm long and 4.0–4.2 µm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, aerophilous diatom (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), a neutrophilous, oligosaprobous, oligotraphentic, terrestrial and fresh brackish water species.

19. ***Diatoma*** Bory

1. ***Diatoma mesodon*** (Ehrenberg) Kützing Plates 3: 14–19; 54: 8, 9; 55: 1–6

Fragilaria mesodon Ehrenberg; *Diatoma hiemale* var. *mesodon* (Ehrenberg) Van Heurck

Ref. Krammer & Lange-Bertalot 1991a (p. 100, Figs 91: 1; 92: 1–4; 98: 7; 99: 1–12).

DIMENSIONS. Valves 12.0–24.4 µm long and 6.4–8.5 µm wide, with 3.0–4.8 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Very frequent.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a, b, 1967), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), spring in Jerzmanowice (Skalna 1973), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1991a). According to Van Dam *et al.* (1994), neutrophilous, oligosaprobous, meso-eutraphentic, and fresh water species.

REMARKS. Some specimens (e.g., depicted in Plate 3: 14) differed from typical representatives, and bear some similarities to *D. hyemalis* (Roth) Heiberg, a diatom especially common, according to Krammer and Lange-Bertalot (1991a), in boreal and mountain areas, and earlier commonly reported from the Wyżyna Krakowsko-Częstochowska upland sites with unspecified location (Raciborski 1888; Gutwiński 1895), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), Vistula River (Starmach 1938; Kyselowa & Kysela 1966), spring of Szklarka stream (Skalska 1966a, b), springs of Kobylanka stream (Skalna 1969) and springs of Będkówka stream (Kubik 1970).

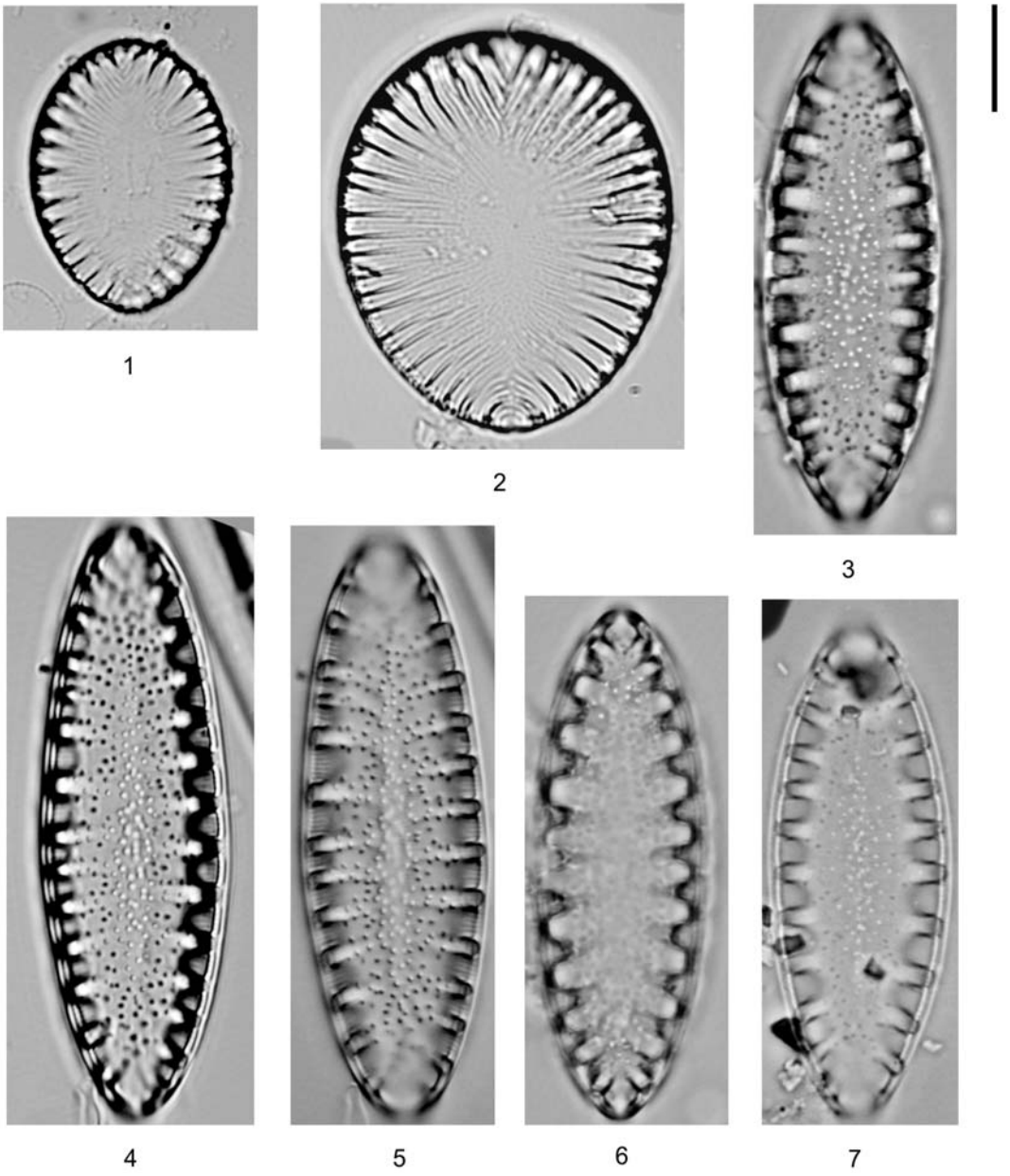


Plate 44. 1, 2 – *Surirella crumena* (Brébisson) Van Heurck; 3–7 – *S. helvetica* Brun; all LM. Scale bar = 10 µm.

2. ****Diatoma moniliformis** Kützing
Plates 3: 11–13; 54: 10

Diatoma tenuis var. *moniliformis* Kützing

Ref. Krammer & Lange-Bertalot 1991a (p. 98, Figs 92: 6; 96: 11–21).

DIMENSIONS. Valves 10.5–32.4 µm long and 3.4–4.5 µm wide, with 8–10 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

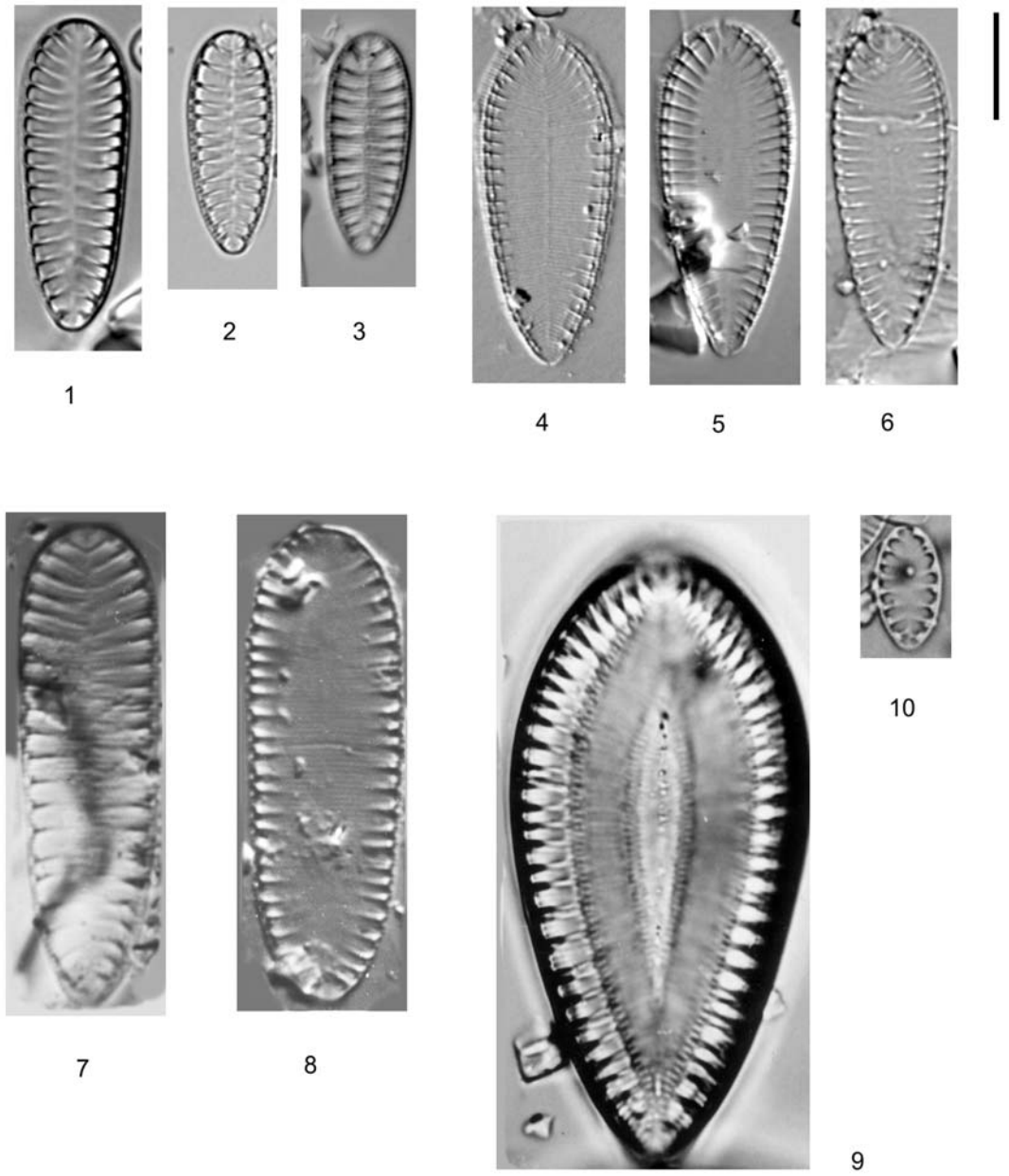


Plate 45. 1–3, 10 – *Surirella terricola* Lange-Bertalot & Alles; 4–6 – *S. minuta* (Brébisson) Kützing; 7, 8 – *Surirella* sp. 1; 9 – *S. ovalis* Brébisson; all LM. Scale bar = 10 μm.

GENERAL DISTRIBUTION AND ECOLOGY. The diatom inhabits inland and coastal waters, especially those with higher conductivity (Krammer & Lange-Bertalot 1991a).

3. ***Diatoma vulgaris*** Bory Plate 3: 20–24

Diatoma vulgare Bory

Ref. Krammer & Lange-Bertalot 1991a (p. 95, Fig. 94: 1–13).

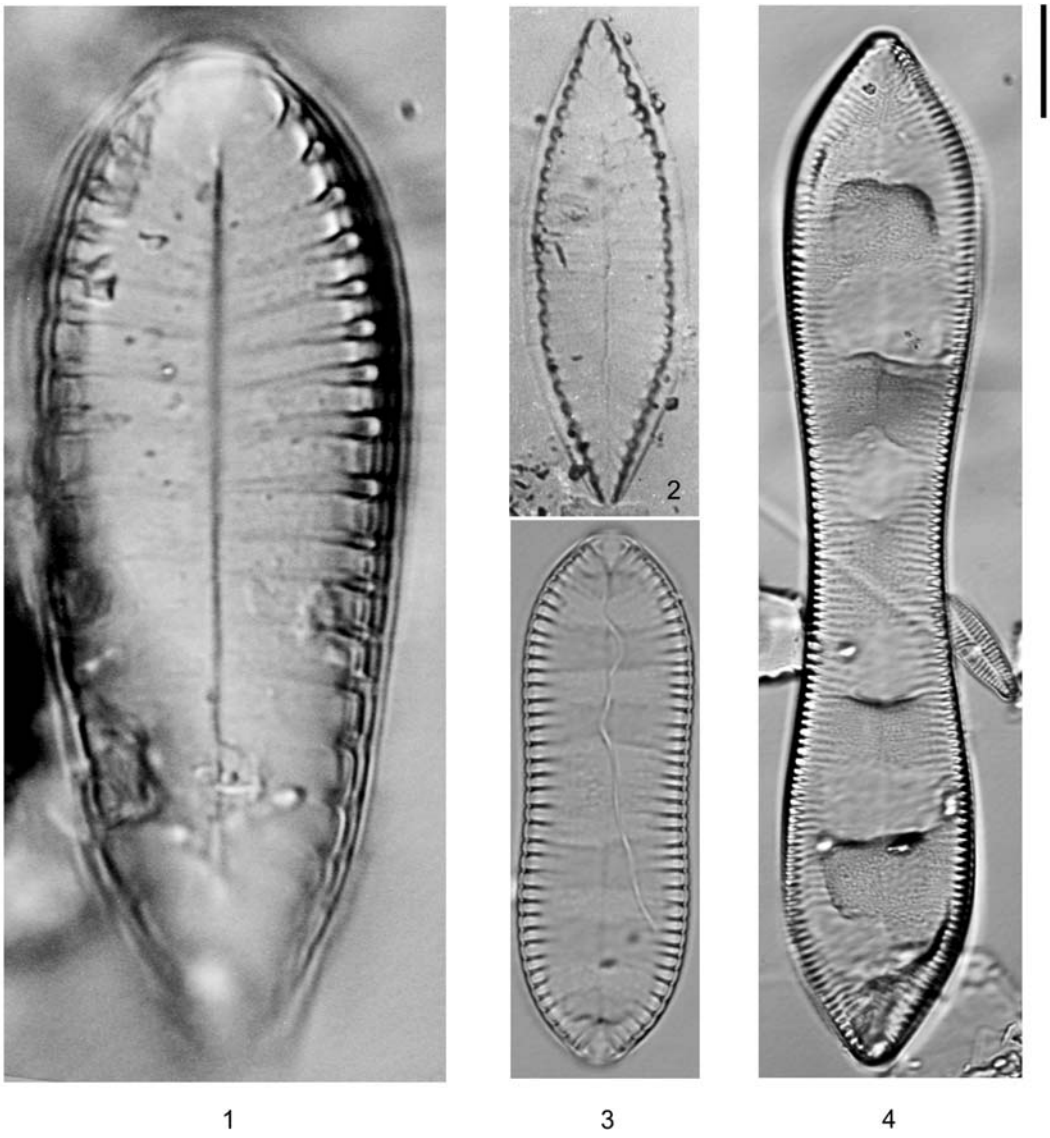


Plate 46. 1 – *Surirella tenera* Gregory; 2 – *Surirella* sp. 2; 3, 4 – *Cymatopleura solea* (Brébisson) W. Smith; all LM. Scale bar = 10 μm.

DIMENSIONS. Valves 6.4–36.0 μm long and 5.8–9.2 μm wide, with 8–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Common.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Without exact localities (Raciborski 1888; Gutwiński 1895), Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Uherkovich 1970) Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Cabejszek 1951; Kadłubowska 1964b), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), spring of Szklarka stream (Skalska 1966a, b), springs of Kobylanka stream (Skalna

1969), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, occurring in waters of moderate conductivity (Krammer & Lange-Bertalot 1991a). According to Van Dam *et al.* (1994), an alkalibiontic, β-mesosaprobous, meso-eutraphentic, strictly aquatic and fresh brackish water species.

20. ***Diploneis*** Ehrenberg

1. *****Diploneis fontanella*** Lange-Bertalot Plate 20: 1–4

Ref. Werum & Lange-Bertalot 2004 (p. 141, Figs 74: 1–15; 75: 4).

DIMENSIONS. Valves 14.5–24.0 μm long and 7.0–7.2 μm wide, with 18–21 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with mosses and sometimes with *Vaucheria* sp.

GENERAL DISTRIBUTION AND ECOLOGY. Widespread but not common in Northern Hemisphere, in waters with a broad range of pH (Werum & Lange-Bertalot 2004).

2. ***Diploneis krammeri*** Lange-Bertalot & Reichardt Plates 19: 9; 20: 5, 6; 75: 1–8

Diploneis ovalis (Hilse) Cleve *auct.*

Ref. Krammer & Lange-Bertalot 1986 (p. 286, Fig. 108: 14, 15); Lange-Bertalot 2000 (p. 652, Figs 4: 1–10, 15; 5: 1–5; 6: 1–5).

DIMENSIONS. Valves 29.0–33.6 μm long and 8.8–13.2 μm wide, with 12.5–14.4 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton and epipelon samples from above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a, b), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. *Diploneis ovalis* is a very common taxon (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread in waters of moderate and high conductivity (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), *D. ovalis* is an alkaliphilous, oligosaprobous and fresh brackish water species.

3. ***Diploneis oblongella*** (Nägeli) Cleve-Euler Plate 20: 7–10

Diploneis ovalis var. *oblongella* (Nägeli) Cleve

Ref. Krammer & Lange-Bertalot 1986 (p. 287, Fig. 108: 7–10).

DIMENSIONS. Valves 16.0–17.6 μm long and 6.5–7.5 μm wide, with 18–20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly above Kobylany village. Reported previously from the same material (Wojtal & Sobczyk 2006).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom, occurring in oligosaprobic waters of moderate conductivity (Krammer & Lange-Bertalot).

21. ***Discostella*** Houk & Klee

1. ***Discostella pseudostelligera*** (Hustedt) Houk & Klee Plate 1: 16, 17

Cyclotella pseudostelligera Hustedt

Ref. Krammer & Lange-Bertalot 1991a (p. 51, Fig. 49: 5–7).

DIMENSIONS. Valves 4–10 μm in diameter, with 8–22 costae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in mud samples from Zielona village, below Kobylany village.

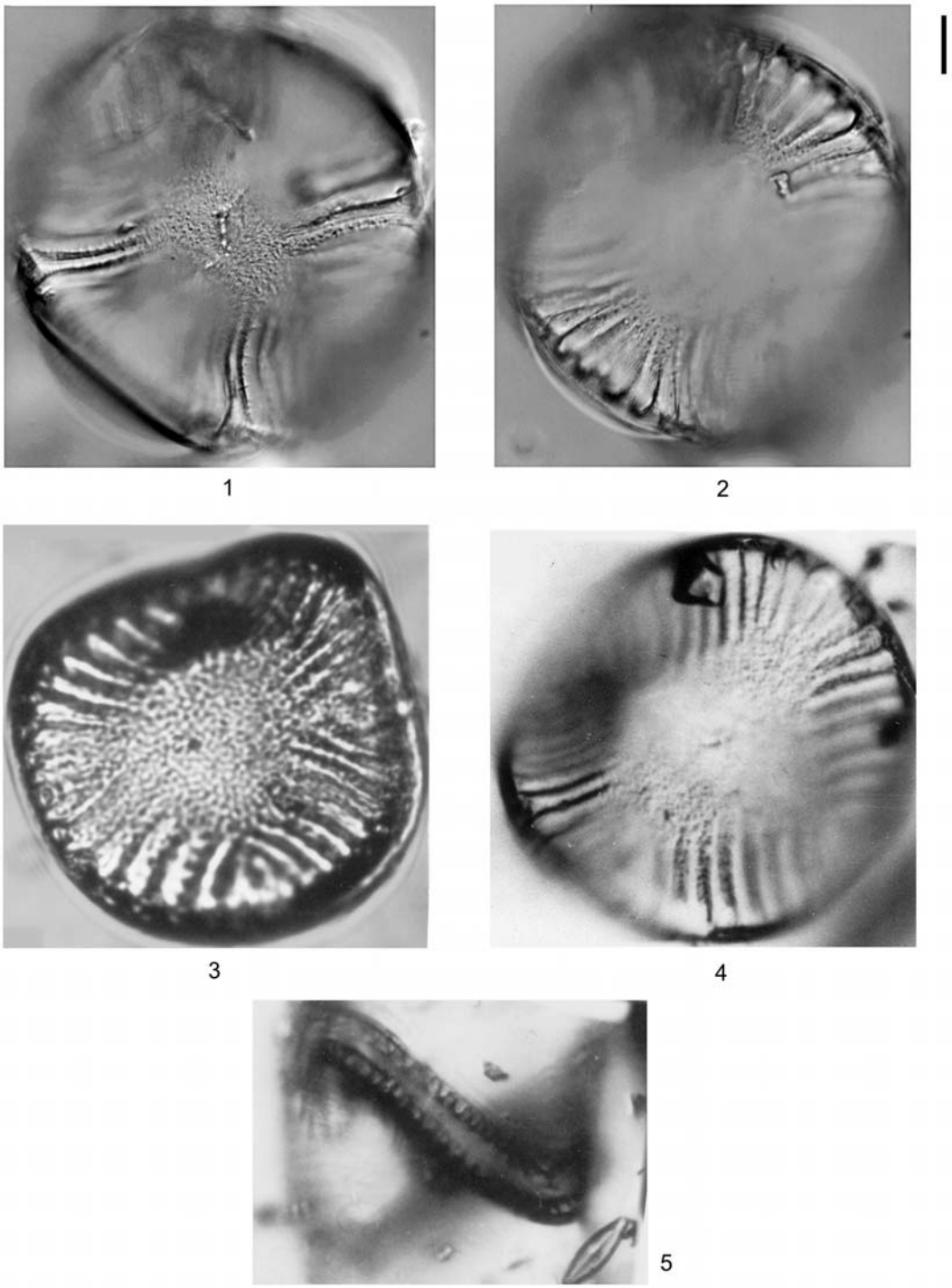


Plate 47. 1–5 – *Campylodiscus hibernicus* Ehrenberg, 1, 2, 4 – photos of the same frustule at different focus; all LM. Scale bar = 10 μm.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Kiss & Pająk 1994), Vistula River, Szreniawa River and Dłubnia River (Kawecka & Kwandrans 2000), Rudawa River, Prądnik River (Wojtal & Kwandrans 2006).

DISTRIBUTION IN POLAND. Rare (Siemińska & Wołowski 2003), up to 1990 reported only by Kiss and Pająk (1994).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1991a). According to Van Dam *et al*. (1994), a fresh brackish, neutrophilous, eutraphentic, α-mesosaprobous and strictly aquatic species.

2. ***Discostella stelligera*** (Cleve & Grunow) Houk & Klee Plate 1: 18

Cyclotella stelligera Cleve & Grunow

Ref. Krammer & Lange-Bertalot 1991a (p. 50, Fig. 49: 1–3).

DIMENSIONS. Valves 12.0–20.4 μm in diameter, *ca* 20–22 costae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon below Kobylany village. Reported previously from the same material (Wojtal & Kwandrans 2006).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), Pilica River (Kadłubowska 1964b), Biała Przemsza River, artificial pond in Modlniczka near Kraków (Wojtal & Kwandrans 2006).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1991a), strictly aquatic and fresh brackish water species (Van Dam *et al.* 1994).

22. ***Ellerbeckia*** Crawford

1. ***Ellerbeckia arenaria*** (Moore) Crawford Plate 1: 5a, b

Melosira arenaria Moore *ex* Ralfs

Ref. Krammer & Lange-Bertalot 1991a (p. 17, Figs 3: 6; 14: 1–5; 15: 1–3).

DIMENSIONS. Valves 60.0–74.4 μm in diameter.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Vaucheria* sp. in Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pilica River (Cabejszek 1951; Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a, b), springs of Centuria stream, not rare in sandy-bottom streams in northern part of the upland (data unpublished).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, aerophilous and littoral diatom (Krammer & Lange-Bertalot 1991a) of a wide trophic spectrum (Lange-Bertalot 1996).

23. ***Encyonema*** Kützing

1. **Encyonema caespitosum*** Kützing Plate 10: 10, 11

Cymbella caespitosa (Kützing) Brun

Ref. Krammer 1997a (p. 118, Figs 65: 1–17; 66: 7–13; 67: 1–8, 15, 16; 68: 1–5; 69: 1–8; 70: 1–2).

DIMENSIONS. Valves 19.5–26.0 μm long and 9.5–10.0 μm wide, with 10–12 striae per 10 μm.

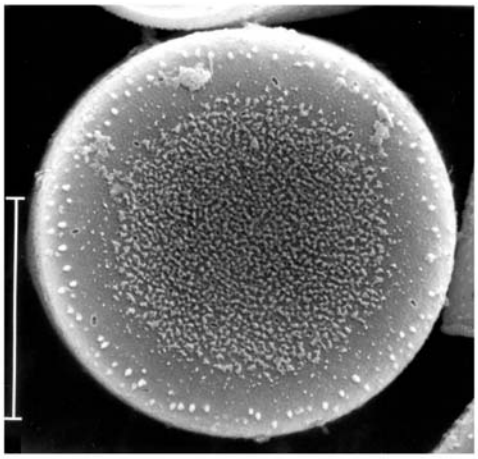
DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly above Kobylany village.

DISTRIBUTION IN POLAND. Rare (Siemińska & Wołowski 2003), reported from, e.g., Zalew Szczeciński (Bąk *et al*. 2006).

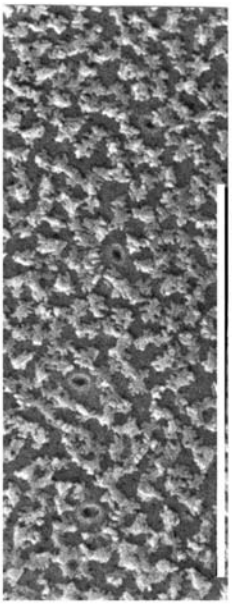
GENERAL DISTRIBUTION AND ECOLOGY. According to Van Dam *et al*. (1994), an α-mesosaprobous and fresh brackish water species occurring in a broad trophic spectrum.

2. ***Encyonema lange-bertalotii*** Krammer Plate 12: 4, 5

Ref. Krammer 1997a (p. 96, Figs 5: 1–16; 6: 2–4; 23: 1, 2; 27: 10, 12).



1



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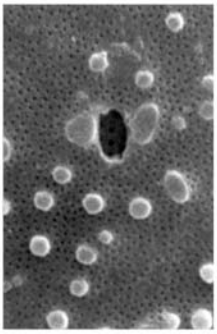

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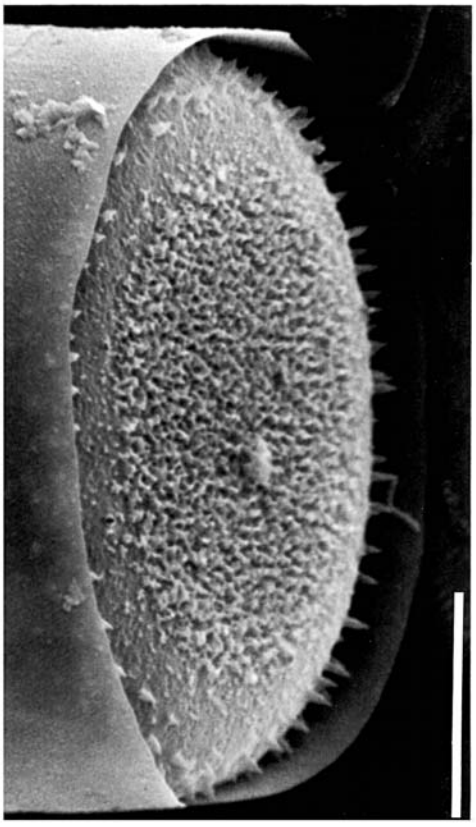

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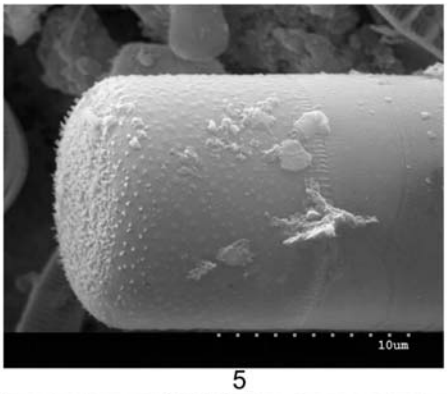

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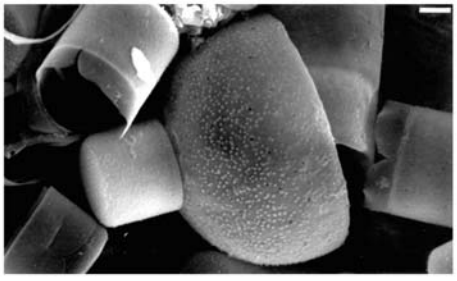


6

Plate 48. 1–6 – *Melosira varians* Agardh, external view (1), detail of central area structure (2), detail of auxospore structure (3), oblique view of valve (4), girdle view (5); auxospore and vegetative valves (6); all SEM. Scale bars: 1, 4 – 10 μm; 2, 5, 6 – 5 μm; 3 – 2 μm.

DIMENSIONS. Valves 18.4–28.6 μm long and 6.8–7.4 μm wide, with 13–15 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton, especially above Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Widespread periphytic diatom of temperate zone. According to Van Dam *et al.* (1994), a α-mesosaprobous and fresh brackish water species, occurring in a broad trophic spectrum.

3. ***Encyonema minutum*** (Hilse *ex* Rabenhorst) D.G. Mann Plates 12: 6, 7; 71: 5, 6, 8

Cymbella minuta Hilse *ex* Rabhenhorst; *C. ventricosa* Kützing *pro parte*

Ref. Krammer & Lange-Bertalot 1986 (p. 305, Figs 16: 4; 119: 1–13); Krammer 1997a (p. 53, Figs 6: 19–27; 24: 5, 6; 25: 1–19).

DIMENSIONS. Valves 7.5–21.0 μm long and 4.0–6.4 μm wide, with *ca* 15.0–16.8 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Kluczwoda stream (Nawrat 1993), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, oligotraphentic, occurring in waters of moderate conductivity (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Krammer (1997a), very common in the temperate zone in oligotrophic waters with moderate conductivity, especially in periphyton.

4. ***Encyonema prostratum*** (Berkeley) Kützing Plate 11: 2–4

Cymbella prostrata (Berkeley) Cleve

Ref. Krammer & Lange-Bertalot 1986 (p. 312, Fig. 123: 7–10); Krammer 1997b (p. 38, Figs 115: 1–15; 116: 1–6; 118: 1–6; 119: 1–6).

DIMENSIONS. Valves 39.4–50.0 μm long and 16.0–21.2 μm wide, with 8.5–9.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon especially above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pond in Kraków (Kukucz 1937), Vistula River (Turoboyski 1962; Kyselowa & Kysela 1966; Uherkovich 1970), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, occurring in mesotrophic waters of an elevated and high conductivity (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic, strictly aquatic and fresh brackish water species.

5. ***Encyonema silesiacum*** (Bleish *in* Rabenhorst) D.G. Mann Plates 12: 1–3; 71: 4

Cymbella silesiaca Bleish *in* Rabenhorst; *C. minuta* var. *silesiaca* (Bleisch) Reimer

Ref. Krammer & Lange-Bertalot 1986 (p. 304, Fig. 117: 1–24); Krammer 1997a (p. 72, Figs 4: 1–18; 7: 1–2, 6–19).

DIMENSIONS. Valves 19.0–28.5 μm long and 7.0–8.2 μm wide, with 12–14 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, occurring in a wide trophic range, and tolerating up to α-mesosaprobic waters (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), a neutrophilous, α-mesosaprobous, strictly aquatic, fresh brackish water species occurring in a wide trophic range.

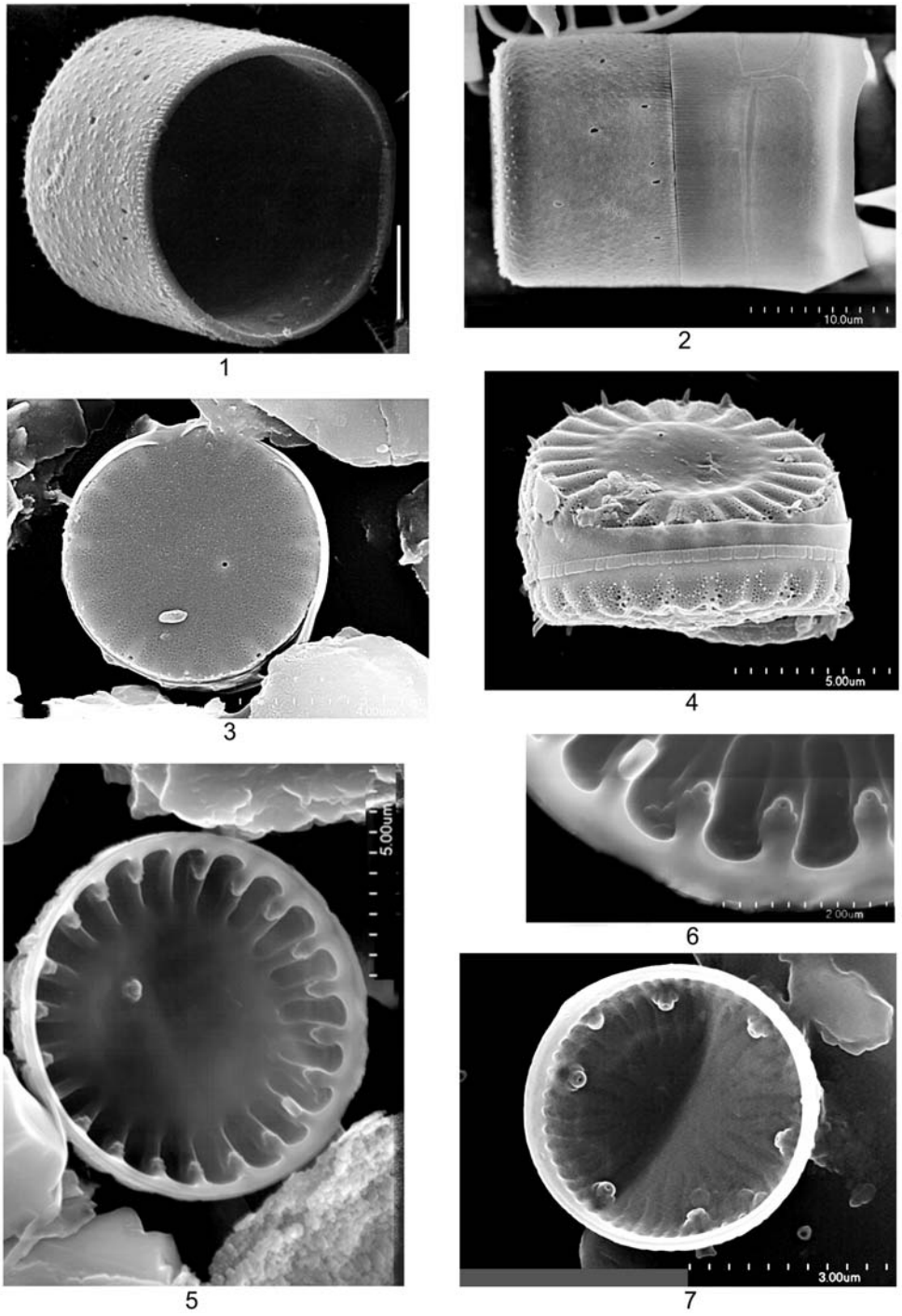


Plate 49. 1, 2 – *Melosira varians* Agardh, girdle view; 3, 7 – *Cyclotella atomus* Hustedt, external (3) and internal (7) view; 4–6 – *C. meneghiniana* Kützing, external (4) and internal (5, 6) view; 7 – *C. atomus*, internal view; all SEM. Scale bars: 1, 4, 5 – 5 μm; 2 – 10 μm; 3 – 4 μm; 6 – 2 μm; 7 – 3 μm.

6. ***Encyonema ventricosum*** (Agardh) Grunow Plate 12: 8, 9, 12

Cymbella ventricosa (Agardh) Agardh *pro parte*

Ref. Krammer 1997a (p. 98, Figs 6: 8–18; 7: 3–5; 23: 3–5; 26: 29–31).

DIMENSIONS. Valves 14.5–21.5 µm long and 5.0–6.2 µm wide, with 14–19 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in periphytic and metaphytic samples.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. *Cymbella ventricosa* was reported from the Vistula River (Starmach 1938; Turoboyski 1962; Kyselowa & Kysela 1966; Pudo 1970b; Uherkovich 1970), fish pond in Mydlniki (Starmach 1939), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Biała Przemsza River (Wasylik 1985).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom of temperate and boreal zones (Krammer 1997a).

7. ***Encyonema ventricosum*** cf. var. ***angusta*** Krammer Plate 12: 10, 11

Ref. Krammer 1997a (p. 99, Fig. 6: 5–7).

DIMENSIONS. Valves 14.8–21.0 µm long and 5–6 µm wide, with 13.0–15.5 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae.

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain.

REMARKS. Some specimens identified here as *Encyonema ventricosum* cf. var. *angusta* possessed valves larger than as given by Krammer (1997a).

8. ***Encyonema*** sp. Plate 12: 13–15

DIMENSIONS. Valves 15.0–23.5 µm long and 5.8–6.2 µm wide, with 15–18 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae.

REMARKS. These specimens could represent more than one taxon, as they differ in outline, especially in the ventral part. Some have an almost straight or even slightly concave ventral margin, whereas others have a slightly convex ventral margin (Plate 12, Figs 13, 14 vs. 15).

24. ***Encyonopsis*** Krammer

1. ***Encyonopsis microcephala*** (Grunow) Krammer Plates 8: 15–16; 71: 7

Cymbella microcephala Grunow

Ref. Krammer 1997b (p. 91, Figs 143: 1, 4, 5, 8–26; 146: 1–5; 147: 1–3; 201: 13–18).

DIMENSIONS. Valves 12.5–18.8 µm long and 3.5–4.2 µm wide, with 22–24 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in periphytic samples.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. *Cymbella microcephala* was reported from Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. In calcium-rich waters with average conductivity, in Central Europe (Krammer 1997b). According to Van Dam *et al.* (1994), an alkaliphilous, oligosaprobous, mesoeutraphentic and fresh brackish water species.

2. ***Encyonopsis*** sp. Plate 12: 16

DIMENSIONS. Valves 16.0–18.5 µm long and 6.8–7.0 µm wide, with 15–16 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in sample with filamentous algae from above Kobylany village.

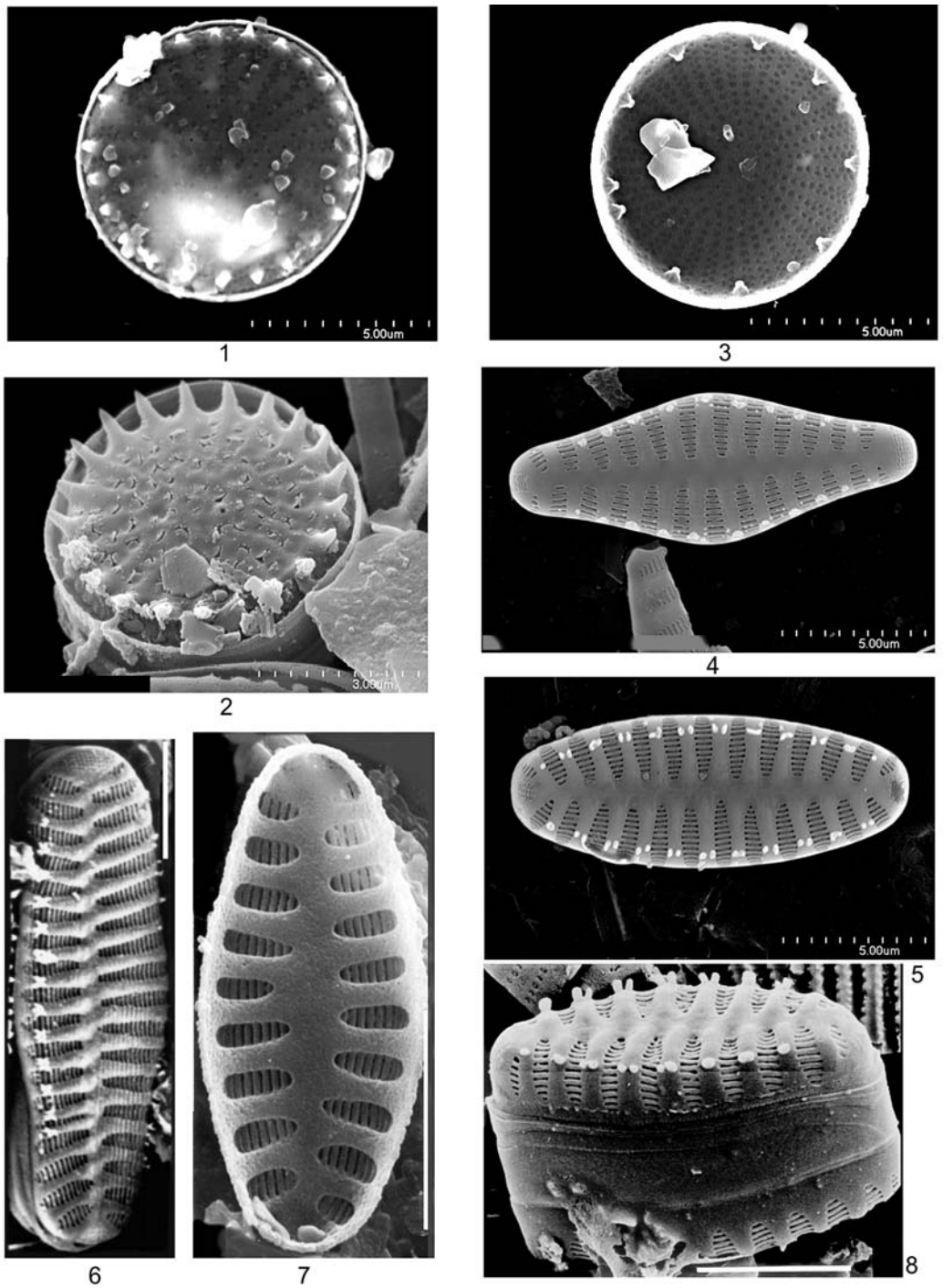


Plate 50. 1–3 – *Stephanodiscus minutulus* (Kützing) Cleve & Möller, external view (1, 2) and internal view (3); 4–8 – *Staurosira pinnata* Ehrenberg *sensu lato*, external view (4–6, 8) and internal view (7); all SEM. Scale bars: 1, 3–5, 7 – 5 μm; 2 – 3 μm; 6, 8 – 2 μm.

25. ***Eolimna*** Lange-Bertalot

1. ***Eolimna minima*** (Grunow *in* Van Heurck) Lange-Bertalot *sensu lato*
Plates 17: 25–27; 21: 6, 7; 94: 1–5

Navicula minima Grunow *in* Van Heurc

Ref. Krammer & Lange-Bertalot 1986 (p. 229, Fig. 76: 39–47).

DIMENSIONS. Valves 6.6–12.8 µm long and 2.6–4.2 µm wide, with *ca* 30 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Będkówka stream (Kłonowska 1986).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, α-meso-polysaprobous species (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkaliphilous, α-meso-polysaprobous, eutraphentic and fresh brackish water species.

REMARKS. Some specimens were identified previously as *Stauroneis lapidicola* Petersen (Wojtal & Sobczyk 2006). Further SEM study revealed very short striae in the middle portion of valves. Especially the diatoms identified as *Eolimna* cf. *minima* (Plate 94: 1–5) follow the broad species concept.

2. ****Eolimna subminuscula*** (Manguin) Moser, Lange-Bertalot & Metzeltin Plate 16: 22–24

Navicula subminuscula Manguin

Ref. Krammer & Lange-Bertalot 1986 (p. 223, Fig. 76: 21–26); Moser *et al*. 1998 (p. 154).

DIMENSIONS. Valves 8.8–12.4 µm long and 4.2–5.4 µm wide, with 20–24 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), reported from Pieniny Mts (Mrozińska 1992) and sewage treatment plant in Kraków (Wołowski 1989). More recently reported from, e.g., Central Poland (Rakowska & Sitkowska 2005), Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common in electrolyte-rich and polluted waters (Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-meso-polysaprobous, eutraphentic and fresh brackish water species.

26. ***Epithemia*** Brébisson *ex* Kützing

1. ***Epithemia turgida*** (Ehrenberg) Kützing
Plate 34: 1

Ref. Krammer & Lange-Bertalot 1988 (p. 155, Fig. 109: 4–7).

DIMENSIONS. Valves 27.0–38.2 µm long and 8.0–9.5 µm wide, with 12.0–13.5 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sites with unspecified location (Gutwiński 1884), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Cabejszek 1951; Kadłubowska 1964b), Vistula River (Turoboyski 1962), ponds near Kraków (Hanak-Szmagier 1967), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, common in mesotrophic to eutrophic waters (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994) an alkalibiontic, β-mesosaprobous, mesoeutraphentic and fresh brackish water species.

27. ***Eucocconeis*** Cleve

1. ***Eucocconeis alpestris*** (Brun) Lange-Bertalot
Plate 6: 24

Achnanthes flexella var. *alpestris* Brun; *A. alpestris* (Brun) Lange-Bertalot & Metzeltin

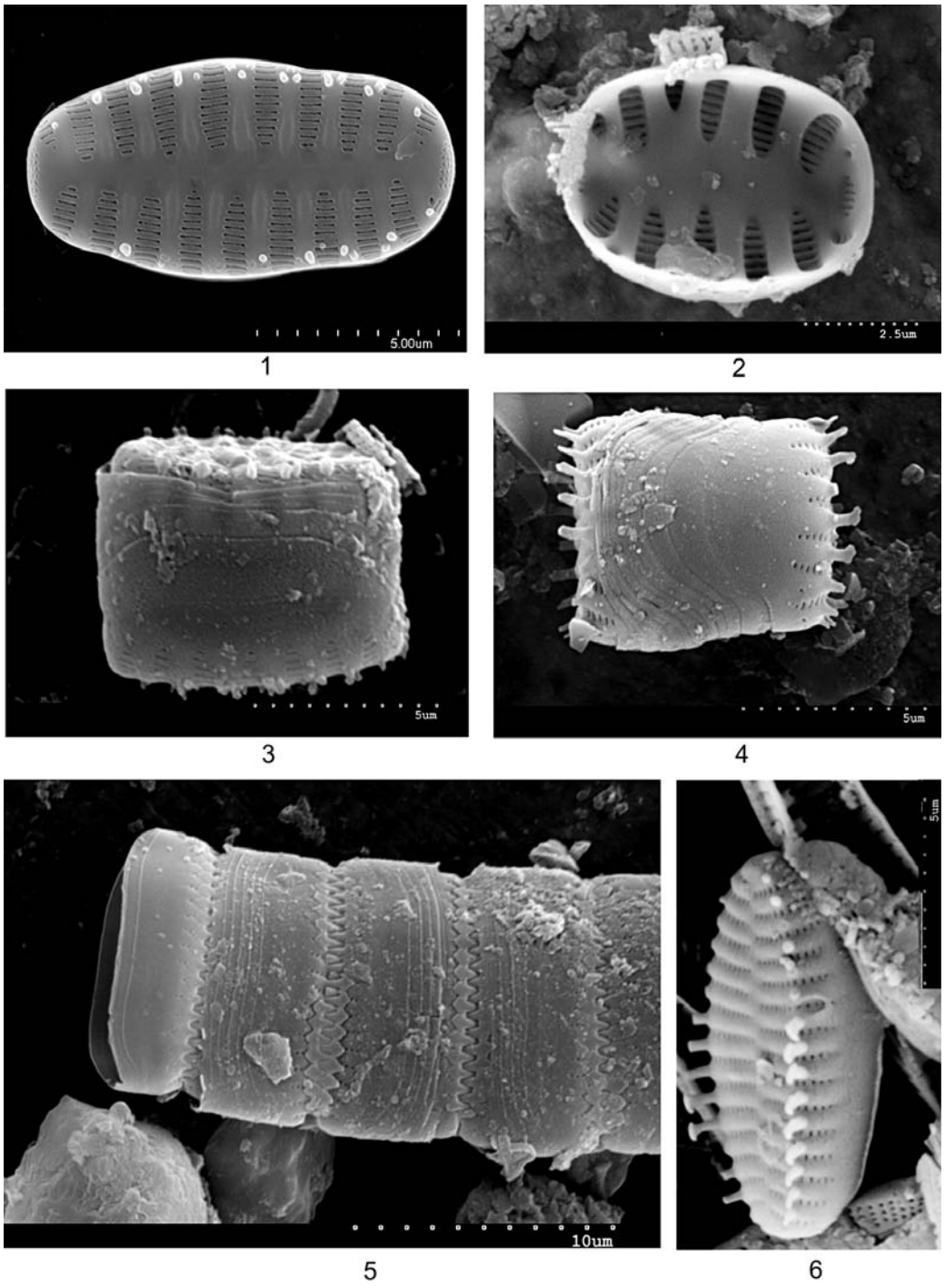


Plate 51. 1 – *Fragilaria leptostauron* var. *dubia* (Grunow) Hustedt, external view; 2 – *Staurosira* cf. *pinnata* Ehrenberg, internal view; 3–6 – *Staurosira venter* (Ehrenberg) H. Kobayashi, girdle view (3–5) and external view (6); all SEM. Scale bars: 1, 3, 4, 6 – 5 μm; 2 – 2.5 μm; 5 – 10 μm.

Ref. Krammer & Lange-Bertalot 1991a (p. 17, Fig. 9: 7–10); Lange-Bertalot & Genkal 1999 (p. 45).

DIMENSIONS. Valves 15 µm long and 7.3 µm wide. Raphe valve with 22 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, only one frustule in a mud sample below Kobylany village found.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Biała Przemsza River (Cabejszekówna 1935), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, occurring in oligotrophic waters of a wide range of pH and conductivity; *Eucocconeis alpestris* is not rare in circumneutral and slightly acidic waters according to Krammer and Lange-Bertalot (1991b). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, oligotraphentic and fresh water species.

28. ***Eunotia*** Ehrenberg

1. **Eunotia incisa* Gregory Plate 4: 9

Ref. Krammer & Lange-Bertalot 1991a (p. 221, Figs 161: 8–19; 163: 1–7).

DIMENSIONS. Valves 16.0–18.4 µm long and 3.2–3.8 µm wide, with 20–24 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, only in one sample with mosses from above Kobylany village.

DISTRIBUTION IN POLAND. Reported from, e.g., Sudety Mts (Kwandrans 1995), Central Poland (Rakowska 2001), Tatra Mts lakes (Kawecka & Galas 2003), peat bog in Central Poland (Rakowska & Sitkowska 2007) and several other localities in southern Poland (A. Wojtal, unpublished data).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1991a). According to Van Dam *et al*. (1994), an acidophilous, oligosaprobous, oligotraphentic, aquatic and subaerophilous and fresh water species.

REMARKS. The dimensions of the observed specimens varied around the lower limits for the species.

2. ***Eunotia*** sp. Plate 4: 10

DIMENSIONS. Valves 21 µm long and 4.5 µm wide, with 20 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, with the only specimen found in a sample with mosses from above Kobylany village.

REMARKS. The valve found has some morphological resemblance to the group around *E. intermedia* (Krasske) Nörpel-Schempp & Lange-Bertalot, but having only one specimen prevents a precise identification.

29. ***Fallacia*** Stickle & D.G. Mann

1. ***Fallacia monoculata*** (Hustedt) D.G. Mann *in* Round, Crawford & Mann Plate 16: 9–13

Navicula monoculata Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 174, Fig. 66: 12–18).

DIMENSIONS. Valves 10.5–18.5 µm long and 3.0–4.8 µm wide, with 23–25 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly epipelic and in samples with *Vaucheria* sp.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Reported previously from the same material (Wojtal & Sobczyk 2006).

DISTRIBUTION IN POLAND. Known from the Dobczyce dam reservoir (S Poland) (Wojtal *et al.* 2005).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread in waters of various character, of moderate and elevated conductivity (Krammer & Lange-Bertalot 1986).

2. ***Fallacia pygmaea*** (Kützing) Stickle & D.G. Mann Plate 16: 5–8

Navicula pygmaea Kützing

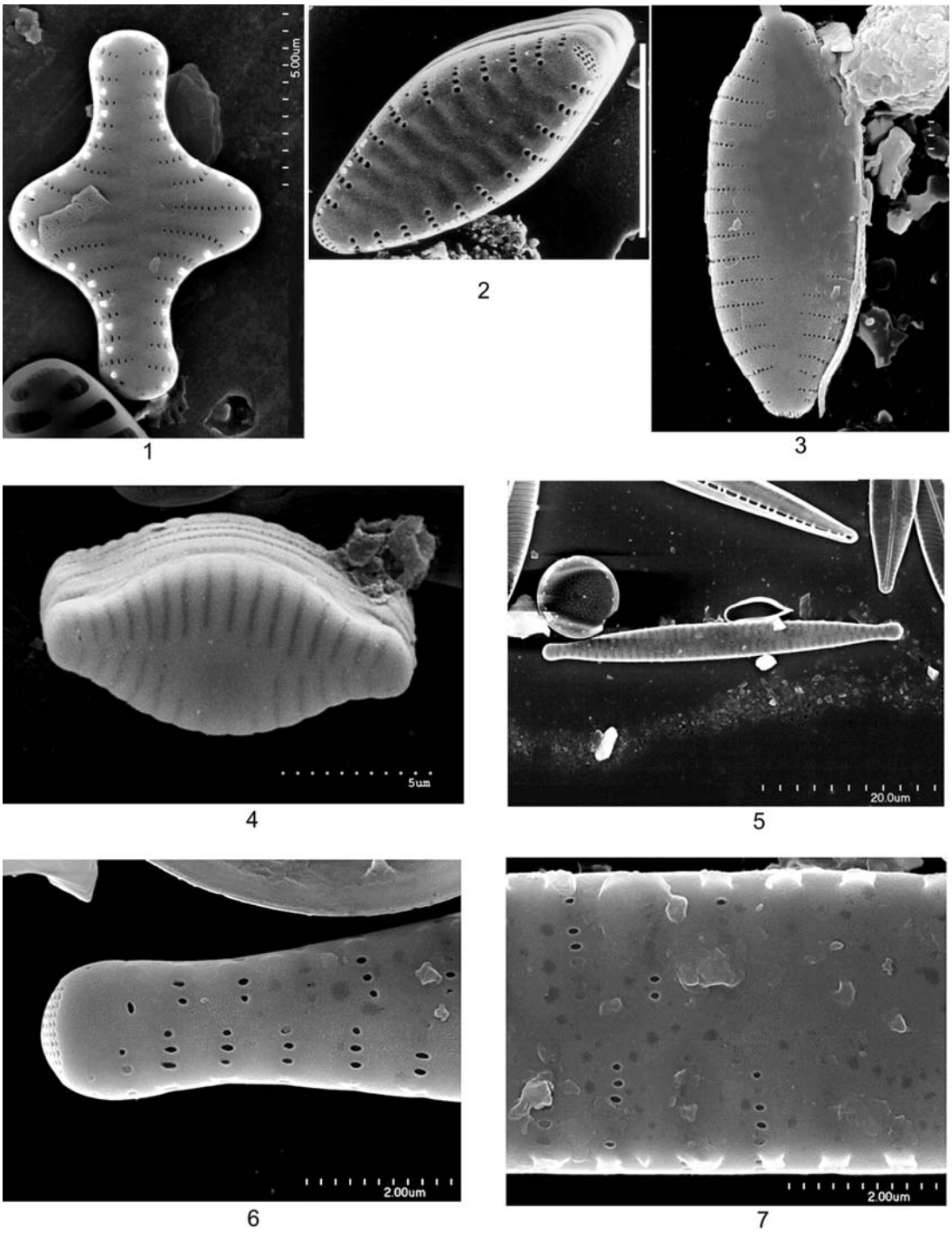


Plate 52. 1 – *Staurosira construens* Ehrenberg var. *construens*; 2 – *S.* cf. *brevistriata* (Grunow) Williams & Round; 3, 4 – *Fragilaria capucina* var. *vaucheriae* (Kützing) Lange-Bertalot; 5–7 – *F. capucina* Desmazières. Figs 1–7 – external view; all SEM. Scale bars: 1–4 – 5 μm; 5 – 20 μm; 6, 7 – 2 μm.

Ref. Krammer & Lange-Bertalot 1986 (p. 171, Fig. 65: 1–6).

DIMENSIONS. Valves 28.2–49.0 μm long and 12.0–14.5 μm wide, with 22–25 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent in epipelic samples, especially below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947) Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b), springs of Będkówka stream (Kubik 1970), streams (Dratnal 1977).

DISTRIBUTION IN POLAND. Frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, epipelic (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), an alkalibiontic, α-mesosaprobous, eutraphentic and brackish fresh water species.

3. ***Fallacia subhamulata*** (Grunow) D.G. Mann Plate 16: 14–16

Navicula subhamulata Grunow *in* Van Heurck

Ref. Krammer & Lange-Bertalot 1986 (p. 192, Figs 66: 32–34; 83: 4).

DIMENSIONS. Valves 17.3–18.6 μm long and 5.1–6.0 μm wide, with 29–30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and samples with *Vaucheria* sp.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), spring of Szklarka stream (Skalska 1966a).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread in waters of various character (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), a neutrophilous, oligosaprobous, meso-eutraphentic and fresh brackish water species.

REMARKS. Probably its occurrence is underestimated in Poland, as this small diatom with finely silicified frustules may be overlooked.

4. ***Fallacia sublucidula*** (Hustedt) D.G. Mann Plate 16: 17–19

Navicula sublucidula Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 193, Fig. 66: 40–42).

DIMENSIONS. Valves 9.0–9.6 μm long and 4.3–4.5 μm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton above Kobylany village. Reported previously from the same material (Wojtal & Sobczyk 2006).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Reported earlier from the same material by Wojtal and Sobczyk (2006).

DISTRIBUTION IN POLAND. Zatoka Gdańska (Stachura & Witkowski 1997).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain.

30. ***Fragilaria*** Lyngbye

1. **Fragilaria austriaca*** (Grunow) Lange-Bertalot Plate 2: 7

Synedra amphicephala var. *austriaca* Grunow; *Fragilaria capucina* var. *austriaca* (Grunow) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1991a (p. 126, Figs 109: 21–24; 113: 3–5).

DIMENSIONS. Valves 30.5 μm long and 3.5 μm wide, with *ca* 14 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae above Kobylany.

DISTRIBUTION IN POLAND. Frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. According to Van Dam *et al*. (1994), an alkalophilous and fresh brackish water taxon.

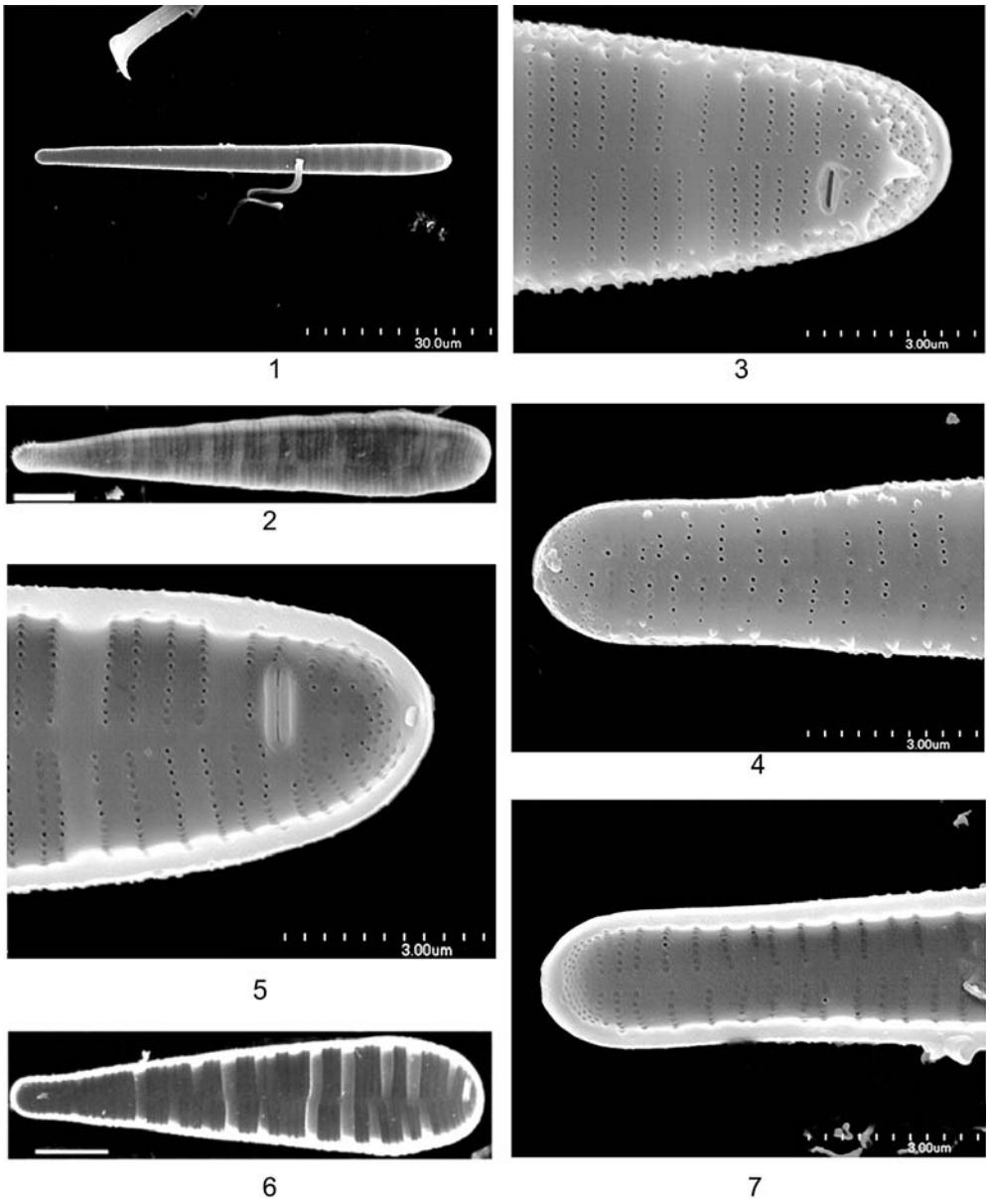


Plate 53. 1–7 – *Meridion circulare* Agardh var. *circulare*, external view (1–4) and internal view (5–7); all SEM. Scale bars: 1 – 30 µm; 2, 6 – 5 µm; 3–5, 7 – 3 µm.

2. * ***Fragilaria bidens*** Heiberg Plate 2: 35, 36

Ref. Krammer & Lange-Bertalot 1991a (p. 127, Fig. 111: 18–22).

DIMENSIONS. Valves 13.5–32.6 µm long and 3.2–5.0 µm wide, with 15–18 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and samples with filamentous algae from the first spring.

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Euplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an alkalophilous, β-mesosaprobous, eutraphentic and fresh brackish water taxon.

3. ***Fragilaria capucina*** Desmazières Plates 2: 8–13; 52: 5–7

Ref. Krammer & Lange-Bertalot 1991a (p. 121, Fig. 108: 1–8).

DIMENSIONS. Valves 2.0–34.5 μm long and 3.4–4.0 μm wide, with 16–17 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Fairly common in samples with filamentous algae and mud.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962; Kyselowa & Kysela 1966), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. A diatom of a wide ecological range, from oligotrophic to slightly mesotrophic waters of low to circumneutral pH and low to moderate conductivity (Krammer & Lange-Bertalot 1991a).

4. ***Fragilaria capucina*** var. ***mesolepta*** (Rabenhorst) Rabenhorst Plate 2: 18

Fragilaria mesolepta Rabenhorst

Ref. Krammer & Lange-Bertalot 1991a (p. 123, Fig. 110: 14–21, 23, 24).

DIMENSIONS. Valves 12–16 μm long and 2.6–3.6 μm wide, with 12–16 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae from the spring.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain. According to Hofmann (1994), an α-mesoeutraphentic, mesosaprobous species.

5. ***Fragilaria capucina*** var. ***vaucheriae*** (Kützing) Lange-Bertalot Plates 2: 14–17; 52: 3, 4

Synedra vaucheriae (Kützing) Kützing; *Fragilaria intermedia* Grunow *in* Van Heurck; *F. vaucheriae* (Kützing) Petersen

Ref. Krammer & Lange-Bertalot 1991a (p. 124, Fig. 108: 10–15).

DIMENSIONS. Valves 12.4–35.0 μm long and 3.8–4.6 μm wide, with 12–14 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Abundant, especially in samples collected from mud and filaments of *Cladophora* sp. or *Vaucheria* sp.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Będkówka stream (Kubik 1970), springs of Kobylanka stream (Skalna 1969), spring of Szklarka stream (Skalska 1966a, b), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain. According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species.

6. ***Fragilaria*** cf. ***crotonensis*** Kitton Plate 2: 21

Ref. Krammer & Lange-Bertalot 1991a (p. 130, Fig. 116: 1–4).

DIMENSIONS. Valves 38.5 μm long and 2.8 μm wide, with 20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in only one epipelic sample from below Kobylany village.

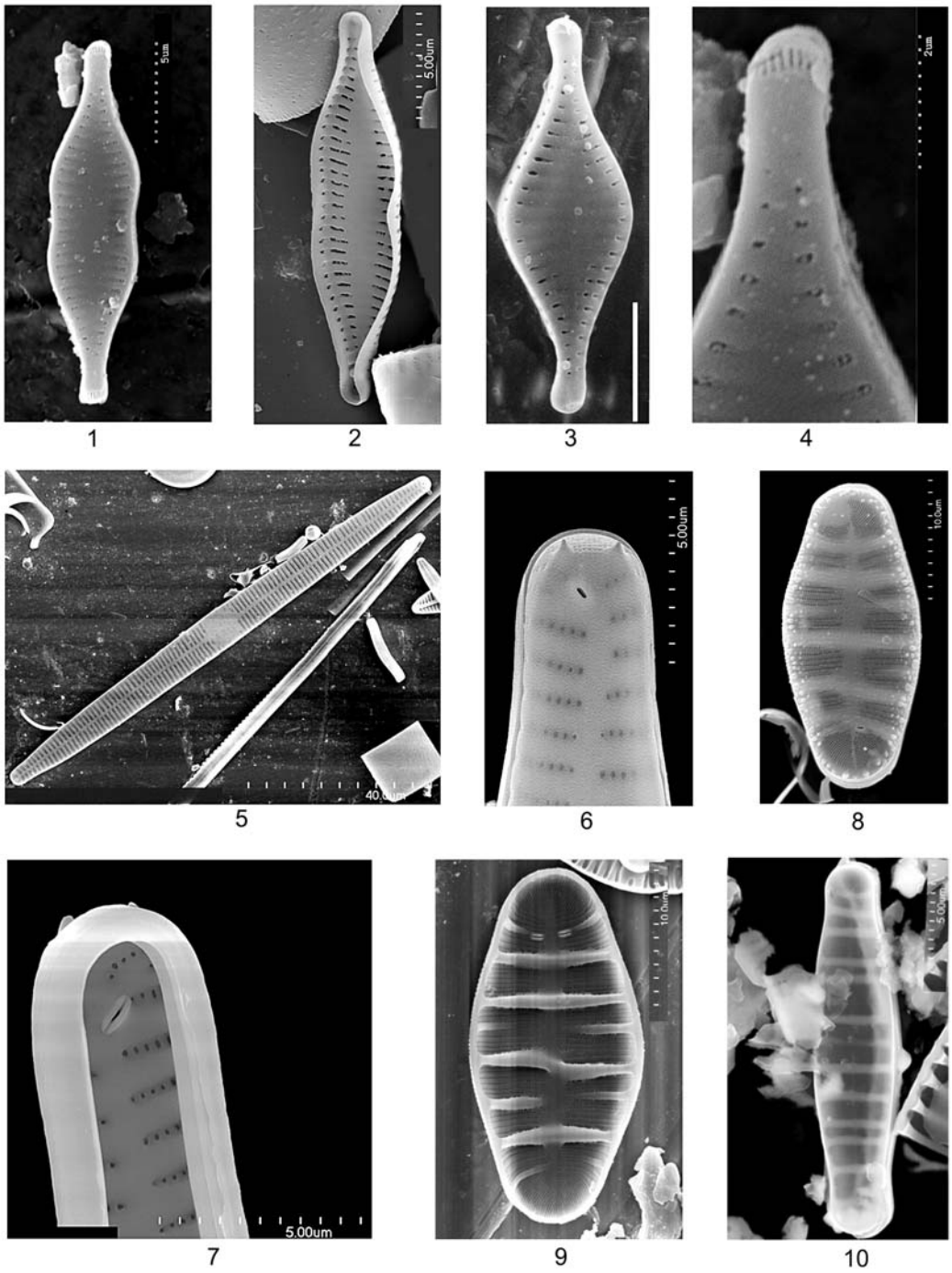


Plate 54. 1, 2 – *Fragilaria parasitica* var. *subconstricta*, external (1) and internal (2) view; 3, 4 – *F. parasitica* var. *parasitica* (W. Smith) Grunow, external view; 5–7 – *F. ulna* (Nitzsch) Lange-Bertalot, external (5, 6) and internal (7) view; 8, 9 – *Diatoma mesodon* (Ehrenberg) Kützing, external (8) and internal (9) view; 10 – *D. moniliformis* Kützing, external view; all SEM. Scale bars: 1–3, 6, 7, 10 – 5 µm; 4 – 2 µm; 5 – 40 µm; 8, 9 – 10 µm.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pond in Mydlniki (Engelhorn 1939), Vistula River (Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Uherkovich 1970), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom probably occurring in a broad ecological spectrum, mostly in slightly alkaline, oligotrophic to weakly mesotrophic waters (Krammer & Lange-Bertalot 1991a). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, mesotraphentic and fresh brackish water species.

REMARKS. SEM studies are needed for unambiguous identification.

7. ***Fragilaria gracilis*** Østrup Plate 2: 22

Fragilaria capucina var. *gracilis* (Østrup) Hustedt

Ref. Krammer & Lange-Bertalot 1991a (p. 123, Figs 111: 1–3; 113: 22–26).

DIMENSIONS. Valves 12–16 μm long and 2.6–3.6 μm wide, with 12–16 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae from spring.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Reported from, e.g., Zalew Szczeciński (Bąk *et al*. 2006) and spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. It prefers oligosaprobic and oligotrophic to mesotrophic, slightly acidic to slightly alkaline waters, with low to moderate conductivity (Krammer & Lange-Bertalot 1991a). According to Van Dam *et al*. (1994), a neutrophilous, oligosaprobous, oligo-mesotraphentic and fresh brackish water species.

8. ***Fragilaria leptostauron*** (Ehrenberg) Hustedt var. ***dubia*** (Grunow) Hustedt

Plates 3: 9, 10; 51: 1

Opephora dubium (Grunow) Hustedt; *Staurosirella dubia* (Grunow) Morales

Ref. Krammer & Lange-Bertalot 1991a (p. 160, Fig. 133: 24–28).

DIMENSIONS. Valves 20.4–28.0 μm long and 8.6–10.0 μm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in mud samples from above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. According to Van Dam *et al.* (1994), an alkaliphilous and fresh brackish water species.

9. ***Fragilaria parasitica*** (W. Smith) Grunow *in* Van Heurck var. ***parasitica***

Plates 2: 32, 33; 54: 3, 4

Synedra parasitica (W. Smith) Hustedt

Ref. Krammer & Lange-Bertalot 1991a (p. 133, Fig. 130: 1–5).

DIMENSIONS: Valves 12.5–18.2 μm long and 3.0–3.8 μm wide, with 17.0–18.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in mud samples from below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Kadłubowska 1964b), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, occurring in small populations, usually in mesotrophic to eutrophic circumneutral waters (Krammer & Lange-Bertalot 1991a).

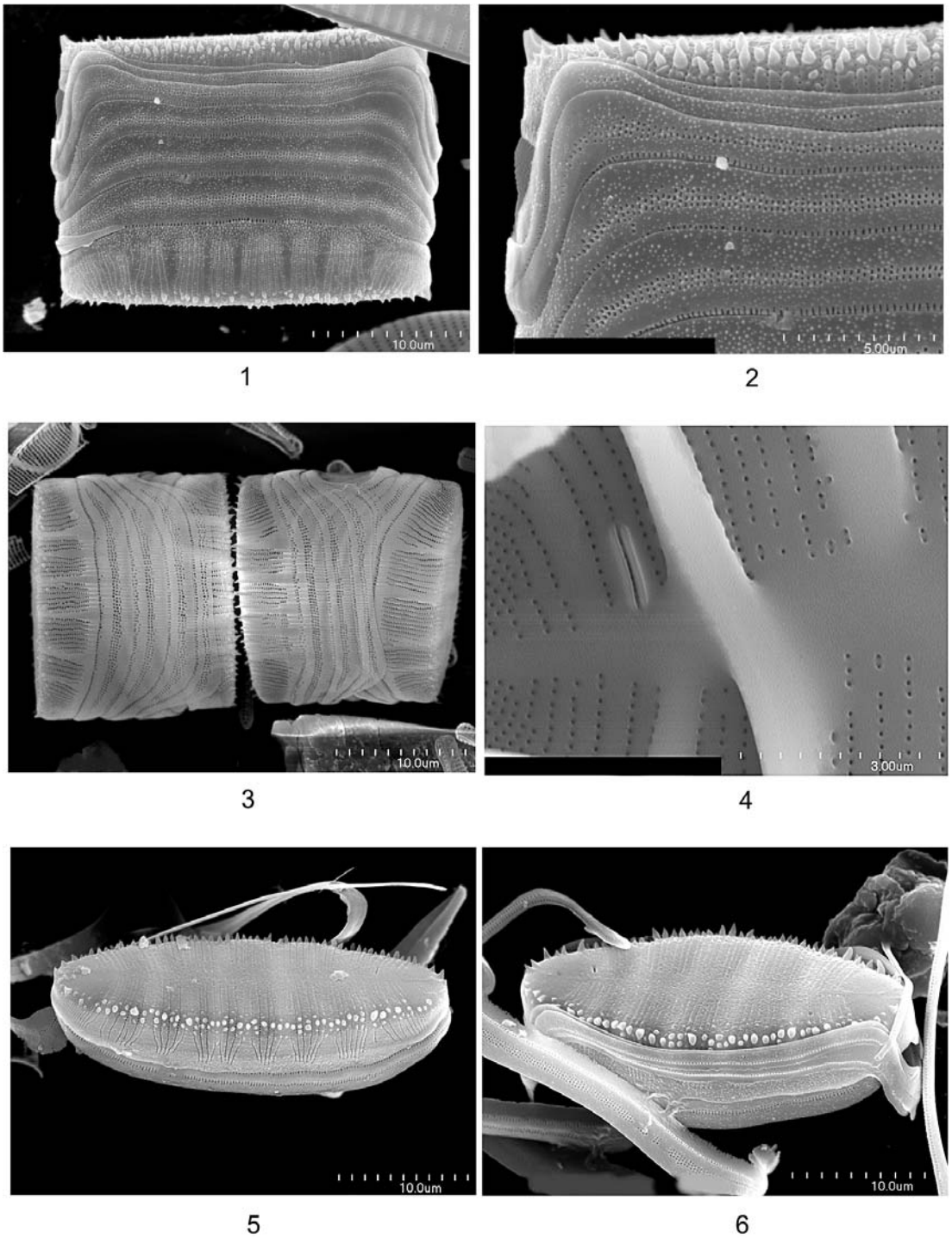


Plate 55. 1–6 – *Diatoma mesodon* (Ehrenberg) Kützing, external (1–3, 5, 6) and internal view (4); 1–3 – girdle view; 4 – detail with rimoportulae; all SEM. Scale bars: 1, 3, 5, 6 – 10 μm; 2 – 5 μm; 4 – 3 μm.

10. ***Fragilaria parasitica*** var. ***subconstricta*** Grunow Plates 2: 34; 54: 1, 2

Ref. Krammer & Lange-Bertalot 1991a (p. 133, Fig. 130: 6–8).

DIMENSIONS. Valves 15.5–21.0 µm long and 3.8–4.5 µm wide, with 16 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae from Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sanka stream (Hojda 1971), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, occurring in circumneutral mesotrophic to eutrophic waters (Krammer & Lange-Bertalot 1991a).

11. ***Fragilaria rumpens*** (Kützing) Carlson Plate 2: 19, 20

Synedra rumpens Kützing; *Fragilaria capucina* var. *rumpens* (Kützing) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1991a (p. 122, Figs 108: 16–21; 110: 1–6a).

DIMENSIONS. Valves 38.0–48.2 µm long and 3.0–3.2 µm wide, with 18–20 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. According to Van Dam *et al*. (1994), a neutrophilous, oligo-mesotraphentic and fresh brackish water species.

12. ***Fragilaria ulna*** (Nitzsch) Lange-Bertalot *sensu lato* Plates 2: 37, 38; 54: 5–7

Synedra ulna (Nitzsch) Ehrenberg; *Ulnaria ulna* (Nitzsch) Compére

Ref. Krammer & Lange-Bertalot 1991a (p. 143, Fig. 119: 1–7).

DIMENSIONS. Valves 41.8–156.0 µm long and 3.4–5.0 µm wide, with 9–12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Common, especially in samples collected from epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Without exact localities (Raciborski 1888), Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Uherkovich 1970; Pudo 1977), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Cabejszek 1951; Kadłubowska 1964a, b), Biała Przemsza River (Wasylik 1985), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963; Pudo & Kurbiel 1970), spring of Szklarka stream (Skalska 1966a, b), ponds near Kraków (Hanak-Szmagier 1967), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, with a wide ecological amplitude (Krammer & Lange-Bertalot 1991a). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous to polysaprobous and fresh brackish water species indifferent to trophic state.

13. ***Fragilaria*** sp. Plate 2: 23, 24

DIMENSIONS. Valves 48.6–58.6 µm long and 2.0–2.2 µm wide, 22–23 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton above Kobylany village.

REMARKS. At first glance the observed specimens resemble *F. famelica* (Kützing) Lange-Bertalot (Krammer & Lange-Bertalot 1991a: p. 128,

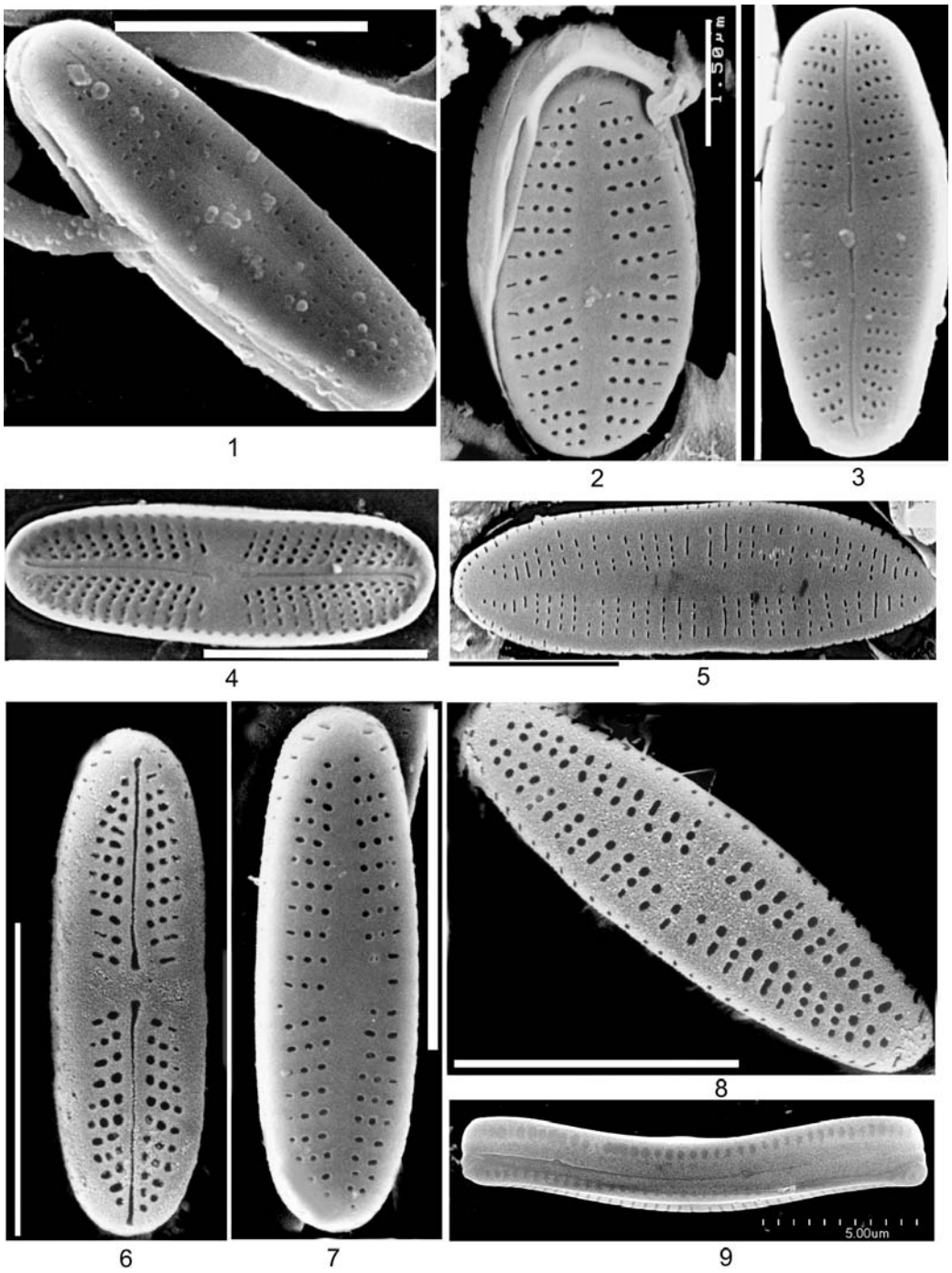


Plate 56. 1, 8, 9 – *Achnanthidium minutissimum* (Kützing) Czarnecki *sensu lato*, external valve (1, 8) and girdle (9) view; 2 – *Achnanthidium* sp. 2, external view; 3 – *A.* cf. *saprophilum* (Kobayasi & Mayama) Round & Bukhtiyarova, external view; 4, 6, 7 – *Achnanthidium* sp. 1, internal (4) and external (6, 7) view; 5 – *A. pyrenaicum* Hustedt, external view; all SEM. Scale bars: 1, 3–9 – 5 µm; 2 – 1.5 µm.

Fig. 111: 4–12, 16, 17), but differ considerably by having finer striation and higher striae density than as given by Krammer and Lange-Bertalot (1991a): 22–23 vs. 11–16 per 10 μm. They also differ from *F. gracilis* Østrup by their valve outline and striae morphology.

31. ***Frustulia*** Rabenhorst

1. ***Frustulia vulgaris*** (Thwaites) De Toni
Plates 8: 10–12; 64: 7, 8; 65: 1–5

Ref. Krammer & Lange-Bertalot 1986 (p. 260, Fig. 97: 1–6); Lange-Bertalot 2001 (p. 175, Fig. 134: 1–7).

DIMENSIONS. Valves 53.0–63.5 μm long and 9.6–12.0 μm wide, with *ca* 25–28 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, the largest populations observed in metaphyton and epipelon. Sometimes specimens dwelling in tubes were observed amongst filaments of *Vaucheria* sp.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, known from a broad range of electrolyte concentrations, including slightly brackish waters, and also from aerophytic biotopes (Krammer & Lange-Bertalot 1986). According to Lange-Bertalot (2001), of an extraordinarily wide ecological amplitude. According to Van Dam *et al*. (1994), an alkaliphilous, β-mesosaprobous, meso- to eutraphentic and fresh brackish water species.

32. ***Gomphocymbellopsis*** Krammer

1. **Gomphocymbellopsis ancyli*** (Cleve) Krammer
Plate 8: 13

Cymbella ancyli Cleve; *Gomphocymbella ancyli* (Cleve) Hustedt

Ref. Krammer 2003 (p. 128, Figs 143: 1–20; 144: 10–19; 145: 1–3).

DIMENSIONS. Valve 35.5 μm long and 8.2 μm wide, with *ca* 10 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, only one specimen found in a sample with filamentous algae from above Kobylany village.

DISTRIBUTION IN POLAND. Zalew Szczeciński (Bąk *et al*. 2006). Regarded as vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread, known from recent materials from oligotrophic lakes (Krammer 2003).

33. ***Gomphonema*** Ehrenberg

1. ***Gomphonema acuminatum*** Ehrenberg
Plate 13: 1

Ref. Krammer & Lange-Bertalot 1986 (p. 365, Fig. 160: 1–12); Reichardt 1999 (Figs 52: 1–14; 53: 1–17).

DIMENSIONS. Valves 34–75 μm long and 8.0–11.5 μm wide, with 11–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae and vascular plants; large population observed in material including *Lemna* sp., where it co-occurred with *Lemnicola hungarica* (Grunow) Round & Basson (Wojtal 2003a).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sites with unspecified location (Raciborski 1888), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963; Hojda 1971), Pilica River (Kadłubowska 1964b), Vistula River (Kyselowa & Kysela 1966), ponds near Kraków (Hanak-Szmagier 1967), springs of Kobylanka stream (Skalna 1969), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1986; Reichardt 1999). An alkaliphilous,

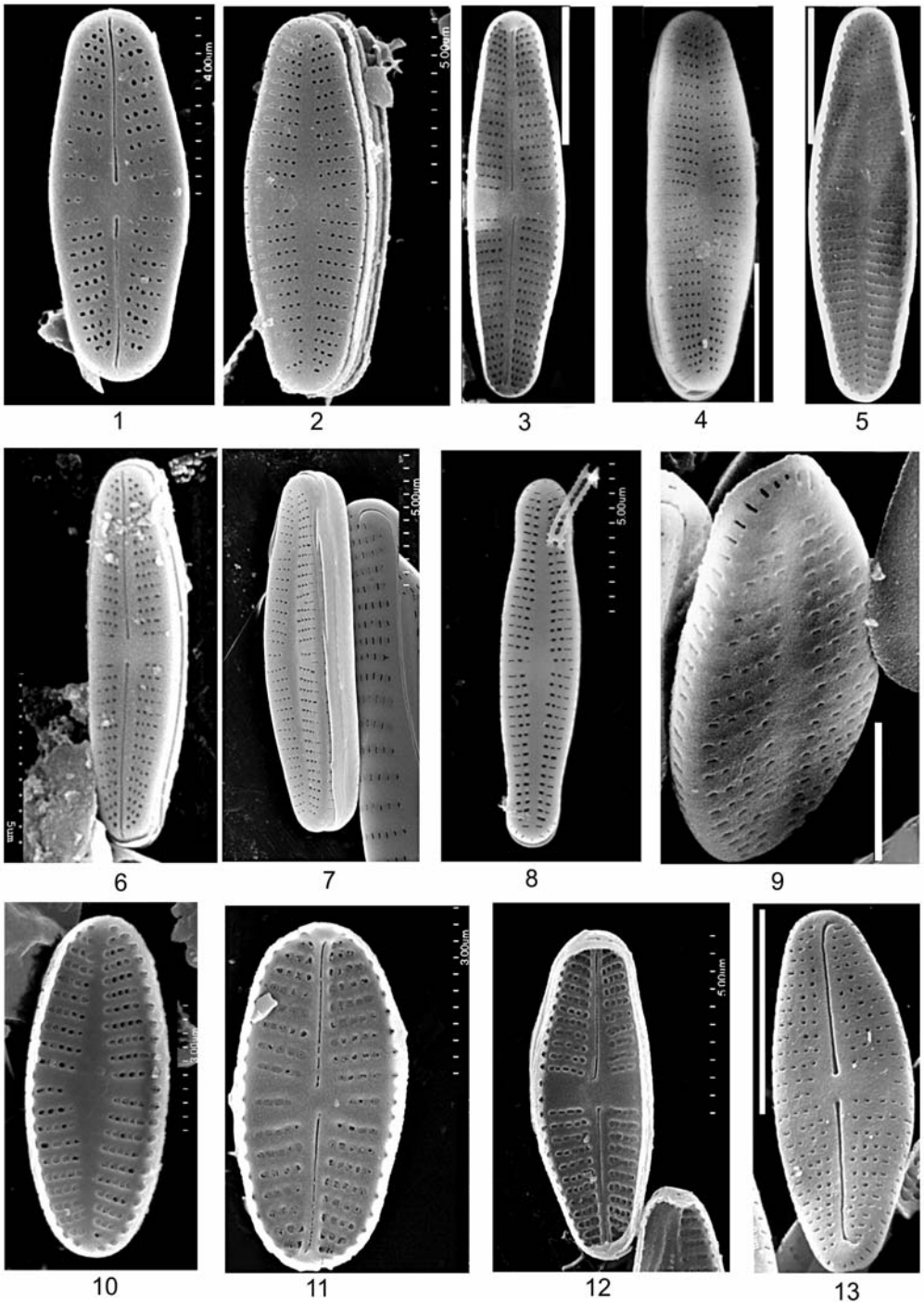


Plate 57. 1–8 – *Achnanthidium minutissimum* (Kützing) Czarnecki *sensu lato*, external (1, 2, 4, 6–8) and internal (3, 5) view; 9–13 – *A. pyrenaicum* Hustedt, external (9, 13) and internal (10–12) view; all SEM. Scale bars: 1 – 4 μm, 2–9, 12, 13 – 5 μm, 10, 11 – 3 μm.

β-mesosaprobous, eutraphentic and fresh brackish water species (Van Dam *et al*. 1994).

2. ***Gomphonema angustatum*** (Kützing) Rabenhorst *sensu lato* Plate 13: 2, 3

Ref. Reichardt 1999 (p. 23, Figs 23: 1–10; 13–16; 24: 1–37).

DIMENSIONS. Valves 27–35 µm long and 5.0–5.8 µm wide, with 12–13 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Vaucheria* sp. Reported previously from the same material (Wojtal 2003a).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), Vistula River (Turoboyski 1962; Pudo 1977), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), spring of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971), Kluczwoda stream (Nawrat 1993), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain.

REMARKS. The species shows great morphological variability. Some of them were previously identified from the same material as *Gomphonema lagerheimii* Cleve (Wojtal 2003a).

3. ***Gomphonema clavatum*** Ehrenberg *sensu* Krammer & Lange-Bertalot Plates 13: 4–7; 72: 4–6; 73: 1

Gomphonema longiceps Ehrenberg; *G. longiceps* var. *montana* (Schumann) Cleve; *G. longiceps* var. *subclavata* Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 367, Fig. 163: 1–12).

DIMENSIONS. Valves 28.4–52.0 µm long and 6.3–9.2 µm wide, with 10–12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon above Kobylany village. Reported previously from the same material (Wojtal 2003a).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. *Gomphonema clavatum* and its synonyms were very commonly reported from Poland (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, occurring in oligosaprobic waters with a wide range of conductivity (Krammer & Lange-Bertalot 1986).

REMARKS. Identification followed the broad species concept. Most specimens found were morphologically allied to the diatom pictured in Fig. 163: 7 by Krammer and Lange-Bertalot (1986).

4. ***Gomphonema micropus*** Kützing Plates 13: 10–14; 73: 2–5

Gomphonema parvulum var. *micropus* (Kützing) Cleve

Ref. Krammer & Lange-Bertalot 1991b (Fig. 74: 1–14); Reichardt 1999 (p. 34, Figs 36: 1–14; 37: 1–29; 38: 1–15; 39: 15–17, 27–29).

DIMENSIONS. Valves 18.8–40.2 µm long and 6.8–8.2 µm wide, with 10–14 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Common, in epilithon, epipelon, periphyton and metaphyton. Reported previously from the same material (Wojtal 2003a, 2006; Wojtal & Sobczyk 2006).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Springs of Będkówka stream (Kubik 1970), Vistula River (Pudo 1977).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread, alkaliphilous (Reichardt 1999). According to Van Dam *et al.* (1994) *G. micropus* is a neutrophilous species.

REMARKS. Some of the specimens differ from typical *G. micropus* by having only one stigma

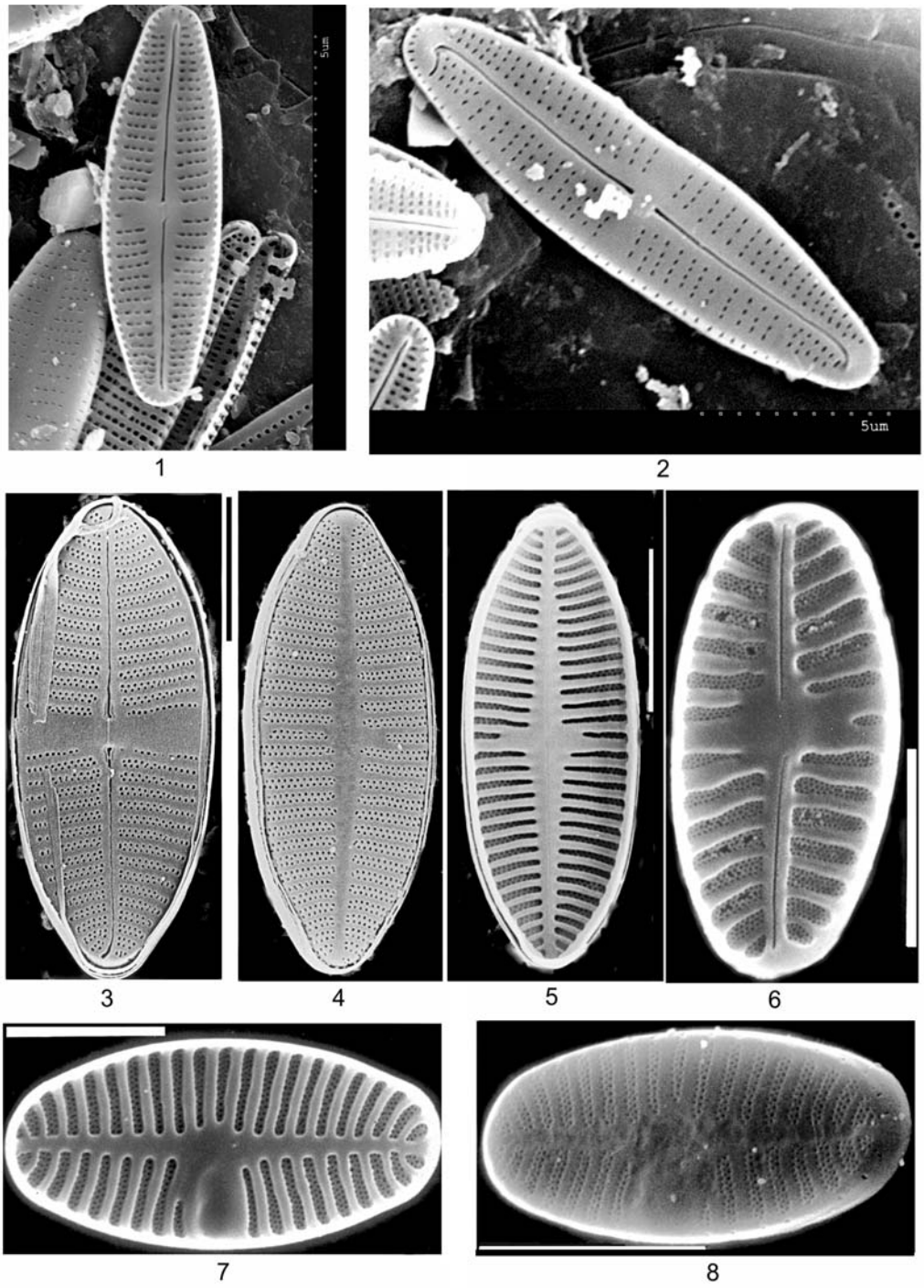


Plate 58. 1, 2 – *Achnanthidium pyrenaicum* Hustedt, internal (1) and external (2) view; 3–5 – *Lemnicola hungarica* (Grunow) Round & Basson, external (3, 4) and internal (5) view; 6–8 – *Planothidium lanceolatum* (Brébisson) Round & Bukhtiyarova, internal (6, 7) and external (8) view; all SEM. Scale bars = 5 μm.

in the central area. They also have a much lower striae count and a different striae pattern (Plate 13: 14).

5. ***Gomphonema minutum*** (Agardh) Agardh Plate 73: 6

Licomorpha minuta Agardh

Ref. Krammer & Lange-Bertalot 1986 (p. 370, Figs 159: 5–10; 167: 1).

DIMENSIONS. Valves 9.7–28.2 µm long and 4.1–7.0 µm wide, with 15.5–18.5 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse. Reported previously from the same material (Wojtal 2003a).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

6. ***Gomphonema olivaceum*** (Hornemann) Brébisson var. ***olivaceum*** Plate 14: 1–6

Ref. Krammer & Lange-Bertalot 1986 (p. 374, Fig. 165: 1–18); Krammer & Lange-Bertalot 1991b (Fig. 88: 10–13).

DIMENSIONS. Valves 10–42 µm long and 3.5–8.6 µm wide, with 10.5–14.0 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent in epilithon, epipelon, periphyton and metaphyton. Reported previously from the same material (Wojtal 2003a).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962; Kyselowa & Kysela 1966; Uherkovich 1970), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), sewage ponds in Pieskowa Skała (Pudo 1978a).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom, occurring in waters of a wide range of trophic states (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkalibiontic, β-mesosaprobous, eutraphentic and fresh brackish water species.

7. ***Gomphonema parallelistriatum*** Lange-Bertalot & Reichardt *in* Lange-Bertalot Plate 14: 7

Ref. Krammer & Lange-Bertalot 1991b (Fig. 80: 7–11); Lange-Bertalot 1993 (p. 68, Fig. 76: 11–16).

DIMENSIONS. Valves 22.0–26.5 µm long and 7.0–7.4 µm wide, with 11–12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Reported previously from the same locality (Wojtal 2003a; Wojtal & Sobczyk 2006) as a new species for the Polish flora. Sparse, in samples with filamentous algae from above Kobylany village.

DISTRIBUTION IN POLAND. Dam reservoir in Dobczyce (Wojtal *et al*. 2005).

GENERAL DISTRIBUTION AND ECOLOGY. Known from Germany, co-occurring with *Gomphonema micropus*, in oligosaprobic, mesotrophic to eutrophic waters (Lange-Bertalot 1993).

8. ***Gomphonema parvulum*** (Kützing) Rabenhorst var. ***parvulum*** Plate 14: 8–12

Ref. Krammer & Lange-Bertalot 1986 (p. 358, Fig. 154: 1–3); Krammer & Lange-Bertalot 1991b (Fig. 76: 1–7); Reichardt 1999 (Fig. 33: 22, 23, 30, 31).

DIMENSIONS. Valves 18.5–29.0 µm long and 4.0–6.5 µm wide, with 9–12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially common in samples from below Kobylany village. Reported previously from the same material (Wojtal 2003a).

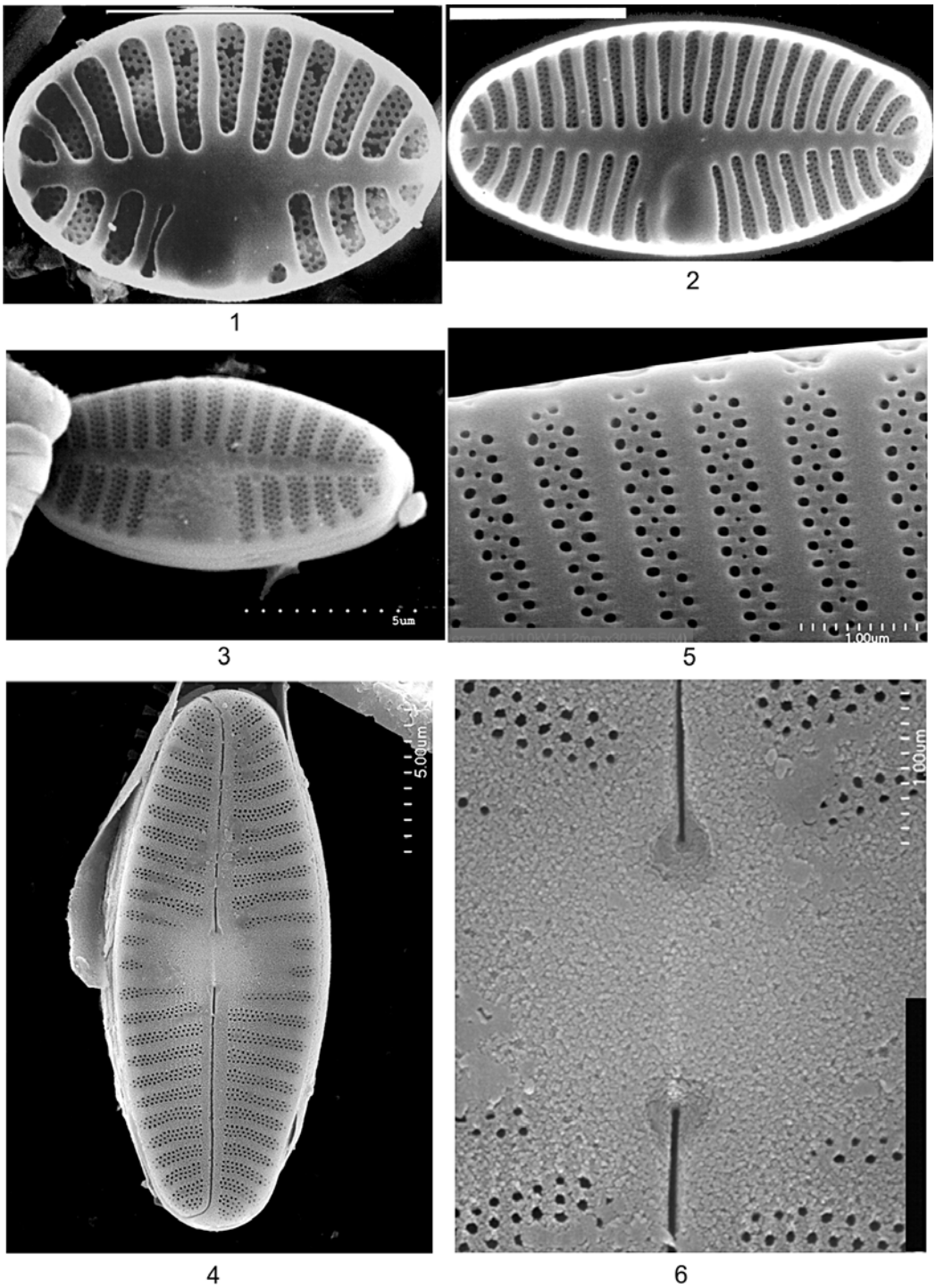


Plate 59. 1–6 – *Planothidium lanceolatum* (Brébisson) Round & Bukhtiyarova, internal (1, 2) and external (3–6) view; all SEM. Scale bars: 1–4 – 5 μm; 5, 6 – 1 μm.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962; Kyselowa & Kysela 1966), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Będkówka stream (Kubik 1970), Biała Przemsza River (Wasylik 1985), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), a neutrophilous, α-meso- polysaprobous, eutraphentic and fresh brackish water species.

9. *****Gomphonema parvulum*** var. ***parvulius*** Lange-Bertalot & Reichardt Plate 14: 13

Ref. Krammer & Lange-Bertalot 1991b (Fig. 76: 22–29); Lange-Bertalot 1993 (p. 70).

DIMENSIONS. Valves 18.5–23.0 μm long and 4–5 μm wide, with *ca* 12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples from above Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain.

10. *****Gomphonema parvulum*** var. ***parvulum*** f. ***saprophilum*** Lange-Bertalot & Reichardt Plate 14: 14

Ref. Krammer & Lange-Bertalot 1991b (Fig. 76: 8–13); Lange-Bertalot 1993 (p. 69).

DIMENSIONS. Valves 18.4–20.0 μm long and 6.0–7.5 μm wide, with 12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton and epipelon.

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain. Described from urban aquatic environment (Lange-Bertalot 1993). Neutrophilous, α-meso-polysaprobous, eutraphentic and fresh brackish water species (Van Dam *et al*. 1994).

11. ***Gomphonema*** cf. ***pseudoaugur*** Lange-Bertalot Plate 14: 15, 16

Ref. Krammer & Lange-Bertalot 1986 (p. 364, Fig. 159: 1–4).

DIMENSIONS. Valves 22.0–36.2 μm long and 7.5–9.2 μm wide, with 12–14 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Vaucheria* sp.

GENERAL DISTRIBUTION AND ECOLOGY. It occurs in mesotrophic to eutrophic, β -α-mesosaprobic waters (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), a neutrophilous, polysaprobous, hypereutraphentic and fresh brackish water species.

REMARKS. Some of the diatoms identified here as *Gomphonema* cf. *pseudoaugur* had valves smaller than as given by Krammer and Lange-Bertalot (1986). The specimens observed also resemble *G. lippertii* Reichardt, a species widespread in Europe in calcium-rich waters, especially in calcarious alpine lakes (Reichardt 1999: p. 21, Fig. 21: 1–15).

12. ***Gomphonema pumilum*** (Grunow) Reichardt & Lange-Bertalot Plates 14: 17–22; 74: 1–6

Gomphonema intricatum var. *pumila* Grunow

Ref. Krammer & Lange-Bertalot 1986 (Fig. 164: 7); Krammer & Lange-Bertalot 1991b (Fig. 85: 13–16); Reichardt 1991 (p. 528, Fig. 6).

DIMENSIONS. Valves 13.0–19.8 μm long and 4.5–6.0 μm wide, with 11.0–12.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with submerged mosses and epipelon, mostly from springs and the stream above Kobylany village. Reported previously from the same material (Wojtal 2003a).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Springs of Kobylanka stream (Skalna 1969) and springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

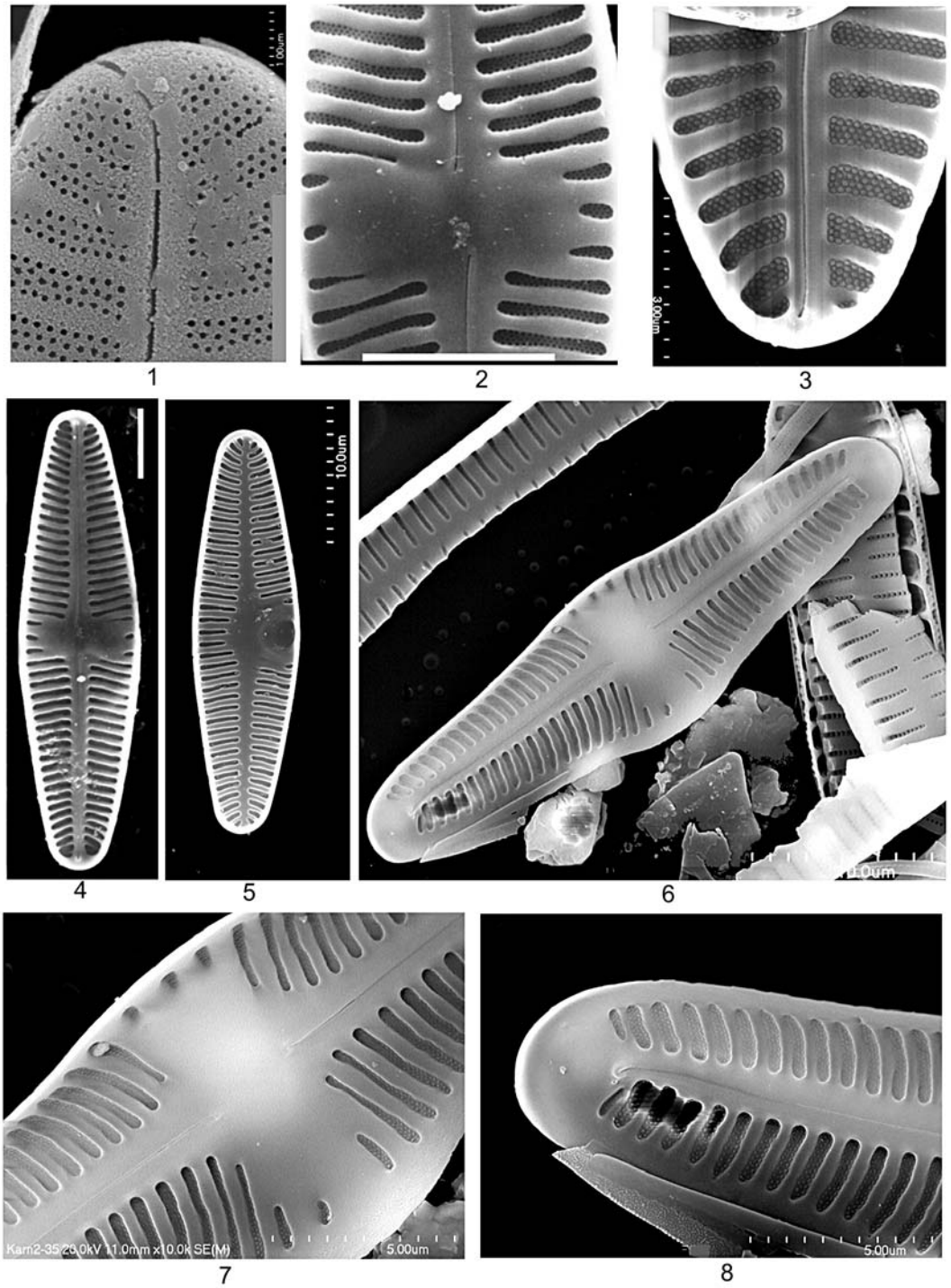


Plate 60. 1–8 – *Planothidium lanceolatum* (Brébisson) Round & Bukhtiyarova, external (1) and internal (2–8) view; all SEM. Scale bars: 1 – 1 μm; 2, 4, 7, 8 – 5 μm; 3 – 3 μm; 5, 6 – 10 μm.

GENERAL DISTRIBUTION AND ECOLOGY. According to Van Dam *et al.* (1994), a fresh brackish water species indifferent to trophic state.

13. **Gomphonema sarcophagus* Gregory Plate 13: 15, 16

Gomphonema angustatum var. *sarcophagus* (Gregory) Grunow

Ref. Krammer & Lange-Bertalot 1991b (Fig. 75: 1–12); Reichardt 1999 (p. 30, Figs 30: 1–30; 31: 1–6).

DIMENSIONS. Valves 16–200 μm long and 7.0–7.8 μm wide, with 10–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Vaucheria* sp. and epipelon from above Kobylany village. Reported earlier from the same material (Wojtal 2003a) as a new species for the upland.

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, mesotraphentic and fresh brackish water species.

14. *Gomphonema tergestinum* (Grunow) Fricke Plate 12: 30–33

Ref. Krammer & Lange-Bertalot 1986 (p. 373, Fig. 162: 6, 7); Reichardt 1991 (Fig. 10: 14–17).

DIMENSIONS. Valves 11.0–19.5 μm long and 4.5–5.5 μm wide, with 11–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. *Gomphonema tergestinum* was reported only from Vistula River (Turoboyski 1962), so far.

DISTRIBUTION IN POLAND. *G. tergestinum* is in light of reports, rare (Siemińska & Wołowski 2003) according to the classification used; outside of the upland, reported from the Vistula River (Starmach 1938), Mszanka stream (Starmach 1966a), Skawa River (Chudyba 1968), Czarny Dunajec River tributary (Wasylik 1971) and Mazurian lakes (Chudyba 1975, 1979). Regarded as endangered in Poland (Siemińska *et al.* 2006).

GENERAL DISTRIBUTION AND ECOLOGY. According to Van Dam *et al.* (1994), an alkaliphilous, oligosaprobous, oligo-mesotraphentic and fresh brackish water species.

15. *Gomphonema truncatum* Ehrenberg *sensu lato* Plates 14: 23–25; 73: 7, 8

Gomphonema constrictum Ehrenberg

Ref. Krammer & Lange-Bertalot 1986 (p. 369, Fig. 159: 11–18).

DIMENSIONS. Valves 26.0–38.6 μm long and 8.6–10.2 μm wide, with 12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Vaucheria* sp. and epipelon, especially above Kobylany village. Reported previously from the same material (Wojtal 2003a).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sites with unspecified location (Gutwiński 1895), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1956; Kyselowa & Kysela 1966), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), springs of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, often recorded in streams with water of high conductivity, up to β-mesosaprobic (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, meso- to eutraphentic and fresh brackish water species.

16. *Gomphonema* sp. Plate 13: 8, 9

DIMENSIONS. Valves 18.0–22.2 μm long and 5.5–6.2 μm wide, with 10–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

REMARKS. It resembles *Gomphonema utae*

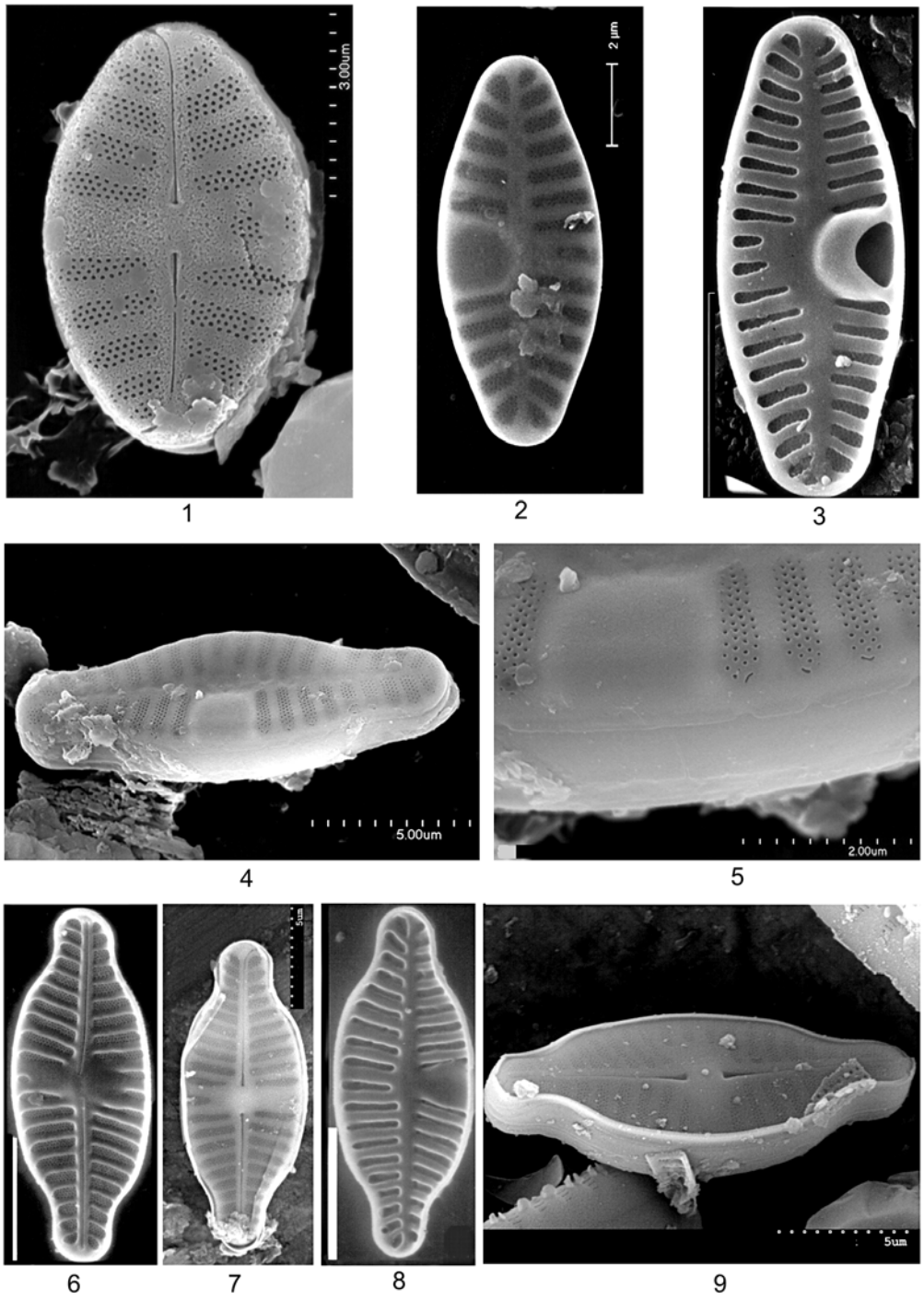


Plate 61. 1–5 – *Planothidium frequentissimum* (Lange-Bertalot) Round & Bukhtiyarova, external (1, 2, 4, 5) and internal (3) view; 6–9 – *P. reichardtii* Lange-Bertalot & Werum, internal (6, 8) and external (7, 9) view; all SEM. Scale bars: 1 – 3 µm; 2, 5 – 2 µm; 3, 4, 6–9 – 5 µm.

Lange-Bertalot & Reichardt, but for unambiguous identification further studies are needed.

34. ***Grunowia*** Rabenhorst

1. **Grunowia sinuata* Thwaites Plate 42: 14, 15

Nitzschia sinuata (Thwaites) Grunow

Ref. Krammer & Lange-Bertalot 1988 (p. 52, Fig. 40: 1–3).

DIMENSIONS. Valva 32 µm long and 4.5 µm wide, with 5 fibulae and *ca* 18 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in epipelon below Kobylany village.

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, mesotraphentic and fresh brackish water species.

2. ***Grunowia solgensis*** (Cleve-Euler) Aboal Plate 42: 11–13

Nitzschia solgensis Cleve-Euler; *N. denticula* var. *delognei* Grunow *in* Van Heurck; *N. sinuata* var. *delognei* (Grunow) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1988 (p. 53, Fig. 40: 7, 8).

DIMENSIONS. Valves 14.0–28.2 µm long and 4.0–4.6 µm wide, with 6–8 fibulae and *ca* 20 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA. Sparse, mainly in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Springs of Kobylanka stream (Skalna 1969).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, especially common in waters of moderate to very high conductivity, β- α-mesosaprobic (Krammer & Lange-Bertalot 1988). In Germany, classified as in regression (Lange-Bertalot 1996). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, aerophilous, meso- to eutraphentic and fresh brackish water species.

3. ***Grunowia tabellaria*** (Grunow) Rabenhorst Plates 42: 7; 97: 7, 8; 98: 1, 2

Nitzschia sinuata var. *tabellaria* (Grunow) Grunow

Ref. Krammer & Lange-Bertalot 1988 (p. 53, Fig. 39: 10–13).

DIMENSIONS. Valve 14.2–28.0 µm long and 5.5–8.8 µm wide, with 6–8 fibulae and 22–25 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found numerous only once in epipelon of a spring.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, mesotraphentic and fresh water species.

35. ***Gyrosigma*** Hassal

1. ***Gyrosigma acuminatum*** (Kützing) Rabenhorst Plates 23: 1–5; 87: 1–8; 88: 1, 3

Ref. Krammer & Lange-Bertalot 1986 (p. 296, Fig. 114: 4, 8).

DIMENSIONS. Valves 63–130 µm long and 11–18 µm wide, with 19–22 apical striae and 19–23 transapical striae per 10 µm.

DISTRIBUTION IN KOBYLANKA. Sparse, in epipelic and metaphytic samples, clearly more common below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Pudo 1977), Sanka

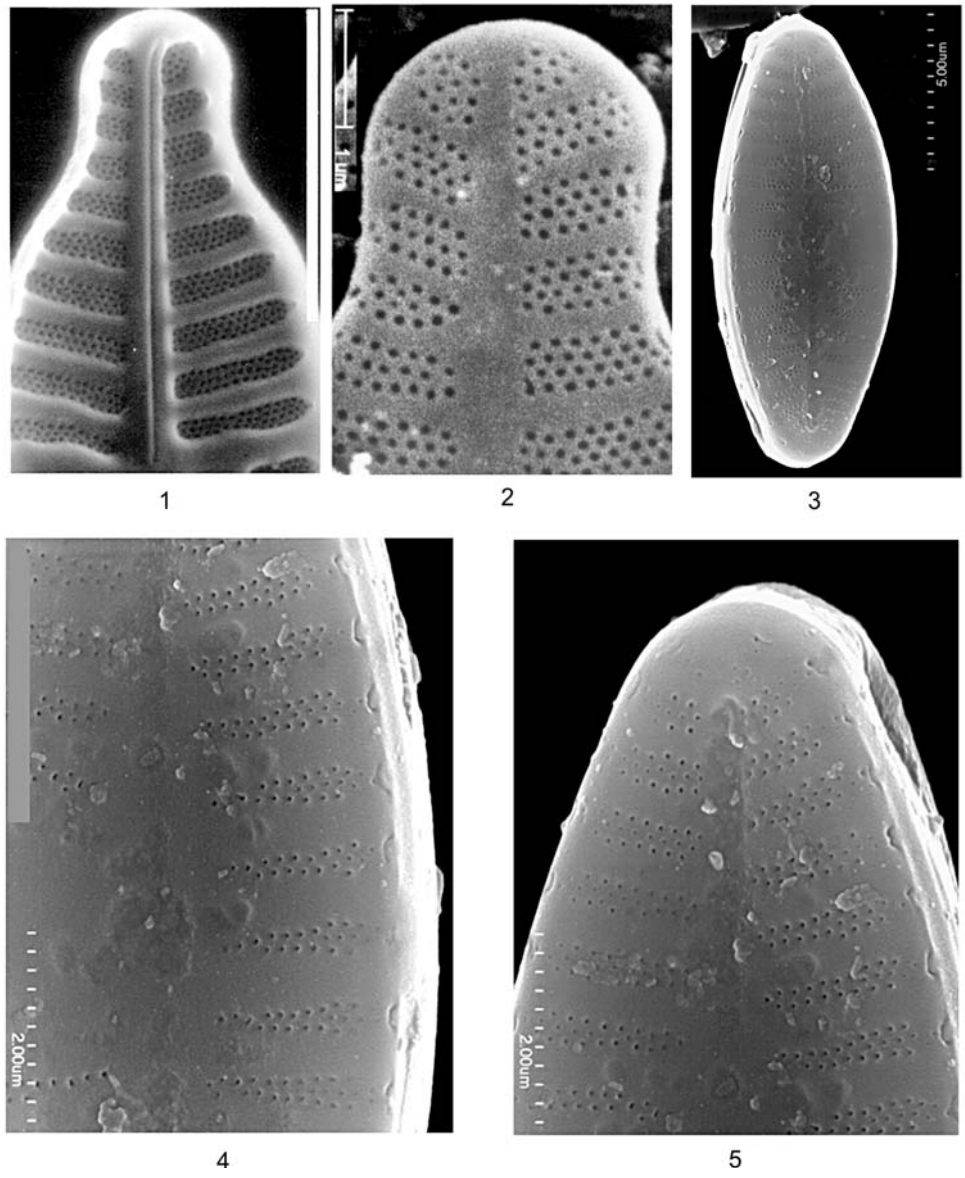


Plate 62. 1, 2 – *Planothidium reichardtii* Lange-Bertalot & Werum, internal (1) and external (2) view; 3–5 – *P. minutissimum* (Krasske) Morales, external view; all SEM. Scale bars: 1, 3 – 5 μm; 2 – 1 μm; 4, 5 – 2 μm.

stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964a, b), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common mesosaprobous diatom (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkalibiontic, β-mesosaprobous, eutraphentic and fresh brackish water species.

2. ***Gyrosigma attenuatum*** (Kützing) Rabenhorst
Plates 24: 1–4; 88: 2, 4, 5

Ref. Krammer & Lange-Bertalot 1986 (p. 297, Fig. 114: 5, 7, 9).

DIMENSIONS. Valves 151.6–310.0 μm long and 22.2–26.0 μm wide, with 11.0–12.5 apical striae and 14–16 transapical striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in larger numbers in epipelic samples from above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pilica River (Kadłubowska 1964a, b), springs of Kobylanka stream (Skalna 1969).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, especially in waters with moderate conductivity (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkalibiontic, β-mesosaprobous, eutraphentic, strictly aquatic and fresh brackish water species.

3. ***Gyrosigma scalproides*** (Rabenhorst) Cleve
Plate 24: 5

Ref. Krammer & Lange-Bertalot 1986 (p. 299, Fig. 116: 3).

DIMENSIONS. Valves 47–58 μm long and 12 μm wide, with 28 apical striae and 22 transapical striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1956; Pudo 1977), Sanka stream (Kądziołka 1963).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain. A cosmopolitan diatom in waters with moderate to elevated conductivity (Krammer & Lange-Bertalot 1986).

36. ***Hantzschia*** Grunow

1. ***Hantzschia abundans*** Lange-Bertalot
Plate 35: 1–3, 7–12

Ref. Lange-Bertalot 1993 (p. 75, Fig. 85: 12–18).

DIMENSIONS. Valves 38.0–48.6 μm long and 7.0–8.2 μm wide, with *ca* 8 fibulae and 19–20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse. Reported previously from the same material (Wojtal & Sobczyk 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Lange-Bertalot 1993) and not rare. According to Van Dam *et al.* (1994), a neutrophilous, α-mesosaprobous, eurytraphentic and fresh brackish water species.

2. ***Hantzschia amphioxys*** (Ehrenberg) Grunow
Plate 35: 4–6

Ref. Krammer & Lange-Bertalot 1988 (p. 128, Fig. 88: 1–7); Lange-Bertalot 1993 (p. 77, Figs 85: 1–11; 86: 1–8; 87: 1–6; 88: 1–10).

DIMENSIONS. Valves 16.2–40.0 μm long and 4.8–7.5 μm wide, with *ca* 10 fibulae and 24–26 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962; Kyselowa & Kysela 1966), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971), sewage ponds in Pieskowa Skała (Pudo 1978b), soil samples (Skalna 1979), Kluczwoda stream (Nawrat 1993), caves (Mrozińska-Broda & Czerwik-Marcinkowska 2004).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, one of the most frequently reported

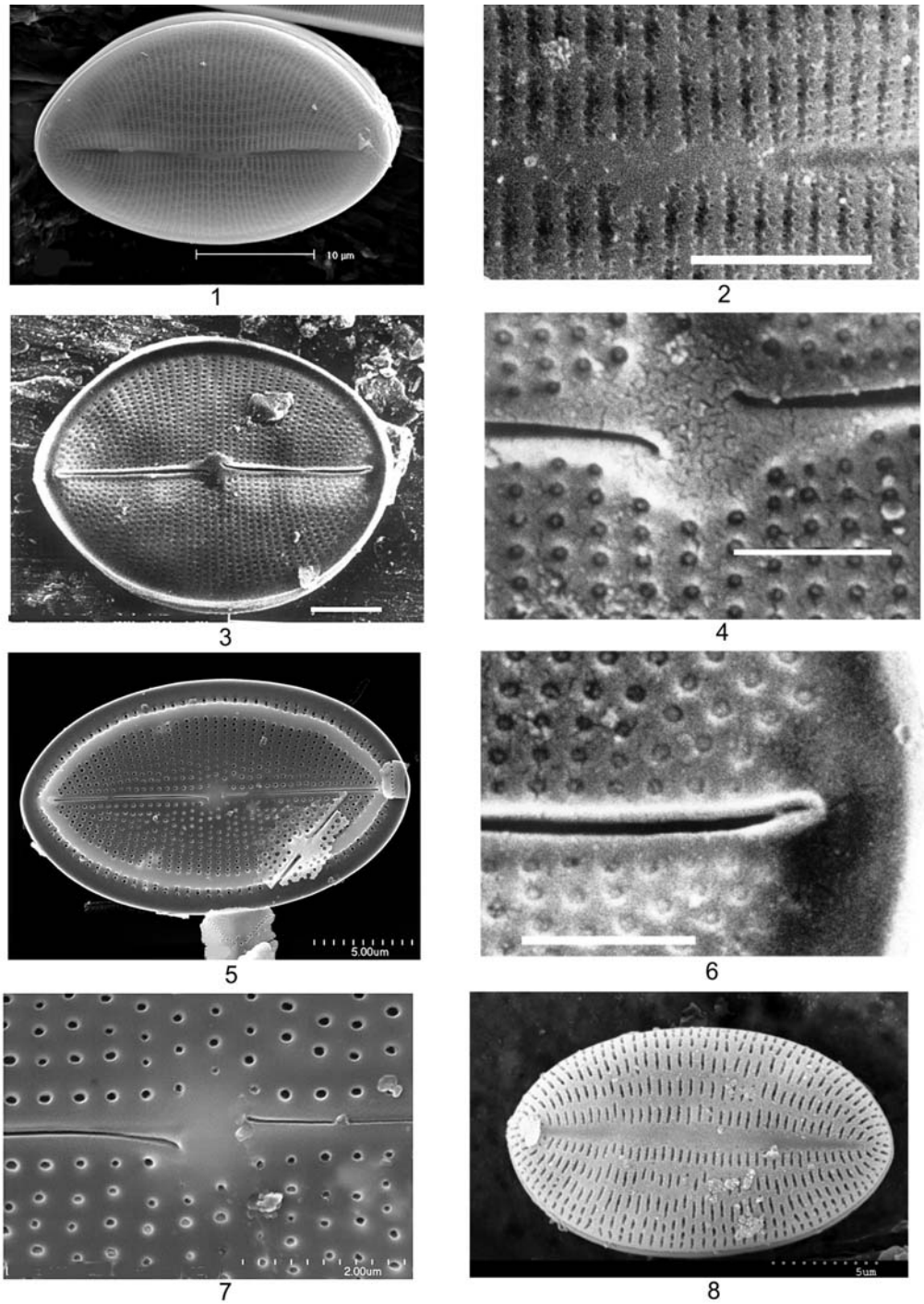


Plate 63. 1–4, 6 – *Cocconeis pediculus* Ehrenberg, external (1, 2; sternum valve) and internal (3, 4, 6; raphe valve) view; 5, 7, 8 – *Cocconeis placentula* Ehrenberg, internal (5, 7; raphe valve) and external (8; sternum valve) view; all SEM. Scale bars 1 – 10 µm; 2–6, 8 – 5 µm; 7 – 2 µm.

diatom from aerophytic habitats (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), a neutrophilous, α-mesosaprobous, eurytraphentic and fresh brackish water species.

3. ***Hantzschia*** cf. ***subrupestris*** Lange-Bertalot Plate 35: 13, 14

Ref. Lange-Bertalot 1993 (p. 85, Figs 91: 1–6; 92: 2–7; 93: 1–6).

DIMENSIONS. Valves 89.2–95.0 μm long and 7.6–10.0 μm wide, with *ca* 8 fibulae and 17.5–19.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom.

REMARKS. SEM studies are needed for unambiguous identification.

37. ***Hippodonta*** Lange-Bertalot, Metzeltin & Witkowski

1. ***Hippodonta capitata*** (Ehrenberg) Lange-Bertalot, Metzeltin & Witkowski Plates 17: 13–16; 78: 5–7

Navicula capitata Ehrenberg

Ref. Krammer & Lange-Bertalot 1986 (p. 123, Fig. 42: 1–4); Lange-Bertalot 2001 (p. 98, Figs 75: 1–6; 77: 17).

DIMENSIONS. Valves 22.0–27.4 μm long and 6.8–8.4 μm wide, with 8–10 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962; Pudo 1977; Uherkovich 1970), Prądnik River (Stępień 1963), Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964a, b), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1986; Lange-Bertalot 2001), occurring in electrolyte-rich waters. According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, meso-eutraphentic and fresh brackish water species.

2. ***Hippodonta costulata*** (Grunow) Lange-Bertalot, Metzeltin & Witkowski Plates 17: 22–24; 78: 8

Navicula costulata Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 124, Fig. 42: 13–15); Lange-Bertalot 2001 (p. 98, Figs 75: 18–26; 79: 9).

DIMENSIONS. Valves 12.8–17.8 μm long and 3.8–4.8 μm wide, with 8–10 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in epipelon and samples with filamentous algae.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom occurring in electrolyte-rich and slightly brackish waters (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous and fresh brackish water species.

3. ***Hippodonta hungarica*** (Grunow) Lange-Bertalot, Metzeltin & Witkowski Plate 17: 17–21

Navicula hungarica Grunow; *N. hungarica* var. *capitata* (Ehrenberg) Cleve

Ref. Krammer & Lange-Bertalot 1986 (p. 123, Fig. 42: 5–9); Lange-Bertalot 2001 (p. 100, Fig. 75: 7–12).

DIMENSIONS. Valves 18.4–22.0 μm long and 6.9–7.8 μm wide, with 10.0–10.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach

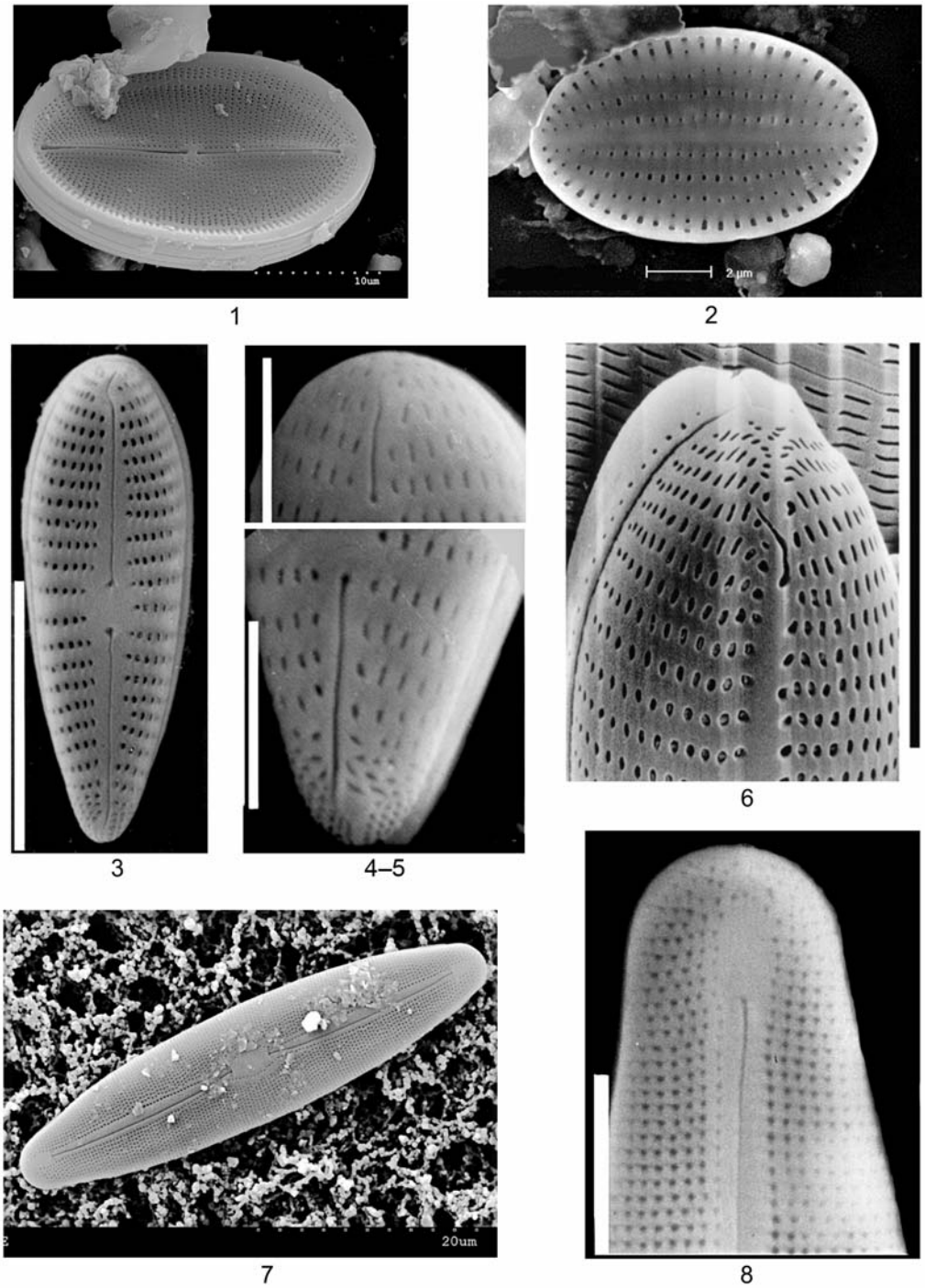


Plate 64. 1, 2 – *Cocconeis placentula* Ehrenberg (1 – raphe valve), internal view (2 – sternum valve); 3–6 – *Rhoicosphaenia abbreviata* (Agardh) Lange-Bertalot, external view; 7, 8 – *Frustulia vulgaris* (Thwaites) De Toni, external view; all SEM. Scale bars: 1 – 10 µm; 2, 4, 5 – 2 µm; 3, 6, 8 – 5 µm; 7 – 20 µm.

1938; Kyselowa & Kysela 1966), Młynówka stream (Gumiński 1947), Pilica River (Kadłubowska 1964b), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Probably eutraphentic diatom occurring in waters rich in electrolytes (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, meso-eutraphentic and fresh brackish water species.

38. ***Lemnicola*** Round & Basson

1. ***Lemnicola hungarica*** (Grunow) Round & Basson
Plates 6: 19–23; 58: 3–5

Achnanthes hungarica (Grunow) Grunow

Ref. Krammer & Lange-Bertalot 1991b (p. 33, Fig. 19: 1–15).

DIMENSIONS. Valves 22.0–29.2 μm long and 5.5–8.0 μm wide, both valves with 18–21 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, but large populations were observed in materials with *Lemna* sp.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sanka stream (Hojda 1971), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, in waters with moderate or elevated conductivity (Krammer & Lange-Bertalot 1991b). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, hypereutraphentic and fresh brackish water species.

39. ***Luticola*** D.G. Mann

1. **Luticola acidoclinata*** Lange-Bertalot
Plate 15: 1

Ref. Lange-Bertalot & Metzeltin 1996 (p. 76, Figs 24: 24–26; 104: 10–16); Werum & Lange-Bertalot 2004 (Fig. 31: 2–6).

DIMENSIONS. Valves 19.0–22.2 μm long and 5.5–7.5 μm wide, with *ca* 20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, only in moss samples from above Kobylany village.

DISTRIBUTION IN POLAND. Raised peat bog near Nowy Targ (Wojtal *et al.* 1999), peat bog in Świętokrzyskie Mts (Czerwik-Marcinkowska & Mrozińska-Broda 2001). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Reported from oligotrophic to dystrophic, neutral to slightly acidic waters (Lange-Bertalot & Metzeltin 1996) and subaeric biotopes (Werum & Lange-Bertalot 2004).

2. **Luticola goeppertiana*** (Bleisch) D.G. Mann
Plate 15: 2, 3

Navicula goeppertiana (Bleisch) H.L. Smith

Ref. Krammer & Lange-Bertalot 1986 (p. 150, Fig. 62: 1–7).

DIMENSIONS. Valves 10.2–65.4 μm long and 6.0–15.2 μm wide, with 18–24 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN POLAND. Central Poland (Rakowska 2001), Tatra Mts lakes (Kawecka & Galas 2003), Zalew Szczeciński (Bąk *et al*. 2006).

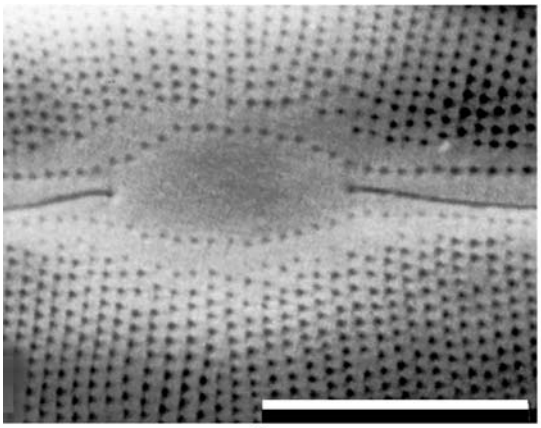
GENERAL DISTRIBUTION AND ECOLOGY. Uncertain, probably a cosmopolitan diatom. According to Van Dam *et al*. (1994), an alkaliphilous, α-meso polysaprobous, eutraphentic and fresh brackish water species.

REMARKS. Identification of the specimens found followed broad species concept.

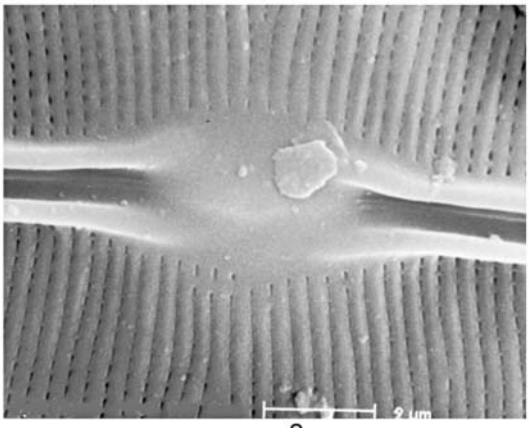
3. ***Luticola mutica*** (Kützing) D.G. Mann
Plate 15: 4–7

Navicula mutica Kützing

Ref. Krammer & Lange-Bertalot 1986 (p. 149, Fig. 61: 1–8).



1



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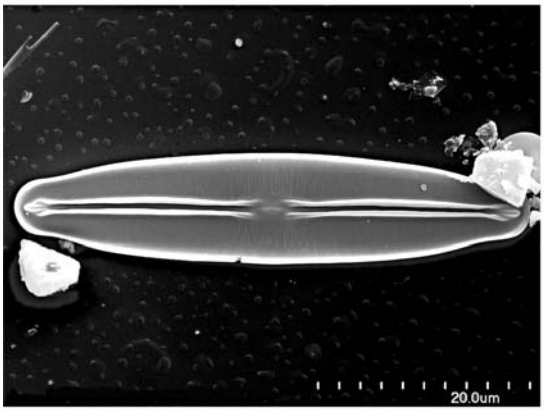
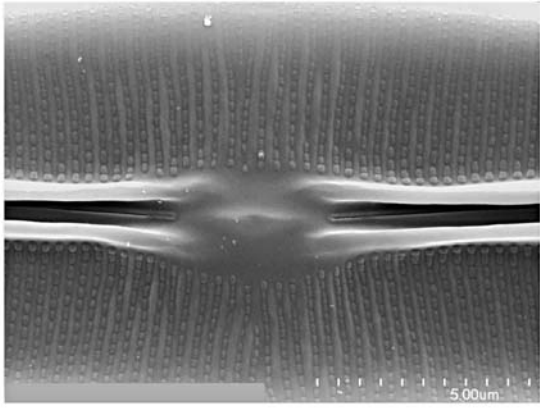
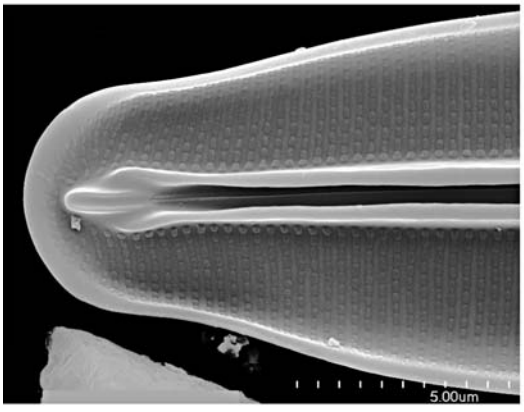


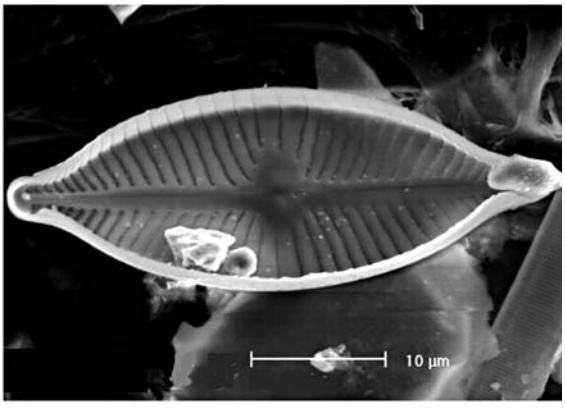
3



4



5



6

Plate 65. 1–5 – *Frustulia vulgaris* (Thwaites) De Toni, external view (1) and internal (2–5); 6 – *Placoneis porifera* (Hustedt) Cox, internal view; all SEM. Scale bars: 1, 4, 5 – 5 µm; 2 – 2 µm; 3 – 20 µm; 6 – 10 µm.

DIMENSIONS. Valves 10.5–15.0 μm long and 5.6–6.2 μm wide, with *ca* 14–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, never numerous.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962; Pudo 1970a, b), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), spring of Szklarka stream (Skalska 1966a), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), caves (Mrozińska-Broda & Czerwik-Marcinkowska 2004).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, aerophilic diatom (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), a neutrophilous, α-mesosaprobous, eutraphentic and brackish fresh water species.

4. ***Luticola nivalis*** (Ehrenberg) D.G. Mann Plate 15: 9

Navicula nivalis Ehrenberg

Ref. Krammer & Lange-Bertalot 1986 (p. 153, Fig. 61: 17–20).

DIMENSIONS. Valves 12.2–36.0 μm long and 5.5–13.0 μm wide, with 17–20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Caves (Mrozińska-Broda & Czerwik-Marcinkowska 2004).

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), reported from northern Poland (Schmidt 1925) and fossil materials in Imbramowice (Kaczmarska 1976). More recently reported from spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, aerophilic (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), a neutrophilous, β-mesosaprobous, eutraphentic and brackish fresh water species.

5. *****Luticola paramutica*** (Bock) D.G. Mann var. ***binodis*** (Bock) Van de Vijver Plate 15: 10

Navicula paramutica Bock var. *binodis*

Ref. Krammer & Lange-Bertalot 1986 (p. 155, Fig. 61: 30, 31); Hustedt 1966 (p. 594, Fig. 1599: f, g); Van de Vijver *et al.* 2002 (p. 58, Fig. 56: 17, 18).

DIMENSIONS. Valves 10.4–15.0 μm long and 4.2–6.0 μm wide, with 17–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton.

GENERAL DISTRIBUTION AND ECOLOGY. Widespread (Van de Vijver *et al.* 2002).

6. *****Luticola ventriconfusa*** Lange-Bertalot Plate 15: 11

Navicula neoventricosa Hustedt (*excl. basionym*); *N. mutica* var. *ventricosa* (Kützing) Grunow *sensu* Krammer & Lange-Bertalot 1986

Ref. Lange-Bertalot *et al.* 2003 (p. 72, Fig. 73: 12–20).

DIMENSIONS. Valves 14.4–17.8 μm long and 6.5–8.0 μm wide, with *ca* 20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton.

GENERAL DISTRIBUTION AND ECOLOGY. Widespread but infrequent, autecology uncertain (Lange-Bertalot *et al*. 2003).

7. ***Luticola ventricosa*** (Kützing) D.G. Mann Plates 15: 8, 12; 72: 3

Navicula mutica var. *ventricosa* (Kützing) Cleve & Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 150, Fig. 61: 9–11).

DIMENSIONS. Valves 12.0–16.7 μm long and 4.1–5.6 μm wide, with *ca* 18–20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mostly in samples with *Vaucheria* sp. and mosses from above Kobylany village.

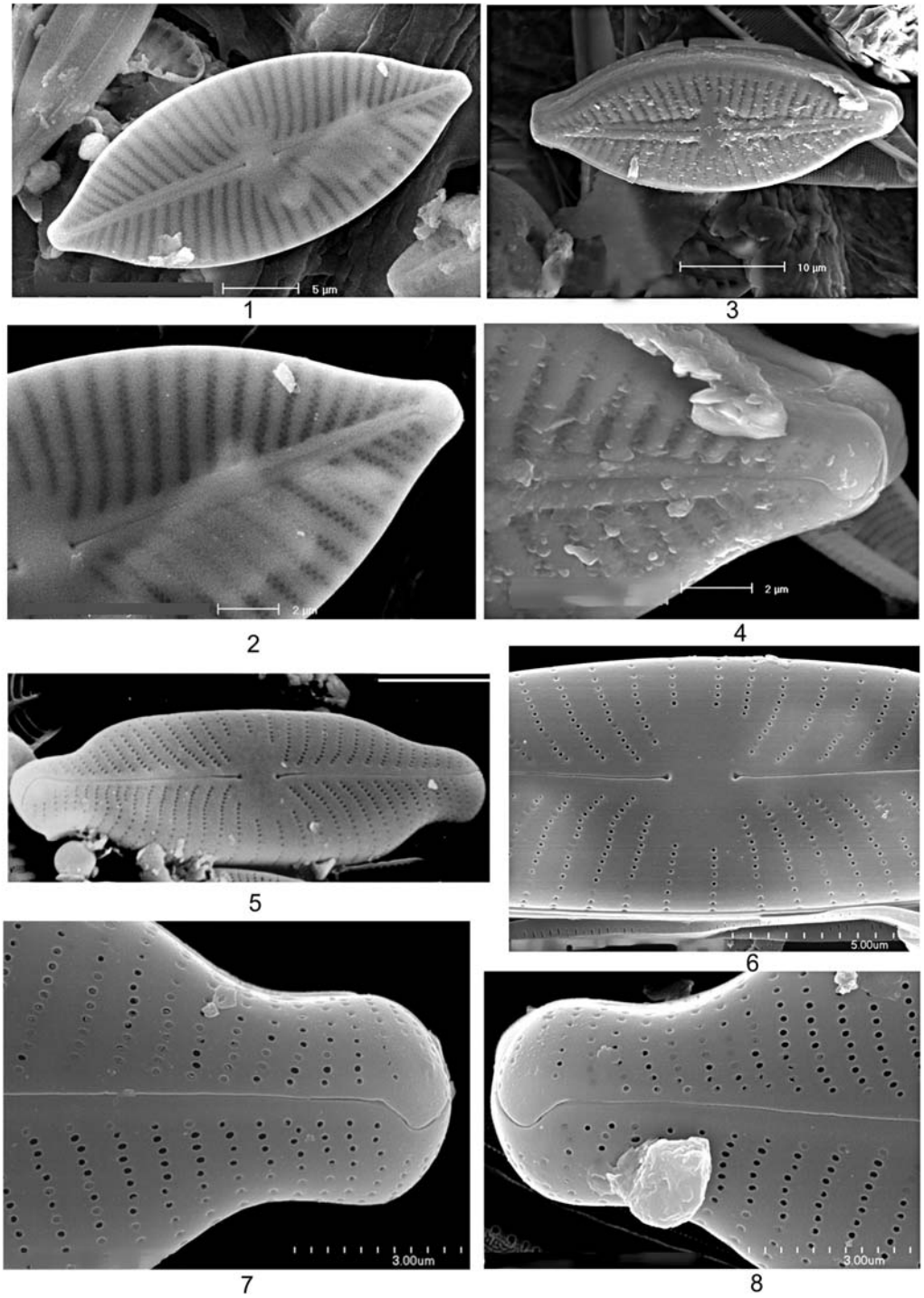


Plate 66. 1, 2 – *Placoneis porifera* (Hustedt) Cox, external view; 3, 4 – *P.* cf. *porifera*, external view; 5–8 – *P. paraelginensis* Lange-Bertalot, external view; all SEM. Scale bars: 1, 5, 6 – 5 µm; 2, 4 – 2 µm; 3 – 10 µm; 7, 8 – 3 µm.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Rare (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, aerophilous, very common in brackish waters (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), a neutrophilous, β-mesosaprobous, eutraphentic and brackish fresh water species.

40. ***Mayamaea*** Lange-Bertalot

1. ***Mayamaea atomus*** (Kützing) Lange-Bertalot *sensu lato* Plates 17: 4–8; 94: 7

Navicula atomus var. *atomus* (Kützing) Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 216, Fig. 74: 10, 18–26); Lange-Bertalot 2001 (p. 136, Figs 103: 2, 3; 104: 1–6).

DIMENSIONS. Valves 8.2–9.4 µm long and 3.8–5.5 µm wide, with 20–22 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA. Common, especially in material including mud or filamentous algae.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, especially common in highly eutrophic, electrolyte-rich waters (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous to polysaprobous, hypereutraphentic and fresh brackish water species.

2. **Mayamaea atomus* var. ***permitis*** (Hustedt) Lange-Bertalot Plate 17: 1–3, 9, 10

Navicula permitis Hustedt; *N. atomus* var. *permitis* (Hustedt) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1986 (p. 216, Fig. 74: 14–17); Lange-Bertalot 2001 (p. 136, Fig. 104: 7–13).

DIMENSIONS. Valves 6.2–8.6 µm long and 2.9–3.6 µm wide, with *ca* 24 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent.

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan and very abundant in polluted, polysaprobic European waters (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, α-meso-polysaprobous, eutraphentic and fresh brackish water species.

3. ***Mayamaea fossalis*** (Krasske) Lange-Bertalot var. ***fossalis*** Plate 17: 52

Navicula fossalis Krasske

Ref. Krammer & Lange-Bertalot 1986 (p. 217, Fig. 74: 29–33); Lange-Bertalot *et al.* 1996b (p. 109, Fig. 19: 14, 15); Lange-Bertalot 2001 (p. 138, Fig. 104: 25–30).

DIMENSIONS. Valves 9.6–11.2 µm long and 3.4–4.4 µm wide, with *ca* 20 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Vaucheria* sp. from above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), reported only from Słonka stream near Rabka (Tarnowska 1970), Kamionka stream in the Pieniny Mts (Tarnowska 1971). After 1990, known from Bór na Czerwonem Peat Bog Reserve (Wojtal *et al*. 1999) and spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Probably cosmopolitan or at least dispersed in aerophytic biotopes of Northern Hemisphere (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, aerophilous and fresh brackish water species.

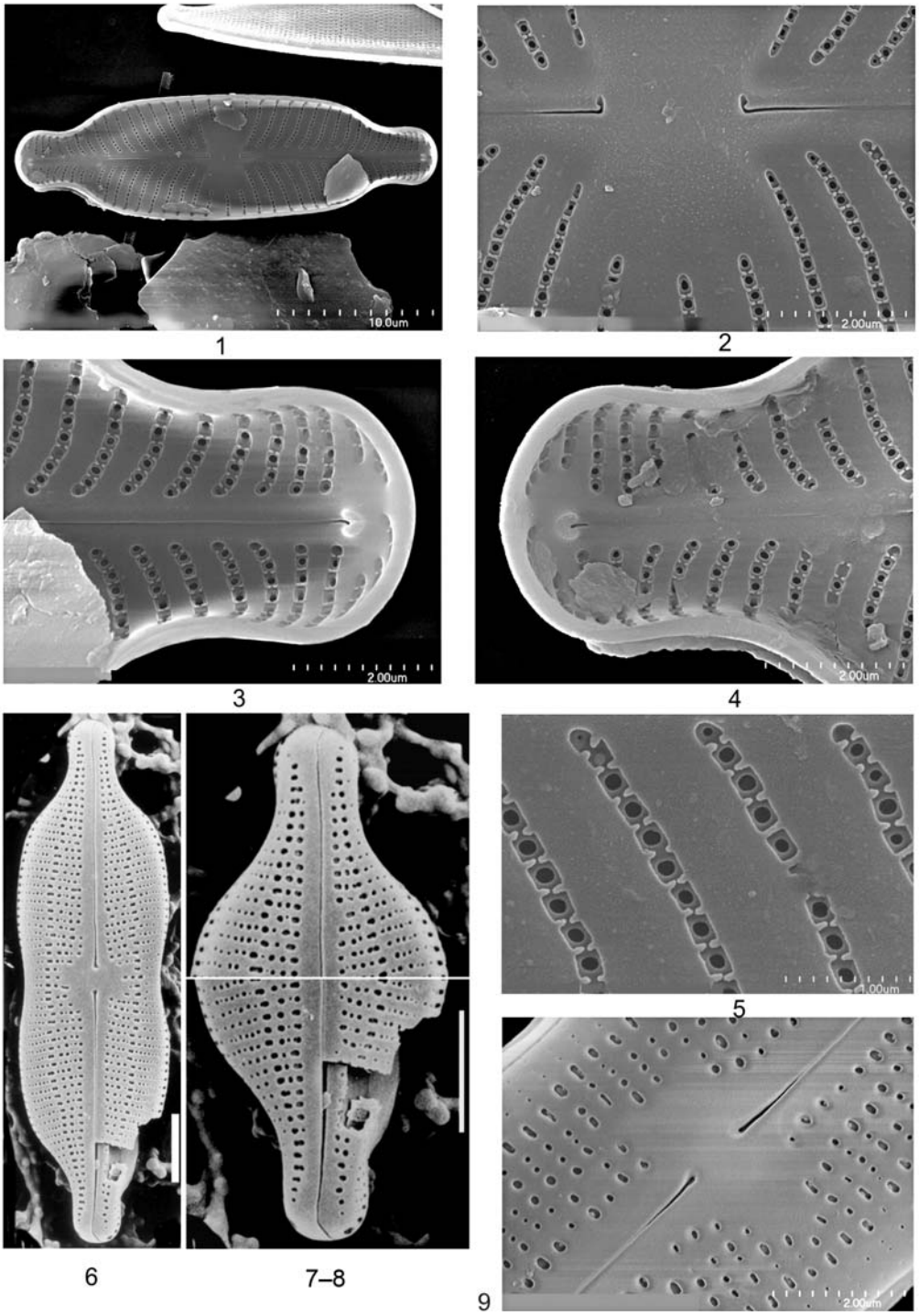


Plate 67. 1–5 – *Placoneis paraelginensis* Lange-Bertalot, internal view; 6–9 – *Neidium binodis* (Ehrenberg) Hustedt *sensu lato*, external view; all SEM. Scale bars: 1 – 10 μm; 2–4, 9 – 2 μm; 5 – 1 μm; 6–8 – 5 μm.

4. ***Mayamaea*** sp. Plate 17: 11, 12

DIMENSIONS. Valves 5.5–9.8 μm long and 4.2–4.8 μm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

REMARKS. Of uncertain generic affinity. It has not been observed in large numbers from any collection. For more precise identification further studies are needed.

41. ***Melosira*** Agardh

1. ***Melosira varians*** Agardh
Plates 1: 1–4; 48: 1–6; 49: 1, 2

Ref. Krammer & Lange-Bertalot 1991a (p. 7, Fig. 4: 1–8).

DIMENSIONS. Valves 9–29 μm in diameter, cell height 5.0–12.4 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent. Macroscopic colonies were observed in places protected from the current. Auxospores were observed during mass occurrence (summer/autumn) (Plate 48: 6).

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Without exact localities (Gutwiński 1884, 1895), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Przemsza River (Cabejszek 1951), Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Uherkovich 1970), Prądnik River (Stępień 1963), Sanka stream (Kądziołka 1963; Hojda 1971), Pilica River (Kadłubowska 1964a, b), spring of Szklarka stream (Skalska 1966a, b), spring in Jerzmanowice (Skalna 1973), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, benthic and planktic, in waters of a broad spectrum of trophic states and conductivity (Krammer & Lange-Bertalot 1991a). Alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species (Van Dam *et al*. 1994).

42. ***Meridion*** Agardh

1. ***Meridion circulare*** Agardh var. ***circulare***
Plates 4: 1–7; 53: 1–7

Ref. Krammer & Lange-Bertalot 1991a (p. 101, Figs 100: 1–3; 101: 1–5).

DIMENSIONS. Valves 7.8–49.5 μm long and 4.0–6.8 μm wide, with 14.5–17.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Abundant, especially in periphyton, where brown, macroscopically visible colonies (up to 7 cm long) were observed in May 1993 amongst submerged grass stems above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Without exact localities (Raciborski 1888), Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Uherkovich 1970), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Cabejszek 1951; Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), Sanka stream (Kądziołka 1963; Hojda 1971; Dumnicka *et al.* 1990), Prądnik River (Stępień 1963), springs of Kobylanka stream (Skalna 1969), Biała Przemsza River (Wasylik 1985), Kluczwoda stream (Nawrat 1993), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common in calcium-rich spring waters (Krammer & Lange-Bertalot 1991a); alkaliphilous, β-mesosaprobous and oligo- to eutraphentic fresh brackish water species (Van Dam *et al*. 1994).

43. ***Microcostatus*** Johansen & Sray

1. ***Microcostatus kuelbsii*** (Lange-Bertalot) Lange-Bertalot Plate 16: 20, 21

Navicula kuelbsii Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1985 (p. 77, Fig. 25: 4–7); Krammer & Lange-Bertalot 1986 (p. 213, Figs 78: 29; 80: 32–34).

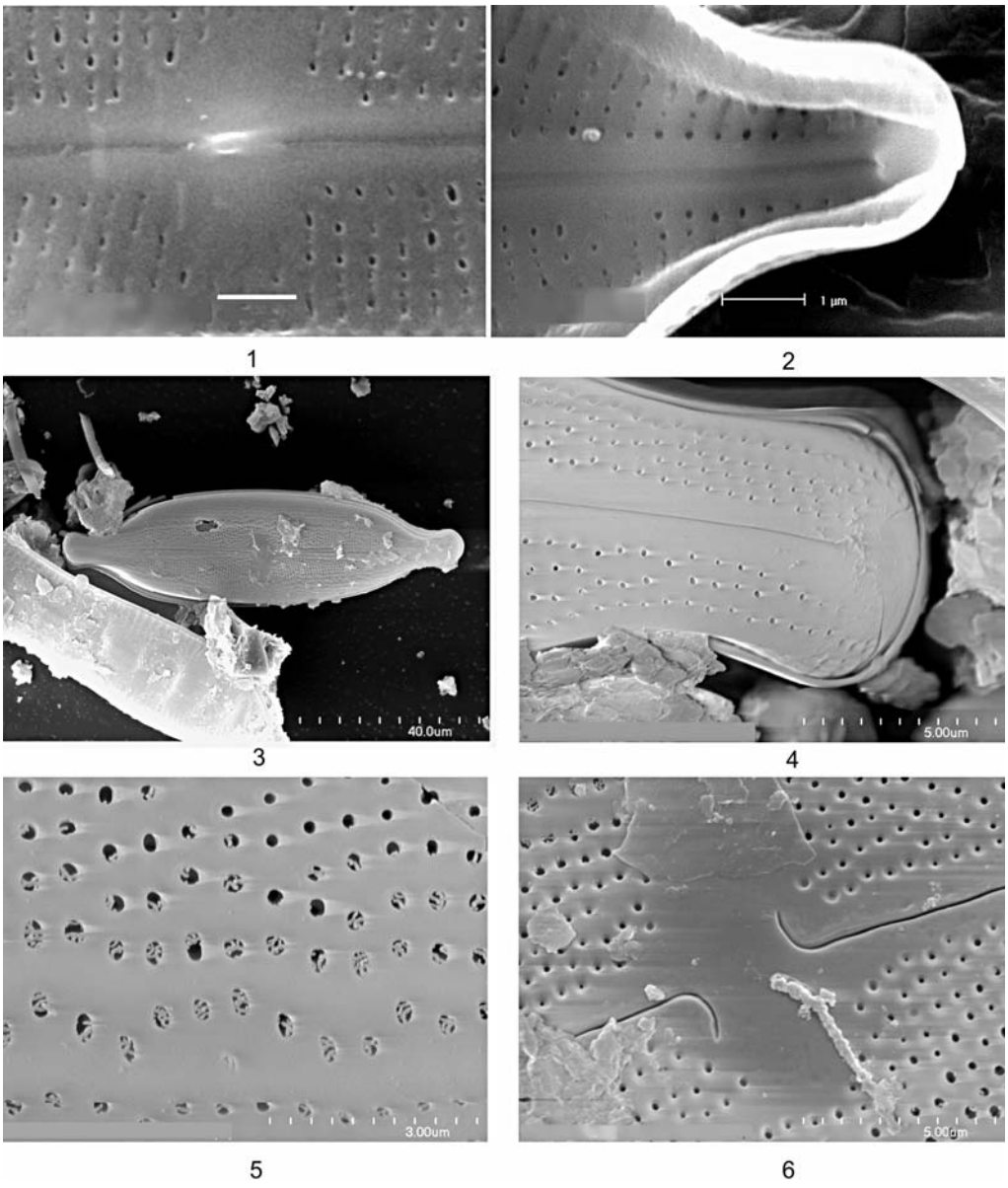


Plate 68. 1, 2 – *Neidium binodis* (Ehrenberg) Hustedt *sensu lato*, internal view; 3–6 – *N. productum* (W. Smith) Cleve, external view; all SEM. Scale bars: 1, 2 – 1 µm; 3 – 40 µm; 4, 6 – 5 µm; 5 – 3 µm.

DIMENSIONS. Valves 4.5–12.5 µm long and 3–4 µm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epilithon from Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Reported previously from the same material by Wojtal and Sobczyk (2006).

DISTRIBUTION IN POLAND. Zatoka Gdańska (Stachura & Witkowski 1997).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain. Classified as extremely rare in Germany (Lange-Bertalot 1996).

44. ***Navicula*** Bory de St. Vincent

1. ***Navicula antonii*** Lange-Bertalot
Plates 29: 1–9; 89: 1–4

Navicula menisculus f. *minutissima* Hustedt; *N. menisculus* var. *grunowii* Lange-Bertalot

Ref. Lange-Bertalot 1993 (p. 120, Fig. 64: 1–11); Lange-Bertalot 2001 (p. 15, Figs 13: 1–15; 28: 6).

DIMENSIONS. Valves 12.4–26.2 µm long and 6.2–7.8 µm wide, with 11–15 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent. Reported previously from the same material (Wojtal & Sobczyk 2006).

DISTRIBUTION IN POLAND. Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species (Van Dam *et al*. 1994). According to Lange-Bertalot (2001), very common in eutrophic to hypereutrophic waters with moderate conductivity, tolerating a weakly α-mesosaprobic pollution level.

REMARKS. Identification of some of the specimens found followed the broad species concept.

2. ***Navicula aquaedurae*** Lange-Bertalot
Plate 29: 10

Ref. Lange-Bertalot 1993 (p. 95, Fig. 46: 14–18); Lange-Bertalot 2001 (p. 16, Figs 16: 11–21; 69: 2).

DIMENSIONS. Valves 14.4–18.2 µm long and 4.6–5.8 µm wide, with 15–16 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples from above Kobylany village. Reported from the same material (Wojtal 2001a).

GENERAL DISTRIBUTION AND ECOLOGY. Known from calcium-rich waters (Lange-Bertalot 1993). According to Lange-Bertalot (2001), occurs generally in oligosaprobic, oligotrophic to eutrophic waters with average electrolyte concentration.

3. ***Navicula capitatoradiata*** Germain
Plate 29: 16–19

Navicula cryptocephala var. *intermedia* Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 105, Fig. 32: 12–15); Lange-Bertalot 2001 (p. 22, Figs 29: 15–20; 73: 6).

DIMENSIONS. Valves 38.0–43.6 µm long and 7.5–8.6 µm wide, with 12–14 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and sometimes periphyton, especially in lower part of stream.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), Vistula River (Turoboyski 1962; Pudo 1977), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), spring of Szklarka stream (Skalska 1966b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species (Van Dam *et al*. 1994). Cosmopolitan and relatively common in slightly brackish waters, or in freshwater with high conductivity, eutraphentic and tolerating pollution up to β- α-mesosaprobic levels (Lange-Bertalot 2001).

4. ***Navicula cari*** Ehrenberg Plate 29: 11, 12

Ref. Krammer & Lange-Bertalot 1986 (p. 96, Fig. 27: 12–17); Lange-Bertalot 2001 (p. 22, Figs 11: 1–20; 66: 3; 67: 6).

DIMENSIONS. Valves 21.2–24.2 µm long and 6.1–9.4 µm wide, with 11–12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Frequent (Siemińska & Wołowski 2003).

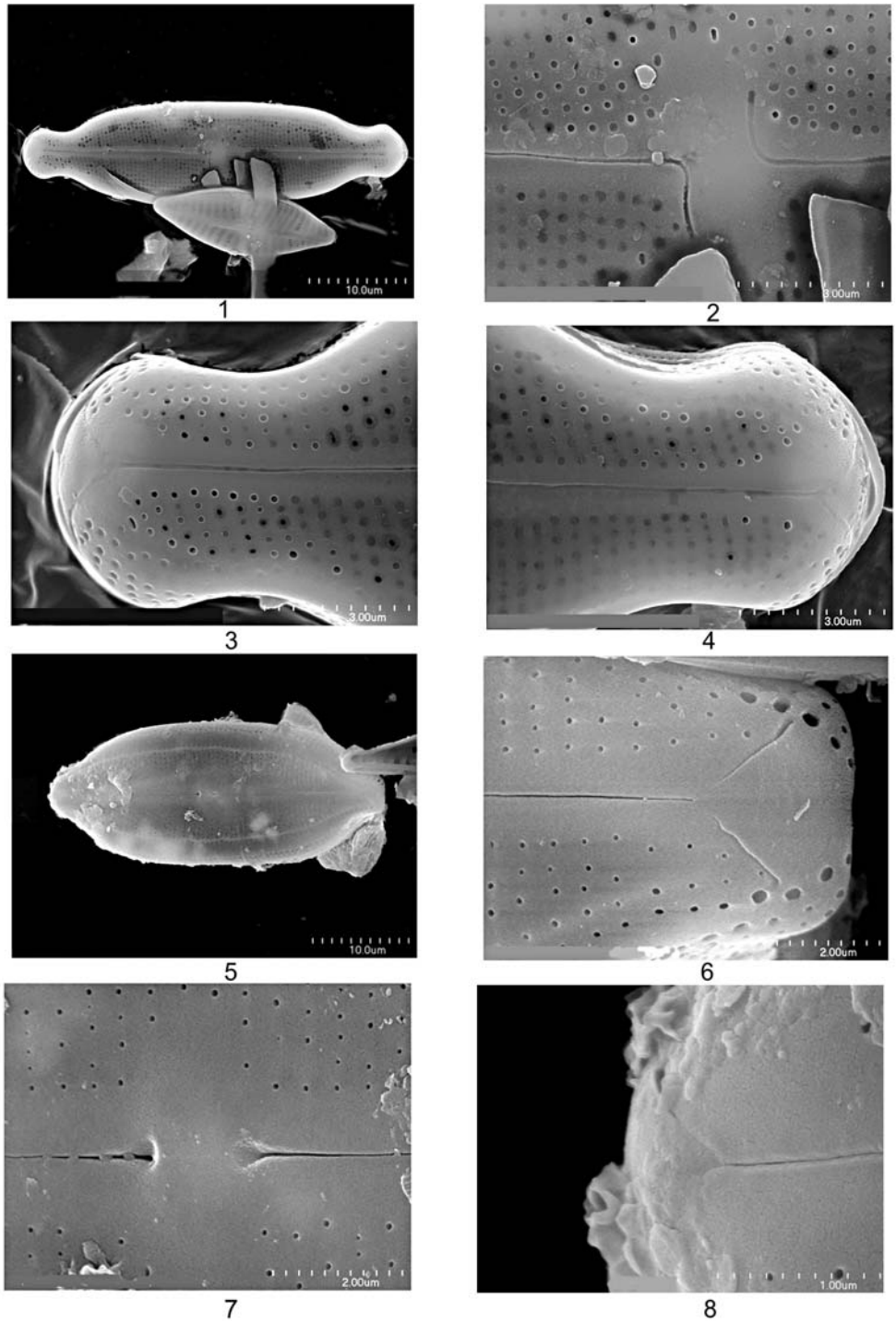


Plate 69. 1–4 – *Neidium* aff. *affine* (Ehrenberg) Pfitzer, external view; 5–8 – *N. dubium* (Ehrenberg) Cleve, external view, apex with lacinia (6, 8); all SEM. Scale bars: 1, 5 – 10 μm; 2–4 – 3 μm; 6, 7 – 2 μm; 8 – 1 μm.

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan and common in eutrophic waters with moderate and high conductivity, tolerating pollution up to β- α-mesosaprobic levels (Lange-Bertalot 2001). Eurytraphentic, fresh brackish water diatom (Van Dam *et al*. 1994).

5. ***Navicula cincta*** (Ehrenberg) Ralfs *in* Pritchard
Plates 29: 13–15; 89: 7, 8

Pinnularia cincta Ehrenberg; *Navicula cincta* var. *heuflerii* Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 98, Fig. 28: 8–15); Lange-Bertalot 2001 (p. 26, Fig. 41: 1–29).

DIMENSIONS. Valves 16.0–18.5 μm long and 4.8–7.0 μm wide, with *ca* 10.0–12.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton samples from upper part of stream.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Vistula River (Pudo 1977).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Alkaliphilous, α-mesosaprobous, eutraphentic, fresh brackish water diatom (Van Dam *et al*. 1994). According to Lange-Bertalot (2001), cosmopolitan, relatively common in eutrophic, electrolyte-rich to brackish waters. Also sporadically present in more polluted waters up to α-mesosaprobic levels, periodically wet biotopes (Lange-Bertalot 2001).

6. ***Navicula cryptocephala*** Kützing
Plates 29: 20–23; 90: 6

Ref. Krammer & Lange-Bertalot 1986 (p. 102, Fig. 31: 8–14); Lange-Bertalot 2001 (p. 27, Figs 17: 1–10; 18: 9–20).

DIMENSIONS. Valves 18.7–40.0 μm long and 6.4–7.5 μm wide, with *ca* 15.6–19.2 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962; Uherkovich 1970; Kyselowa & Kysela 1966; Pudo 1977), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964a, b), spring of Szklarka stream (Skalska 1966a, b), ponds near Kraków, without exact localities (Hanak-Szmagier 1967), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Biała Przemsza River (Wasylik 1985), Kluczwoda stream (Nawrat 1993), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, reported from waters of a broad environmental spectrum (Lange-Bertalot 2001). According to Van Dam *et al*. (1994), a neutrophilous, α-mesosaprobous and fresh brackish water species indifferent to trophic state.

7. **Navicula cryptotenella* Lange-Bertalot
Plates 30: 1–4; 89: 5

Navicula radiosa var. *tenella* (Brébisson) Van Heurck

Ref. Krammer & Lange-Bertalot 1986 (p. 106, Fig. 33: 9–11); Lange-Bertalot 2001 (p. 28, Figs 26: 17–32; 27: 19–22; 28: 3; 69: 5).

DIMENSIONS. Valves 14.6–25.6 μm long and 5.0–9.6 μm wide, with *ca* 15.5–16.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA. Sparse, mainly in epipelon and periphyton.

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Alkaliphilous, β-mesosaprobous, eurytraphentic, fresh brackish water diatom (Van Dam *et al*. 1994). Cosmopolitan, very common in Europe, in waters up to β-mesosaprobic, of broad trophic and conductivity ranges (Lange-Bertalot 2001).

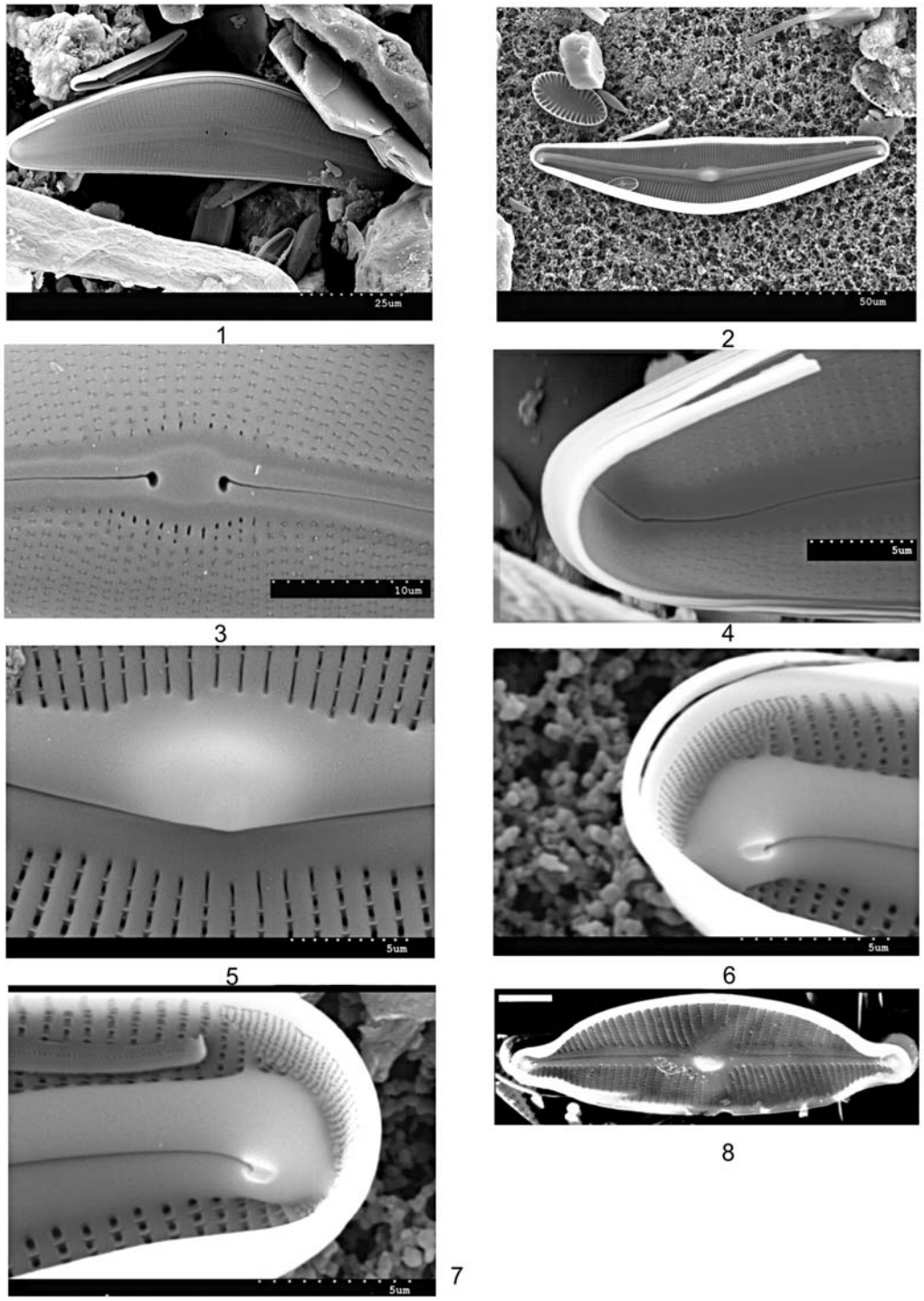


Plate 70. 1–7 – *Cymbella aspera* (Ehrenberg) Cleve, external (1, 3, 4) and internal view (2, 5–7); 8 – *Cymbopleura naviculiformis* (Auerswald) Krammer, internal view; all SEM. Scale bars: 1 – 25 μm; 2 – 50 μm; 3 – 10 μm; 4–8 – 5 μm.

8. **Navicula cryptotenelloides* Lange-Bertalot
Plates 30: 5; 89: 6

Ref. Lange-Bertalot 1993 (p. 105, Figs 50: 9–12; 51: 1, 2); Lange-Bertalot 2001 (p. 29, Figs 26: 8–16; 28: 1, 2).

DIMENSIONS. Valves 14.6–25.6 µm long and 5.0–9.6 µm wide, with 11–16 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Not rare in epilithic and peryphytic samples, but always in small populations.

DISTRIBUTION IN POLAND. Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Reported from calcium-rich, eutrophic waters (Lange-Bertalot 1993). According to Lange-Bertalot (2001), widespread in mesotrophic and eutrophic, calcium-rich lakes.

9. *Navicula gregaria* Donkin
Plates 30: 6–9; 90: 1–3

Ref. Krammer & Lange-Bertalot 1986 (p. 116, Fig. 38: 10–15); Lange-Bertalot 2001 (p. 85, Figs 38: 8–18; 64: 4; 71: 5).

DIMENSIONS. Valves 15.0–24.4 µm long and 3.0–7.2 µm wide, with *ca* 19–22 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in epipelon below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), Sanka stream (Kądziołka 1963), springs of Kobylanka stream (Skalna 1969), Biała Przemsza River (Wasylik 1985).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, in brackish waters, common in eutrophic and hypereutrophic freshwaters with average to high conductivity (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and brackish fresh water species.

10. *Navicula lanceolata* (Agardh) Ehrenberg
Plates 30: 18–23; 90: 5; 91: 1, 2, 4

Ref. Krammer & Lange-Bertalot 1986 (p. 100, Fig. 29: 5–7); Lange-Bertalot 2001 (p. 87, Figs 39: 15–22; 69: 3, 4).

DIMENSIONS. Valves 45.0–61.2 µm long and 9.4–12.0 µm wide, with 9–13 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Very frequent, especially in epipelon below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), spring of Szklarka stream (Skalska 1966a), springs of Będkówka stream (Kubik 1970), spring in Warta River valley.

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, a reliable indicator of eutrophication, oligosaprobic to α- β-mesosaprobic waters (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and brackish fresh water species.

REMARKS. Identification of some of the specimens found (e.g., Plate 30: 22–23) followed the broad species concept.

11. *Navicula libonensis* Schoeman Plate 30: 10

Ref. Krammer & Lange-Bertalot 1986 (p. 99, Fig. 28: 17–19); Lange-Bertalot 2001 (p. 45, Fig. 43: 7–14).

DIMENSIONS. Valves 25.0–40.2 µm long and 5.5–8.0 µm wide, with 12.0–13.5 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Rawka River (Rakowska 1990, 2001).

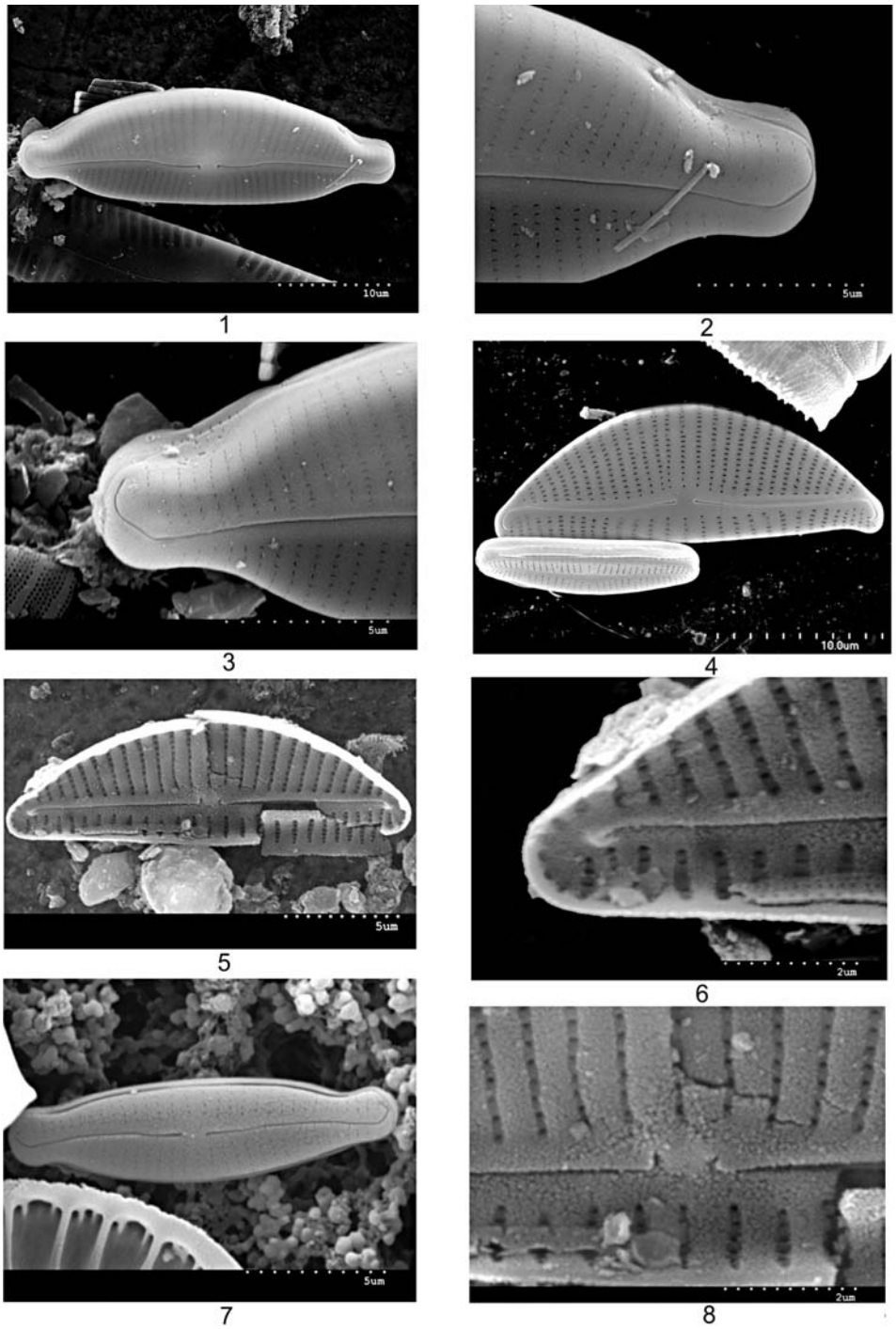


Plate 71. 1–3 – *Cymbopleura naviculiformis* (Auerswald) Krammer, external view; 4 – *Encyonema* cf. *silesiacum* (Bleish) D.G. Mann, external view; 5, 6, 8 – *E. minutum* (Hilse *ex* Rabenhorst) D.G. Mann, internal view; 7 – *Encyonopsis microcephala* (Grunow) Krammer, external view; all SEM. Scale bars: 1, 4 – 10 μm; 2, 3, 5, 7 – 5 μm; 6, 8 – 2 μm.

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, in electrolyte-rich eutrophic waters, up to α-mesosaprobic or even more polluted (Lange-Bertalot 2001).

12. ***Navicula menisculus*** Schumann
Plate 30: 16

Ref. Krammer & Lange-Bertalot 1986 (p. 105, Fig. 32: 16–25); Krammer & Lange-Bertalot 1991b (Fig. 61: 16, 17); Lange-Bertalot 2001 (p. 47, Fig. 12: 1–7).

DIMENSIONS. Valves 27.5–30.0 μm long and 7.5–8.0 μm wide, with 11 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Biała Przemsza River (Wasylik 1985).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. In calcium-rich meso- to moderately eutrophic waters (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species.

13. **Navicula moskali* Metzeltin, Witkowski & Lange-Bertalot
Plate 30: 15

Ref. Lange-Bertalot 2001 (p. 50, Fig. 14: 1–14).

DIMENSIONS. Valves 24.0–27.2 μm long and 6.8–8.0 μm wide, with 11.5–15.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA. Sparse, found mainly in epipelon below Kobylany village.

DISTRIBUTION IN POLAND. Zalew Szczeciński (Bąk *et al*. 2006), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain, according to Lange-Bertalot (2001), known from a few scattered localities.

REMARKS. Probably its occurrence is underestimated in Poland.

14. ***Navicula*** cf. ***oligotraphenta*** Lange-Bertalot & Hofmann
Plate 31: 1–3

Navicula trivialis var. *oligotraphenta* Lange-Bertalot & Hofmann

Ref. Lange-Bertalot 1993 (p. 128, Figs 48: 6–11; 49: 3, 4); Lange-Bertalot 2001 (p. 51, Figs 29: 7–14; 68: 3).

DIMENSIONS. Valves 29.0–32.4 μm long and 8 μm wide, with 12–13 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

GENERAL DISTRIBUTION AND ECOLOGY. Widespread and not rare in Europe, in Alps and their foothills, in oligothropic and mesotrophic waters (Lange-Bertalot 2001). Classified previously as endangered in Germany (Lange-Bertalot 1994).

REMARKS. Some specimens were broader than as given by Lange-Bertalot (1993, 2001) and the dimensions overlap with the similar *Navicula trivialis* Lange-Bertalot also present in the material. Other features of these broad specimens were as in *Navicula oligotraphenta.*

15. ***Navicula radiosa*** Kützing
Plates 31: 14; 91: 3, 5, 6

Ref. Krammer & Lange-Bertalot 1986 (p. 99, Fig. 29: 1–4); Lange-Bertalot 2001 (p. 59, Figs 8: 1–7, 67: 1, 2).

DIMENSIONS. Valves 68.0–70.4 μm long and 10.2–11.8 μm wide, with 12.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse in periphyton above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Starmach 1939; Siemińska 1947), Młynówka stream (Gumiński 1947), Vistula River (Turoboyski 1956, 1962; Kyselowa & Kysela 1966), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), Pilica River (Kadłubowska

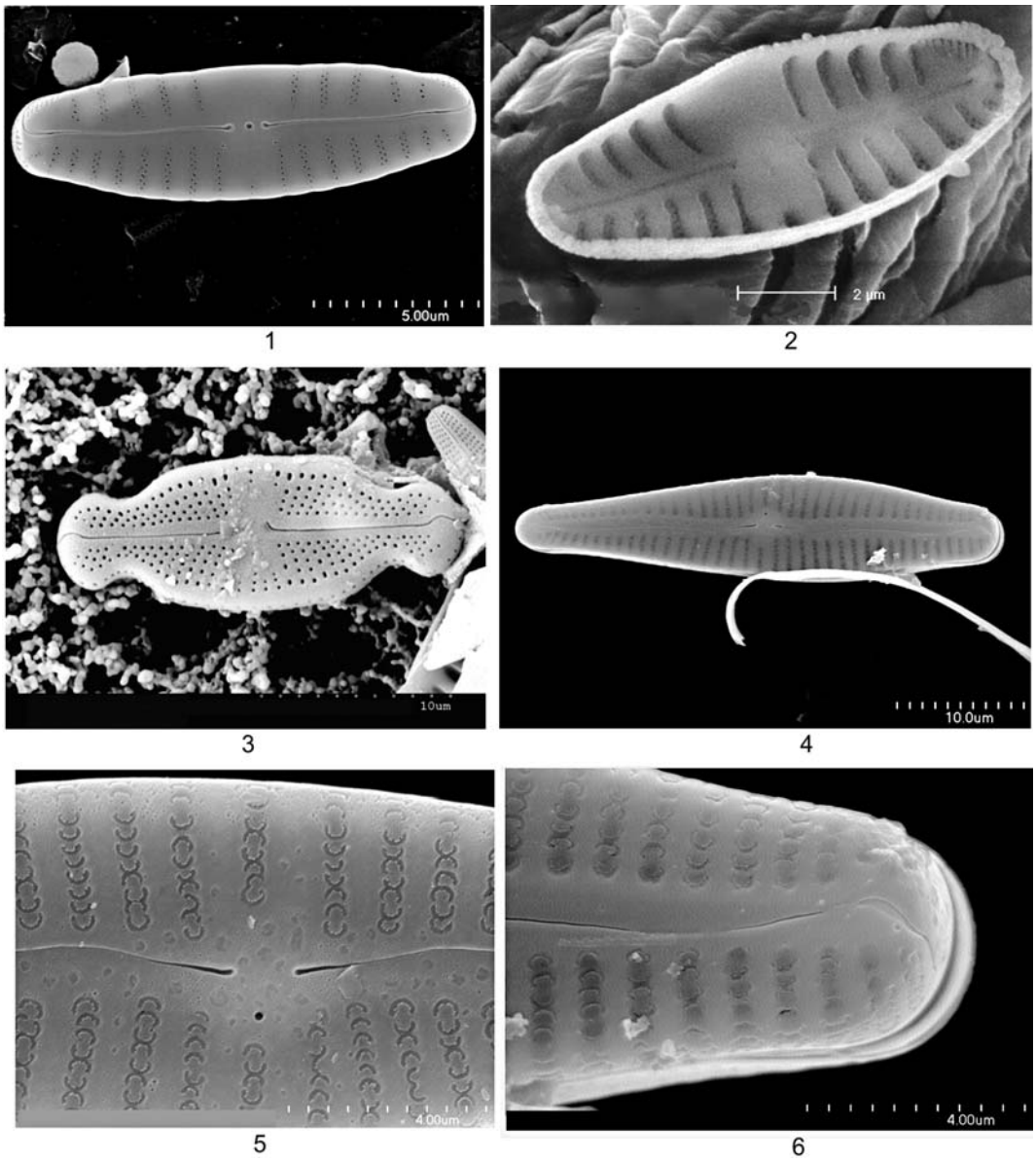


Plate 72. 1, 2 – *Reimeria sinuata* (Gregory) Kociolek & Stoermer, external (1) and internal (2) view; 3 – *Luticola ventricosa* (Kützing) D.G. Mann, external view; 4–6 – *Gomphonema clavatum* Ehrenberg, external view; all SEM. Scale bars: 1 – 5 µm; 2 – 2 µm; 3, 4 – 10 µm; 5, 6 – 4 µm.

1964b), springs of Będkówka stream (Kubik 1970), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, of a wide range of conductivity, calcium content and water trophy, from oligosaprobic to β-mesosaprobic (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, meso- to eutraphentic and fresh brackish water species.

16. ***Navicula reichardtiana*** Lange-Bertalot
Plates 31: 8, 9; 90: 4

Ref. Krammer & Lange-Bertalot 1991b (Figs 68: 10–15; 69: 11); Lange-Bertalot 2001 (p. 63, Figs 13: 25–35; 28: 5).

DIMENSIONS. Valves 12.0–22.6 μm long and 5.0–6.4 μm wide, with 14–16 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epipelon below Kobylany village. Reported previously from the same material (Wojtal 2001a).

DISTRIBUTION IN POLAND. Central Poland (Rakowska 2001), Bzura River (Szczepocka 2005), Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, in eutrophic waters with average conductivity, especially calcium-rich but also rarely in brackish waters; eutraphentic and β-mesosaprobous (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous and fresh brackish water species.

17. ***Navicula slesviscensis*** Grunow
Plate 31: 4, 5

Navicula viridula var. *slesviscensis* (Grunow) Van Heurck

Ref. Krammer & Lange-Bertalot 1986 (p. 102, Fig. 31: 3–5); Lange-Bertalot 2001 (p. 67, Figs 44: 1–7; 64: 5; 70: 2).

DIMENSIONS. Valves 30.0–38.2 μm long and 10.2–11.2 μm wide, with 9.5–10.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epipelic samples from below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Będkówka stream (Kubik 1970), spring in Warta River valley.

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Probably cosmopolitan, eutraphentic, in electrolyte-rich freshwaters and slightly brackish waters (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and brackish fresh water species.

18. **Navicula tenelloides*** Hustedt
Plate 30: 11–14

Ref. Krammer & Lange-Bertalot 1986 (p. 117, Fig. 38: 16–20); Lange-Bertalot 2001 (p. 72, Fig. 32: 1–10).

DIMENSIONS. Valves 15.0–17.2 μm long and 3.5–3.7 μm wide, with 16.0–17.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and samples with *Vaucheria* sp. from above Kobylany village. Reported previously from the same material (Wojtal 2001a).

DISTRIBUTION IN POLAND. Central Poland (Rakowska 1990, 2001), Zalew Szczeciński (Bąk *et al*. 2006), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom tolerating a wide range of environments, including subaerial biotopes (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkalophilous, aerophilous, oligosaprobous, eutraphentic and fresh brackish water species, whereas Lange-Bertalot (2001) defined it as eurytraphentic, occurring also in very polluted α-mesosaprobic to polysaprobic waters.

19. ***Navicula tripunctata*** (O. Müller) Bory
Plates 31: 15–20; 91: 7, 8; 92: 1–5

Navicula gracilis Ehrenberg

Ref. Krammer & Lange-Bertalot 1986 (p. 95, Fig. 27: 1–3); Lange-Bertalot 2001 (p. 73, Figs 1: 1–8; 67: 3, 4).

DIMENSIONS. Valves 34.0–58.2 μm long and 8.5–8.8 μm wide, with 11 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Common.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Without exact localities (Gutwiński 1895), Vistula River (Starmach 1938; Pudo 1977), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska

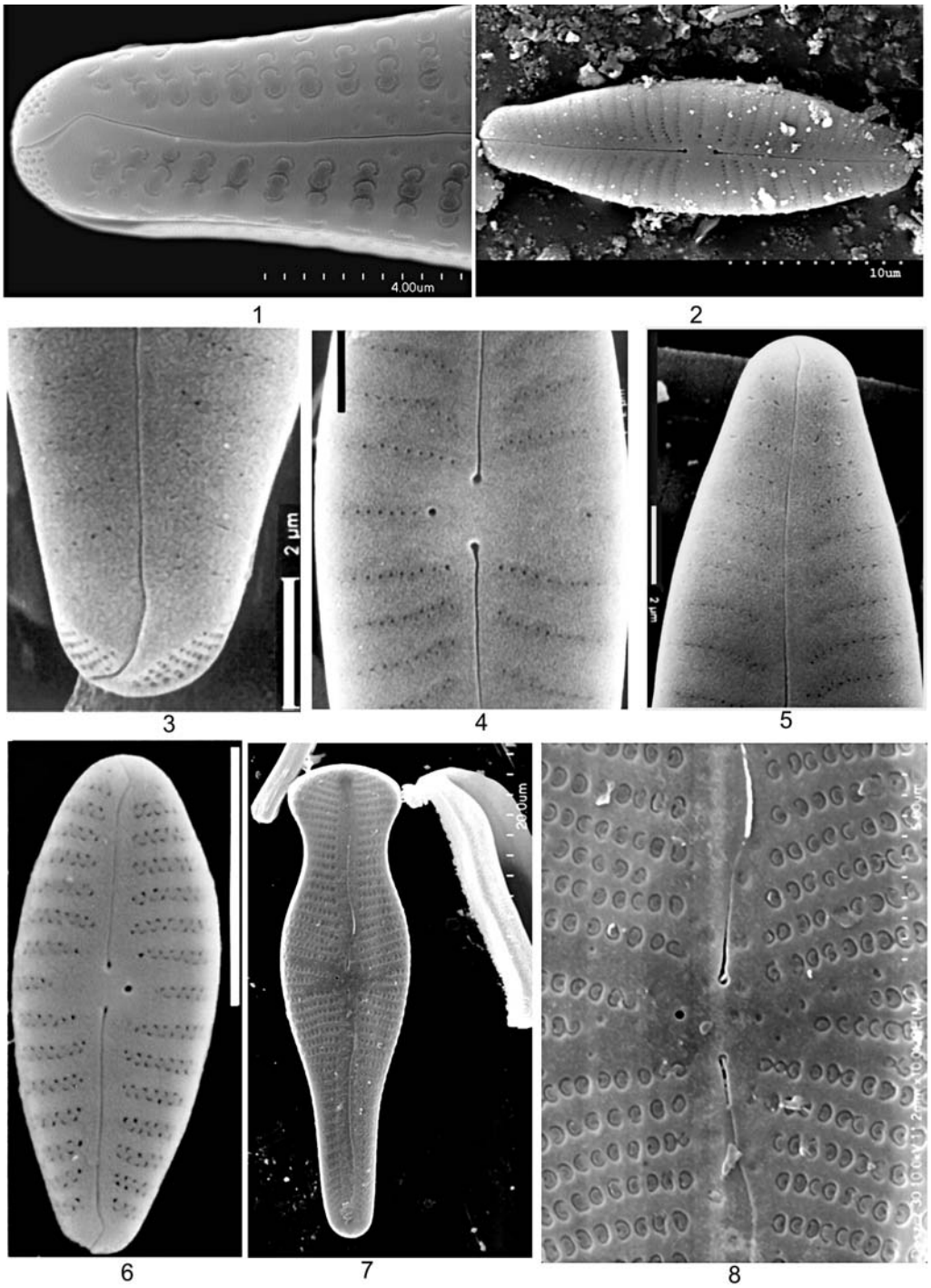


Plate 73. 1 – *Gomphonema clavatum* Ehrenberg, external view; 2–5 – *G. micropus* Kützing, external view; 6 – *G. minutum* (Agardh) Agardh, external view; 7, 8 – *G. truncatum* Ehrenberg *sensu lato*, external view; all SEM. Scale bars: 1 – 4 µm, 2 – 10 µm; 3–5 – 5 µm; 3–5 – 2 µm; 6, 8 – 5 µm; 7 – 20 µm.

1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964a, b), spring of Szklarka stream (Skalska 1966a, b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970) and Biała Przemsza River (Wasylik 1985).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common in electrolyte-rich and brackish waters, up to of β- α-mesosaprobic waters (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

20. ***Navicula trivialis*** Lange-Bertalot Plates 32: 1–3; 92: 6–8

Navicula lanceolata sensu Kützing, *sensu* Grunow, *non sensu* Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 110, Fig. 35: 1–4); Krammer & Lange-Bertalot 1991b (Fig. 60: 14, 15); Lange-Bertalot 2001 (p. 73, Figs 29: 1–6; 64: 1; 68: 1, 2).

DIMENSIONS. Valves 29.5–49.5 μm long and 8.5–11.2 μm wide, with 11–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Very frequent, especially in epipelon.

DISTRIBUTION IN POLAND. Reported from, e.g., central Poland (Rakowska 2001), Tatra Mts lakes (Kawecka & Galas 2003), Zatoka Gdańska (Witkowski 2004), Zalew Szczeciński (Bąk *et al*. 2006) spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Very common, cosmopolitan, prefers ion-rich waters, including brackish waters (Krammer & Lange-Bertalot 1986). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and brackish fresh water species.

21. **Navicula upsaliensis* (Grunow) Peragallo Plate 32: 10–19

Navicula menisculus var. *upsaliensis* Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 105, Fig. 32: 16, 17); Lange-Bertalot 2001 (p. 75, Figs 12: 8–14; 64: 2, 3).

DIMENSIONS. Valves 19.0–30.2 μm long and 8.5–10.0 μm wide, with 11.5–12.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epipelon above Kobylany village.

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003). Reported from, e.g., Cedronka stream (Starmach 1969), Zalew Wiślany (Jankowska *et al*. 2005), Zalew Szczeciński (Bąk *et al*. 2006), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006), Lake Raduń (Kowalska & Luścińska 2006). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. The species was determined by Lange-Bertalot (1996) as very rare in Germany; occurring in alkaline waters with average to moderately high conductivity (Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous and fresh brackish water species.

REMARKS. Recent reports from Poland could suggest that the diatom is not very rare, as was thought.

22. ***Navicula veneta*** Kützing Plate 32: 4–9

Navicula cryptocephala var. *veneta* (Kützing) Rabenhorst

Ref. Krammer & Lange-Bertalot 1986 (p. 104, Fig. 32: 1–4); Lange-Bertalot 2001 (p. 78, Figs 14: 23–30; 65: 3).

DIMENSIONS. Valves 17.0–18.6 μm long and 4.4–5.6 μm wide, with 15.0–15.6 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in epipelon below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), Vistula River (Turoboyski 1962; Uherkovich 1970; Pudo 1977), Sanka stream

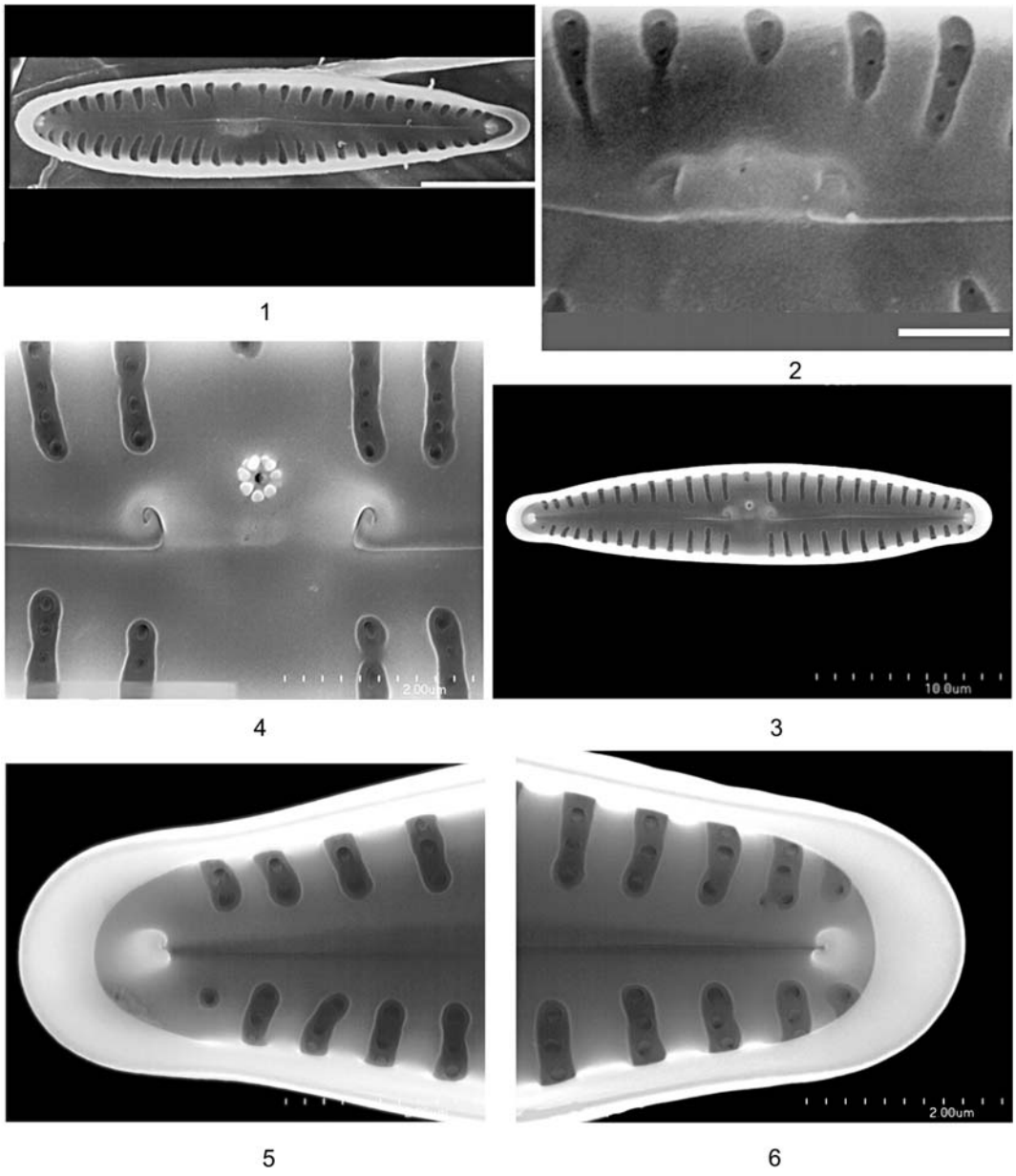


Plate 74. 1–6 – *Gomphonema pumilum* (Grunow) Reichardt & Lange-Bertalot *sensu lato*, internal view; all SEM. Scale bars: 1, 2 – 5 µm; 3 – 10 µm; 4–6 – 2 µm.

(Kądziołka 1963), Prądnik River (Stępień 1963), springs of Kobylanka stream (Skalna 1969).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. According to Krammer and Lange-Bertalot (1986), a cosmopolitan diatom, common in waters of elevated conductivity and eutrophic as well as polysaprobic waters. According to Van Dam *et al.*

(1994), an alkaliphilous, α-meso-polysaprobous, eutraphentic and brackish fresh water species.

23. ***Navicula vilaplanii** (Lange-Bertalot & Sabater) Lange-Bertalot & Sabater
Plate 31: 6, 7

Navicula longicephala var. *vilaplanii* Lange-Bertalot & Sabater

Ref. Krammer & Lange-Bertalot 1991b (Fig. 68: 34–36); Lange-Bertalot 2001 (p. 78, Figs 32: 48–53).

DIMENSIONS. Valves 14.5–16.5 μm long and 2.8–3.2 μm wide, with 18.5–20.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

GENERAL DISTRIBUTION AND ECOLOGY. According to Lange-Bertalot (2001), a cosmopolitan diatom, inhabiting eutrophic waters with moderate to elevated conductivity. Classified as very rare in Germany (Lange-Bertalot 1996).

24. ***Navicula viridula*** (Kützing) Ehrenberg
Plates 33: 1, 2; 93: 1–3

Ref. Krammer & Lange-Bertalot 1986 (p. 114, Fig. 37: 1, 2); Lange-Bertalot 2001 (p. 94, Fig. 36: 1–3).

DIMENSIONS. Valves 47.8–65.0 μm long and 10.6–12.5 μm wide, with 9.5–11.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epipelon below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Pudo 1977), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963; Pudo & Kurbiel 1970), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), sewage ponds in Pieskowa Skała (Pudo 1978a).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1986; Lange-Bertalot 2001). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic, strictly aquatic and fresh brackish water species.

25. ***Navicula wiesneri*** Lange-Bertalot
Plates 31: 10–13; 93: 4–8

Navicula heufleri Grunow f. *minuta* Grunow

Ref. Krammer & Lange-Bertalot 1991b (Fig. 59: 19–22); Lange-Bertalot 1993 (p. 140, Figs 41: 23–27; 42: 3–6); Lange-Bertalot 2001 (p. 80, Fig. 23: 1–13).

DIMENSIONS. Valves 18.4–28.8 μm long and 4.8–5.4 μm wide, with 12–14 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epipelon and periphyton. Reported previously from the same material (Wojtal 2001a).

DISTRIBUTION IN POLAND. Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom, very common in European electrolyte-rich and eutrophic waters (Lange-Bertalot 1993, 2001). According to Van Dam *et al.* (1994), an alkalophilous, aerophilous and fresh brackish water species.

26. ***Navicula*** sp. 1 Plate 32: 20–22

DIMENSIONS. Valves 21.8–30.0 μm long and 7.1–7.8 μm wide, with 10–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, above Kobylany village.

REMARKS. The observed specimens resemble *Navicula moenofranconica* Lange-Bertalot (Lange-Bertalot 2001, p. 47, Fig. 12: 15–21), but they were always narrower and had distinctly higher striae density (8.5–9.5 striae per 10 μm vs. 10–12 striae per 10 μm).

27. ***Navicula*** sp. 2 Plate 33: 3

DIMENSIONS. Valves 55.6–60.0 μm long and 8.8–9.0 μm wide, with 12–13 striae per 10 μm.

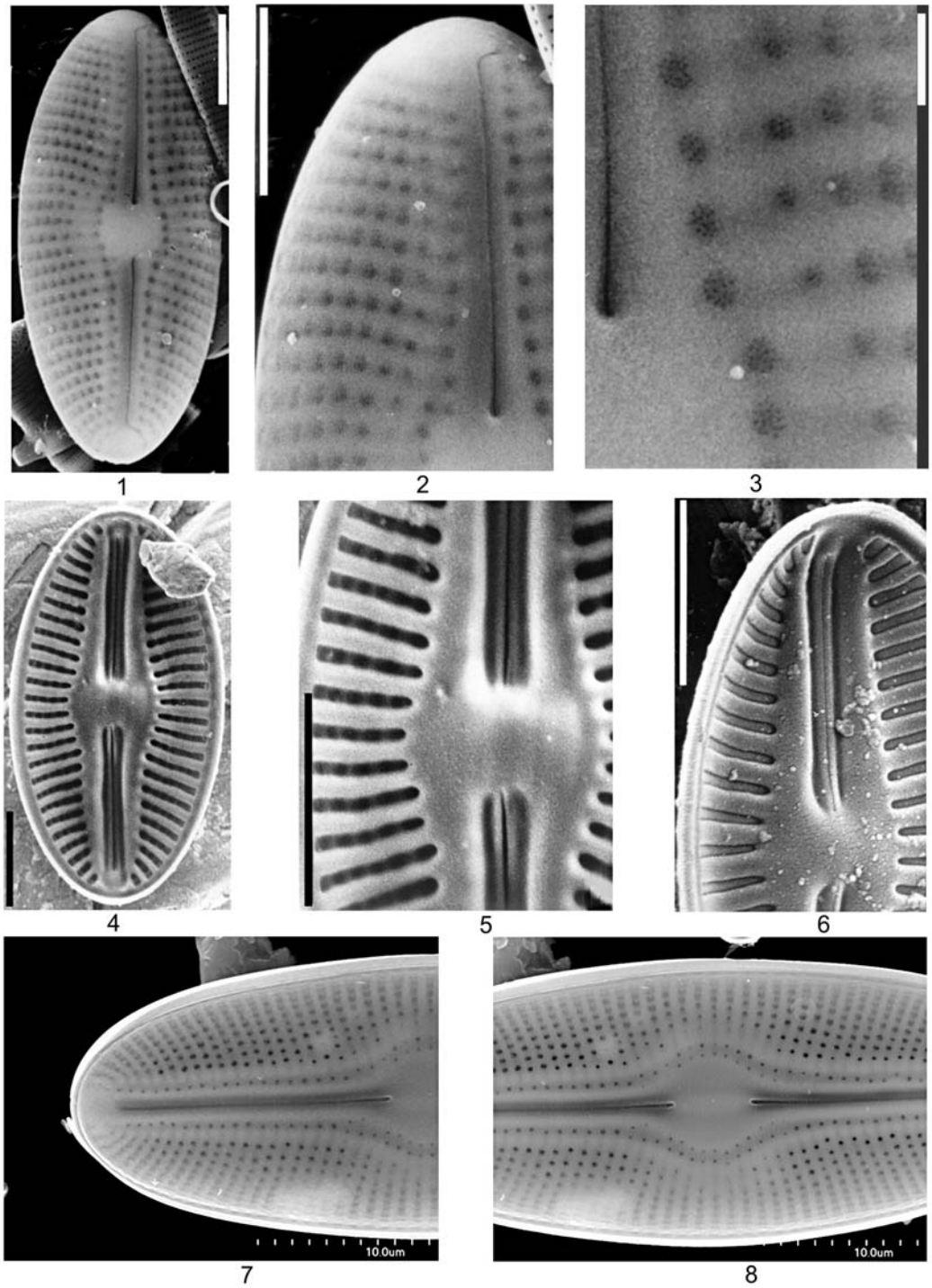


Plate 75. 1–6 – *Diploneis* cf. *krammeri* Lange-Bertalot & Reichardt, external view (1–3) and internal (4–6); 7, 8 – *D. krammeri* Lange-Bertalot & Reichardt, external view; all SEM. Scale bars: 1, 2, 4–6 – 5 μm; 3 – 1 μm; 7, 8 – 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare.

REMARKS. For precise identification further studies are needed.

28. ***Navicula*** sp. 3 Plate 33: 4

DIMENSIONS. Valves 12 μm long and 3.8 μm wide, with *ca* 20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare.

REMARKS. For precise identification further studies are needed.

45. ***Naviculadicta*** Lange-Bertalot

1. **Naviculadicta brockmannii* (Hustedt) Lange-Bertalot *in* Lange-Bertalot & Metzeltin 1996 Plate 18: 13–18

Navicula brockmannii Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 183, Fig. 79: 16, 17); Lange-Bertalot & Metzeltin 1996 (Fig. 83: 22, 23).

DIMENSIONS. Valves 16.6–20.0 μm long and 5.8–6.0 μm wide, with *ca* 25 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN POLAND. Reported from Rawka River (Rakowska 1990, 2001).

GENERAL DISTRIBUTION AND ECOLOGY. Reported from oligosaprobic waters of low conductivity (Krammer & Lange-Bertalot 1986). *Navicula brockmannii* was classified as presumably endangered in Germany (Lange-Bertalot 1994). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous and fresh water species.

2. ***Naviculadicta*** cf. ***raederiae*** Lange-Bertalot Plates 17: 28–32; 78: 3, 4

Ref. Lange-Bertalot & Metzeltin 1996 (p. 88, Figs 83: 37–40; 116: 5, 6).

DIMENSIONS. Valves 5.5–9.3 μm long and 3.8–4.5 μm wide, with 25–28 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA. Sparse, in epipelon and periphyton above Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Known from oligotrophic to mesotrophic waters, rich in calcium (Lange-Bertalot & Metzeltin 1996).

REMARKS. Some observed specimens were 0.2–0.5 μm wider than as given in the diagnosis, with the width of one probably abnormal specimen (Plate 17: 32) reaching 5 μm. Previously identified collectively with *Eolimna minima* as one taxon (Wojtal & Sobczyk 2006).

3. ***Naviculadicta*** sp. 1 Plate 16: 30, 31

DIMENSIONS. Valve 7.5–8.5 μm long and 3.5–4.0 μm wide.

DISTRIBUTION IN KOBYLANKA. Sparse, in periphyton above Kobylany village.

REMARKS. The genus of this species remains uncertain.

4. ***Naviculadicta*** sp. 2 Plate 94: 6

DIMENSIONS. Valve 20 μm long and 8.4 μm wide, with 14 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA. Rare, in periphyton above Kobylany village.

REMARKS. The genus of this species remains uncertain.

5. ***Naviculadicta*** sp. 3 Plate 95: 1, 2

DIMENSIONS. Valve 8.8–9.2 μm long and 3.9 μm wide, with *ca* 30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA. Rare, in periphyton above Kobylany village.

REMARKS. The specimens found has coarse areolation, a narrow axial area and distinctly rhombic central area. Raphe filiform, straight.

46. ***Neidium*** Pfitzer

1. ***Neidium*** cf. ***affine*** (Ehrenberg) Pfitzer Plates 18: 21–23; 69: 1–4

Ref. Krammer & Lange-Bertalot 1986 (p. 280, Fig. 106: 8, 10); Hamilton & Jahn 2005 (p. 281, Figs 16–47).

DIMENSIONS. Valves 36.8–48.0 μm long and 10.0–11.5 μm wide, with 20–22 striae per 10 μm.

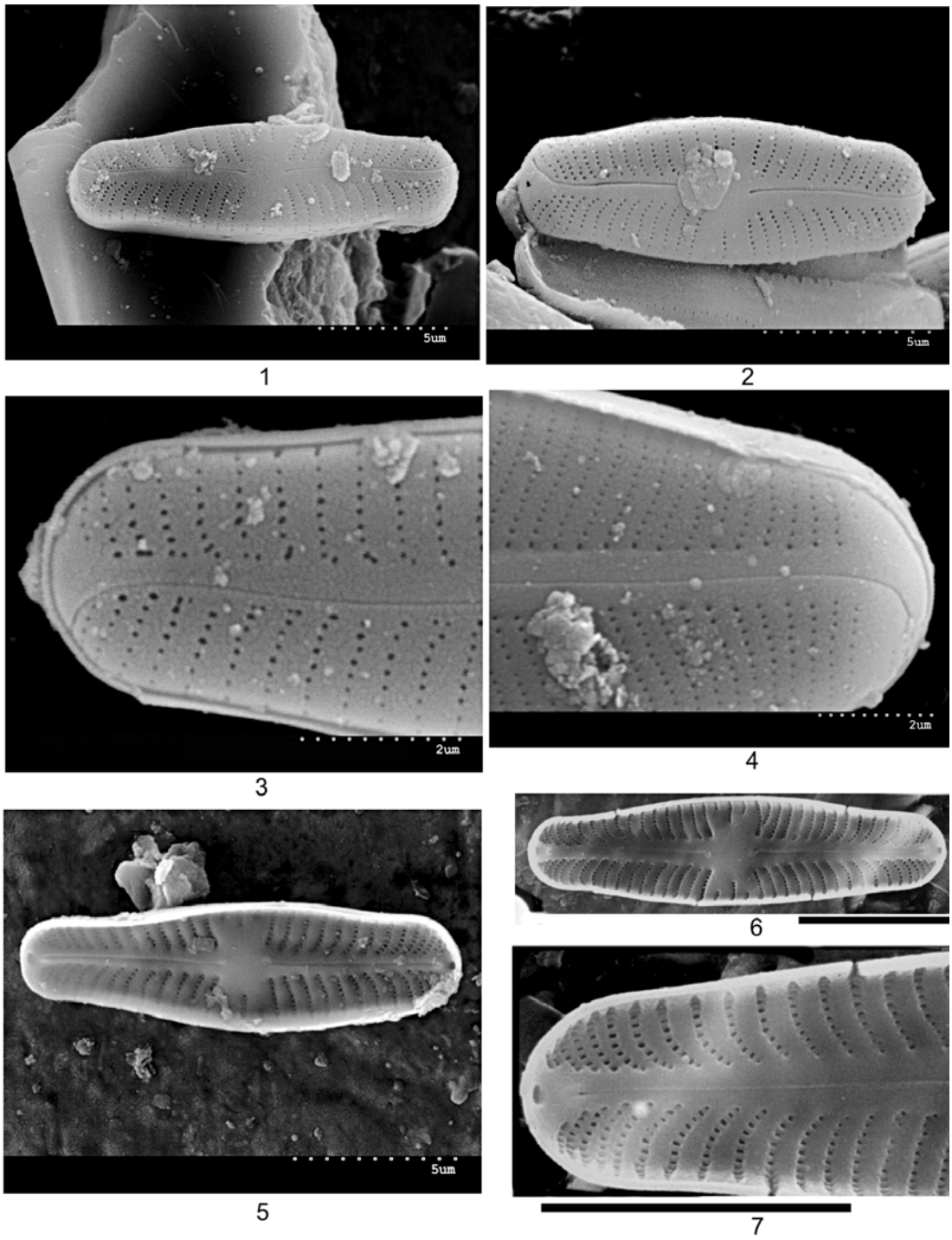


Plate 76. 1–7 – *Sellaphora joubaudii* (Germain) Aboal, external (1–4) and internal (5–7) view; all SEM. Scale bars: 1, 2, 5–7 – 5 μm; 3, 4 – 2 μm.

DISTRIBUTION IN KOBYLANKA. Sparse, in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. *Neidium affine* reported from Vistula River (Starmach 1938) and fish ponds in Mydlniki (Siemińska 1947).

DISTRIBUTION IN POLAND. *N. affine* is a common diatom according to the classification applied here (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, especially in oligosaprobic waters of moderate electrolyte content (Krammer & Lange-Bertalot 1986), euplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, meso-eutraphentic, strictly aquatic and fresh brackish water species.

REMARKS. Identification here followed the broad species concept.

2. ***Neidium binodis*** (Ehrenberg) Hustedt *sensu lato* Plates 19: 1, 2; 67: 6–9; 68: 1, 2

Navicula binodis Ehrenberg

Ref. Krammer & Lange-Bertalot 1986 (p. 270, Fig. 100: 3–5).

DIMENSIONS. Valves 24.5–28.5 µm long and 7.2–8.5 µm wide, with *ca* 24–29 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelic and periphytic samples.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pilica River, as *Navicula binodis* Ehrenberg (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. According to Siemińska and Wołowski (2003), *Navicula binodis* was frequently reported.

GENERAL DISTRIBUTION AND ECOLOGY. Probably widespread, prefers waters of high conductivity (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, meso- to eutraphentic and fresh brackish water species.

REMARKS. The lack of lacinia and the lack of deflection of the central raphe fissures suggest an affinity to a genus other than *Neidium*.

3. ***Neidium dubium*** (Ehrenberg) Cleve Plates 19: 3–6; 69: 5–8

Ref. Krammer & Lange-Bertalot 1986 (p. 267, Fig. 99: 1–7).

DIMENSIONS. Valves 33–35 µm long and 11.5–12.2 µm wide, with 17–22 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse in epipelic samples.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Będkówka stream (Kubik 1970), Vistula River (Pudo 1977).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, preferring oligosaprobic waters of moderate electrolyte content (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), a neutrophilous, β-mesosaprobous, meso- to eutraphentic, strictly aquatic and fresh brackish water species.

4. ***Neidium productum*** (W. Smith) Cleve Plates 19: 7, 8; 68: 3–6

Ref. Krammer & Lange-Bertalot 1986 (p. 281, Fig. 107: 4–6).

DIMENSIONS. Valves 74–79 µm long and 19–27 µm wide, with 18 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in metaphyton and epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970).

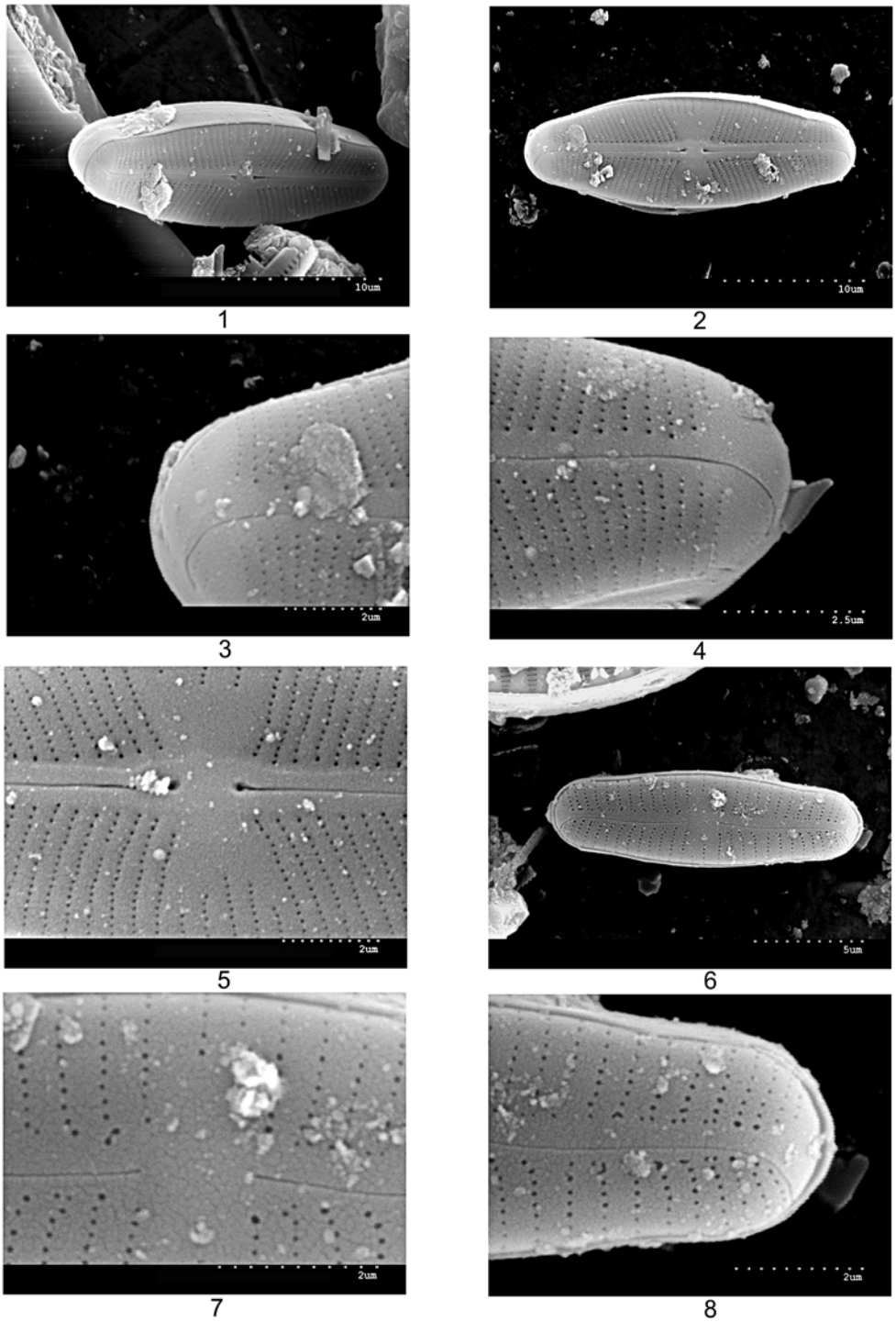


Plate 77. 1–8 – *Sellaphora pupula* (Kützing) Mereschkovsky *sensu lato*, external view; all SEM. Scale bars: 1, 2, 6 – 5 μm; 3–5, 7, 8 – 2 μm.

DISTRIBUTION IN POLAND. Frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, preferring oligosaprobic waters of low ion content (Krammer & Lange-Bertalot 1986).

47. ***Nitzschia*** Hasall

1. ***Nitzschia acicularis*** (Kützing) W. Smith
Plate 41: 1–4

Ref. Krammer & Lange-Bertalot 1988 (p. 123, Fig. 85: 1–4).

DIMENSIONS. Valves 45.8–78.0 µm long and 2.8–4.0 µm wide, with *ca* 20 fibulae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Uherkovich 1970), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963; Pudo & Kurbiel 1970), Pilica River (Kadłubowska 1964b), springs of Będkówka stream (Kubik 1970), sewage ponds in Pieskowa Skała (Pudo 1978a, b), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common in waters of moderate or high conductivity and a broad trophic range, but more common in eutrophic waters (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic, strictly aquatic and fresh brackish water species.

2. ***Nitzschia acidoclinata*** Lange-Bertalot
Plate 41: 13, 14

Ref. Krammer & Lange-Bertalot 1988 (p. 100, Fig. 73: 1–8).

DIMENSIONS. Valves 16.5–27.0 µm long and 2.2–3.0 µm wide, with *ca* 15–16 fibulae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread and common, preferring small oligotrophic habitats with waters of low conductivity, known also from carbonaceous peat bogs and springs (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, mesotraphentic and fresh water species.

3. ***Nitzschia amphibia*** Grunow var. ***amphibia***
Plate 42: 8–10

Ref. Krammer & Lange-Bertalot 1988 (p. 108, Fig. 78: 13–20).

DIMENSIONS. Valves 16.0–17.6 µm long and 4.4–4.8 µm wide, with 8.0–9.5 fibulae and *ca* 18 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962), fish ponds in Mydlniki (Siemińska 1947), spring of Szklarka stream (Skalska 1966a), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom of a wide water conductivity spectrum, known also from soil samples (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species.

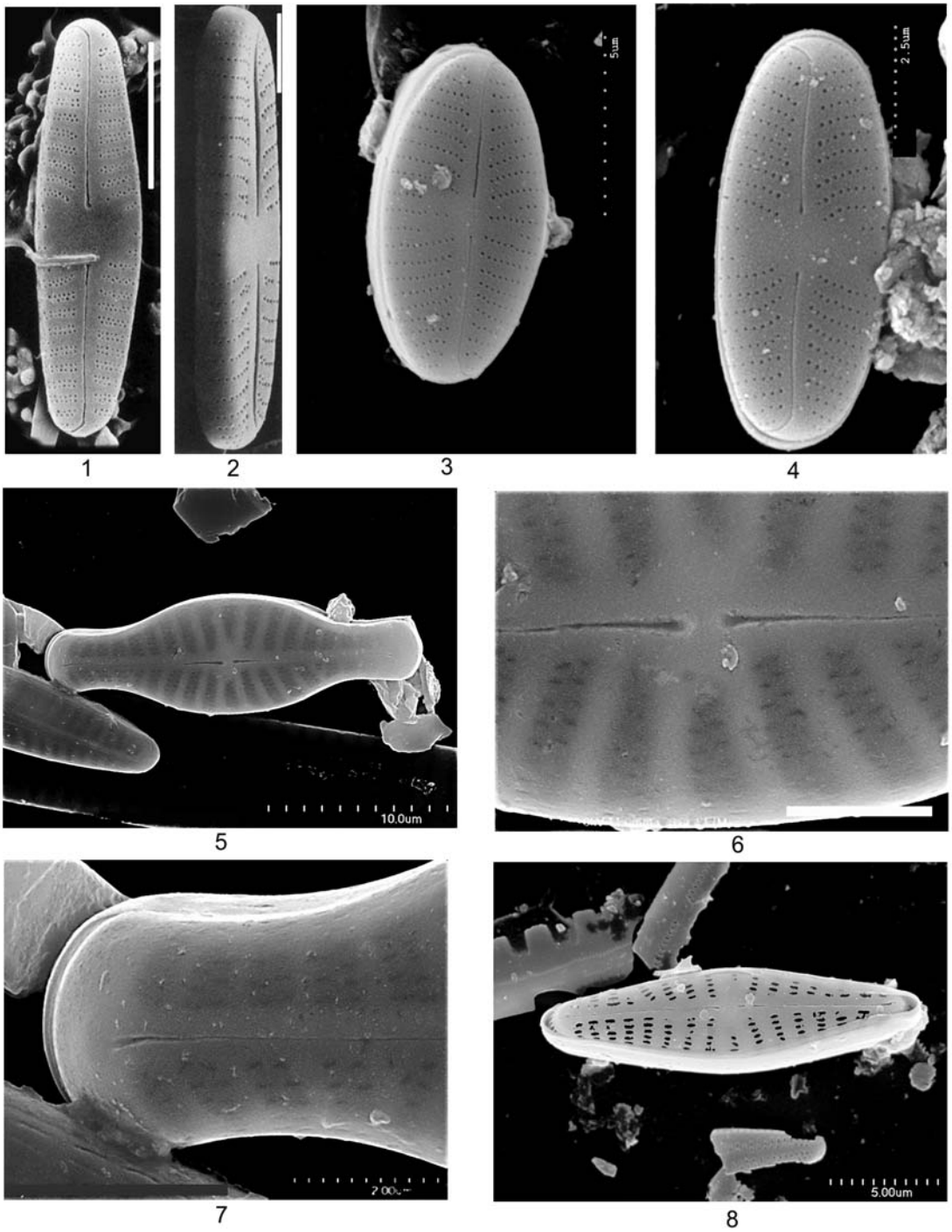


Plate 78. 1, 2 – *Sellaphora* cf. *seminulum* (Grunow) D.G. Mann, external view; 3, 4 – *Naviculadicta* cf. *raederiae*, external view; 5–7 – *Hippodonta capitata* (Ehrenberg) Lange-Bertalot, Metzeltin & Witkowski, external view; 8 – *H. costulata* (Grunow) Lange-Bertalot, Metzeltin & Witkowski, external view; all SEM. Scale bars: 1–3, 8 – 5 µm; 4, 6, 7 – 2 µm; 5 – 2 µm.

4. **Nitzschia archibaldii* Lange-Bertalot Plate 40: 1, 2

Ref. Krammer & Lange-Bertalot 1988 (p. 115, Fig. 81: 10–12).

DIMENSIONS. Valves 18.0–24.6 µm long and 2.4–3.2 µm wide, with *ca* 13.8–15.6 fibulae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epilithon.

DISTRIBUTION IN POLAND. Known from a dam reservoir in southern Poland (Wojtal *et al*. 2005).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread, preferring circumneutral oligosaprobic to β-mesosaprobic waters of moderate conductivity (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

5. ***Nitzschia capitellata*** Hustedt Plate 40: 9–11

Ref. Krammer & Lange-Bertalot 1988 (p. 88, Figs 62: 1–12; 63: 1–3).

DIMENSIONS. Valves 20.5–45.5 µm long and 4.5–6.0 µm wide, with 11–16 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epilithon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962; Uherkovich 1970), Młynówka stream (Gumiński 1947).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, reported frequently from waters of moderate conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-meso-polysaprobous, hypereutraphentic and brackish water species.

6. ***Nitzschia clausii*** Hantzsch Plate 40: 15

Ref. Krammer & Lange-Bertalot 1988 (p. 31, Fig. 19: 1–6A).

DIMENSIONS. Valves 20.0–45.5 µm long and 4.5–6.0 µm wide, with 11–13 fibulae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), Vistula River (Turoboyski 1962), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and brackish water species.

7. ***Nitzschia communis*** Rabenhorst Plate 40: 19, 20

Ref. Krammer & Lange-Bertalot 1988 (p. 110, Fig. 79: 1–6).

DIMENSIONS. Valves 26.4–30.0 µm long and 4.8–5.2 µm wide, with *ca* 11 fibulae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and samples with *Vaucheria* sp.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), Prądnik River (Stępień 1963), spring of Szklarka stream (Skalska 1966a), springs of Kobylanka stream (Skalna 1969).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, preferring waters of high conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-meso-polysaprobous, eutraphentic and fresh brackish water species.

8. **Nitzschia constricta* (Kützing) Ralfs *in* Pritchard Plate 42: 2

Ref. Krammer & Lange-Bertalot 1988 (p. 43, Fig. 35: 1–6).

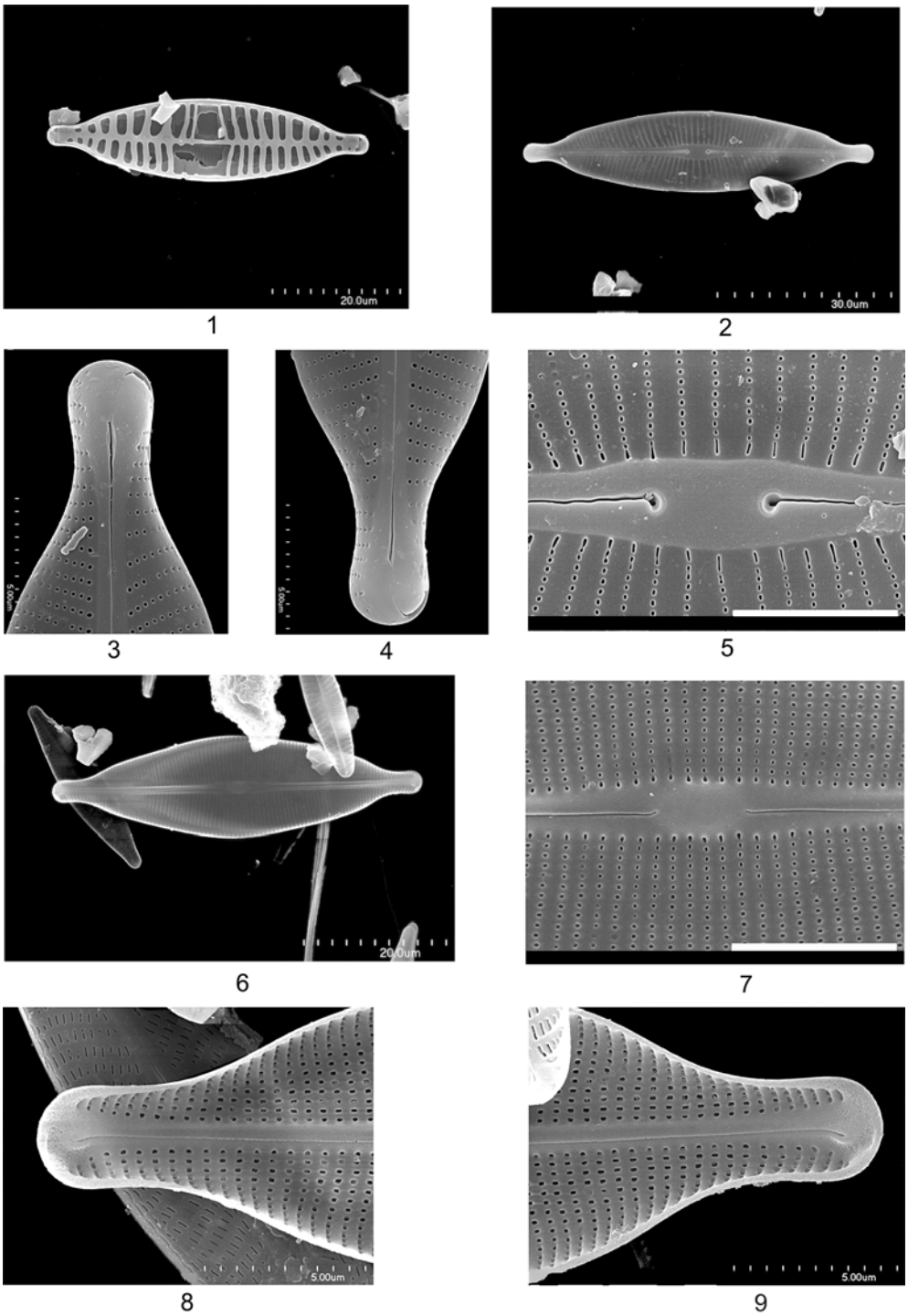


Plate 79. 1–9 – *Craticula ambigua* (Ehrenberg) D.G. Mann, internal (1, 6–9) and external (2–5) view. 1 – craticula; all SEM. Scale bars: 1, 2, 6 – 20 μm; 3–5, 7–9 – 5 μm.

DIMENSIONS. Valves 34–41 μm long and 4.6–5.8 μm wide, with 15–17 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in epipelon below Kobylany village.

DISTRIBUTION IN POLAND. Rare (Siemińska & Wołowski 2003). Spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain.

9. ***Nitzschia dissipata*** (Kützing) Grunow
Plates 41: 6–10; 98: 7, 8

Ref. Krammer & Lange-Bertalot 1988 (p. 19, Fig. 11: 1–7).

DIMENSIONS. Valves 11.0–38.4 μm long and 3.0–5.6 μm wide, with 7–10 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in periphyton and epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962; Kyselowa & Kysela 1966), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), spring of Szklarka stream (Skalska 1966a, b), ponds near Kraków, without exact localities (Hanak-Szmagier 1967), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, one of the most frequently reported diatoms from waters of moderate and high conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, meso- to eutraphentic and fresh brackish water species.

10. ***Nitzschia dubia*** W. Smith Plate 40: 21

Ref. Krammer & Lange-Bertalot 1988 (p. 55, Fig. 41: 1, 2); Witkowski *et al*. 2000 (p. 378, Fig. 190: 7, 8).

DIMENSIONS. Valves 78.4–112.0 μm long and 12–14 μm wide, with 10 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), springs of Będkówka stream (Kubik 1970.

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, especially in brackish waters (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, eutraphentic and brackish fresh water species.

11. ***Nitzschia fonticola*** Grunow *in* Cleve & Müller
Plates 40: 3–5

Ref. Krammer & Lange-Bertalot 1988 (p. 103, Fig. 75: 1–22).

DIMENSIONS. Valves 16.4–20.4 μm long and 2.8–4.2 μm wide, with 26–30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Vistula River (Uherkovich 1970).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Probably cosmopolitan and common in European waters of a broad conductivity range and oligosaprobic to β-mesosaprobic conditions (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, meso- to eutraphentic and fresh brackish water species.

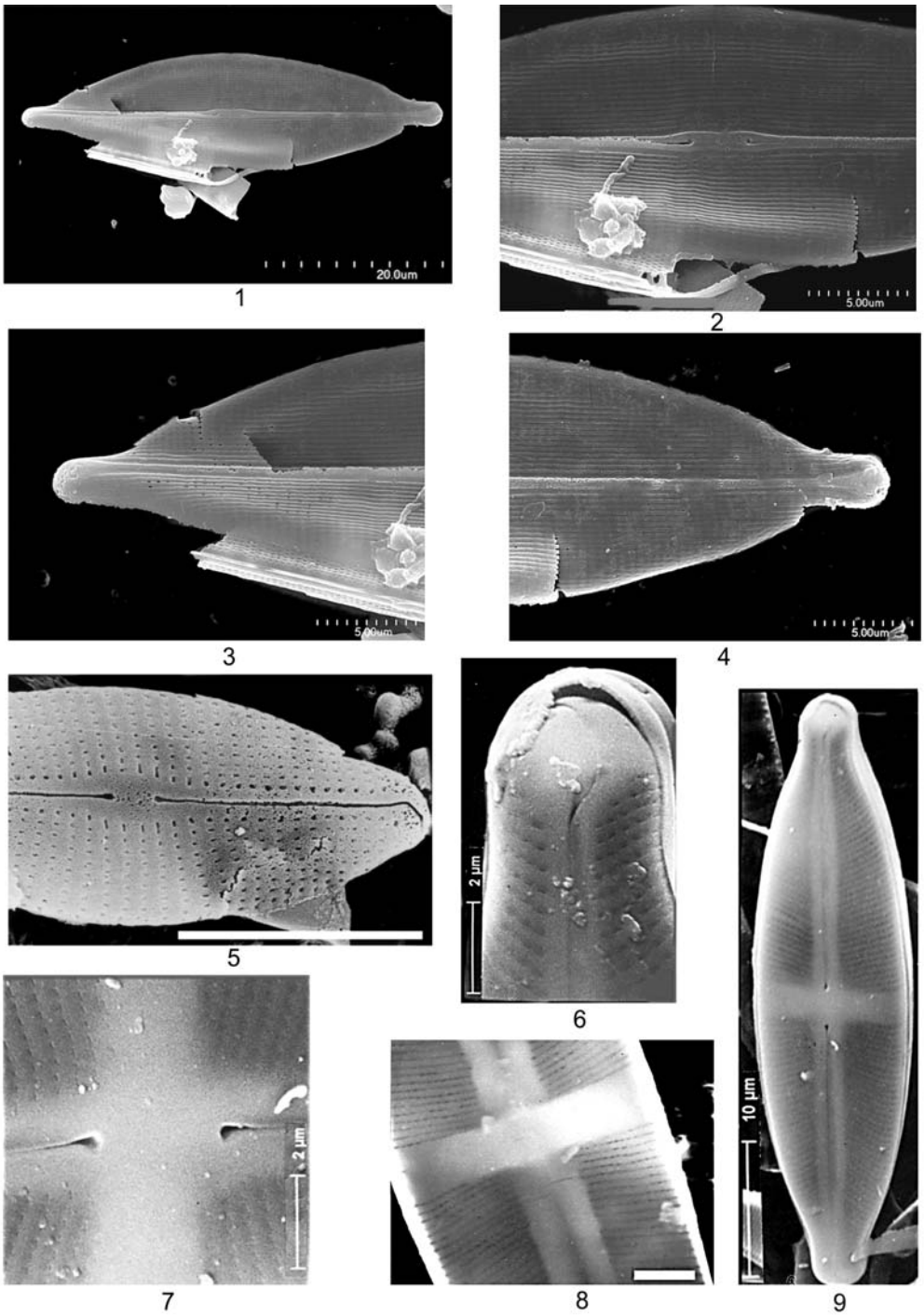


Plate 80. 1–4 – *Craticula* cf. *ambigua* (Ehrenberg) D.G. Mann, external view; 5 – *Craticula* sp., external view; 6–9 – *Stauroneis anceps* Ehrenberg, external (6–8) and internal (9) view; all SEM. Scale bars: 1 – 20 µm; 2–5, 8 – 5 µm; 6, 7 – 2 µm; 9 – 10 µm.

12. ****Nitzschia frequens** Hustedt Plate 40: 12

Ref. Hustedt 1957 (p. 348, Figs 52–54).

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DIMENSIONS. Valves 43.0–47.5 µm long and 5.5–6.0 µm wide, with 11–12 fibulae per 10 µm.

GENERAL DISTRIBUTION AND ECOLOGY. Halophilous, alkaliphilous (Hustedt 1957), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous to polysaprobous, hypereutraphentic, brackish water species occurring also in subaerial biotopes.

REMARKS. For a long time it was subsumed in a broad concept of *N. capitellata*.

13. ***Nitzschia frustulum*** (Kützing) Grunow Plate 41: 19–24

Ref. Krammer & Lange-Bertalot 1988 (p. 94, Fig. 68: 1–8).

DIMENSIONS. Valves 7.7–22.4 µm long and 2.6–3.2 µm wide, with 8.0–12.5 fibulae and *ca* 23–28 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), Vistula River (Turoboyski 1962).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan and common, especially in lakes and coastal waters (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and brackish fresh water species.

14. ***Nitzschia gracilis*** Hantzsch Plate 41: 5

Ref. Krammer & Lange-Bertalot 1988 (p. 93, Fig. 66: 1–11).

DIMENSIONS. Valves 43–67 µm long and 4.0–4.5 µm wide, with 14–16 fibulae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton, mainly above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962; Kyselowa & Kysela 1966), springs of Kobylanka stream (Skalna 1969).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Euplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, mesotraphentic strictly aquatic and fresh water species.

15. ***Nitzschia hantzschiana*** Rabenhorst Plates 41: 15, 16; 98: 3

Ref. Krammer & Lange-Bertalot 1988 (p. 101, Fig. 73: 9–18).

DIMENSIONS. Valves 12.6–28.0 µm long and 3.2–4.0 µm wide, with 8–12 fibulae and 22–24(28) striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent.

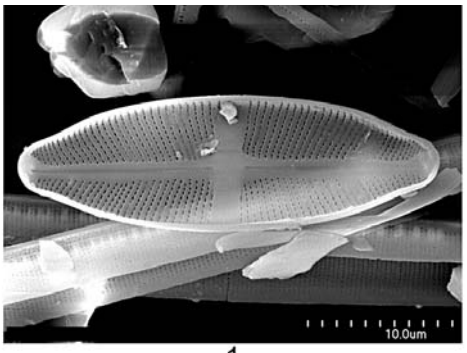
DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

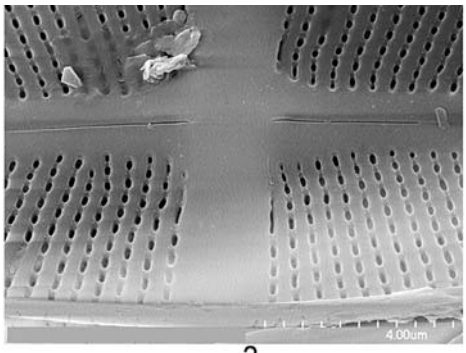
GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994),

→

Plate 81. 1–4 – *Stauroneis tackei* (Hustedt) Krammer, Lange-Bertalot, Kuesber & Metzeltin, internal view; 5–8 – *S. smithii* Grunow, internal (5–7) and external (8) view; all SEM. Scale bars: 1, 5, 8 – 10 µm; 2, 4 – 4 µm; 3 – 5 µm; 6, 7 – 3 µm.



1



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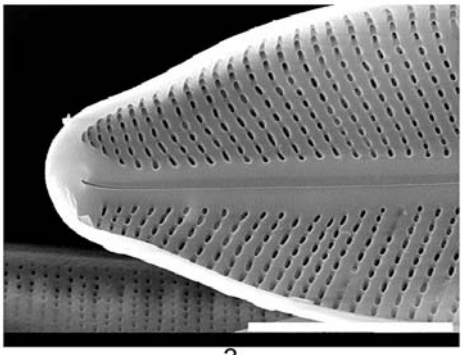

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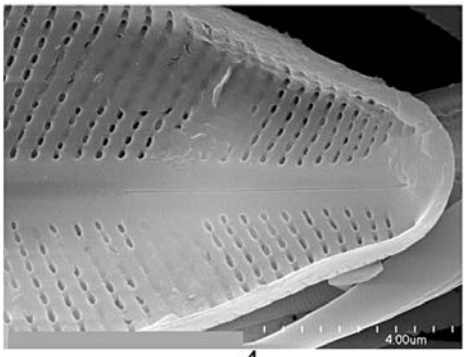

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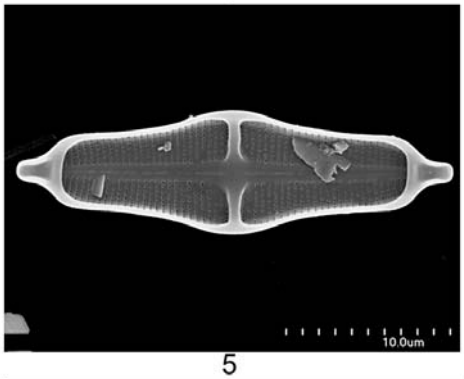

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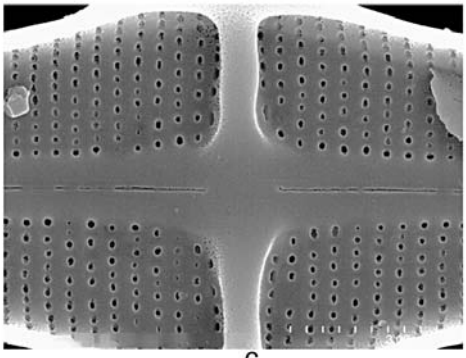

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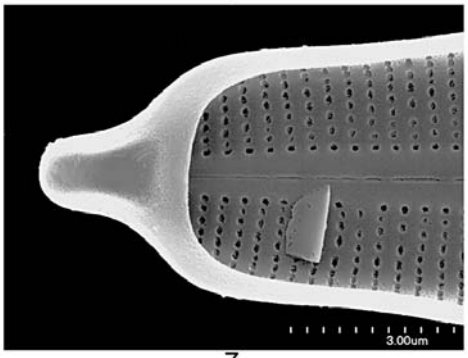

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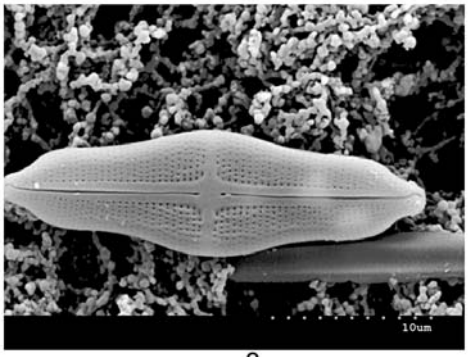


8

a neutrophilous, oligosaprobous, mesotraphentic, aerophilous and fresh water species.

REMARKS. The highest striae count was based on SEM observation.

16. **Nitzschia inconspicua* Grunow
Plate 41: 17, 18

Nitzschia frustulum var. *inconspicua* Grunow *in* Van Heurck

Ref. Krammer & Lange-Bertalot 1988 (p. 95, Fig. 69: 1–13).

DIMENSIONS. Valves 8.0–10.2 µm long and 2.6–3.4 µm wide, with 7.5–12.0 fibulae and 24.0–27.5 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), reported from, e.g., saline springs (Liebetanz 1925), nd Zatoka Pucka (Witak 2002), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common in waters of moderate and high conductivity, up to α- β-mesosaprobic zone (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and brackish fresh water species.

17. ***Nitzschia*** cf. ***intermedia*** Hantzsch
Plate 38: 4, 5

Ref. Krammer & Lange-Bertalot 1988 (p. 87, Fig. 61: 1–10).

DIMENSIONS. Valves 108.5–132.0 µm long and 4.9–6.0 µm wide, with 7–13 fibulae and 22.0–26.5 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in spring epipelon.

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), only in the vicinity of Wadowice and Maków (Gutwiński 1897) and Słowiński National Park (Bresińska-Burchardt 1972).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1988), euplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, eutraphentic, strictly aquatic and fresh brackish water species.

REMARKS. Further studies are needed for unambiguous identification.

18. ***Nitzschia linearis*** (Agardh) W. Smith var. ***linearis*** Plates 37: 1–5; 38: 1–3; 99: 3–8; 100: 1

Ref. Krammer & Lange-Bertalot 1988 (p. 69, Fig. 55: 1–4).

DIMENSIONS. Valves 58.6–114.4 µm long and 4.2–5.8 µm wide, with 8–14 fibulae and *ca* 30 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, mainly in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962; Kyselowa & Kysela 1966; Uherkovich 1970), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Cabejszek 1951; Kadłubowska 1964b), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), spring of Szklarka stream (Skalska 1966a), ponds near Kraków (Hanak-Szmagier 1967), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. One of the most frequently reported diatom, of a broad ecological spectrum, neutrophilous (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, meso- to eutraphentic and fresh brackish water species.

19. ***Nitzschia linearis*** cf. var. ***tenuis*** (W. Smith) Grunow Plate 37: 8

Nitzschia tenuis W. Smith

Ref. Krammer & Lange-Bertalot 1988 (p. 70, Fig. 55: 5, 6).

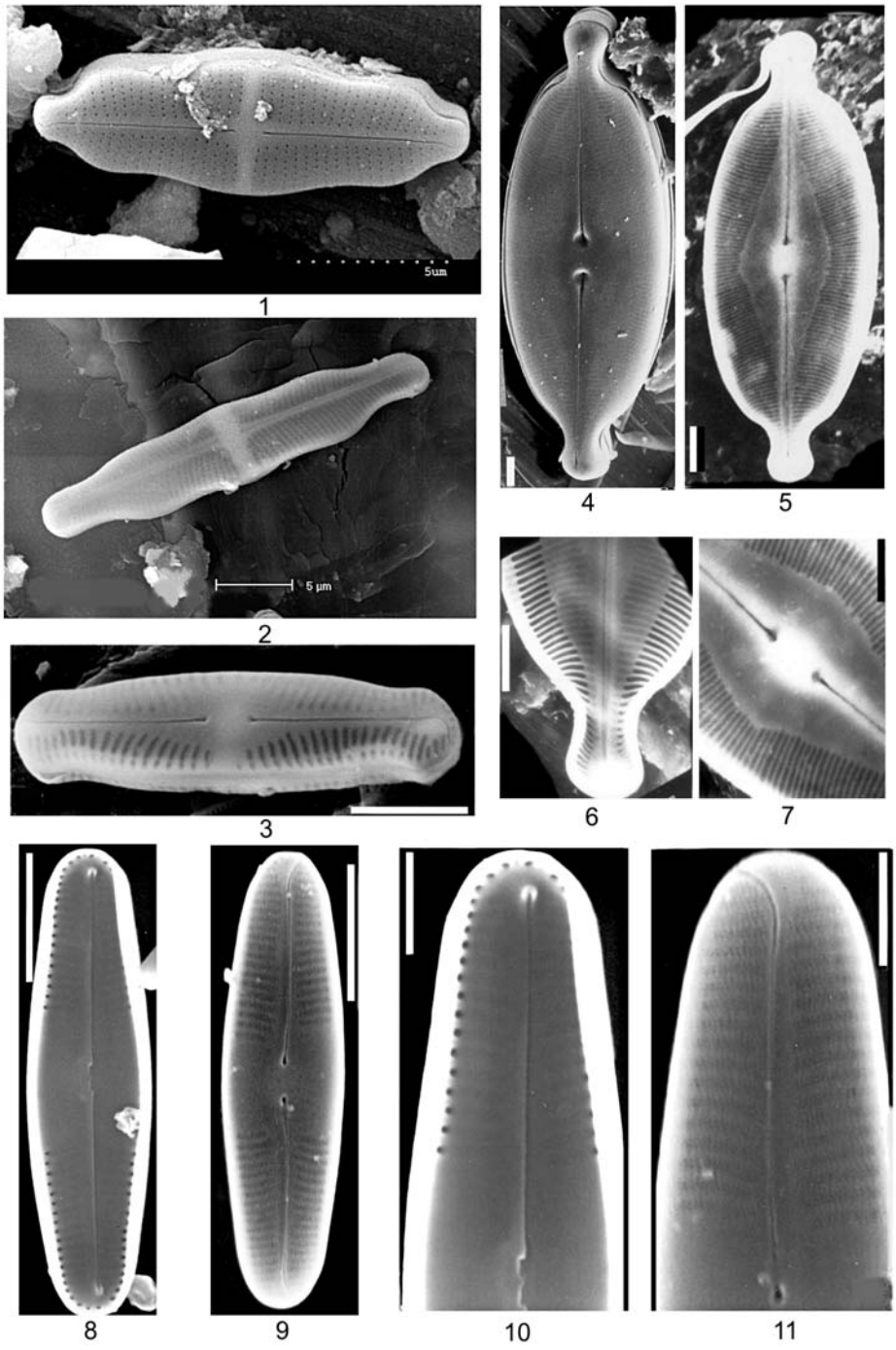


Plate 82. 1 – *Stauroneis separanda* Lange-Bertalot & Werum, external view; 2 – *S. prominula* (Grunow) Hustedt, external view; 3 – *Chamaepinnularia krookiformis* (Krammer) Lange-Bertalot & Krammer; 4–7 – *Caloneis amphisbaena* (Bory) Cleve, external (4) and internal (5–7) view; 8–11 – *C.* cf. *bacillum* (Grunow) Cleve *sensu lato*, internal (8, 10) and external (9, 11) view; all SEM. Scale bars = 5 µm.

DIMENSIONS. Valves 123.0–166.4 μm long and 5.8–6.0 μm wide, with 10–11 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Occurring in a broad trophic spectrum (Lange-Bertalot 1996). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, strictly aquatic and fresh brackish water species.

REMARKS. Further studies are needed for unambiguous identification.

20. ****Nitzschia media*** Hantzsch
Plates 41: 11, 12; 99: 1, 2

Nitzschia dissipata var. *media* (Hantzsch) Grunow

Ref. Krammer & Lange-Bertalot 1988 (p. 19, Fig. 11: 8–14); Van de Vijver *et al*. 2002 (p. 71, Fig. 127: 6–16).

DIMENSIONS. Valves 48.6–91.0 μm long and 4.2–6.0 μm wide, with 8–9 fibulae and *ca* 30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), reported from Beskid Żywiecki Mts (Gutwiński 1897), Tatra Mts (Gutwiński 1909), Soła River (Wasylik 1965) and spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Occurring in waters of a wide conductivity spectrum (Lange-Bertalot 1993). According to Van Dam *et al.* (1994), an alkaliphilous and fresh brackish water species.

REMARKS. Its distribution seems to be seriously underestimated in Poland.

21. ***Nitzschia palea*** (Kützing) W. Smith
Plate 39: 12–17

Ref. Krammer & Lange-Bertalot 1988 (p. 85, Fig. 59: 1–17).

DIMENSIONS: Valves 17.2–44.0 μm long and 2.5–5.0 μm wide, with 13–17 fibulae and *ca* 28–32 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962; Kyselowa & Kysela 1966; Uherkovich 1970), sewage ponds in Pieskowa Skała (Pudo 1978b), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), sewage ponds in Pieskowa Skała (Pudo 1978a), Biała Przemsza River (Wasylik 1985), Kluczwoda stream (Nawrat 1993), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan and common, especially in α-mesosaprobic and polysaprobic waters (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, polysaprobous, hypereutraphentic and fresh brackish water species.

22. ***Nitzschia palea*** var. ***debilis*** (Kützing) Grunow
Plate 39: 10, 11

Ref. Krammer & Lange-Bertalot 1988 (p. 86, Fig. 60: 1–7).

DIMENSIONS. Valves 24.2–33.4 μm long and 2.8–3.8 μm wide. Valves with 13–16 fibulae and *ca* 30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sanka stream (Kądziołka 1963).

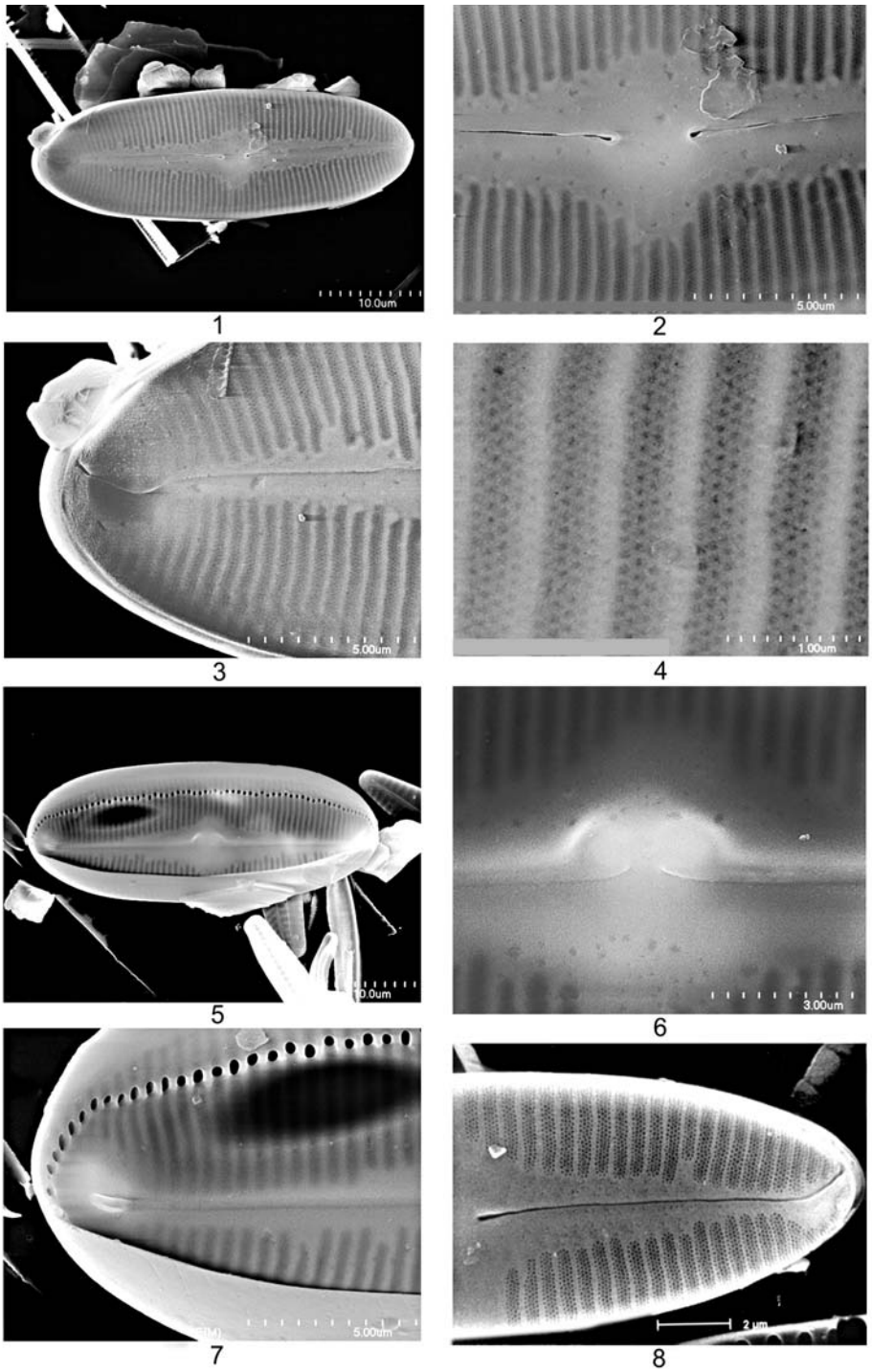


Plate 83. 1–7 – *Caloneis silicula* (Ehrenberg) Cleve, external (1–4) and internal (5–7) view; 8 – *C.* cf. *silicula*, external view; all SEM. Scale bars: 1, 5 – 10 µm; 2, 3, 7 – 5 µm; 4 – 1 µm; 6 – 3 µm; 8 – 2 µm.

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), reported from Pieniny Mts (Filarszky 1899), Morskie Oko lake in Tatra Mts (Gutwiński 1914), raised peat bog near Nowy Targ (Wojtal *et al*. 1999).

GENERAL DISTRIBUTION AND ECOLOGY. According to Krammer and Lange-Bertalot (1988), the optimal ecological conditions for *N. palea* var. *debilis* are oligotrophic waters of low conductivity, tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, oligotraphentic and fresh water species.

23. ***Nitzschia*** cf. ***paleacea*** (Grunow) Grunow *in* Van Heurck Plate 40: 7, 8

Ref. Krammer & Lange-Bertalot 1988 (p. 114, Fig. 81: 1–7).

DIMENSIONS. Valves 23.0–32.5 μm long and 2.8–3.8 μm wide, with 18.5–19.0 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan and very common in eutrophic waters of moderate or high conductivity (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species.

REMARKS. For unambiguous identification further studies are needed.

24. ***Nitzschia*** cf. ***perminuta*** (Grunow) Peragallo Plate 98: 4

Nitzschia palea var. *perminuta* Grunow *in* Cleve & Grunow

Ref. Krammer & Lange-Bertalot 1988 (p. 99, Fig. 72: 1–15, 17–23a).

DIMENSIONS. Valves 7.5–25.8 μm long and (2.2)2.5–3.4 μm wide, with 11–15 fibulae and 26–29 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN POLAND. Dam reservoir in southern Poland (Wojtal *et al.* 2005).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread, preferring probably oligosaprobic waters of low or moderate conductivity (Krammer & Lange-Bertalot 1988). According to Lange-Bertalot (1996), occurring in oligotrophic and eutrophic waters. According to Van Dam *et al.* (1994), an alkaliphilous, oligosaprobous, oligo- to mesotraphentic and fresh brackish water species.

REMARKS. Further studies are needed for unambiguous identification.

25. **Nitzschia pura* Hustedt Plate 39: 18, 19

Ref. Krammer & Lange-Bertalot 1988 (p. 75, Fig. 58: 1–9); Lange-Bertalot & Genkal 1999 (Fig. 70: 4, 5).

DIMENSIONS. Valves 34.2–46.8 μm long and 4.1–4.8 μm wide, with 16–18 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epipelon above Kobylany village.

DISTRIBUTION IN POLAND. Pieniny Mts (Mrozińska 1992), Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Commonly reported diatom in oligotrophic and eutrophic waters (Lange-Bertalot 1996), occurring in waters up to β-mesosaprobic, of high conductivity (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), an oligosaprobous and fresh brackish water species.

26. **Nitzschia pusilla* Grunow Plates 40: 16–18; 98: 5, 6

Ref. Krammer & Lange-Bertalot 1988 (p. 111, Fig. 79: 12–15).

DIMENSIONS. Valves 8.8–16.0 μm long and 2.5–4.0 μm wide, with 16–18 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse,

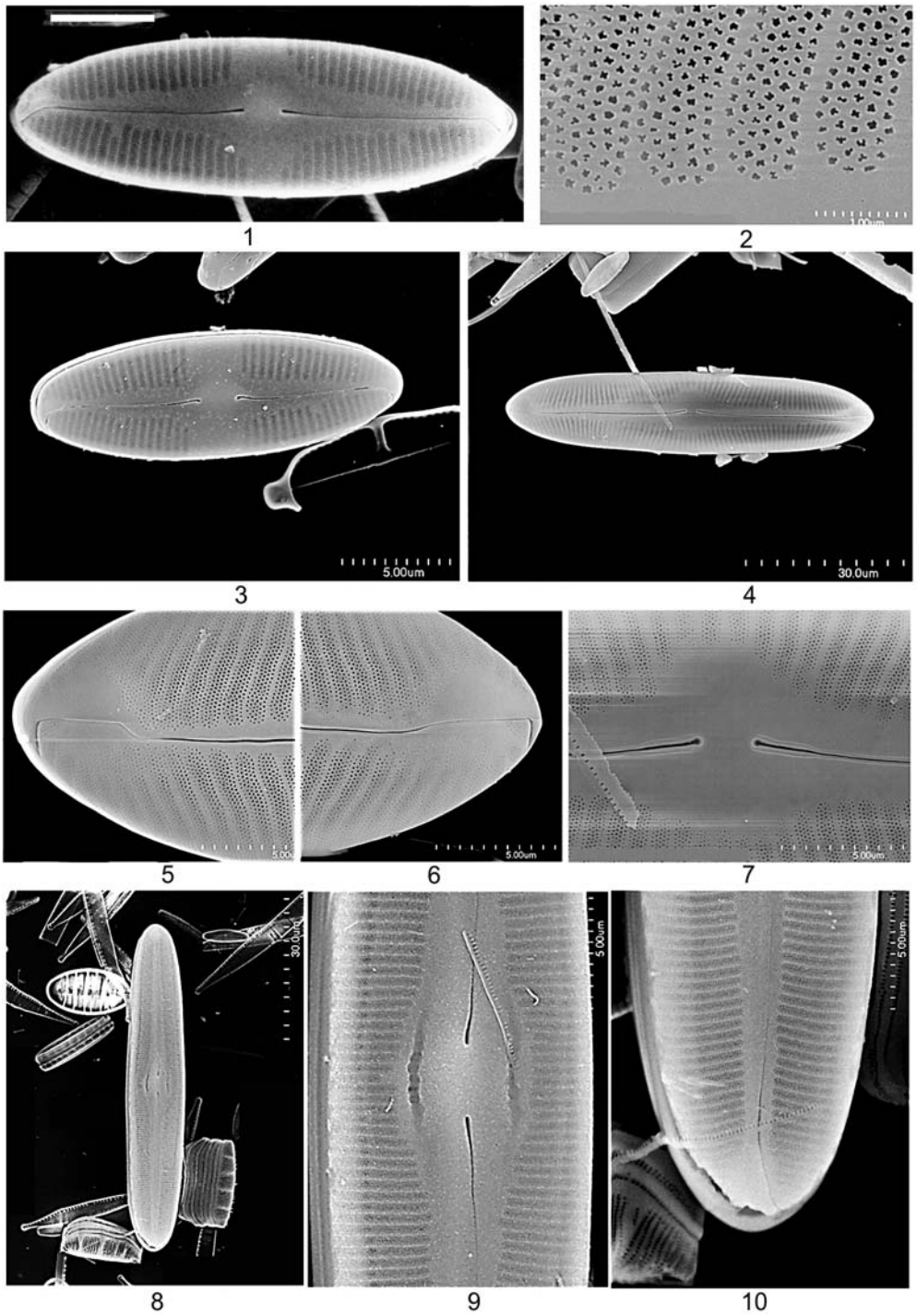


Plate 84. 1–7 – *Caloneis* cf. *silicula* (Ehrenberg) Cleve, external view; 8–10 – *C.* cf. *alpestris* (Grunow) Cleve, external view; all SEM. Scale bars: 1, 3, 5–7, 9, 10 – 5 µm; 2 – 1 µm; 4, 8 – 30 µm.

in epipelon and periphyton above Kobylany village.

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), reported only from Ciechocinek vicinity (Kozłowski 1890) and spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan and common diatom, of a wide ecological tolerance, eutraphentic (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, eurytraphentic and fresh brackish water species.

27. ***Nitzschia recta*** Hantzsch *in* Rabenhorst Plate 38: 6–8

Ref. Krammer & Lange-Bertalot 1988 (p. 20, Fig. 12: 1–11).

DIMENSIONS. Valves 37.6–66.2 μm long and 3.7–4.8 μm wide, with 7–8 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), spring of Szklarka stream (Skalska 1966a), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Euplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eurytraphentic, strictly aquatic and fresh brackish water species.

28. ***Nitzschia sigma*** (Kützing) W. Smith Plate 36: 10, 11

Ref. Krammer & Lange-Bertalot 1988 (p. 32, Figs 23: 1–9; 24: 1).

DIMENSIONS. Valves 86.8–284.0 μm long and 7.8–10.0 μm wide, with 8–12 fibulae and 22–25 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and brackish water species.

29. ***Nitzschia sigmoidea*** (Nitzsch) W. Smith Plates 36: 6–9; 101: 1–5

Ref. Krammer & Lange-Bertalot 1988 (p. 12, Figs 4: 1, 2; 5: 1–5).

DIMENSIONS. Valves 134.0–180.2 μm long and 8.2–11.0 μm wide, with 7 fibulae and *ca* 26–27 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966), pond in Mydlniki (Engelhorn 1939), Młynówka stream (Gumiński 1947), Pilica River (Kadłubowska 1964a, b, c).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom common in mesotrophic and eutrophic waters of moderate and high conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

30. **Nitzschia sociabilis* Hustedt Plate 39: 1–6

Ref. Krammer & Lange-Bertalot 1988 (p. 119, Fig. 83: 1–9).

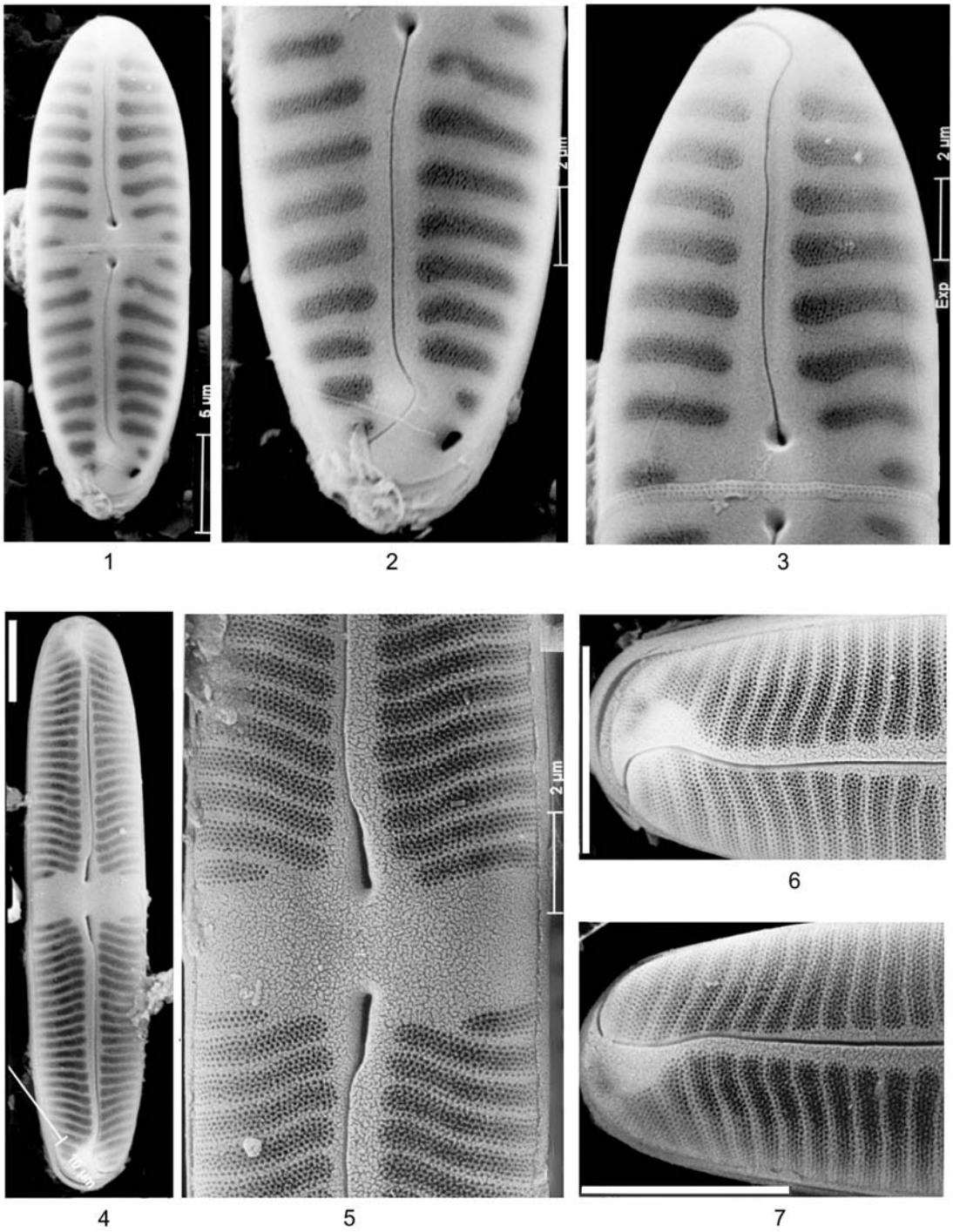


Plate 85. 1–3 – *Pinnularia borealis* Ehrenberg, external view; 4–7 – *P.* cf. *microstauron* (Ehrenberg) Cleve, external view; all SEM. Scale bars: 1, 4, 6, 7 – 5 µm; 2, 3, 5 – 2 µm.

DIMENSIONS. Valves 22.8–45.2 μm long and 3.4–4.6 μm wide, with 10–12 fibulae and 26–27 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003). Spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Probably a cosmopolitan diatom, especially common in waters of moderate to very high conductivity (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

31. ***Nitzschia sublinearis*** Hustedt

Plate 39: 20, 21

Ref. Krammer & Lange-Bertalot 1988 (p. 74, Fig. 58: 10–15).

DIMENSIONS. Valves 44.2–56.0 μm long and 4.0–4.8 μm wide, with 15–16 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), springs of Będkówka stream (Kubik 1970), springs of Kobylanka stream (Skalna 1969).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Reported from electrolyte-rich waters, up to β-mesosaprobic (Krammer & Lange-Bertalot 1988).

32. ***Nitzschia subtilis*** Grunow *in* Cleve & Grunow

Plate 37: 6, 7

Nitzschia linearis var. *subtilis* (Grunow) Hustedt

Ref. Krammer & Lange-Bertalot 1988 (p. 71, Fig. 55: 7–10).

DIMENSIONS. Valves 39.6–64.4 μm long and 3.1–4.8 μm wide, with 10–14 fibulae and *ca* 30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain.

REMARKS. *Nitzschia subtilis* (syn. *N. linearis* var. *subtilis*) generally is not noted as an independent entity. Its distribution, autecology, morphology and taxonomy need further studies and clarification.

33. **Nitzschia supralitorea*** Lange-Bertalot

Plate 40: 6

Ref. Krammer & Lange-Bertalot 1988 (p. 97, Fig. 70: 14–21).

DIMENSIONS. Valves 19.6–22.8 μm long and 2.8–3.8 μm wide, with 14–16 fibulae and *ca* 30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epipelon and periphyton.

DISTRIBUTION IN POLAND. Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, especially common in eutrophic waters of moderate and high conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, α-mesosaprobous, eutraphentic, aerophilous and fresh brackish water species.

34. ***Nitzschia tubicola*** Grunow

Plate 40: 13, 14

Ref. Krammer & Lange-Bertalot 1988 (p. 90, Fig. 63: 8–13; 64: 1–16).

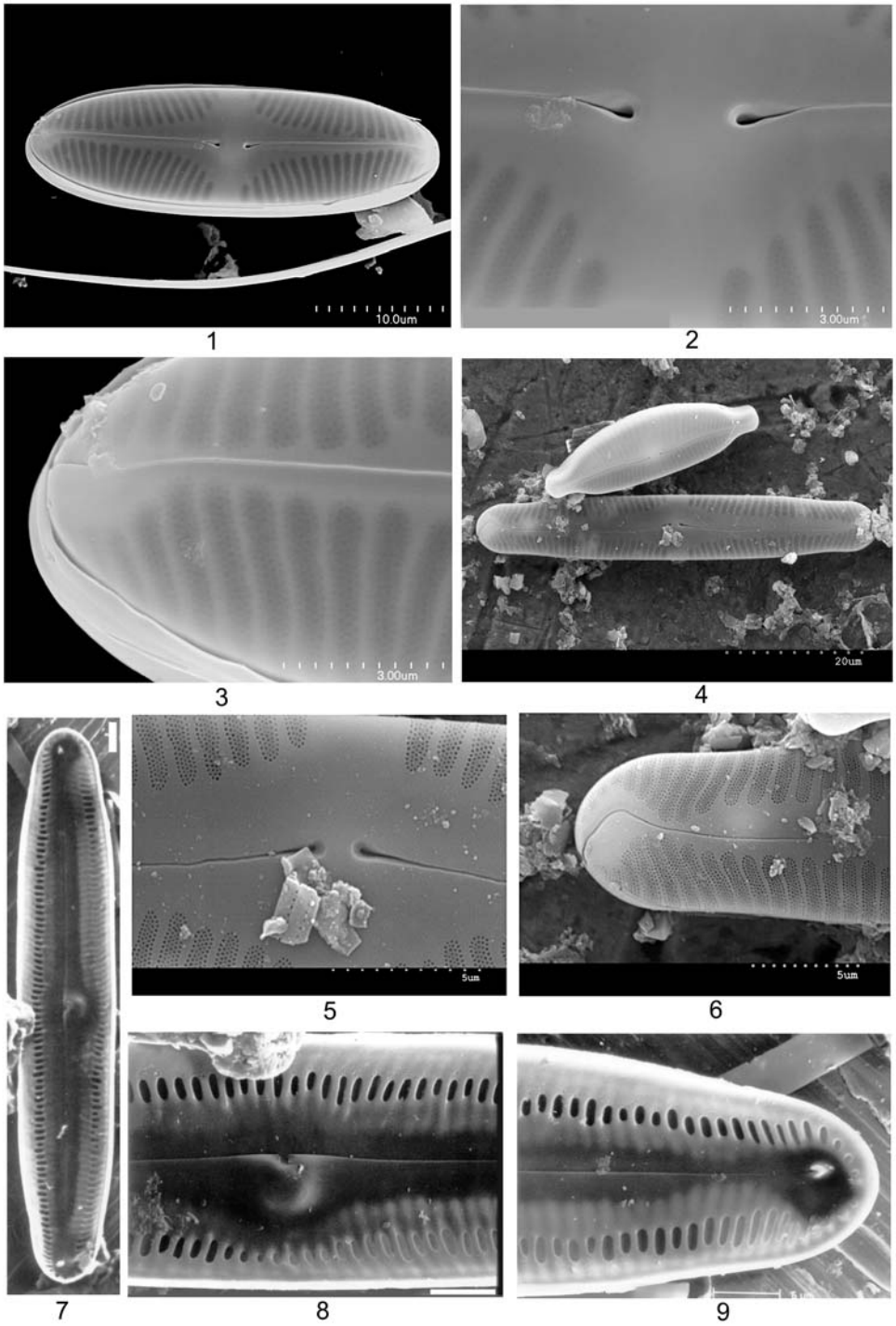


Plate 86. 1–3 – *Pinnularia brebissonii* (Kützing) Rabenhorst, external view; 4–6 – *Pinnularia* sp. 2, external view; 7–9 – *Pinnularia* sp. 3, internal view; all SEM. Scale bars: 1 – 10 μm; 2, 3 – 3 μm; 4 – 20 μm; 5–9 – 5 μm.

DIMENSIONS. Valves 24.6–30.2 μm long and 5–6 μm wide, with 12–13 fibulae and *ca* 30–34 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon below Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, especially common in brackish water (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991).

35. ***Nitzschia vermicularis*** (Kützing) Hantzsch *in* Rabenhorst Plates 36: 1–5; 100: 2–8

Ref. Krammer & Lange-Bertalot 1988 (p. 14, Figs 4: 4, 5; 7: 1–7; 8: 1, 2).

DIMENSIONS. Valves 84.2–96.6 μm long and 3.6–4.6 μm wide, with *ca* 8.0–9.5 fibulae per 10 μm and *ca* 30 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1956, 1962), Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Probably cosmopolitan, occurring in oligotrophic and slightly eutrophic waters of moderate or high conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eurytraphentic and fresh brackish water species.

36. ***Nitzschia*** sp. Plate 39: 7–9

DIMENSIONS. Valves 38.5–46.5 μm long and 4.0 μm wide, with 10.0–11.5 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton above Kobylany village.

REMARKS. The specimens found resemble diatoms from the group around *N. recta* Hantzsch/*N. rectiformis* Hustedt. For unambiguous identification further study is needed.

48. ***Pinnularia*** Ehrenberg

1. ***Pinnularia appendiculata*** (Agardh) Cleve Plate 26: 10

Ref. Krammer & Lange-Bertalot 1986 (p. 427, Fig. 193: 19–29); Krammer 2000 (p. 121, Fig. 91: 1–7, 10, 11, 33, 36).

DIMENSIONS. Valves 18.2–19.8 μm long and 4.4–4.6 μm wide, with 19–20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with mosses.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an acidophilous, oligosaprobous, oligo-mesotraphentic, aerophilous and fresh water species.

2. ***Pinnularia borealis*** Ehrenberg Plates 26: 11–13; 85: 1–3

Ref. Krammer & Lange-Bertalot 1986 (p. 405); Krammer 2000 (p. 24, Fig. 7: 6–13).

DIMENSIONS. Valves 22.0–25.5 μm long and 8.5–9.2 μm wide, with *ca* 6–8 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), caves (Mrozińska-Broda & Czerwik-Marcinkowska 2004).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

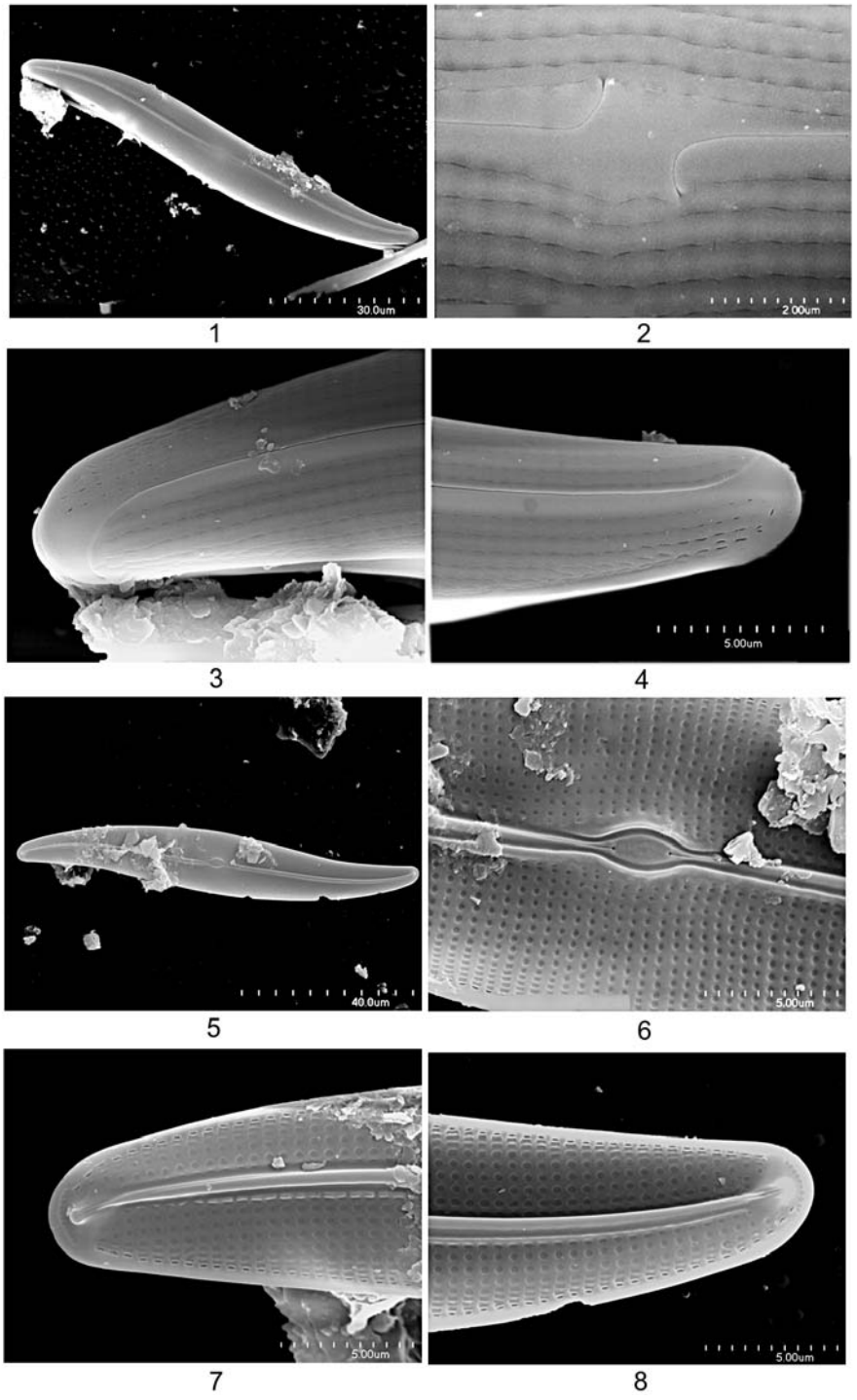


Plate 87. 1–8 – *Gyrosigma acuminatum* (Kützing) Rabenhorst, external (1–4) and internal (5–8) view; all SEM. Scale bars: 1 – 30 μm; 2 – 3 μm; 3, 4, 6–8 – 5 μm; 5 – 40 μm.

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, aerophilous (Krammer & Lange-Bertalot 1986; Krammer 2000). According to Van Dam *et al*. (1994), a neutrophilous, β-mesosaprobous, oligomesotraphentic, fresh brackish water diatom.

3. ***Pinnularia brebissonii*** (Kützing) Rabenhorst
Plates 26: 15–19; 86: 1–3

Pinnularia microstauron var. *brebissonii* (Kützing) Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 426, Fig. 191: 7–9); Krammer 2000 (p. 69, Figs 45: 1–17; 48: 15–17; 49: 4–9).

DIMENSION. Valves 26.4–50.0 μm long and 8.2–11.2 μm wide, with 8.5–14.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), a neutrophilous, α-mesopolysaprobous, eutraphentic, fresh brackish water diatom. Waters of moderate or high electrolyte concentration, including brackish coastal waters (Krammer 2000).

4. *****Pinnularia frequentis*** Krammer
Plate 26: 20, 21

Pinnularia rupestris sensu Krammer 1992

Ref. Krammer 2000 (p. 132, Fig. 104: 1–8).

DIMENSION. Valves 55–65 μm long and 11.5–12.0 μm wide, with 10.0–10.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

GENERAL DISTRIBUTION AND ECOLOGY. According to Krammer (2000), widespread and abundant in Central European streams, in oligotrophic and mesotrophic waters with low to average conductivity.

5. *****Pinnularia isselana*** Krammer
Plate 27: 1–7

Ref. Krammer 2000 (p. 132, Fig. 103: 1–20).

DIMENSION. Valves 24.0–33.7 μm long and 6.9–8.2 μm wide, with 11–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

GENERAL DISTRIBUTION AND ECOLOGY. According to Krammer (2000), *Pinnularia isselana* is widespread and abundant in swamps and ponds and occurs in large populations in oligotrophic waters with average conductivity.

REMARKS. Distinctly smaller representatives (Plate 27: 2–7) identified as *Pinnularia* cf. *isselana* were more common but never abundant.

6. *****Pinnularia kuetzingii*** Krammer
Plate 27: 8

Pinnularia appendiculata sensu Cleve

Ref. Krammer 2000 (p. 120, Fig. 91: 8, 9, 12–21).

DIMENSIONS. Valves 24 μm long and 4.8 μm wide, with 18 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in periphyton above Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Rarely occurring in great numbers, known only from localities with water of average to higher conductivity, including thermal springs (Krammer 2000).

7. ***Pinnularia microstauron*** (Ehrenberg) Cleve
Plates 26: 14; 85: 4–7

Ref. Krammer & Lange-Bertalot 1986 (p. 425, Fig. 191: 1–6); Krammer 2000 (p. 73, Figs 50: 1–12; 52: 14–20; 55: 3–6).

DIMENSIONS. Valves 34.5–44.0 μm long and 9.0–10.4 μm wide, with 11–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon, especially below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka

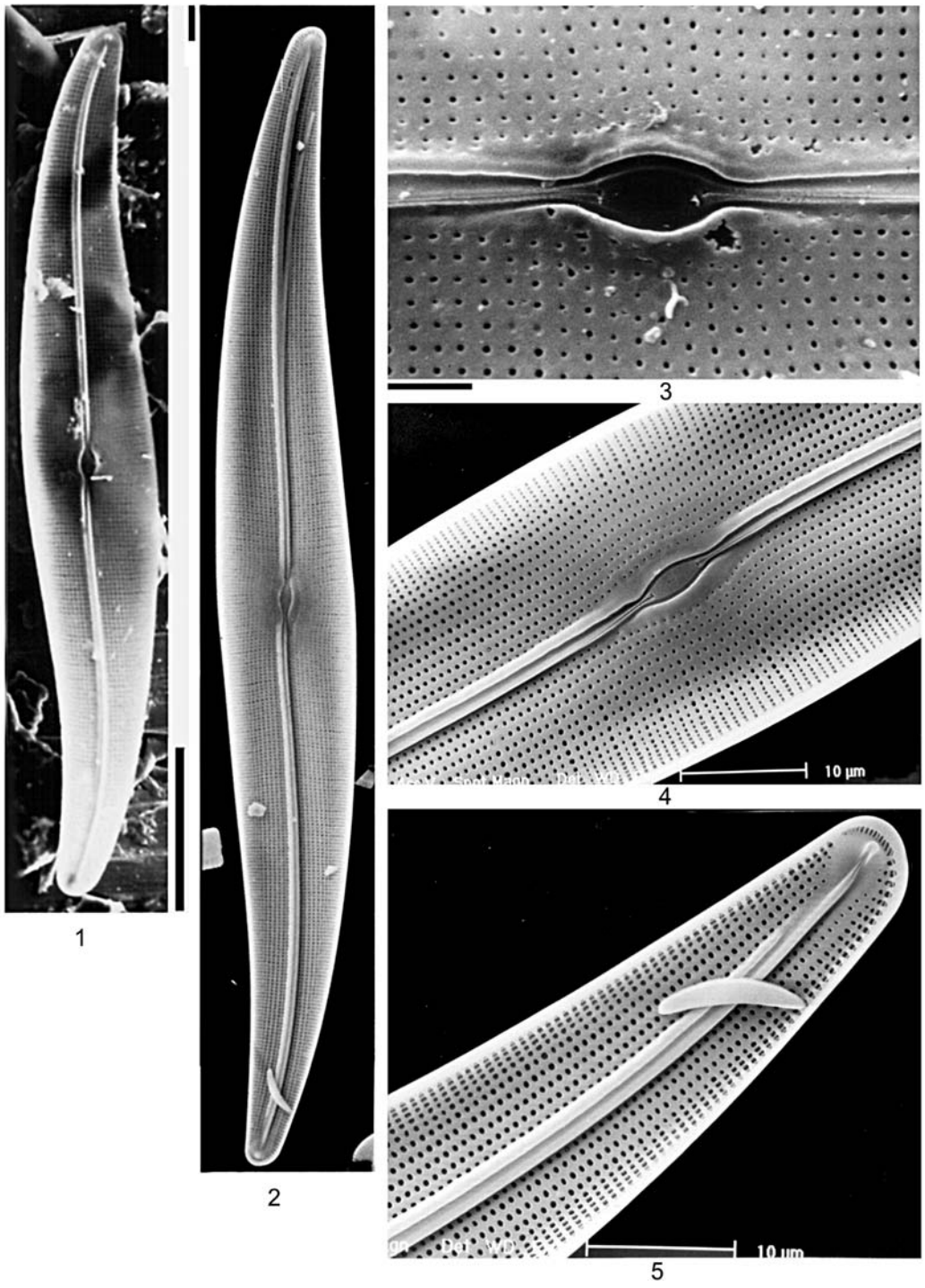


Plate 88. 1, 3 – *Gyrosigma acuminatum* (Kützing) Rabenhorst, internal view; 2, 4, 5 – *G. attenuatum* (Kützing) Rabenhorst, internal view; all SEM. Scale bars: 1, 2, 4, 5 – 10 µm; 3 – 2 µm.

1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Krammer (2000), an oligotraphentic, oligosaprobous diatom, occurring in cold, oxygen-rich, waters with low conductivity. According to Van Dam *et al*. (1994), a neutrophilous, β-mesosaprobous, eurytraphentic and fresh brackish water species.

8. ***Pinnularia neomajor*** Krammer var. ***neomajor*** Plate 28: 1, 2

Pinnularia neomajor Krammer morf. I 1992; *P. maior sensu* Cleve *non* Rabenhorst; *P. major* (Kützing) Cleve

Ref. Krammer 1992 (p. 150, Figs 6: 1–4; 62: 1–5; 63: 1); Krammer 2000 (p. 165, Figs 163: 1; 170: 3; 172: 1–4; 173: 1–6).

DIMENSIONS. Valves 170.8–167.5 µm long and 26.6–28.9 µm wide, with 6–7 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epipelon, sometimes in samples with *Vaucheria* sp.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1956), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. *Pinnularia major* is a name very commonly reported (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer 2000).

9. **Pinnularia obscura* Krasske Plate 27: 9–11

Ref. Krammer & Lange-Bertalot 1986 (p. 420, Fig. 185: 20–23); Krammer 2000 (p. 50, Fig. 13: 10–27).

DIMENSIONS. Valves 16.8–22.8 µm long and 4.0–4.5 µm wide, with 10–12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in epipelon above Kobylany village.

DISTRIBUTION IN POLAND. Reported from, e.g., peat bog in Kraków (Rumek 1946), Cieszyn vicinity (Huk 1973), Rawka River (Rakowska 1990, 2001), peat bog in Świętokrzyskie Mts (Czerwik-Marcinkowska & Mrozińska-Broda 2001), Tatra Mts lakes (Kawecka & Galas 2003), Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991). Cosmopolitan, aerophilous diatom (Krammer 2000). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous and fresh brackish water species.

10. ***Pinnularia*** cf. ***peracuminata*** Krammer Plate 27: 17

Ref. Krammer 2000 (p. 157, Fig. 142: 1–10).

DIMENSIONS. Valves 65.5–79.0 µm long and 12.4–13.0 µm wide, with *ca* 12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in epipelon from a sample above Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Known from mountain brooks and aerial biotopes (Krammer 2000).

REMARKS. The observed valves were distinctly cuneate with relatively many striae per 10 µm. Striae radiate in the central valve portion, becoming convergent toward the apices. Further studies are needed for unambiguous identification.

11. **Pinnularia septentrionalis* Krammer Plate 27: 14–16

Navicula mesolepta var. *stauroneiformis* Grunow; *Pinnularia mesolepta* var. *stauroneiformis* (Grunow) Gutwiński

Ref. Krammer 2000 (p. 103, Figs 82: 1–6; 83: 7).

DIMENSIONS. Valves 50.0–62.2 µm long and 10–12 µm wide, with 10 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

DISTRIBUTION IN POLAND. According to Siemińska and Wołowski (2003), *Navicula mesolepta*

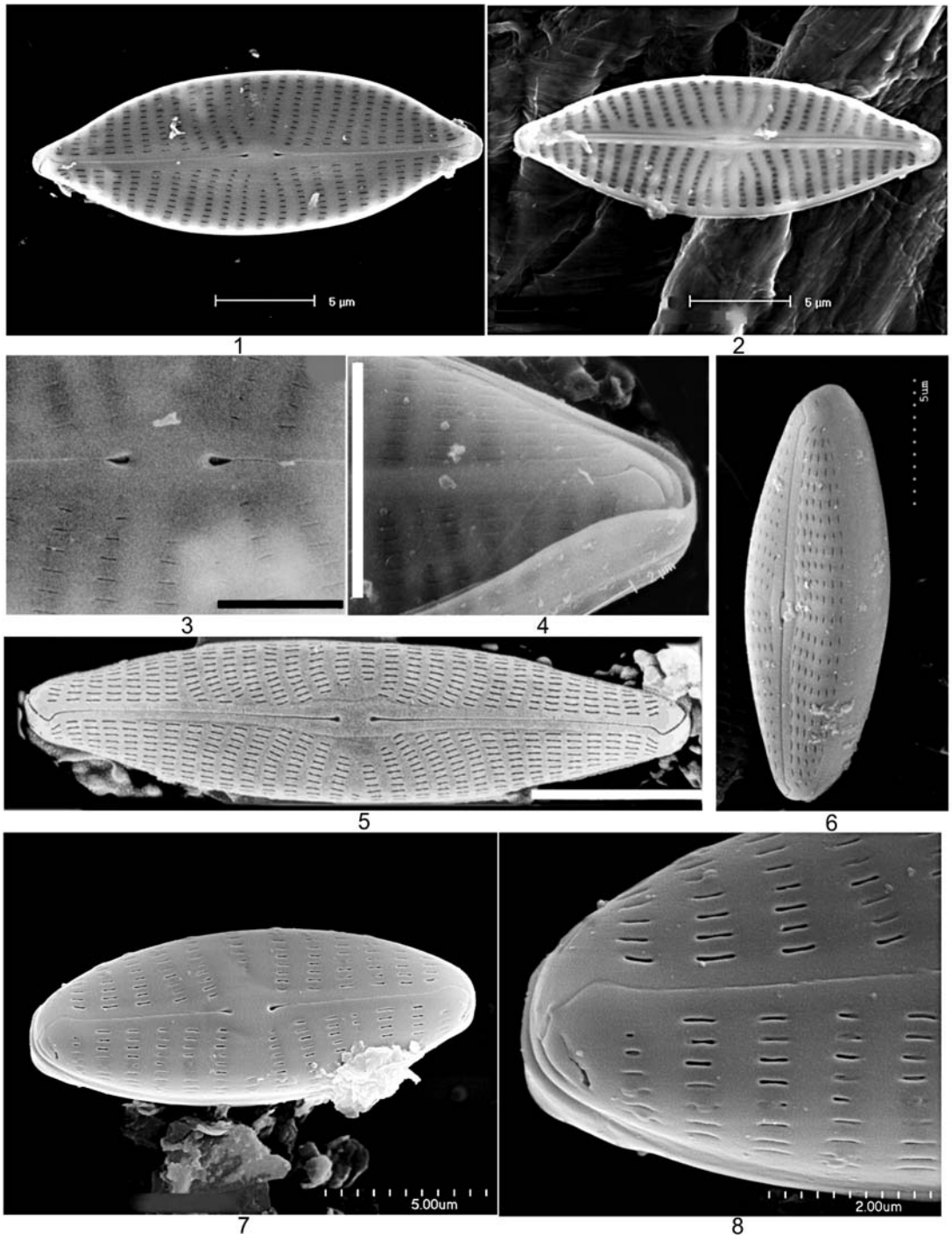


Plate 89. 1–4 – *Navicula* cf. *antonii* Lange-Bertalot, external (1, 3, 4) and internal (2) view; 5 – *N. cryptotenella* Lange-Bertalot, external view; 6 – *N.* cf. *cryptotenelloides* Lange-Bertalot, external view; 7, 8 – *N. cincta* (Ehrenberg) Ralfs, external view; all SEM. Scale bars: 1–7 – 5 µm; 8 – 2 µm.

var. *stauroneiformis* and *Pinnularia mesolepta* var./f. *stauroneiformis* are among the diatoms rarely reported in Poland.

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain. According to Krammer (2000), the species was identified as *P. mesolepta* (Ehrenberg) W. Smith previously.

REMARKS. *Pinnularia mesolepta* which belongs to the large taxonomic complex was reported from the Wyżyna Krakowsko-Częstochowska upland from fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962; Kyselowa & Kysela 1966), Sanka stream (Kądziołka 1963; Hojda 1971), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970) and very commonly reported from Poland. To exclude or confirm whether the diatom reported by these authors is conspecific with the species identified from the Kobylanka stream material re-examination of the material is needed.

12. *****Pinnularia subcomutata*** Krammer
Plates 26: 22; 27: 18

Pinnularia rupestris Hantzsch *sensu* Krammer 1992 *pro parte*

Ref. Krammer 2000 (p. 140, Figs 119: 1–5, 120: 6–11).

DIMENSIONS. Valves 32–83 μm long and 10.0–13.4 μm wide. Length/width ratio *ca* 4.7. Valves with 9–12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

GENERAL DISTRIBUTION AND ECOLOGY. Moderate to abundant occurrence in Central Europe in oligotrophic to mesotrophic waters of low or moderate conductivity (Krammer 2000).

13. ***Pinnularia*** cf. ***subgibba*** Krammer
Plate 27: 19

Ref. Krammer 2000 (p. 84, Figs 64: 1–11; 65: 14; 66: 3–7; 72: 2–6).

DIMENSIONS. Valves 59.0–86.6 μm long and 9.5–10.0 μm wide, with 9–11 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in epipelon.

DISTRIBUTION IN POLAND. Regarded as endangered in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan. Not rare in Central and Northern Europe (Krammer 2000).

REMARKS. Further studies are needed for precise identification.

14. ***Pinnularia viridiformis*** Krammer
Plate 28: 3, 4

Pinnularia viridis var. *minor* Cleve

Ref. Krammer 1992 (p. 160, Figs 1: 4; 4: 1–4; 68: 1–4; 69: 1–5); Krammer 2000 (p. 167, Figs 138: 1–5; 160: 1–4; 161: 1–4; 162: 1–4; 163: 3, 4; 164: 1–4; 165: 1–6; 166: 1–4; 167: 1–5; 168: 1–9; 170: 1).

DIMENSIONS. Valves 87–118 μm long and 16–21 μm wide, with 8–9 striae per 10 μm.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN POLAND. Regarded as endangered in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, one of the most common oligo-mesotraphentic species in waters of low or moderate conductivity (Krammer 2000).

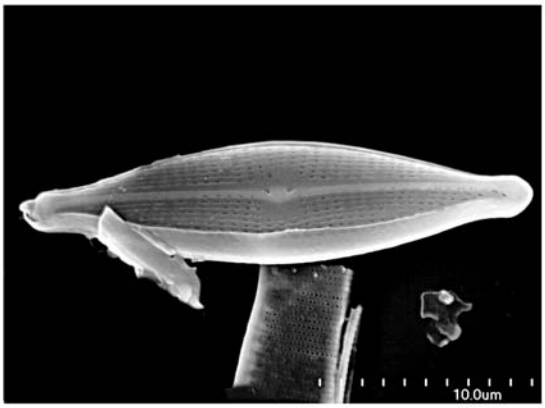
REMARKS. Presumably its occurrence is underestimated in Poland and was reported previously as *Pinnularia viridis* Ehrenberg.

15. ***Pinnularia*** sp. 1 Plate 27: 12, 13

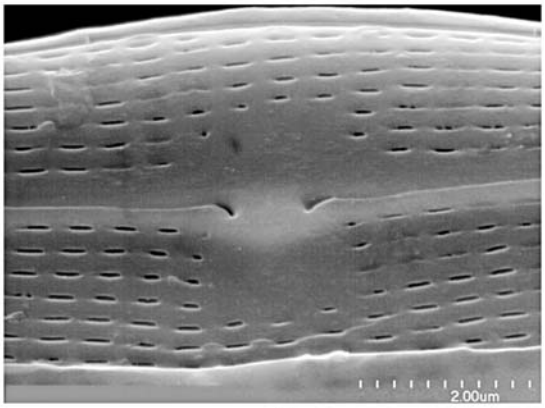
DIMENSIONS. Valves 14.0–18.5 μm long and 3.5 μm wide, with *ca* 20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with mosses.

REMARKS. Dimensions and striae density correspond to *P. silvatica sensu* Krammer 2000, but



1



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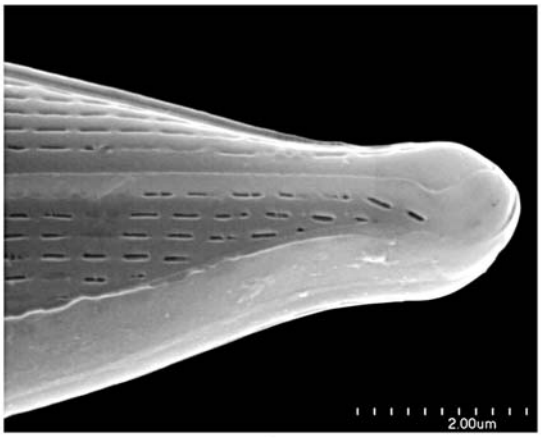

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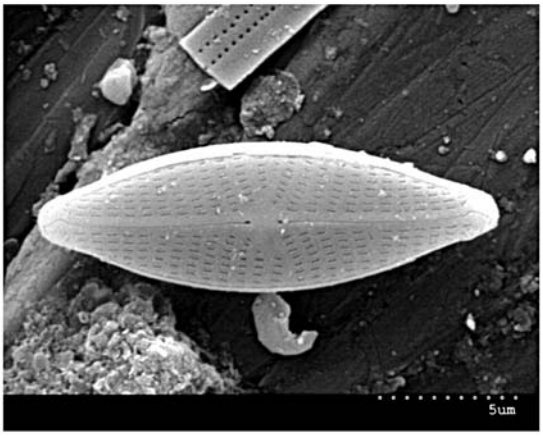

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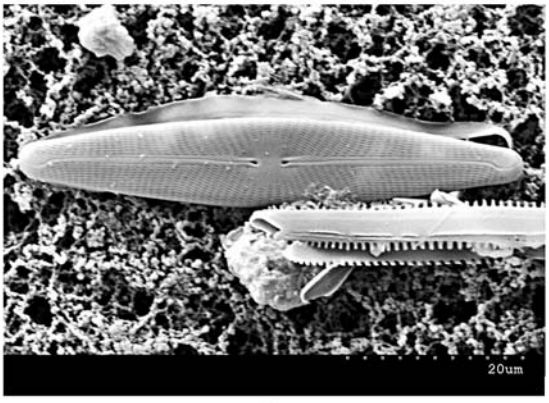

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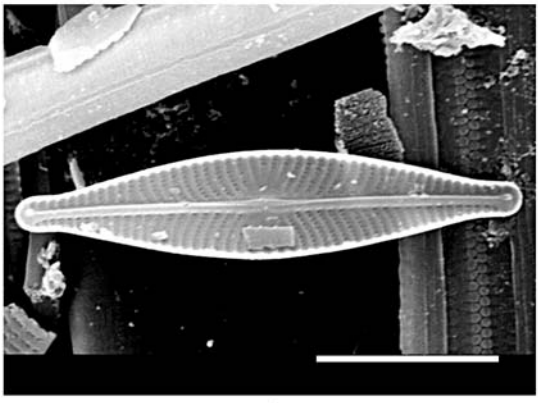


6

Plate 90. 1–3 – *Navicula gregaria* Donkin, external view; 4 – *N. reichardtiana* Lange-Bertalot; 5 – *N. lanceolata* (Agardh) Ehrenberg, external view; 6 – *N. cryptocephala* Kützing, internal view; all SEM. Scale bars: 1, 6 – 10 μm; 2, 3 – 2 μm; 4 – 5 μm; 5 – 20 μm.

its outline and large fascia reaching the valve margins resemble rather *P. schoenfelderi* Krammer or *P. obscura* Krasske.

16. ***Pinnularia*** sp. 2 Plate 86: 4–6

DIMENSIONS. Valves 111 μm long and 20 μm wide, with *ca* 5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in epipelon.

REMARKS. Further studies are needed for precise identification.

49. ***Placoneis*** Mereschkovsky

1. ***Placoneis anglica*** (Gregory) Cox
Plate 15: 23, 24

Navicula anglica Ralfs

Ref. Cox 2003 (p. 64, Figs 59–62).

DIMENSIONS. Valves 19.6–26.2 μm long and 7.8–9.0 μm wide, with 10.0–11.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and metaphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Vistula River (Turoboyski 1962), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. According to Cox (2003), *Placoneis anglica* occurs in circumneutral, mesotrophic and slightly eutrophic waters.

2. ****Placoneis clementis*** (Grunow) Cox
Plate 15: 21, 22

Navicula clementis Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 139, Figs 47: 1–9; 53: 3).

DIMENSIONS. Valves 16.8–47.0 μm long and 7.4–12.8 μm wide, with 12–15 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain distribution, known from Europe and America (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an alkaliphilous, β-mesosaprobous, mesoeutraphentic and brackish fresh water species.

3. ****Placoneis paraelginensis*** Lange-Bertalot
Plates 15: 25–31; 66: 5–8; 67: 1–5

Navicula elginensis (Gregory) Ralfs *auct. partim*

Ref. Rumrich *et al.* 2000 (p. 208, Fig. 60: 17–20); Cox 2003 (p. 67, Figs 63–65).

DIMENSIONS. Valves 20–30 μm long and 6.5–8.0 μm, with 12–18 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

GENERAL DISTRIBUTION AND ECOLOGY. According to Cox (2003), a widespread diatom, reported from Europe and America (e.g., Rumrich *et al.* 2000; Miho & Lange-Bertalot 2006). Ecology uncertain.

REMARKS. Some of the observed specimens were smaller, with more striae per 10 μm than as given by Cox (2003).

4. ***Placoneis placentula*** (Ehrenberg) Heinzerling
Plate 16: 1–4

Navicula placentula (Ehrenberg) Kützing

Ref. Krammer & Lange-Bertalot 1986 (p. 145, Fig. 50: 1–4); Cox 2003 (p. 62, Figs 47–55).

DIMENSIONS. Valves 32.2–47.0 μm long and 19.4–22.8 μm wide, with 8–10 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mostly in epipelon below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pilica River (Kadłubowska 1964a, b), springs of Kobylanka stream (Skalna 1969), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

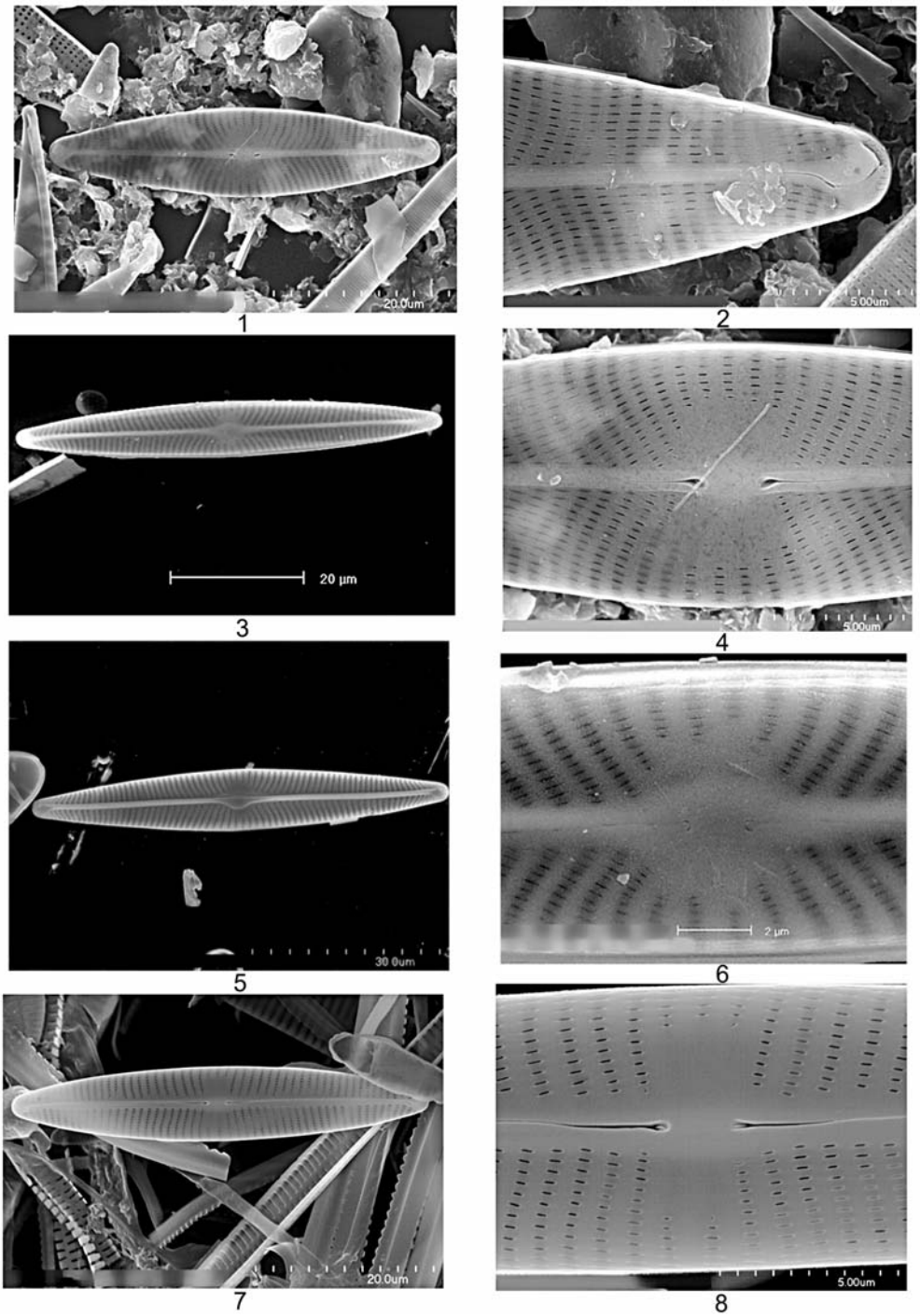


Plate 91. 1, 2, 4 – *Navicula lanceolata* (Agardh) Ehrenberg, external view; 3, 5, 6 – *N. radiosa* Kützing, external (3) and internal (5, 6) view; 7, 8 – *N. tripunctata* (O. Müller) Bory, external view; all SEM. Scale bars: 1, 3, 7 – 20 µm; 2, 4, 8 – 5 µm; 5 – 30 µm; 6 – 2 µm.

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, of uncertain autecology, in oligosaprobic waters of a broad range of electrolyte content (Krammer & Lange-Bertalot 1986), euplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eurytraphentic, strictly aquatic and fresh brackish water species. According to Cox (2003), a circumneutral, mesotraphentic or eutraphentic diatom, occurring also in slightly brackish waters.

5. ****Placoneis porifera*** (Hustedt) Cox
Plates 65: 6; 66: 1–4

Navicula porifera Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 141, Fig. 47: 19–24); Cox 2003 (p. 74).

DIMENSIONS. Valves 32.2–47.0 μm long and 19.4–22.8 μm wide, with 8–10 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mostly in epipelon above Kobylany village.

DISTRIBUTION IN POLAND. Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006). Known from Zalew Szczeciński (Bąk *et al*. 2006), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread in Europe, of uncertain autecology, in oligosaprobic waters of a broad range of electrolyte content (Krammer & Lange-Bertalot 1986). In Germany classified as very rare (Lange-Bertalot 1996).

50. ***Planothidium*** Round & Bukhtiyarova

1. ***Planothidium conspicuum*** (A. Mayer) Morales
Plate 5: 34, 35

Achnanthes conspicua A. Mayer

Ref. Krammer & Lange-Bertalot 1991b (p. 28, Fig. 16: 22–33); Morales 2006 (p. 327, Figs 1–25, 67–72).

DIMENSIONS. Valves 7.2–13.0 μm long and 3.8–4.7 μm wide. On raphe valve 13–16 striae per 10 μm, on sternum valve *ca* 12.5 per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963; Dratnal 1977), spring of Szklarka stream (Skalska 1966a), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. A diatom with wide trophic state tolerance limits, with a wide range of trophic states, preferring waters with moderate and higher conductivity (Krammer & Lange-Bertalot 1991b), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, eurytraphentic and fresh water species.

2. ***Planothidium delicatulum*** (Kützing) Round & Bukhtiyarova
Plate 5: 45, 46

Achnanthidium delicatulum Kützing; *Achnanthes delicatula* (Kützing) Grunow subsp. *delicatula sensu lato*; *Achnantheiopsis delicatula* (Kützing) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1991b (p. 71, Fig. 39: 8–14).

DIMENSIONS. Valves 11.0–19.4 μm long and 5.0–6.4 μm wide. Both valve with *ca* 12 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), Pilica River (Kabłubowska 1964b) and spring in Dubie (Skalska 1966a).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread, occurring in oligotrophic, fresh and brackish waters rich in electrolytes (Krammer & Lange-Bertalot 1991b), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkalibiontic and brackish water species.

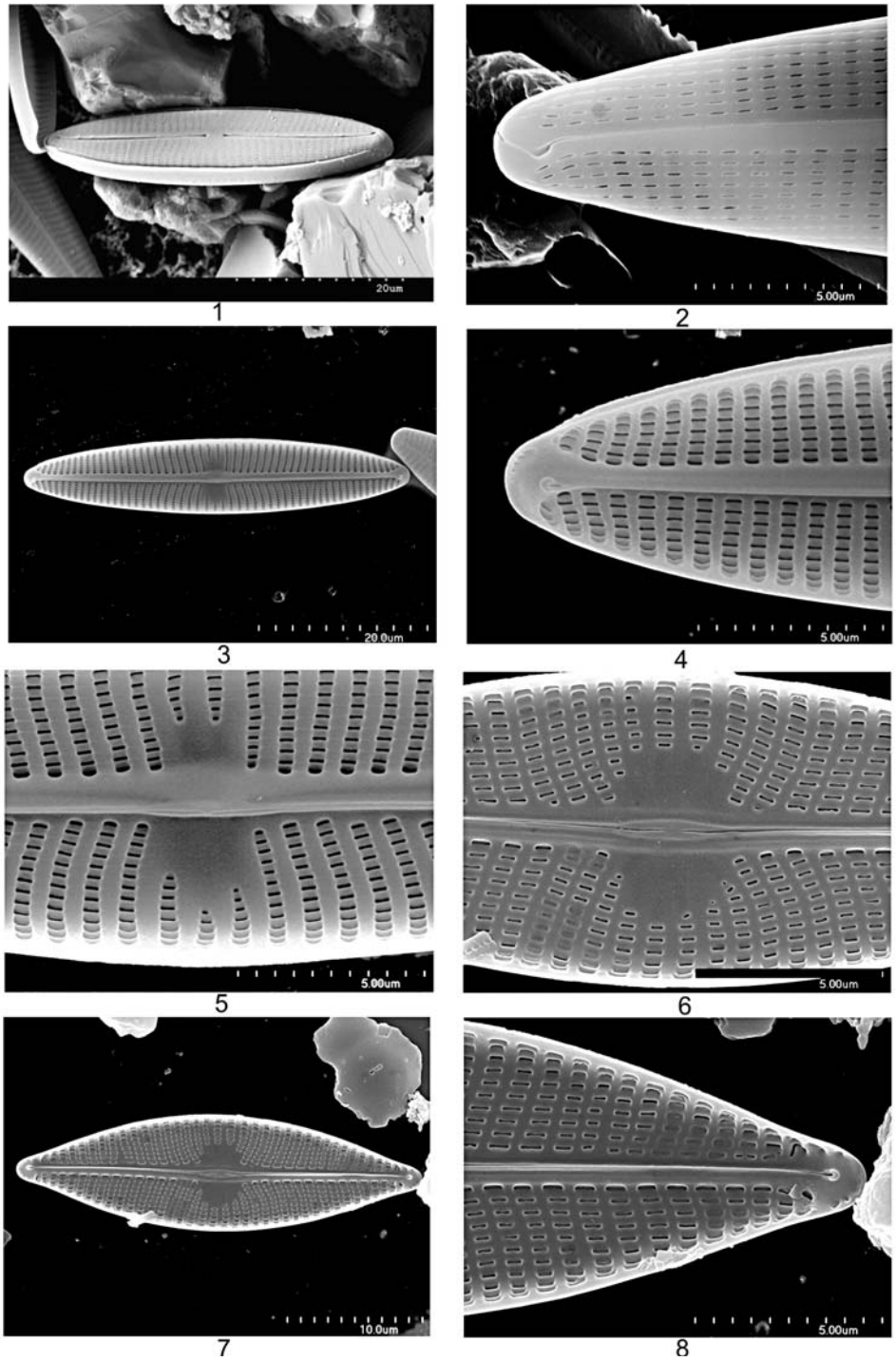


Plate 92. 1–5 – *Navicula tripunctata* (O. Müller) Bory, external (1, 2) and internal (3–5) view; 6–8 – *N. trivialis* Lange-Bertalot, internal view; all SEM. Scale bars: 1, 3 – 20 µm; 2, 4–6, 8 – 5 µm, 7 – 10 µm.

3. ***Planothidium dubium*** (Grunow) Round & Bukhtiyarova Plate 5: 47–52

Achnanthes lanceolata var. *dubia* Grunow *in* Cleve & Grunow 1880 *non Achnanthes lanceolata* var. *dubia* Grunow *sensu* Van Heurck 1885 *et auct. nonnull*; *A. lanceolata* subsp. *dubia* (Grunow) Lange-Bertalot; *Achnantheiopsis dubia* (Grunow) Lange-Bertalot; *A. dubia* (Grunow) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1991a (p.76, Fig. 42: 7–26).

DIMENSIONS. Valves 9.4–15.6 µm long and 5.7–6.6 µm wide. Raphe valves with 14–15 striae per 10 µm and 10–12 striae per 10 µm on sternum valves.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Regarded as widespread, requiring calcium-rich waters of moderate or elevated conductivity (Krammer & Lange-Bertalot 1991b; Werum & Lange-Bertalot 2004).

REMARKS. Two different morphotypes were observed (Plate 5: 47, 48 vs. Plate 5: 49–52). Some specimens depicted in Plate 5: 49–52 resemble *P. daui* (Foged) Lange-Bertalot. A considerable number of literature records of *Planothidium dubium* from Poland presumably concern *P. reichardtii*, a common diatom described in 2004.

4. ***Planothidium frequentissimum*** (Lange-Bertalot) Round & Bukhtiyarova Plates 6: 1–7; 61: 1–5

Achnanthes lanceolata var. *dubia* Grunow *sensu* Van Heurck 1885 *et auct. nonnull*, *non Achnanthes lanceolata* var. *dubia* Grunow in Cleve & Grunow 1880; *A. lanceolata* subsp. *frequentissima* Lange-Bertalot var. *frequentissima* 1991b; *Achnantheiopsis frequentissima* (Lange-Bertalot) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1991b (p. 78, Fig. 44: 1–23).

DIMENSIONS. Valves 7.5–19.4 µm long and 4.2–5.8 µm wide. Both valves with 14.5–16.0 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent.

DISTRIBUTION IN POLAND. Recorded, e.g., from spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. According to Krammer and Lange-Bertalot (1991b), *P. frequentissimum* is a widespread diatom often reported from calcium-rich waters. According to Van Dam *et al.* (1994), an alkaliphilous, α-mesopolysaprobous, eurytraphentic and fresh brackish water species.

REMARKS. Although *P. frequentissimum* has been reported from Poland since 1991, when the fourth volume of the most popular key was published with its description (Krammer & Lange-Bertalot 1991b), this diatom presumably was previously included in the broad concept of *Achnanthes lanceolata* and especially its varieties *A. lanceolata* var. *dubia* Grunow *auct.* and *A. lanceolata* var. *rostrata* Hustedt. Observed in numerous localities in Poland (data unpublished).

5. ***Planothidium lanceolatum*** (Brébisson) Round & Bukhtiyarova Plates 6: 8–18; 58: 6–8; 59: 1–6; 60: 1–8

Achnanthidium lanceolatum (Brébisson *ex* Kützing) Czarnecki; *Achnanthes lanceolata* (Brébisson) Grunow subsp. *lanceolata* var. *lanceolata*; *A. lanceolata* (Brébisson) Grunow subsp. *lanceolata* var. *boyei* (Østrup) Lange-Bertalot; *A. lanceolata* f. *ventricosa* Hustedt; *Achnantheiopsis lanceolata* (Brébisson *ex* Kützing) Lange-Bertalot; *Planothidium ellipticum* (Cleve) Round & Bukhtiyarova

Ref. Krammer & Lange-Bertalot 1991b (p. 75, Fig. 41: 1–15).

DIMENSIONS. Valves 9.7–34.5 µm long and 4.7–8.5 µm wide. Raphe valves with 12–14 striae per 10 µm and sternum valves with 14–16 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Common.

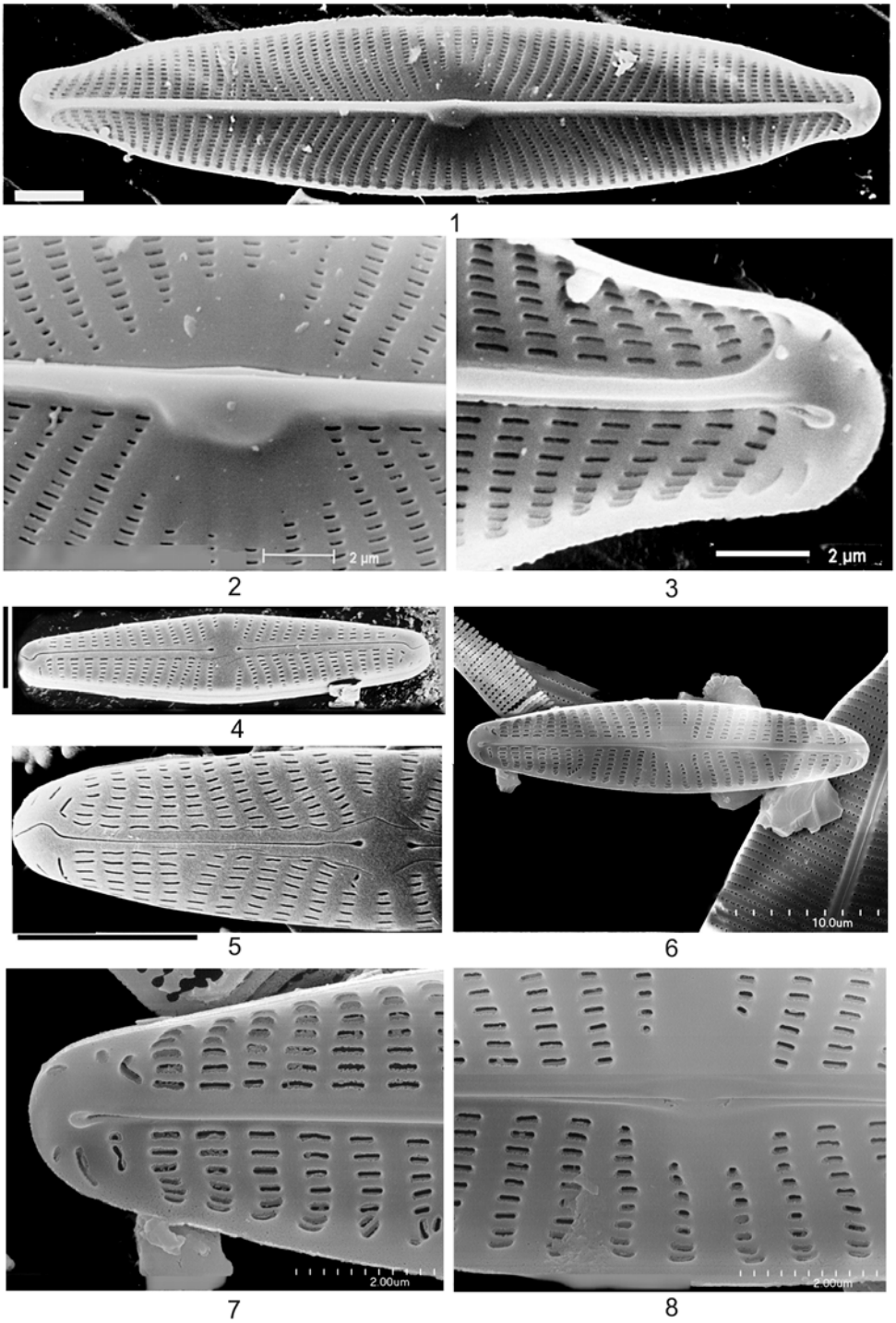


Plate 93. 1–3 – *Navicula viridula* (Kützing) Ehrenberg, internal view; 4–8 – *N. wiesneri* Lange-Bertalot, external (5, 6) and internal (6–8) view; all SEM. Scale bars: 1, 4, 5 – 5 µm; 2, 3, 7, 8 – 2 µm; 6 – 10 µm.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962; Kyselowa & Kysela 1966), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Cabejszek 1951; Kadłubowska 1964a, b), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), spring of Szklarka stream (Skalska 1966a, b), ponds near Kraków (Hanak-Szmagier 1967), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Biała Przemsza River (Wasylik 1985), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. *Planothidium lanceolatum* prefers calcium-rich waters with average to high electrolyte concentration (Krammer & Lange-Bertalot 1991b), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species.

REMARKS. Shows wide morphological diversity. Some of them formerly identified as *Achnanthes lanceolata* (Brébisson) Grunow subsp. *lanceolata* var. *boyei* (Østrup) Lange-Bertalot (Plate 60: 6–8) and *Planothidium ellipticum* (Cleve) Round & Bukhtiyarova (Plates 6: 8, 9; 58: 7, 8) are now regarded as conspecific with the nominal variety, as life stage cells of *Planothidium lanceolatum*. Initial cells were observed in material collected from submerged mosses in an unpolluted part of the stream.

6. *****Planothidium minutissimum*** (Krasske) Morales Plates 5: 36–44; 62: 3–5

Achnanthes lanceolata var. *minutissima* Krasske

Ref. Lange-Bertalot *et al.* 1996 (p. 32, Fig. 6: 18–22; Morales 2006 (p. 338, Figs 57–66, 91–96).

DIMENSIONS. Valves 9.5–12.5 µm long and 4.5–5.2 µm wide. Raphe valves with 12–13 striae per 10 µm and sternum valves *ca* 12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly above Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Widespread, autecology uncertain.

REMARKS. Probably not very rare in mesotrophic, alkaline waters, but usually represented by few specimens (data unpublished).

7. ***Planothidium reichardtii*** Lange-Bertalot & Werum Plates 5: 53–59; 61: 6–9; 62: 1, 2

Ref. Werum & Lange-Bertalot 2004 (p. 172, Figs 15: 9–18; 16: 1–5).

DIMENSIONS. Valves 9.2–15.6 µm long and 4.4–6.0 µm wide. Both valves with 14–15 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Common in springs (Wojtal 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, known from calcium-rich waters of a broad trophic range (Werum & Lange-Bertalot 2004).

REMARKS. Previously included in the broad concept of *Planothidium dubium*, a much rarer diatom in eutrophic waters of southern Poland (data unpublished).

51. ***Psammothidium*** Bukhtiyarova & Round

1. ***Psammothidium grischunum*** (Wuthrich) Bukhtiyarova & Round Plate 5: 15–18

Achnanthes grischuna Wuthrich

Ref. Lange-Bertalot & Krammer 1989 (p. 62, Figs 26: 22–36; 62: 1–3; 96: 17–20); Krammer & Lange-Bertalot 1991b (p. 24, Fig. 13: 24–40).

DIMENSIONS. Valves 8.6–17.8 µm long and 3.8–5.2 µm wide. Both valves with 18–24 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Reported previously from the same material (Wojtal 2004b).

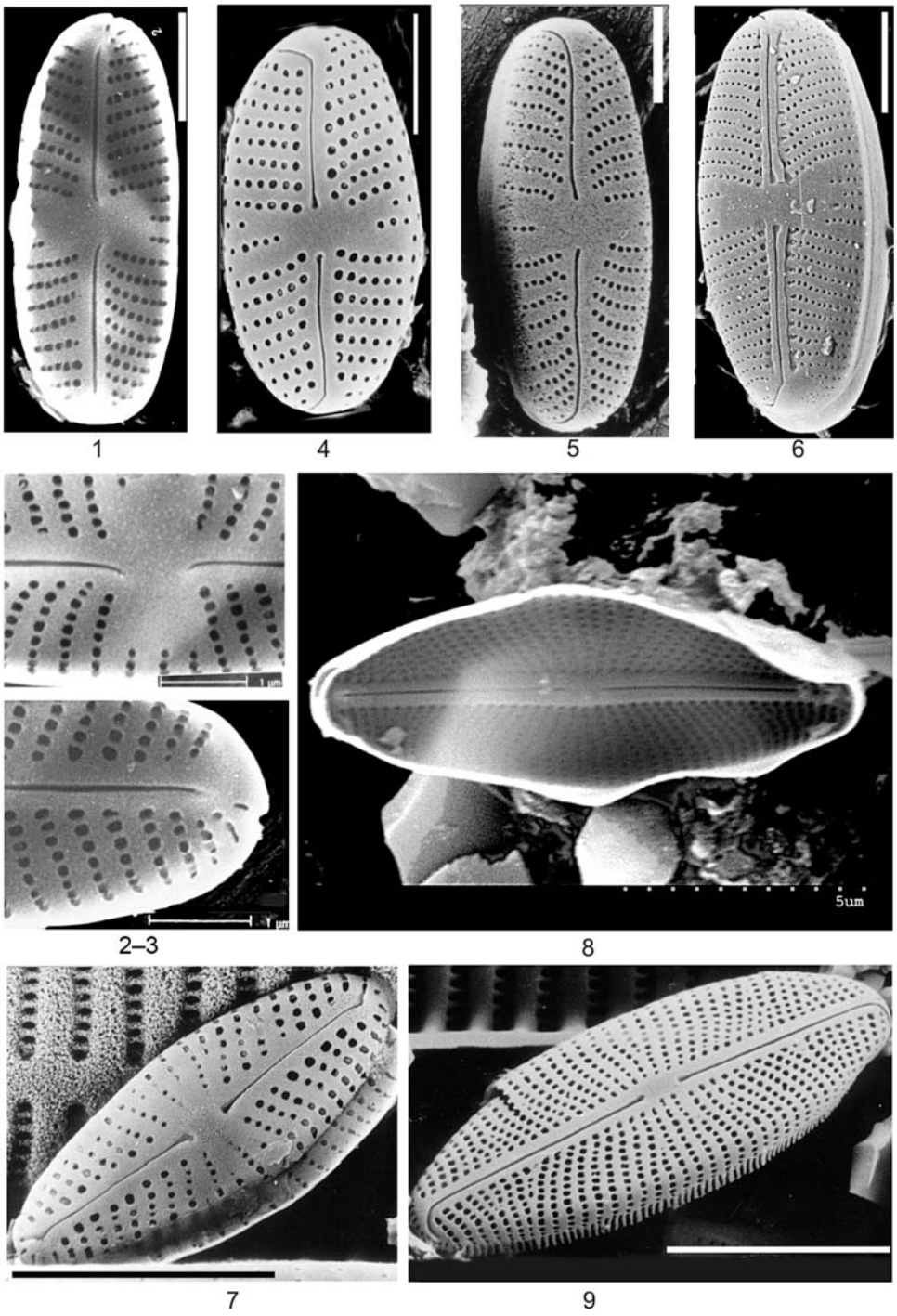


Plate 94. 1–5 – *Eolimna* cf. *minima* (Grunow) Lange-Bertalot *sensu lato*, internal (1–3) and external (4, 5) view; 6 – *Naviculadicta* sp. 2, external view; 7 – *Mayamaea atomus* (Kützing) Lange-Bertalot, external view; 8, 9 – *Adlafia minuscula* (Grunow) Lange-Bertalot, internal (8) and external (9) view; all SEM. Scale bars: 1, 4–9 – 5 μm; 2, 3 – 1 μm.

GENERAL DISTRIBUTION AND ECOLOGY. Reported from springs and streams of circumneutral pH with low or moderate conductivity (Lange-Bertalot & Krammer 1991b). According to Van Dam *et al.* (1994), a fresh water species.

2. ***Psammothidium lauenburgianum*** (Hustedt) Bukhtiyarova & Round Plate 5: 19–21

Achnanthes lauenburgiana Hustedt

Ref. Lange-Bertalot & Krammer 1989 (p. 94, Figs 28: 3–7; 35: 1–10); Krammer & Lange-Bertalot 1991 (p. 26, Fig. 14: 27–34).

DIMENSIONS. Valves 5.5–13.0 μm long and 3.5–5.0 μm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in upper and lower part of the stream. Reported previously from the same material (Wojtal 2004b).

DISTRIBUTION IN POLAND. Zalew Szczeciński (Bąk *et al.* 2006), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006). Regarded as vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Known from scattered localities in the Northern Hemisphere, from waters with a wide range of conditions, low and moderate electrolyte concentration, oligomesotrophic (Krammer & Lange-Bertalot 1991), euplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, oligomesotraphentic and fresh brackish water species. In Germany classified as in regression (Lange-Bertalot 1996).

REMARKS. Recent reports from Poland may suggest that it is not very rare, as has been regarded.

52. ***Reimeria*** Kociolek & Stoermer

1. ***Reimeria sinuata*** (Gregory) Kociolek & Stoermer Plates 12: 17–22; 72: 1, 2

Cymbella sinuata Gregory

Ref. Krammer & Lange-Bertalot 1986 (p. 341, Fig. 148: 10–17).

DIMENSIONS. Valves 14.0–22.6 μm long and 4.5–5.2 μm wide, with *ca* 10–14 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Pudo 1977), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963; Hojda 1971), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964a, b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991).

2. ***Reimeria uniseriata*** Sala, Guerrero & Ferrario Plate 12: 24–29

Ref. Sala *et al.* 1993 (p. 445, Figs 2–6).

DIMENSIONS. Valves 19.5–28.0 μm long and 6.0–7.2 μm with *ca* 9–10 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse. Reported previously from the same material by Wojtal and Sobczyk (2006).

GENERAL DISTRIBUTION AND ECOLOGY. Presumably cosmopolitan diatom, of uncertain ecology.

REMARKS. Scattered specimens from other localities were also observed, but always represented by few valves per slide.

3. ***Reimeria*** sp. Plate 12: 23

DIMENSIONS. Valves 19.5–28.0 μm long and 6.0–7.2 μm wide, with *ca* 9–10 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epilithon.

REMARKS. The observed specimens resemble *Reimeria sinuata* but have isobilateral but almost isopolar valves, whereas *R. sinuata* has distinctively heteropolar valves. The axial and central areas differ in size and shape between the taxa.

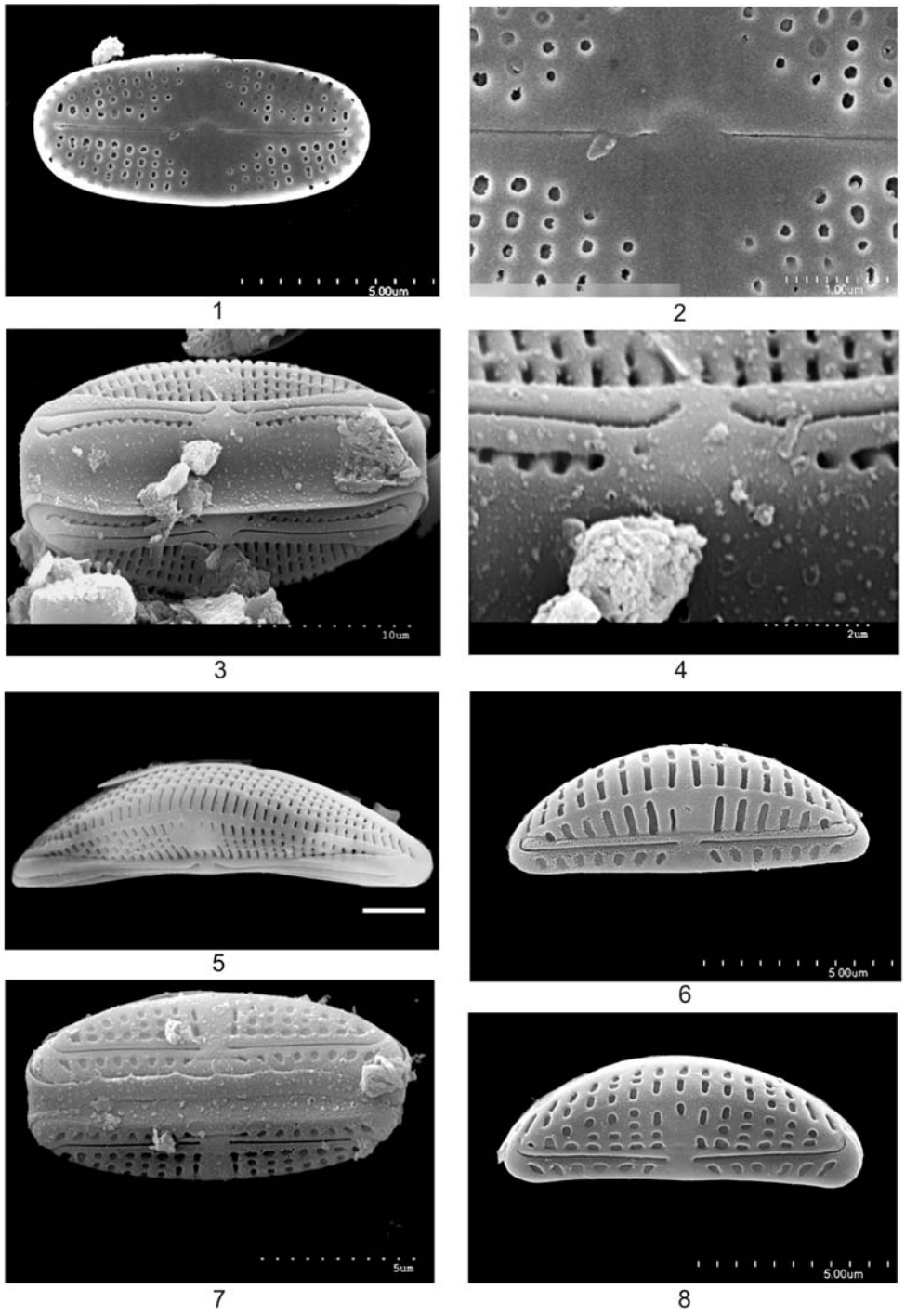


Plate 95. 1, 2 – *Naviculadicta* sp. 3, internal view; 3–5 – *Amphora copulata* (Kützing) Schoeman & Archibald, external view; 6 – *A. inariensis* Krammer, external view; 7, 8 – *A. pediculus* (Kützing) Grunow, external view; all SEM. Scale bars: 1, 5–8 – 5 μm; 2 – 1 μm; 3 – 10 μm; 4 – 2 μm.

53. ***Rhoicosphenia*** Grunow

1. ***Rhoicosphenia abbreviata*** (Agardh) Lange-Bertalot Plates 8: 4–9; 64: 3–6

Rhoicosphaenia curvata (Kützing) Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 381, Fig. 91: 20–28).

DIMENSIONS. Valves 18.5–35.8 μm long and 4.5–6.2 μm wide, with 18–22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Abundant, with the largest populations observed in periphytic material (especially submerged mosses and *Cladophora* sp.) collected in Kobylany and Zielona villages.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sites with unspecified location (Gutwiński 1895), Vistula River (Starmach 1938; Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Uherkovich 1970), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), Sanka stream (Hojda 1971), Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

54. ***Rhopalodia*** O. Müller

1. ***Rhopalodia gibba*** (Ehrenberg) O. Müller Plates 34: 2–6; 97: 5, 6

Ref. Krammer & Lange-Bertalot 1988 (p. 159, Figs 111: 1, 2, 4, 6–13; 111A: 1–7).

DIMENSIONS. Valves 48.0–85.6 μm long and 8.2–10.6 μm wide, with 8 fibulae and *ca* 13 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Pilica River (Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common in standing and slow-flowing waters, especially common in springs in waters of moderate or high conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkalibiontic, β-mesosaprobous, eutraphentic and fresh brackish water species.

55. ***Rossithidium*** Round & Bukhtiyarova

1. ***Rossithidium petersenii*** (Hustedt) Round & Bukhtiyarova Plate 5: 28

Achnanthes pusilla var. *petersenii* (Hustedt) Lange-Bertalot; *A. petersenii* Hustedt

Ref. Lange-Bertalot & Krammer 1989 (p. 117, Figs 65: 18–44; 66: 4–7); Krammer & Lange-Bertalot 1991a (p. 67, Fig. 37: 24–40).

DIMENSIONS. Valves 14.6–22.8 μm long and 4.2–5.0 μm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, in epilithon above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Będkówka stream (Kłonowska 1986).

DISTRIBUTION IN POLAND. Regarded as endangered in Poland (Siemińska *et al*. 2006), reported from, e.g., Central Poland (Rakowska 2001) and Tatra Mts lakes (Kawecka & Galas 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, oligotraphentic, inhabiting circumneutral waters of low or moderate conductivity (Krammer & Lange-Bertalot 1991b). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, oligotraphentic and fresh water species.

REMARKS. Identified as *Achnanthes* sp. in Wojtal and Sobczyk (2006, Figs 20, 21).

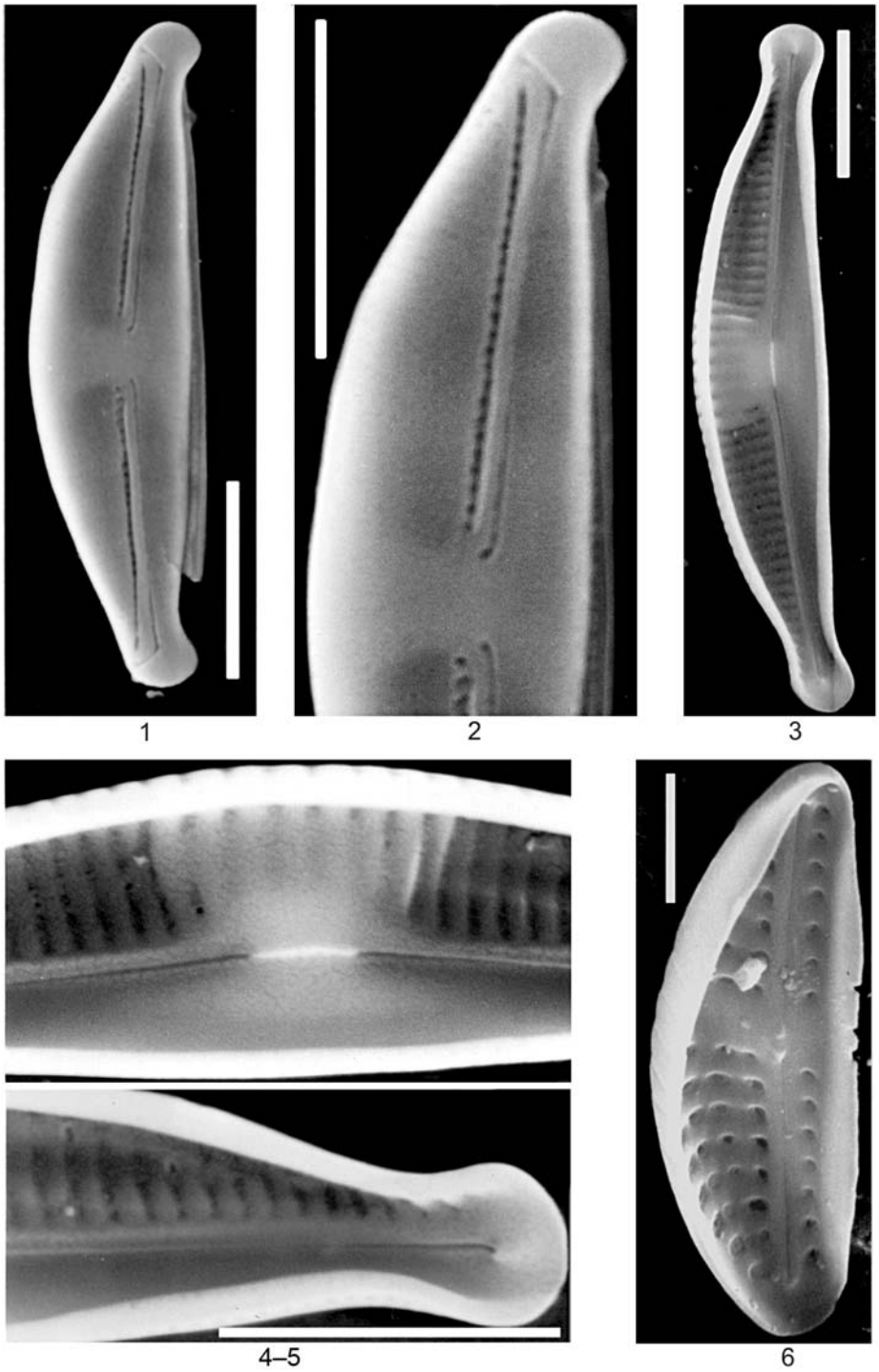


Plate 96. 1–5 – *Amphora montana* Krasske, external (1, 2) and internal (3–5) view; 6 – *A. pediculus* (Kützing) Grunow, internal view; all SEM. Scale bars: 1–5 – 5 μm; 6 – 2 μm.

56. ***Sellaphora*** Mereshkovsky

1. ***Sellaphora bacilloides*** (Hustedt) Levkov, Krstic & Nakov Plate 17: 44–46

Navicula bacilloides Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 188, Fig. 67: 5).

DIMENSIONS. Valves 24.0–28.5 μm long and 8.5–9.6 μm wide, with 22–24 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphytic material from upper part of stream. Reported previously from the same material (Wojtal 2001a).

DISTRIBUTION IN POLAND. Rawka River (Rakowska 1990, 2001), Zalew Szczeciński (Bąk *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. According to Krammer and Lange-Bertalot (1986), *S. bacilloides* is very rare.

2. ***Sellaphora hustedtii*** (Krasske) Lange-Bertalot & Werum Plate 30: 17

Navicula hustedtii Krasske

Ref. Krammer & Lange-Bertalot 1986 (p. 199, Fig. 71: 22–24).

DIMENSIONS. Valves 12.5–14.4 μm long and 3.0–3.4 μm wide, with *ca* 26 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Vaucheria* sp. from above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Prądnik River (Stępień 1963).

DISTRIBUTION IN POLAND. Rare (Siemińska & Wołowski 2003). Regarded as vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread, especially common in waters of low conductivity, e.g., in springs and subaerial biotopes (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), an acidophilous, aerophilous and fresh water species.

3. ***Sellaphora joubaudii*** (Germain) Aboal Plates 17: 33–37; 76: 1–7

Navicula seminulum var. *radiosa* Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 231, Fig. 76: 37, 38).

DIMENSIONS. Valves 13.6–14.0 μm long and 3.8–4.0 μm wide, with 17.5–22.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mostly in samples collected above Kobylany village. Reported previously from the same material (Wojtal 2001a).

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003), reported from central Poland (Rakowska 2001), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Reported from oligo- to β-mesotrophic waters, common also in aerophytic biotopes (Krammer & Lange-Bertalot 1986). Known from several localities in Europe. According to Van Dam *et al*. (1994), a β-mesosaprobous and fresh brackish water species.

4. *****Sellaphora nana*** (Hustedt) Lange-Bertalot Plate 17: 47, 48

Stauroneis nana Hustedt; *Navicula gerloffii* Schimanski; *Naviculadicta gerloffii* (Hustedt) Lange-Bertalot

Ref. Krammer & Lange-Bertalot 1986 (p. 212, Fig. 80: 18–20); Lange-Bertalot *et al.* 2003 (p. 119, Fig. 21: 1–14).

DIMENSIONS. Valves 9.2–11.8 μm long and 3.2–3.8 μm wide.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in mud samples.

GENERAL DISTRIBUTION AND ECOLOGY. Classified as extremely rare in in Germany (Lange-Bertalot 1996). *Navicula gerloffi* is an acidophilous species (Van Dam *et al*. 1994). According to Lange-Bertalot *et al.* (2003), occurs in alkaline, electrolyte-rich waters.

REMARKS. Some specimens resemble *Sellaphora nanoides* Lange-Bertalot (Plate 17: 48) but have different dimensions and striation.

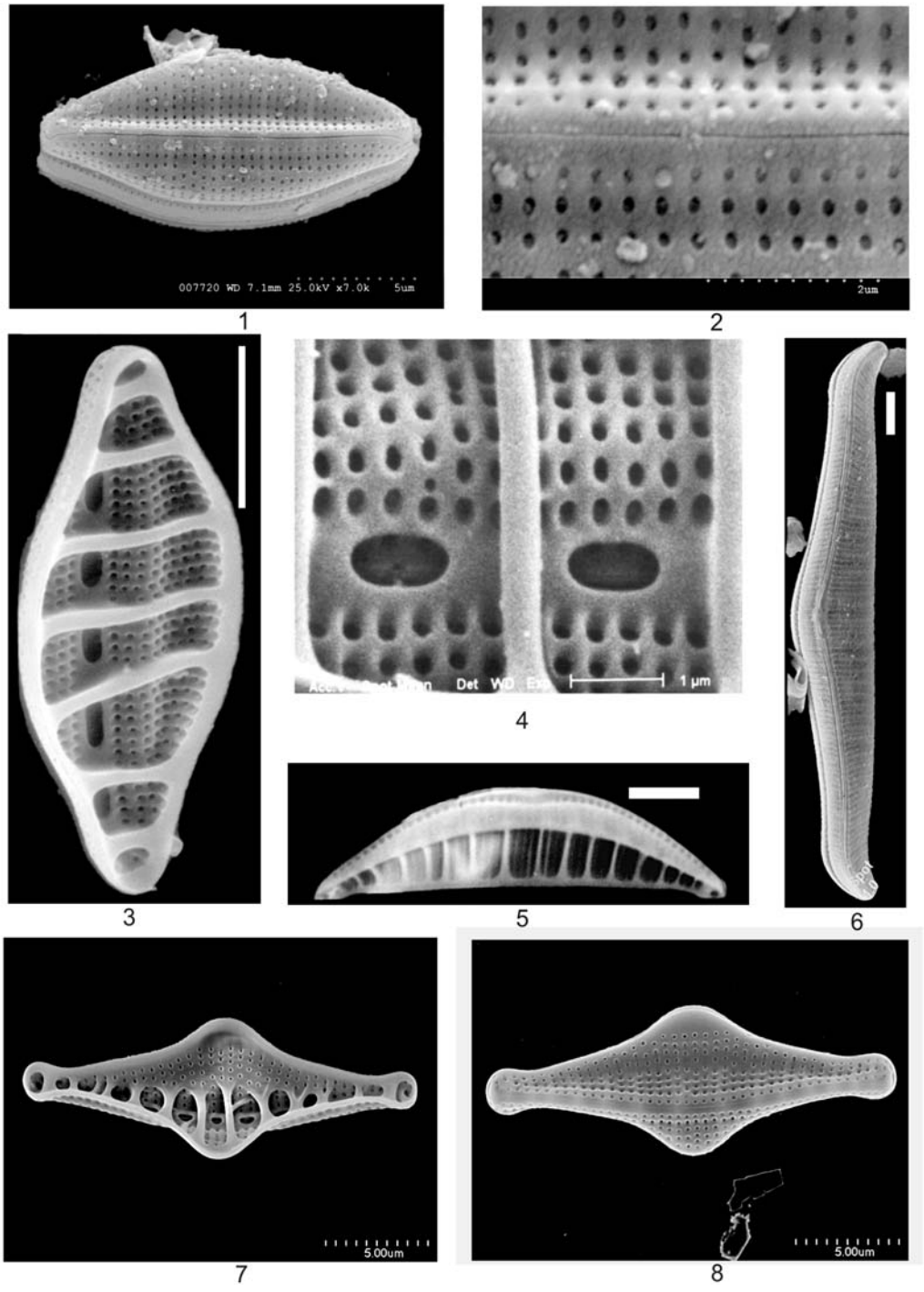


Plate 97. 1–4 – *Denticula tenuis* Kützing, external (1, 2) and internal (3, 4) view; 5, 6 – *Rhopalodia gibba* (Ehrenberg) O. Müller, internal (5) and external (6) view; 7, 8 – *Grunowia tabellaria* (Grunow) Rabenhorst, external view; all SEM. Scale bars: 1, 3, 5–8 – 5 µm; 2 – 2 µm, 4 – 1 µm.

5. ***Sellaphora pupula*** (Kützing) Mereschkovsky
Plates 17: 49–51; 18: 1–11; 77: 1–8

Navicula pupula Kützing var. *pupula*

Ref. Krammer & Lange-Bertalot 1986 (p. 189, Fig. 68: 1–21).

DIMENSIONS. Valves 14.4–24.0 µm long and 4.8–9.0 µm wide, with 20–25 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, largest populations observed in metaphyton and epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964a, b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Vistula River (Pudo 1977), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, α-mesosaprobous, meso- to eutraphentic and fresh brackish water species.

REMARKS. Identification followed the very broad species concept.

6. ***Sellaphora seminulum*** (Grunow) D.G. Mann
Plates 17: 38–43; 78: 1, 2

Navicula seminulum Grunow

Ref. Krammer & Lange-Bertalot 1986 (p. 230, Fig. 76: 30–36).

DIMENSIONS. Valves 8.3–9.6 µm long and 3.5–4.0 µm wide, with 18.5–19.0 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in samples collected in Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Pudo 1977).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, occurring in a wide range of conditions, in waters of high conductivity (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), a neutrophilous, α-mesopolysaprobous, eutraphentic and fresh brackish water species.

REMARKS. Identification followed the broad species concept. The identified here as *S. seminulum* specimens posses different morphology of transapical striae: uni- or biseriate (Plate 78: 1, 2).

7. ***Sellaphora*** cf. ***stroemii*** (Hustedt) D.G. Mann
Plate 18: 12

Navicula stroemii Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 194, Fig. 69: 1–10).

DIMENSIONS. Valves 8.3–9.6 µm long and 3.5–4.0 µm wide, with 18.5–19.0 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

GENERAL DISTRIBUTION AND ECOLOGY. Probably cosmopolitan, occurring especially in cold, electrolyte-rich waters (Krammer & Lange-Bertalot 1986). According to Van Dam *et al*. (1994), an alkalophilous, aerophilous and fresh brackish water species. Classified as endangered in Germany (Lange-Bertalot 1996).

REMARKS. Further studies are needed for unambiguous identification.

57. ***Simonsenia*** Lange-Bertalot

1. *****Simonsenia delognei*** (Grunow) Lange-Bertalot
Plate 42: 16, 17

Nitzschia delognei Grunow *in* Van Heurck; *N. chasei* Cholnoky

Ref. Krammer & Lange-Bertalot 1988 (p. 135, Fig. 84: 13–17).

DIMENSIONS. Valves 14–16 µm long and 1.8–2.0 µm wide, with 17–18 striae per 10 µm.

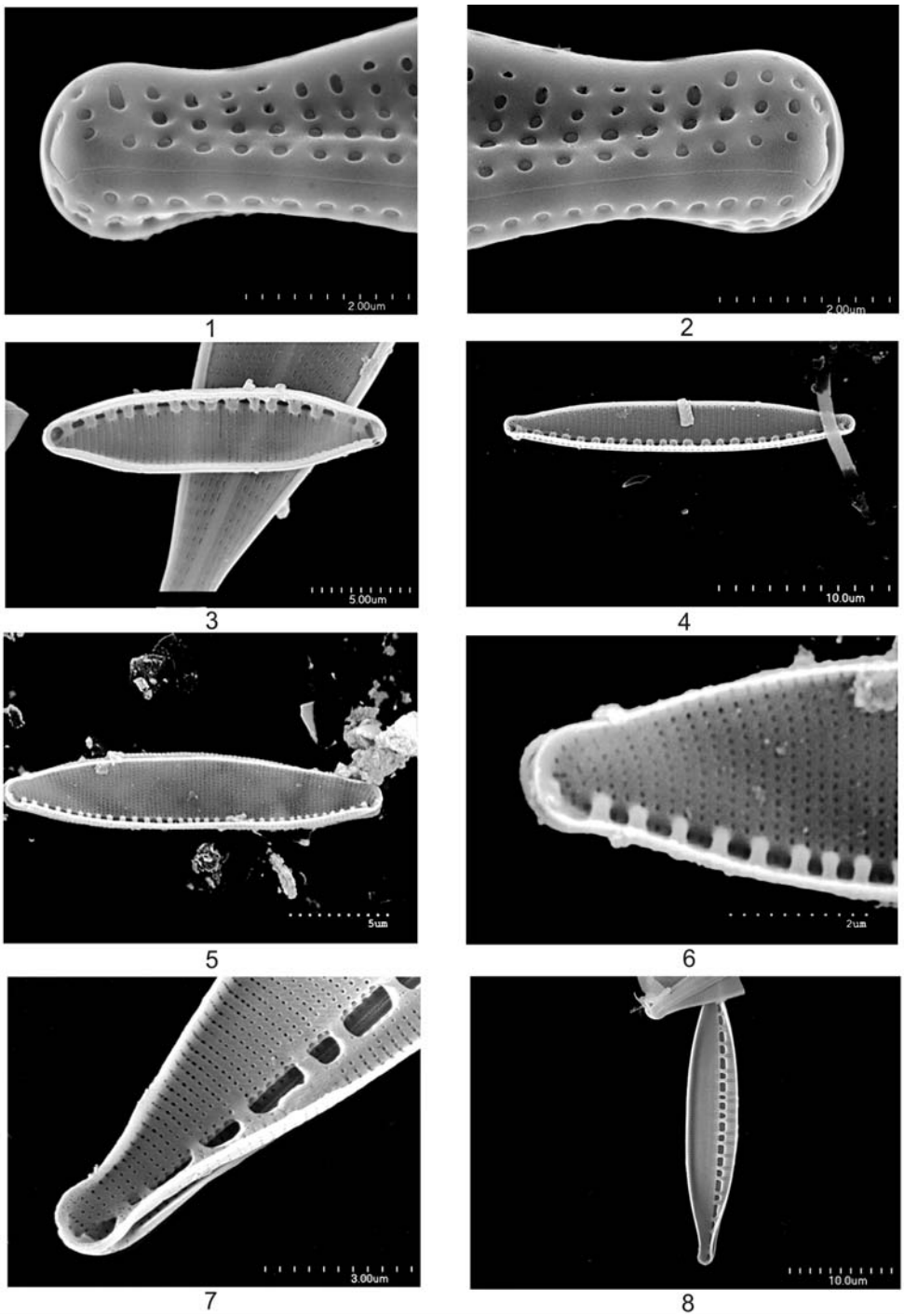


Plate 98. 1, 2 – *Grunowia tabellaria* (Grunow) Rabenhorst, external view; 3 – *Nitzschia hantzschiana* Rabenhorst, internal view; 4 – *N.* cf. *perminuta* (Grunow) Peragallo, internal view; 5, 6 – *N. pusilla* Grunow, internal view; 7, 8 – *N. dissipata* (Kützing) Grunow, internal view; all SEM. Scale bars: 1, 2, 6 – 2 μm; 3, 5 – 5 μm; 4, 8 – 10 μm; 7 – 3 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Vaucheria* sp. from below Kobylany village.

GENERAL DISTRIBUTION AND ECOLOGY. Widespread in Europe, in waters of high conductivity (Lange-Bertalot 1979b). According to Lange-Bertalot (1996), a common aerophilous diatom. According to Van Dam *et al.* (1994), an α-mesosaprobous, eutraphentic and brackish fresh water species.

58. ***Stauroneis*** Ehrenberg

1. ***Stauroneis anceps*** Ehrenberg *sensu lato*
Plates 21: 1–5; 80: 6–9

Ref. Krammer & Lange-Bertalot 1986 (p. 240, Figs 87: 3–9; 88: 1–4); Reichardt 1995 (p. 25, Fig. 17: 10–11).

DIMENSIONS. Valves 34.4–46.8 μm long and 6.8–7.6 μm wide, with 26.0–28.5 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pond in Kraków (Kukucz 1937), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), Vistula River (Pudo 1977), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, meso-eutraphentic and fresh brackish water species.

REMARKS. Identification followed the broad species concept. The morphology of specimens observed corresponds generally with *S. anceps* deme 2, designated from type material by Reichardt (1995).

2. ***Stauroneis*** cf. ***borrichii*** (Petersen) Lund
Plate 21: 10, 11

Ref. Krammer & Lange-Bertalot 1986 (p. 245, Fig. 90: 10–12); Van de Vijver *et al*. 2004 (p. 25, Fig. 62: 1–7).

DIMENSIONS. Valves 15.2–20.6 μm long and 3.5–4.5 μm wide, with *ca* 20–24 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, mainly in samples with *Vaucheria* sp. from above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Reported previously as *Stauroneis borrichii* from the same material (Wojtal & Sobczyk 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, fresh water species.

REMARKS. The observed specimens differ in outline and striae morphology from diatoms presented in the species references. They somewhat resemble *Stauroneis obtusa* Lagerstedt f. *minor* Krasske depicted by Lange-Bertalot *et al*. (1996), but are distinctly smaller. Another similar diatom is *S. muriella* Lund. For unambiguous identification more studies are needed.

3. *****Stauroneis leguminopsis*** Lange-Bertalot & Krammer
Plate 21: 8, 9

Ref. Lange-Bertalot & Genkal 1999 (p. 94, Fig. 33: 4–8); Van de Vijver *et al.* 2004 (p. 50, Fig. 109: 1–16).

DIMENSIONS. Valves 22.5–24.0 μm long and 5.0–5.5 μm wide, with 25–26 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in periphyton.

GENERAL DISTRIBUTION AND ECOLOGY. Widely distributed in the arctic region (Van de Vijver *et al.* 2004), but its autecology remains uncertain.

4. ***Stauroneis*** cf. ***montana*** Krasske f. ***lanceolata*** Hustedt
Plate 21: 12, 13

Ref. Krammer & Lange-Bertalot 1986 (Fig. 90: 34).

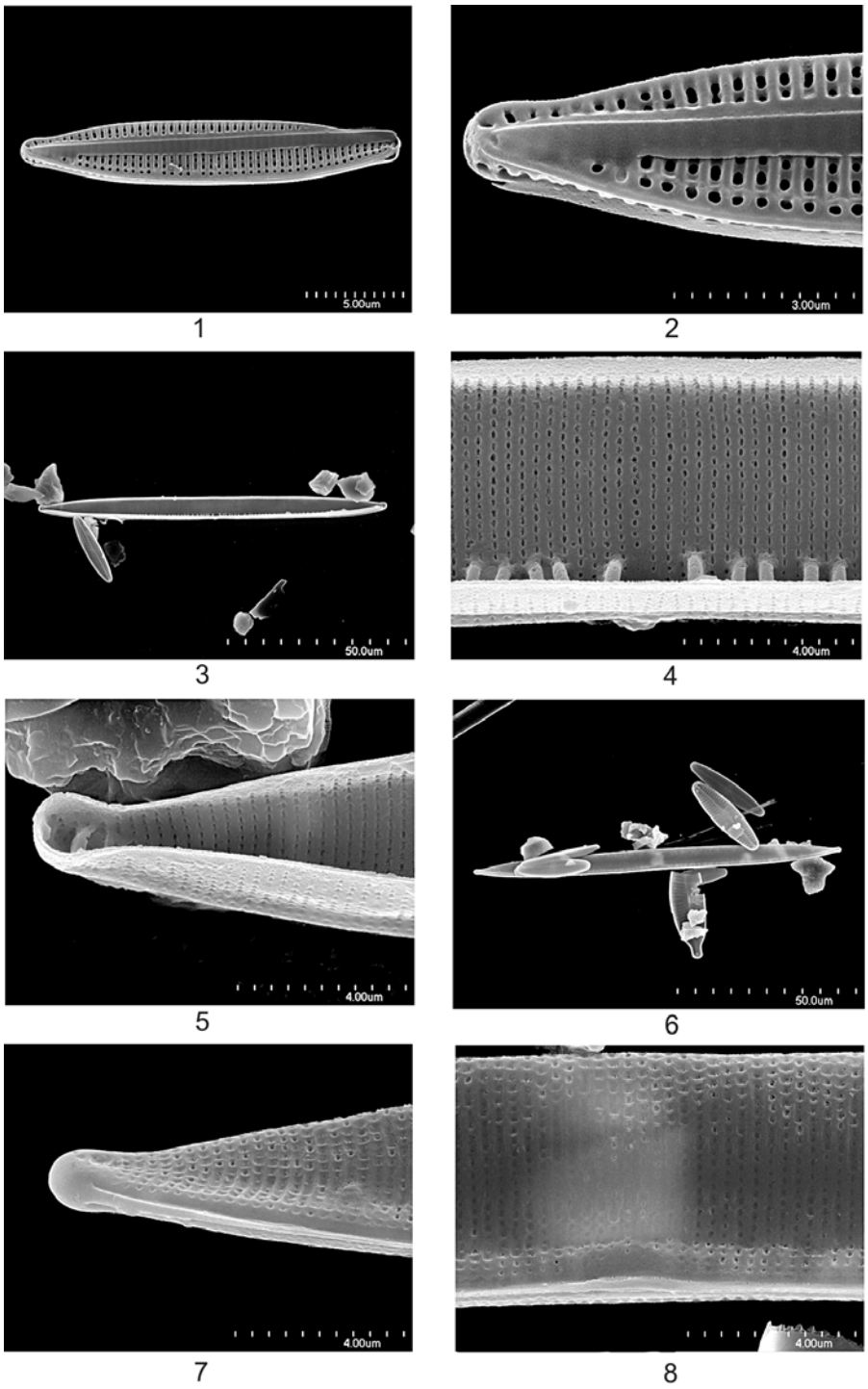


Plate 99. 1, 2 – *Nitzschia* cf. *media* Hantzsch, external view; 3–8 – *Nitzschia linearis* (Agardh) W. Smith var. *linearis*, internal (3–5) and external (6–8) view; all SEM. Scale bars: 1 – 5 μm; 2 – 3 μm; 3, 6 – 50 μm; 4, 5, 7, 8 – 4 μm.

DIMENSIONS. Valves 15–18 μm long and 2.8–3.0 μm wide, with 23–24 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in periphyton.

GENERAL DISTRIBUTION AND ECOLOGY. Uncertain.

REMARKS. For a long time it was treated as conspecific with *Stauroneis thermicola* (Petersen) Lund (e.g., Krammer & Lange-Bertalot 1986). Further studies are needed for unambiguous identification.

5. ***Stauroneis phoenicenteron*** (Nitzsch) Ehrenberg Plate 22: 1

Ref. Reichardt 1995 (Fig. 21: 1–5); Lange-Bertalot *et al*. 2003 (p. 142, Figs 31: 1, 2; 33: 3, 4); Siver *et al*. 2005 (p. 190, Fig. 67: 1–3).

DIMENSIONS. Valves 100–112 μm long and 20.0–27.6 μm wide, with 20–21 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), Pilica River (Kadłubowska 1964b), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003). Regarded as vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Presumably cosmopolitan, of uncertain autecology. Tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, meso-eutraphentic and fresh brackish water species.

REMARKS. Although *Stauroneis phoenicenteron* is one of the most frequently reported diatoms in Poland (Siemińska & Wołowski 2003), its real distribution in Poland may be overestimated and remains uncertain, since presumably several reports concern morphologically similar but not conspecific taxa.

6. *****Stauroneis prominula*** (Grunow) Hustedt Plates 21: 19, 20; 82: 2

Ref. Krammer & Lange-Bertalot 1986 (p. 247, Fig. 90: 16–20); Lange-Bertalot & Genkal 1999 (Fig. 32: 5–10).

DIMENSIONS. Valves 22.6–26.2 μm long and 4.8–5.0 μm wide, with 28 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

GENERAL DISTRIBUTION AND ECOLOGY. Widespread in different kinds of water bodies, always occurring in small numbers and preferring waters of moderate or elevated conductivity (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). Classified as very rare in Germany (Lange-Bertalot 1996).

7. *****Stauroneis separanda*** Lange-Bertalot & Werum Plates 21: 16–18; 82: 1

Ref. Werum & Lange-Bertalot 2004 (p. 180, Fig. 46: 1–12).

DIMENSIONS. Valves 11.2–14.5 μm long and 4.2–4.5 μm wide, with *ca* 28 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

GENERAL DISTRIBUTION AND ECOLOGY. According to Werum and Lange-Bertalot (2004), scattered in Europe in waters rich in calcium and electrolytes.

8. ***Stauroneis smithii*** Grunow Plates 21: 21–24; 81: 5–8

Ref. Krammer & Lange-Bertalot 1986 (p. 244, Fig. 89: 16–23).

DIMENSIONS. Valves 20.2–28.6 μm long and 6.5–8.0 μm wide, with 26.4–28.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent, especially in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Pond in Kraków (Kukucz 1937), Vistula River (Pudo 1977), fish ponds in Mydlniki (Siemińska 1947), Sanka stream

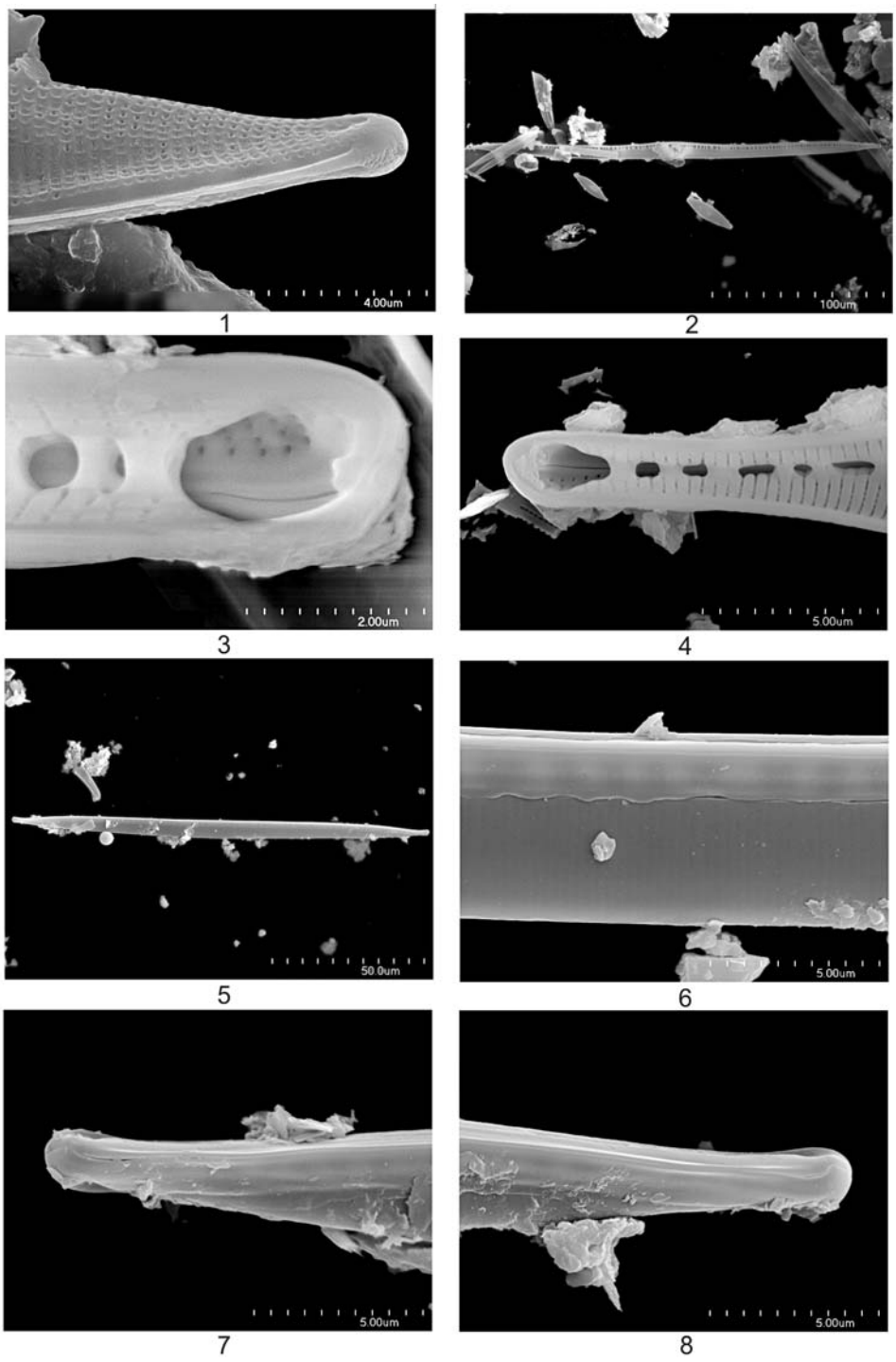


Plate 100. 1 – *Nitzschia linearis* (Agardh) W. Smith var. *linearis*, external view; 2–8 – *N. vermicularis* (Kützing) Hantzsch, internal (2–4) and external (5–8) view; all SEM. Scale bars: 1 – 4 µm; 2 – 100 µm; 3 – 2 µm; 4, 6–8 – 5 µm; 5 – 50 µm.

(Kądziołka 1963), Młynówka stream (Gumiński 1947), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Kluczwoda stream (Nawrat 1993), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, occurring in waters of various conductivity, usually in small numbers (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eurytraphentic and fresh brackish water species.

9. ****Stauroneis tackei*** (Hustedt) Krammer, Lange-Bertalot, Kuesber & Metzeltin
Plates 22: 5–9; 81: 1–4

Navicula tackei Hustedt

Ref. Krammer & Lange-Bertalot 1986 (p. 249, Fig. 91: 12, 13).

DIMENSIONS. Valves 18.8–28.0 μm long and 5.2–6.6 μm wide, with 24–28 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with *Vaucheria* sp.

DISTRIBUTION IN POLAND. Zatoka Gdańska (Witkowski 1994), Rawka River (Rakowska 1990, 2001).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991), fresh brackish water diatom (Van Dam *et al*. 1994). Distribution and ecology uncertain, classified as very rare in Germany (Lange-Bertalot 1996).

10. ***Stauroneis thermicola*** (Petersen) Lund
Plate 21: 14, 15

Stauroneis montana Krasske

Ref. Krammer & Lange-Bertalot 1986 (p. 248, Fig. 90: 31–34); Lange-Bertalot *et al*. 1996 (p. 176; Fig. 26: 28–30).

DIMENSIONS. Valves 12.4–15.2 μm long and 3.0–3.2 μm wide, with 24–25 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Reported from the same material by Wojtal and Sobczyk (2006).

DISTRIBUTION IN POLAND. Very rare (Siemińska & Wołowski 2003). Reported from (at present nonexisting) peat bog in Kraków (Rumek 1946) and from other localities including Raba River (Starmach 1966b) and Mazurian lakes (Chudyba 1979), central Poland (Rakowska 2001) and Zalew Szczeciński (Bąk *et al*. 2006). Regarded as vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, usually occurring in small numbers in aerophytic biotopes (Krammer & Lange-Bertalot 1986), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), a neutrophilous, β-mesosaprobous, eurytraphentic, aerophilous and fresh brackish water species.

11. ***Stauroneis*** sp. Plate 22: 2–4

DIMENSIONS. Valves 58–80 μm long and 12.5–14.5 μm wide, with 20–24 striae and 28–30 areolae per 10 μm.

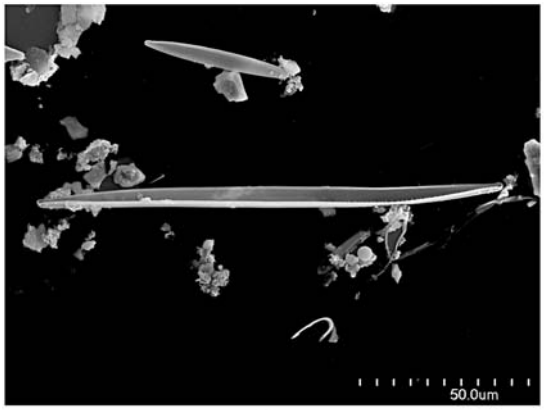
DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

REMARKS. Study of type material of *Stauroneis gracilis* Ehrenberg (Reichardt 1995 p. 27, Figs 19: 1–6; 20: 1 6) clarified its morphological limits; all the morphologically allied taxa can no longer be treated collectively. Several diatoms of the group around the species have recently been separated (e.g., Lange-Bertalot & Genkal 1999; Lange-Bertalot *et al*. 2003; Van de Vijver *et al.* 2004). The observed specimens presumably represent the same taxon as illustrated by Van de Vijver *et al*. 2004, Figs 27: 7–9; 28: 7, 8, determined as *Stauroneis* spec. (aff. *subgracilis*?).

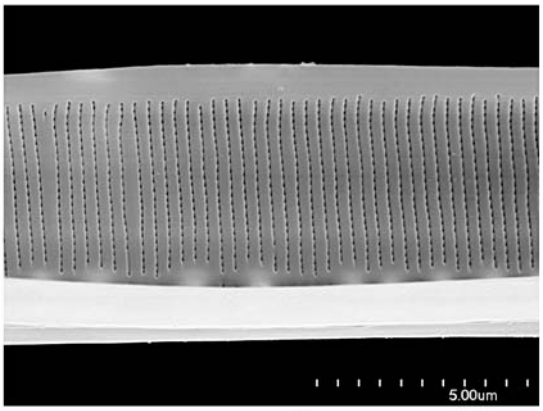
59. ***Staurosira*** (Ehrenberg) Williams & Round

1. ***Staurosira brevistriata*** (Grunow *in* Van Heurck) Williams & Round Plates 2: 25–29; 52: 2

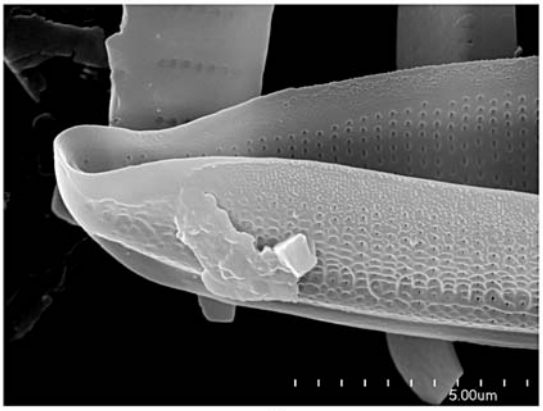
Fragilaria brevistriata Grunow *in* Van Heurck; *Pseudostaurosira brevistriata* (Grunow *in* Van Heurck) Williams *et* Round



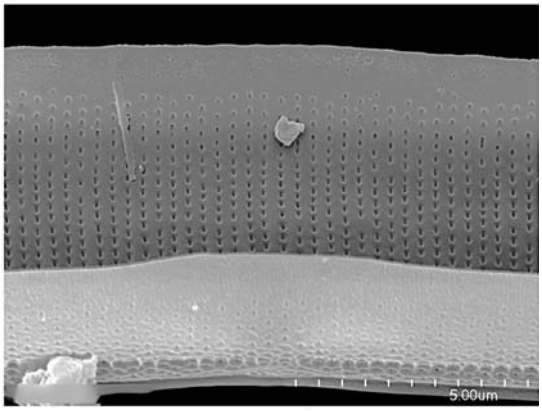
1



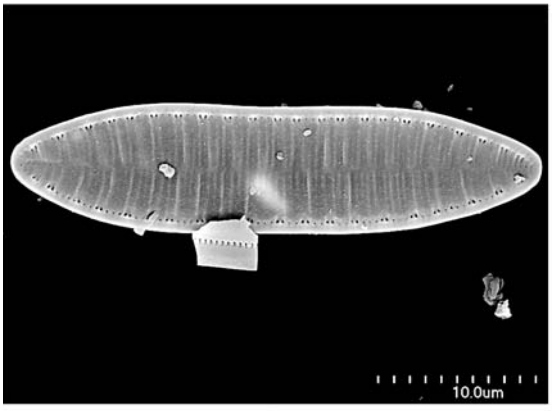
2



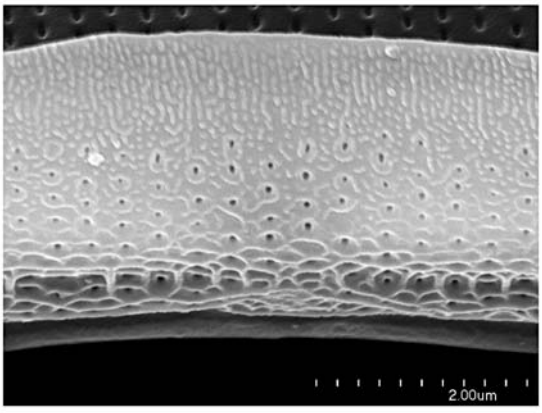
3



4



6



5

Plate 101. 1–5 – *Nitzschia sigmoidea* (Nitzsch) W. Smith, internal view; 6 – *Surirella minuta* (Brébisson) Kützing, internal view; all SEM. Scale bars: 1 – 50 μm; 2–4 – 5 μm; 5 – 2 μm 6 – 10 μm.

Ref. Krammer & Lange-Bertalot 1991a (p. 162, Fig. 130: 9–12, 14–16).

DIMENSIONS. Valves 5.4–30.0 µm long and 2.8–6.5 µm wide, with 16.0–17.5 striae per 10 µm. Some specimens were below the length limits given by Krammer & Lange-Bertalot (1991a).

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common, preferring oligosaprobic waters of a wide range of trophic range and conductivity (Krammer & Lange-Bertalot 1991a), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, oligosaprobous, eurytraphentic and fresh brackish water species.

2. ***Staurosira construens*** Ehrenberg var. ***construens*** Plates 2: 30; 52: 1

Fragilaria construens (Ehrenberg) Grunow

Ref. Krammer & Lange-Bertalot 1991a (p. 153, Fig. 132: 1–5, 29).

DIMENSIONS: Valves 10.5–22.0 µm long and 4.5–6.9 µm wide, with 14–16 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Guminski 1947), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, preferring stagnant, oligosaprobic waters of a wide trophic range (Krammer & Lange-Bertalot 1991a), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, meso-eutraphentic, strictly aquatic and fresh brackish water species.

3. ***Staurosira construens*** var. ***binodis*** (Ehrenberg) Hamilton Plate 2: 31

Fragilaria construens var. *binodis* (Ehrenberg) Grunow; *F. construens* f. *binodis* (Ehrenberg) Hustedt; *Pseudostaurosira construens* var. *binodis* (Ehrenberg) Edlund

Ref. Krammer & Lange-Bertalot 1991a (p. 153, Fig. 132: 23–27).

DIMENSIONS. Valves 10.5–16.2 µm long and 4–6 µm wide, with 15.5–18.0 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a, b), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, oligosaprobous, meso-eutraphentic and fresh brackish water species.

4. ***Staurosira pinnata*** Ehrenberg Plates 3: 4–8; 50: 4–8; 51: 2

Fragilaria pinnata Ehrenberg var. *pinnata*; *Staurosirella pinnata* (Ehrenberg) Williams *et* Round var. *pinnata*

Ref. Krammer & Lange-Bertalot 1991a (p. 156, Fig. 133: 1–18).

DIMENSIONS. Valves 8.4–29.0 µm long and 2.8–5.8 µm wide, with 11–12 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Frequent.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River

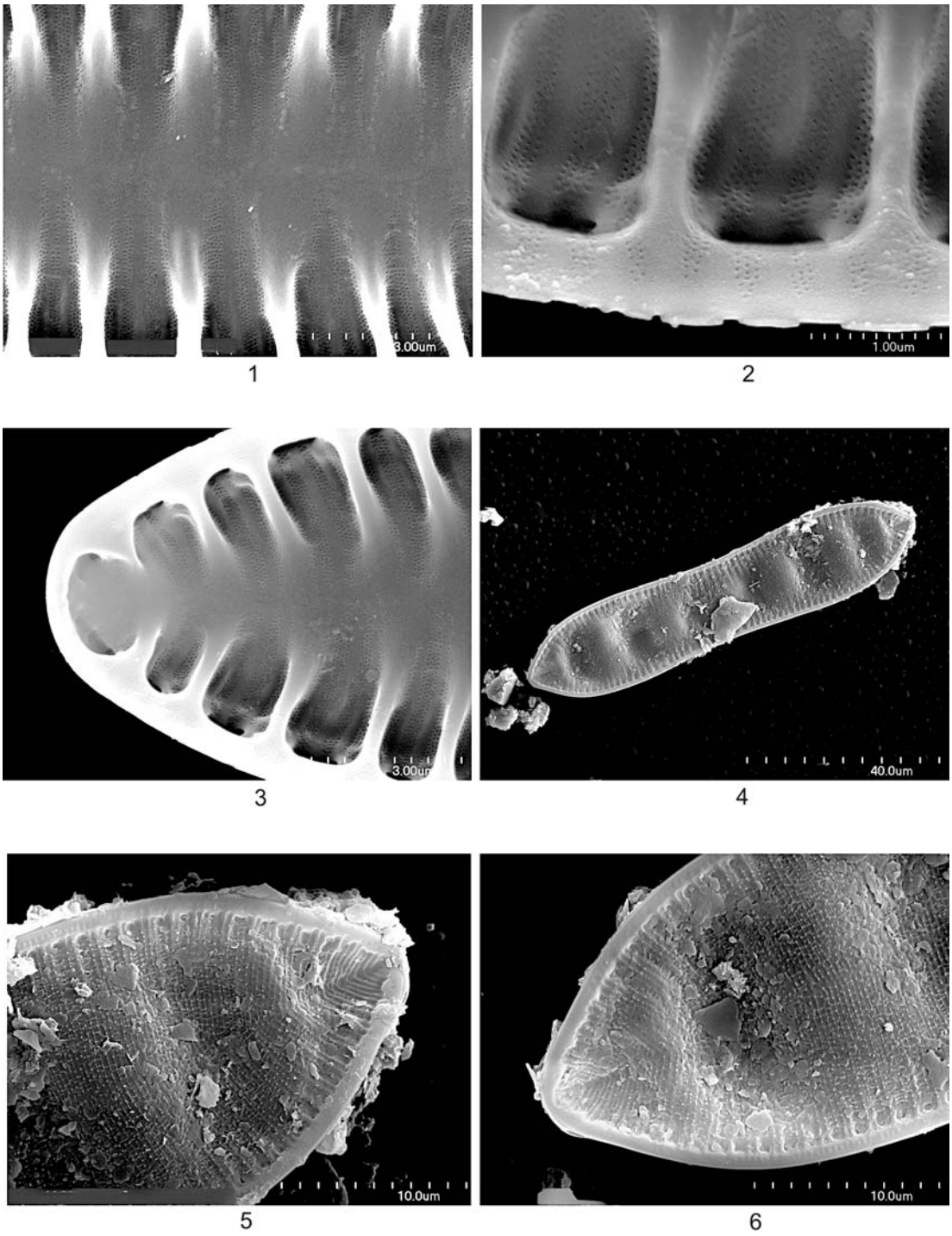


Plate 102. 1–3 – *Surirella minuta* (Brébisson) Kützing, internal view; 4–6 – *Cymatopleura solea* (Brébisson) W. Smith, external view; all SEM. Scale bars: 1, 3 – 3 μm; 2 – 1 μm; 4 – 40 μm; 5, 6 – 10 μm.

(Starmach 1938; Turoboyski 1962), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963; Hojda 1971), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1991a), tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an alkaliphilous, β-mesosaprobous, eurytraphentic, fresh brackish water taxon.

5. ***Staurosira venter*** (Ehrenberg) H. Kobayasi
Plates 3: 1–3; 51: 3–6

Fragilaria venter Ehrenberg; *F. construens* (Ehrenberg) Grunow f. *venter* (Ehrenberg) Hustedt; *Staurosira construens* var. *venter* (Ehrenberg) P.B. Hamilton

Ref. Krammer & Lange-Bertalot 1991a (p. 153, Figs 131: 6; 132: 9–16, 28).

DIMENSIONS. Valves 6.0–9.5 μm long and 4–6 μm wide, with 16–18 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a, b), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, preferring stagnant, oligosaprobic waters, of a wide trophic range (Krammer & Lange-Bertalot 1991a), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, meso-eutraphentic strictly aquatic and fresh brackish water species.

60. ***Stephanodiscus*** Ehrenberg

1. ***Stephanodiscus hantzschii*** Grunow
Plate 2: 1–3

Stephanodiscus tenuis Hustedt; *S. hantzschii* Grunow f. *tenuis* Håkansson *et* Stoermer

Ref. Krammer & Lange-Bertalot 1991a (p. 73, Figs 75: 4–14; 76: 1–3); Håkansson 2002 (p. 39, Figs 112–119).

DIMENSIONS. Valves 5–28 μm in diameter, with 8–12 costae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in mud samples from Karniowice and Zielona village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938), Sąspówka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b), Będkówka stream (Kłonowska 1986).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom (Krammer & Lange-Bertalot 1991a), euplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an alkalibiontic, hypereutraphentic, α-mesosaprobous to polysaprobous and strictly aquatic, fresh brackish water species.

2. ***Stephanodiscus minutulus*** (Kützing) Cleve & Möller Plates 2: 4–6; 50: 1, 3

Stephanodiscus astraea var. *minutula* (Kützing) Grunow); *S. parvus* Stoermer *et* Håkansson

Ref. Krammer & Lange-Bertalot 1991a (p. 71, Fig. 74: 1–7); Håkansson 2002 (p. 44, Figs 133–144).

DIMENSIONS. Valves 3.5–9.5 μm in diameter, with 8–12 costae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with filamentous algae and mud from Karniowice and Zielona village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Kawecka & Kwandrans 2000) and material collected from one spring of the Biała Przemsza River (Wojtal & Kwandrans 2006).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1988). Tychoplanktonic, of epontic origin (Denys 1991), known from waters with elevated conductivity (Krammer & Lange-Bertalot 1991), eutraphentic (Lange-Bertalot 1996).

61. ***Surirella*** Turpin

1. ***Surirella angusta*** Kützing
Plates 43: 1–4; 101: 6

Ref. Krammer & Lange-Bertalot 1988 (p. 187, Figs 133: 6–13; 134: 1, 7–10).

DIMENSIONS. Valves 20.2–28.6 µm long and 8.0–10.2 µm wide, with 6–7 ribs and 13–16 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1962), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), spring of Szklarka stream (Skalska 1966a), Sanka stream (Hojda 1971), peat bog in Modlniczka (Piątek 2007).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, reported from waters of moderate conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Lange-Bertalot (1996) it prefers eutrophic waters. According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and fresh brackish water species.

2. ***Surirella brebissoni*** Krammer & Lange-Bertalot Plate 43: 5, 6

Surirella ovata Kützing *sensu* Hustedt 1930 *pro parte* Ref. Krammer & Lange-Bertalot 1988 (p. 179, Fig. 126: 2–11).

DIMENSIONS. Valves 12.5–46.2 µm long and 7.8–9.0 µm wide, with 4–6 ribs and 18–19 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Kluczwoda stream (Nawrat 1993).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, preferring waters of moderate or high conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Lange-Bertalot (1996) it prefers eutrophic waters. According to Van Dam *et al.* (1994), an alkaliphilous and brackish fresh water species.

3. ***Surirella brebissonii*** var. ***kuetzingii*** Krammer & Lange-Bertalot Plate 43: 7–9

Ref. Krammer & Lange-Bertalot 1988 (p. 180, Fig. 127: 1–8).

DIMENSIONS. Valves 12.5–32.8 µm long and 9.5–17.8 µm wide, with 5–6 ribs and 18–19 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Turoboyski 1956, 1962; Kyselowa & Kysela 1966; Pudo 1970a, b; Uherkovich 1970), Młynówka stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964a, b), spring of Szklarka stream (Skalska 1966a), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971), Biała Przemsza River (Wasylik 1985).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, preferring waters of moderate or high conductivity (Krammer & Lange-Bertalot 1988). According to Lange-Bertalot (1996) it is especially common in eutrophic waters. According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species.

4. **Surirella crumena* (Brébisson) Van Heurck Plates 43: 10; 44: 1, 2

Surirella ovata var. *crumena* (Brébisson) Van Heurck

Ref. Krammer & Lange-Bertalot 1988 (p. 182, Fig. 29: 1–5).

DIMENSIONS. Valves 48–55 μm long and 22.4–27.0 μm wide, with 6–8 ribs and *ca* 22 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon above Kobylany village.

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003). Regarded as at risk of becoming endangered or vulnerable in Poland (Siemińska *et al*. 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic and brackish fresh water species.

5. ***Surirella helvetica*** Brun Plate 44: 3–7

Surirella linearis var. *helvetica* (Brun) Meister

Ref. Krammer & Lange-Bertalot 1988 (p. 199, Fig. 151: 2–4).

DIMENSIONS. Valves 44.6–84.2 μm long and 12.0–18.6 μm wide, with *ca* 3–5 ribs per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epipelon above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b), springs of Będkówka stream (Kubik 1970).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan diatom, most common in waters of moderate conductivity (Krammer & Lange-Bertalot 1988). According to Van Dam *et al.* (1994), a neutrophilous, oligosaprobous, oligotraphentic and fresh brackish water species.

6. ***Surirella minuta*** (Brébisson) Kützing Plates 45: 4–6; 101: 6; 102: 1–3

Surirella ovata var. *salina* (W. Smith) Rabenhorst

Ref. Krammer & Lange-Bertalot 1988 (p. 186, Figs 134: 2; 135: 1–14).

DIMENSIONS. Valves 8.8–36.5 μm long and 8–10 μm wide, with 7–8 ribs and 22.5–26.0 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon and periphyton.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sanka stream (Kądziołka 1963).

DISTRIBUTION IN POLAND. Not frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common in eutrophic waters of moderate conductivity (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al*. (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species.

REMARKS. Some reports of the occurrence of *Surirella ovata* var. *pinnata* (W. Smith) Hustedt from the upland may concern *S. minuta*. The former was reported from the Vistula River (Turoboyski 1962), Prądnik River (Stępień 1963), Pilica River (Kadłubowska 1964b), springs of Kobylanka stream (Skalna 1969), springs of Będkówka stream (Kubik 1970) and Sanka River (Hojda 1971).

7. ***Surirella ovalis*** Brébisson Plate 45: 9

Ref. Krammer & Lange-Bertalot 1988 (p. 178, Figs 125: 1–7; 126: 1).

DIMENSIONS. Valves 8.8–36.5 µm long and 8–10 µm wide, with 7–8 ribs and 22.5–26.0 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Młynówka stream (Gumiński 1947), Pilica River (Kadłubowska 1964b), ponds near Kraków, without exact localities (Hanak-Szmagier 1967).

DISTRIBUTION IN POLAND. Frequent (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and brackish water species.

8. ***Surirella tenera*** Gregory Plate 46: 1

Ref. Krammer & Lange-Bertalot 1988 (p. 203, Figs 164: 1–4; 165: 1–3).

DIMENSIONS. Valves 8.8–36.5 µm long and 8–10 µm wide, with 7–8 ribs and 22.5–26.0 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Sites with unspecified location (Raciborski 1888), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Cabejszek 1951; Kadłubowska 1964b).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1988). Euplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, β-mesosaprobous, eutraphentic, strictly aquatic and fresh brackish water species.

9. ****Surirella terricola** Lange-Bertalot & Alles Plate 45: 1–3, 10

Ref. Lange-Bertalot & Metzeltin 1996 (p. 107, Fig. 106: 16).

DIMENSIONS. Valves 14.5–18.0 µm long and 6.2–7.4 µm wide, with *ca* 5 fibulae and 20.0–22.5 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon.

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, preferring aerophytic habitats (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic and fresh brackish water species.

10. ***Surirella*** sp. 1 Plate 45: 7, 8

DIMENSIONS. Valves 45.5–48.8 µm long and 14.0–14.5 µm wide, with 5–6 fibulae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon below Kobylany village.

REMARKS. For precise identification further studies are needed.

11. ***Surirella*** sp. 2 Plate 46: 2

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon below Kobylany village.

DIMENSIONS. Valve 41.5–45.0 µm long and 14–15 µm wide, with 5.5–6.0 fibulae per 10 µm.

62. ***Tabellaria*** Ehrenberg

1. ***Tabellaria flocculosa*** (Roth) Kützing Plate 4: 8

Ref. Krammer & Lange-Bertalot 1991a (p. 108, Figs 106: 1–13; 107: 7, 11, 12).

DIMENSIONS. Valves 15 µm long and 6 µm wide, with 24–26 striae per 10 µm.

DISTRIBUTION IN KOBYLANKA STREAM. Rare, only in sample with mosses from above Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1962), fish ponds in Mydlniki (Siemińska 1947), Pilica River (Kadłubowska 1964b), Sanka stream (Hojda 1971).

DISTRIBUTION IN POLAND. Common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan (Krammer & Lange-Bertalot 1991a), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an acidophilous, β-mesosaprobous, mesotraphentic, subaerophilous and fresh water species.

63. ***Thalassiosira*** Cleve

1. ***Thalassiosira duostra*** Pienaar Plate 1: 12a–d

Ref. Pienaar & Pieterse 1990 (p. 106, Fig. 1–11).

DIMENSIONS. Valves 10.3–25.7 μm in diameter.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in mud samples from below Kobylany village. Reported previously from the same material by Wojtal and Kwandrans (2006).

GENERAL DISTRIBUTION AND ECOLOGY. Rare, presumably cosmopolitan diatom (Wojtal & Kwandrans 2006). Characterized as a freshwater, probably mesohalobous species present in the eutrophic Vaal River in South Africa (Pienaar & Pieterse 1990); reported also from polluted, eutrophic or even wastewater (Torgan *et al*. 2006).

2. ***Thalassiosira pseudonana*** Hasle & Heimdal Plate 1: 6–9

Ref. Krammer & Lange-Bertalot 1991a (p. 80, Fig. 60: 6a, b).

DIMENSIONS. Valves 4.5–6.0 μm in diameter.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in samples with mud and filamentous algae from below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Bucka 2000; Kawecka & Kwandrans 2000; Wojtal & Kwandrans 2006), Rudawa River, Prądnik River (Wojtal & Kwandrans 2006).

DISTRIBUTION IN POLAND. Reported from, e.g., Zatoka Gdańska (Witkowski 1994), Zbiornik Puławski reservoir (Bucka & Wilk-Woźniak 2002; Wilk-Woźniak & Ligęza 2003), Zalew Szczeciński (Bąk *et al*. 2006) and several rivers of southern Poland (data unpublished).

GENERAL DISTRIBUTION AND ECOLOGY. Widespread (Krammer & Lange-Bertalot 1991a), not rare but often overlooked or misidentified. According to Van Dam *et al.* (1994), an alkaliphilous, hypereutraphentic, α-mesosaprobous, strictly aquatic and fresh brackish water species.

REMARKS. Identification followed the broad species concept.

64. ***Tryblionella*** W. Smith

1. **Tryblionella debilis* Arnott Plate 42: 3, 4

Nitzschia debilis (Arnott) Grunow

Ref. Krammer & Lange-Bertalot 1988 (p. 39, Fig. 27: 9–11).

DIMENSIONS. Valves 14.0–24.6 μm long and 6.8–9.6 μm wide, with 8–10 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, found mainly in epipelon below Kobylany village.

DISTRIBUTION IN POLAND. Rare (Siemińska & Wołowski 2003). Spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, aerophilous and fresh brackish water species.

2. ***Tryblionella hungarica*** (Grunow) Frenguelli Plate 42: 1

Nitzschia hungarica Grunow

Ref. Krammer & Lange-Bertalot 1988 (p. 42, Fig. 34: 1–3).

DIMENSIONS. Valves 38.5–51.0 μm long and 7–9 μm wide, with 18–20 striae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in epipelon below Kobylany village.

DISTRIBUTION IN THE WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND. Vistula River (Starmach 1938; Turoboyski 1956, 1962), Młynówka

stream (Gumiński 1947), fish ponds in Mydlniki (Siemińska 1947), Sanka stream (Kądziołka 1963), Pilica River (Kadłubowska 1964b), Prądnik River (Stępień 1963), springs of Będkówka stream (Kubik 1970), Sanka stream (Hojda 1971), sewage ponds in Pieskowa Skała (Pudo 1978b).

DISTRIBUTION IN POLAND. Very common (Siemińska & Wołowski 2003).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, common in brackish water, up to α-mesosaprobic (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic, strictly aquatic and brackish fresh water species.

3. **Tryblionella levidensis* W. Smith

Plate 42: 5, 6

Nitzschia levidensis (W. Smith) Grunow

Ref. Krammer & Lange-Bertalot 1988 (p. 37, Figs 28: 1–11; 29: 1–5); Witkowski *et al.* 2000 (p. 389, Fig. 180: 1–4).

DIMENSIONS. Valves 18.5–62.0 μm long and 9.4–16.0 μm wide, with 7–12 fibulae per 10 μm.

DISTRIBUTION IN KOBYLANKA STREAM. Sparse, in spring epipelon.

DISTRIBUTION IN POLAND. Reported from, e.g., Zatoka Pucka (Witak 2002), spring in Warta River valley (Żelazna-Wieczorek & Mamińska 2006).

GENERAL DISTRIBUTION AND ECOLOGY. Cosmopolitan, especially common in brackish waters, up to α-mesosaprobic (Krammer & Lange-Bertalot 1988), tychoplanktonic (Denys 1991). According to Van Dam *et al.* (1994), an alkaliphilous, α-mesosaprobous, eutraphentic, strictly aquatic and brackish fresh water species.

DISCUSSION

The presence of diatom frustules in small streams reflects the current environmental state, unlike in lakes where they can be preserved in sediments. Input of live allochthonous diatoms and empty frustules is much less in small watercourses than in large rivers; and in first-order streams the range of physical and chemical variables and of microhabitats is also much narrower than in large rivers. Despite these limitations, 307 diatom taxa of 64 genera have been identified in the Kobylanka stream and its four springs (from 4 to 38 taxa per sample). The genera best represented in terms of species richness are *Navicula* (28), *Nitzschia* (36), and *Gomphonema* (16).

According to Van Dam *et al.*'s (1994) classification, most species, especially the dominant ones, were alkaliphilous or circumneutral, oligo- to mesosaprobous, mesotraphentic, fresh brackish water diatoms. The most common epilithic diatoms, especially above Kobylany village, were *Achnanthidium minutissimum*, *A. pyrenaicum*, *Amphora pediculus*, *Cocconeis placentula*, *Denticula tenuis*, *Gomphonema micropus*, *Planothidium lanceolatum* and *P. reichardtii* (Wojtal & Sobczyk 2006). Submerged mosses were commonly inhabited by *Cymbella aspera*, *Caloneis fontinalis*, *Diploneis fontanella* and several other diatoms. Such taxa as *Eunotia incisa*, *Eunotia* sp. and *Tabellaria flocculosa* were found in desiccating mosses. *Gomphonema acuminatum* and *Lemnicola hungarica* co-occurred always with *Lemna* sp. in stream parts protected from current. Samples with *Cladophora* sp., especially in Kobylany village, were dominated by *Cocconeis pediculus*, *Fragilaria capucina*, *Encyonema* spp., *Diatoma* spp. and *Rhoicosphenia abbreviata*. Filamentous thalli of *Vaucheria* sp. were inhabited by periphytic diatoms (*Achnanthidium minutissimum*, *A. biasolethianum*, *Gomphonema micropus*, *G. olivaceum*, *Cocconeis* spp., *Fragilaria capucina*) as well as epipelic ones (*Fragilaria ulna*, *Nitzschia linearis*, *N. palea*, *Gyrosigma attenuatum*, *Hippodonta costulata*, *Navicula lanceolata*, *N. gregaria*, *N. tripunctata*, *N. trivialis*, *Sellaphora pupula*), taxa that exist in mucilage tubes (e.g., *Frustulia vulgaris*, *Encyonema* spp.), or colonial forms of the ribbon-like and chain-forming *Meridion circulare* and *Diatoma mesodon*. This type of sample clearly represents the periphytic and metaphytic diatom assemblages.

Within increased ion content (Table 1) and mud accumulation in the stream, especially below

Kobylany village, several motile brackish freshwater taxa (e.g., *Caloneis amphisbaena*, *Fallacia pygmaea*, *Navicula gregaria*, *N. slesviscensis*, *N. veneta*, *Nitzschia hungarica*, and *Nitzschia* spp., *Pinnularia* spp.) appeared. Sometimes even brackish water diatoms were also observed here (e.g., *Cylindrotheca gracilis*, *Nitzschia clausii*, *N. sigma*), and such hypereutraphentic ones as *Craticula accomoda* or *Mayamaea atomus* var. *permitis*. Despite the shallow depth and small size of the stream, typical aerophilous and terrestrial diatoms along the whole length of the stream were represented only by sparse specimens of *Achnanthes coarctata*, *Amphora montana*, *Diadesmis contenta*, *D. gallica*, *Hantzschia amphioxys*, *Luticola mutica*, *L. nivalis*, *L. ventricosa*, *Pinnularia borealis* and *Stauroneis thermicola*. Species regarded as strictly aquatic were also present (e.g., *Cyclotella atomus*, *Discostella pseudostelligera*, *Stephanodiscus hantzschii*, *Thalassiosira pseudonana*, *Nitzschia recta*).

The observed diatoms represent a broad spectrum of tolerance, from regarded as oligosaprobous taxa (e.g., *Fragilaria gracilis*, *Staurosira construens* var. *binodis*, *Achnanthidium affine*, *Eucocconeis alpestris*, *Cymbella aspera*, *Tabellaria flocculosa*) to polysaprobous ones (e.g., *Craticula accomoda*, *Mayamaea atomus* var. *permitis*, *Nitzschia palea*). Most of the taxa were recorded in low or very low numbers, several of them only once during 14 years of study.

Twenty-seven species are reported for the first time from Poland: *Achnanthidium jackii*, *Chamaepinnularia submuscicola*, *Cymbella affiniformis*, *C. lange-bertalotii*, *Cymbopleura hercynica*, *C. inaequaliformis*, *Diatoma moniliformis*, *Diploneis fontanella*, *Encyonema lange-bertalotii*, *Gomphonema parvulum* var. *parvulius*, *G. parvulum* var. *parvulum* f. *saprophilum*, *Luticola paramutica* var. *binodis*, *L. ventriconfusa*, *Navicula vilaplanii*, *Nitzschia frequens*, *N. tubicola*, *Pinnularia frequentis*, *P. isselana*, *P. kuetzingii*, *P. subcomutata*, *Planothidium minutissimum*, *Sellaphora nana*, *Simonsenia delognei*, *Stauroneis leguminopsis*, *S. prominula*, *S. separanda* and *Surirella tericola*. A further eleven published previously from the same material (Wojtal 2001a, 2004b, 2006; Wojtal & Kwandrans 2006; Wojtal & Sobczyk 2006) are reported from Poland so far only from the stream: *Achnanthidium straubianum*, *Fallacia sublucidula*, *Hantzschia abundans*, *Microcostatus kuelbsii*, *Navicula aquaedurae*, *Navicula reichardtiana*, *N. wiesneri*, *Planothidium reichardtii*, *Psammothidium grischunum*, *Reimeria uniseriata* and *Thalassiosira duostra*.

Forty-seven diatoms are new to the Wyżyna Krakowsko-Częstochowska upland: *Achnanthidium eutrophilum*, *A. minutissimum* var. *inconspicua*, *Amphora inariensis*, *A. montana*, *A. veneta*, *Caloneis aerophila*, *Chamaepinnularia krookiformis*, *Cocconeis pseudolineata*, *Craticula accomoda*, *C. molestiformis*, *Cylindrotheca gracilis*, *Cymbella proxima*, *Cymbopleura subaequalis*, *Encyonema caespitosum*, *Eolimna subminuscula*, *Eunotia incisa*, *Fragilaria austriaca*, *F. bidens*, *Gomphocymbellopsis ancyli*, *Gomphonema sarcophagus*, *Grunowia sinuata*, *Luticola acidoclinata*, *L. goeppertiana*, *Mayamaea atomus* var. *permitis*, *Navicula cryptotenella*, *N. cryptotenelloides*, *N. moskali*, *N. tenelloides*, *N. upsaliensis*, *Naviculadicta brockmannii*, *Nitzschia archibaldii*, *N. constricta*, *N. inconspicua*, *N. media*, *N. pura*, *N. pusilla*, *N. sociabilis*, *N. supralitorea*, *Pinnularia obscura*, *P. septentrionalis*, *Placoneis clementis*, *P. paraelginensis*, *P. porifera*, *Stauroneis tackei*, *Surirella crumena*, *Tryblionella debilis*, and *T. levidensis*. For such previously reported diatoms as *Fallacia monoculata*, *Grunowia sinuata*, *Hantzschia abundans*, *Navicula antonii*, *Psammothidium lauenburgianum* and *Sellaphora bacilloides*, (Wojtal 2001b, 2004b; Wojtal & Sobczyk 2006), Kobylanka stream remains the only locality in the Wyżyna Krakowsko-Częstochowska upland documented so far. For another 30 taxa (*Achnanthes* cf. *brevipes* var. *intermedia*, *A. coarctata*, *Achnanthidium affine*, *A. pyrenaicum*, *Adlafia bryophila*, *Amphora copulata*, *Caloneis fontinalis*, *C. lancettula*, *Cocconeis placentula* var. *lineata*, *Diadesmis contenta*, *D. gallica*, *D. perpusilla*, *Encyonema silesiacum*, *Encyonopsis microcephala*, *Fragilaria capucina* var. *mesolepta*, *F. leptostauron* var. *dubia*, *Gomphonema minutum*, *Grunowia solgensis*, *G. tabellaria*, *Luticola nivalis*, *L. ventricosa*, *Mayamaea atomus*, *M. fossalis*

var. *fossalis*, *Neidium binodis*, *Nitzschia palea* var. *debilis*, *Pinnularia appenddiculata*, *P. viridiformis*, *Planothidium dubium*, *Sellaphora hustedtii*, *S. seminulum*) the stream is the second locality in the upland. Ten of the 16 taxa determined here as 'cf.' and 'aff.' were not previously reported from Poland (*Achnanthidium* cf. *saprophilum*, *Craticula* cf. *minusculoides*, *Encyonema ventricosum* cf. var. *angusta*, *Gomphonema* cf. *pseudoaugur*, *Hantzschia* cf. *subrupestris*, *Navicula* cf. *oligotraphenta*, *Naviculadicta* cf. *raederae*, *Pinnularia* cf. *peracuminata*, *Sellaphora* cf. *stroemii*, *Stauroneis* cf. *montana* Krasske f. *lanceolata*), and the other six were not previously reported from the upland (*Achnanthes* aff. *curtissima*, *Caloneis* cf. *alpestris*, *Cymbella* cf. *parva*, *Nitzschia* cf. *intermedia*, *N.* cf. *perminuta*, *Pinnularia* cf. *subgibba*).

There are two reasons for the large number of diatoms identified. The first is the rapid increase in the number of species distinguished and described recently, which were hidden within the broad concepts of several taxa. Many of the diatoms determined here as new or rare for Poland (16 of the 26), and as new for the Wyżyna Krakowsko-Częstochowska upland (11 of the 46) are recently described species (e.g., *Diploneis fontanella*, *Cymbopleura inaequaliformis*, *Navicula aquaedurae*, *N. moskali*, *N. vilaplanii*, *N. wiesneri*, *Pinnularia isselana*, *P. septentrionalis*, *Surirella terricola*), and they may be not rare but even common.

The second reason is the detail of this analysis of a huge amount of material, in which several diatoms were represented by only a few valves in a few samples or even one sample (*Achnanthes* cf. *brevipes* var. *intermedia*, *A. coarctata*, *Achnanthidium straubianum*, *Adlafia bryophila*, *Brachysira neoexilis*, *Cocconeis pseudolineata*, *Cyclotella distinguenda*, *Cylindrotheca gracilis*, *Cymbella lange-bertalotii*, *C.* cf. *parva*, *C. proxima*, *Cymbopleura inaequaliformis*, *Diadesmis biceps*, *D. gallica*, *Diatoma moniliformis*, *Ellerbeckia arenaria*, *Epithemia turgida*, *Eucocconeis alpestris*, *Eunotia incisa*, *Fragilaria capucina* var. *mesolepta*, *F. crotonensis*, *Gomphocymbellopsis ancyli*, *Gomphonema parallelistriatum*, *Luticola acidoclinata*, *L. goeppertiana*, *L. paramutica* var. *binodis*, *Microcostatus kuelbsii*, *Nitzschia constricta*, *Nitzschia frequens*, *N. hantzschiana*, *Pinnularia appenddiculata*, *Planothidium delicatulum*, *Rhopalodia gibba*, *Rossithidium petersenii*, *Sellaphora bacilloides*, *S. hustedtii*, *Simonsenia delognei*, *Stauroneis* cf. *montana* f. *lanceolata*, *S. phoenicenteron*, *S. tackei*, *Tabellaria flocculosa*, *Thalassiosira duostra*). The presence of *Diadesmis tabellariaeformis* (Krasske) Lange-Bertalot & Wojtal and *Brachysira minor* (Krasske) Lange-Bertalot, common diatoms in the Antarctic region, found in material collected in 1993 (Wojtal 2003b, 2004a), remains enigmatic. Of the 307 diatom taxa found, 24 are on the *Red list of the algae in Poland* (Siemińska *et al*. 2006). Six of them were classified as vulnerable taxa ('taxa believed likely to move into the 'Endangered' category in the near future if the causal factors persist'): *Psammothidium lauenburgianum*, *Cymbella aspera*, *Gomphocymbellopsis ancyli*, *Gomphonema sarcophagus*, *Sellaphora hustedtii* and *Stauroneis phoenicenteron*. Three diatoms are classified by Siemińska *et al*. (2006) as endangered (*Gomphonema tergestinum*, *Pinnularia viridiformis*, *Rossithidium petersenii*), and 14 as rare ('taxa not endangered or vulnerable, but at risk of becoming so'): *Achnanthes brevipes* var. *intermedia*, *A. coarctata*, *Caloneis aerophila*, *C. fontinalis*, *C. lancettula*, *Chamaepinnularia krookiformis*, *Diploneis oblongella*, *Fallacia subhamulata*, *Luticola acidoclinata*, *Navicula moskali*, *N. upsaliensis*, *Placoneis porifera*, *Surirella brebissoni* and *S. crumena*.

Of the 97 diatom species reported by Skalna (1969) 73 (over 75%) were confirmed. Such taxa as *Ceratoneis arcus* (Ehrenberg) Kutzing and *Navicula laterostrata* Hustedt were not found. The identity of several other taxa (e.g., *Achnanthes linearis* W. Smith, *A. lanceolata* fo. *ventricosa* Hustedt, *A. lanceolata* var. *rostrata* (Østrup) Hustedt, *Pinnularia mesolepta* (Ehrenberg) W. Smith requires revision for taxonomic consistency. For example, the concept of *P. mesolepta* has changed several times in the course of decades, and according to Krammer (2000: 99) 'in all probability *P. mesolepta* is a taxon far from nearly all forms designated to date with this name.' Other diatoms found previously but not found in this study may

have been published earlier under different name, for example, the past concept of *Achnanthes lanceolata* var. *rostrata* (Østrup) Husted overlaps *Planothidium freqentissimum*, which was frequent in this study. The distribution information is general, since much of the literature gives only species names. New methods, tools and achievements have made the identification and description of diatom morphotaxa much more precise. Several species have been split into independent taxa. When reinvestigation is impossible and/or morphological information is lacking in the literature, data employing at least historically established catch-all names (e.g., *Achnanthidium minutissimum*, *Caloneis bacillum*, *Stauroneis anceps*, *Navicula cryptocephala*, *Nitzschia palea*, *Pinnularia microstauron*, *P. viridis*, *Neidium ampliatum*) should be approached with caution.

The occurrence of rarely reported diatoms (e.g., *Sellaphora bacilloides*, *S. nana*, *Microcostatus kuelbsii*, *Naviculadicta brockmannii*, *Planothidium minutissimum*, *Psammothidium lauenburgianum Thalassiosira duostra*, *Stauroneis tackei*) in Kobylanka stream may suggest serious underestimation of their real distribution, and they may have been simply overlooked. The high diatom species richness of such a small watercourse suggests that biodiversity has been underestimated in standard studies. Small aquatic environments may make an important contribution in biodiversity on at least the regional scale, despite their modest physical extent and despite their sometimes far from natural conditions.

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Index of Latin names

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