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TAXONOMICAL AND DISTRIBUTION GUIDE OF DIATOMS IN SODA PANS OF CENTRAL EUROPE

Csilla Stenger-Kovács[1]* and Edina Lengyel[2]

[1]*University of Pannonia, Department of Limnology, H–8200 Veszprém, Egyetem utca 10, Hungary; *stenger@almos.uni-pannon.hu*
[2]*MTA-PE, Limnoecology Research Group of the Hungarian Academy of Sciences, H–8200 Veszprém, Egyetem utca 10, Hungary*

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Abstract: The 93 most characteristic and dominant diatom taxa (including varieties and forms) of soda pans are presented in this study with detailed information on their distribution. The taxonomical position of five taxa is still unclear. Altogether 1257 light and 180 scanning electron microscopic photos are shown from cleaned valves and frustules as well as from living cells (cultures isolated from these lakes).

Key words: Carpathian Basin, Central Europe, diatoms, soda pans

INTRODUCTION

Inland saline waters occur on each continent (Williams 2005). On a European scale, smaller or bigger saline lake districts are found in France, Spain and Germany. In Hungary, by the western margin of the Eurasian steppe zone, saline lakes are found in large areas (1,000,000 ha; Szabó 1997) of two hydrological basins (one is the Danube–Tisza Interfluve and the other is the area around Lake Fertő (Neusiedler See) partly in Austrian territory).

The general, limnological explanation of the development of such lake districts argues that in endorheic drainage basins precipitation and evaporation are coequal in long term, which results in alkalisation on the carbonaceous bedrock (Kalff 2002). Results of contemporary hydrological surveys outline diverse ways of evolution of salty character (Holzbecher 2005, Wardlaw and Valentine 2005), and in the case of the Hungarian saline lakes this study contradicts the traditional view. It has been demonstrated quite recently that saline inland lakes in the area between the two large rivers, Danube and Tisza in the Carpathian Basin are fed by saline water from deep-layer aquifers (Mádl-Szőnyi and Tóth 2009). Such surface leakages have been known for a long time (Kiss 1979, 1990) but their hydrogeological importance has not been recognised until now. Thus, these lakes, independently from their traditionally established (TP-total phos-

phorous) high trophic conditions, are gems of the Earth's lake diversity and they serve as important deposits of biodiversity.

From ecological point of view these habitats impose a multiple stress on their biota. Most of such lakes dry out completely by late summer; others dry out according to mesoclimatic cycles (10–12 years; PADISÁK 1998). Permanent water cover is more of an exception than rule. When their basin is more or less filled with water, they are saline (conductivity ranges from 3,000 to 60,000 $\mu S\ cm^{-1}$) and inorganically very turbid (Secchi transparency extends to only a few centimetres (HORVÁTH *et al.* 2013)). Since they serve as resting places of migratory birds (some species are also nesting), phosphorus load by the waterfowl results in permanently high TP values (BOROS *et al.* 2006). Due to their shallowness, they warm up substantially on summer days and the day-night temperature variation is also high (BOROS and VÖRÖS 2010). Such habitats allow only low-diversity assemblages (PADISÁK *et al.* 2006) and the species selection is driven by the ability of the individual species to tolerate multiple stress conditions. It implies that their competitive abilities are, most probably, of minor importance. In other words, biotic communities of such lakes are severely controlled physically (GARCÍA *et al.* 1997).

To preserve the good ecological status of surface waters is one of the most important tasks for us and the future generations. As a consequence of anthropogenic activity wetland areas decreased drastically as well as their ecological status became worsened. From nature conservation point of view these small saline lakes are especially important. Most are threatened by ill-considered human activities (draining, water supply, etc.). Their complete protection is needed because of their sensitivity, which will be impossible due to the incorrect judgments of their ecological status based on benthic diatoms. The above mentioned reasons support that ecological investigations and the development of a biota-based system are necessary and very urgent.

This study is part of the project "Ecophysiological investigation of diatom species in small saline lakes in relation to the ecological status and climate change". The aim of the project is to get new information about the ecology of saline-lake diatoms based on the experimental analyses and field work and to prepare a taxonomical guide for the authorities and users working on the monitoring of these small saline lakes. Using these data, development of such kind of systems is possible for the applied science. Major tasks are (i) to assess the ecological status of these lakes, and (ii) to predict changes in diatom communities according to climate changes. Furthermore, this study will provide new information for conservation biologists about saline-lakes species, which are threatened or may be threatened by climate change or anthropogenic activities.

During the five-year study spatial and temporal investigations revealed the composition of the diatom communities (LENGYEL and STENGER-KOVÁCS 2012,

Lengyel *et al.* 2012, Stenger-Kovács and Padisák 2012, Stenger-Kovács and Lengyel 2014, Stenger-Kovács *et al.* 2014*a*, Körmendi *et al.* 2015) and explained physical and chemical characteristics of the lakes (Stenger-Kovács *et al.* 2014*b*, Abonyi *et al.* unpubl.). Different diversity metrics were also tested (Stenger-Kovács *et al.* unpubl.) to preserve the lakes and their diatom communities from conservational and limnoecological point of view. Diatom species were isolated and cultured in laboratory conditions to define their ecophysiological optima and tolerances, furthermore, their response to the predictable climate changes (Lengyel and Stenger-Kovács 2013, Stenger-Kovács 2013, Szabó and Stenger-Kovács 2013, Lengyel 2014, Lengyel *et al.* 2014, Lengyel *et al.* 2015, Lázár *et al.* 2015, Padisák *et al.* 2015). As a final document, now, we present the most abundant and frequent diatom species of soda pans in the Carpathian Basin investigated during the last five years.

The study of the algal flora (mostly phytoplankton) of Hungarian saline lakes started relatively early (e.g. Véghné Varga 1956, 1959, 1960, 1961, 1963, 1966, Kiss 1976, Padisák 1999, Fehér and Schmidt 2003, Fehér 2010). Some studies dealt with their diatom flora, and authors published only some records of their diatom species (Grunow 1860, 1862, 1863, Cholnoky 1929, Hustedt 1959*a*, *c*, Uherkovich 1965, 1969, 1970, Kiss 1971, 1974, 1975, 1978, Schmidt and Fehér 1996, Schmidt 2003) in contrast to the thoroughly studied three biggest, shallow saline lakes: Lake Velence, Lake Fertő/Neusiedler See and Lake Szelidi-tó (Pantocsek 1912, Donászy *et al.* 1959, Hustedt 1959*b*, *c*, Szemes 1959, Buczkó 1986, 1989, Ács *et al.* 1991, Buczkó and Ács 1996–1997). Most of these publications listed only the species names of the diatoms and only some authors provided well documented drawings (Grunow 1860, 1862, 1863, Pantocsek 1912, Donászy *et al.* 1959, Hustedt 1959*a*, *b*, *c*).

Although, with the implementation of the Water Framework Directive more and more countries compiled their own iconographies (e.g. Spain, Poland, France, Germany) (Blanco *et al.* 2010, Bąk *et al.* 2012, Bey and Ector 2013, Hofmann *et al.* 2013) in addition to the existing European guides, photo documentation of the Hungarian diatom flora is sporadic and it is restricted to only some images or plates (Vízkelety 1977–1978, 1979, 1981*a*, *b*, 1987–1988, Vízkelety and Varga 2012, Buczkó *et al.* 2009, Buczkó and Wojtal 2005, Stenger-Kovács and Padisák 2009, Lengyel *et al.* 2010, Bíró *et al.* 2011, Buczkó 2015, Körmendi *et al.* 2015). In these studies only single specimens of taxa are demonstrated, in turn, the documentation of the populations and the ranges of their morphological parameters are important and very useful for biologists and assistants who work in biomonitoring according to the objectives of Water Framework Directive. These alkaline, saline lakes are unique in Hungary and even in Central Europe. However, there are no iconographic works of dia-

toms neither at national nor at international level. Only some guides are available on marine diatoms (Witkowski *et al.* 2000) and on diatom species of saline lakes in Africa and Antarctica (Taylor *et al.* 2007, Roberts and McMinn 1999). The present work fills the gap and provides the first photo documentation of diatom species and their distribution in soda pans of the Carpathian Basin. Electron microscopic images were also taken because of the possible identification problems in light microscopy.

MATERIAL AND METHODS

Benthic diatom samples were taken from 117 sampling occasions in 31 soda pans between 2005 and 2012, in two regions of Central Europe (Table 1). These are the Danube–Tisza Interfluve and the Fertő–Hanság region extending to two countries (Austria and Hungary). During 2012–2013, other 90 samples were collected, especially from the Fertő–Hanság region from three lakes: Borsodi-dűlő, Lake Legény and Nyéki-szállás. The physical and chemical features of the lakes were published in Stenger-Kovács *et al.* (2014*b*).

The samples were boiled in 30% H_2O_2. HCl was also added to remove carbonates. Since these lakes are full of small, suspended, solid particles further treatments were needed (e.g. $KClO_3$, H_2SO_4, HNO_3 and K_2MnO_4). Despite all efforts the samples could not be cleaned perfectly. Diatom valves were mounted in Naphrax. Light microscopic photos were taken on a Zeiss Axio Imager A1 microscope with Axiocam MRc5 digital camera using Planapochromat DIC lense at 1000× magnification. For scanning electron microscopic studies cleaned valves were dried and coated with gold-palladium and investigated with a Hitachi S-2600 N scanning electron microscope. The concept of the identification followed the literatures of Krammer and Lange-Bertalot.

The data tables contain the references of a given species with the exact sides, tables and photos, where the species and its description can be found. Furthermore, they consist of the sites, the mean and the maximal abundance, constancy and ecology of the species with the taxonomical notes on their identifications. It is also indicated in which pan the photos were taken. Species composition and relative abundance of the species were calculated after counting ~400 valves in each sample. Mean abundance expresses the average of the relative abundance of a given species in the sites where the species is present. Constancy of the species was estimated based on the presence of a given species in all of the samples in both regions/one of the regions. Five categories were distinguished as follows: 1: <20% (the species is present in less than 20% of all sampling sites); 2: 20–40%; 3: 40–60%, 4: 60–80%, 5: >80%.

Table 1. The investigated soda pans and their coordinates.

Name of the soda pan	GPS coordinates		Country
Albersee	47.77415° N	16.76961° E	Austria
Bába-szék	46.74051° N	19.15031° E	Hungary
Bíbic-tó	46.46841° N	19.97478° E	Hungary
Borsodi-dűlő	47.68151° N	16.84001° E	Hungary
Böddi-szék	46.75648° N	19.13955° E	Hungary
Büdös-szék	46.85961° N	19.18238° E	Hungary
Büdös-szék Pusztaszer	46.54108° N	20.26358° E	Hungary
Cikes	47.69605° N	16.84098° E	Hungary
Csárda-szék	46.75543° N	19.45656° E	Hungary
Fehér-szék	46.80473° N	19.18598° E	Hungary
Fülöp-szék	46.92412° N	19.99420° E	Hungary
Hattyús-szék	46.87536° N	19.43916° E	Hungary
Herrnsee	47.74348° N	16.77016° E	Austria
kardoskúti Fehér-tó	46.47075° N	20.63031° E	Hungary
Kelemen-szék	46.79173° N	19.17651° E	Hungary
Kirchsee	47.75738° N	16.78831° E	Austria
Kisréti-tó	46.86790° N	19.32266° E	Hungary
Kondor-tó	46.89118° N	19.41780° E	Hungary
Legény-tó	47.66321° N	16.81336° E	Hungary
Neubruch	47.78603° N	16.84425° E	Austria
Nyéki-szállás	47.67705° N	16.83283° E	Hungary
Ősze-szék	46.41020° N	19.99030° E	Hungary
Paprét	47.66571° N	16.82661° E	Hungary
pirtói Nagy-tó	46.52705° N	19.46981° E	Hungary
Sárkány-tó	46.74135° N	19.38693° E	Hungary
Szappan-szék	46.89118° N	19.41780° E	Hungary
Szarvas-tó	46.54623° N	19.48353° E	Hungary
Szívós-szék	46.87918° N	19.44111° E	Hungary
Untersee	47.80160° N	16.78418° E	Austria
Zab-szék	46.83583° N	19.16853° E	Hungary
Zicklacke	47.76791° N	16.78116° E	Austria

Scale bar is always 10 μm unless indicated otherwise (especially in the case of SEM pictures). Images indicated by black letters are light, by white, bold letters are electron microscopic pictures.

RESULTS AND DISCUSSION

The total number of the samples was 210 in which 188 species were identified. The 93 most abundant and/or widely distributed taxa were selected and illustrated in this work along with their biogeographical data. The enumeration of the species is in alphabetical order. There were different varieties and forms within the 93 taxa belonging to 39 genera. Most of the species were members of the motile ecological guilds (including fast moving species), mainly *Nitzschia* (38) and *Navicula* (27) species. Based on their relative abundance in the whole database the first three dominant species were *Nitzschia frustulum* (Kützing) Grunow, *Nitzschia supralitorea* Lange-Bertalot and *Nitzschia aurariae* Cholnoky. Some low profile species, like *Halamphora* spp., also occurred in considerable quantities. The most frequent species were *Nitzschia frustulum* and *Navicula veneta* Kützing and belonged to the constancy class 4. The group of the constancy marked 3 involved *Craticula buderi* (Hustedt) Lange-Bertalot, *Nitzschia palea* (Kützing) W. Smith, *Nitzschia supralitorea* and *Tryblionella apiculata* Gregory. Most of the species had constancy value of 1 (67 taxa) or 2 (15 taxa), which indicated that each of the lakes has unique diatom species and communities.

Some red-list species were also registered. *Cylindrotheca gracilis* (Brébisson ex Kützing) Grunow and *Surirella peisonis* Pantocsek are vulnerable species, *Campylodiscus bicostatus* W. Smith ex F. C. S. Roper and *Nitzschia vitrea* G. Norman are under low risk and *Craticula halophila* (Grunow) D. G. Mann, *Scoliopleura peisonis* Grunow and *Bacillaria paradoxa* J. F. Gmelin are presumably endangered according to the Hungarian red list (Németh 2005). According to the German red list (Rumrich *et al.* 2000) *Fragilaria famelica* (Kützing) Lange-Bertalot is endangered, *Pinnularia oriunda* K. Krammer is presumably endangered, *Nitzschia valdecostata* Lange-Bertalot et Simonsen is extremely rare and the populations of *Campylodiscus bicostatus*, *Navicula oblonga* (Kützing) Kützing and *Gyrosigma acuminatum* (Kützing) Rabenhorst are in regression.

The occurrence of some taxa is of distinguished floristical importance. *Scoliopleura peisonis*, *Surirella hoefleri* Hustedt, *Surirella peisonis*, and *Campylodiscus bicostatus* were published as character species of Lake Fertő, or of the small saline lakes around Lake Fertő (Burgenland, Seewinkel) (Krammer and Lange-Bertalot 1988, 1999). However, apart from two species (*Scoliopleura peisonis*,

Campylodiscus bicostatus) the other ones were also recognised in the pans of the Danube–Tisza Interfluve. New *Halamphora* species (*H. dominici* Ács et Levkov and *H. kevei* Levkov) were also found in the soda pans, which were originally described from their Chilean type locality (Levkov 2009). Some species appeared only in the Danube–Tisza Interfluve: *Gomphonema brebissonii* Kützing, *Gomphonema clavatum* Ehrenberg, *Nitzschia* sp. 2 and *Surirella* sp. 1. On the other hand, some species were characteristic only for the Fertő–Hanság region (e.g. *Bacillaria paxilifer* (Müller) T. Marsson, *Nitzschia elegantula* Grunow) and some especially for a single pan of the region. *Achnanthes brevipes* Agardh var. *intermedia* (Kützing) Cleve, and *Cylindrotheca gracilis* were found only in the Borsodi-dűlő, while *Amphora copulata* (Kützing) Schoeman et R. E. M. Archibald, *Cymatopleura solea* (Brébisson) W. Smith var. *apiculata* (W. Smith) Ralfs, *Navicula duerrenbergiana* Hustedt in Schmidt *et al.*, and *Tryblionella gracilis* W. Smith were recorded only in the Legény-tó.

Five (three *Nitzschia*, one *Mastogloia*, and one *Surirella* species) of the 93 taxa are presumably new to science based on their unequivocally different features. The morphological analyses of these species are given in the corresponding plates. Their publications are in progress.

It is obvious, that soda pans have very special limnological features; it follows from this very special biota (Lengyel *et al.* 2012). Species living in the pans have to adapt to high level stress on long time scales (Stenger-Kovács *et al.* 2014*b*). Only few closely related species can survive and maintain permanent populations under these conditions, therefore, species richness and diversity are low in soda pans (Stenger-Kovács *et al.* unpubl.). Mostly cosmopolitan, widely distributed species occurred, but they are specifically characteristic for saline waters, which are unique ecosystems in Central Europe. Overall, the species composition indicates the high trophic state and salinity of these lakes. The main drivers determining diatom composition were conductivity, HCO_3^-, SO_4^{2-} and temperature (Stenger-Kovács *et al.* 2014*b*).

Nowadays, the identification of diatom species bases on the morphological features of the valves. Although, genetic based separation (DNA barcoding) of the species will provide a huge number of new information about the taxa and their taxonomical hierarchy, they cannot substitute microscopic studies, which are the basis of ecological status assessments, even if they are promising techniques (Kermarrec *et al.* 2014) for detecting all the species in a sample. Henceforth, gaining knowledge on the diatom flora is a major task for basic research.

Achnanthes brevipes Agardh 1824 var. *intermedia* (Kützing) Cleve 1895 (Plate 1: Figs 1–14)

References: Krammer and Lange-Bertalot (1991: 3, pl. 1: 4–8), Hofmann *et al.* (2013: 70, pl. 21: 6–9), Witkowski *et al.* (2000: 86, pl. 43: 1–5).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	14–130	31.4–50.8
Width	9.5–40	9.1–12.5
Striae	9–10/10	9–10/10

Distribution in soda pans of the Carpathian Basin (Fertő–Hanság region)

Lakes	Borsodi-dűlő, Nyéki-szállás
Mean / max. abundance	0.9% / 4.3%
Constancy	2 (26.9%)

Ecology: Cosmopolitan species in marine coasts and in saline, inland waters.

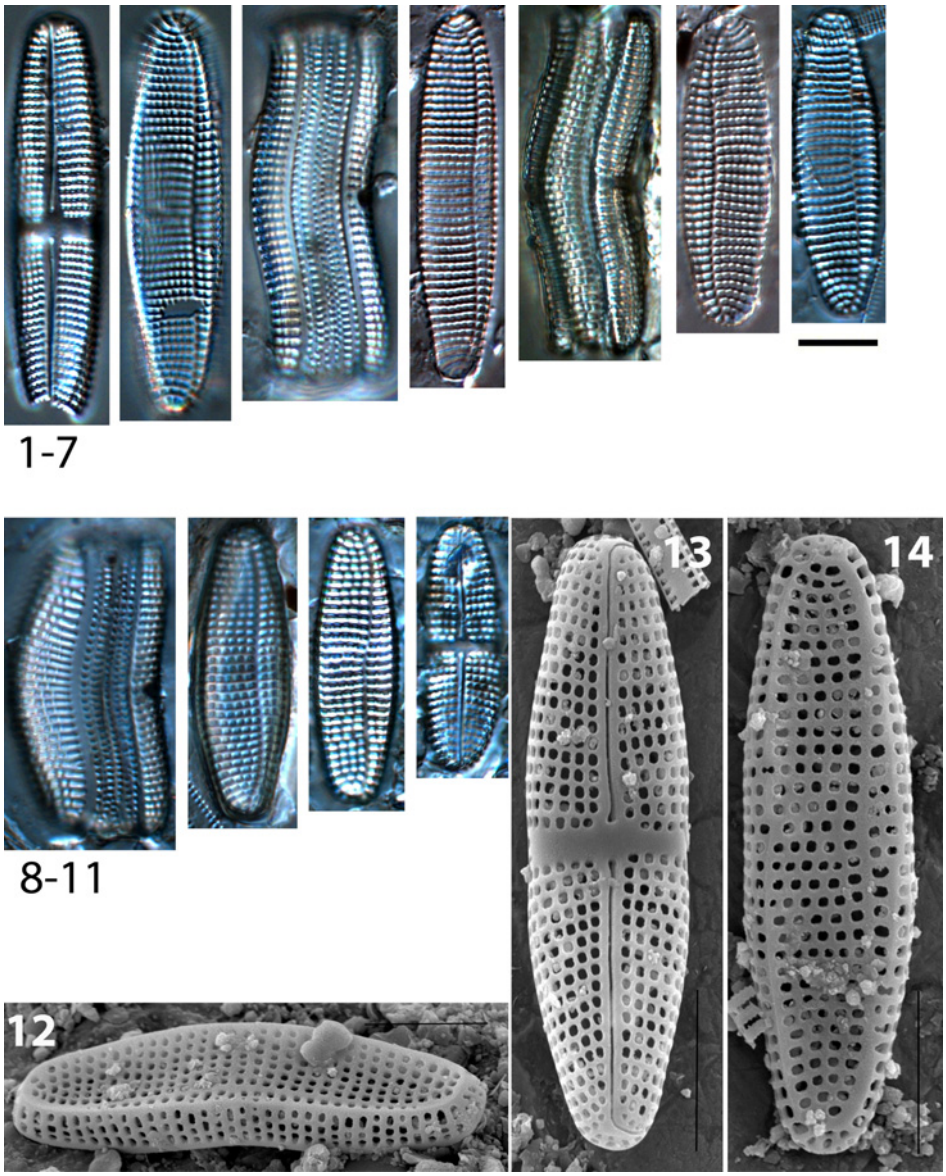


Plate 1: *Achnanthes brevipes* var. *intermedia*. **Figs 1–5**: Nyéki-szállás; **Figs 6–14**: Borsodi-dűlő. – **Figs 1, 11**: raphe valve; **Figs 2, 4, 6–9**: rapheless valve; **Figs 3, 5, 8**: girdle view; **Figs 12, 14**: external view of the rapheless valve (SEM); **Fig. 13**: external view of the raphe valve (SEM).

Achnanthidium minutissimum (Kützing) Czarnecki 1994
(Plate 2: Figs 1–32)

References: Krammer and Lange-Bertalot (1991: 56, pl. 32: 1–24; pl. 35: 1–2), Bey and Ector (2013: 106–107), Hofmann *et al.* (2013: 83, pl. 23: 15–21), Taylor *et al.* (2007: pl. 95).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	5–25	7.6–24.2
Width	2.5–4	2.6–3.5
Striae	~30/10	30/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Bíbic-tó, Borsodi-dűlő, Büdös-szék (Pusztaszer), Cikes, Csárda-szék, Hattyús-szék, Kardoskúti Fehér-tó, Kisréti-tó, Kondor-tó, Legény-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Pirtói Nagy-tó, Sárkány-tó, Szarvas-tó, Szívós-szék
Mean / max. abundance	5.9% / 41.8%
Constancy	2 (28.2%)

Ecology: Very abundant species with wide ecological tolerance. It can be found in all types of water bodies.

Taxonomical note: *Achnanthidium minutissimum* var. *jackii* (Rabenhorst) Lange-Bertalot has lower striae density (~26/10 μm).

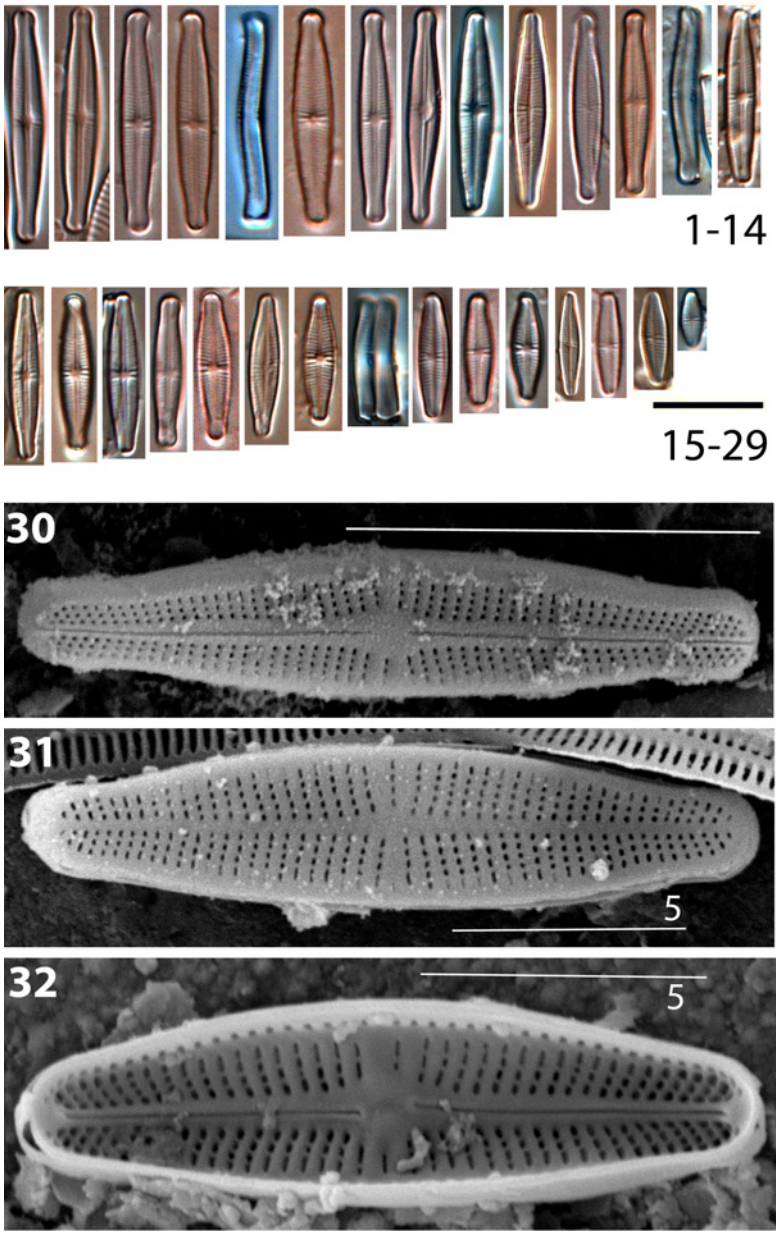


Plate 2: *Achnanthidium minutissimum*. **Figs 1–2, 4, 6**: Ősze-szék; **Figs 3, 7–8, 11, 19, 24**: Bíbic-tó; **Figs 5, 9–10, 13–17, 20–22, 25–26, 28–32**: Legény-tó; **Fig. 12**: Szarvas-tó; **Figs 18, 23**: Csárda-szék; **Fig. 27**: Büdös-szék (Pusztaszer). – **Figs 1–4, 6–12, 14–21, 23–29**: valve view; **Figs 5, 13, 22**: girdle view; **Fig. 30**: external view of the raphe valve (SEM); **Fig. 31**: external view of the rapheless valve (SEM); **Fig. 32**: internal view of the raphe valve (SEM).

Amphora copulata (Kützing) Schoeman et Archibald 1986 (Plate 3: Figs 1–16)

References: Krammer and Lange-Bertalot (1999: 345, pl. 149: 3–11 (*Amphora libyca*)), Levkov (2009: 49, pl. 46, pl. 47, pl. 59, pl. 154, pl. 157, pl. 162), Bey and Ector (2013: 754–755), Hofmann *et al.* (2013: 95, pl. 91: 4–8).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	19–42	20.3–32.9
Width	5–7.5	5.4–7.2
Striae on the dorsal side	14–16/10	14–16/10
Striae on the ventral side	12–14/10	12–14/10

Distribution in soda pans of the Carpathian Basin

Lakes	Legény-tó
Mean / max. abundance	1.3% / 41.8%
Constancy	1 (7.7%)

Ecology: Widely distributed freshwater species in meso- to eutrophic waters.

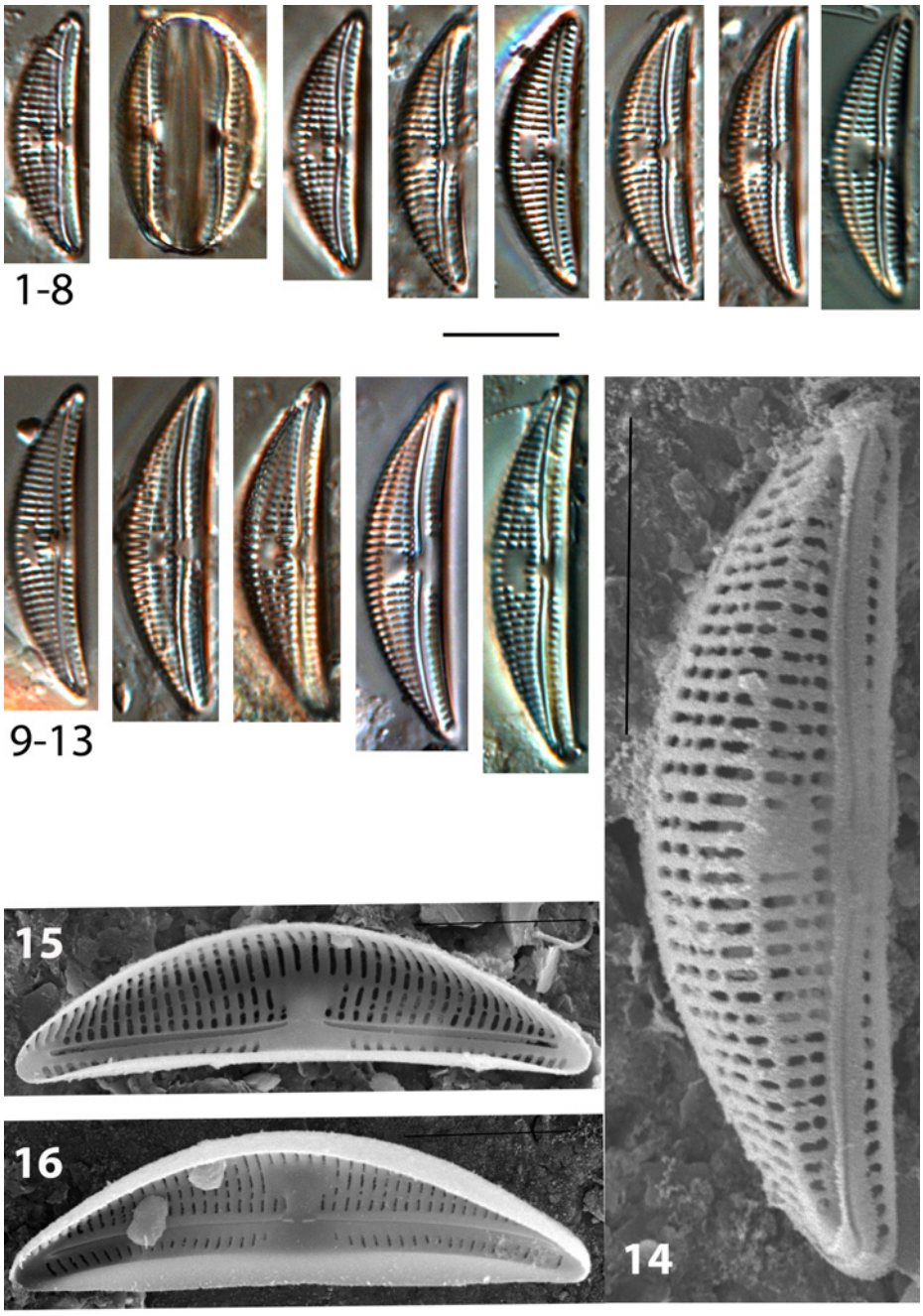


Plate 3: *Amphora copulata*. **Figs 1–16**: Legény-tó. – **Figs 1–16**: valve view; **Fig. 14**: external view of the valve (SEM); **Figs 15–16**: internal view of the valve (SEM).

Amphora indistincta Levkov 2009
(Plate 4: Figs 1–24)

References: Levkov (2009: 69, pl. 56, pl. 78, pl. 152, pl. 193, pl. 196), Bey and Ector (2013: 758–759), Hofmann *et al.* (2013: 97, pl. 91: 24–28).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	6–20	7.4–14.9
Width	3–4	2.5–3.6
Striae on the dorsal side	18–22/10	19–22/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Borsodi-dűlő, Böddi-szék, Csárda-szék, Legény-tó, Fülöp-szék, Hattyús-szék, Kisréti-tó, Kondor-tó, Szívós-szék, Zab-szék
Mean / max. abundance	1.6% / 8.9%
Constancy	1 (11.1%)

Ecology: Epiphytic diatom species in eutrophic, moderately polluted freshwaters.

Taxonomical note: *Amphora indistincta* has a dorsal ridge and each stria consists of a single areola in contrast to *Amphora pediculus* (Kützing) Grunow ex A. Schmidt.

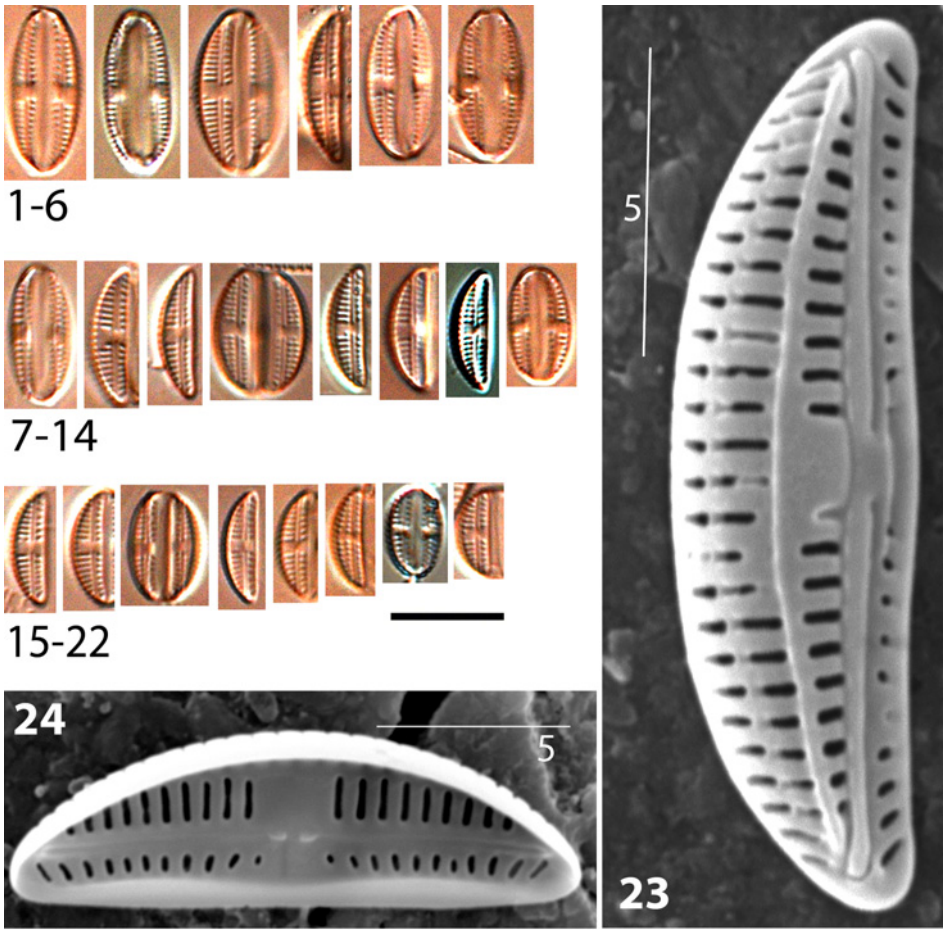


Plate 4: *Amphora indistincta*. **Figs 1, 3–4, 7–10, 12, 14–20, 22**: Bíbic-tó; **Figs 2, 5–6**: Kondor-tó; **Figs 11, 13, 21, 23–24**: Legény-tó. – **Figs 1–22**: valve view; **Fig. 23**: external view of the valve (SEM); **Fig. 24**: internal view of the valve (SEM).

Anomoeoneis sphaerophora Pfitzer 1871 f. *sphaerophora* (Plate 5: Figs 1–12)

References: Krammer and Lange-Bertalot (1999: 252, pl. 92: 1–2, 6), Bey and Ector (2013: 346–347), Hofmann *et al.* (2013: 103, pl. 66: 31), Taylor *et al.* (2007: pl. 63).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	25–80	33–68.2
Width	13–22	11.9–21.5
Striae on the dorsal side	15–20/10	16–19/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Bába-szék, Borsodi-dűlő, Böddi-szék, Fülöp-szék, Kelemen-szék, Legény-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Szívós-szék, Untersee, Zicklacke
Mean / max. abundance	1.5% / 10.5%
Constancy	2 (32.5%)

Ecology: Abundant in brackish waters, marshes and saline inland waters.

Taxonomical note: *Anomoeoneis sphaerophora* f. *sphaerophora* has middle-sized valve with big head, f. *costata* (Kützing) Schmid has rhombic-elongated shape with rounded apices, while f. *sculpta* (Ehrenberg) Krammer has elliptic-elongated valve shape with small pointed head.

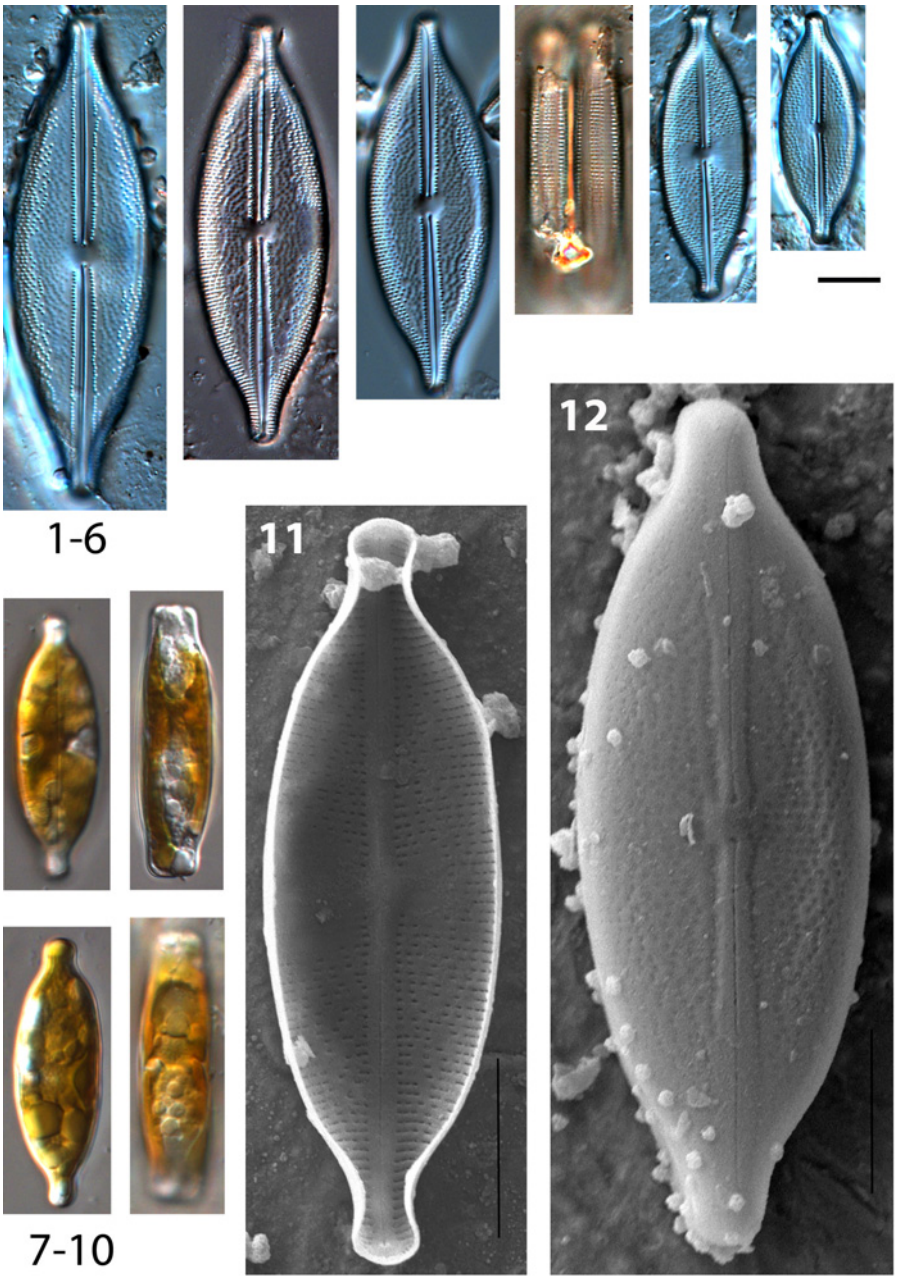


Plate 5: *Anomoeoneis sphaerophora* f. *sphaerophora*. **Fig 1–6**: Borsodi-dűlő; **Figs 7–11**: culture isolated from Bogárzó; **Figs 12**: Nyéki-szállás. – **Figs 1–3, 5–7, 9, 11–13**: valve view; **Figs 4, 8, 10**: girdle view; **Figs 7–10**: living cells; **Fig. 11** (strongly corroded): external view of the valve (SEM); **Fig. 12**: internal view of the valve (SEM).

Anomoeoneis sphaerophora f. *costata* (Kützing) Schmid 1977 (Plate 6: Figs 13–19)

References: Krammer and Lange-Bertalot (1999: 252, pl. 92: 5, pl. 93: 1–3), Taylor *et al.* (2007: pl. 63).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	25–200	45.8–110.1
Width	12–60	16.5–26.2
Striae on the dorsal side	13–20/10	15–16/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Borsodi-dűlő, Herrnsee, Zicklacke
Mean / max. abundance	0.5% / 1%
Constancy	1 (5.1%)

Ecology: Abundant in brackish waters, marshes and saline inland waters.

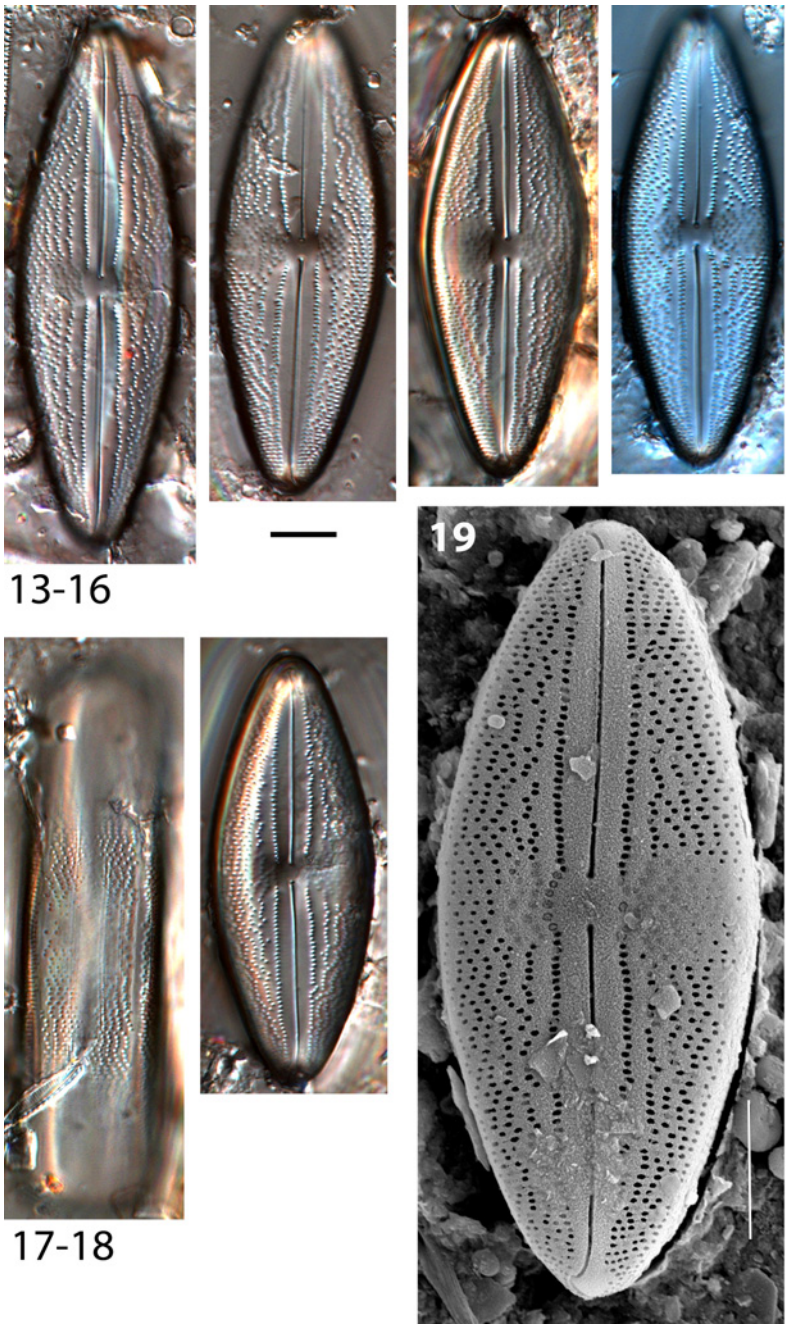


Plate 6: *Anomoeoneis sphaerophora* f. *costata*. **Fig. 13**: Nyéki-szállás, **Figs 14–19**: Borsodi-dűlő. – **Figs 14–17, 19**: valve view; **Fig. 18**: girdle view; **Fig. 19**: external view of the valve (SEM).

Anomoeoneis sphaerophora f. *sculpta* (Ehrenberg) Krammer 1985 (Plate 7: Figs 20–25)

Reference: Krammer and Lange-Bertalot (1999: 252, pl. 92: 3–4).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	65–200	55–97.1
Width	25–45	22.9–32.7
Striae on the dorsal side	10–16/10	14–15/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Zicklacke
Mean / max. abundance	0.6% / 1.6%
Constancy	1 (6%)

Ecology: Abundant in brackish waters, marshes and saline inland waters.

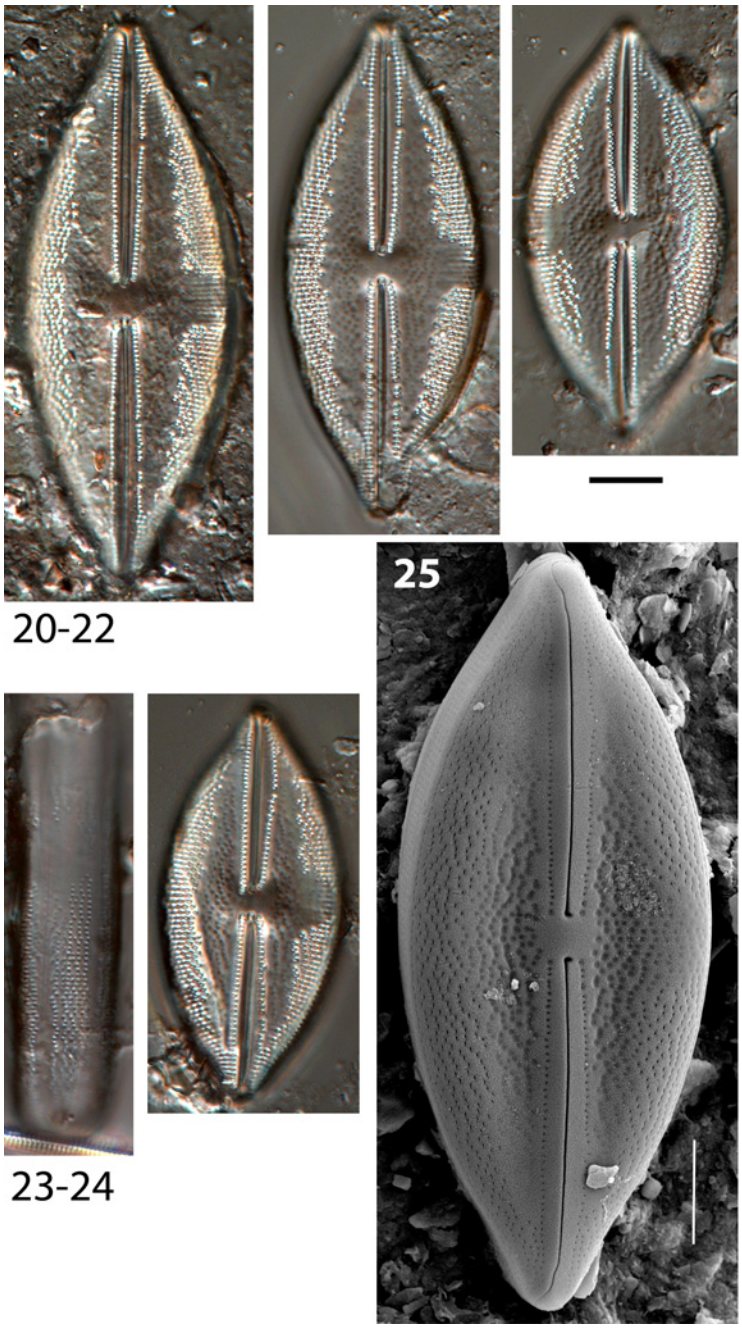


Plate 7: *Anomoeoneis sphaerophora* f. *sculpta*. **Figs 20–25**: Borsodi-dűlő. – **Figs 20–23, 25**: valve view; **Fig. 24**: girdle view; **Fig. 25**: external view of the valve (SEM).

Bacillaria paxillifera (Müller) Hendey 1951
(Plate 8: Figs 1–13)

References: KRAMMER and LANGE-BERTALOT (1999: 8, pl. 87: 4–7 (*Bacillaria paradoxa*)), WITKOWSKI *et al.* (2000: 357, pl. 212: 9–12), TAYLOR *et al.* (2007: pl. 136), BEY and ECTOR (2013: 976–977), HOFMANN *et al.* (2013: 105, pl. 118: 1–5).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	38–150	74.1–96.3
Width	4–8	4.8–6
Striae	20–25/10	22–24/10
Fibulae	5–9/10	5–8/10

Distribution in soda pans of the Carpathian Basin (Fertő–Hanság region)

Lakes	Borsodi-dűlő, Legény-tó, Nyéki-szállás
Mean / max. abundance	0.5 % / 1.6%
Constancy	1 (12.2%)

Ecology: Cosmopolitan species, abundant in marine coasts and in waters with high conductivity and alkaline pH.

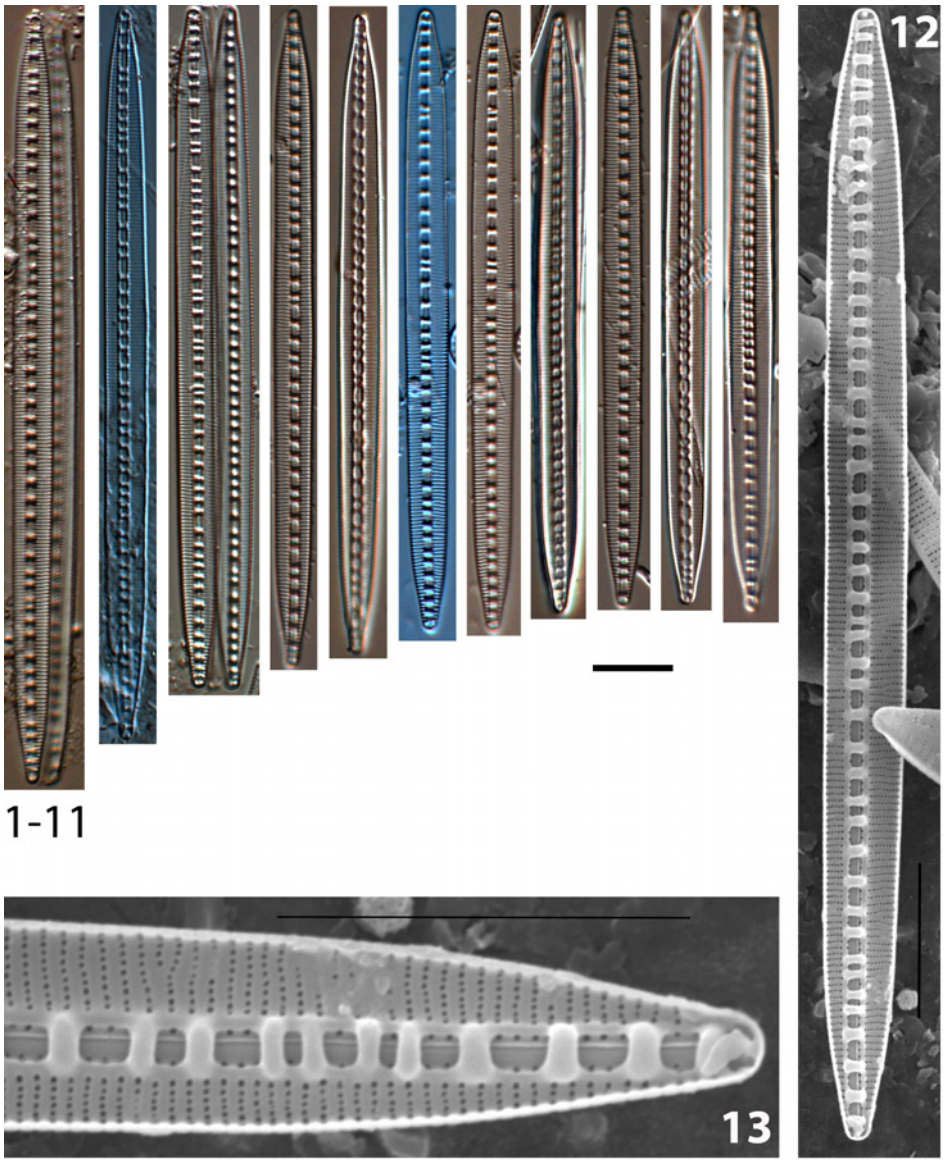


Plate 8: *Bacillaria paxillifera*. **Figs 1–11**: Borsodi-dűlő; **Figs 12–13**: Legény-tó. – **Figs 1–13**: valve view; **Figs 12–13**: internal view of the valve (SEM).

Caloneis amphisbaena (Bory) Cleve 1894
(Plate 9: Figs 1–7)

References: Krammer and Lange-Bertalot (1999: 385, pl. 168: 4–5), Bey and Ector (2013: 362–363), Hofmann *et al.* (2013: 116, pl. 69: 1–5).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	36–80	63.7–75.9
Width	20–30	21.4–26.3
Striae	15–18/10	15–16/10

Distribution in soda pans of the Carpathian Basin (Fertő–Hanság region)

Lakes	Borsodi-dűlő, Legény-tó, Nyéki-szállás
Mean / max. abundance	0.5% / 1.4%
Constancy	1 (7.7%)

Ecology: Abundant in waters with moderate and high conductivity.

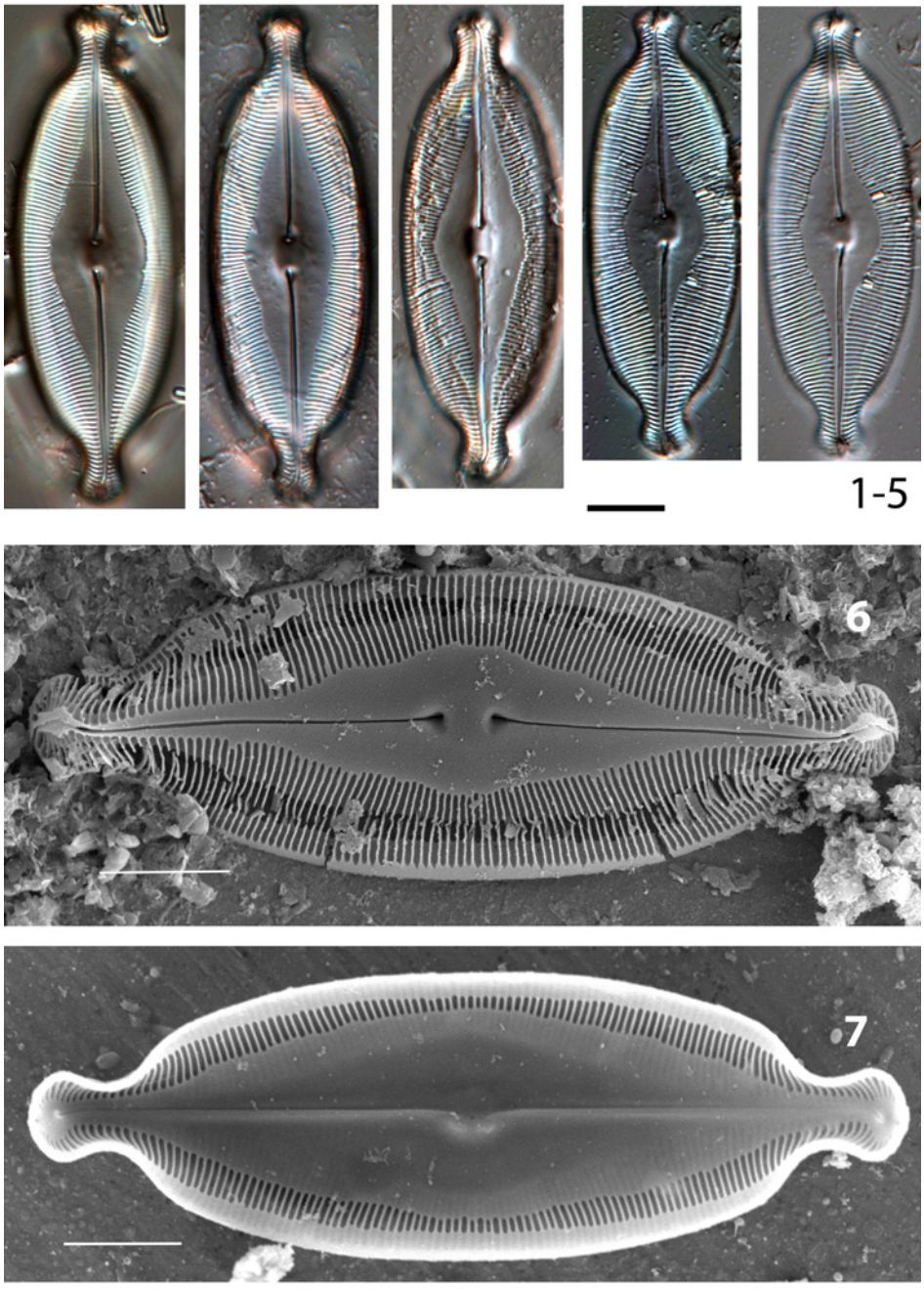


Plate 9: *Caloneis amphisbaena*. **Figs 1–5**: Legény-tó; **Figs 6–7**: Borsodi-dűlő. – **Figs 1–7**: valve view; **Fig. 6**: external view of the valve (SEM); **Fig. 7**: internal view of the valve (SEM).

Caloneis silicula (Ehrenberg) Cleve 1894
(Plate 10: Figs 1–9)

References: Krammer and Lange-Bertalot (1999: 388, pl. 172: 1–13), Bey and Ector (2013: 372–373), Hofmann *et al.* (2013: 119–120, pl. 68: 1–4), Taylor *et al.* (2007: pl. 86).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	~25–120	43.5–73.7
Width	~10–20	10.3–14.4
Striae	15–20/10	16–18/10

Distribution in soda pans of the Carpathian Basin (Fertő–Hanság region)

Lakes	Borsodi-dűlő, Legény-tó
Mean / max. abundance	0.4% / 1.6%
Constancy	1 (15.5%)

Ecology: Abundant in the littoral regions of lakes with moderate conductivity.

Taxonomical note: Central area of *Caloneis schumanniana* (Grunow) Cleve has a moon shape depression, and it is thinner (8–14/10 μm) than *C. silicula*.

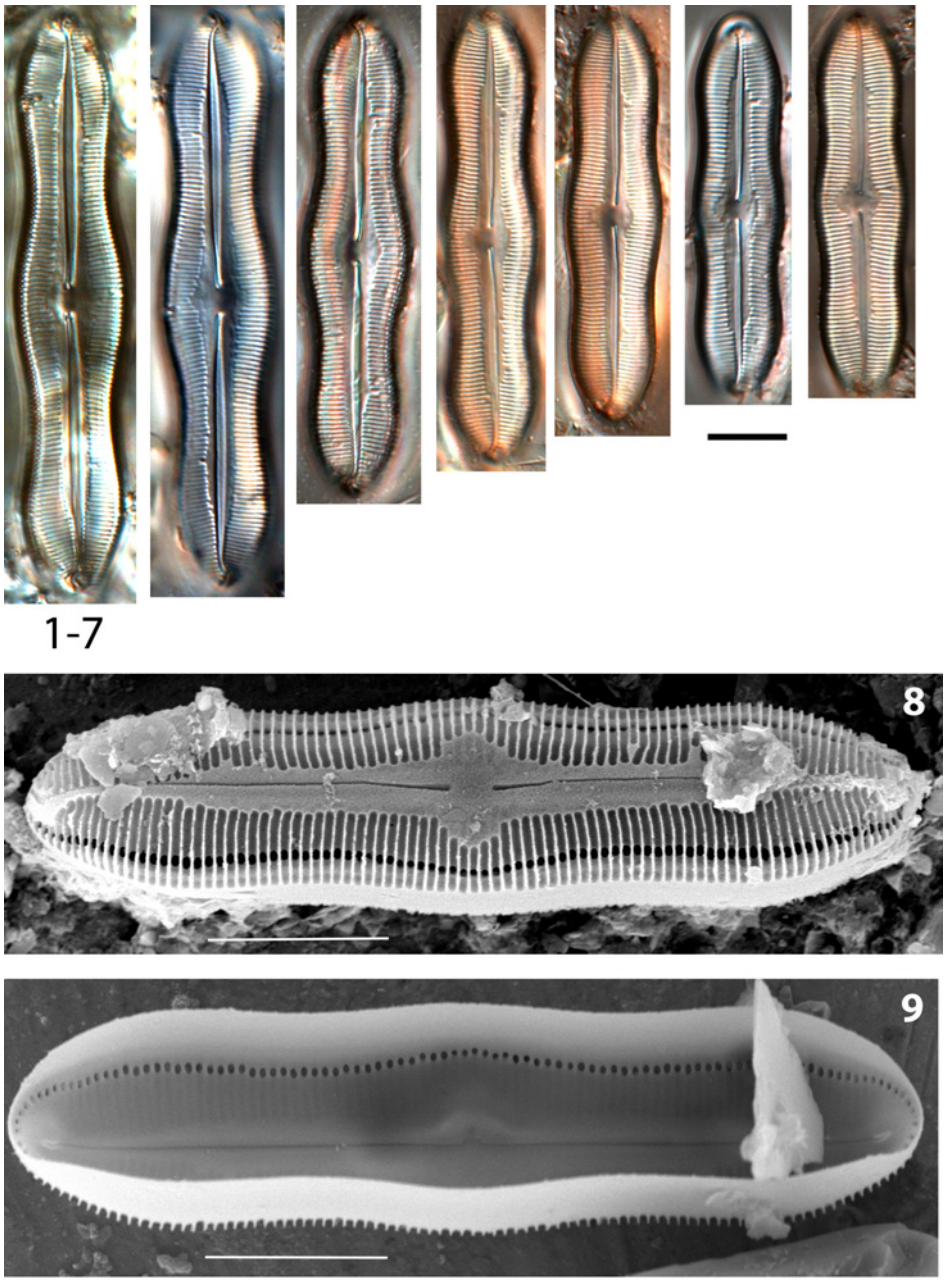


Plate 10: *Caloneis silicula*. **Figs 1–9**: Legény-tó. – **Figs 1–9**: valve view; **Fig. 8**: external view of the valve (SEM); **Fig. 9**: internal view of the valve (SEM).

Campylodiscus bicostatus W. Smith 1854
(Plate 11: Figs 1–9)

Reference: Krammer and Lange-Bertalot (1999: 215, pl. 178: 1–6).

	Morphological parameters (µm)	Observations in soda pans (µm)
Diameter	40–85	39–71.8
Fibulae	15–25/100	15–25/100

Distribution in soda pans of the Carpathian Basin (Fertő–Hanság region)

Lakes	Borsodi-dűlő, Legény-tó
Mean / max. abundance	0.7% / 2.3%
Constancy	1 (11.1%)

Ecology: Cosmopolitan, littoral species of marine coasts and abundant in inland waters with higher conductivity (Neusiedler See, Lake Fertő).

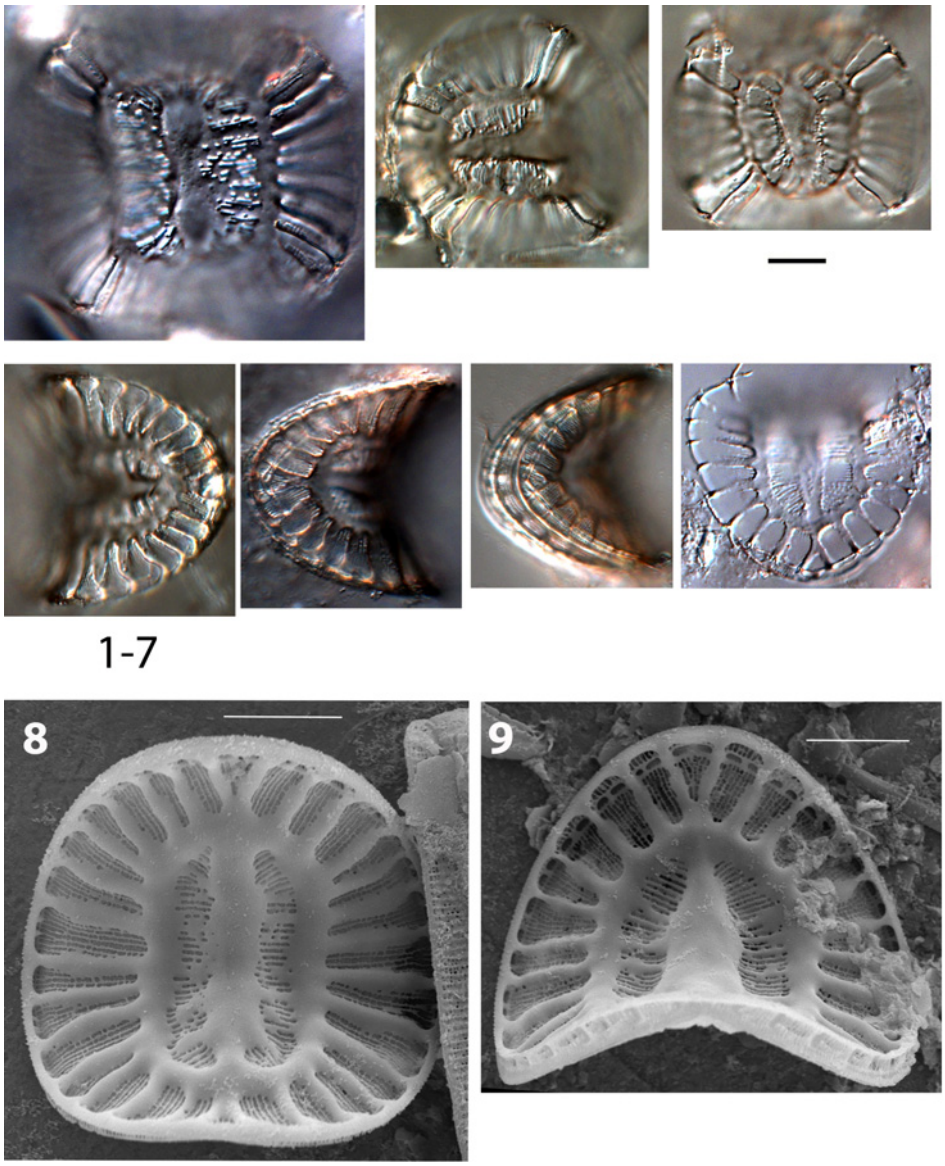


Plate 11: *Campylodiscus bicostatus*. **Figs 1, 7–9**: Legény-tó; **Figs 2–6**: Borsodi-dűlő. – **Figs 1–9**: valve view; **Figs 8–9**: internal view of the valve.

Cocconeis placentula Ehrenberg 1838
(Plate 12: Figs 1–14)

References: Krammer and Lange-Bertalot (1991: 86, pl. 49–54), Hofmann *et al.* (2013: 133, pl. 19: 1–12).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	7.5–98	15.7–31.1
Width	8–40	9.6–19.5
Striae	13–36/10 (rapheless valve)	22–26/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Büdös-szék (Pusztaszer), Fehér-szék, Hattyús-szék, Legény-tó, Nyéki-szállás, Pirtói Nagy-tó, Szarvas-tó
Mean / max. abundance	4% / 41.3%
Constancy	1 (10.3%)

Ecology: Epiphytic species with wide ecological tolerance.

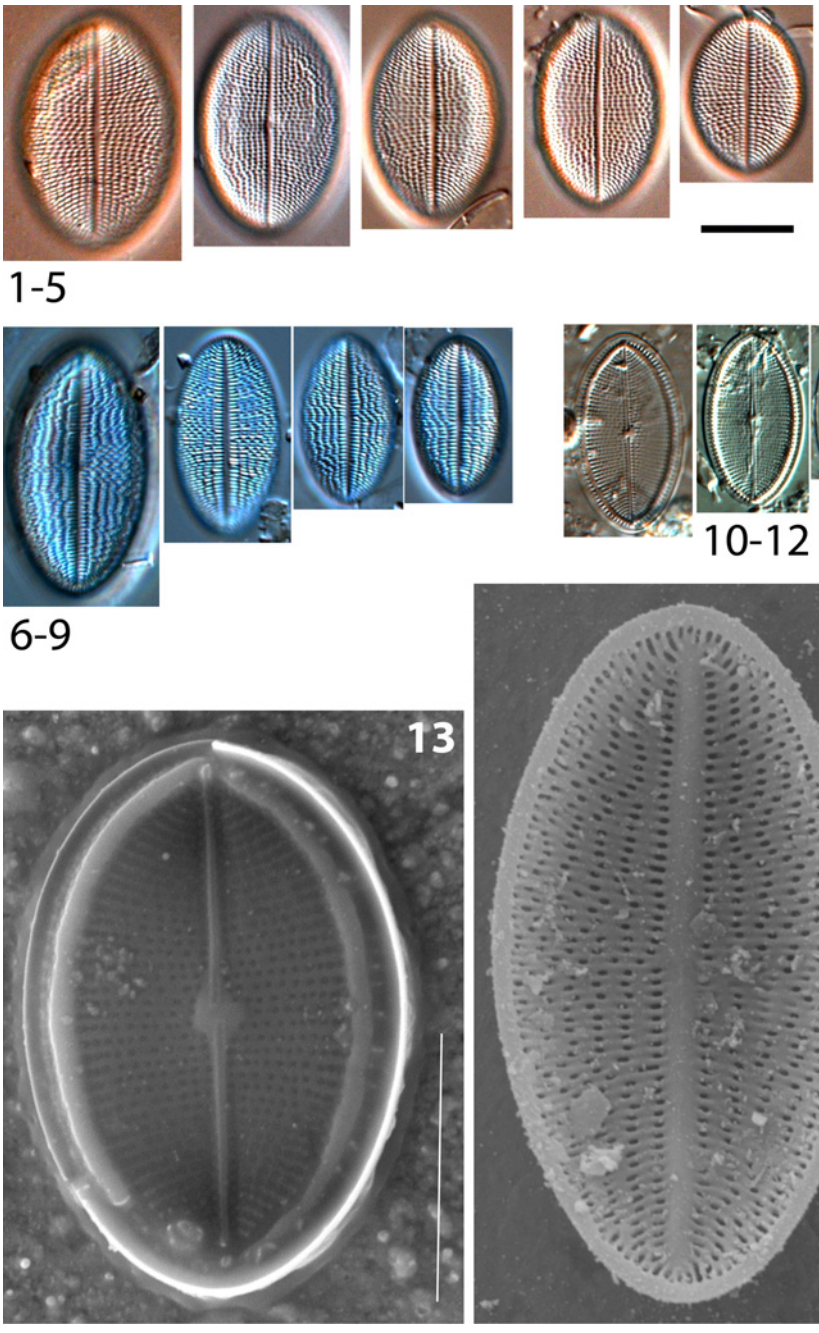


Plate 12: *Cocconeis placentula*. **Figs 1–5**: Szarvas-tó; **Figs 6–14**: Legény-tó. – **Figs 1–14**: rapheless valve; **Figs 10–12**: raphe valve (SEM); **Fig. 13**: raphe valve (SEM); **Fig. 14**: rapheless valve (SEM).

Craticula ambigua (Ehrenberg) D. G. Mann 1990
(Plate 13: Figs 1–11)

References: Lange-Bertalot (2001: 109, pl. 82: 4–8), Bey and Ector (2013: 388–389), Hofmann *et al.* (2013: 138, pl. 44: 3–5), Taylor *et al.* (2007: pl. 47).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	42–95	45.5–64
Width	13–24	13–16.5
Striae	15–18/10	16–18/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó, Nyéki-szállás, Zab-szék
Mean / max. abundance	2.3% / 13.7%
Constancy	1 (13.7%)

Ecology: Epipelic species in eutrophic waters with moderate to high salinity levels. Resistant to organic pollutants.

Taxonomical note: *Craticula cuspidata* is longer and wider, the striae density is higher than in the case of *C. cuspidata* 11–15/10 μm. (Fuelling, L. (2011) *Craticula cuspidata*. In Diatoms of the United States. Retrieved October 30, 2014). Valves with craticula are formed as the result of increased salinity.

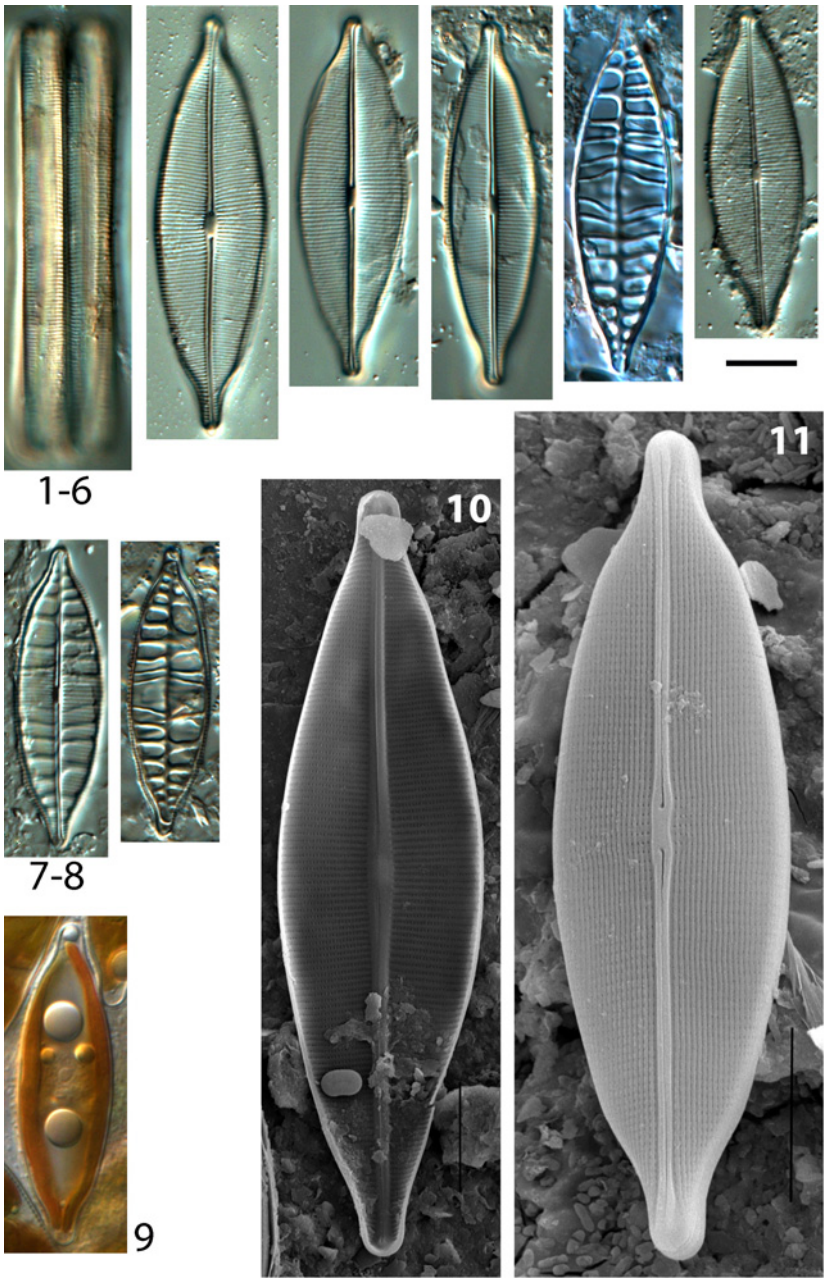


Plate 13: *Craticula ambigua*. **Figs 1, 4–5, 10–11**: Borsodi-dűlő; **Figs 2–3, 6–8**: Nyéki-szállás; **Fig. 9**: culture isolated from Borsodi-dűlő. – **Fig. 1**: girdle view; **Figs 2–4, 6, 9–11**: valve view; **Figs 5, 7–8**: valve view with craticula; **Fig. 9**: living cell; **Fig. 10**: internal view of the valve; **Fig. 11**: external view of the valve.

Craticula buderi (Hustedt) Lange-Bertalot 2000
(Plate 14: Figs 1–17)

References: Lange-Bertalot (2001: 110, pl. 90–91: 1–7; 15–20), Bey and Ector (2013: 390–391), Hofmann *et al.* (2013: 138, pl. 45: 6–10), Taylor *et al.* (2007: pl. 49).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	10–40	23.3–38.8
Width	5–8	5.9–7.6
Striae	17–24/10	17–20/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Bába-szék, Borsodi-dűlő, Böddi-szék, Büdös-szék, Büdös-szék (Pusztaszer), Cikes, Csárda-szék, Kardoskúti Fehér-tó, Kisréti-tó, Kondor-tó, Fehér-szék, Hattyús-szék, Herrnsee, Kelemen-szék, Kirchsee, Legény-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Pirtói Nagy-tó, Sárkány-tó, Szarvas-tó, Szívós-szék, Untersee, Zicklacke, Zab-szék
Mean / max. abundance	5% / 55.1%
Constancy	3 (55.6%)

Ecology: Common species in freshwaters with moderate and high conductivity. It is very tolerant to organic and inorganic nutrient content.

Taxonomical note: *Craticula bruderi* is thinner than *C. halophila* (8–18 μm).

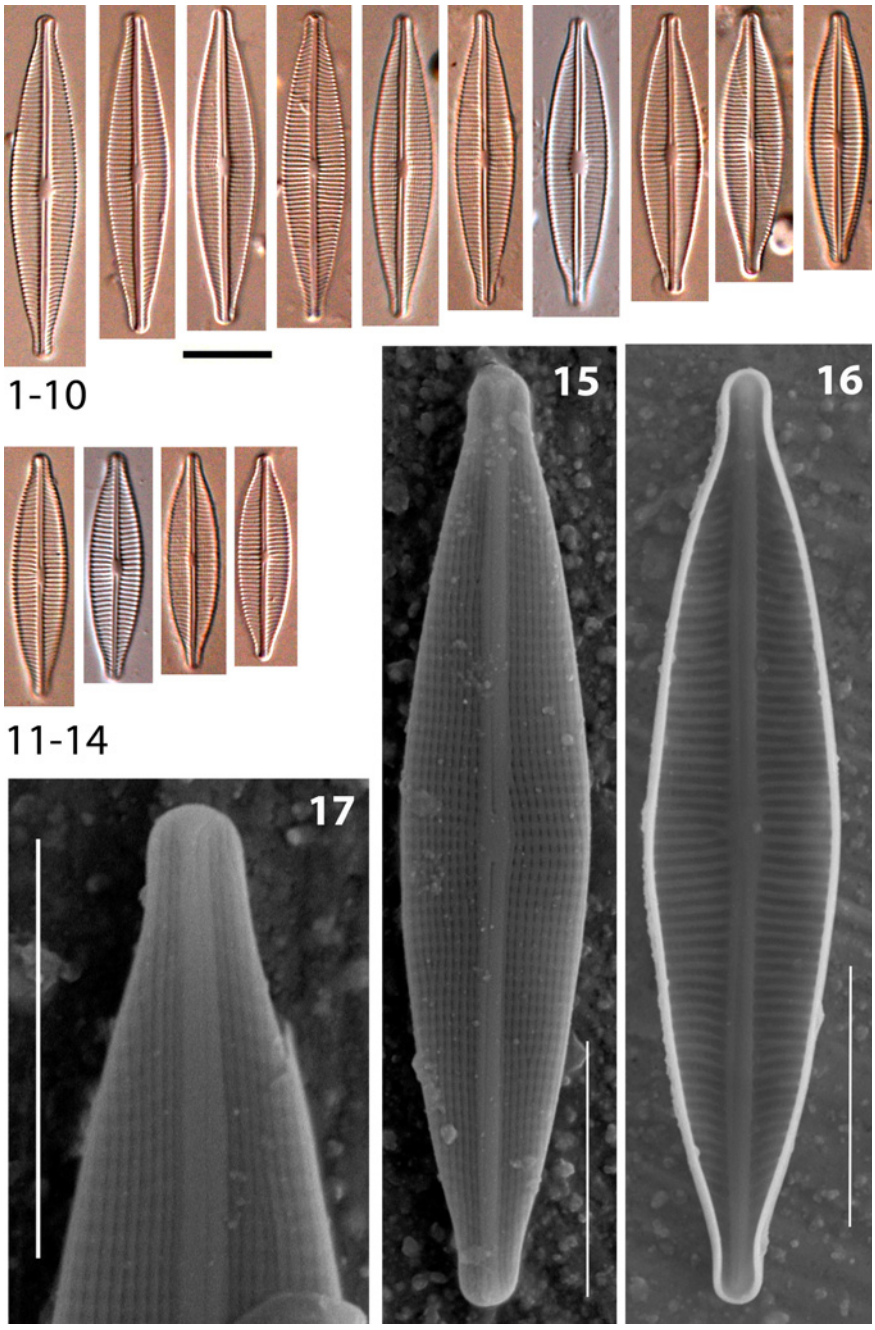


Plate 14: *Craticula buderi*. **Figs 1–17**: Pirtói Nagy-tó. – **Figs 1–16**: valve view; **Fig. 15**: external view of the valve; **Fig. 16**: internal view of the valve; **Fig. 17**: apex of the valve from external view.

Craticula elkab (Müller) Lange-Bertalot, Kusber et Cocquyt 2007 (Plate 15: Figs 1–15)

Reference: Lange-Bertalot (2001: 112, pl. 91: 8–14).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	16–35 (40)	17.3–20.5
Width	4–5.3	4.1–4.9
Striae	20–25/10	22–26/10

Distribution in soda pans of the Carpathian Basin

Lakes	Kardoskúti Fehér-tó, Kelemen-szék, Nyéki-szállás, Zab-szék
Mean / max. abundance	2.7% / 14.5%
Constancy	1 (6.8%)

Ecology: Abundant in electrolyte-rich waters especially, in those with high Na_2CO_3 and Cl^- concentrations in warmer climates.

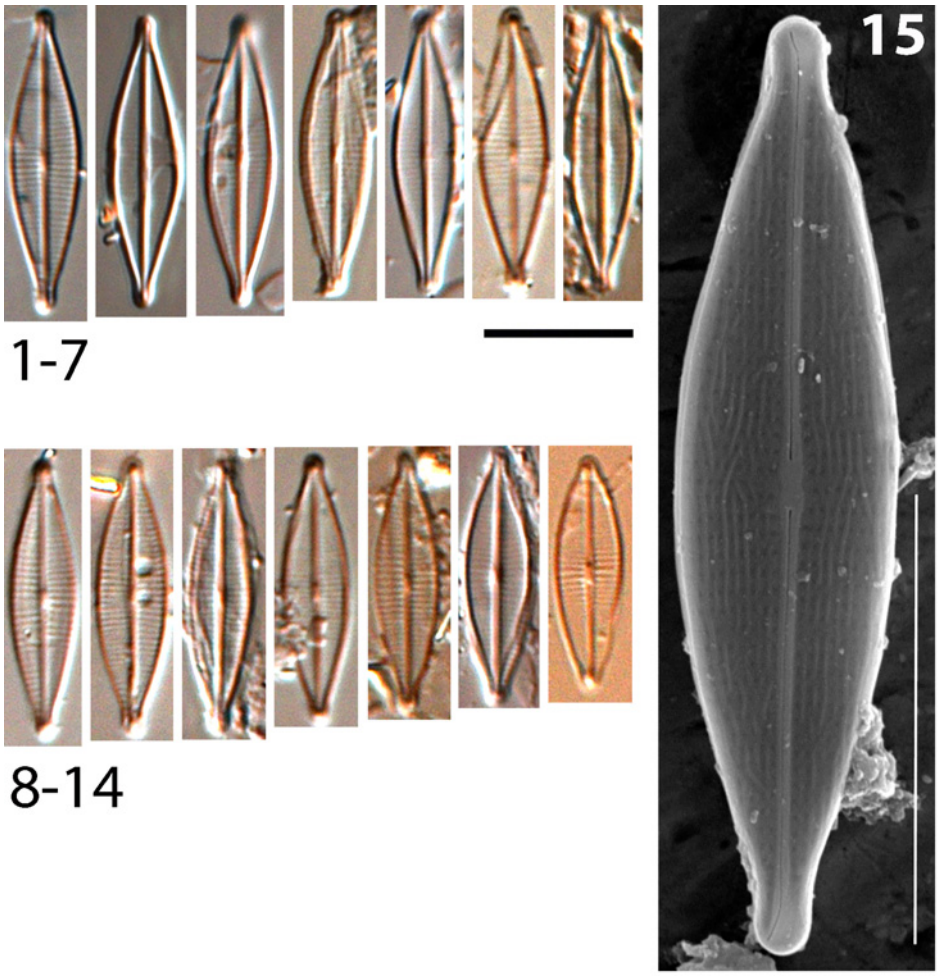


Plate 15: *Craticula elkab*. **Figs 1–9, 11–12**: Zab-szék; **Figs 10, 13–14**: Kelemen-szék; **Fig 15**: Kardoskúti Fehér-tó. – **Figs 1–15**: valve view; **Fig. 15**: external view of the valve (SEM).

Craticula halophila (Grunow) D. G. Mann 1990
(Plate 16: Figs 1–13)

References: Lange-Bertalot (2001: 114, pl. 89: 1–7), Hofmann *et al.* (2013: 139, pl, 44: 7–11), Taylor *et al.* (2007: pl. 49).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	20–140	23.6–62
Width	8–18	8.5–10.9
Striae	15–20/10	15–17/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Csárda-szék, Herrnsee, Legény-tó, Ősze-szék, Pirtó Nagy-tó, Szívós-szék, Untersee, Zab-szék
Mean / max. abundance	3.4% / 26%
Constancy	1 (8.5%)

Ecology: Common species in salt springs and in inland saline waters with high and very high conductivity.

Taxonomical note: *Craticula halophila* is wider than *C. bruderi* (Hustedt) Lange-Bertalot (5–8 μm).

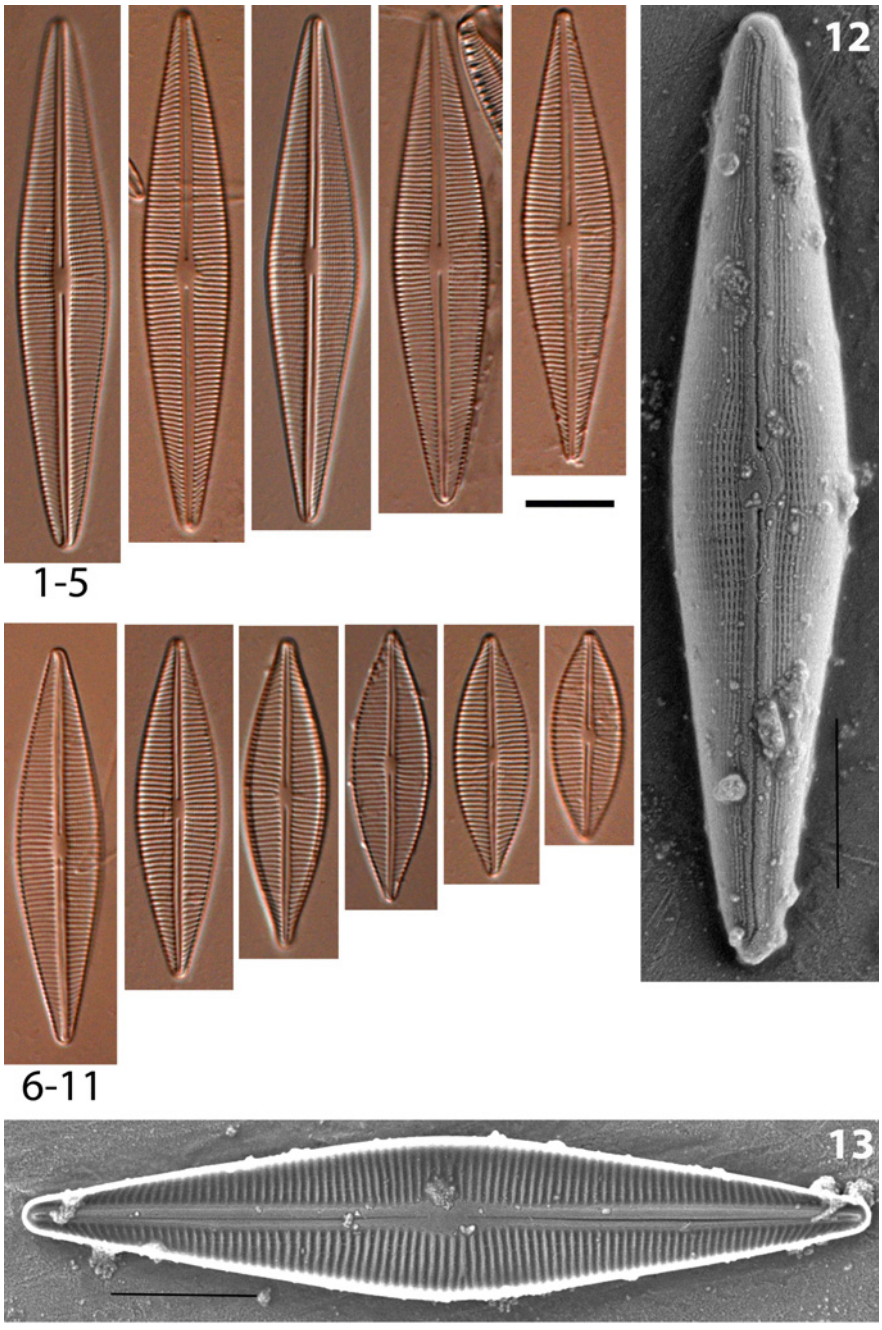


Plate 16: *Craticula halophila*. **Figs 1–13**: Csárda-szék. – **Figs 1–13**: valve view; **Fig. 12**: external view of the valve (SEM); **Fig. 13**: internal view of the valve (SEM).

Ctenophora pulchella (Ralfs ex Kützing) D. M. Williams et Round 1986 (Plate 17: Figs 1–16)

References: Krammer and Lange-Bertalot (2000: 148, pl. 136: 1–7), Bey and Ector (2013: 188–189), Hofmann *et al.* (2013: 273, pl. 4: 13–17), Taylor *et al.* (2007: pl. 19). Witkowski *et al.* (2000: 52, pl. 28: 35, pl. 29: 15–16).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	20–200	32.6–97.1
Width	5–8.5	4.6–6
Striae	9–17/10	14–18/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Borsodi-dűlő, Büdös-szék (Pusztaszer), Cikes, Fehér-szék, Herrnsee, Kardoskúti Fehér-tó, Legény-tó, Nyéki-szállás, Őrse-szék, Pap-rét, Untersee, Zicklacke
Mean / max. abundance	5.8% / 41.6%
Constancy	2 (32.5%)

Ecology: Cosmopolitan, abundant, benthic species in brackish waters of marine coasts and in inland saline waters as well as in freshwaters with moderate salinity content. Tolerant up to α-mesosaprobic level.

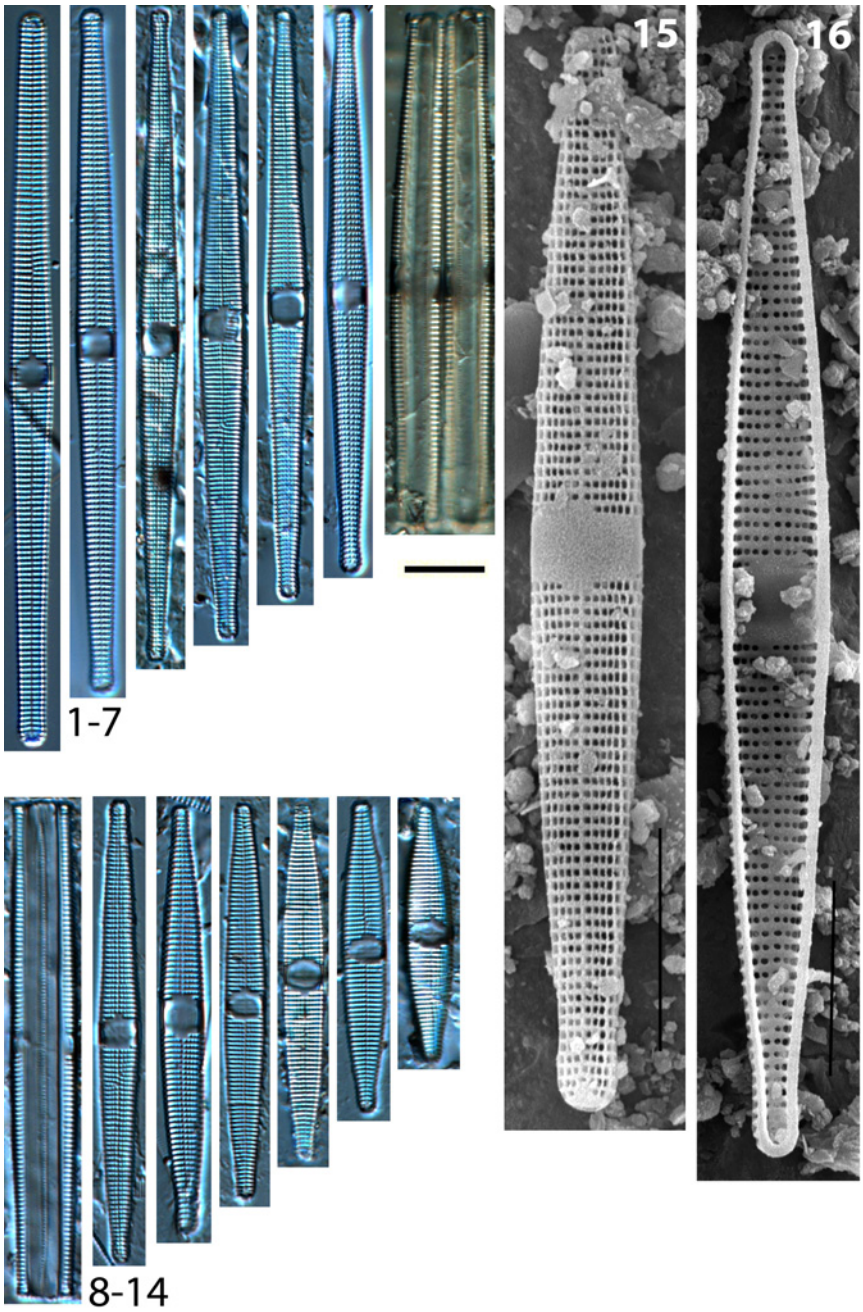


Plate 17: *Ctenophora pulchella*. **Figs 1–2, 6, 8**: Legény-tó; **Figs 3–5, 7, 9–16**: Borsodi-dűlő. – **Figs 1–6, 9–16**: valve view; **Figs 7–8**: girdle view; **Fig. 15**: external view of the valve; **Fig. 16**: internal view of the valve.

Cyclotella meneghiniana Kützing 1844
(Plate 18: Figs 1–12)

References: Krammer and Lange-Bertalot (2000: 44, pl. 44: 1–10), Bey and Ector (2013: 30–31), Houk *et al.* (2010: 16, pl. 143–147), Taylor *et al.* (2007: pl. 4).

	Morphological parameters (µm)	Observations in soda pans (µm)
Diameter	5–60	5.5–23.3
Striae	6–10/10	7–10/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Borsodi-dűlő, Büdös-szék (Pusztaszer), Csárda-szék, Kelemen-szék, Kondor-tó, Legény-tó, Nyéki- szállás, Pap-rét, Őszeszék
Mean / max. abundance	4.3% / 29.1%
Constancy	2 (22.2%)

Ecology: Littoral, pelagic species of eutrophic lentic and slowly running waters.

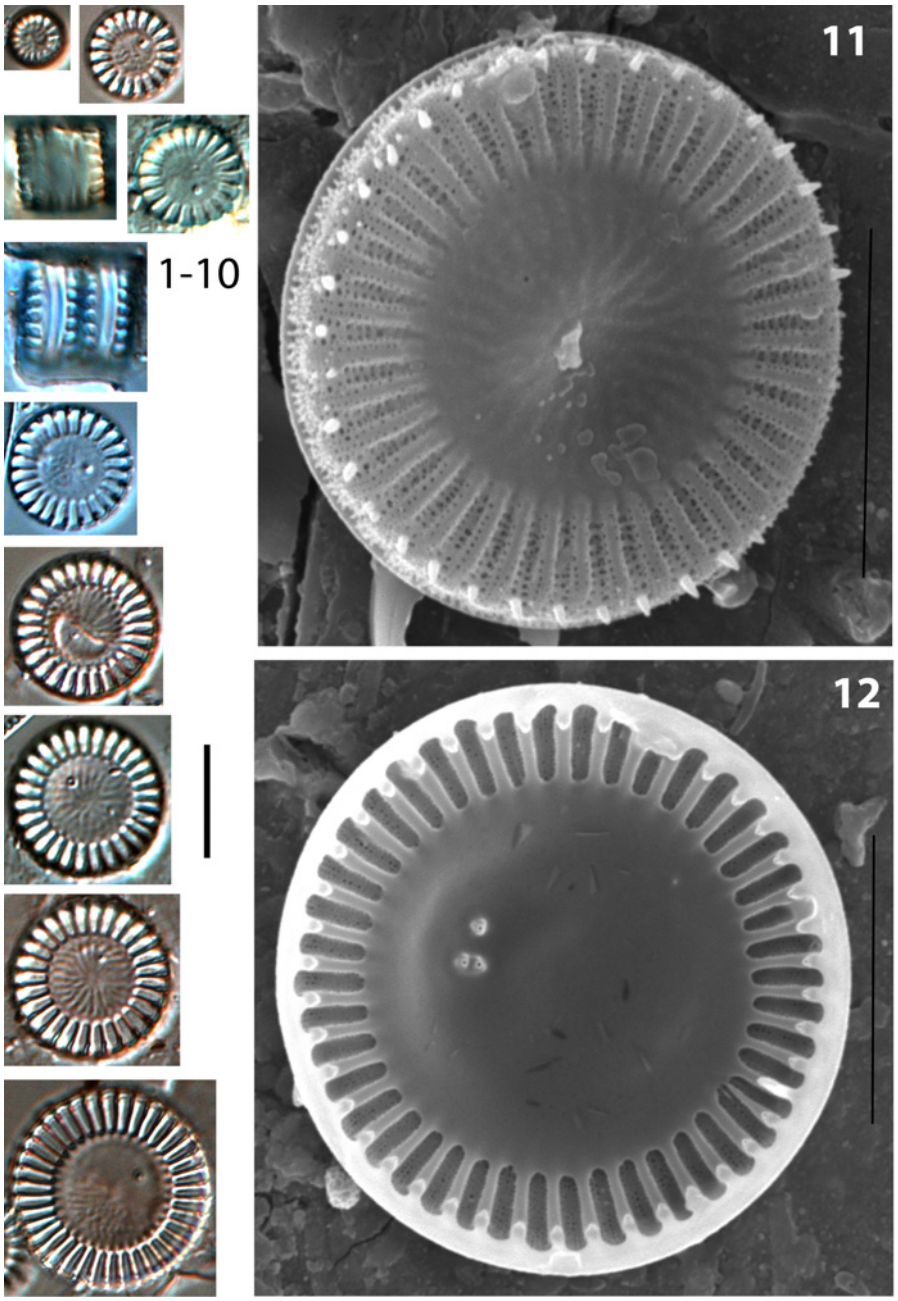


Plate 18: *Cyclotella meneghiniana*. **Figs 1, 8, 11–12**: Legény-tó; **Figs 2, 9–10**: Nyéki-szállás; **Figs 3–7**: Borsodi-dűlő. – **Figs 1–2, 4, 6–12**: valve view; **Figs 3, 5**: girdle view; **Fig. 11**: external view of the valve (SEM); **Fig. 12**: internal view of the valve (SEM).

Cylindrotheca gracilis (Brébisson) Grunow 1882
(Plate 19: Figs 1–12)

References: KRAMMER and LANGE-BERTALOT (1999: 134, pl. 87: 3), HOFMANN *et al.* (2013: 142, pl. 118: 6.), WITKOWSKI *et al.* (2000: 358, pl. 212: 7).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	60–340	77.9 –192
Width	4–14	4–6.4
Fibulae	15–24/10	16–20/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő
Mean / max. abundance	5.4% / 11.3%
Constancy	1 (4.3%)

Ecology: Abundant in marine coasts and in inland saline waters with high conductivity.

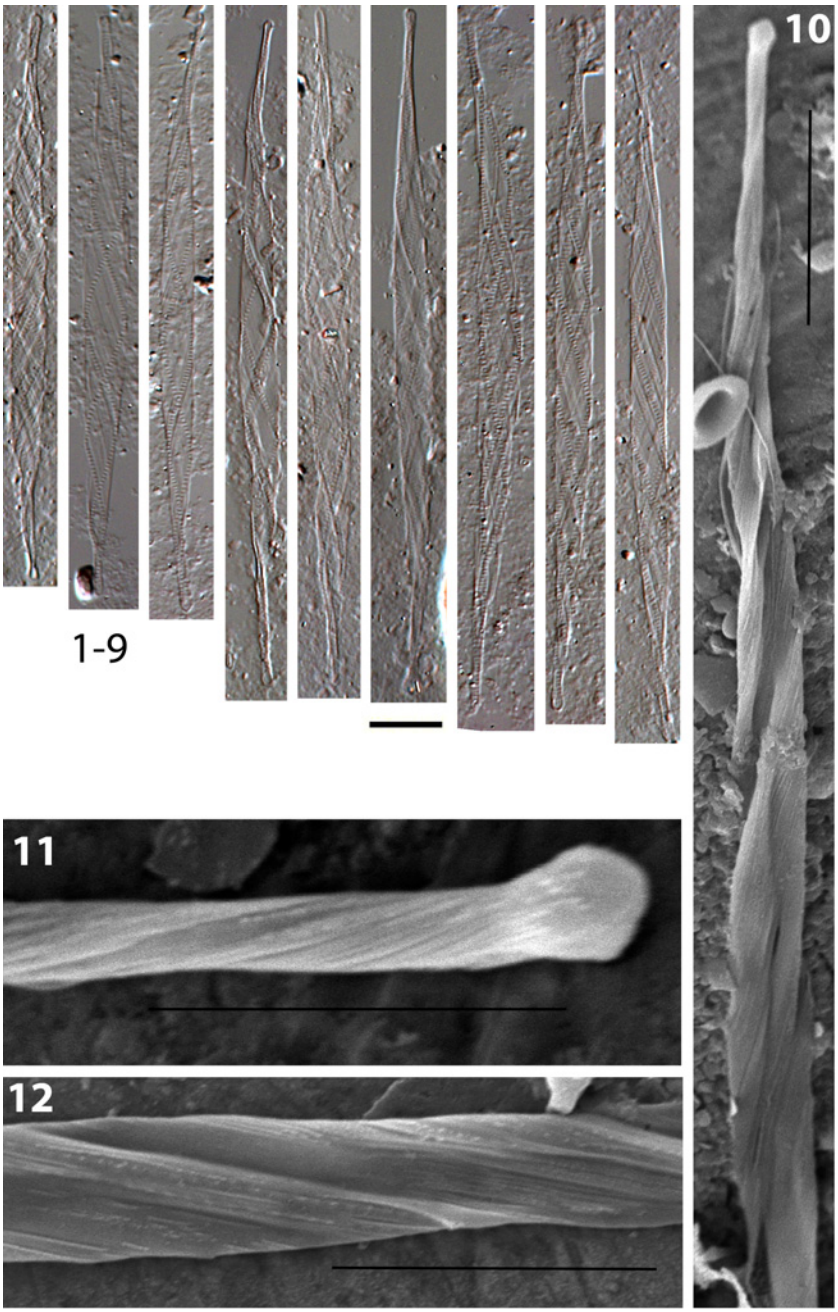


Plate 19: *Cylindrotheca gracilis*. **Figs 1–12**: Borsodi-dűlő. – **Figs 1–12**: valve view; **Fig. 10**: external valve view (SEM); **Fig. 11**: apex of the valve, external view (SEM); **Fig. 12**: an item from the valve, external view (SEM).

Cymatopleura solea (Brébisson) W. Smith 1851 var. *apiculata* (W. Smith) Ralfs 1861 (Plate 20: Figs 1–5)

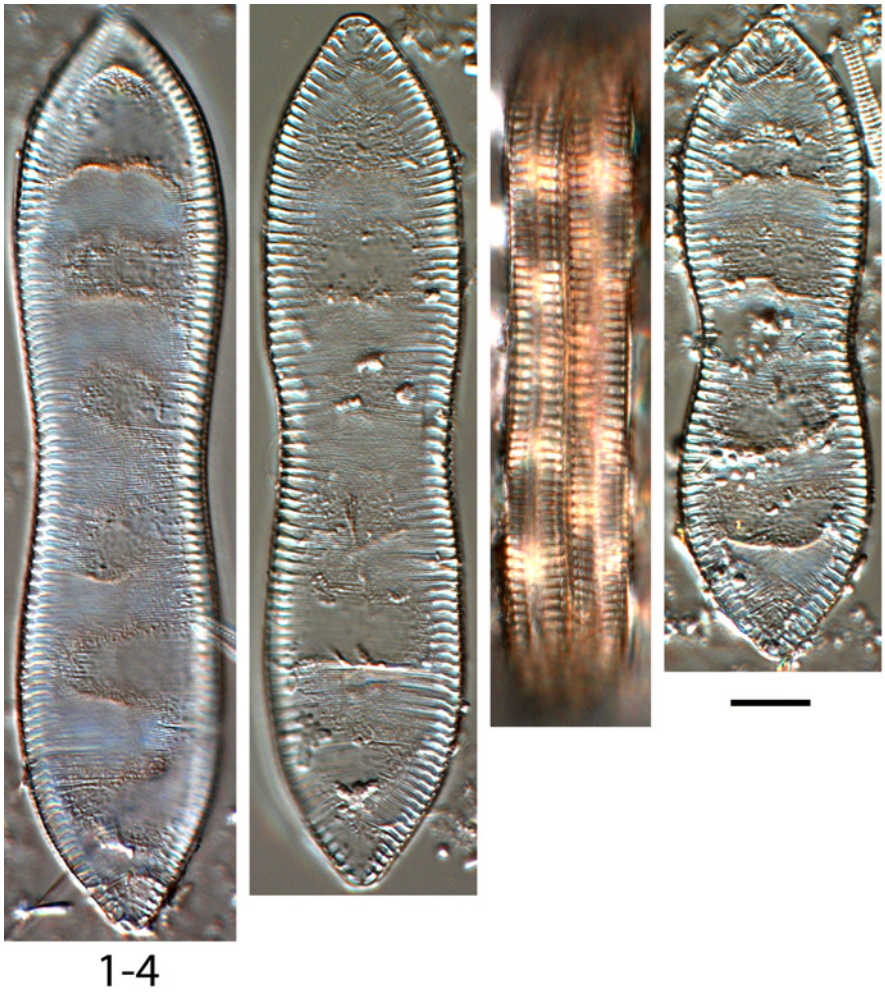
References: Krammer and Lange-Bertalot (1999), Bey and Ector (2013: 1140), Hofmann *et al.* (2013: 144, pl. 125: 1–5), Taylor *et al.* (2007: pl. 174).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	30–150	81.6–116.5
Width	10–40	22.8–26.8
Costae	6–9/10	7–8/10

Distribution in soda pans of the Carpathian Basin

Lakes	Legény-tó
Mean / max. abundance	0.5 % / 0.7%
Constancy	1 (2.6%)

Ecology: The species is characteristic in meso- and eutrophic waters with moderate to high electrolyte content.



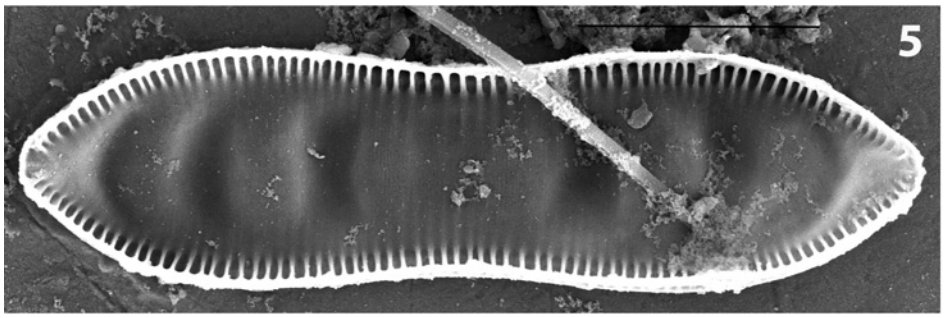


Plate 20: *Cymatopleura solea* var. *apiculata*. **Figs 1–5**: Legény-tó. – **Figs 1–2, 4–5**: valve view; **Fig. 3**: girdle view; **Fig. 5**: internal view of the valve (SEM).

Cymbella neocistula Krammer 2002
(Plate 21: Figs 1–9)

References: Krammer (2002: 94, pl. 85–92), Bey and Ector (2013: 782–783), Hofmann *et al.* (2013: 154, pl. 79: 1–5), Taylor *et al.* (2007: pl. 104).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	34–110	40.4–70.2
Width	12–19	13–15.4
Striae	7–9/10 (in the middle part)	7–9/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Borsodi-dűlő, Legény-tó, Ősze-szék, Pap-rét, Sárkány-tó, Untersee
Mean / max. abundance	1.2% / 3.9%
Constancy	1 (11.97%)

Ecology: Epiphytic and epilithic species. It is abundant in mesotrophic and circumneutral or slightly alkaline waters, from average to higher electrolyte content.

Taxonomical note: Similar to *C. cymbiformis*, but the outline, the distinct dorsal central area and the three or more stigmata enable its separation.

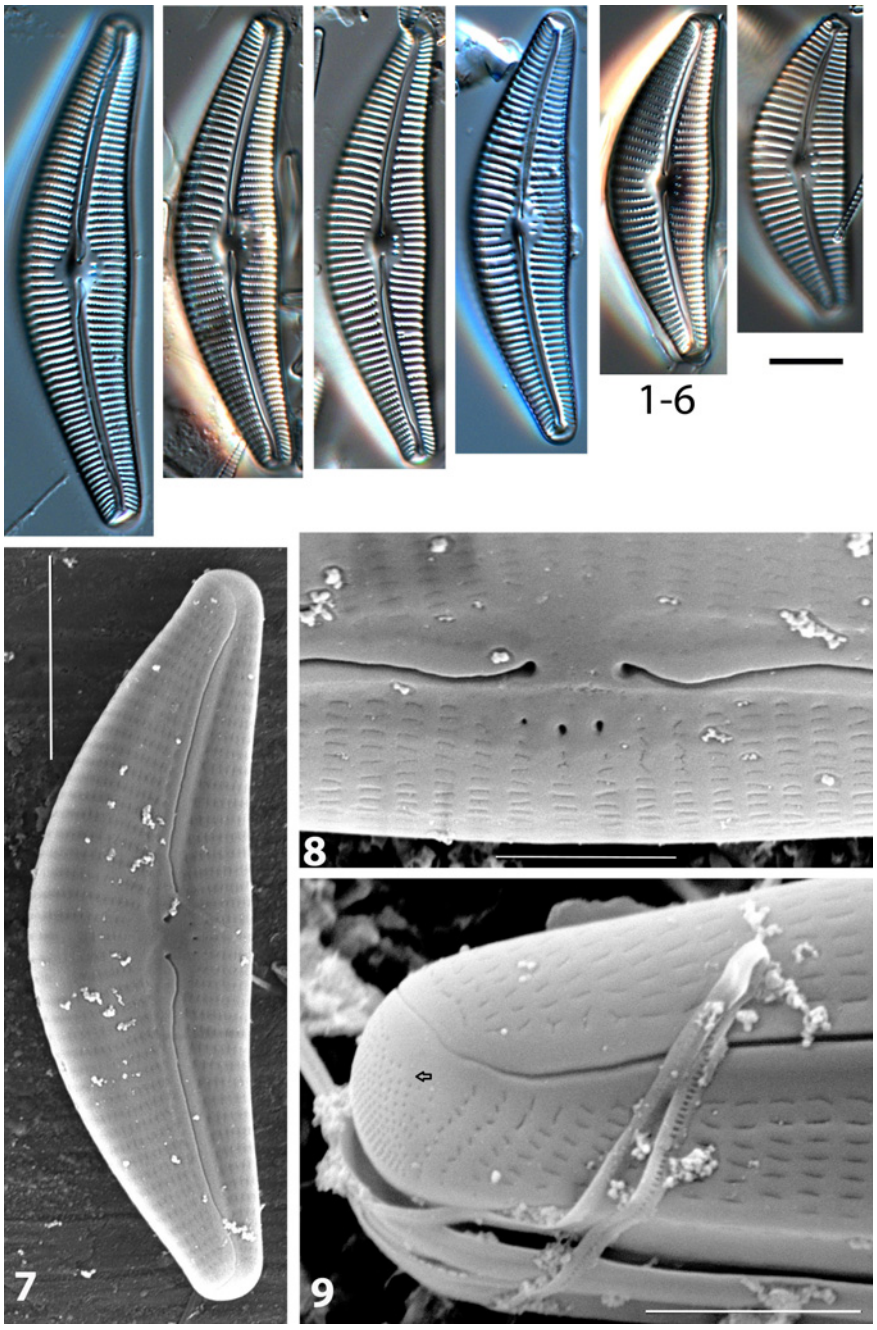


Plate 21: *Cymbella neocistula*. **Figs 1–9**: Legény-tó. – **Figs 1–7**: valve view; **Fig. 7**: external view of the valve (SEM); **Fig. 8**: central area of the valve (SEM); **Fig. 9**: apex with apical porefields [APF] (SEM).

Diatoma tenuis Agardh 1812
(Plate 22: Figs 1–14)

References: Krammer and Lange-Bertalot (2000: 97, pl. 96: 1–9, Bey and Ector (2013: 202–203, Hofmann *et al.* (2013: 172, pl. 2: 25).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	22–120	24.9–67.4
Width	2–5	2.9–4.6
Transapical ribs	6–10/10	6–8/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Borsodi-dűlő, Büdös-szék (Pusztaszer), Csárda-szék, Fehér-szék, Kondor-tó, Legény-tó, Ősze-szék, Untersee
Mean / max. abundance	4.3% / 21.1%
Constancy	1 (15.4%)

Ecology: Epiphytic and planktonic species. Abundant in moderate and high salinity levels with alkaline pH.

Taxonomical note: *Diatoma tenuis* has linear shape with capitate apices, which are wider than its width in contrast to *D. moniliformis* (Kützing) D. M. Williams with elliptical, elliptic-lanceolate shape and rounded or subcapitate apices. (Potapova, M. (2010): Diatoma tenuis. In Diatoms of the United States. Retrieved March 10, 2015, from http://westerndiatoms.colorado.edu/taxa/species/diatoma_tenuis).

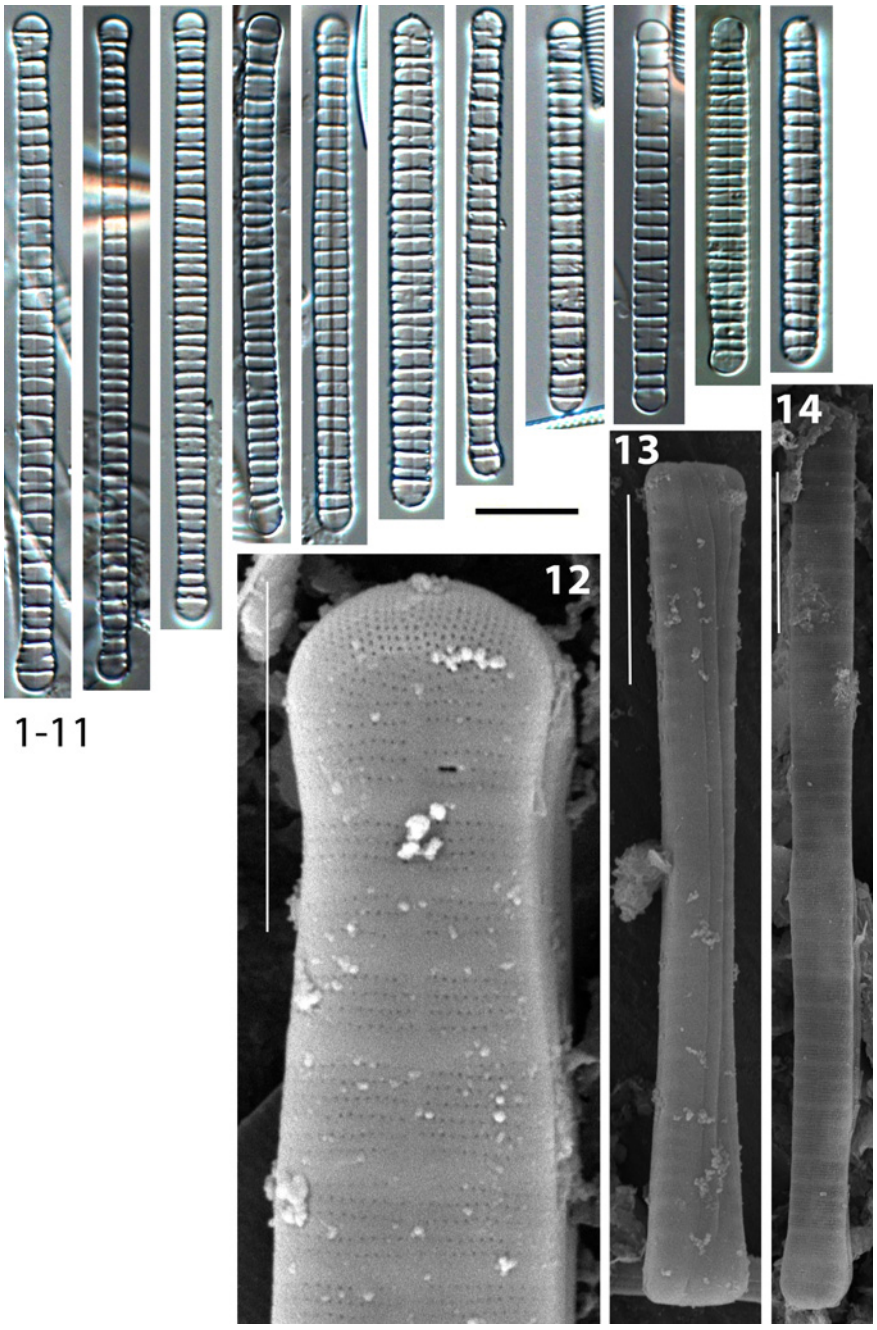


Plate 22: *Diatoma tenuis*. **Figs 1–14**: Legény-tó.– **Figs 1–11, 14**: valve view; **Fig. 12**: apex of the valve (SEM); **Fig. 13**: girdle view (SEM); **Fig. 14**: external view of the valve (SEM).

Entomoneis paludosa (W. Smith) Reimer in Patrick et Reimer 1975 var. *subsalina* (Cleve) Krammer 1987
(Plate 23: Figs 1–9)

References: Krammer and Lange-Bertalot (1999: 439, pl. 204–205), Hofmann *et al.* (2013: 200, pl. 131: 13–15).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	40–130	42.7–86.9
Width	20–50	22.6–27.8
Striae	19–23/10	22–24/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó, Pap-rét, Ősze-szék
Mean / max. abundance	13.6% / 66.4%
Constancy	1 (16.2%)

Ecology: Abundant in marine coasts, in inland saline lakes as well as waters with high electrolyte content.

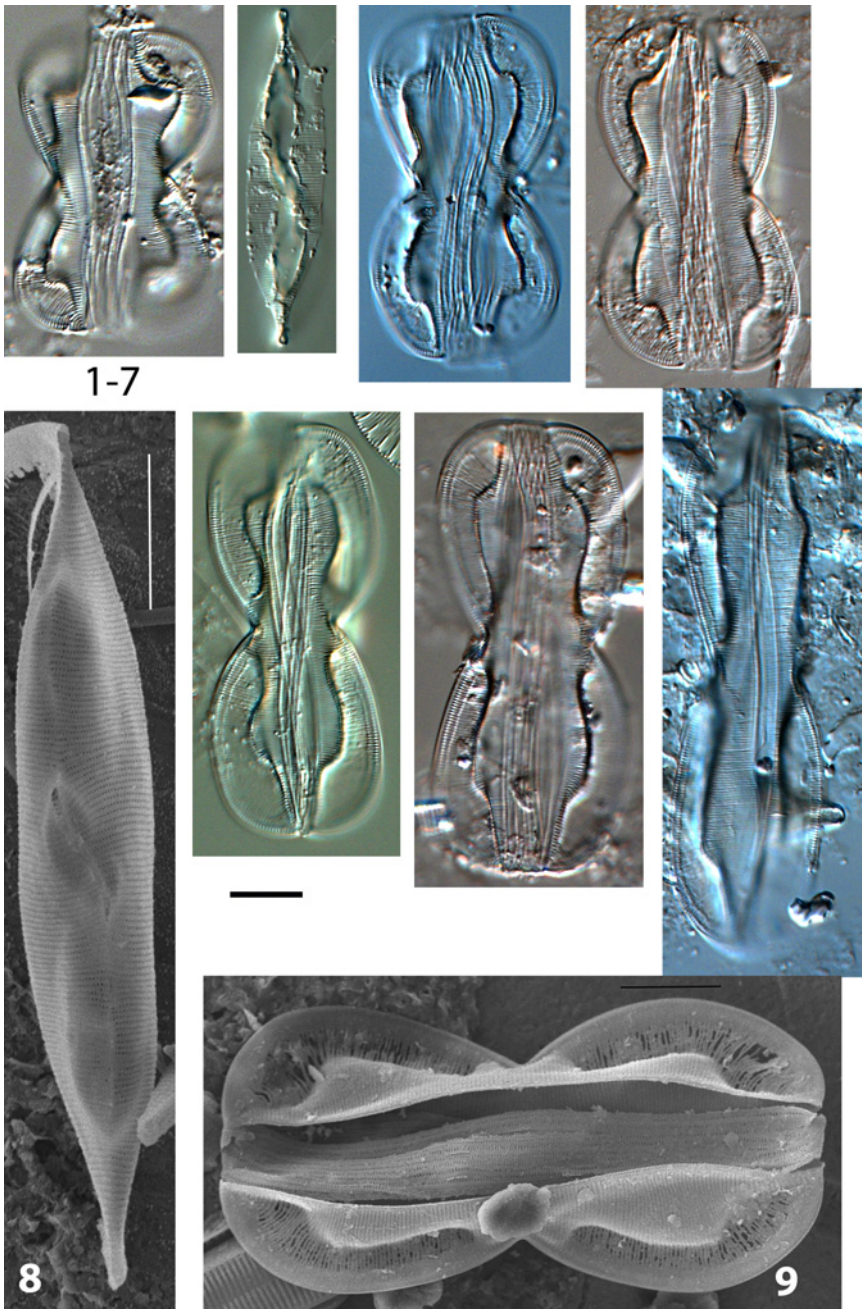


Plate 23: *Entomoneis paludosa* var. *subsalina*. **Figs 1, 4**: Borsodi-dűlő; **Figs 2–3, 5–9**: Legény-tó. – **Figs 1, 3–7, 9**: valve view; **Fig. 2**: girdle view; **Fig. 8**: girdle view (SEM); **Fig. 9**: external view of the valve (SEM).

Epithemia sorex Kützing 1844
(Plate 24: Figs 1–13)

References: Krammer and Lange-Bertalot (1999: 154, pl. 106: 1–14), Bey and Ector (2013: 1126–1127), Hofmann *et al.* (2013: 206, pl. 121: 1–7), Taylor *et al.* (2007: pl. 130).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	8–70	24.8–33.3
Width	6.5–16	7.4–9.8
Fibulae	5–7.5/10	6–7.5/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Borsodi-dűlő, Legény-tó
Mean / max. abundance	2.2% / 10.2%
Constancy	1 (4.3%)

Ecology: Epiphytic diatoms in the littoral region of HCO_3^- rich lakes with moderate and high conductivity or in slow streams.

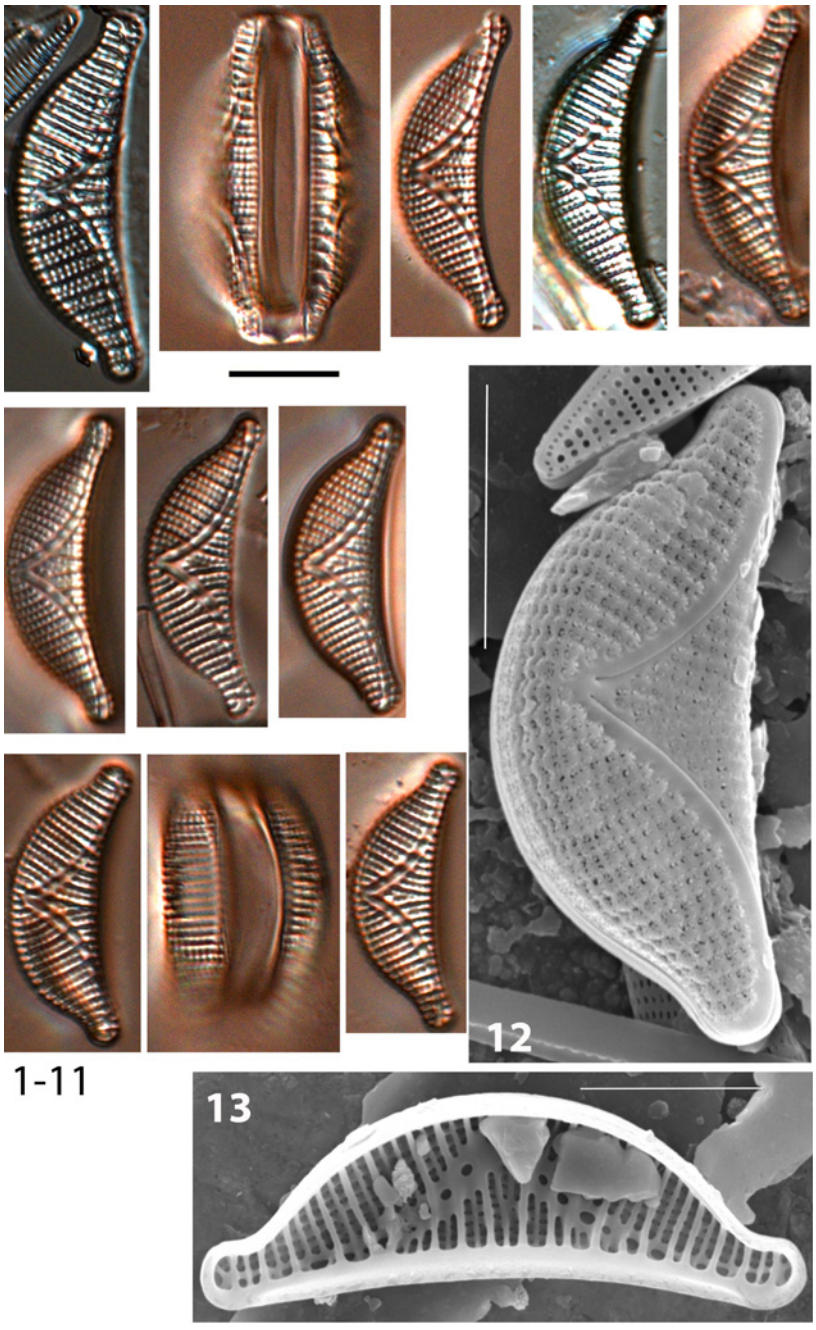


Plate 24: *Epithemia sorex*. **Figs**: **1–11**: Bíbic-tó; **Figs 12–13**: Legény-tó. – **Figs 1–9, 11–13**: valve view; **Fig. 10**: girdle view; **Fig. 12**: external view of the valve (SEM); **Fig. 13**: internal view of the valve (SEM).

Fallacia pygmaea (Kützing) A. J. Stickle et D. G. Mann 1990 (Plate 25: Figs 1–11)

References: Krammer and Lange-Bertalot (1999: 171, pl. 65: 1–6 (*Navicula pygmaea*)), Bey and Ector (2013: 430–431), Hofmann *et al.* (2013: 245, pl. 46: 31–37), Taylor *et al.* (2007: pl. 56), Witkowski *et al.* (2000: 211, pl. 72: 28–30).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	20–62	20.9–37.1
Width	9–20	9.3–12.7
Striae	22–28/10	24–28/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Cikes, Legény-tó, Nyéki-szállás, Pap-rét
Mean / max. abundance	1.4% / 8.6%
Constancy	1 (17.1%)

Ecology: Abundant in brackish waters and in freshwaters with high conductivity and carbonate content.

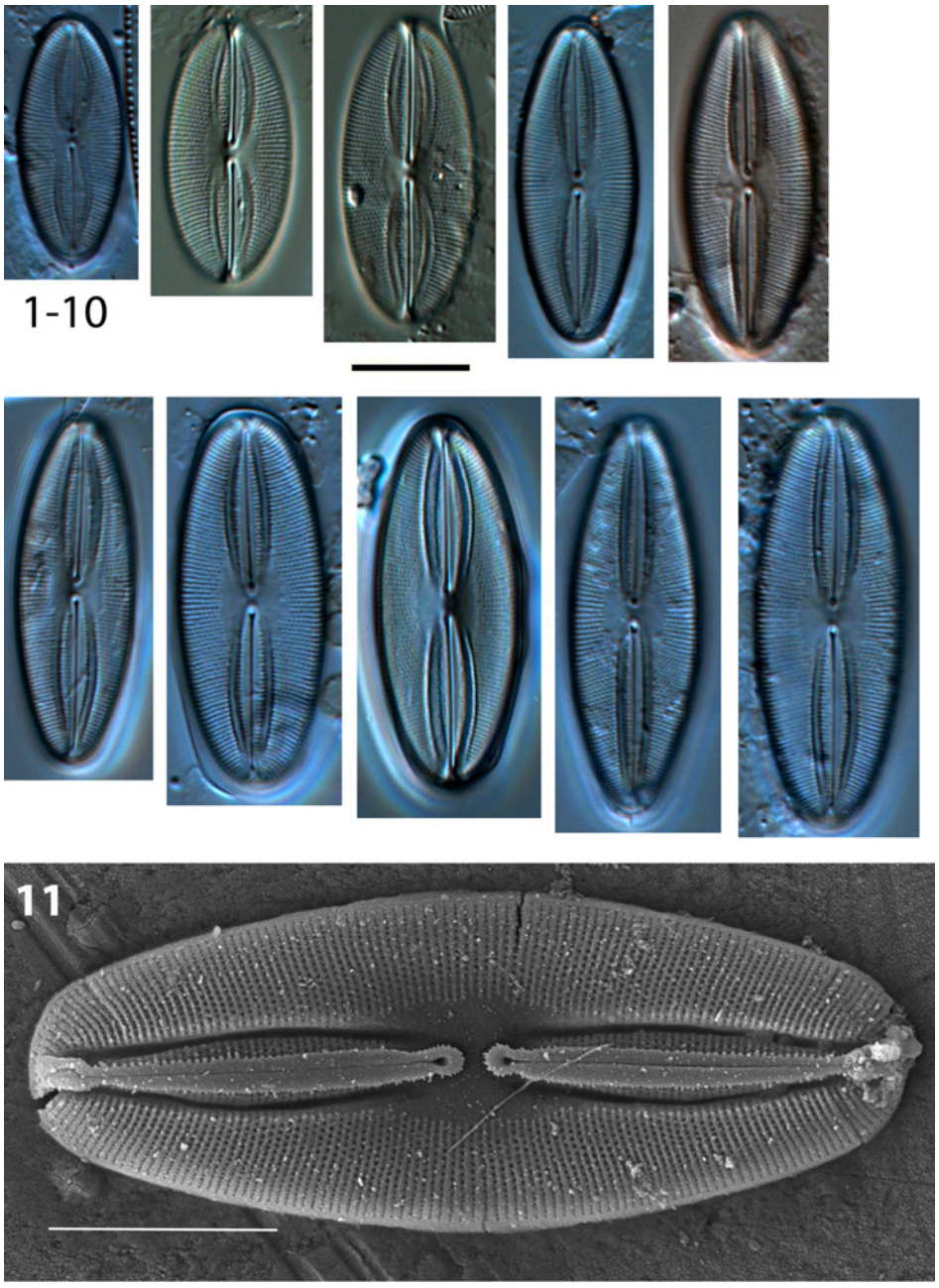


Plate 25: *Fallacia pygmaea*. **Figs 1, 4–6**: Borsodi-dűlő; **Figs 2–3, 7–11**: Legény-tó. – **Figs 1–11**: valve view; **Fig. 11**: external view of the valve (SEM).

Fallacia pygmaea subsp. *subpygmaea* Lange-Bertalot, Cavicini, Tagliaventi et Alfinito 2003
(Plate 26: Figs 1–12)

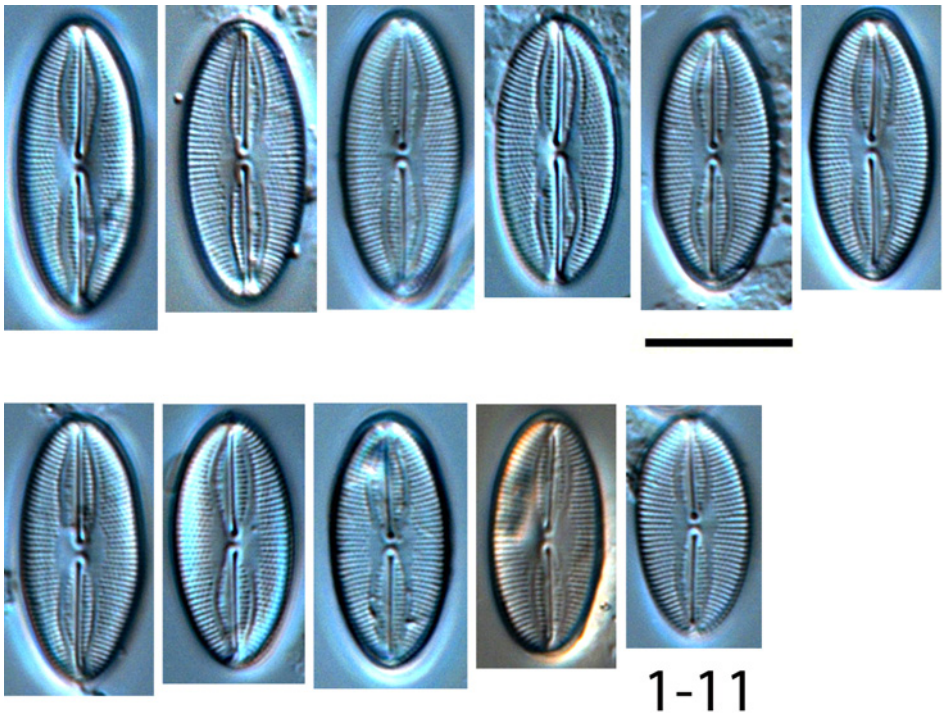
References: Krammer and Lange-Bertalot (1999: 171, pl. 65: 1–6 (*Navicula pygmaea*)), Bey and Ector (2013: 430–431), Hofmann *et al.* (2013: 245, pl. 46: 31–37).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	9–15	15.2–19.9
Width	6–9	7.4–9.8
Striae	22–28/10	25–28/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Büdös-szék (Pusztaszer), Cikes, Legény-tó, Nyéki-szállás, Pap-rét
Mean / max. abundance	2.9% / 18.3%
Constancy	2 (28.2%)

Taxonomical note: Specimens are longer than those of the type population.



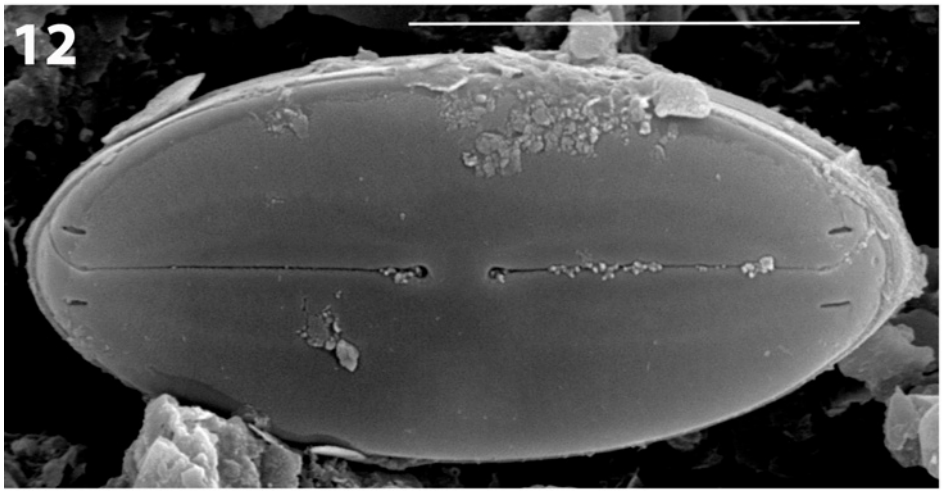


Plate 26: *Fallacia pygmaea* subsp. *subpygmaea*. **Figs 1–9, 11**: Borsodi-dűlő; **Figs 10, 12**: Legény-tó. – **Figs 1–12**: valve view; **Fig. 12**: external view of the valve (SEM).

Fragilaria famelica (Kützing) Lange-Bertalot 1980
(Plate 27: Figs 1–16)

References: Krammer and Lange-Bertalot (2000: 128, pl. 11: 4–17), Bey and Ector (2013: 202–203), Hofmann *et al.* (2013: 263, pl. 8: 11–21), Witkowski *et al.* (2000: 49, pl. 28: 28–34).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	10–70	15–63.5
Width	2.5–4	2.5–3.3
Striae	11–16/10	12–16/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó, Nyéki-szállás
Mean / max. abundance	1.2% / 4.6%
Constancy	1 (13.3%)

Ecology: Abundant in brackish waters and in electrolyte-rich inland waters.

Taxonomical note: Similar to *Fragilaria gracilis* Østrup, but they can be separated based on the striae density and width (2–3 μm, striae: 20/10 μm). In LM the striae of *F. gracilis* are specifically dotted.

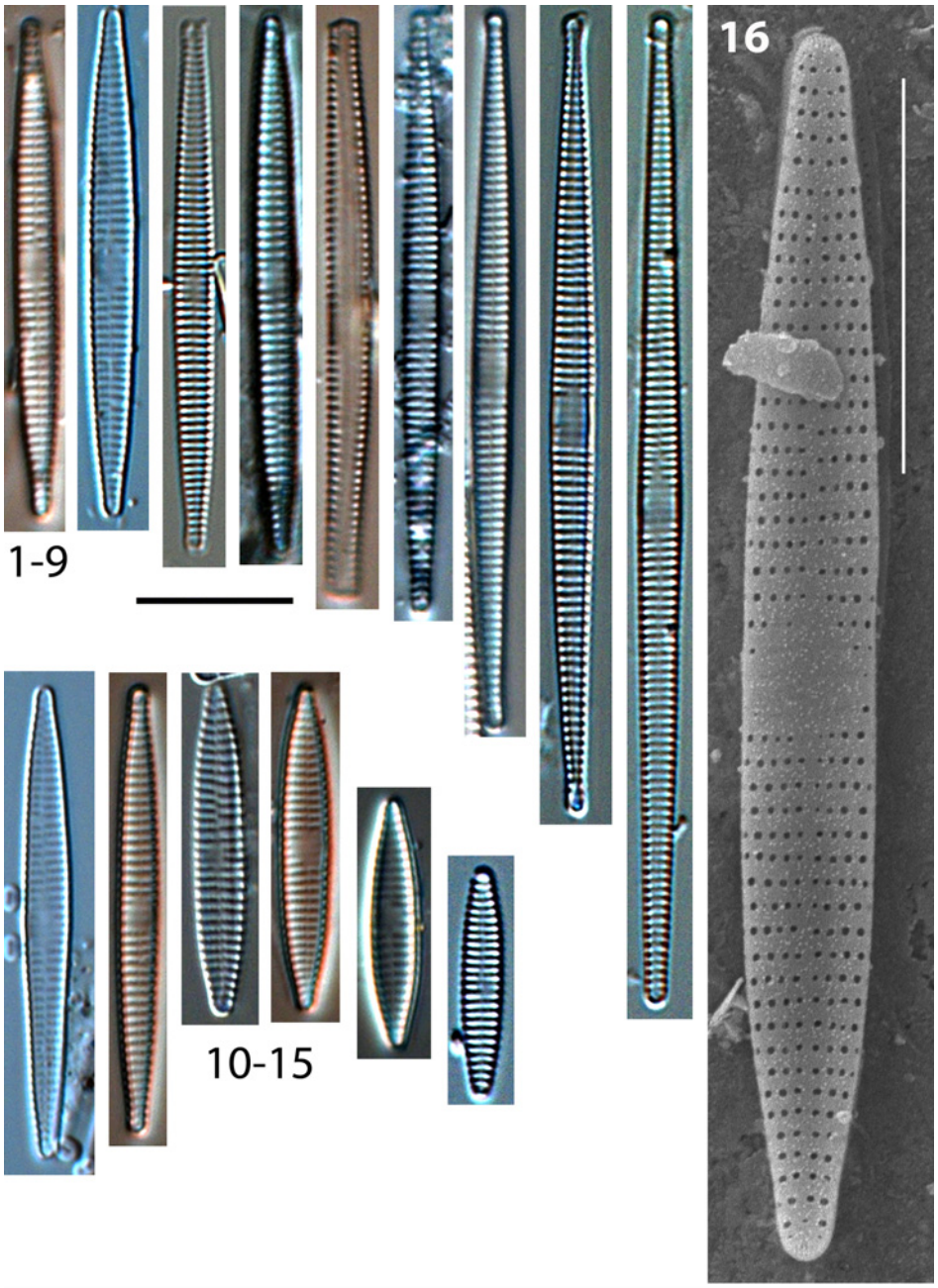


Plate 27: *Fragilaria famelica*. **Figs 1–16**: Legény-tó. – Figs **1–4, 6–16**: valve view; **Fig. 5**: girdle view; **Fig. 16**: external view of the valve (SEM).

Gomphonema brebissonii Kützing 1849
(Plate 28: Figs 1–14)

References: Krammer and Lange-Bertalot (1999: 365, pl. 160: 1–12 (*Gomphonema acuminatum*)), Bey and Ector (2013: 892), Hofmann *et al.* (2013: 298, pl. 93: 16–18).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	30–86 (26–48.5)	37.9–51.1
Width	7.6–11.4 (6.6–8.7) (in middle part)	7.9–9.6
Width	8.3–14 (7.3–9.4) (under the headpole)	8.4–11.7
Striae	9–11 (9–12)/10	9–11/10

Distribution in soda pans of the Carpathian Basin

Lakes	Pirtói Nagy-tó, Sárkány-tó, Szarvas-tó
Mean / max. abundance	0.7% / 1.5%
Constancy	1 (2.6%)

Ecology: Abundant in oligosaprobic, oligo- to eutrophic waters with low and moderate conductivity.

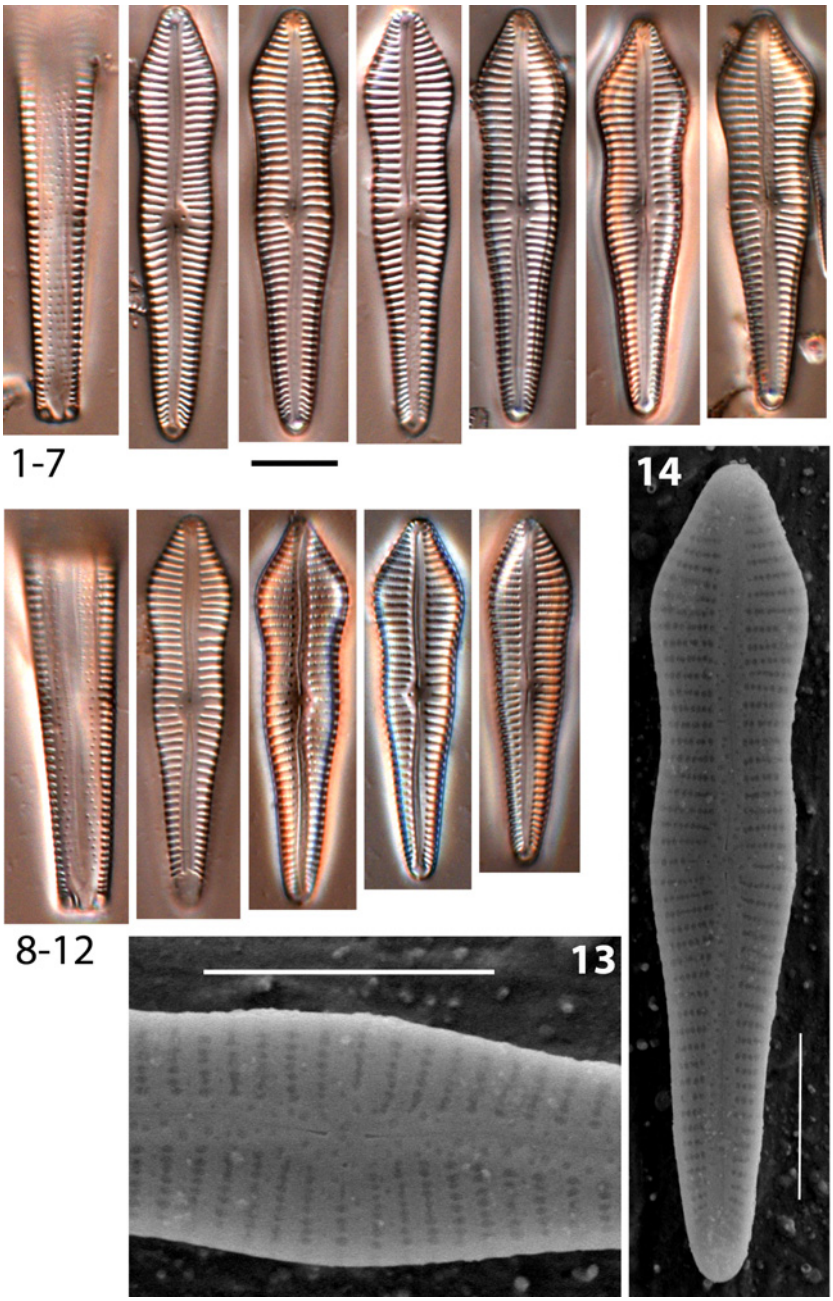


Plate 28: *Gomphonema brebissonii*. **Figs 1–12**: Sárkány-tó; **Fig 13–14**: Pirtói Nagy-tó. – **Figs 2–7, 9–14**: valve view; **Figs 1, 8**: girdle view; **Fig. 13**: central area of the valve, external view (SEM); **Fig. 14**: external view of the valve (SEM).

Gomphonema clavatum Ehrenberg 1832 s. l.
(Plate 29: Figs 1–16)

References: Krammer and Lange-Bertalot (1999: 367, pl. 163: 1–12), Bey and Ector (2013: 898–899), Hofmann *et al.* (2013: 300, pl. 94: 1–5), Taylor *et al.* (2007: pl. 121).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	~30–70	23.8–38.8
Width	7–10	5.9–6.9
Striae	~9–11/10	10–12/10

Distribution in soda pans of the Carpathian Basin

Lakes	Kisréti-tó, Kondor-tó, Pirtói Nagy-tó, Sárkány-tó, Szarvas-tó, Szívós-szék
Mean / max. abundance	1.2% / 3.5%
Constancy	1 (6%)

Ecology: Abundant in electrolyte-rich waters, especially, in HCO_3^- rich, mesotrophic lakes.

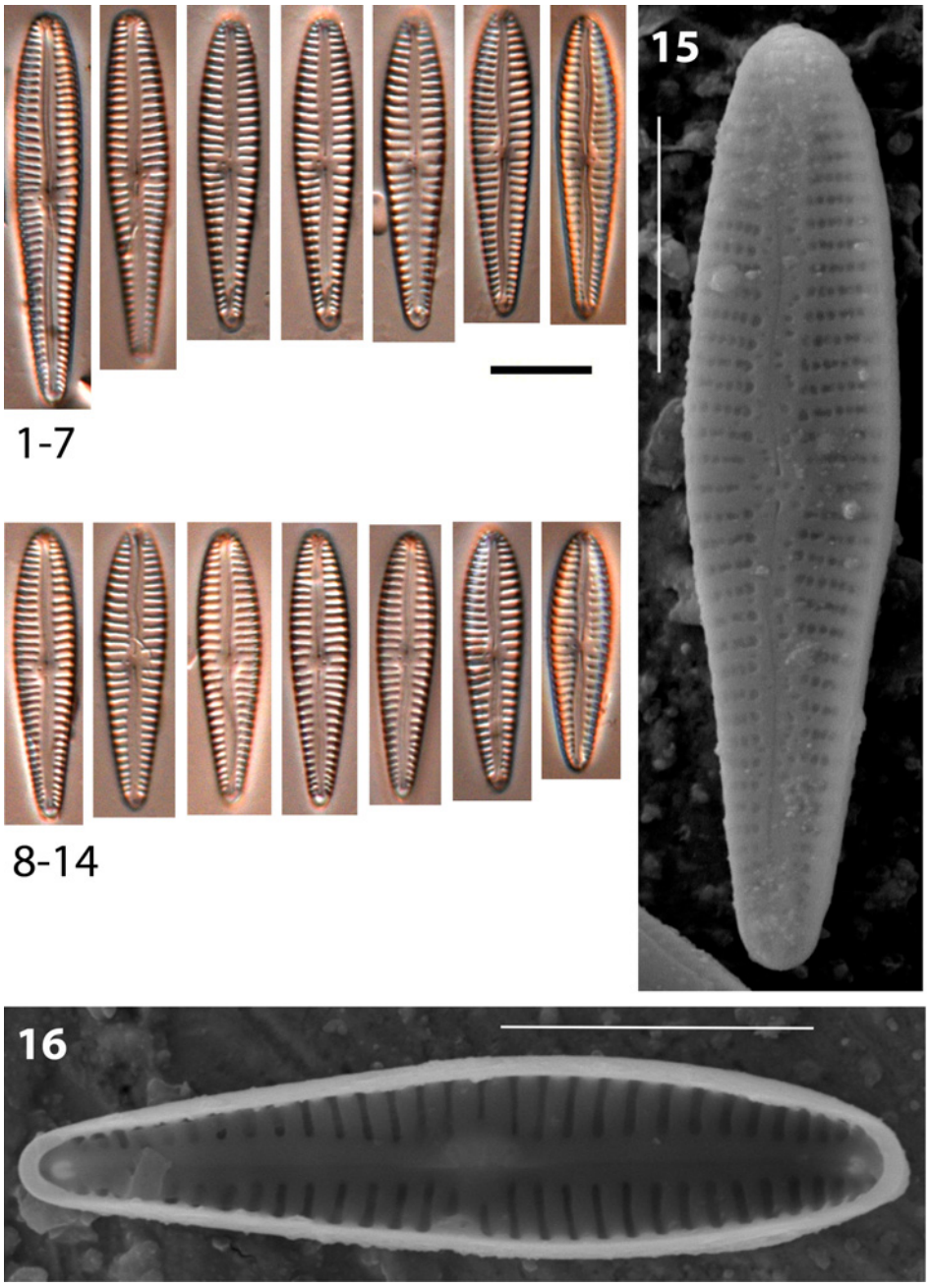


Plate 29: *Gomphonema clavatum* s. l. **Figs 1–16**: Pirtói Nagy-tó. – **Figs 1–16**: valve view; **Fig. 15**: external view of the valve (SEM); **Fig. 16**: internal view of the valve (SEM).

Gomphonema olivaceum (Hornemann) Brébisson 1838 s. l.
(Plate 30: Figs 1–14)

References: Krammer and Lange-Bertalot (1999: 374, pl. 165: 1–18), Bey and Ector (2013: 928–929), Hofmann *et al.* (2013: 310, pl. 95: 1–6).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	12–42	18.4–48.6
Width	5.5–9	5.5–9.2
Striae	8–12/10	10–12/10

Distribution in soda pans of the Carpathian Basin

Lakes	Csárda-szék, Legény-tó
Mean / max. abundance	3.2% / 10.6%
Constancy	1 (3.4%)

Ecology: Abundant in eutrophic waters with moderate conductivity. Tolerant to α-β mesosaprobic conditions.

Taxonomical note: Our specimens are out of the range of the species, they are larger than the species description indicates.

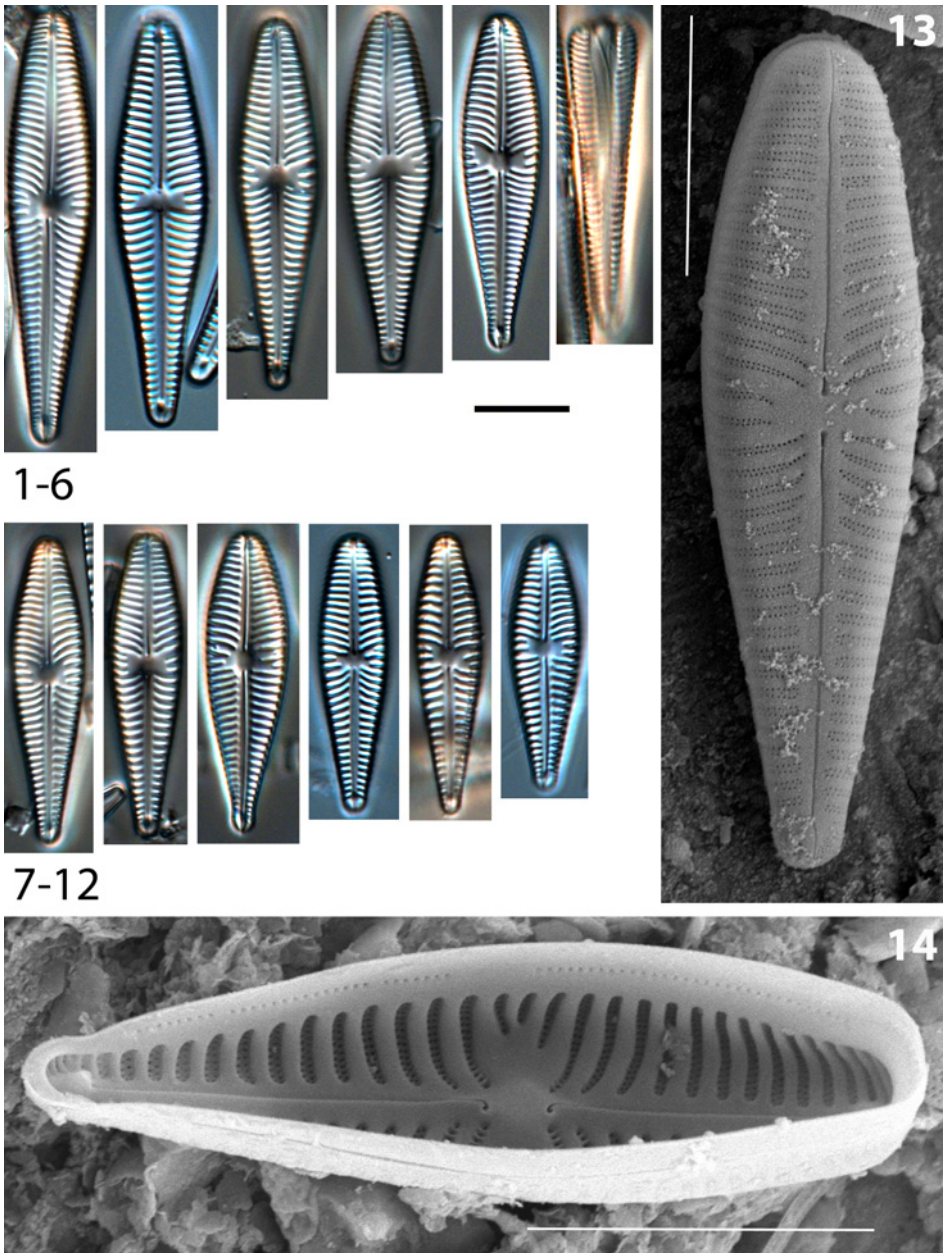


Plate 30: *Gomphonema olivaceum* s. l. **Figs 1–14**: Legény-tó. – **Figs 1–5, 7–14**: valve view; **Fig. 6**: girdle view; **Fig. 13**: external view of the valve (SEM); **Fig. 14**: internal view of the valve (SEM).

Gomphonema parvulum (Kützing) Kützing 1849 var. *parvulum* (Plate 31: Figs 1–23)

Gomphonema parvulum var. *parvulum* f. *parvulum* (Plate 31: Figs 1–14, 22)
Gomphonema parvulum var. *parvulum* f. *saprophilum* Lange-Bertalot et Reichardt (Plate 31: Figs 15–21, 23)

References: Krammer and Lange-Bertalot (1999: 358, pl. 154: 1–25), Bey and Ector (2013: 932–933), Hofmann *et al.* (2013: 312, pl. 99: 1–10).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	~10–36	12.8–25.5
Width	5–8	4–6
Striae	7–20/10	14–18/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Borsodi-dűlő,Büdös-szék (Pusztaszer), Cikes, Csárda-szék, Fehér-szék, Fülöp-szék, Hattyús-szék, Herrnsee, Kardoskúti Fehér-tó, Kirchsee, Kisréti-tó, Kondor-tó,Legény-tó, Pirtói Nagy-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Sárkány-tó, Szarvas-tó, Szívós-szék, Untersee, Zicklacke
Mean / max. abundance of f. *parvulum*	2.6% / 20.0%
Constancy of f. *parvulum*	2 (35%)

Lakes	Büdös-szék (Pusztaszer), Cikes, Nyéki-szállás, Pap-rét
Mean / max. abundance of f. *saprophilum*	4.5% / 13.3%
Constancy of f. *saprophilum*	1 (5.1%)

Ecology: *G. parvulum* var. *parvulum* f. *parvulum* abundant in oligo- and mesosaprobic waters independently of trophic level. *G. parvulum* var. *parvulum* f. *saprophilum* occurs in α-mesosaprobic and polysaprobic waters.

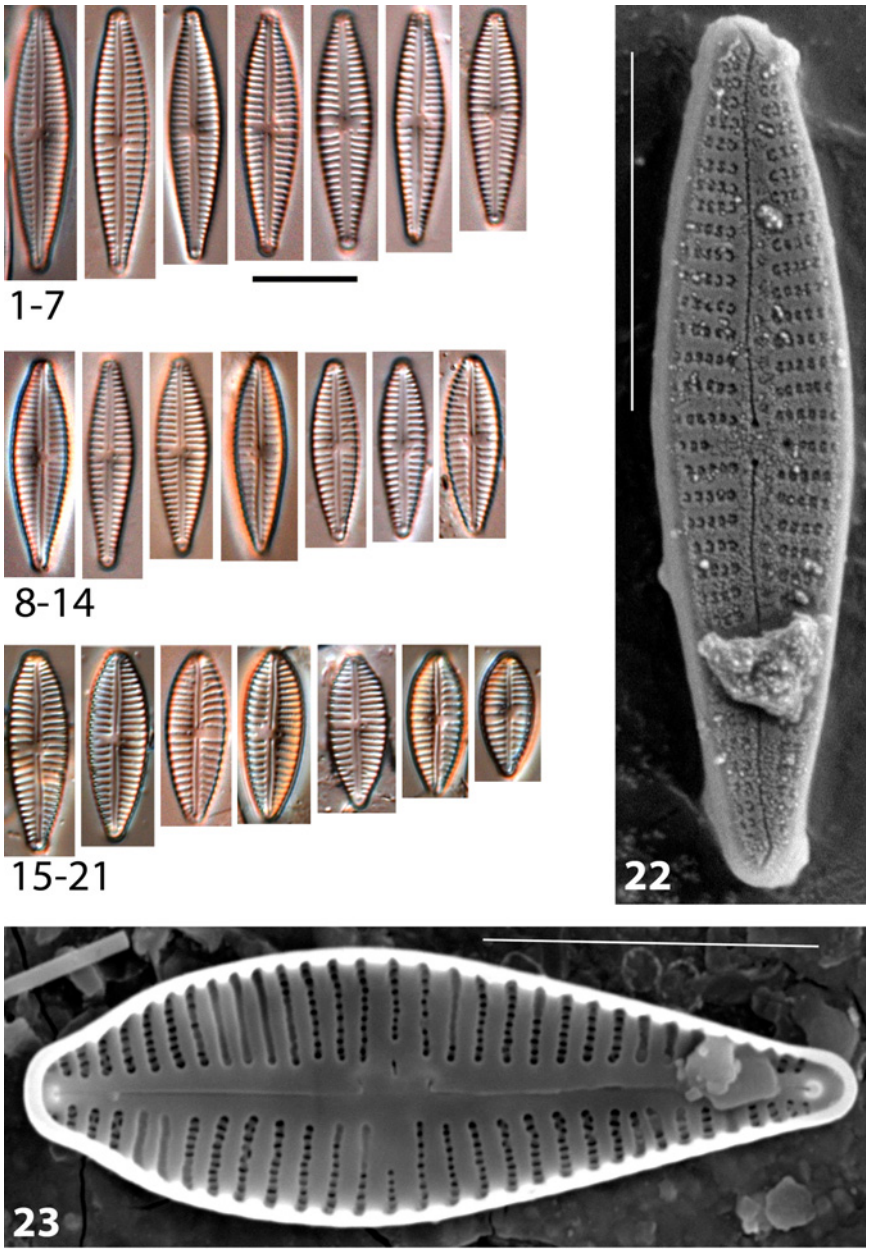


Plate 31: *Gomphonema parvulum*. **Figs 1, 4–5, 7–8**: Bíbic-tó; **Figs 2–3, 12**: Szívós-szék; **Figs 6, 13**: Sárkány-tó; **Fig. 9**: Pirtói Nagy-tó; **Figs 10, 14, 17**: Büdös-szék (Pusztaszer); **Fig 11**: Fehér-szék; **Figs 15–16, 18, 20**: Nyéki-szállás; **Fig. 19**: Pap-rét; **Fig. 21**: Cikes; **Fig. 22**: Csárda-szék; **Fig. 23**: Legény-tó. – **Figs 1–23**: valve view; **Fig. 22**: external view of the valve (SEM); **Fig. 23**: internal view of the valve (SEM).

Gyrosigma acuminatum (Kützing) Rabenhorst 1853
(Plate 32: Figs 1–8)

References: Krammer and Lange-Bertalot (1999: 296, pl. 32: 1–4), Hofmann *et al.* (2013: 323, pl. 62: 1–4), Taylor *et al.* (2007: pl. 35).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	60–180	76.3–111.2
Width	11–24	12.2–14.9
Striae	16–24/10	18–19/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó
Mean / max. abundance	2.6% / 8%
Constancy	1 (9.4%)

Ecology: Cosmopolitan species in lotic and lentic environments. Tolerant to β-α-mesosaprobic conditions. In the Nordic-Alps it is the most abundant *Gyrosigma* species. Smaller forms are abundant in waters with higher conductivity.

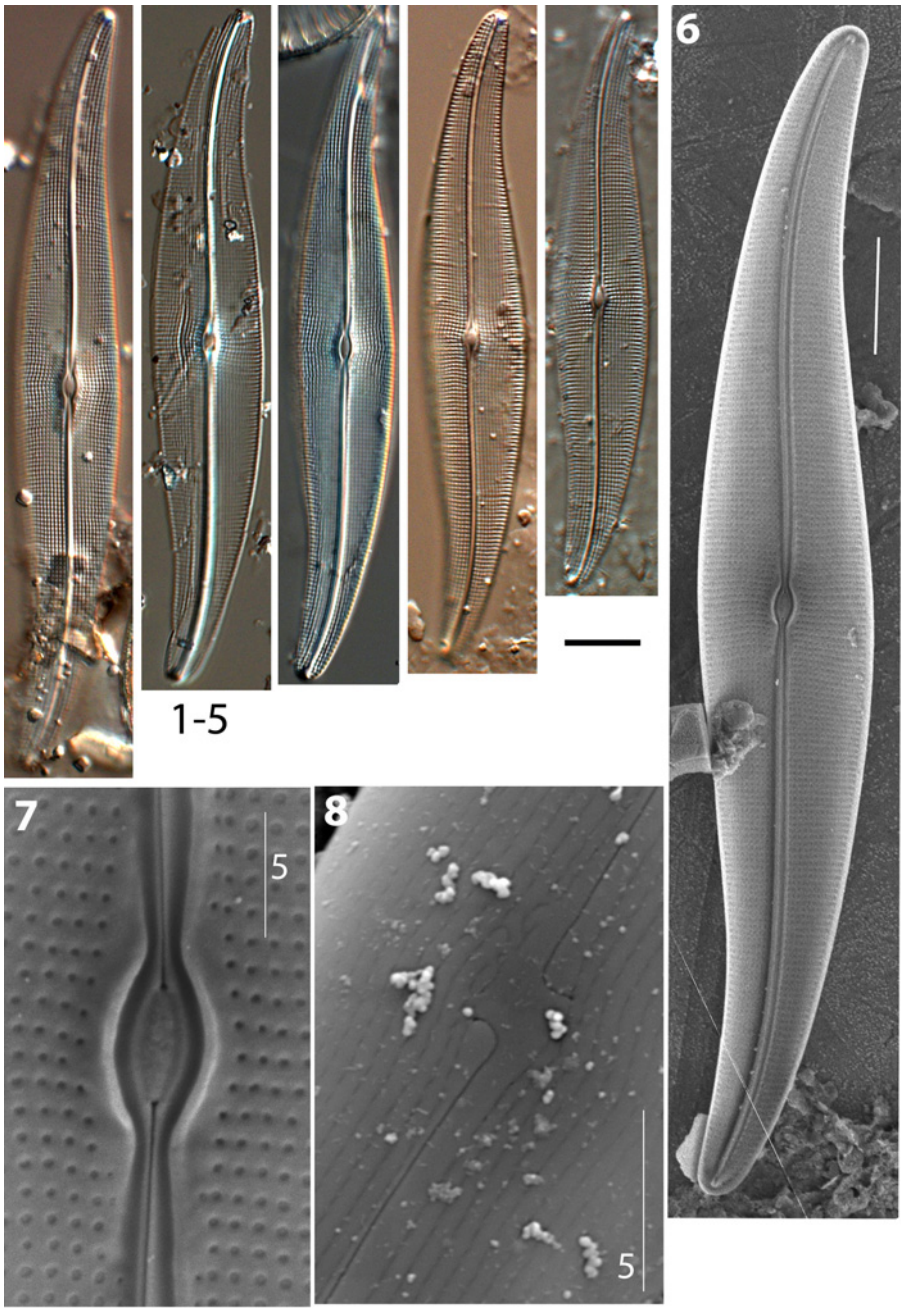


Plate 32: *Gyrosigma acuminatum*. **Fig. 1**: Borsodi-dűlő; **Figs 2–8**: Legény-tó. – **Figs 1–6**: valve view; **Fig. 6**: internal view of the valve (SEM); **Fig. 7**: central area, internal view (SEM); **Fig. 8**: central area, external view (SEM).

Halamphora dominici Ács et Levkov 2009
(Plate 33: Figs 1–21)

Reference: Levkov (2009: 185, pl. 90: 17–28, pl. 201: 4–7).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	10–20	8.6–18.1
Width	3.5–4	3.5–4.3
Striae on the dorsal side	24–28/10	24–28/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Bába-szék, Borsodi-dűlő, Böddi-szék, Büdös-szék, Büdös-szék (Pusztaszer), Csárda-szék, Fehér-szék, Herrnsee, Kardoskúti Fehér-tó, Kelemen-szék, Legény-tó, Neubruch, Nyéki-szállás, Őszeszék, Pap-rét, Zab-szék, Zicklacke
Mean / max. abundance	10.5% / 67%
Constancy	2 (27.4%)

Ecology: Halophilous species. So far known only from the type locality (Laguna Blanca).

Taxonomical note: The outline of the species and the density of striae differ from *H. veneta* (Kützing) Levkov, which is semi-lanceolate with 18–22/10 μm striae density. Our specimens are out of the range of the species. They are a bit smaller than the type population.

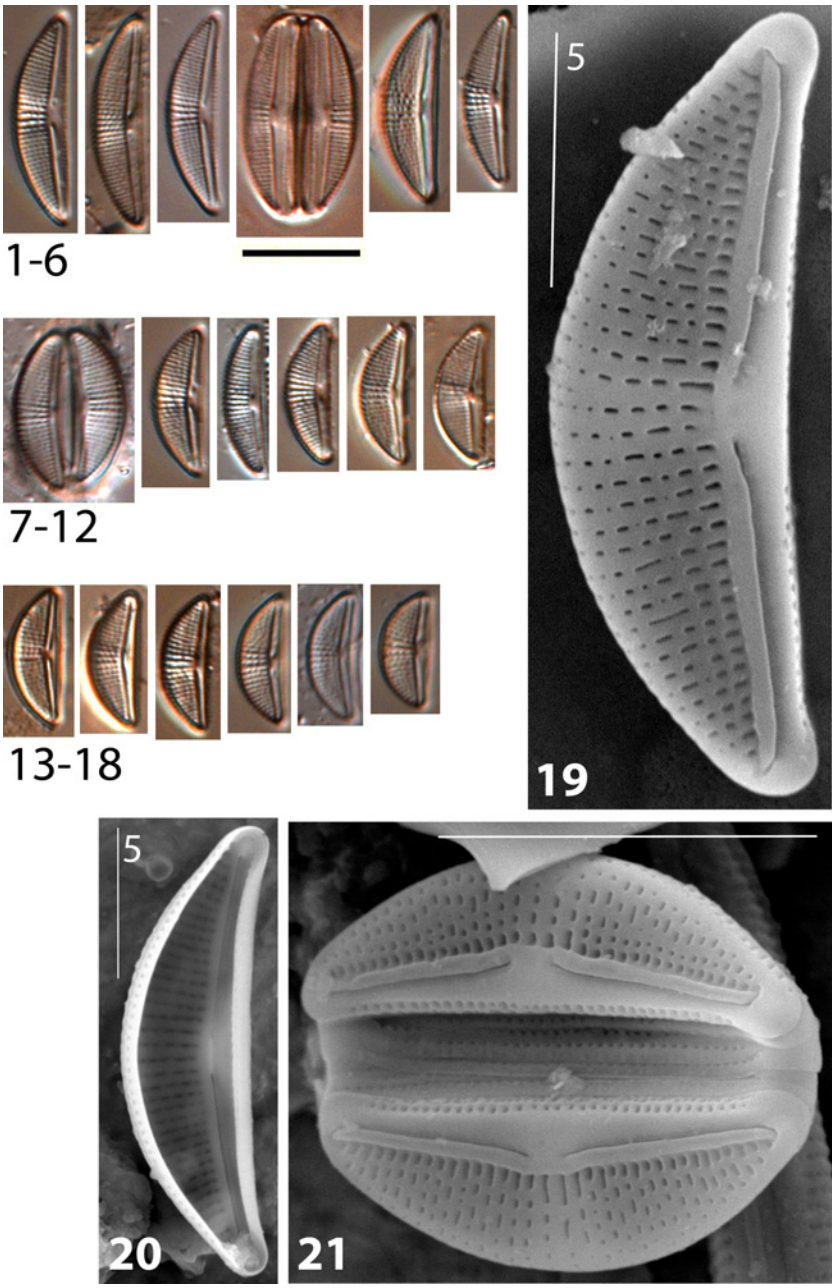


Plate 33: *Halamphora dominici*. **Figs 1–2**: Herrnsee; **Figs 3, 5–6, 8, 17–21**: Zab-szék; **Figs 4, 16**: Kelemen-szék; **Figs 7, 10**: Büdös-szék; **Fig. 9**: Legény-tó; **Fig. 11**: Zicklacke; **Fig 12–15**: Nyéki-szállás. – **Figs 1–21**: valve view; **Figs 19–20**: external view of the valve (SEM); **Fig. 21**: internal view of the valve (SEM).

Halamphora kevei Ács et Levkov 2009
(Plate 34: Figs 1–27)

Reference: Levkov (2009: 200, pl. 90: 1–16, 209: 1–6, 201: 1–3).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	11–40	11.8–24.5
Width	3.5–5.7	3.8–5.2
Striae on the dorsal side	24–30/10	24–28/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Borsodi-dűlő, Böddi-szék, Büdös-szék, Csárda-szék, Fehér-szék, Herrnsee, Kelemen-szék, Kirchsee, Neubruch, Nyéki-szállás, Ősze-szék, Pap-rét, Szappan-szék, Untersee, Zab-szék, Zicklacke
Mean / max. abundance	6.1% / 40%
Constancy	2 (28.2%)

Ecology: Halophilous species. Known only from the type locality (Laguna Blanca).

Taxonomical note: *Halamphora veneta* has lower striae (coarsely punctate) density (18–22/10 µm). *H. dominici* has different shape and valve ends.

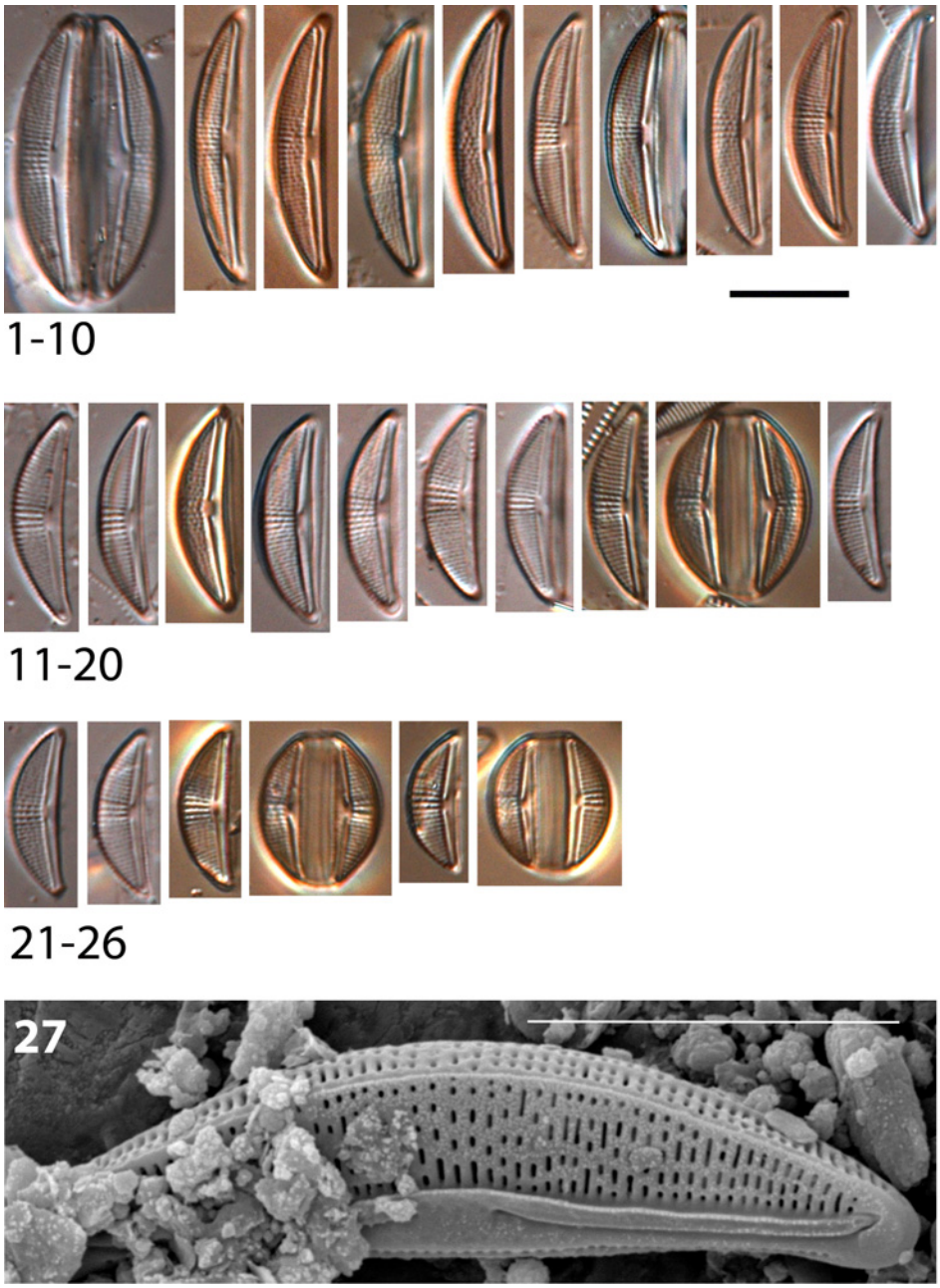


Plate 34: *Halamphora kevei*. **Figs 1–3, 10–11, 18, 20, 22, 27**: Zab-szék; **Figs 4, 13, 19, 23–26**: Nyéki-szállás; **Fig. 5**: Böddi-szék; **Figs 6, 12, 14, 16–17, 21**: Büdös-szék; **Figs 7–9**: Szappan-szék; **Fig. 15**: Kelemen-szék. – **Figs 1–27**: valve view; **Fig. 27**: external view of the valve (SEM).

Halamphora paraveneta (Lange-Bertalot, Cavacini, Tagliaventi et Alfinito) Levkov 2009 (Plate 35: Figs 1–12)

References: Lange-Bertalot *et al.* (2003: 28–30, pl. 95: 1–5, pl. 96: 1–7 (*Amphora paraveneta*)), Levkov (2009: 215, pl. 86: 8–13, pl. 87: 18–22, pl. 107A: 44–51, pl. 245: 1–3).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	20–75	20.5–45.8
Width	4–9	4.5–6.9
Striae on the dorsal side	8–21/10 (in the middle part)	20–22/10

Distribution in soda pans of the Carpathian Basin

Lakes	Büdös-szék (Pusztaszer), Cikes, Csárda-szék, Fehér-szék, Herrnsee, Nyéki-szállás, Pap-rét, Zab-szék
Mean / max. abundance	2.8% / 22.1%
Constancy	1 (9.4%)

Ecology: Frequent in ephemeral waters.

Taxonomical note: The specimens of this species are longer than those of *H. veneta* and the valve ends are more broadly rounded.

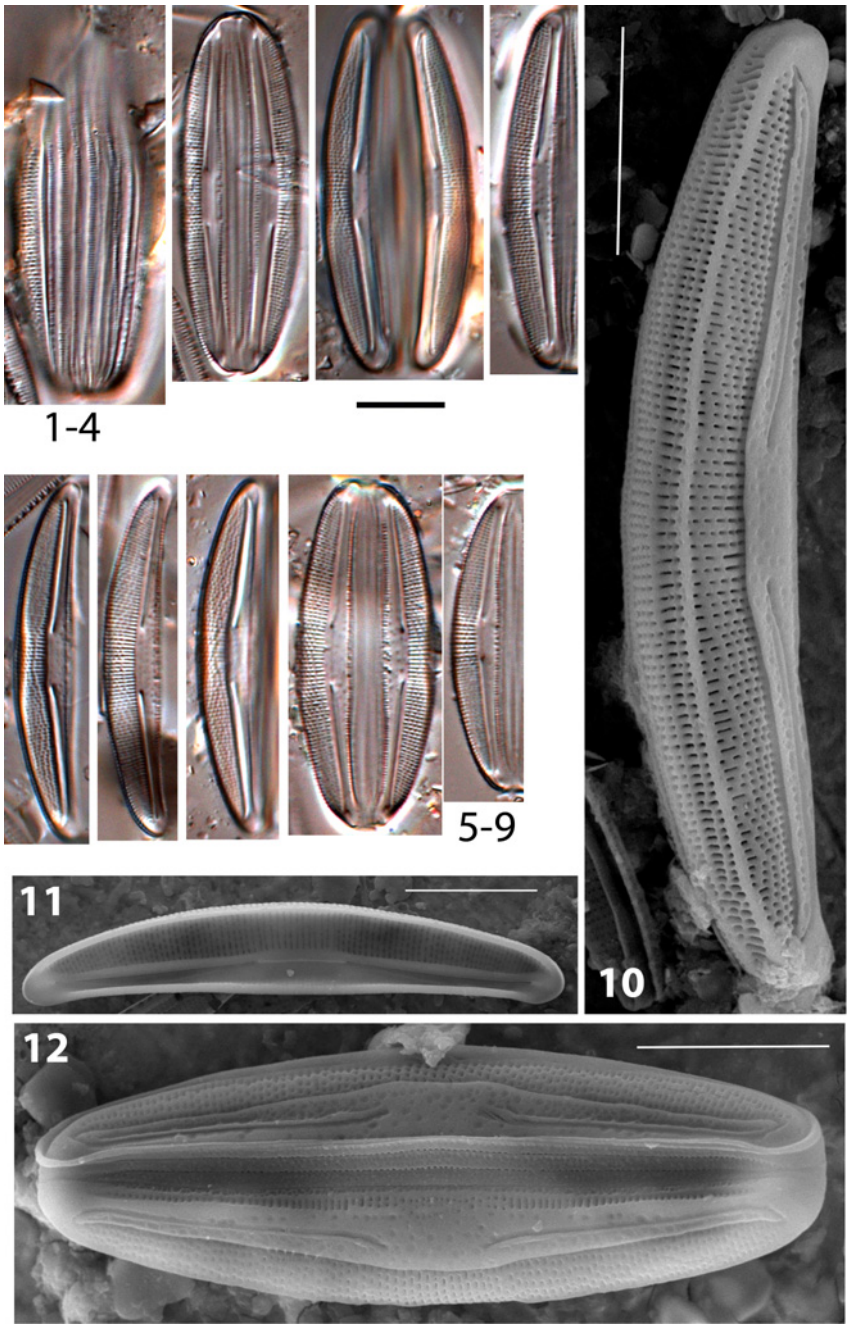


Plate 35: *Halamphora paraveneta*. **Figs 1–12**: Zab-szék. – **Figs 1–12**: valve view; **Figs 10, 12**: external view of the valve (SEM); **Fig. 11**: internal view of the valve (SEM).

Halamphora subcapitata (Kisselew) Levkov 2009
(Plate 36: Figs 1–9)

References: Krammer and Lange-Bertalot (1999: 351, pl. 153: 1–3 (*Amphora subcapitata*)), Levkov (2009: 226, pl. 81, 198–199).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	31–61	30.2–55
Width	7.5–12	8.3–11.5
Striae on the dorsal side	20–22/10	20–22/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó, Untersee, Zicklacke
Mean / max. abundance	5.6% / 14.3%
Constancy	1 (5.9%)

Ecology: Common species in saline lakes and mineral springs.

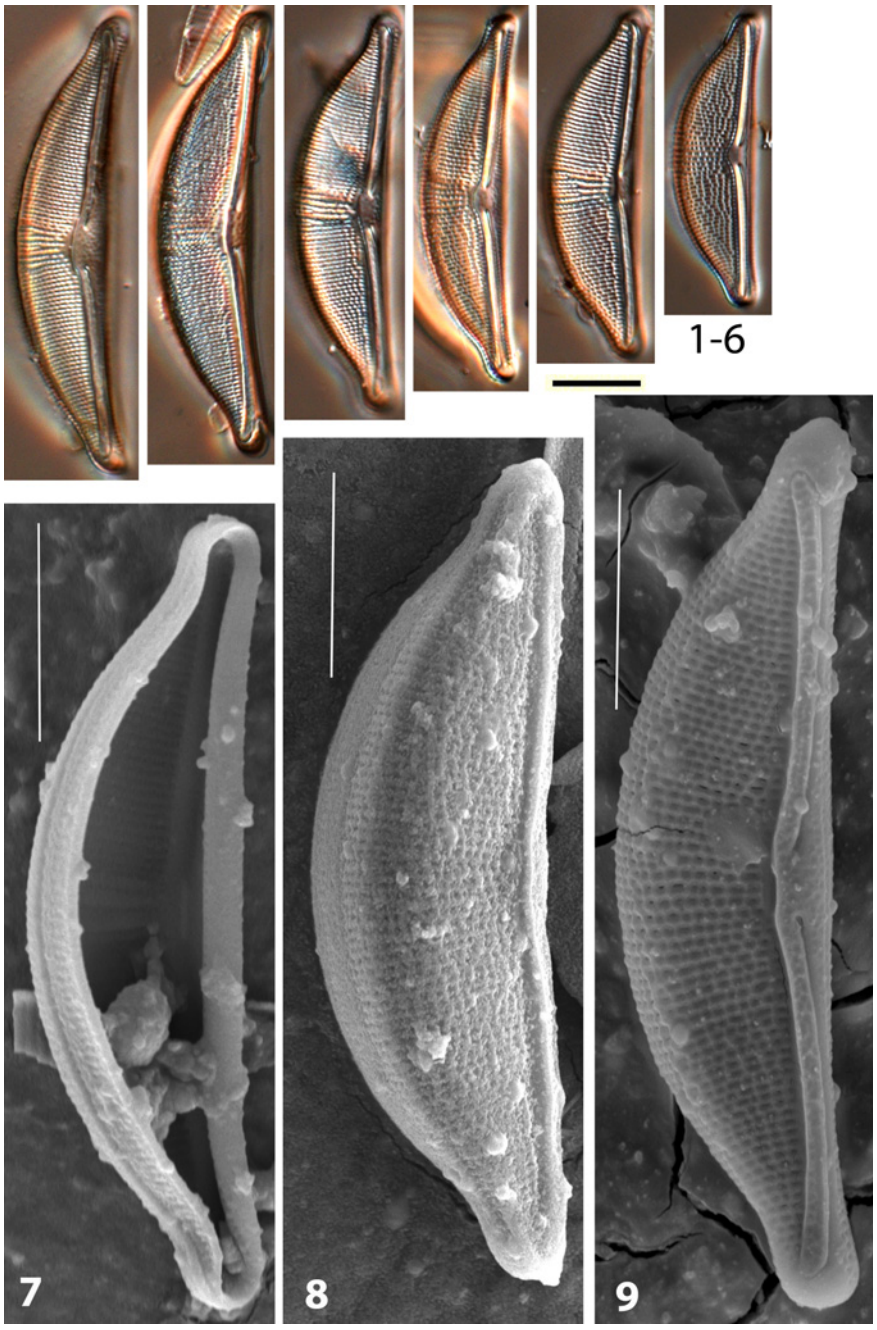


Plate 36: *Halamphora subcapitata*. **Figs 1–9**: Untersee. – **Figs 1–9**: valve view; **Fig. 7**: internal view of the valve (SEM); **Figs 8–9**: external view of the valve (SEM).

Halamphora veneta (Kützing) Levkov 2009
(Plate 37: Figs 1–18)

References: Krammer and Lange-Bertalot (1999: 348, pl. 151: 7–17 (*Amphora veneta*)), Levkov (2009: 242, pl. 94: 9–19, 102: 17–30, 217:1–5, 218: 1–5), Bey and Ector (2013: 862–863), Hofmann *et al.* (2013: 330, pl. 92: 20–25), Taylor *et al.* (2007: pl. 96).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	17–35	17.6–33.8
Width	4–6.5	4.2–5.6
Striae on the dorsal side	18–22/10 (in middle)	20–23/10

Distribution in soda pans of the Carpathian Basin

Lakes	Böddi-szék, Csárda-szék, Herrnsee, Kardoskúti Fehér-tó, Kelemen-szék, Legény-tó, Nyéki-szállás, Ősze-szék, Sárkány-tó, Untersee, Zab-szék, Zicklacke
Mean / max. abundance	10% / 52.4%
Constancy	1 (17.1%)

Ecology: Abundant species in freshwaters and slightly brackish waters in eutrophic condition.

Taxonomical note: See *Halamphora paraveneta*, *H. kevei* and *H. dominici.*

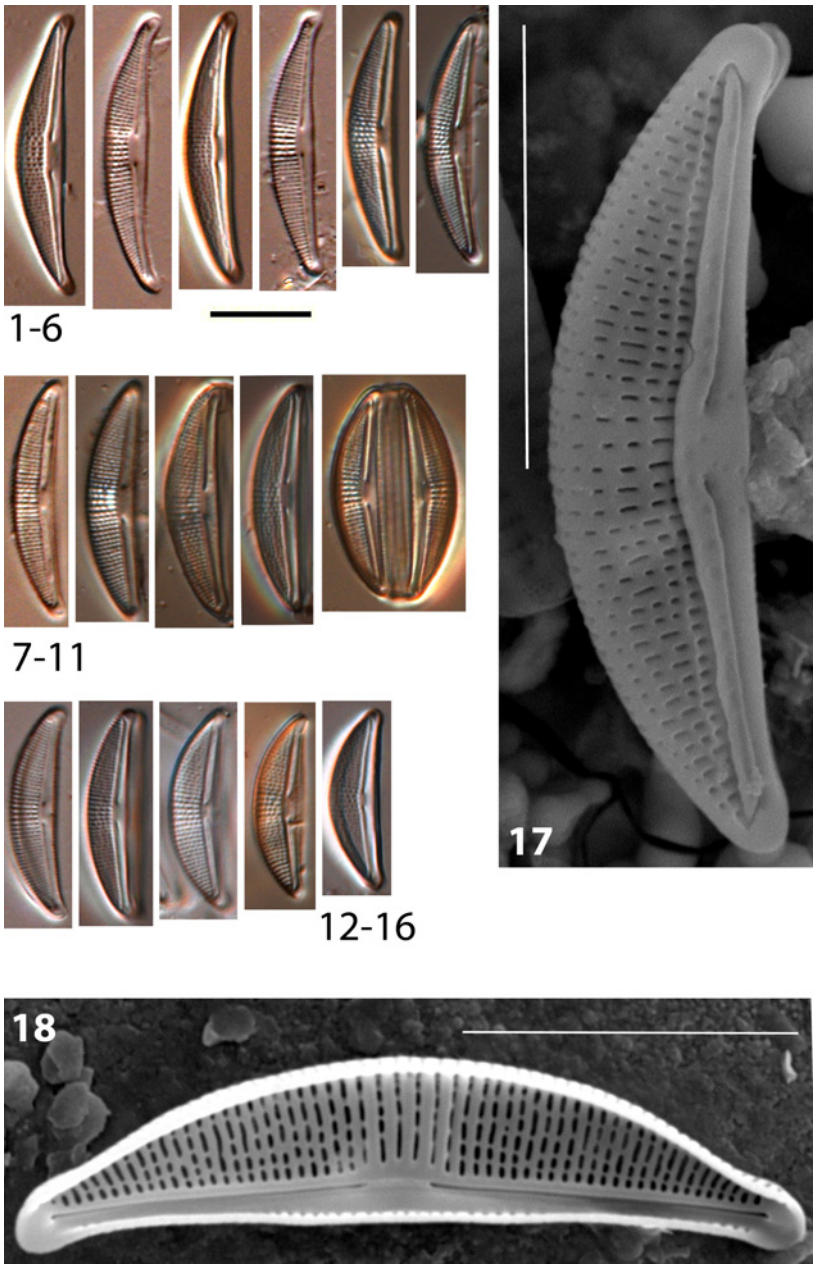


Plate 37: *Halamphora veneta*. **Figs 1–2, 4**: Sárkány-tó; **Fig. 3**: Kardoskúti Fehér-tó; **Figs 5–6, 9–11**: Nyéki-szállás; **Figs 7, 14–15**: Zab-szék; **Fig. 8**: Zicklacke; **Figs 12–13**: Csárda-szék; **Fig. 16**: Böddi-szék; **Figs 17–18**: Legény-tó. – **Figs 1–18**: valve view; **Fig. 17**: external view of the valve (SEM); **Fig. 18**: internal view of the valve (SEM).

Hantzschia abundans Lange-Bertalot 1993
(Plate 38: Figs 1–14)

References: Bey and Ector (2013: 990), Hofmann *et al.* (2013: 333, pl. 102: 6–10).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	40–80	39.5–75.5
Width	7–10	7–9.9
Striae	15–20/10	15–19/10
Fibulae	5–8/10	5–7/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Csárda-szék, Fehér-szék, Hattyús-szék, Kisréti-tó, Kondor-tó, Pirtói Nagy-tó, Sárkány-tó, Szappan-szék, Szívós-szék
Mean / max. abundance	0.8% / 2.4%
Constancy	1 (11.1%)

Ecology: Species occurs in neutral pH, tolerates dry periods as an aerophilous species.

Taxonomical note: *Hantzschia abundans* is often not distinguished from *H. amphioxys*, however based on the length (5–7 μm) and striae number (20–29/10 μm) they can be easily separated.

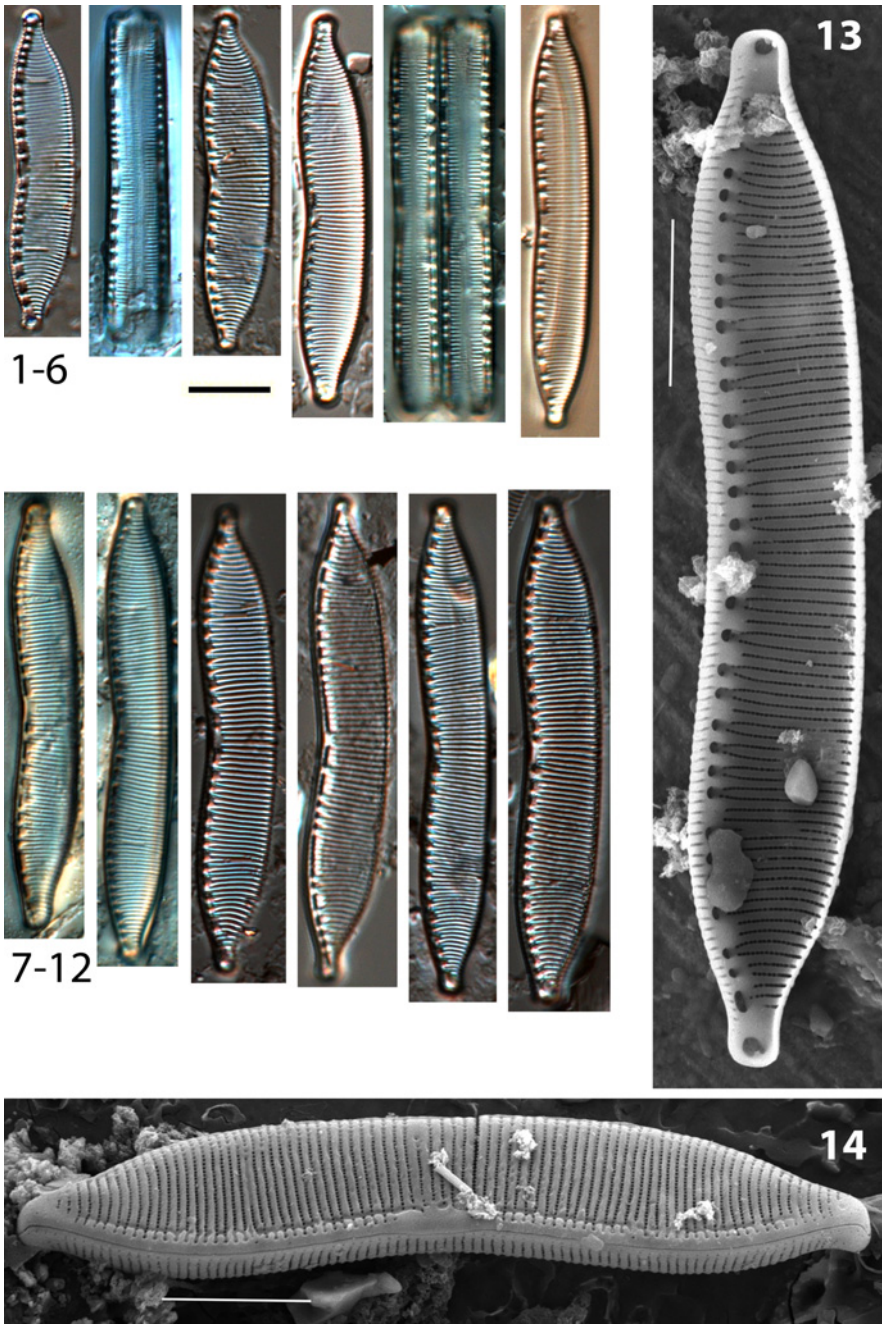


Plate 38: *Hantzschia abundans*. **Figs 1–14**: Borsodi-dűlő. – **Figs 1, 3–4, 6–14**: valve view; **Figs 2, 5**: girdle view; **Fig. 13**: internal view of the valve (SEM); **Fig. 14**: external view of the valve (SEM).

Hantzschia amphioxys (Ehrenberg) Grunow 1880 (Plate 39: Figs 1–12)

References: Krammer and Lange-Bertalot (1999: 128, pl. 88: 1–7), Bey and Ector (2013: 988–999), Hofmann *et al.* (2013: 333, pl. 102: 1–5), Taylor *et al.* (2007: pl. 137).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	15–50	28–49.7
Width	5–7	4.7–6.7
Striae	20–29/10	20–26/10
Fibulae	(4)5–8(11)/10	6–8/10

Distribution in soda pans of the Carpathian Basin

Lakes	Kondor-tó, Pirtói Nagy-tó
Mean / max. abundance	0.6% / 1%
Constancy	1 (1.7%)

Ecology: Species occurs in neutral pH, tolerates dry periods as an aerophilous species.

Taxonomical note: *Hantzschia amphioxys* is often not distinguished from *H. abundans*, however based on the length (7–10 µm) and striae number (15–20/10 µm), they can be easily separated.

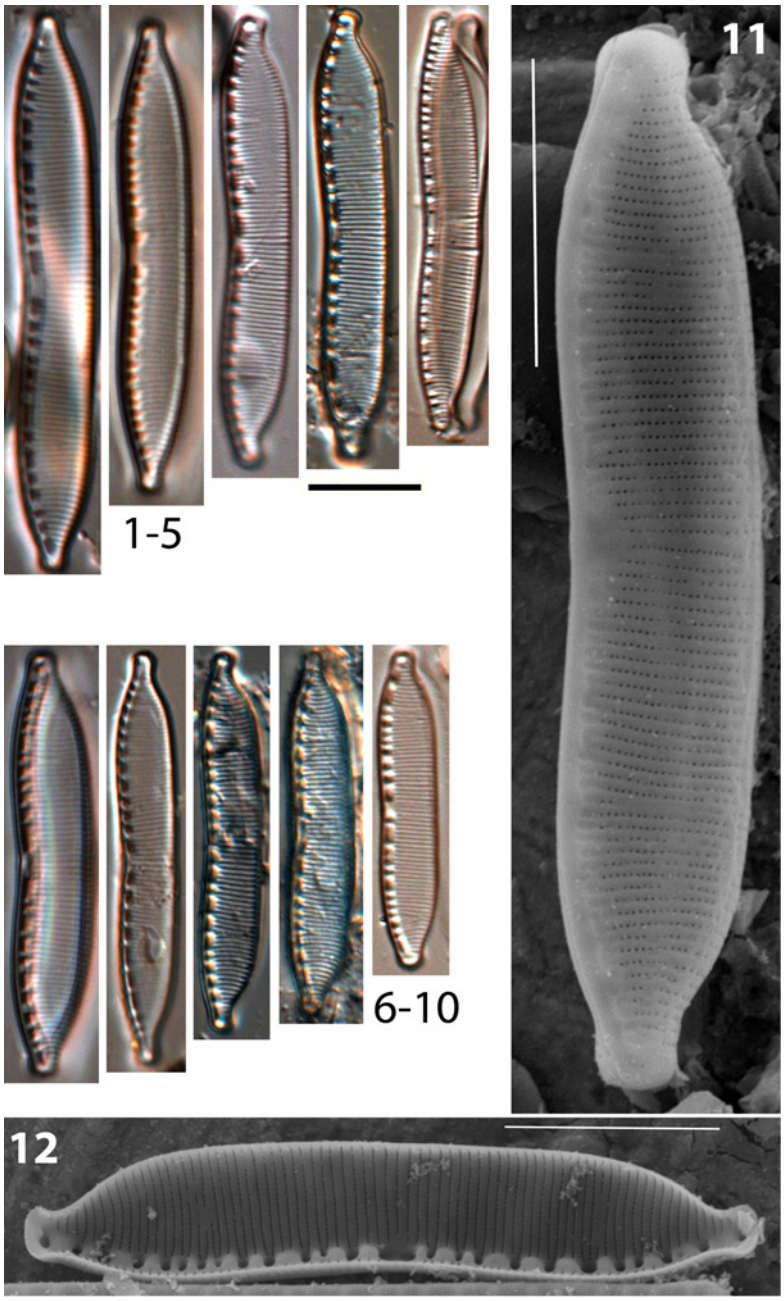


Plate 39: *Hantzschia amphioxys*. **Figs 1–2, 5, 10**: Kondor-tó; **Figs 3, 7**: Pirtói Nagy-tó; **Figs 4, 6, 8–9, 11–12**: Borsodi-dűlő. – **Figs 1–12**: valve view; **Fig. 11**: external view of the valve (SEM); **Fig. 12**: internal view of the valve (SEM).

Hippodonta hungarica (Grunow) Lange-Bertalot, Metzeltin et Witkowski 1996
(Plate 40: Figs 1–10)

References: Krammer and Lange-Bertalot (1999: 123, pl. 42: 5–9 (*Navicula capitata* var. *hungarica*)), Hofmann *et al.* (2013: 336, pl. 51: 16–20).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	10–36	13–22.1
Width	5–10	5–6.4
Striae	7–10/10	7–10/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Herrnsee, Legény-tó
Mean / max. abundance	2% / 9%
Constancy	1 (6.8%)

Ecology: Abundant in waters with moderate and high conductivity from eutrophic to polytrophic conditions.

Taxonomical note: *Hippodonta capitata* is similar to *H. hungarica*, but the latter has elliptical-lanceolate shape with rounded apices in contrast to capitate apices of *H. capitata*.

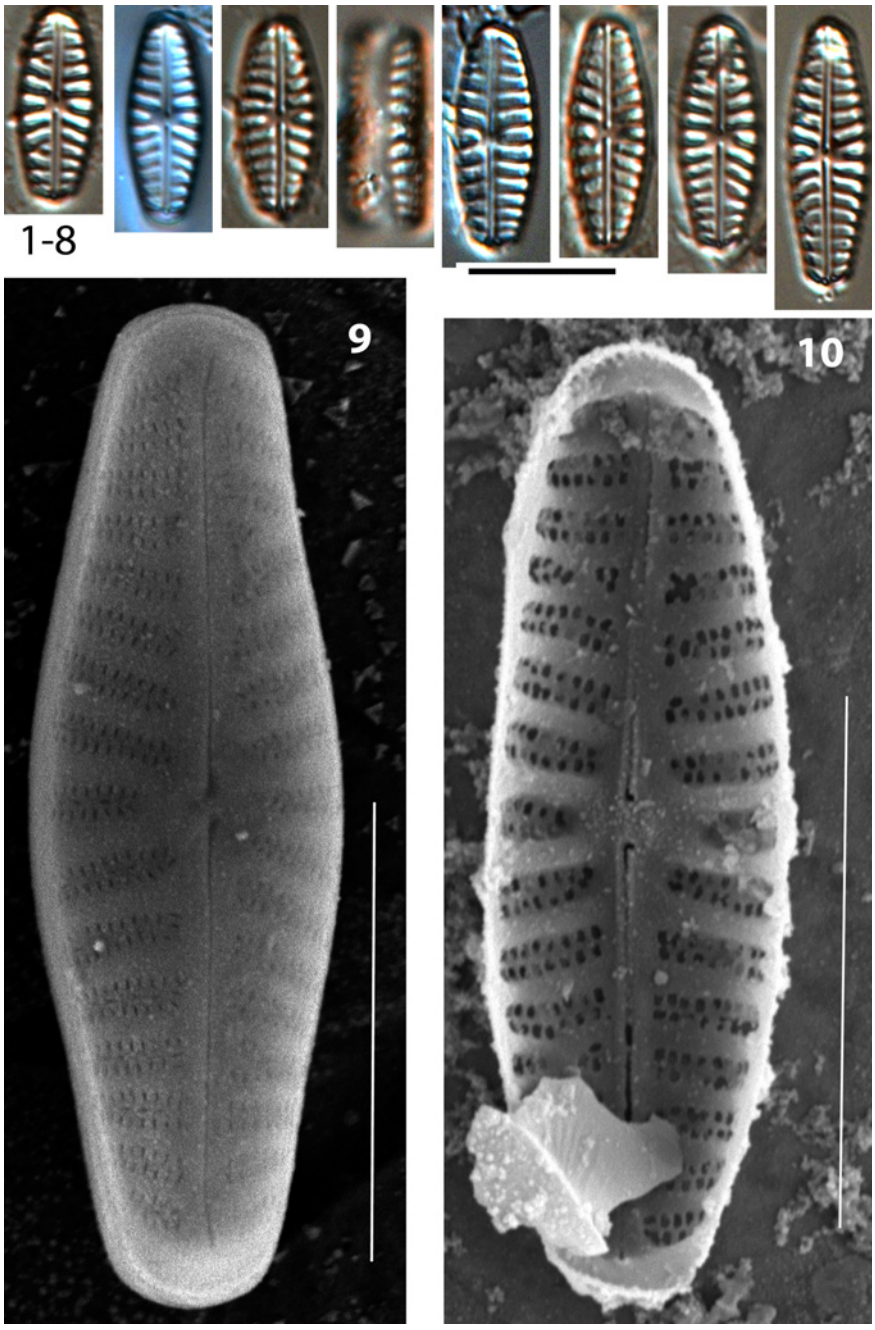


Plate 40: *Hippodonta hungarica*. **Figs 1–10**: Legény-tó. – **Figs 1–3, 5–10**: valve view; **Fig. 4**: girdle view; **Fig. 9**: external view of the valve (SEM); **Fig. 10**: internal view of the valve (SEM).

Mastogloia sp. 1
(Plate 41: Figs 1–13)

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	–	23.5–38.6
Width	–	9.4–11.5
Striae	–	17–19/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó
Mean / max. abundance	0.8% / 1.5%
Constancy	1 (3.4%)

Taxonomical note: It is similar to *Mastogloia smithii* Thwaites ex W. Smith and *M. pseudosmithii* S. S. Lee, E. E. Gaiser, B. Van de Vijver, M. B. Edlund et S. A. Spaulding. *M. smithii* with protracted apices is wider (11–15 μm) and has higher striae density (20–21/10 μm). *M. pseudosmithii* with rostrate and rounded apices (11–14 μm) is also wider but its striae density is lower (16–17/10 μm). Probably, it is an undescribed species.

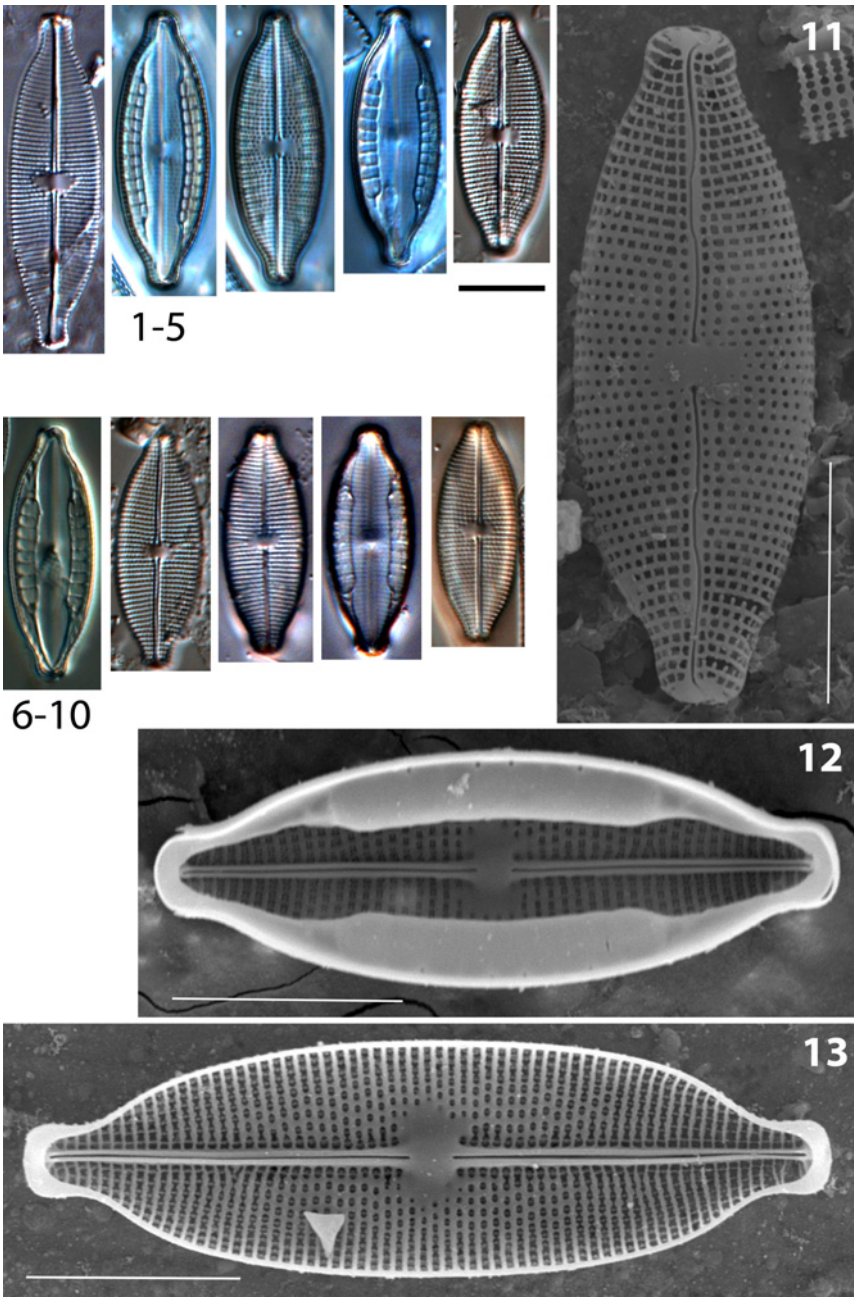


Plate 41: *Mastogloia* sp. 1. **Figs 1–13**: Legény-tó. – **Figs 1–13**: Valve view with striation; **Figs 2, 4, 6, 9**: valve view with partecta; **Fig. 11**: external view of the valve (SEM); **Fig. 12**: partectal ring, internal view (SEM); **Fig. 13**: internal view of the valve (SEM).

Mayamaea atomus (Kützing) Lange-Bertalot 1997 var. *permitis* (Hustedt) Lange-Bertalot 1997 (Plate 42: Figs 1–18)

References: Krammer and Lange-Bertalot (1999: 216, pl. 74: 14–17 (*Navicula atomus* var. *permitis*)), Lange-Bertalot (2001: 136, pl. 104: 7–13), Bey and Ector (2013: 492–493 (*Mayamaea permitis*)), Hofmann *et al.* (2013: 354, pl. 49: 13–19), Taylor *et al.* (2007: pl. 53).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	6–9	7.6–9.4
Width	*ca* 3–4	2.9–3.7
Striae	(25) 30–36/10	28–32/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Büdös-szék, Büdös-szék (Pusztaszer), Csárda-szék, Fehér-szék, Fülöp-szék, Kardoskúti Fehér-tó, Kelemen-szék, Nyéki-szállás, Pirtói Nagy-tó, Sárkány-tó, Zab-szék
Mean / max. abundance	5.7% / 33.2%
Constancy	1 (13.7%)

Ecology: Abundant in waste waters and in polysaprobic habitats.

Taxonomical note: Specimens of *Mayamaea atomus* var. *atomus* are wider and longer (width: 4–5.5 µm, length: 8.5–13 µm) and their striae density is lower (19–22/10 µm) than in the case of *M. alcimonica* (Reichardt) Monnier et Ector (24–26/10 µm).

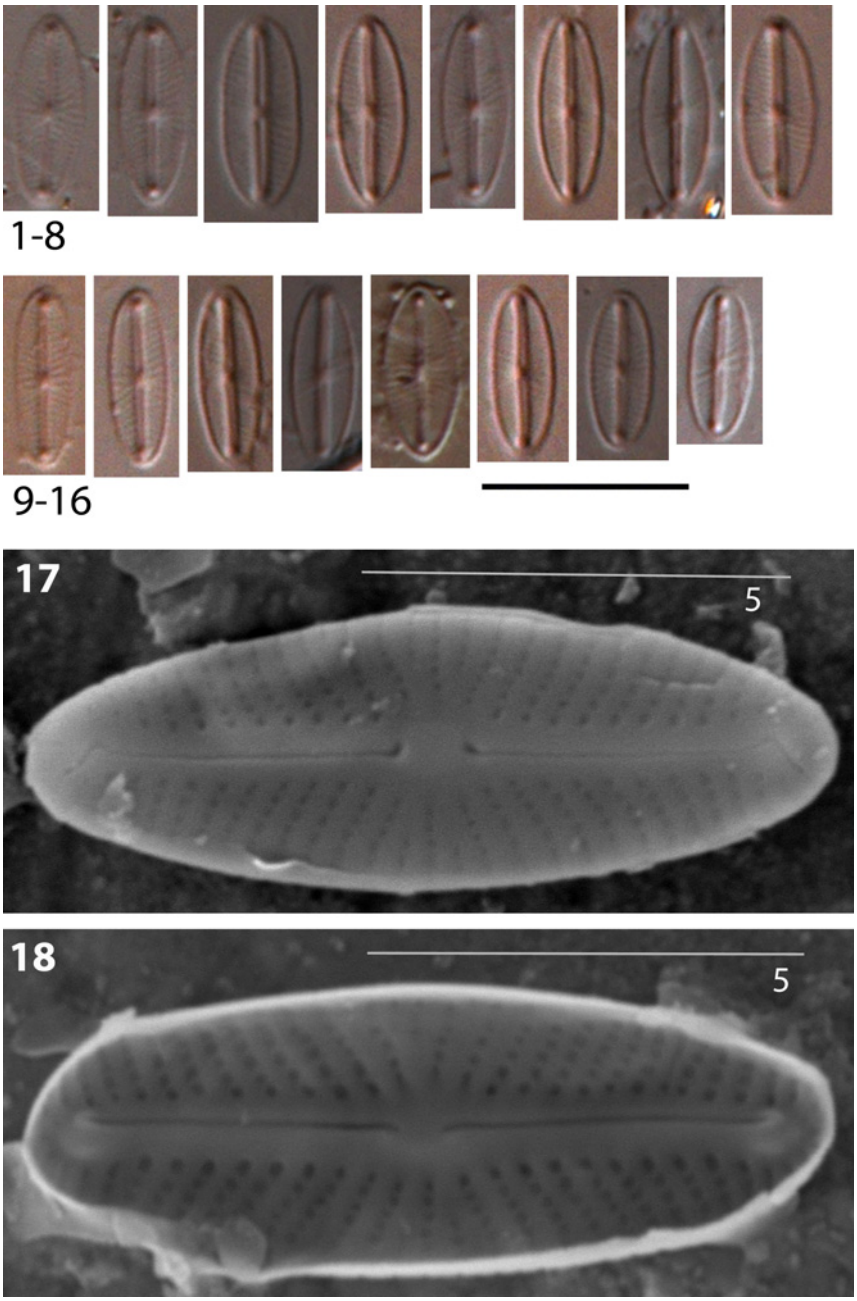


Plate 42: *Mayamaea atomus* var. *permitis*. **Figs 1–2, 9**: Büdös-szék; **Figs 3–4, 6, 8, 10–12, 15–16, 18**: Csárda-szék; **Figs 5, 7, 13–14**: Zab-szék; **Fig. 17**: Sárkány-tó. – **Figs 1–18**: valve view; **Fig. 17**: external view of the valve (SEM); **Fig. 18**: internal view of the valve (SEM).

Navicula cryptotenella Lange-Bertalot 1985
(Plate 43: Figs 1–19)

References: Krammer and Lange-Bertalot (1999: 106, pl. 33: 9–11), Lange-Bertalot (2001: 28, pl. 26: 17–32), Bey and Ector (2013: 556–557), Hofmann *et al.* (2013: 378, pl. 32: 1–5), Taylor *et al.* (2007: pl. 75).

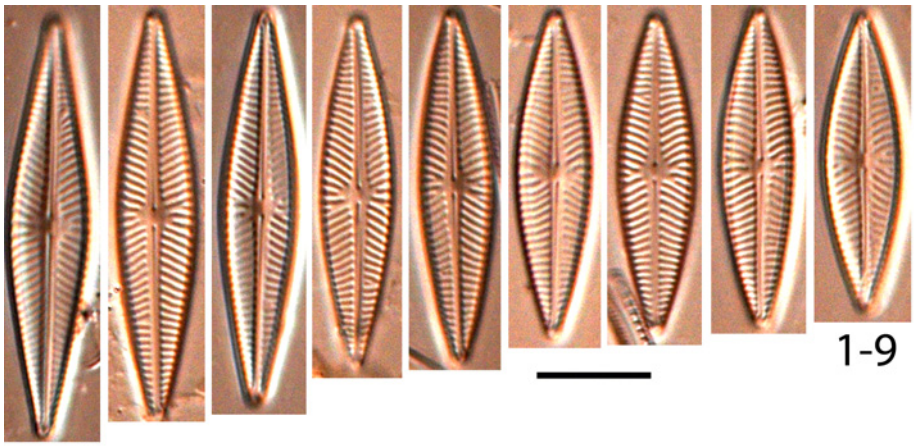
	Morphological parameters (μm)	Observations in soda pans (μm)
Length	12–40	20.9–37.3
Width	5–7	6–7.2
Striae	14–16/10	12–15/10

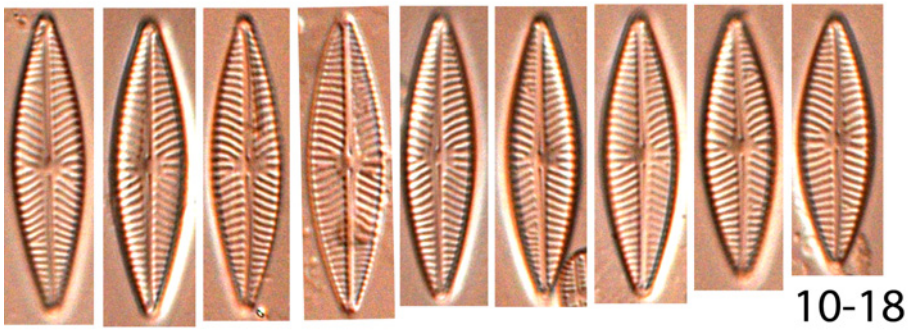
Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Bíbic-tó, Böddi-szék, Szappan-szék
Mean / max. abundance	1.3% / 3.7%
Constancy	1 (3.4%)

Ecology: Common species of oligotrophic to eutrophic waters with moderate electrolyte concentrations. Indicator species of β-mesosaprobic conditions or better.

Taxonomical note: Specimens of *Navicula cryptotenelloides* are shorter (maximal length: 19 μm), thinner (3.7–4.2 μm), and their striae density is higher (16–18/10 μm) than those in specimens of *N. cryptotenella*.





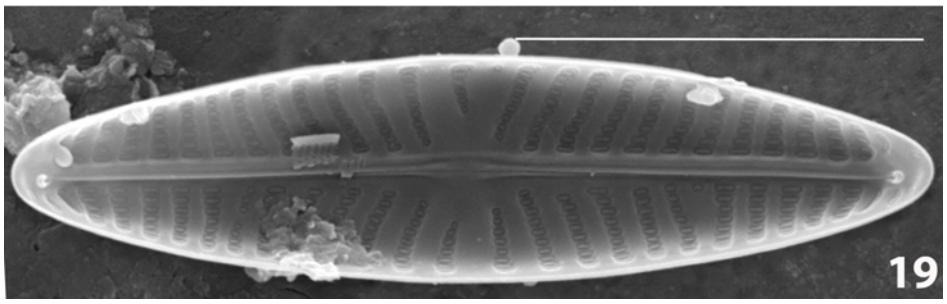


Plate 43: *Navicula cryptotenella*. **Figs 1–19**: Bíbic-tó. – **Figs 1–19**: valve view; **Fig. 19**: internal view of the valve (SEM).

Navicula cryptotenelloides Lange-Bertalot 1993
(Plate 44: Figs 1–17)

References: Lange-Bertalot (2001: 29, pl. 26: 8–16; pl. 28: 1–2), Bey and Ector (2013: 558–559), Hofmann *et al.* (2013: 379, pl. 32: 6–10), Taylor *et al.* (2007: pl. 74).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	9–18	12.3–19.6
Width	3.7–4.2	3.8–4.4
Striae	16–18/10	18–19/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Bíbic-tó, Kondor-tó, Legény-tó
Mean / max. abundance	1.4% / 5.1%
Constancy	1 (6%)

Ecology: Abundant in carbonate-rich lakes.

Taxonomical note: Specimens of *Navicula cryptotenella* are longer (12–40 μm), wider (5–7 μm), and their striae density is lower (14–16/10 μm) than those of this species. Our specimens are out of the range of the species, they are larger than indicated in the protologue.

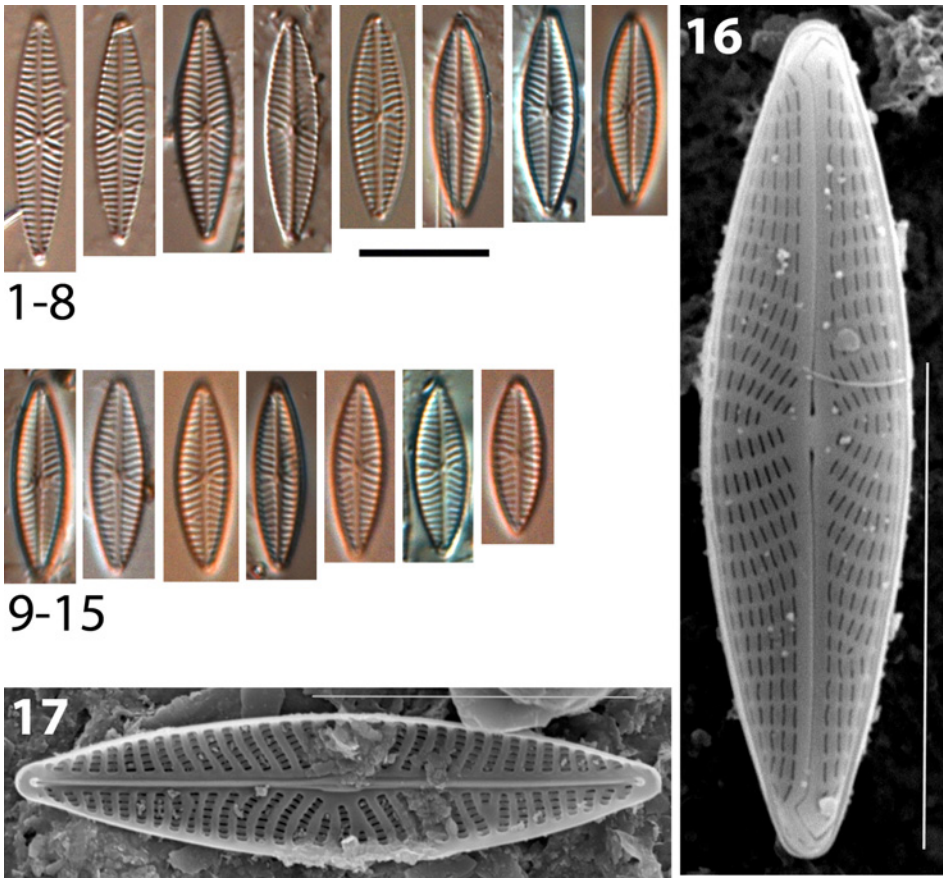


Plate 44: *Navicula cryptotenelloides*. **Figs 1–15**: Kondor-tó; **Figs 16–17**: Legény-tó. – **Figs 1–17**: valve view; **Fig. 16**: external view of the valve (SEM); **Fig. 17**: internal view of the valve (SEM).

Navicula duerrenbergiana Hustedt 1934
(Plate 45: Figs 1–22)

References: Krammer and Lange-Bertalot (1999: 119, pl. 39: 6–11), Lange-Bertalot (2001: 33, pl. 51: 8–15), Witkowski *et al.* (2000: 276, pl. 116: 8–14; pl. 145: 14).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	20–60	29.4–36.2
Width	4–7	4.9–5.5
Striae	14–15/10	15–6/10

Distribution in soda pans of the Carpathian Basin

Lakes	Legény-tó
Mean / max. abundance	1.9% / 3%
Constancy	1 (2.5%)

Ecology: Predominant species in saline and freshwaters with high conductivity and in brackish waters.

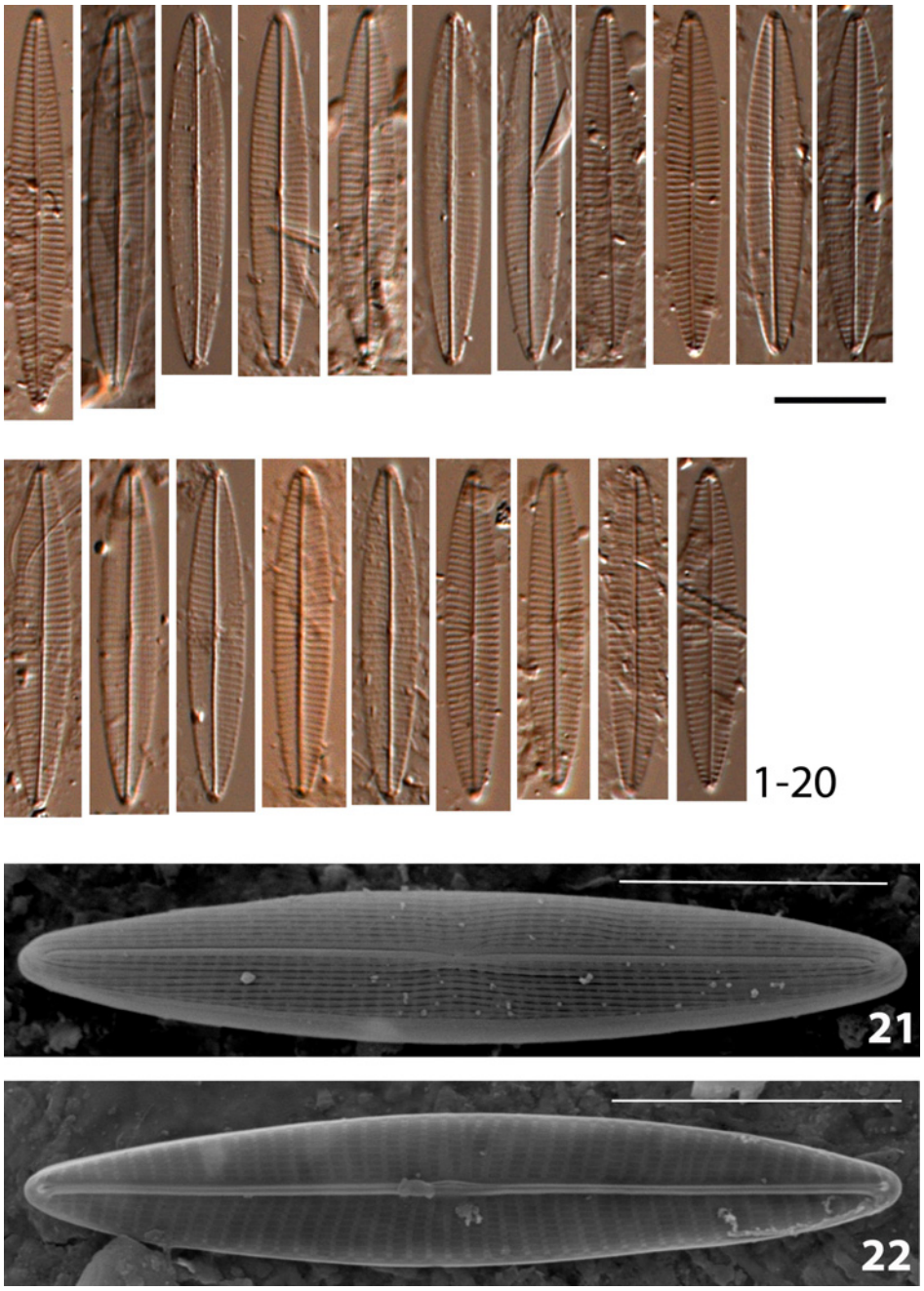


Plate 45: *Navicula duerrenbergiana*. **Figs 1–22**: Legény-tó. – **Figs 1–22**: valve view; **Fig. 21**: external view of the valve (SEM); **Fig. 22**: internal view of the valve (SEM).

Navicula oblonga (Kützing) Kützing 1844
(Plate 46: Figs 1–8)

References: Krammer and Lange-Bertalot (1999: 121, pl. 41: 2), Lange-Bertalot (2001: 51, pl. 6: 12–14), Bey and Ector (2013: 586–587), Hofmann *et al.* (2013: 390, pl. 34: 1–3).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	70–220	76.2–119.1
Width	12–24	13.9–16.7
Striae	6–9/10	6–8/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó, Nyéki-szállás, Ősze-szék, Sárkány-tó, Untersee
Mean / max. abundance	0.4% / 0.8%
Constancy	1 (6%)

Ecology: Epipelic species of lentic, alkaline waters with high conductivity or slightly brackish waters. It has broad tolerance along trophic and saprobic gradients. It can be found in habitats with extremely low oxygen levels.

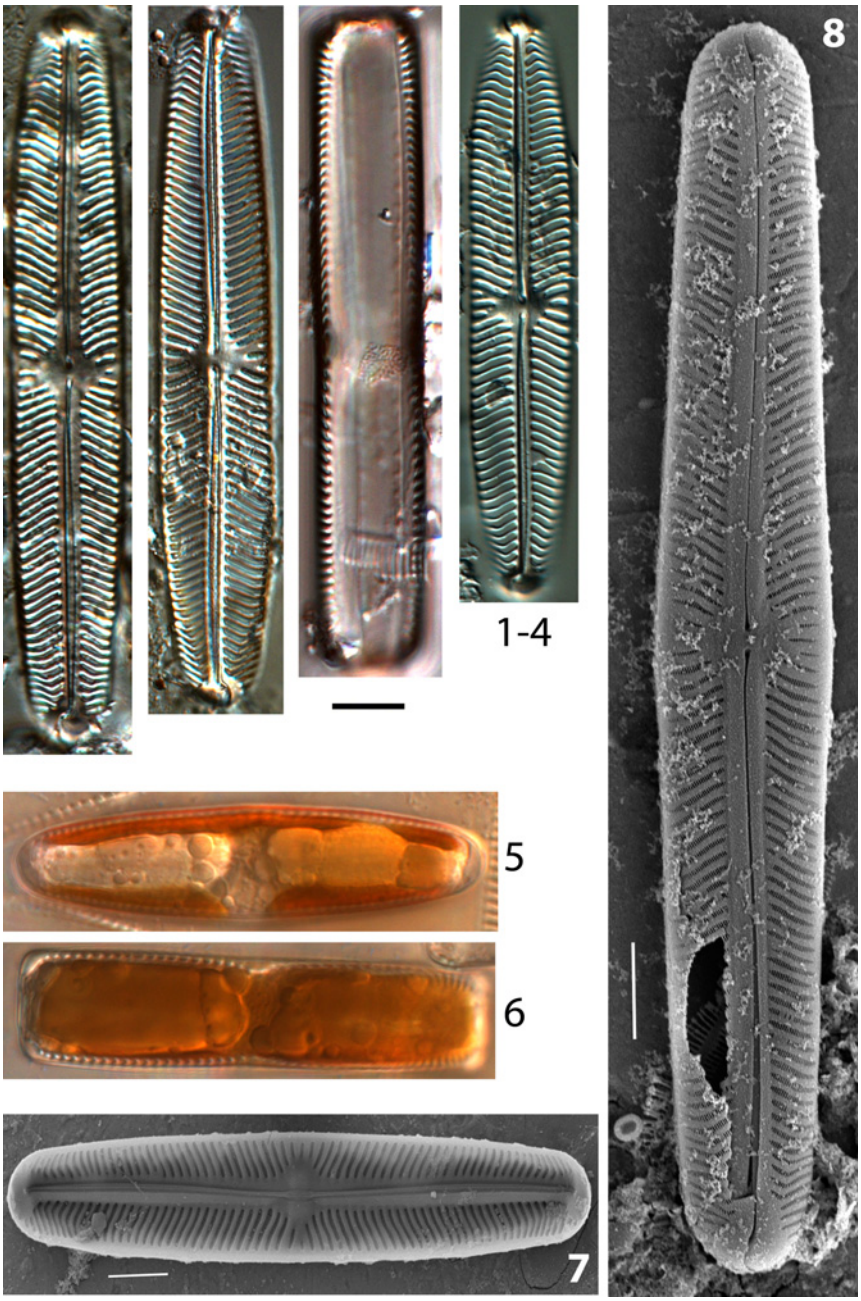


Plate 46: *Navicula oblonga*. **Figs 1–4, 7–8**: Legény-tó; **Figs 5–6**: culture isolated from Legény-tó. – **Figs 1–2, 4, 5, 7–8**: valve view; **Figs 3, 6**: girdle view; **Figs 5–6**: living cells; **Fig. 7**: internal view of the valve (SEM); **Fig. 8**: external view of the valve (SEM).

Navicula radiosa Kützing 1844
(Plate 47: Figs 1–12)

References: Krammer and Lange-Bertalot (1999: 99, pl. 29: 1–4), Lange-Bertalot (2001: 59, pl. 8: 1–7), Bey and Ector (2013: 590–591), Hofmann *et al.* (2013: 394, pl. 35: 1–5), Taylor *et al.* (2007: pl. 68).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	40–120	53.1–70.7
Width	8–12	10–11.5
Striae	10–12/10	10–12/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Borsodi-dűlő, Hattyús-szék, Kisréti-tó, Kondor-tó, Legény-tó
Mean / max. abundance	0.7% / 2.1%
Constancy	1 (5.1%)

Ecology: Cosmopolitan species with very wide ecological tolerance to electrolyte content. Abundant in waters ranging from weakly acidic to calcium rich, alkaline (weakly to strongly) along the eutrophication gradient.

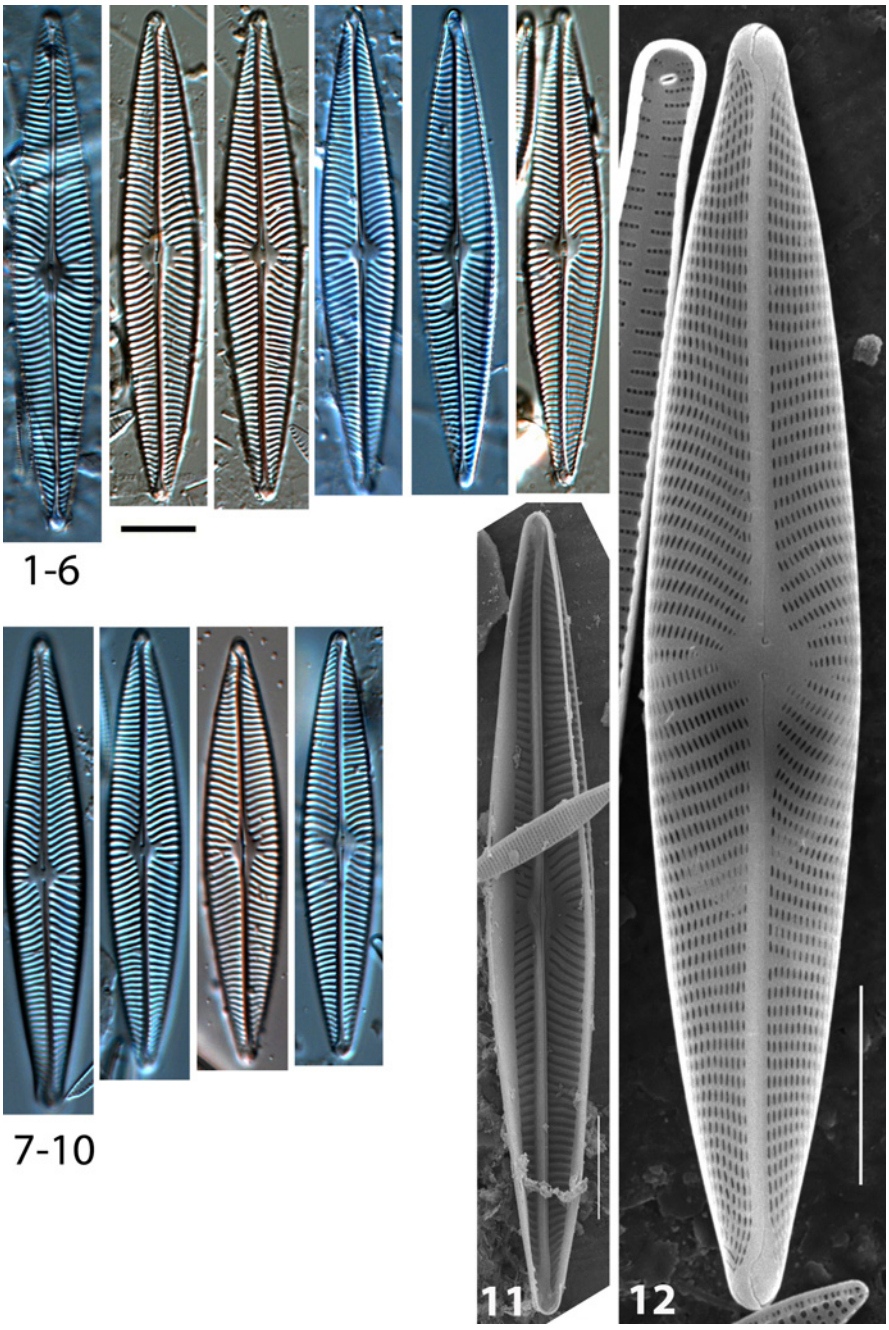


Plate 47: *Navicula radiosa*. **Figs 1–12**: Legény-tó. – **Figs 1–12**: valve view; **Fig. 11**: internal view of the valve (SEM); **Fig. 12**: external view of the valve (SEM).

Navicula salinarum Grunow 1880 var. *salinarum* (Plate 48: Figs 1–10)

References: Krammer and Lange-Bertalot (1999: 110, pl. 35: 5–8), Lange-Bertalot (2001: 65, pl. 45: 1–8), Hofmann *et al.* (2013: 398, pl. 36: 4–8).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	18–50	26.7–36.6
Width	8–12	8.4–11.9
Striae	14–16/10	15–16/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó, Nyéki-szállás
Mean / max. abundance	1.9% / 5.7%
Constancy	1 (10.3%)

Ecology: Cosmopolitan, abundant species in marine coasts, inland waters with high salinity, and in the tidal reaches of rivers.

Taxonomical note: *Navicula salinarum* var. *rostrata* has smaller striae density (12.5–14/10 µm), var. *minima* is smaller (length: ~ 20 µm, width: 6.5–9 µm) and its striae density is a bit higher (16–17/10 µm) than in var. *salinarum*.

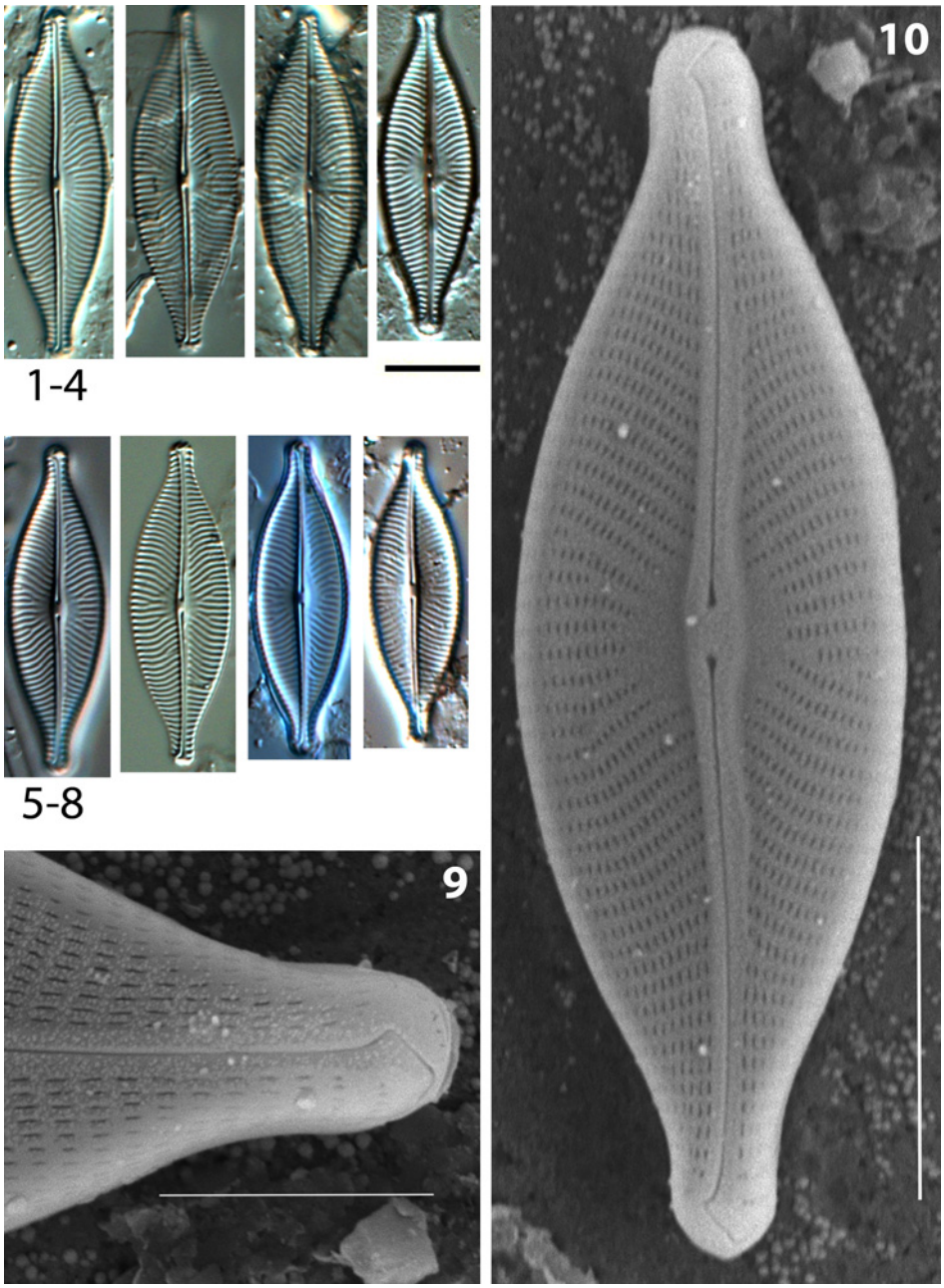


Plate 48: *Navicula salinarum* var. *salinarum*. **Figs 1, 5, 8, 9–10**: Legény-tó; **Figs 2–4, 6–7**: Nyéki-szállás. – **Figs 1–10**: valve view; **Fig. 9**: apex of the valve (SEM); **Fig. 10**: external view of the valve (SEM).

Navicula veneta Kützing 1844
(Plate 49: Figs 1–15)

References: Krammer and Lange-Bertalot (1999: 104, pl. 32: 1–4), Lange-Bertalot (2001: 78, pl. 14: 23–30), Bey and Ector (2013: 626–627), Hofmann *et al.* (2013: 406, pl. 31: 44–48), Taylor *et al.* (2007: pl. 73), Witkowski *et al.* (2000: 315, pl. 125: 40–46).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	13–30	19–27.5
Width	5–6	4.8–6
Striae	13.5–15/10	14–15/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Bába- szék, Bíbic-tó, Borsodi-dűlő, Böddi-szék, Büdös-szék, Büdös-szék (Pusztaszer), Cikes, Csárda-szék, Fehér-szék, Fülöp-szék, Hattyús-szék, Hernsee, Kardoskúti Fehér-tó, Kelemen-szék, Kirchsee, Kisréti-tó, Kondor-tó, Legény-tó, Neubruch, Nyéki-szállás, Ősze-szék, Pap-rét, Pirtói Nagy-tó, Sárkány-tó, Szappan-szék, Untersee, Zab-szék, Zicklacke
Mean / max. abundance	8.4% / 83%
Constancy	4 (68.4%)

Ecology: Abundant in waters with high conductivity, and in brackish waters with eutrophic and polysaprobic conditions.

Taxonomical note: Figs 1, 2, 4 are *Navicula* cf. *veneta*, because of the rounded valve shape.

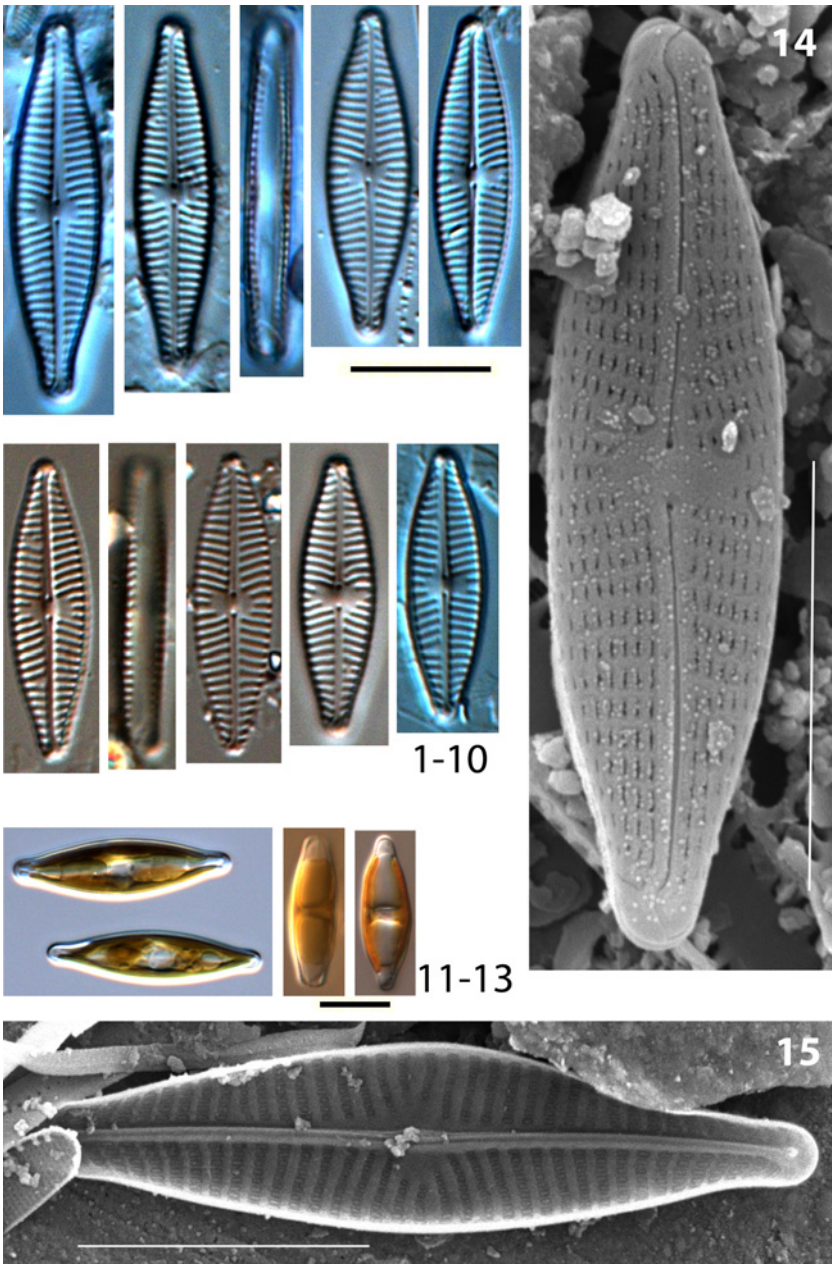


Plate 49: *Navicula veneta*. **Figs 1–4, 7, 9, 15**: Legény-tó; **Figs 5, 10, 14**: Borsodi-dűlő; **Figs 6, 8, 10**: Nyéki-szállás; **Figs 10–13**: culture isolated from Kelemen-szék. – **Figs 1–2, 4–6, 8–15**: valve view; **Figs 3, 7**: girdle view; **Figs 11–13**: living cells; **Fig. 14**: external view of the valve (SEM); **Fig. 15**: internal view of the valve (SEM).

Navicula wiesneri Lange-Bertalot 1993
(Plate 50: Figs 1–12)

Reference: Lange-Bertalot (2001: 80, pl. 23: 1–13).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	13–38	15.9–32.6
Width	4.5–6	4.5–5.6
Striae	11.5–14/10	11.5–13/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Bába-szék, Borsodi-dűlő, Böddi-szék, Büdös-szék, Büdös-szék (Pusztaszer), Csárda-szék, Fehér-szék, Fülöp-szék, Hattyús-szék, Herrnsee,Kelemen-szék, Kondor-tó, Legény-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Pirtói Nagy-tó, Szappan-szék, Untersee, Zab-szék, Zicklacke
Mean / max. abundance	3.4% / 62%
Constancy	3 (47.9%)

Ecology: Abundant in eutrophic brackish and freshwaters with high conductivity.

Taxonomical note: *Navicula cincta* (Ehrenberg) Ralfs is wider (5.5–8 μm) and its striae density is lower (8–12/10 μm). Characteristically, there are shorter striae on both sides in the central area of *N. cincta*.

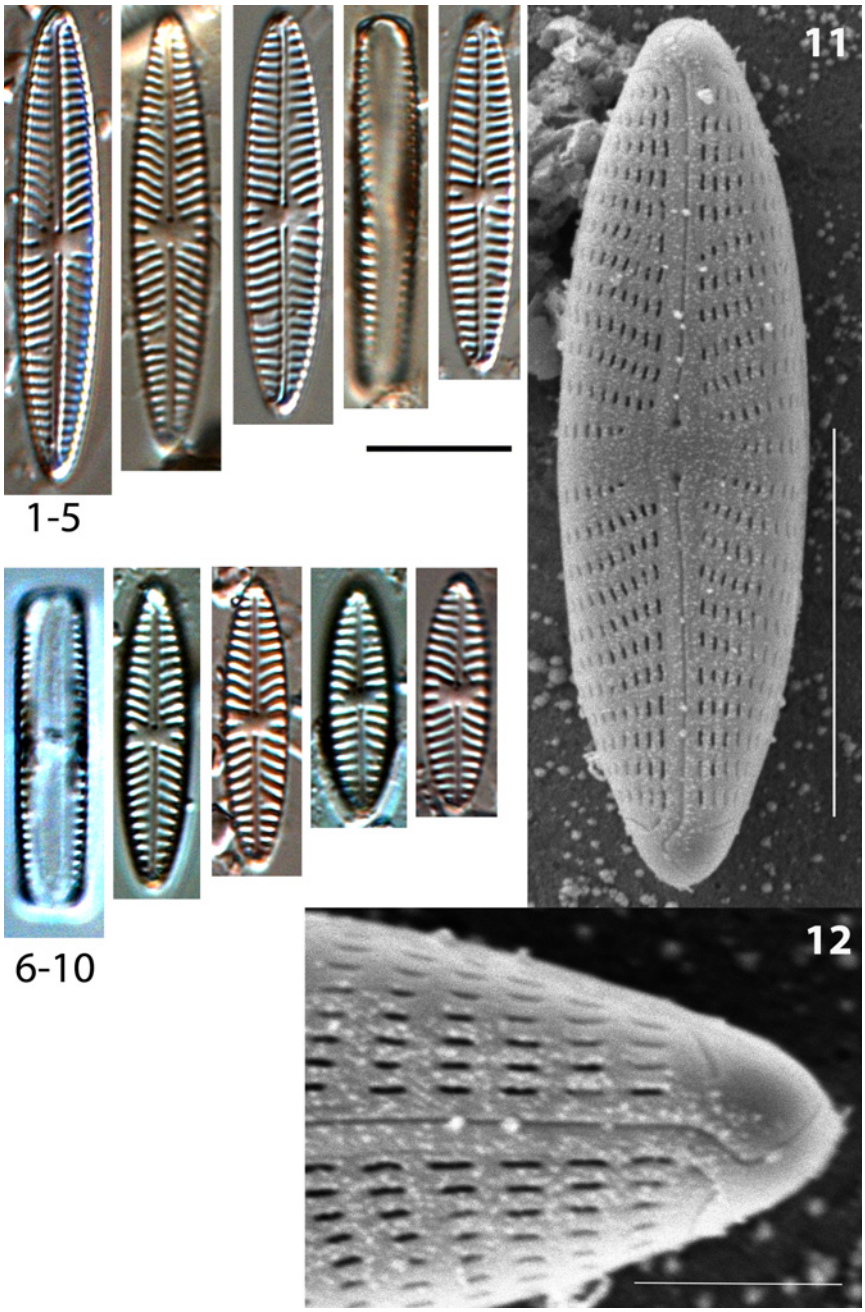


Plate 50: *Navicula wiesneri*. **Figs 1–10**: Nyéki-szállás; **Figs 11–12**: Legény-tó. – **Figs 1–3, 5, 7–11**: valve view; **Figs 4, 6**: girdle view; **Fig. 11**: external view of the valve (SEM); **Fig. 12**: apex of the valve, external view (SEM).

Navicymbula pusilla (Grunow) Krammer 2003
(Plate 51: Figs 1–12)

References: Krammer and Lange-Bertalot (1999: 340, pl. 148: 1–9 (*Cymbella pusilla*)), Krammer (2003: 124, pl. 136, 138, 141), Hofmann *et al.* (2013: 414, pl. 88: 30–34), Taylor *et al.* (2007: pl. 108).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	14–42	20.5–31.7
Width	4–6.5	5–6.2
Striae	15–18/10	15–18/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Borsodi-dűlő, Cikes, Hernsee, Legény-tó, Nyéki-szállás, Pap-rét, Untersee
Mean / max. abundance	2% / 8.4%
Constancy	2 (21.4%)

Ecology: Abundant in waters with high conductivity (brackish and saline waters, calcareous springs).

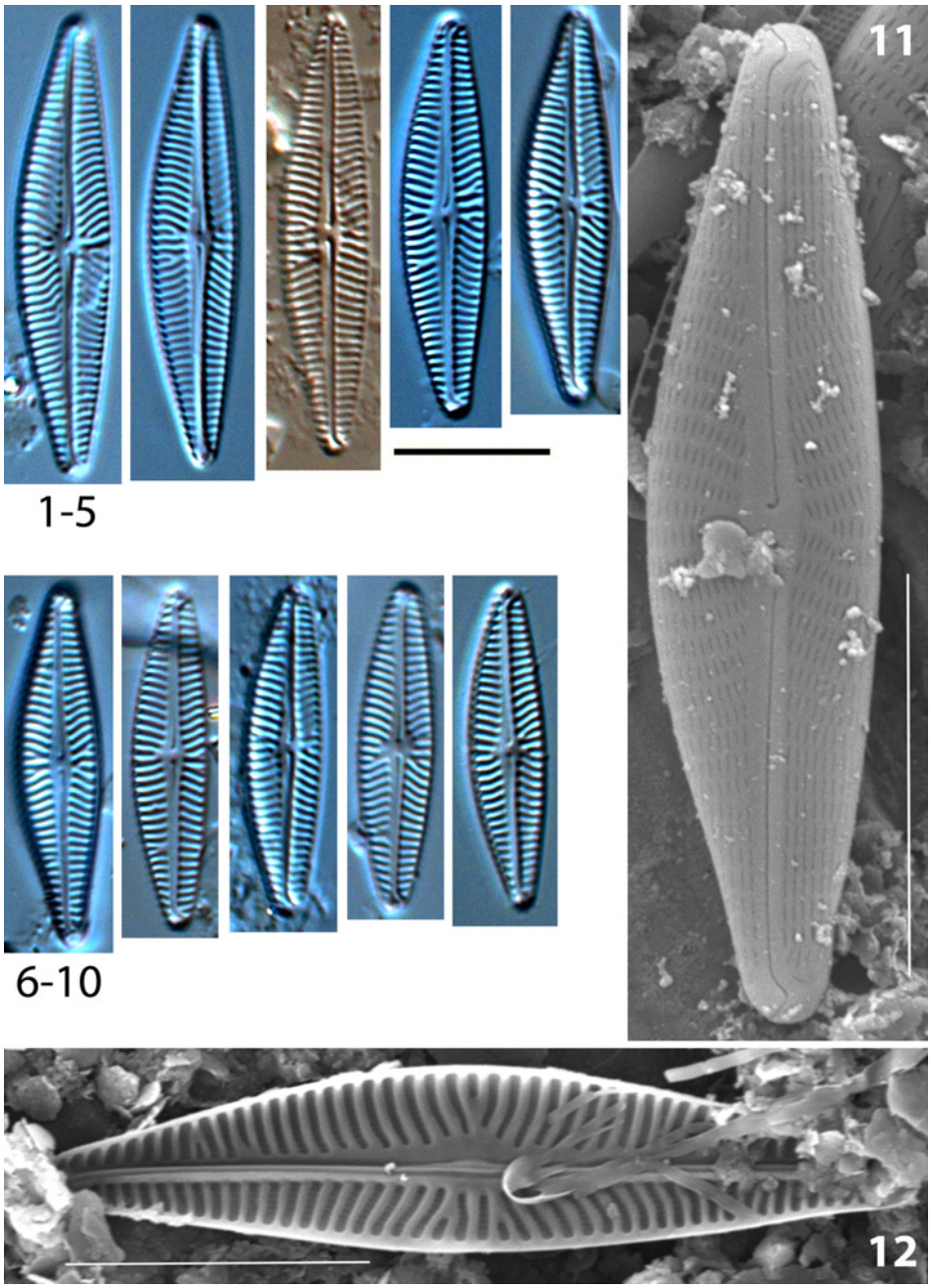


Plate 51: *Navicymbula pusilla*. **Figs 1–12**: Legény-tó. – **Figs 1–12**: valve view; **Fig. 11**: external view of the valve (SEM); **Fig. 12**: internal view of the valve (SEM).

Nitzschia amphibia Grunow 1862
(Plate 52: Figs 1–25)

References: Krammer and Lange-Bertalot (1999: 108, pl. 78: 13–26), Bey and Ector (2013: 1004–1005), Hofmann *et al.* (2013: 433, pl. 117: 9–15), Taylor *et al.* (2007: pl. 163).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	6–50	13.2–28.3
Width	4–6	3.8–4.5
Fibulae	7–9/10	6–9/10
Striae	13–18/10	16–18/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Büdös-szék (Pusztaszer), Legény-tó, Ősze-szék, Pirtói Nagy-tó, Sárkány-tó, Szarvas-tó
Mean / max. abundance	9.6% / 63.3%
Constancy	1 (6.8%)

Ecology: Abundant in alkaline waters with moderate and high electrolyte content and trophic gradient. Tolerant to α-mesosaprobic condition.

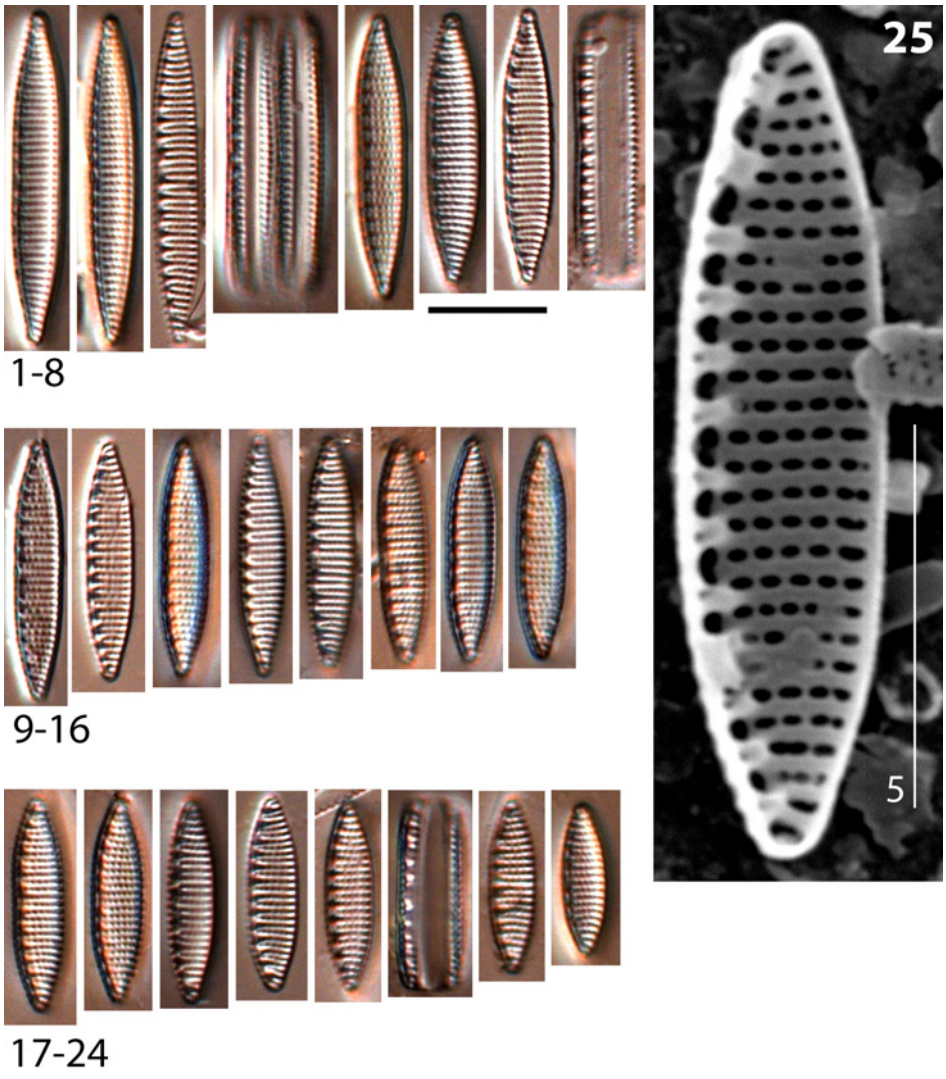


Plate 52: *Nitzschia amphibia*. **Figs 1–24**: Sárkány-tó; **Fig 25**: Legény-tó. – **Figs 1–3, 5–7, 9–21, 23–24**: valve view; **Figs 4, 8, 22**: girdle view; **Fig. 25**: internal view of the valve (SEM).

Nitzschia aurariae Cholnoky 1966
(Plate 53: Figs 1–17)

References: KRAMMER and LANGE-BERTALOT (1999: 113, pl. 80: 16–21), HOFMANN *et al.* (2013: 435, pl. 112: 6–9), TAYLOR *et al.* (2007: pl. 164), WITKOWSKI *et al.* (2000: 369, pl. 210: 21).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	6.5–18	11.3–18
Width	2.5–4	2.5–3.4
Fibulae	13–18/10	14–17/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Borsodi-dűlő, Cikes, Legény-tó, Nyéki-szállás, Pap-rét, Zab-szék
Mean / max. abundance	29.4% / 92.8%
Constancy	2 (24.8%)

Ecology: Abundant in electrolyte rich waters.

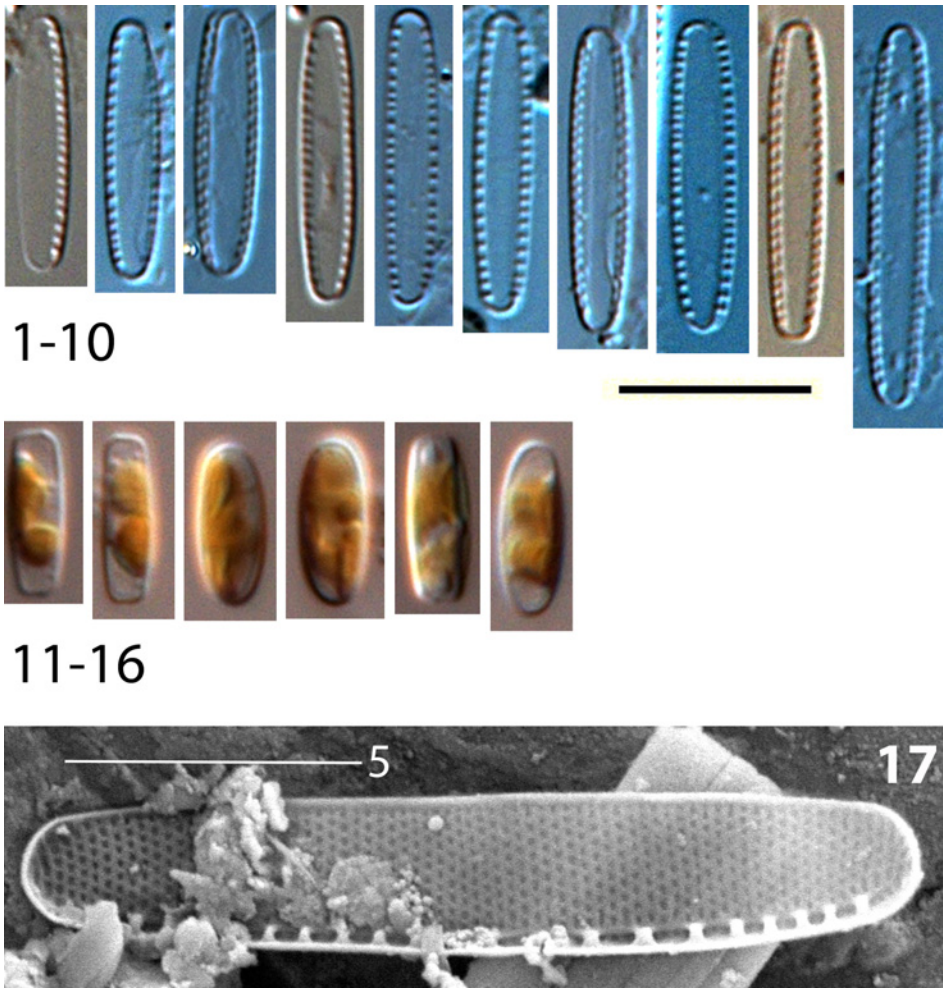


Plate 53: *Nitzschia aurariae*. **Figs 1–10**: Borsodi-dűlő; **Figs 11–16**: culture isolated from Legény-tó; **Fig 17**: Legény-tó. – **Figs 1–10, 13–14, 16–17**: valve view; **Figs 11–12, 15**: girdle view; **Figs 11–16**: living cells; **Fig. 17**: internal view of the valve (SEM).

Nitzschia bergii Cleve-Euler 1952
(Plate 54: Figs 1–18)

References: Krammer and Lange-Bertalot (1999: 113, pl. 80: 10–15), Bey and Ector (2013: 1014–1015), Witkowski *et al.* (2000: 370, pl. 210: 19–20).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	14–60	13.7–25.6
Width	4–5	3.6–5
Fibulae	14–18 (20)/10	16–20/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Böddi-szék, Kardoskúti Fehér-tó, Kelemen-szék, Zab-szék
Mean / max. abundance	29.6% / 76.1%
Constancy	1 (12.8%)

Ecology: Abundant in saline waters.

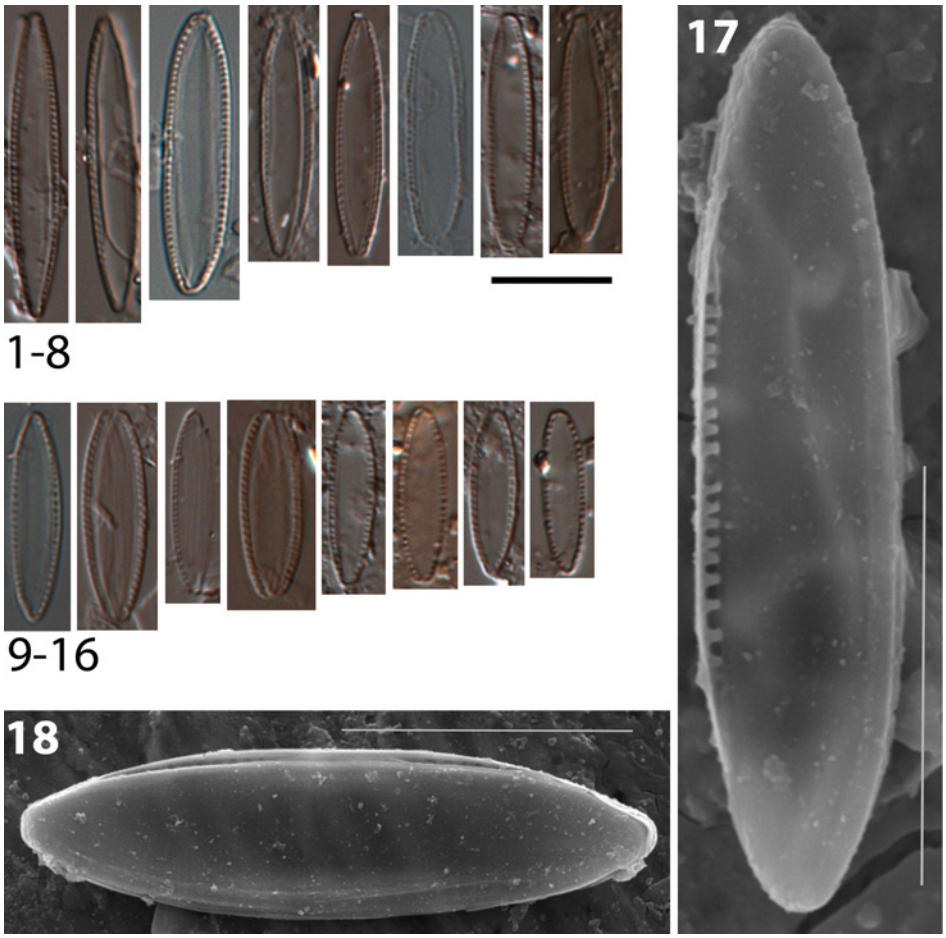


Plate 54: *Nitzschia bergii*. **Figs 1–4, 7, 12–14, 16**: Bába-szék; **Figs 5, 8, 10**: Böddi-szék; **Fig. 11**: Kelemen-szék; **Figs 6, 9, 15, 17–18**: Kardoskúti Fehér-tó. – **Figs 1–18**: valve view; **Fig. 17**: internal view of the valve (SEM); **Fig. 18**: external view of the valve (SEM).

Nitzschia communis Rabenhorst 1860
(Plate 55: Figs 1–17)

References: Krammer and Lange-Bertalot (1999: 110, pl. 79: 1–6), Bey and Ector (2013: 1024–1025), Hofmann *et al.* (2013: 439, pl. 112: 1–5), Taylor *et al.* (2007: pl. 165), Witkowski *et al.* (2000: 375, pl. 210: 5–10).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	6–40	22.9–30.3
Width	4–6	4–4.8
Fibulae	8–14/10	9–13/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Böddi-szék, Csárda-szék, Kardoskúti Fehér-tó, Kelemen-szék, Ősze-szék, Sárkány-tó, Szappan-szék, Szarvas-tó, Zab-szék
Mean / max. abundance	1.5% / 9.9%
Constancy	1 (8.5%)

Ecology: Abundant in habitats ranging from electrolyte-rich waters to brackish waters. Tolerant to slightly polisaprobic condition.

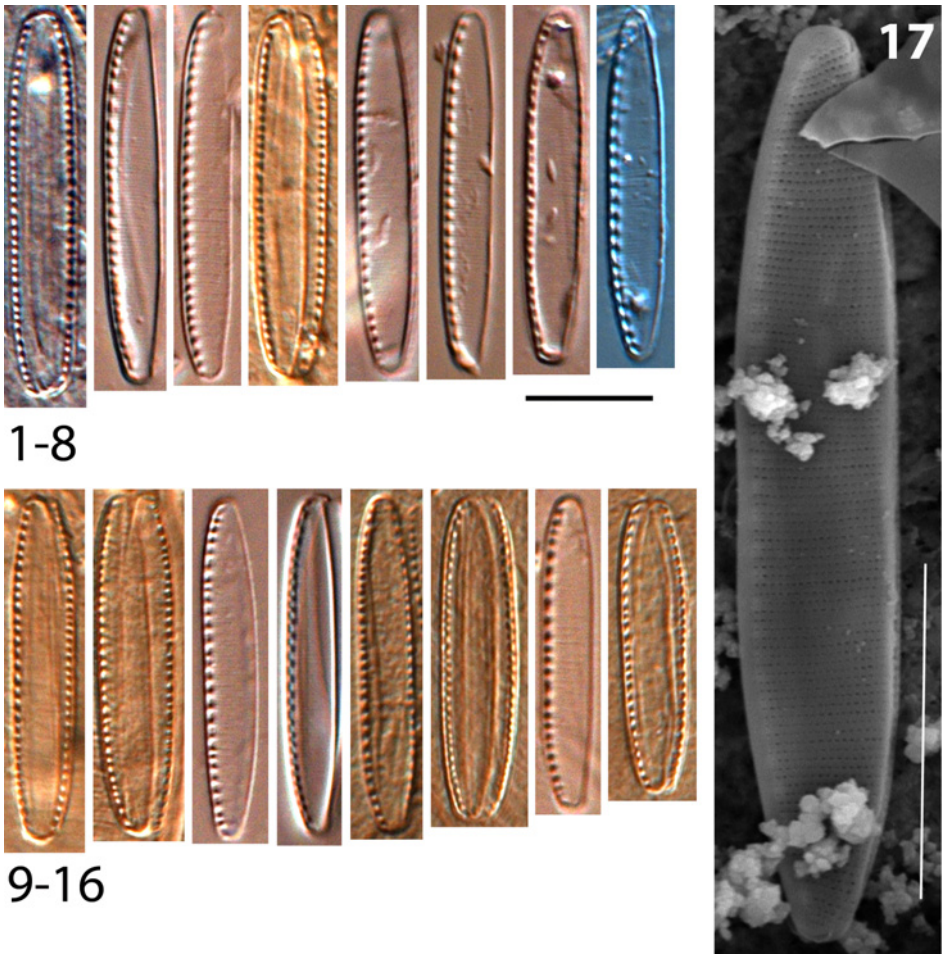


Plate 55: *Nitzschia communis*. **Figs 1, 4, 9–10, 13–14, 16–17**: Kardoskúti Fehér-tó; **Figs 2–3, 5–8, 11–12, 15**: Sárkány-tó. – **Figs 1–17**: valve view; **Fig. 17**: external view of the valve (SEM).

Nitzschia commutata Grunow 1880
(Plate 56: Figs 1–15)

References: KRAMMER and LANGE-BERTALOT (1999: 56, pl. 42: 1–6), WITKOWSKI *et al.* (2000: 375, pl. 195: 3–5).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	45– >100	56.1–86.7
Width	5–8	5.2–6.8
Striae	(18)19–23(24) /10	20–22/10
Fibulae	9–12/10	8–10/10

Distribution in soda pans of the Carpathian Basin

Lakes	Csárda-szék, Fülöp-szék, Kisréti-tó, Sárkány-tó, Szívós-szék
Mean / max. abundance	2.8% / 9.2%
Constancy	1 (4.3%)

Ecology: Abundant in electrolyte-rich inland waters and in brackish waters.

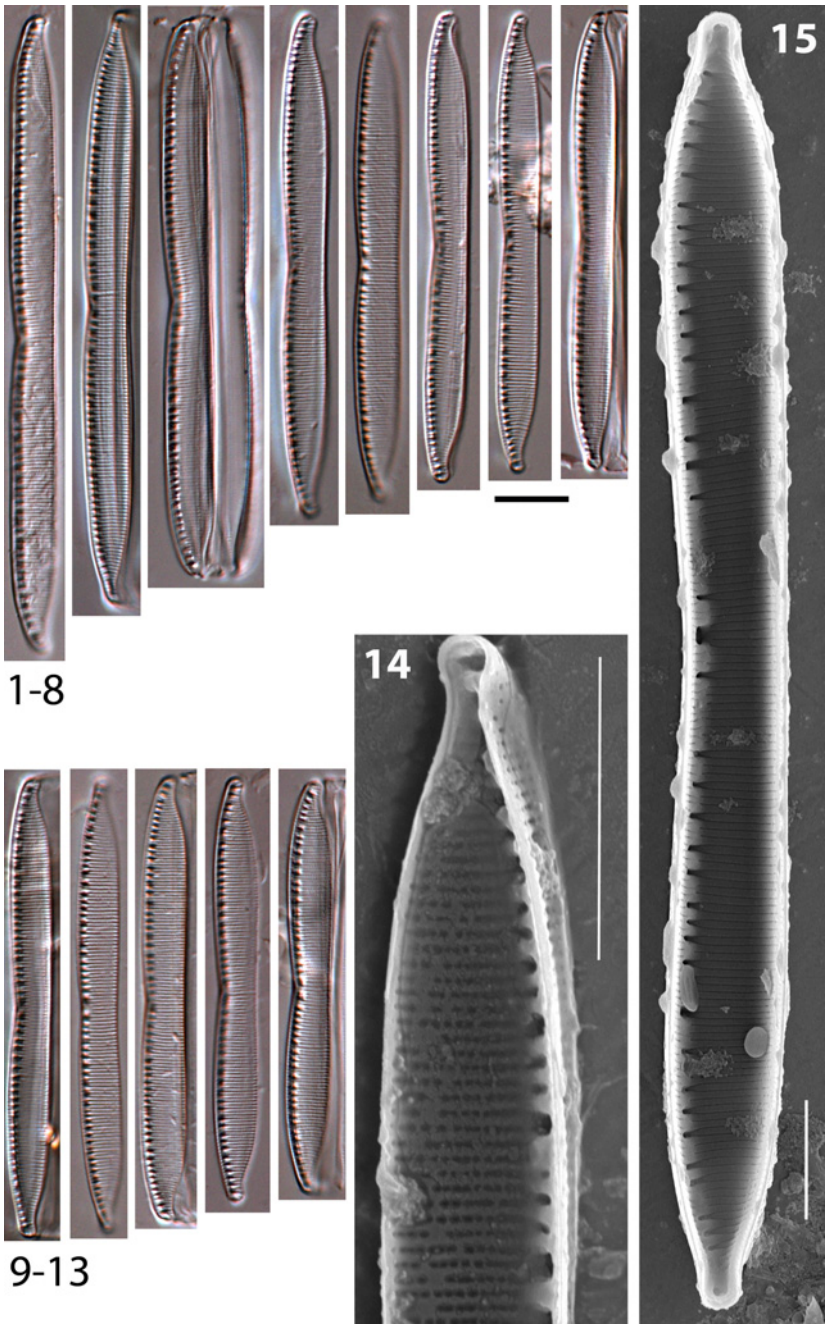


Plate 56: *Nitzschia commutata*. **Figs 1–15**: Csárda-szék. – **Figs 1–14**: valve view; **Fig. 14**: internal view of the valve (SEM); **Fig. 15**: a piece of the valve, internal view (SEM).

Nitzschia elegantula Grunow 1881
(Plate 57: Figs 1–21)

References: KRAMMER and LANGE-BERTALOT (1999: 120, pl. 83: 20–24), TAYLOR *et al.* (2007: pl. 169), WITKOWSKI *et al.* (2000: 379, pl. 207: 10–13).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	10–29	12.1–15.8
Width	2.5–4	2.7–3.1
Striae	23–32/10	30–32/10
Fibulae	10–15/10	12–15/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó, Nyéki-szállás
Mean / max. abundance	0.9% / 2.9%
Constancy	1 (7.7%)

Ecology: Sporadic and rare species in electrolyte-rich waters and in marine coasts.

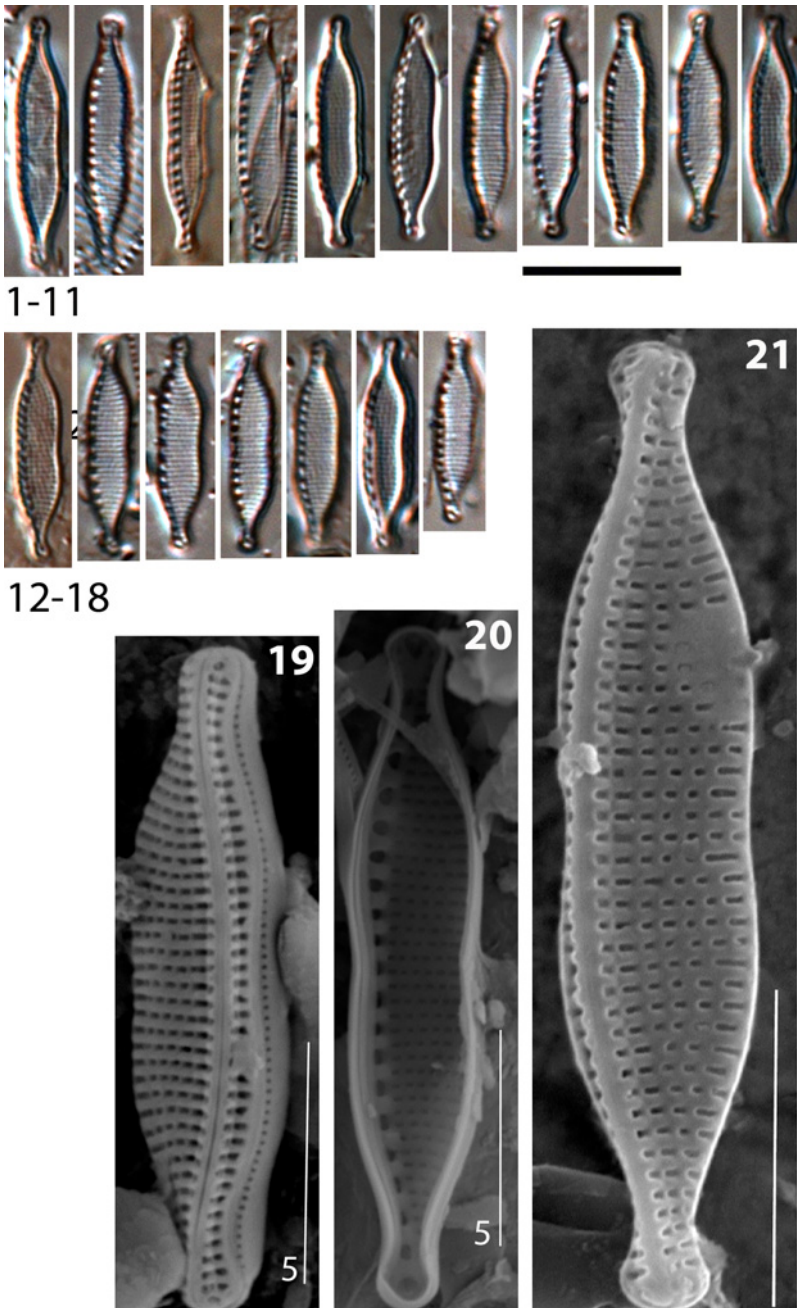


Plate 57: *Nitzschia elegantula*. **Figs 1–21**: Legény-tó. – **Figs 1–21**: valve view; **Fig. 19**: external valve and girdle view (SEM); **Fig. 20**: internal view of the valve (SEM); **Fig. 21**: external view of the valve (SEM).

Nitzschia frustulum (Kützing) Grunow 1880
(Plate 58: Figs 1–26)

References: KRAMMER and LANGE-BERTALOT (1999: 94, pl. 68: 1–19), HOFMANN *et al.* (2013: 445, pl. 112: 28–34), TAYLOR *et al.* (2007: pl. 160), WITKOWSKI *et al.* (2000: 382, pl. 209: 13–17).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	5–60	10.3–34.8
Width	2–4.5	2.6–3.6
Striae	19–30/10	22–26/10
Fibulae	10–16/10	10–12/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Herrnsee, Bába-szék, Bíbic-tó, Borsodi-dűlő, Böddi-szék, Büdös-szék, Büdös-szék (Pusztaszer), Cikes, Csárda-szék, Fehér-szék, Fülöp-szék, Hattyús-szék, Kardoskúti Fehér-tó, Kelemen-szék, Kirchsee, Kisréti-tó, Kondor-tó, Legény-tó, Neubruch, Nyéki-szállás, Ősze-szék, Pap-rét, Pirtói Nagy-tó, Sárkány-tó, Szappan-szék, Szarvas-tó, Szívós-szék, Untersee, Zab-szék, Zicklacke
Mean / max. abundance	17.2% / 93.9%
Constancy	4 (78.6%)

Ecology: Abundant in electrolyte-rich (from natural or anthropogenic source) inland waters.

Taxonomical note: Compared to this species *Nitzschia supralitorea* is shorter (10–25 µm), its fibulae and striae density can be higher (14–20/10 µm; 25–34/10 µm).

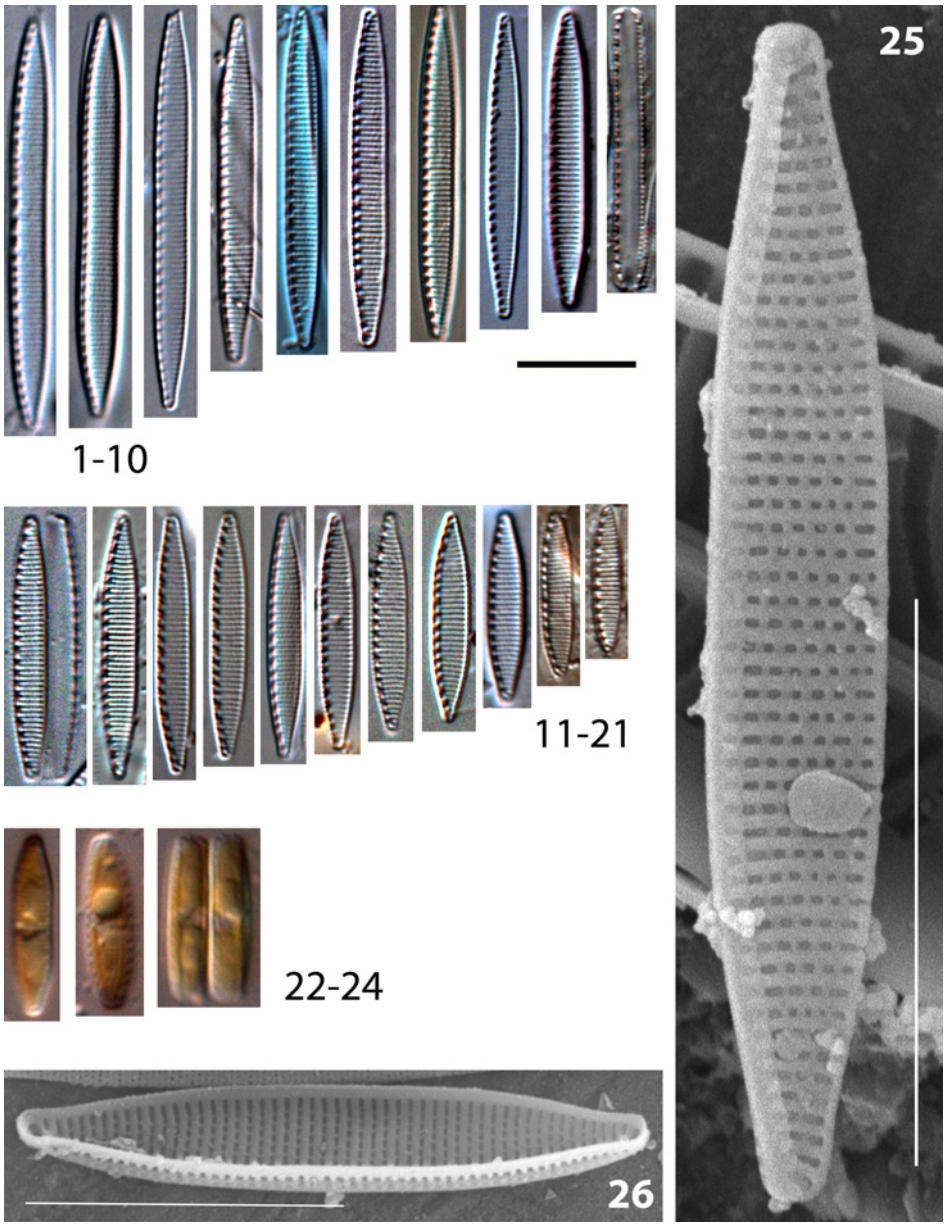


Plate 58: *Nitzschia frustulum*. **Figs 1–3**: Ősze-szék; **Fig. 4**: Szívós-szék; **Figs 5, 8, 15, 20–21**: Borsodi-dűlő; **Figs 6, 9, 12, 25–26**: Legény-tó; **Fig. 7**: Nyéki-szállás; **Fig. 10**: Zab-szék; **Figs 11, 17–18**: Szappan-szék; **Figs 13–14, 16**: Kondor-tó; **Fig. 19**: Kelemen-szék; **Figs 22–24**: culture isolated from Borsodi-dűlő. – **Figs 1–9, 11–23**: valve view; **Figs 10, 24**: girdle view; **Figs 22–24**: living cells; **Fig. 25**: external view of the valve (SEM); **Fig. 26**: internal view of the valve (SEM).

Nitzschia cf. *gracilis* Hantzsch 1860
(Plate 59: Figs 1–12)

References: Krammer and Lange-Bertalot (1999: 93, pl. 66: 1–11), Bey and Ector (2013: 1046–1047), Hofmann *et al.* (2013: 447, pl. 107: 10–14), Taylor *et al.* (2007: pl. 170).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	30–110	65.3–95.4
Width	2.5–4	3.5–4.8
Fibulae	12–18/10	12–15/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Fehér-szék, Legény-tó, Nyéki-szállás, Pap-rét, Untersee, Zicklacke
Mean / max. abundance	0.9% / 2.5%
Constancy	1 (7.7%)

Ecology: Not known exactly, because of its identification problems.

Taxonomical note: Maximal length of *Nitzschia palea* var. *tenuirostris* is 70 μm. It can be wider (2.5–5 μm) with lower fibulae density (9–17/10/10 μm) than *N. gracilis*. The specimens are a bit wider than the type population, and the separation of *N. gracilis* and *N. acicularioides* Hustedt is problematic, because of incomplete morphological data of the type population (*N. acicularoides*) from Lake Fertő (Neusiedler See).

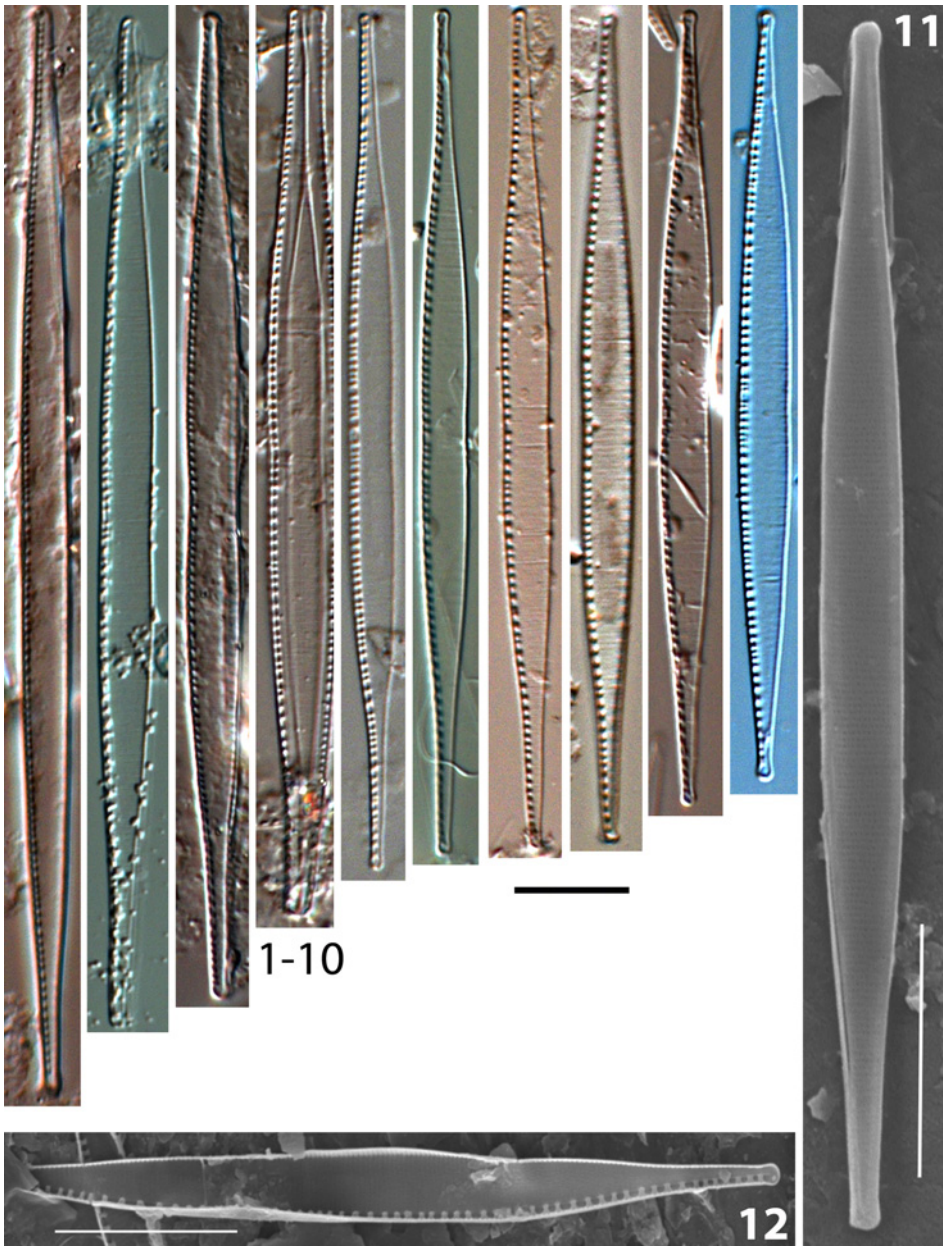


Plate 59: *Nitzschia* cf. *gracilis*. **Figs 1, 3–6, 8–10**: Borsodi-dűlő; **Figs 2, 7**: Legény-tó; **Figs 11–12**: Pap-rét. – **Figs 1–12**: valve view; **Fig. 11**: external view of the valve (SEM); **Fig. 12**: internal view of the valve (SEM).

Nitzschia inconspicua Grunow 1862
(Plate 60: Figs 1–23)

References: KRAMMER and LANGE-BERTALOT (1999): 95, pl. 69: 1–13), BEY and ECTOR (2013: 1053), HOFMANN *et al.* (2013: 446, pl. 112: 35–40).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	3–22	6.3–12.5
Width	2.5–3.5	2.4–3.2
Striae	23–32/10	25–28/10
Fibulae	8–13/10	11–14/10

Distribution in soda pans of the Carpathian Basin (Danube–Tisza Interfluve / Fertő–Hanság region)

Lakes	Büdös-szék (Pusztaszer), Bíbic-tó, Ősze-szék, Pirtói Nagy-tó, Sárkány-tó, Szarvas-tó – Borsodi-dűlő, Legény-tó, Nyéki-szállás, Paprét
Mean / max. abundance	2.2% / 5.2%–2.8% / 9.9%
Constancy	1 (17.1%) / 2 (30%)

Ecology: Abundant in moderate and slightly electrolyte-rich freshwaters.

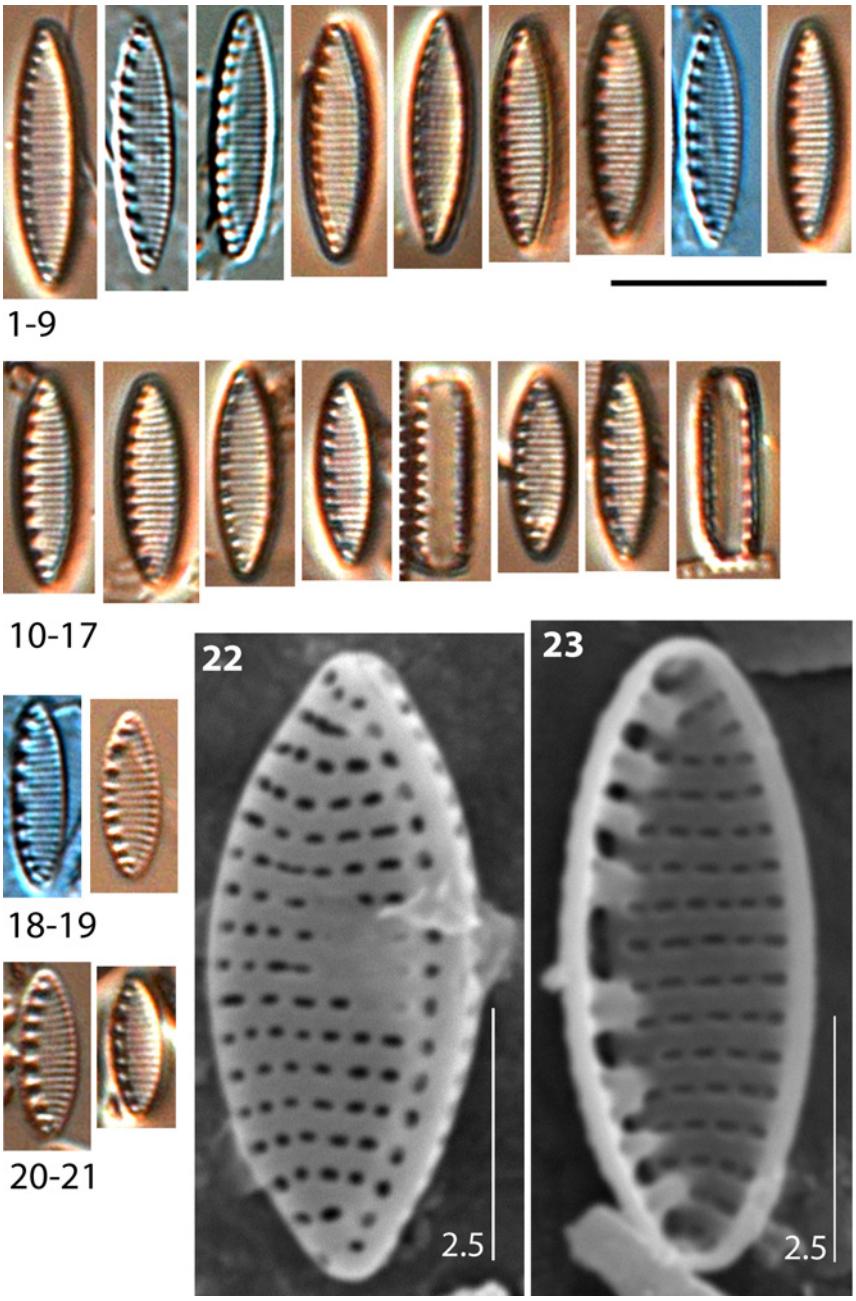


Plate 60: *Nitzschia inconspicua*. **Figs 1, 4–7, 9–21, 31–32**: Nyéki-szállás; **Figs 2–3, 22**: Legény-tó; **Fig. 8**: Borsodi-dűlő; **Fig. 23**: Pap-rét. – **Figs 1–13, 15–16, 18–23**: valve view; **Figs 14, 17**: girdle view; **Fig. 22**: external view of the valve (SEM); **Fig. 23**: internal view of the valve (SEM).

Nitzschia palea (Kützing) W. Smith 1856 var. *palea* (Plate 61: Figs 1–19)

References: Krammer and Lange-Bertalot (1999: 85, pl. 59: 1–10), Bey and Ector (2013: 1064–1065), Hofmann *et al.* (2013: 454, pl. 111: 1–9), Taylor *et al.* (2007: pl. 156–157).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	15–70	27.5–47
Width	2.5–5	4–4.9
Fibulae	9–17/10	11–16/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Bíbic-tó, Borsodi-dűlő, Böddi-szék, Büdös-szék, Büdös-szék (Pusztaszer), Cikes, Fehér-szék, Fülöp-szék, Hattyús-szék, Kardoskúti Fehér-tó, Kelemen-szék, Kirchsee, Kisréti-tó, Kondor-tó, Legény-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Pirtói Nagy-tó, Sárkány-tó, Szarvas-tó, Untersee, Zab-szék, Zicklacke
Mean / max. abundance	6.3% / 87.8%
Constancy	3 (47.9%)

Ecology: One of the most frequent *Nitzschia* species, it is charactheristic from α-mesosaprobe to polysabrobe conditions.

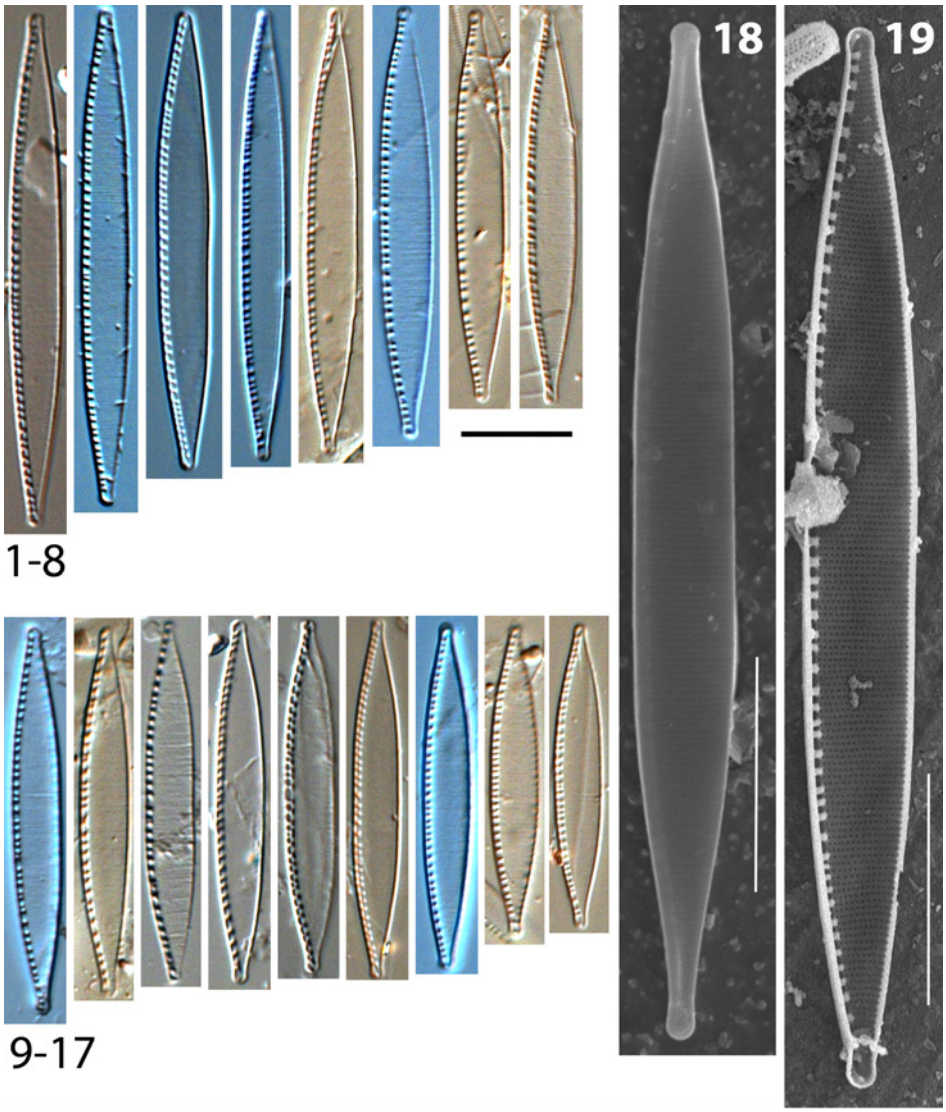


Plate 61: *Nitzschia palea* var. *palea*. **Fig. 1**: Nyéki-szállás; **Figs 2–4, 6, 9, 11–13, 16**: Borsodi-dűlő; **Figs 5, 7–8, 10, 14–15, 17, 19**: Legény-tó; **Fig. 18**: Pap-rét – **Figs 1–19**: valve view; **Fig. 18**: external view of the valve (SEM); **Fig. 19**: internal view of the valve (SEM).

Nitzschia palea var. *tenuirostris* sensu Lange-Bertalot 1976 (Plate 62: Figs 1–19)

References: Krammer and Lange-Bertalot (1999: 85, pl. 59: 21–23), Hofmann *et al.* (2013: 455, pl. 111: 14–20).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	15–70	37.5–58.3
Width	2.5–5	3.6–4.5
Fibulae	9–17/10	11–16/10

Distribution in soda pans of the Carpathian Basin

Lakes	Legény-tó, Nyéki-szállás, Pap-rét, Szarvas-tó, Zicklacke
Mean / max. abundance	8.3% / 36%
Constancy	1 (11.1%)

Ecology: Abundant in nutrient rich habitats.

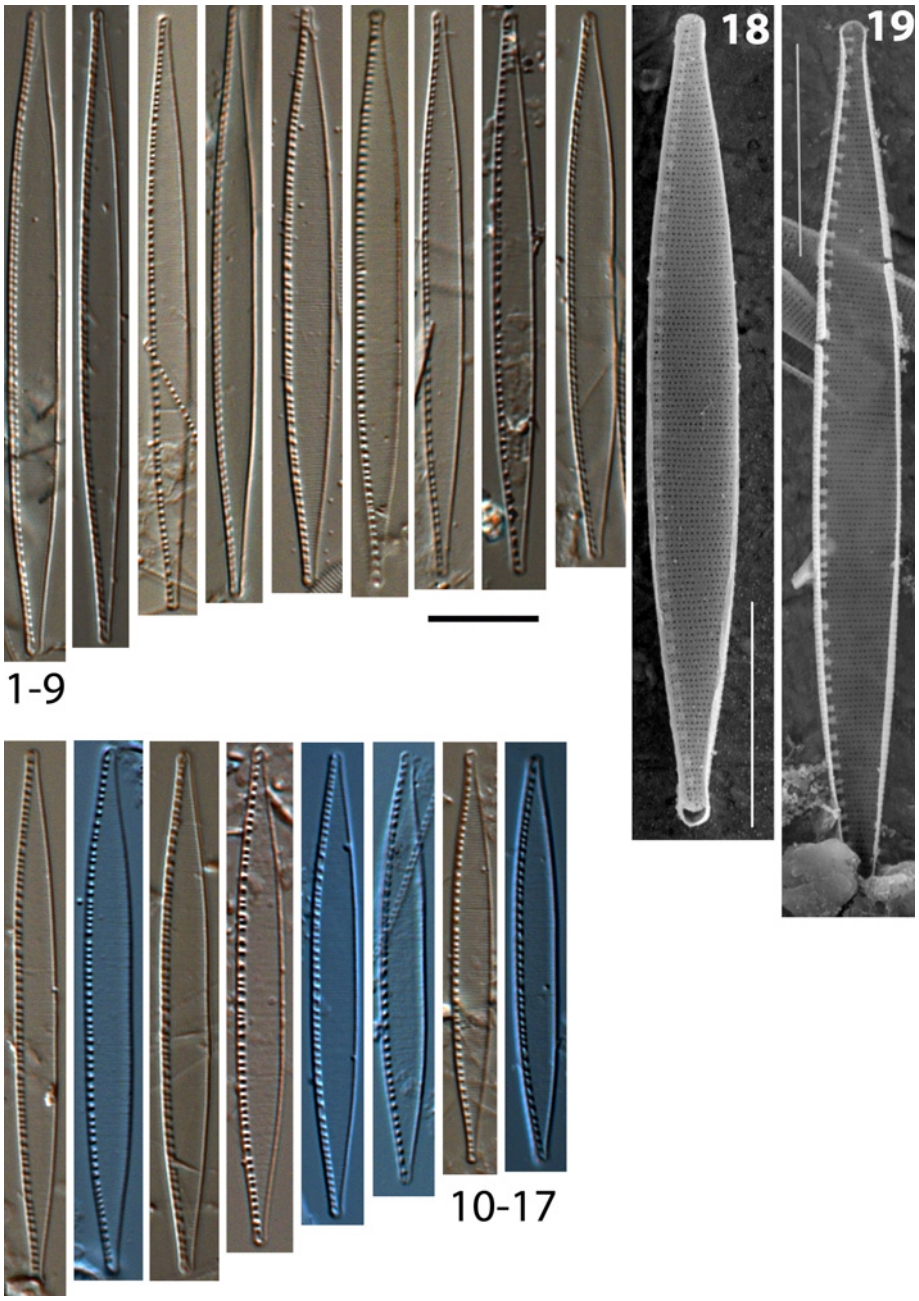


Plate 62: *Nitzschia palea* var. *tenuirostris*. **Figs 1–10, 14, 16**: Legény-tó; **Fig. 13**: Nyéki-szállás; **Figs 11–12, 15, 17–19**: Borsodi-dűlő. – **Figs 1–19**: valve view; **Fig. 18**: external view of the valve (SEM); **Fig. 19**: internal view of the valve (SEM).

Nitzschia paleacea Grunow 1881
(Plate 63: Figs 1–30)

References: Krammer and Lange-Bertalot (1999: 114, pl. 81: 1–7), Bey and Ector (2013: 1066–1067), Hofmann *et al.* (2013: 455, pl. 111: 21–29), Taylor *et al.* (2007: pl. 167).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	8–80	15.3–70.9
Width	1.5–4	2–2.7
Fibulae	12–19/10	14–17/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Büdös-szék (Pusztaszer), Kisréti-tó, Kondor-tó, Legény-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Sárkány-tó, Szappan-szék, Szarvas-tó
Mean / max. abundance	14.4% / 57.9%
Constancy	1 (15.4%)

Ecology: Abundant and dominant species of the benthic and planktonic communities in eu- and polytrophic waters with moderate and high conductivity. Tolerant to α-mesosaprobic level.

Taxonomical note: Maximal length (40 μm) and width (3 μm) of *Nitzschia archibaldii* is smaller and the distance of its fibulae are similar in the central part.

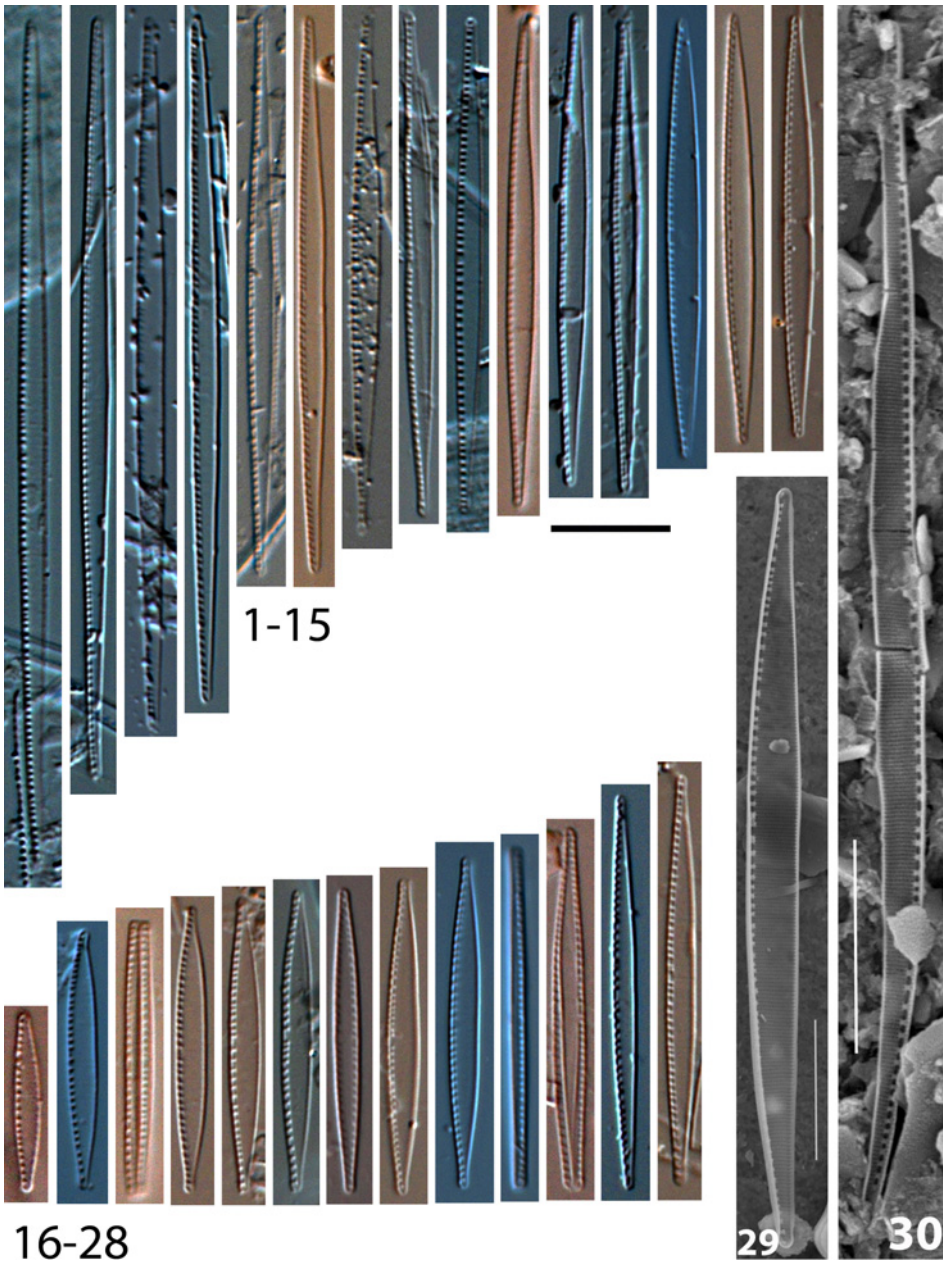


Plate 63: *Nitzschia paleacea*. **Figs 1–4, 9, 11–12, 20, 27**: Nyéki-szállás; **Figs 5, 7–8, 13, 17, 24–25**: Borsodi-dűlő; **Figs 6, 10, 21–22, 26, 29–30**: Legény-tó; **Figs 14–16, 18–19, 23, 28**: Büdös-szék (Pusztaszer). – **Figs 1–17, 19–24, 26–30**: valve view; **Figs 18, 25**: girdle view; **Figs 29–30**: internal view of the valve (SEM).

Nitzschia pusilla Grunow 1862
(Plate 64: Figs 1–19)

References: Krammer and Lange-Bertalot (1999: 111, pl. 79: 12–15), Bey and Ector (2013: 1072–1073), Hofmann *et al.* (2013: 457, pl. 112: 10–15), Taylor *et al.* (2007: pl. 165).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	8–33	16–34
Width	2.5–5	3.2–4.3
Fibulae	14–20 (24)/10	14–17/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Borsodi-dűlő, Cikes, Kisréti-tó, Legény-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Untersee
Mean / max. abundance	2.2% / 9%
Constancy	1 (16.2%)

Ecology: Abundant in various types of electrolyte-rich waters. It prefers high trophic level.

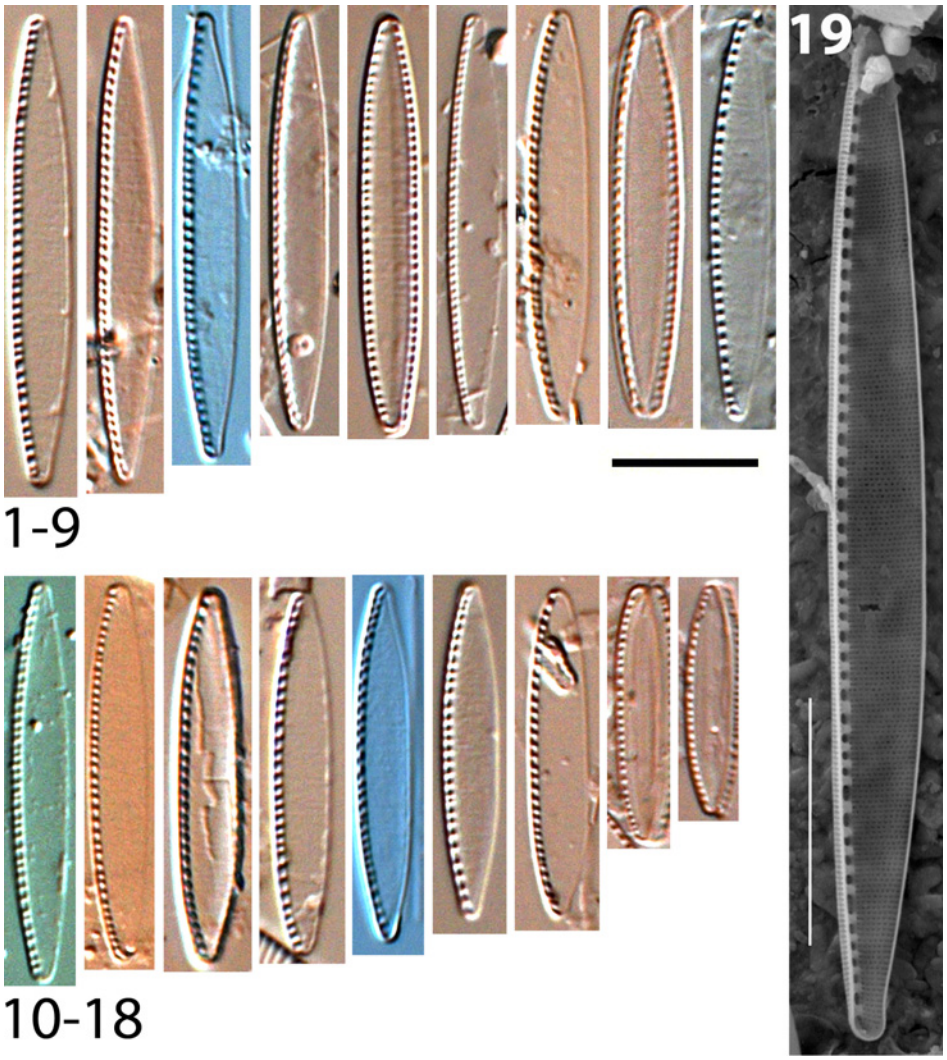


Plate 64: *Nitzschia pusilla*. **Figs 1, 4, 6, 9, 13–15, 19**: Legény-tó; **Figs 2, 5, 7, 12, 16**: Cikes; **Figs 3, 10–11**: Borsodi-dűlő; **Figs 8, 17–18**: Büdös-szék (Pusztaszer). – **Figs 1–19**: valve view; **Fig. 19**: internal view of the valve (SEM).

Nitzschia reversa W. Smith 1853
(Plate 65: Figs 1–10)

References: Krammer and Lange-Bertalot (1999: 124, pl. 85: 7–10), Kociolek (2011), Taylor *et al.* (2007: pl. 172).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	35–75	59.7–102.9
Width	2.5–4.5	3.3–4.5
Fibulae	14–20 /10	11–15/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó, Nyéki-szállás, Pap-rét
Mean / max. abundance	10.6% / 27.5%
Constancy	1 (11.1%)

Ecology: Cosmopolitan, planktonic species in marine coasts and in inland saline waters.

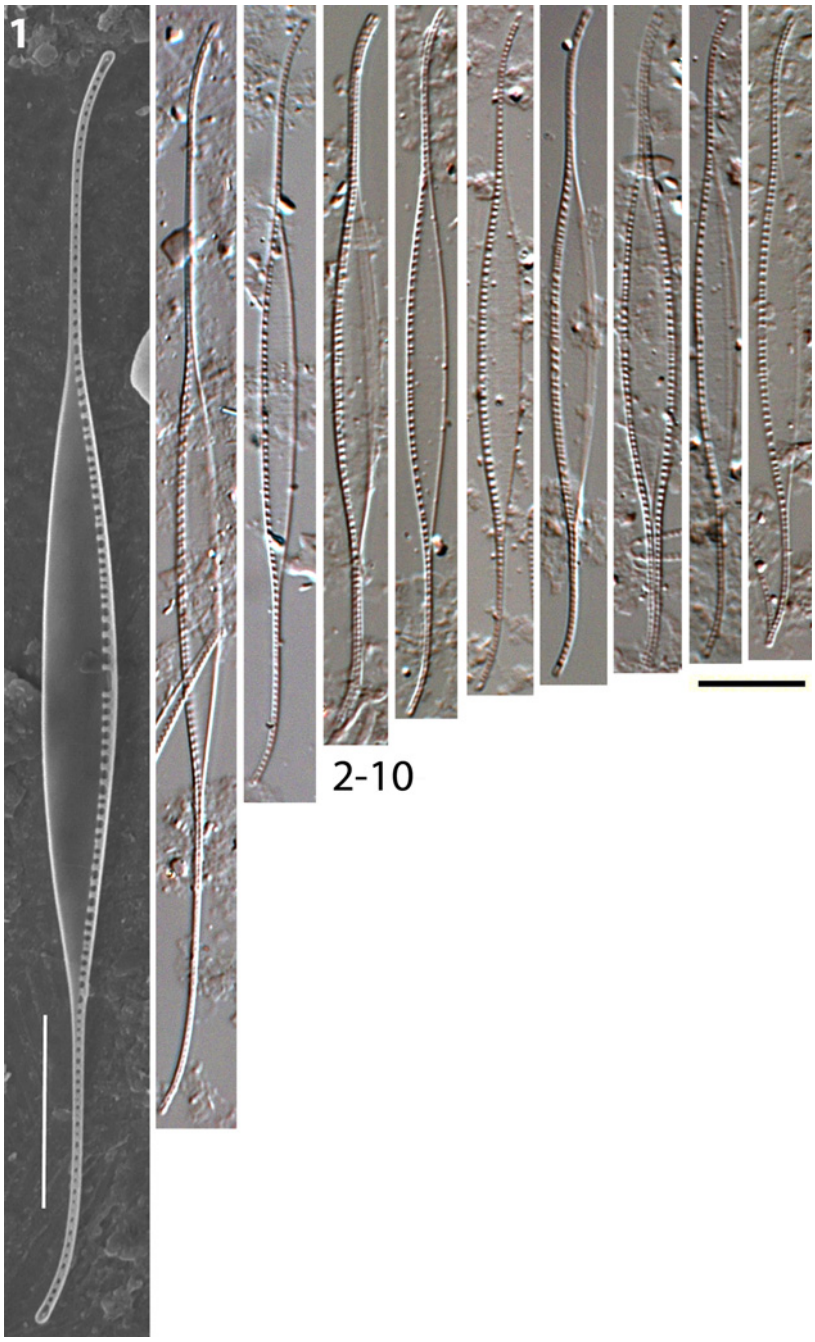


Plate 65: *Nitzschia reversa*. **Figs 1–10**: Pap-rét. – **Figs 1–10**: valve view; **Fig. 1**: internal view of the valve (SEM).

Nitzschia solita Hustedt 1953
(Plate 66: Figs 1–22)

References: Krammer and Lange-Bertalot (1999: 99, pl. 71: 1–12), Bey and Ector (2013: 1082), Hofmann *et al.* (2013: 462, pl. 112: 16–20).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	18–50	18.6–33.8
Width	4–6	4.6–5.6
Striae	24–28/10	26–27/10
Fibulae	11–16/10	11–14/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Kirchsee, Legény-tó, Nyéki-szállás, Pap-rét, Untersee
Mean / max. abundance	1.9% / 12.9%
Constancy	1 (14.5%)

Ecology: The species is abundant in electrolyte-rich, eutrophic waters.

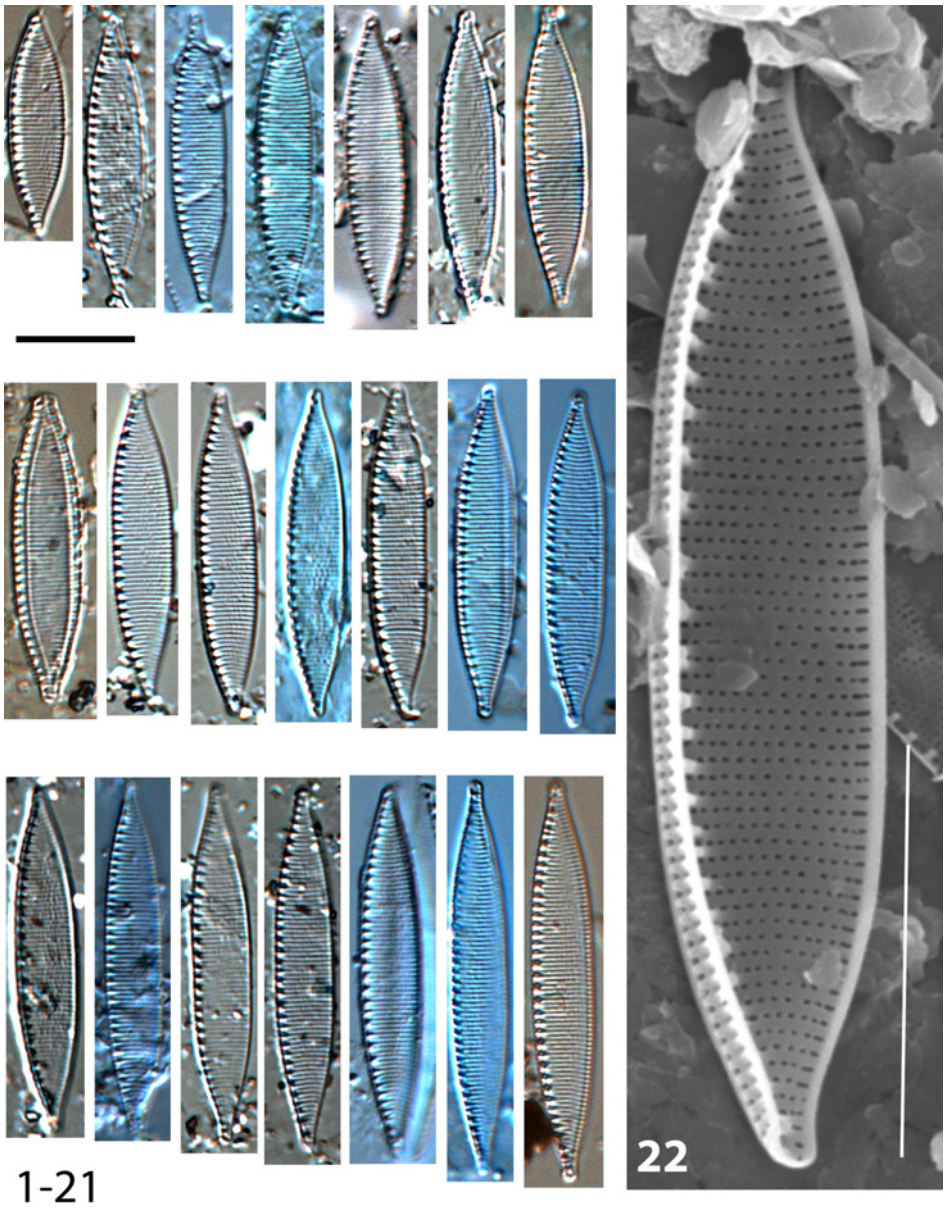


Plate 66: *Nitzschia solita*. **Figs 1, 21**: Nyéki-szállás; **Figs 2–10, 12–20, 22**: Legény-tó; **Fig. 11**: Borsodi-dűlő. – **Figs 1–22**: valve view; **Fig. 22**: internal view of the valve (SEM).

Nitzschia sp. 1
(Plate 67: Figs 1–27)

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	–	12.6–26.2
Width	–	2.6–3.2
Striae	–	25–27/10
Fibulae	–	12–13/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Böddi-szék, Kardoskúti Fehér-tó, Kelemen-szék, Legény-tó, Neubruch, Zab-szék
Mean / max. abundance	20.8% / 61.9%
Constancy	1 (18.8%)

Taxonomical note: Similar to *Nitzschia austriaca* Hustedt, however, *N. austriaca* is thinner (width: 1.8–2.4 μm). It was known only from Austrian saline lakes (Neusiedler Seewinkel). However, the species presented here is more abundant and characteristic in saline lakes of the Danube–Tisza Interfluve (Hungary).

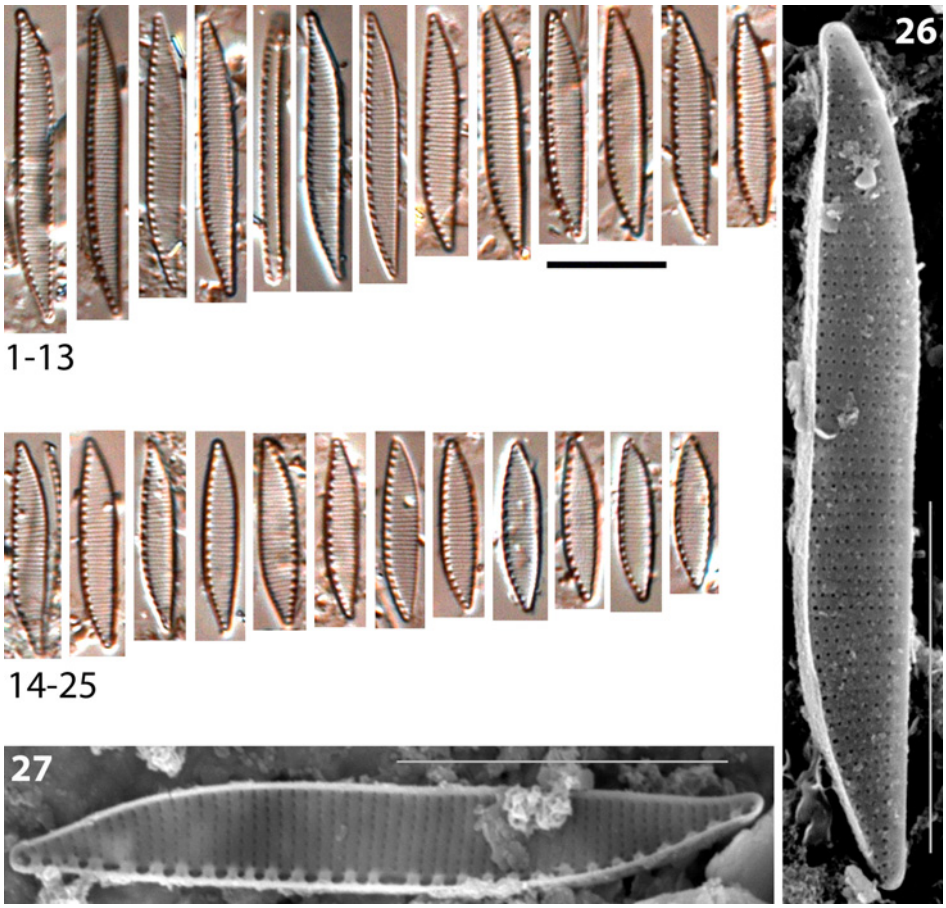


Plate 67: *Nitzschia* sp. 1. **Figs 1, 3, 6, 13–14, 16, 22**: Bába-szék; **Figs 7, 15, 17, 21**: Kelemen-szék; **Figs 2, 4–5, 8–12, 18–20, 23–27**: Böddi-szék. – **Figs 1–27**: valve view; **Fig. 26**: external view of the valve (SEM); **Fig. 27**: internal view of the valve (SEM).

Nitzschia sp. 2
(Plate 68: Figs 1–24)

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	–	19.6–22.4
Width	–	2.8–3.5
Striae	–	not visible in LM
Fibulae	–	6–19/10

Distribution in soda pans of the Carpathian Basin

Lakes	Böddi-szék, Büdös-szék, Fehér-szék, Kardoskúti Fehér-tó, Kelemen-szék, Kisréti-tó, Zab-szék
Mean / max. abundance	22.7% / 72.2%
Constancy	1 (10.3%)

Taxonomical note: Similar to *Nitzschia austriaca* known from Austrian saline lakes (Neusiedler Seewinkel), however, *N. austriaca* is thinner (width: 1.8–2.4 μm), and differs in fibulae and striae density (~12/10 μm; 25–26/10 μm). The species presented here was found only in saline lakes of the Danube–Tisza Interfluve (Hungary).

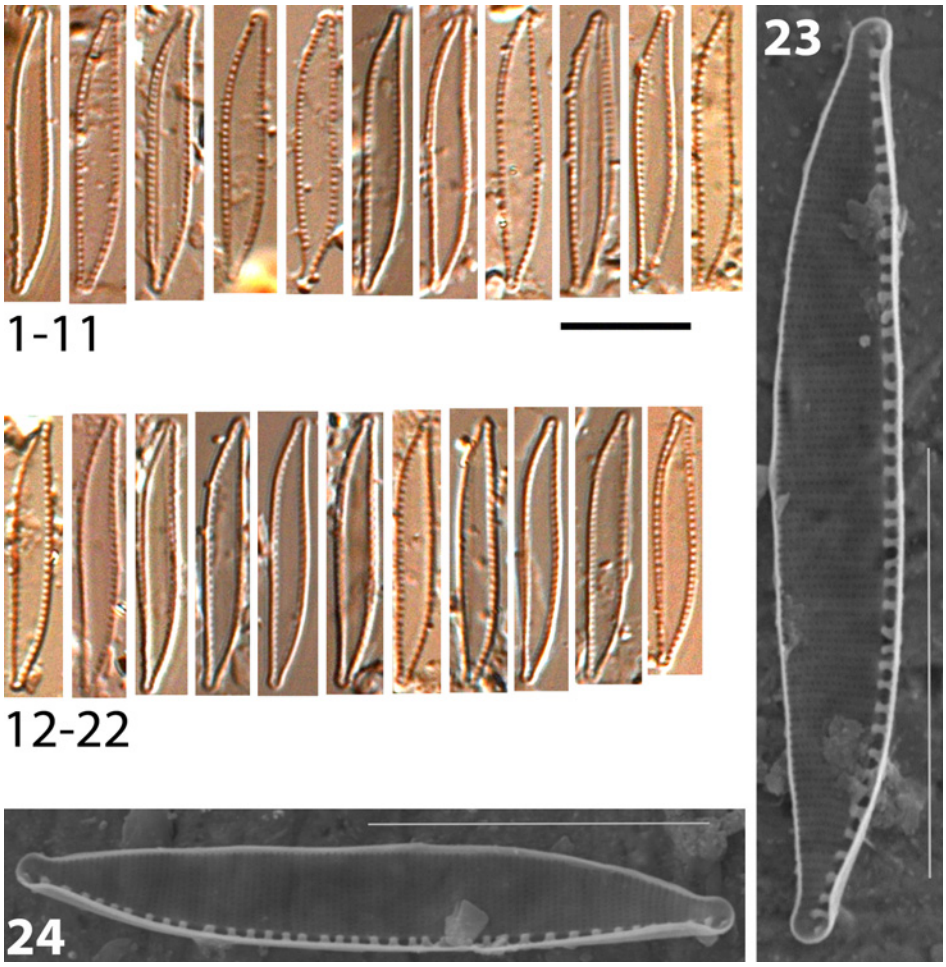


Plate 68: *Nitzschia* sp. 2. **Figs 1–22**: Zab-szék; **Figs 23–24**: Büdös-szék. – **Figs 1–24**: valve view; **Figs 23–24**: internal view of the valve (SEM).

Nitzschia sp. 3
(Plate 69: Figs 1–22)

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	–	21.7–50.7
Width	–	3.6–4.3
Fibulae	–	10–13/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Borsodi-dűlő, Cikes, Kisréti-tó, Legény-tó, Ősze-szék, Pap-rét, Untersee, Zicklacke
Mean / max. abundance	1.3% / 4.8%
Constancy	2 (21.4%)

Taxonomical note: Similar to *Nitzschia pusilla*, but fibulae density (14–20(24)/ 10 μm) and the length (8–33 μm) of *N. pusilla* are different.

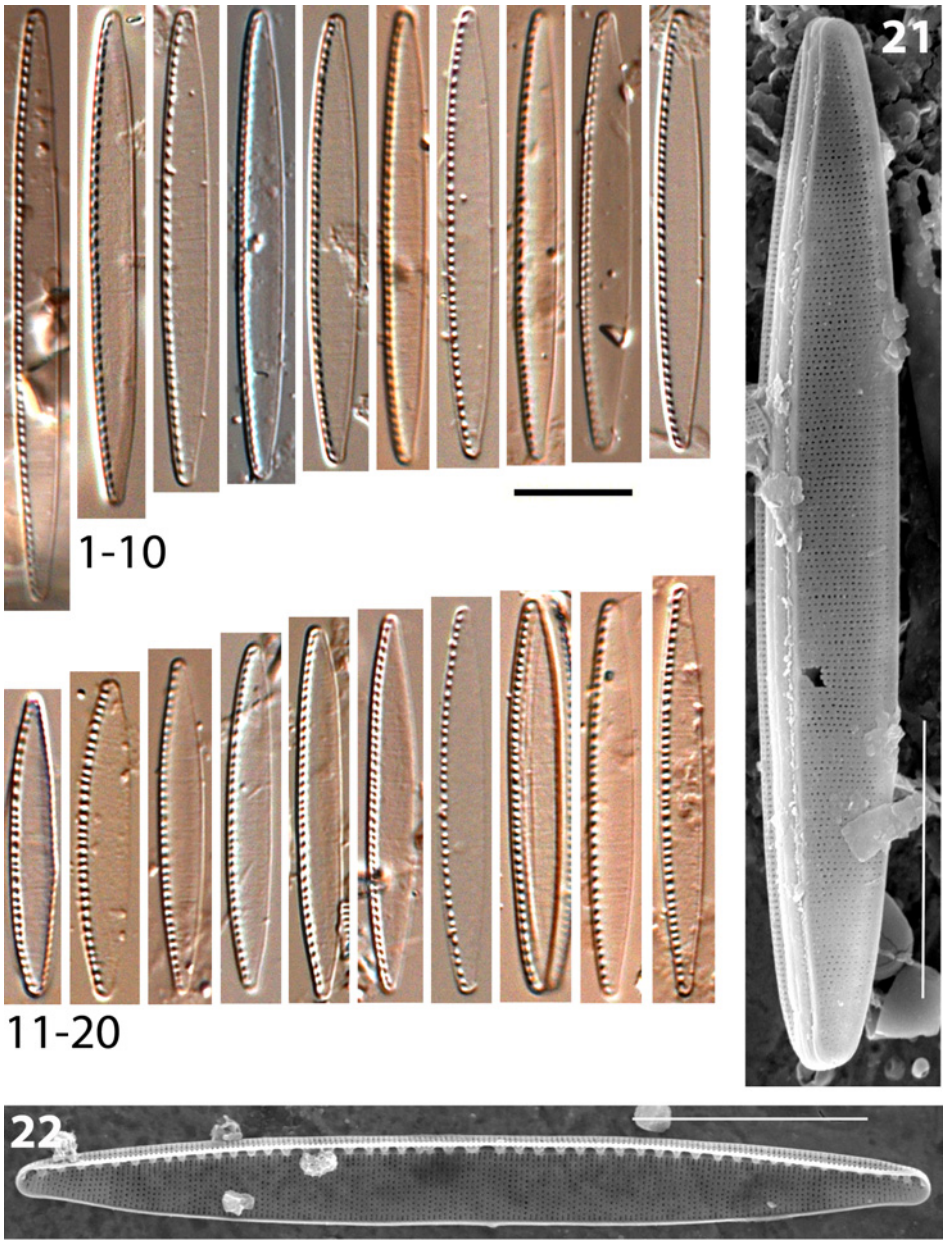


Plate 69: *Nitzschia* sp. 3. **Figs 1, 5**: Borsodi-dűlő; **Figs 2–4, 6–8, 10, 13–14,17, 20–22**: Legény-tó; **Fig. 9**: Zicklacke; **Figs 11–12, 15–16, 18**: Cikes; **Fig. 19**: Untersee. – **Figs 1–22**: valve view; **Fig. 21**: external view of the valve (SEM); **Fig. 22**: internal view of the valve (SEM).

Nitzschia supralitorea Lange-Bertalot 1979
(Plate 70: Figs 1–33)

References: Krammer and Lange-Bertalot (1999: 97, pl. 70: 14–21), Bey and Ector (2013: 1090–1091), Hofmann *et al.* (2013: 464, pl. 112: 66–71), Taylor *et al.* (2007: pl. 161).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	10–25	11.7–20.9
Width	2.5–4	3.1–4
Striae	25–34/10	27–32/10
Fibulae	14–20/10	14–16/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Bíbic-tó, Borsodi-dűlő, Böddi-szék, Büdös-szék, Büdös szék (Pusztaszer), Cikes, Kardoskúti Fehér-tó, Herrnsee, Herrnsee, Kelemen-szék, Legény-tó, Neubruch, Nyéki-szállás, Ősze-szék, Untersee, Zab-szék, Zicklacke
Mean / max. abundance	10% / 56.4%
Constancy	3 (44.4%)

Ecology: The species is abundant in eu- and polytrophic waters with moderate and slightly high conductivity.

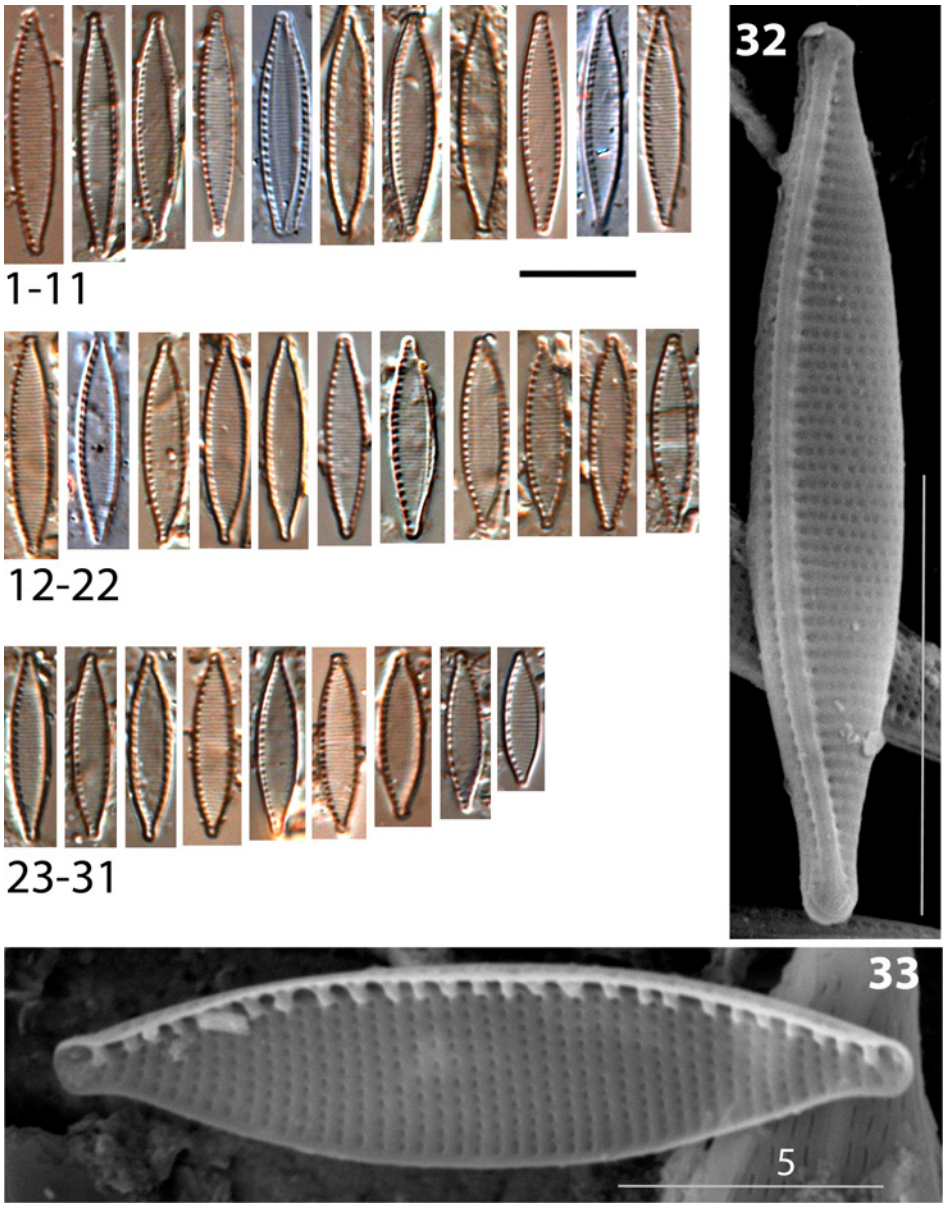


Plate 70: *Nitzschia supralitorea*. **Figs 1, 27, 29**: Bába-szék; **Figs 2–3, 5–16, 18–26, 28, 31**: Böddi-szék; **Figs 4, 17**: Zab-szék; **Fig. 30**: Kelemen-szék; **Figs 32–33**: Büdös-szék. – **Figs 1–33**: valve view; **Fig. 32**: external view of the valve (SEM); **Fig. 33**: internal view of the valve (SEM).

Nitzschia thermaloides Hustedt 1955
(Plate 71: Figs 1–14)

References: Krammer and Lange-Bertalot (1999: 59, pl. 44: 1–7), Hofmann *et al.* (2013: 465, pl. 106: 10–12), Witkowski *et al.* (2000: 406, pl. 190: 13–15, pl. 195:1–2).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	20–73	28.5–48
Width	4–6	5.1–6
Striae	30–36/10	32–35/10
Fibulae	16–20/10	16–18/10

Distribution in soda pans of the Carpathian Basin

Lakes	Legény-tó
Mean / max. abundance	5% / 5.1%
Constancy	1 (1.7%)

Ecology: The species is characteristic in marine coasts, brackish and inland waters with lower or higher conductivity.

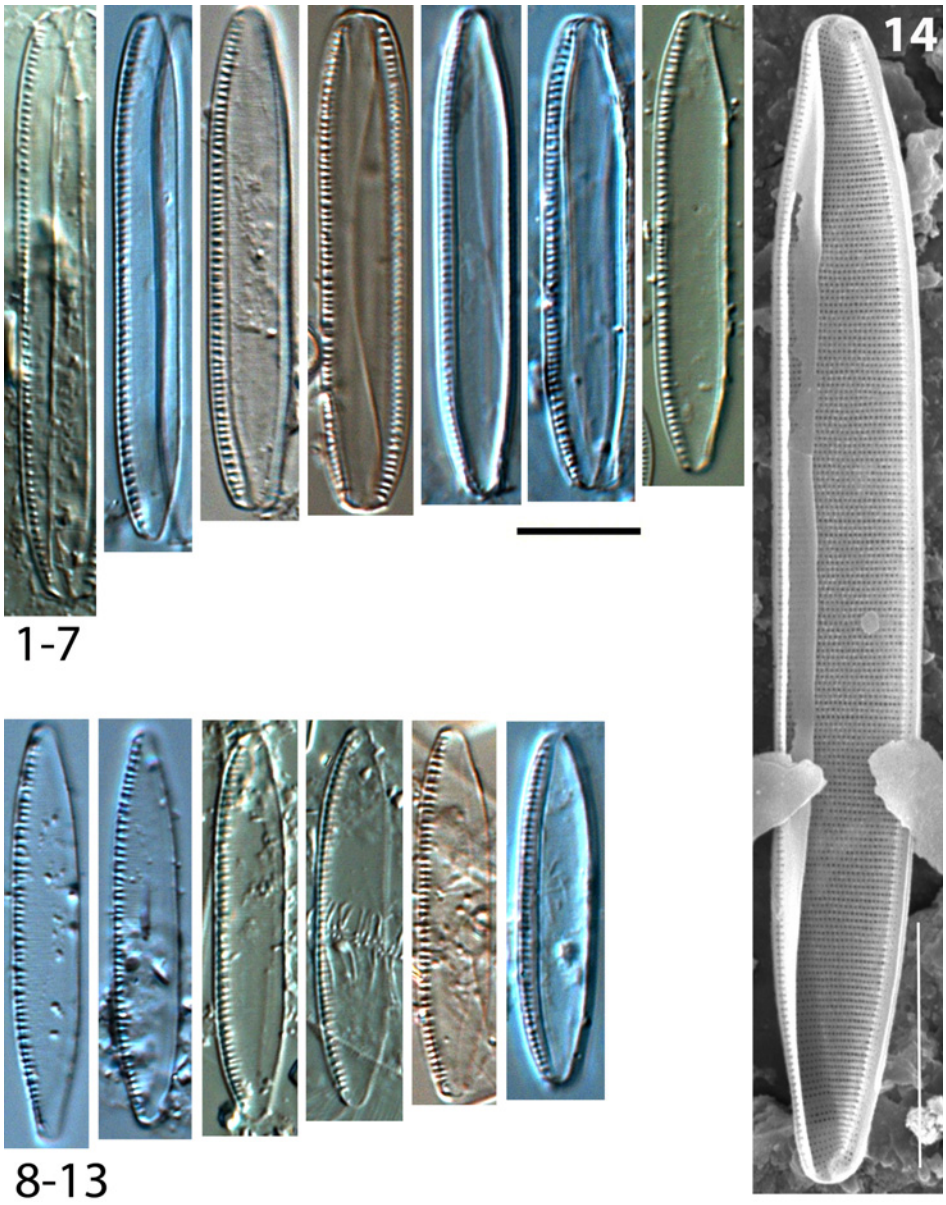


Plate 71: *Nitzschia thermaloides*. **Figs 1–14**: Legény-tó. – **Figs 1–14**: valve view; **Fig. 14**: internal view of the valve (SEM).

Nitzschia valdecostata Lange-Bertalot et Simonsen 1978 (Plate 72: Figs 1–28)

References: Krammer and Lange-Bertalot (1999: 121, pl. 84: 1–8), Taylor *et al.* (2007: pl. 169).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	10–25	10.5–24.5
Width	3–4.5	3.2–4
Striae	17–20/10	17–19/10
Fibulae	7–9/10	7–9/10

Distribution in soda pans of the Carpathian Basin (Danube–Tisza Interfluve / Fertő–Hanság region)

Lakes	Kelemen-szék, Ősze-szék – Borsodi-dűlő, Legény-tó, Nyéki- szállás
Mean / max. abundance	3.7% / 7.1%–10.4% / 76.3%
Constancy	1 (1.7%) / 1 (15.5%)

Ecology: The species is abundant in electrolyte-rich waters with sulphate and carbonate dominance.

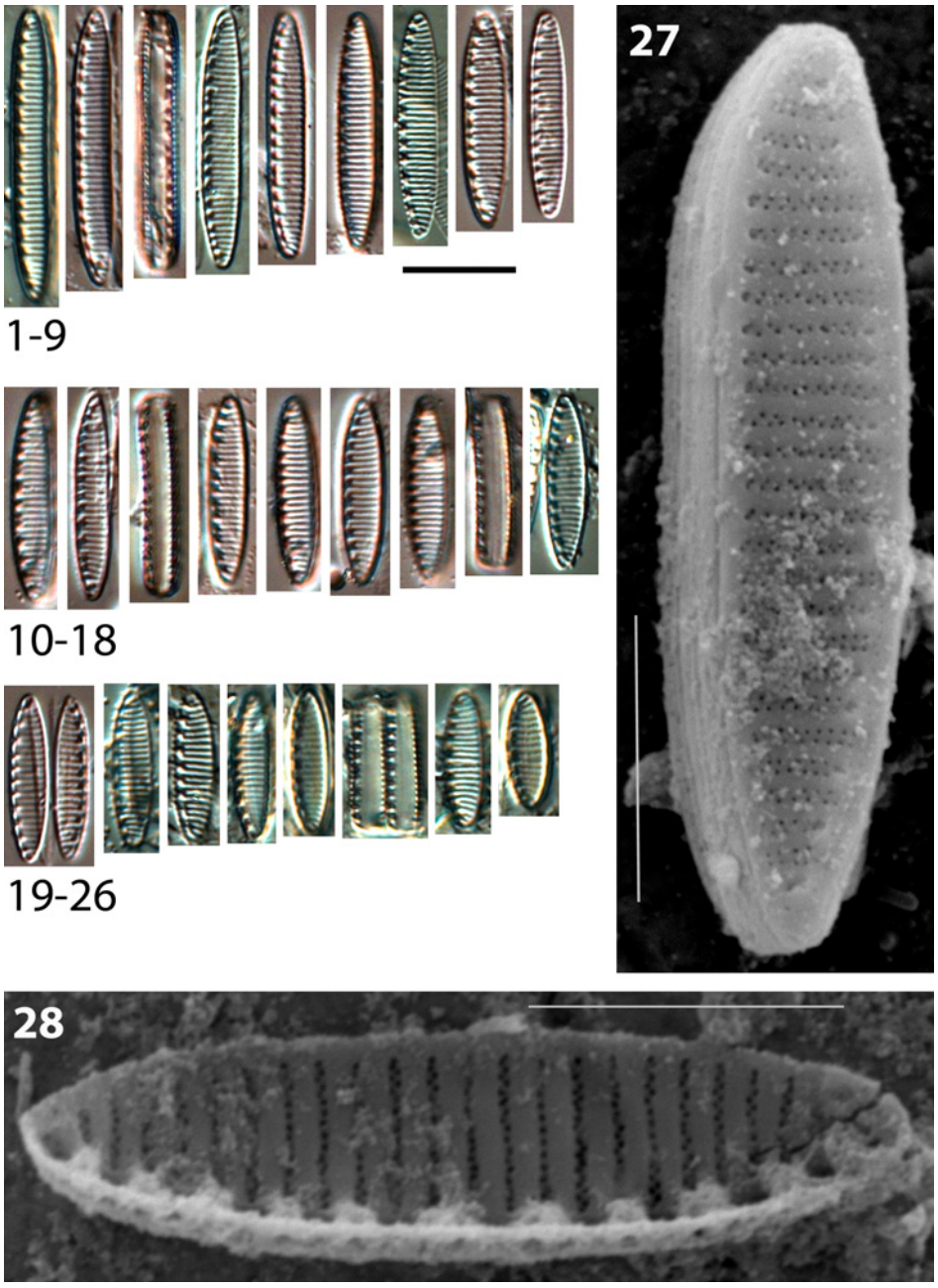


Plate 72: *Nitzschia valdecostata*. **Figs 1–28**: Legény-tó. – **Figs 1–2, 4–11, 13–16, 18–23, 25–28**: valve view; **Figs 3, 12, 17, 24**: girdle view; **Fig. 27**: external view of the valve (SEM); **Fig. 28**: internal view of the valve (SEM).

Nitzschia vitrea G. Norman 1861 var. *vitrea* (Plate 73: Figs 1–15)

Reference: Krammer and Lange-Bertalot (1999: 72, pl. 56: 1–7).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	30–220	32.4–88.6
Width	4–14	7.1–8.5
Striae	20–25.5	22–24
Fibulae	4–8/10	5–7/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Csárda-szék, Fehér-szék, Herrnsee, Kelemen-szék, Kisréti-tó, Legény-tó, Nyéki-szállás, Pap-rét, Szappan-szék, Szívós-szék, Untersee
Mean / max. abundance	1.3% / 5.6%
Constancy	1 (12.8%)

Ecology: The species is abundant in inland saline waters.

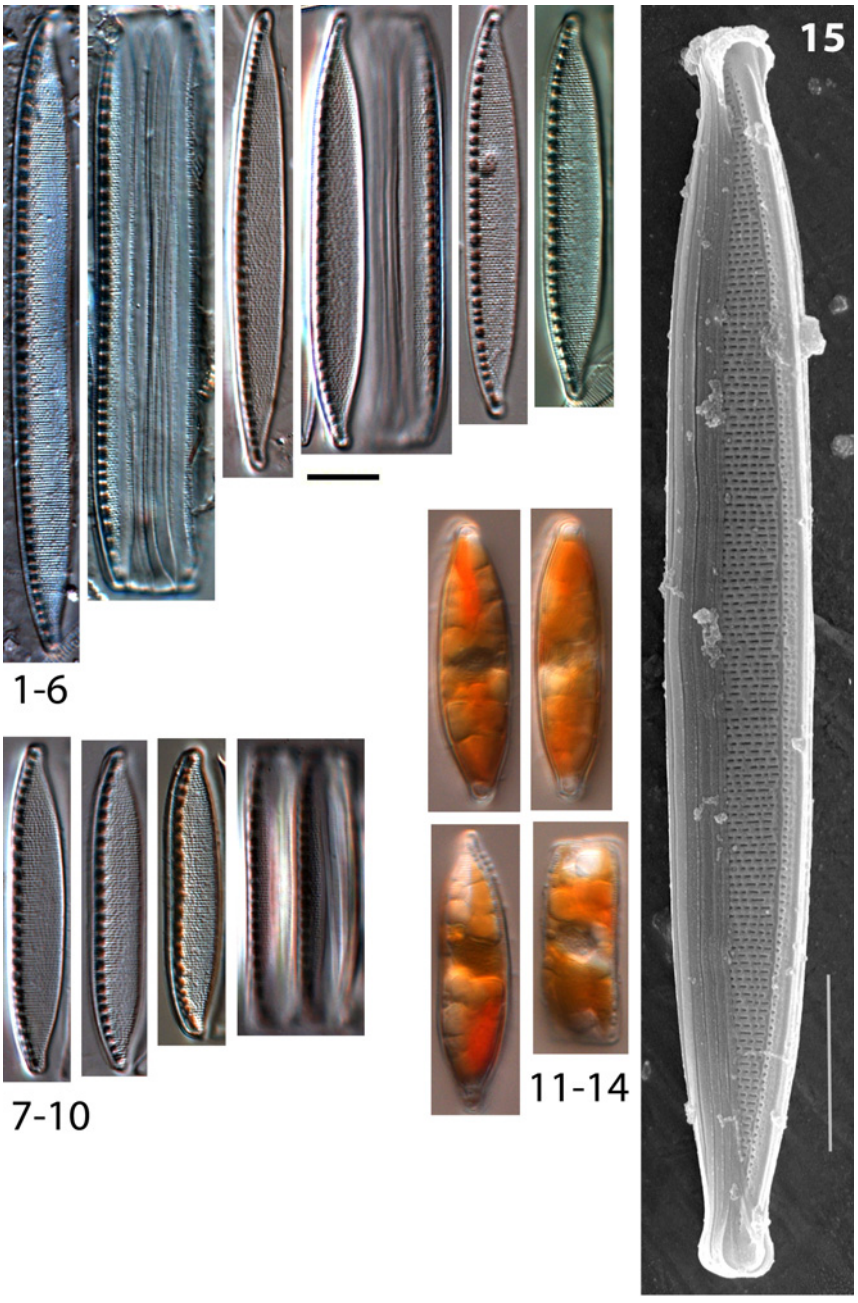


Plate 73: *Nitzschia vitrea* var. *vitrea*. **Figs 1–2**: Nyéki-szállás; **Figs 3–5**: Kondor-tó; **Fig. 6**: Legény-tó; **Figs 7–10, 15**: Csárda-szék; **Figs 11–14**: culture isolated from Böddi-szék. – **Figs 1, 3–9, 11–13, 15**: valve view; **Figs 2, 10, 14**: girdle view; **Figs 11–14**: living cells; **Fig. 15**: external view of the valve (SEM).

Pinnularia brebissonii (Kützing) Rabenhorst 1864 (Plate 74: Figs 1–21)

References: Krammer and Lange-Bertalot (1999: 426, pl. 191: 7–9), Hofmann *et al.* (2013: 482, pl. 70: 9–13).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	15–87	29.2–56.6
Width	5.6–12	8.1–11.5
Striae	9–13/10	10–13/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Legény-tó, Pap-rét
Mean / max. abundance	1.7% / 4.8%
Constancy	1 (6.8%)

Ecology: Abundant in alkaline waters with moderate and high conductivity.

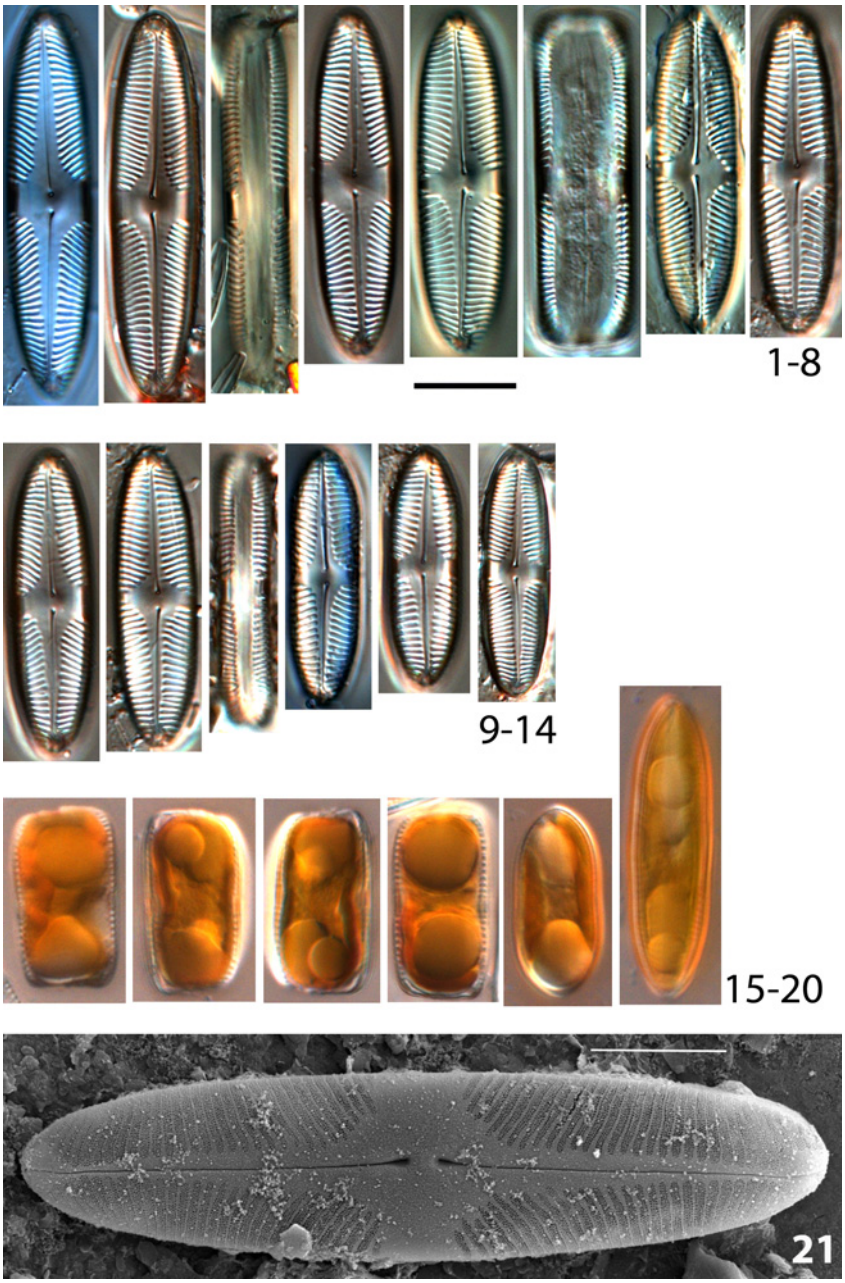


Plate 74: *Pinnularia brebissonii*. **Figs 1, 3, 5, 7, 12, 21**: Legény-tó; **Figs 2, 4, 6, 8–11, 13–14, 21**: Borsodi-dűlő; **Figs 15–20**: culture isolated from Legény-tó. – **Figs 1–2, 4–5, 7–10, 12–14, 19–21**: valve view; **Figs 3, 6, 11, 15–18**: girdle view; **Figs 15–20**: living cells; **Fig. 21**: external view of the valve (SEM).

Pinnularia kneuckeri Hustedt 1949
(Plate 75: Figs 1–23)

References: Krammer and Lange-Bertalot (1999: 418, pl. 185: 26), Krammer (2000: 113, pl. 87: 8–11), Bey and Ector (2013: 651).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	23–30	20.4–30.2
Width	4–5	4.5–5.5
Striae	17–20/10	18–22/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Csárda-szék, Hattyús-szék, Herrnsee, Kondor-tó, Pirtói Nagy-tó, Szarvas-tó, Szívós-szék
Mean / max. abundance	1.9% / 11.1%
Constancy	1 (6.8%)

Ecology: Epipelic species in waters with high conductivity. It is known from Wadi Torfa (Sinai), Lake Fertő (Neusiedler See), and the surrounding soda pans.

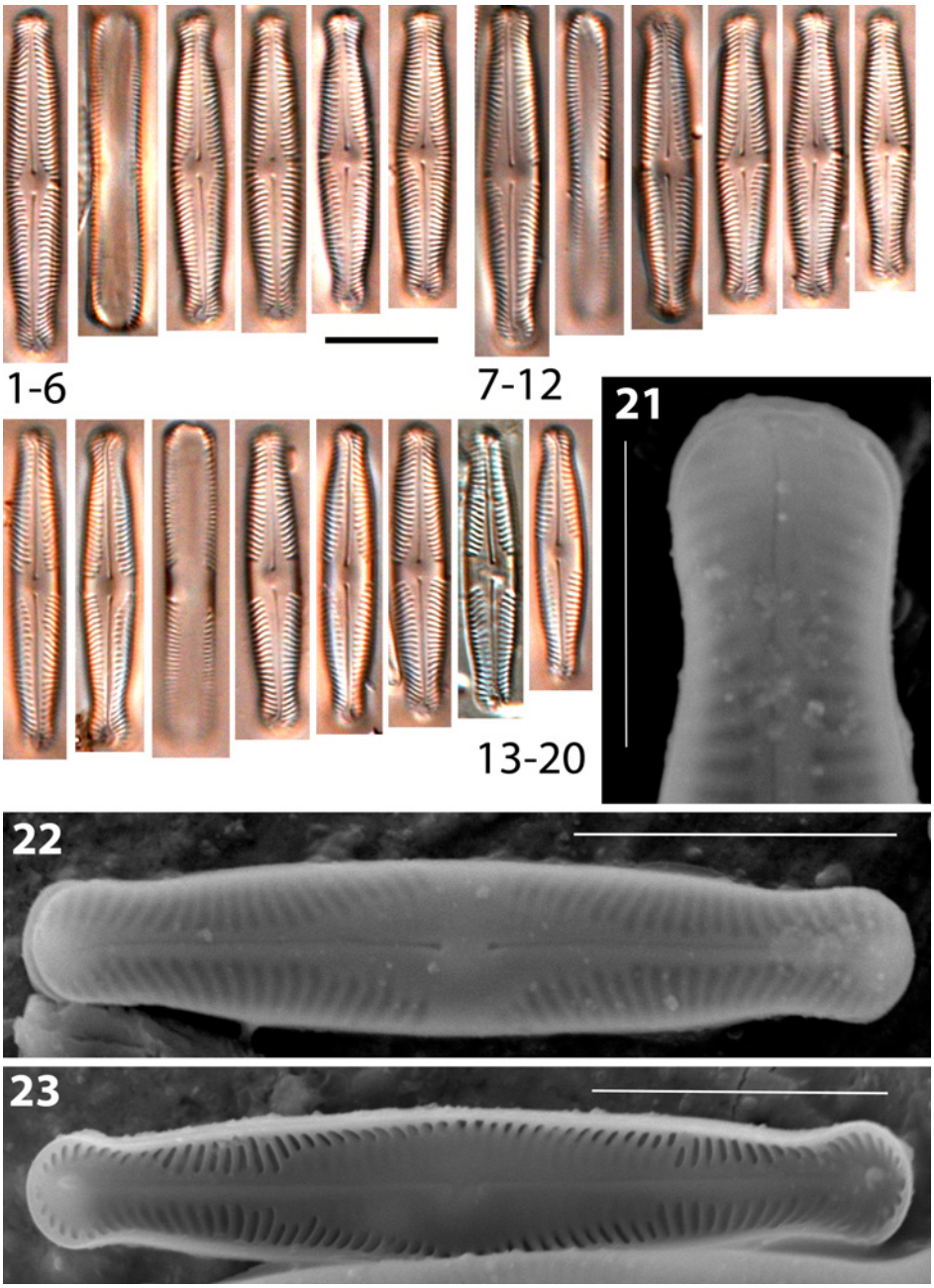


Plate 75: *Pinnularia kneuckeri*. **Figs 1–23**: Pirtói Nagy-tó. – **Figs 1, 3–7, 9–14, 16–23**: valve view; **Figs 2, 8, 15**: girdle view; **Fig. 21**: apex of the valve (SEM); **Fig. 22**: external view of the valve (SEM); **Fig. 23**: internal view of the valve (SEM).

Pinnularia oriunda Krammer 1992 morphotype 2
(Plate 76: Figs 1–7)

Reference: KRAMMER (2000: 136, pl. 112: 1–9).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	55–105	57.9–83
Width	12–17	12.8–16.4
Striae	8–10/10	7–9/10

Distribution in soda pans of the Carpathian Basin

Lakes	Büdös-szék, Fülöp-szék, Pirtói Nagy-tó (Borsodi-dűlő, Nyéki-szállás)
Mean / max. abundance	0.3% / 0.5%
Constancy	1 (2.6%)

Ecology: Abundant in waters with moderate and high conductivity. The characteristic ion dominance of the water is Na_2SO_4. The salinity of the water body is effected by rainfalls.

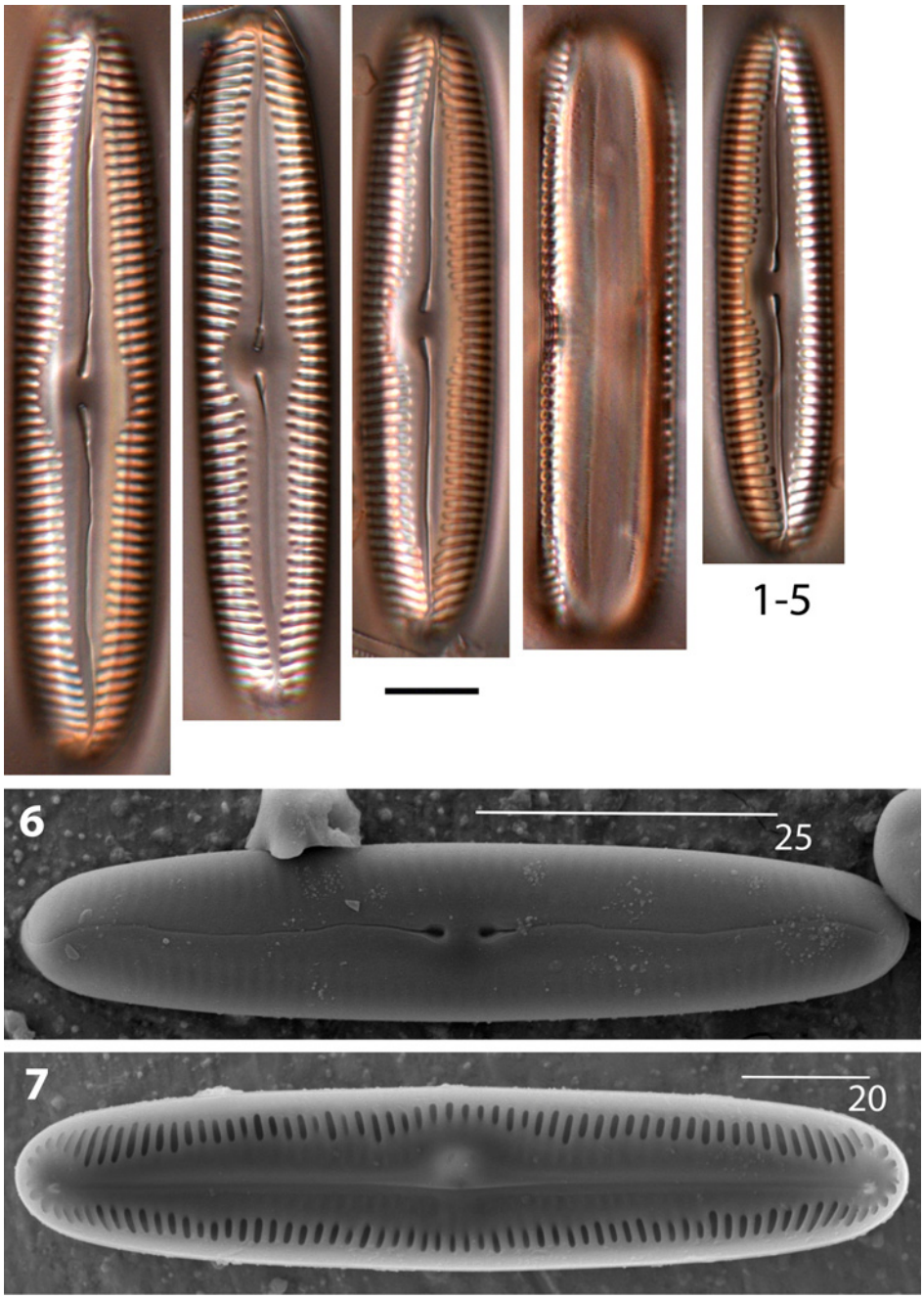


Plate 76: *Pinnularia oriunda*. **Figs 1–7**: Pirtói Nagy-tó. – **Figs 1–3, 5–7**: valve view; **Fig. 4**: girdle view; **Fig. 6**: external view of the valve (SEM); **Fig. 7**: internal view of the valve (SEM).

Rhoicosphenia lacustris Levkov 2010
(Plate 77: Figs 1–11)

Reference: Levkov *et al.* (2010: 145–200).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	25–62	12.7–36
Width	6–9	5–7.5
Striae	13–15/10	13–16/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Herrnsee, Legény-tó, Nyéki-szállás, Ősze-szék, Paprét
Mean / max. abundance	4.4% / 38.8%
Constancy	1 (16.2%)

Ecology: Cosmopolitan species, abundant in habitats ranging from alkaline waters with high conductivity to brackish waters as well as marine coasts. Tolerant to β-α-mesosaprobic conditions and high level of inorganic nutrients.

Taxonomical note: Based on the valve shape and striae density (9–12/10 µm) it differs from *R. abbreviata,* where striae of the centre are distantly spaced, while in the case of *R. lacustris* they are in equal distance. The size of *R. lacustris* in the soda pans is smaller than that of the type population published from Macedonia.

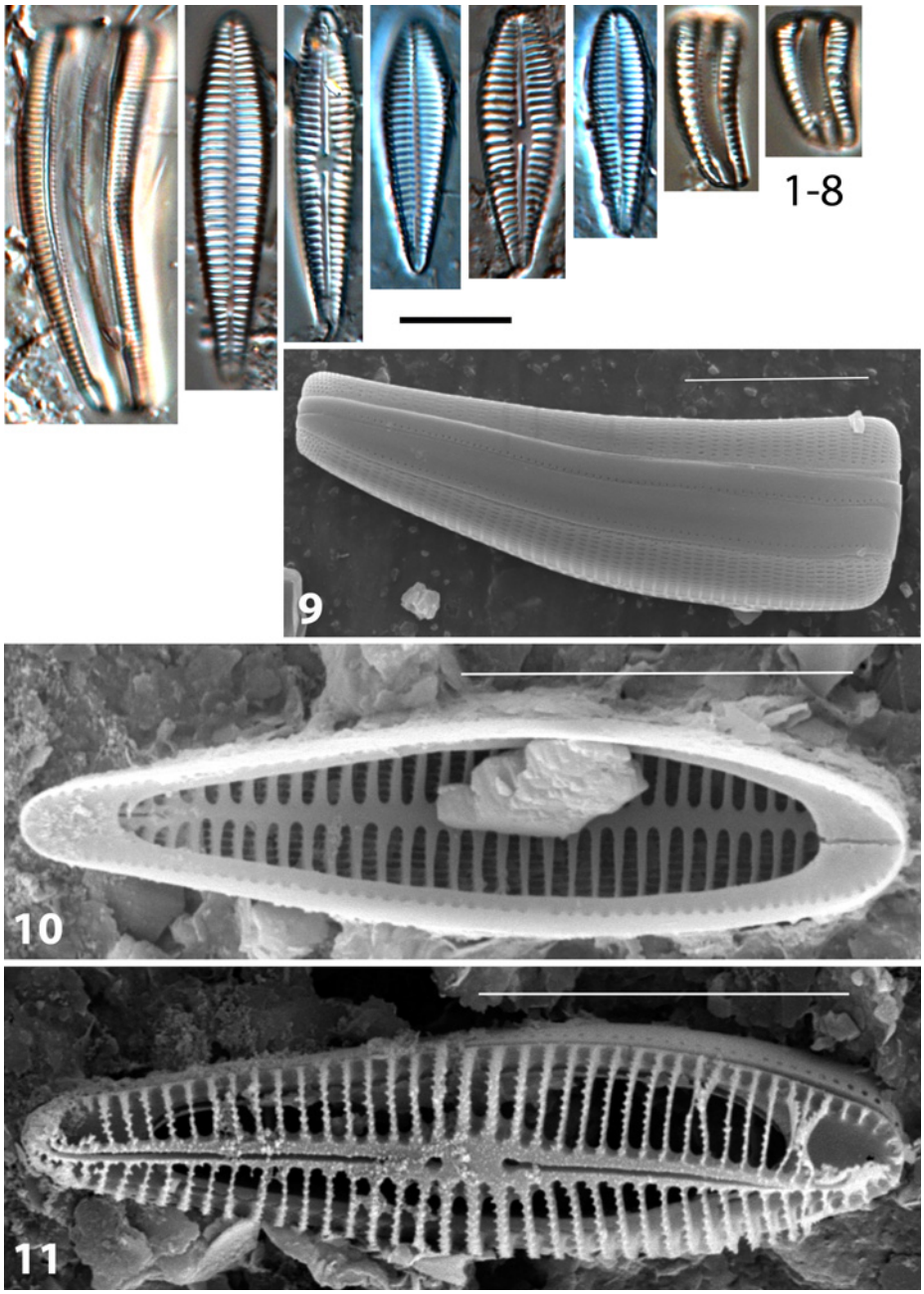


Plate 77: *Rhoicosphenia lacustris*. **Figs 1, 3**: Nyéki-szállás; **Figs 2, 5, 7–8, 10–11**: Legény-tó; **Figs 4, 6**: Borsodi-dűlő; **Fig. 9**: Pap-rét. – **Figs 2–6, 10–11**: valve view; **Figs 1, 7–9**: girdle view; **Fig. 10**: internal view of the valve (SEM); **Fig. 11**: external view of the valve (SEM) (corroded form).

Rhopalodia gibba (Ehrenberg) Müller 1895
(Plate 78: Figs 1–10)

References: Krammer and Lange-Bertalot (1999: 159, pl. 111: 1–13), Bey and Ector (2013: 1132–1133), Hofmann *et al.* (2013: 529, pl. 122: 4–8), Taylor *et al.* (2007: pl. 131–132).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	22–300	28.8–126.6
Width	7–13	8–10.2
Costae	5–8/10	6–8/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Fehér-szék, Legény-tó, Ősze-szék
Mean / max. abundance	2.3% / 8.7%
Constancy	1 (6.8%)

Ecology: Cosmopolitan, abundant species in lentic environments and in lowland rivers with moderate and high conductivity.

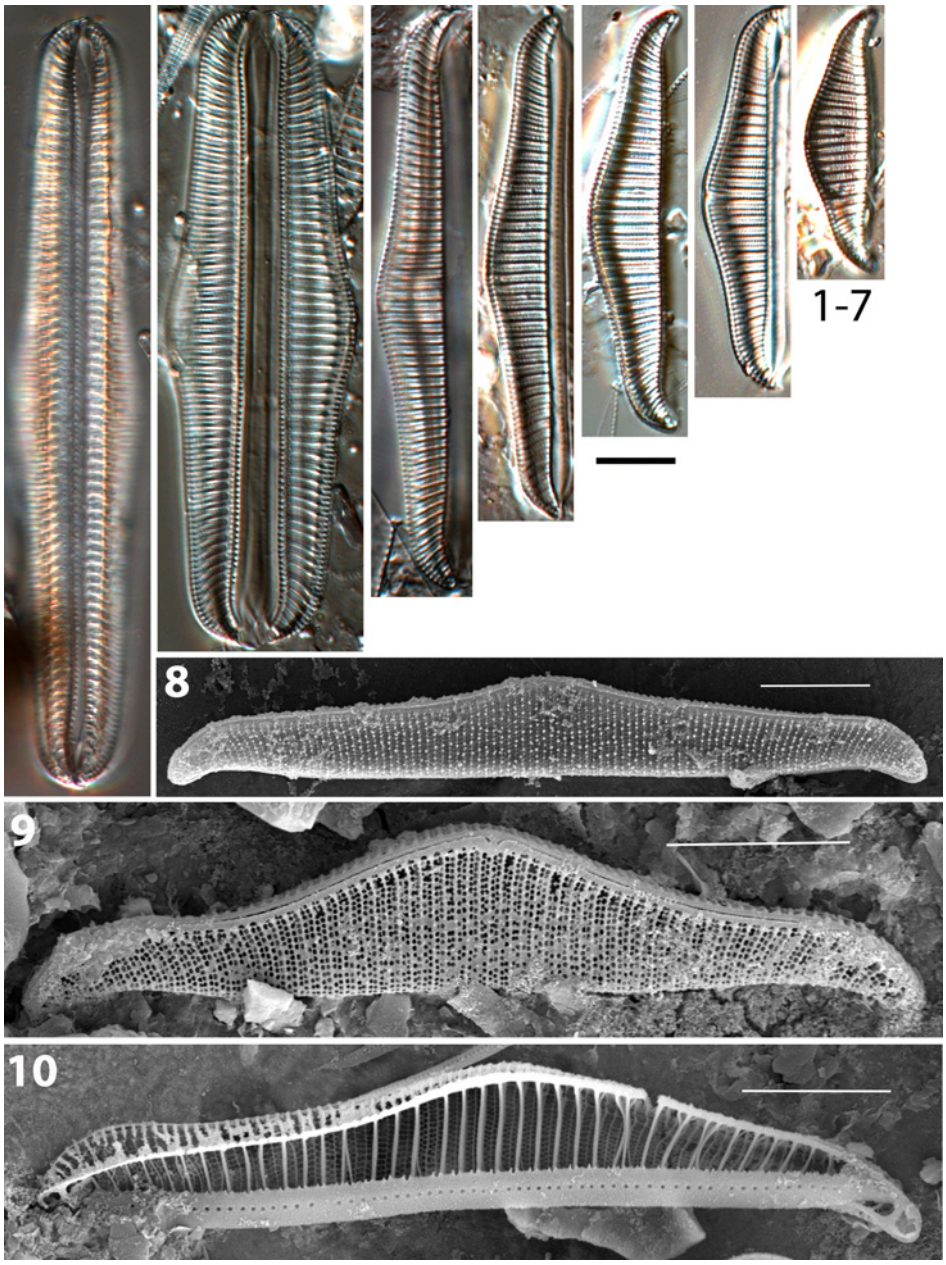


Plate 78: *Rhopalodia gibba*. **Figs 1–4, 7**: Nyéki-szállás; **Figs 5–6, 8–10**: Legény-tó. – **Figs 1–10**: valve view; **Figs 8–9**: external view of the valve (SEM); **Fig. 10**: internal view of the valve (SEM).

Rhopalodia operculata (Agardh) Håkansson 1979
(Plate 79: Figs 1–8)

References: Krammer and Lange-Bertalot (1999: 165, pl. 115: 9–12), Taylor *et al.* (2007).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	18–52	26–37.6
Width	5–10	6.4–9.3
Striae	16–18/10	16–18/10
Costae	3–6/10	3–5/10
Striae between the costae	–	3–6/10

Distribution in soda pans of the Carpathian Basin (Danube–Tisza Interfluve / Fertő–Hanság region)

Lakes	Kardoskúti Fehér-tó – Legény-tó, Nyéki-szállás
Mean / max. abundance	5.9% / 5.9%–1.3% / 7.9%
Constancy	1 (0.9%) / 1 (15.6%)

Ecology: Cosmopolitan species in waters with moderate and high conductivity. Not sensitive to high temperatures.

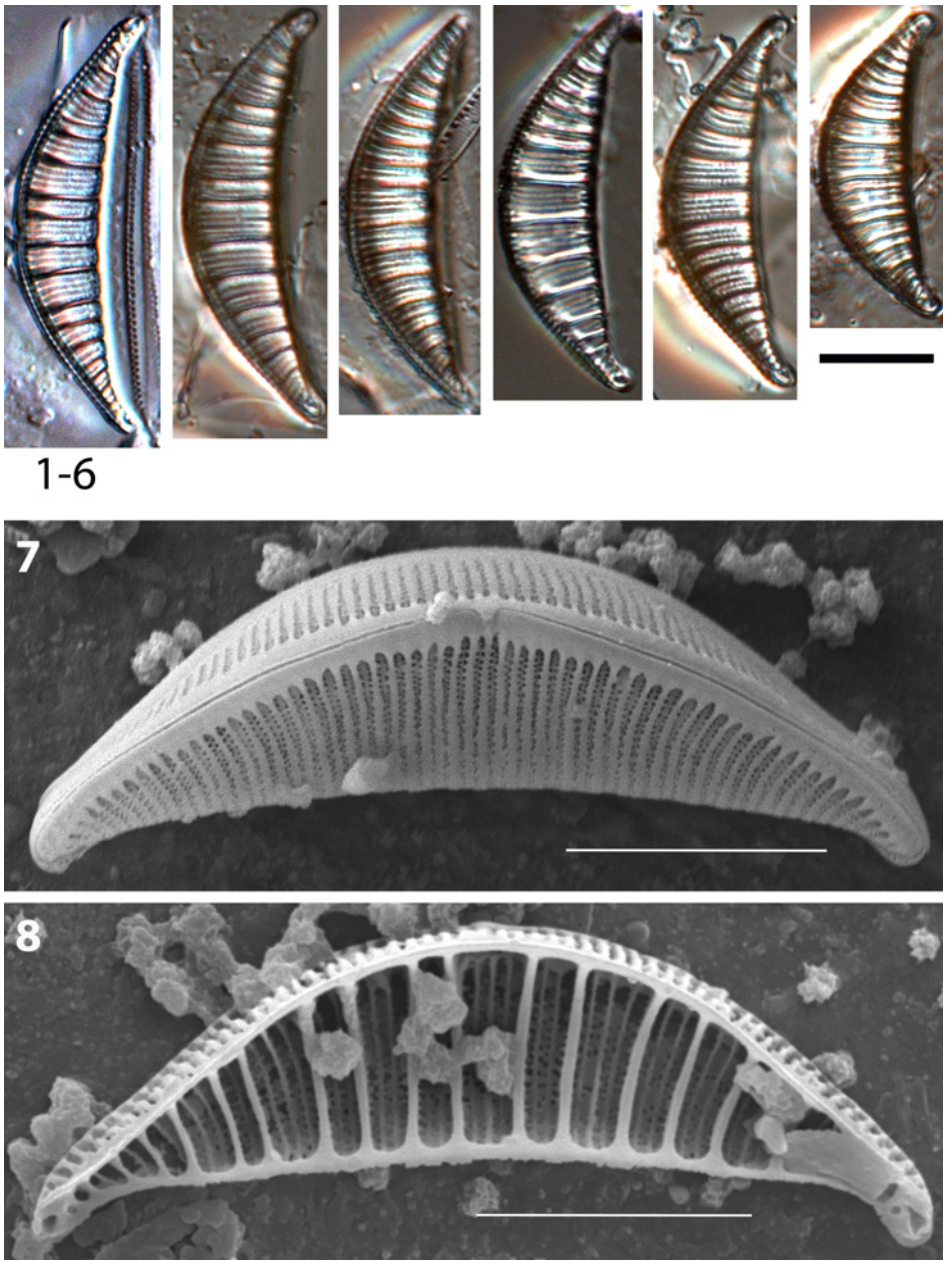


Plate 79: *Rhopalodia operculata*. **Figs 1–8**: Nyéki-szállás. – **Figs 1–8**: valve view; **Fig. 7**: external view of the valve (SEM); **Fig. 8**: internal view of the valve (SEM).

Scoliopleura peisonis Grunow 1860
(Plate 80: Figs 1–14)

References: Pantocsek (1912: 24. pl. 2: 72–73 [1]), Krammer and Lange-Bertalot (1999: 283, pl. 148: 21–24 [2]).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	35–100	34.3–60.2
Width	10–20	10.1–15.9
Striae	16–20/10 [2]; 13–15/10 [1]	13–14/10
Punctae	16–20/10	16–20/10

Distribution in soda pans of the Carpathian Basin (Fertő–Hanság region)

Lakes	Legény-tó, Nyéki-szállás
Mean / max. abundance	0.4% / 0.8%
Constancy	1 (7.7%)

Ecology: Cosmopolitan species in inland waters with high conductivity. Characteristic species of the Austrian Burgenland and the neighbouring Fertő–Hanság region in Hungary.

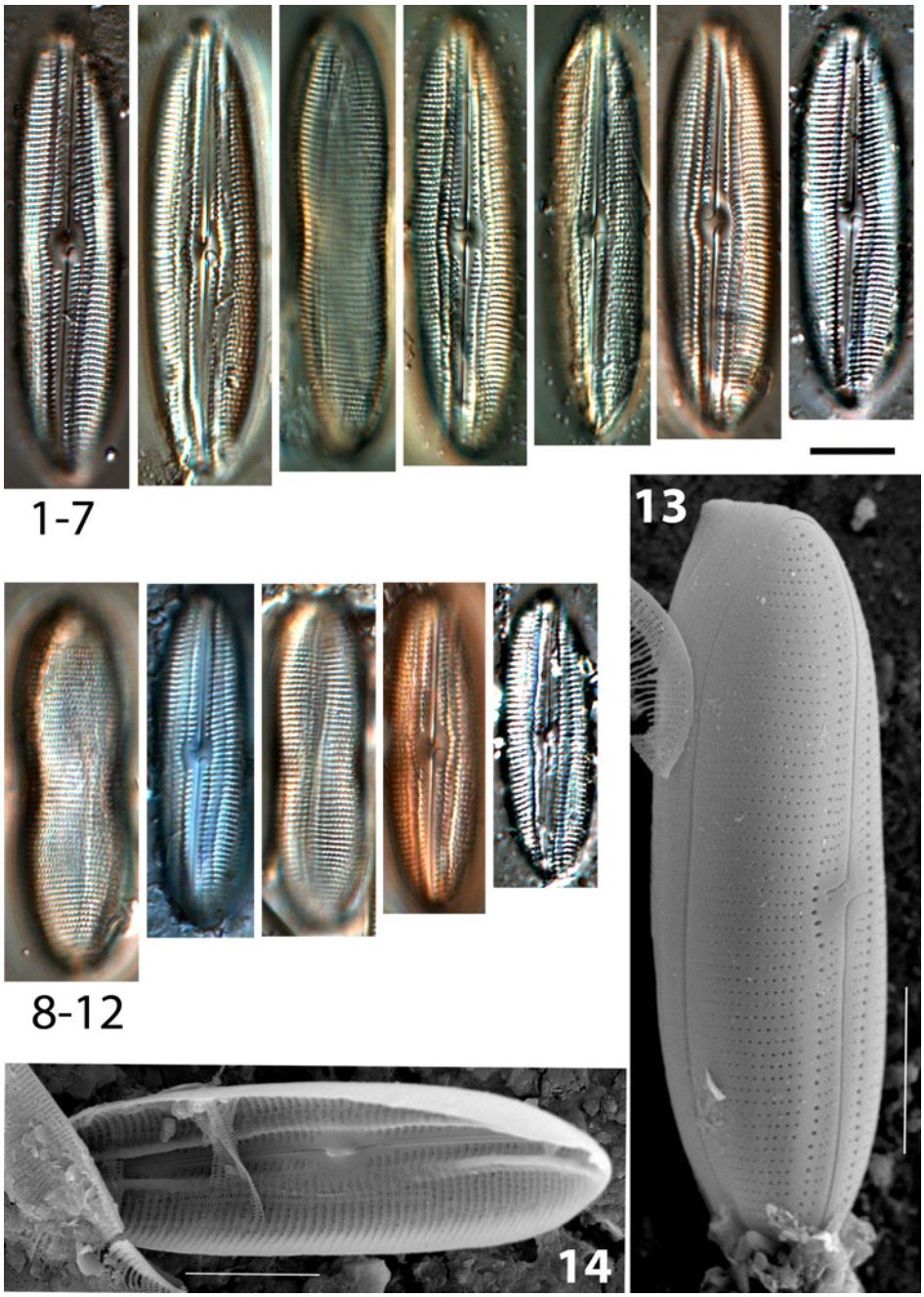


Plate 80: *Scoliopleura peisonis*. **Figs 1, 4**: Nyéki-szállás; **Figs 2–3, 5–14**: Legény-tó. – **Figs 1–14**: Valve view; **Fig. 13**: external view of the valve (SEM); **Fig. 14**: internal view of the valve (SEM).

Staurophora wislouchii (Poretzsky et Anisimowa) D. G. Mann 1990
(Plate 81: Figs 1–15)

References: KRAMMER and LANGE-BERTALOT (1999: 250, pl. 91: 16–17 (*Stauroneis wislouchii*)), BAHLS (2012).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	20–38	24.4–30.4
Width	5–9	5.9–9.1
Striae	22–24/10 (in middle part)	22–24/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Cikes, Legény-tó, Nyéki-szállás
Mean / max. abundance	0.9% / 3.2%
Constancy	1 (7.8%)

Ecology: Abundant in waters with high electrolyte content.

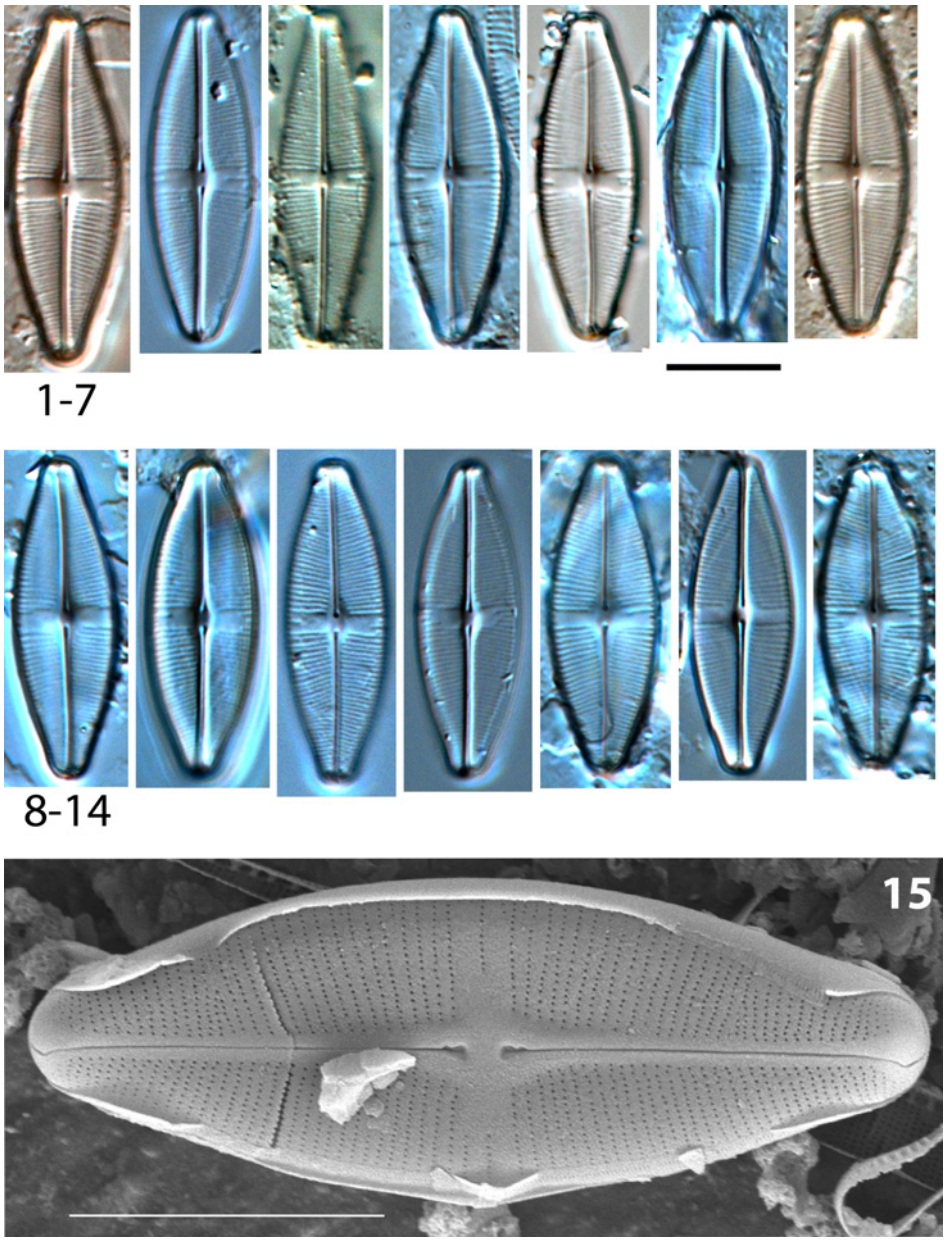


Plate 81: *Staurophora wislouchii*. **Figs 1, 3, 7, 15**: Nyéki-szállás; **Figs 2, 5**: Legény-tó; **Figs 4, 6, 8–14**: Borsodi-dűlő. – **Figs 1–15**: valve view; **Fig. 15**: external view of the valve (SEM).

Stephanodiscus parvus Stoermer et Håkansson 1984 (Plate 82: Figs 1–27)

References: KRAMMER and LANGE-BERTALOT (2000: 71, pl. 74: 5–7), HOUK *et al.* (2014: 38, pl. 122–126).

	Morphological parameters (µm)	Observations in soda pans (µm)
Diameter	5–60	5.5–23.3
Striae	6–10/10	7–10/10

Distribution in soda pans of the Carpathian Basin (Fertő–Hanság region)

Lakes	Borsodi-dűlő, Cikes, Legény-tó, Nyéki-szállás
Mean / max. abundance	18.4% / 61.1%
Constancy	1 (1.1%)

Ecology: Littoral, pelagic species of eutrophic lentic and slow waters.

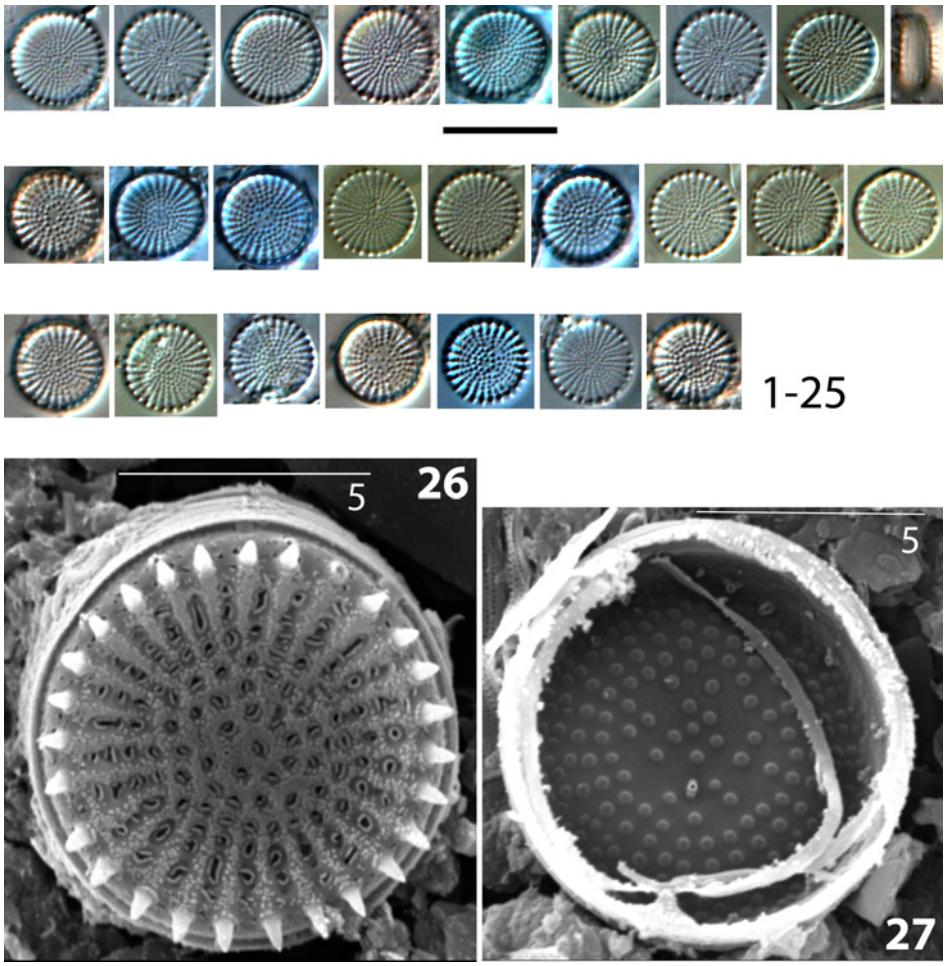


Plate 82: *Stephanodiscus parvus*. **Figs 1–27**: Borsodi-dűlő. – **Figs 1–27**: valve view; **Fig. 26**: external view of the valve (SEM); **Fig. 27**: internal view of the valve (SEM).

Surirella brebissonii Krammer et Lange-Bertalot 1987 (Plate 83: Figs 1–8)

References: Krammer and Lange-Bertalot (1999: 179, pl. 123, 126, 127), Hofmann *et al.* (2013: 556, pl. 130: 11–21), Bey and Ector (2013: 1156–1157), Taylor *et al.* (2007: pl. 176), Witkowski *et al.* (2000: 413, pl. 215: 8, 217: 4–5).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	8–70	21.5–44
Width	8–30	12.1–20.6
Striae	16–20/10	16–20/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Böddi-szék, Büdös-szék, Kardoskúti Fehér-tó, Kelemen-szék, Legény-tó, Neubruck, Nyéki-szállás, Ősze-szék, Pap-rét, Untersee, Zab-szék, Zicklacke
Mean / max. abundance	2.7% / 15.2%
Constancy	2 (31.6%)

Ecology: The species prefers freshwaters with moderate or high conductivity; frequently abundant also in brackish waters. Its abundance is higher in eutrophic waters. Tolerant to α-mesosaprobic level.

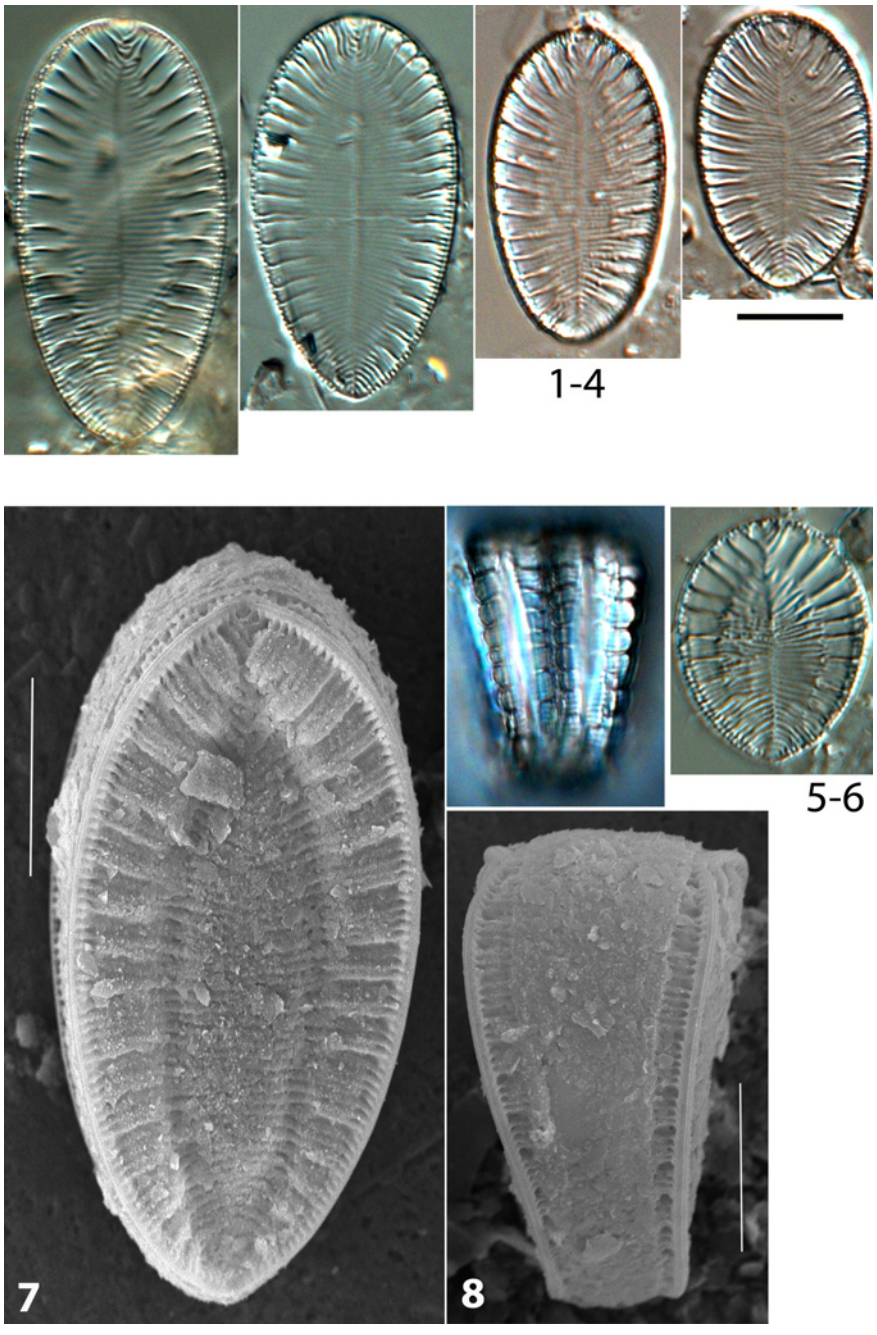


Plate 83: *Surirella brebissonii*. **Figs 1–8**: Legény-tó. – **Figs 1–4, 6–7**: valve view; **Fig. 5**: girdle view; **Fig. 7**: external view of the valve (SEM); **Fig. 8**: girdle view (SEM).

Surirella hoefleri Hustedt 1959
(Plate 84: Figs 1–10)

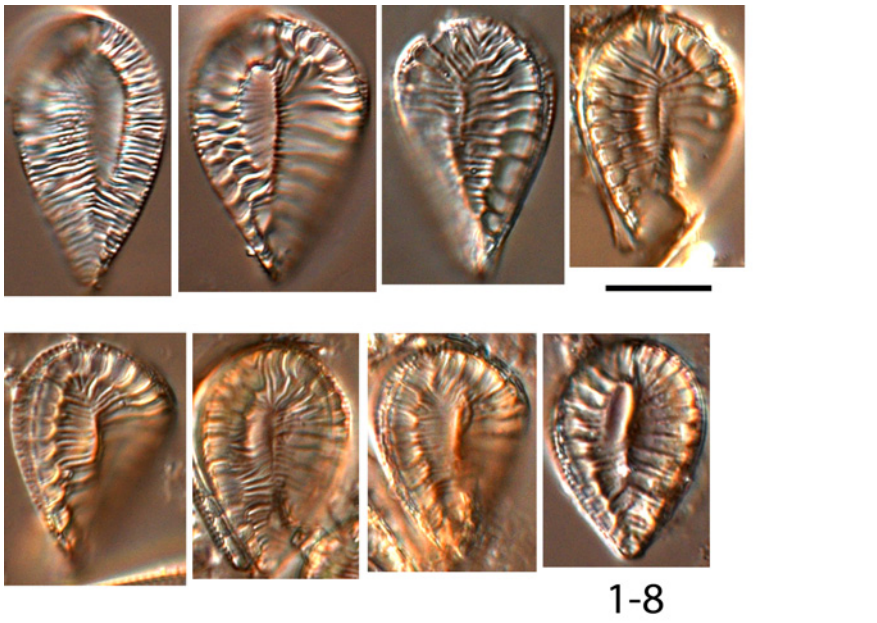
Reference: Krammer and Lange-Bertalot (1999: 182, pl. 130: 1–8).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	15–40	18–26.8
Width	13–22	12.5–17.1
Striae	16–18/10	17–19/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bába-szék, Böddi-szék, Büdös-szék, Kelemen-szék, Untersee, Zab-szék
Mean / max. abundance	0.4% / 1.6%
Constancy	1 (7.7%)

Ecology: The species is abundant in electrolyte-rich soda pans of Seewinkel around Lake Fertő (Neusiedler See).



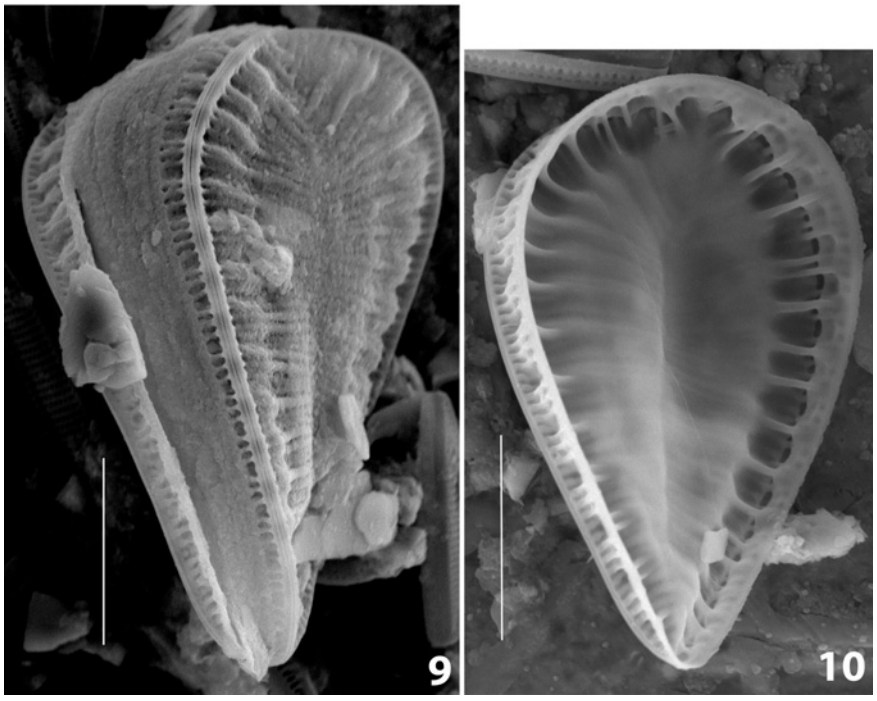


Plate 84: *Surirella hoefleri*. **Figs 1–2**: Untersee; **Figs 3–10**: Böddi-szék. – **Figs 1–10**: valve view; **Fig. 9**: external view of the valve (SEM); **Fig. 10**: internal view of the valve (SEM).

Surirella ovalis Brébisson 1838
(Plate 85: Figs 1–4)

References: Krammer and Lange-Bertalot (1999: 178, pl. 125: 1–7), English (2011), Bey and Ector (2013: 1168–1169), Hofmann *et al.* (2013: 558, pl. 129: 8–10 [1]), Taylor *et al.* (2007: pl. 175), Witkowski *et al.* (2000: 415, pl. 217: 1–3).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	16–120 [1]; 14–75 [2]	44.7–80.4
Width	12–45 [1]; 11–35 [2]	30.1–44.8
Striae	16–19/10 [1]; 14–17/10 [2]	14–17/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Böddi-szék, Kelemen-szék, Legény-tó, Zab-szék
Mean / max. abundance	1.2% / 3.6%
Constancy	1 (7.7%)

Ecology: Cosmopolitan species, not rare in inland waters with high conductivity. Abundant in marine coasts.

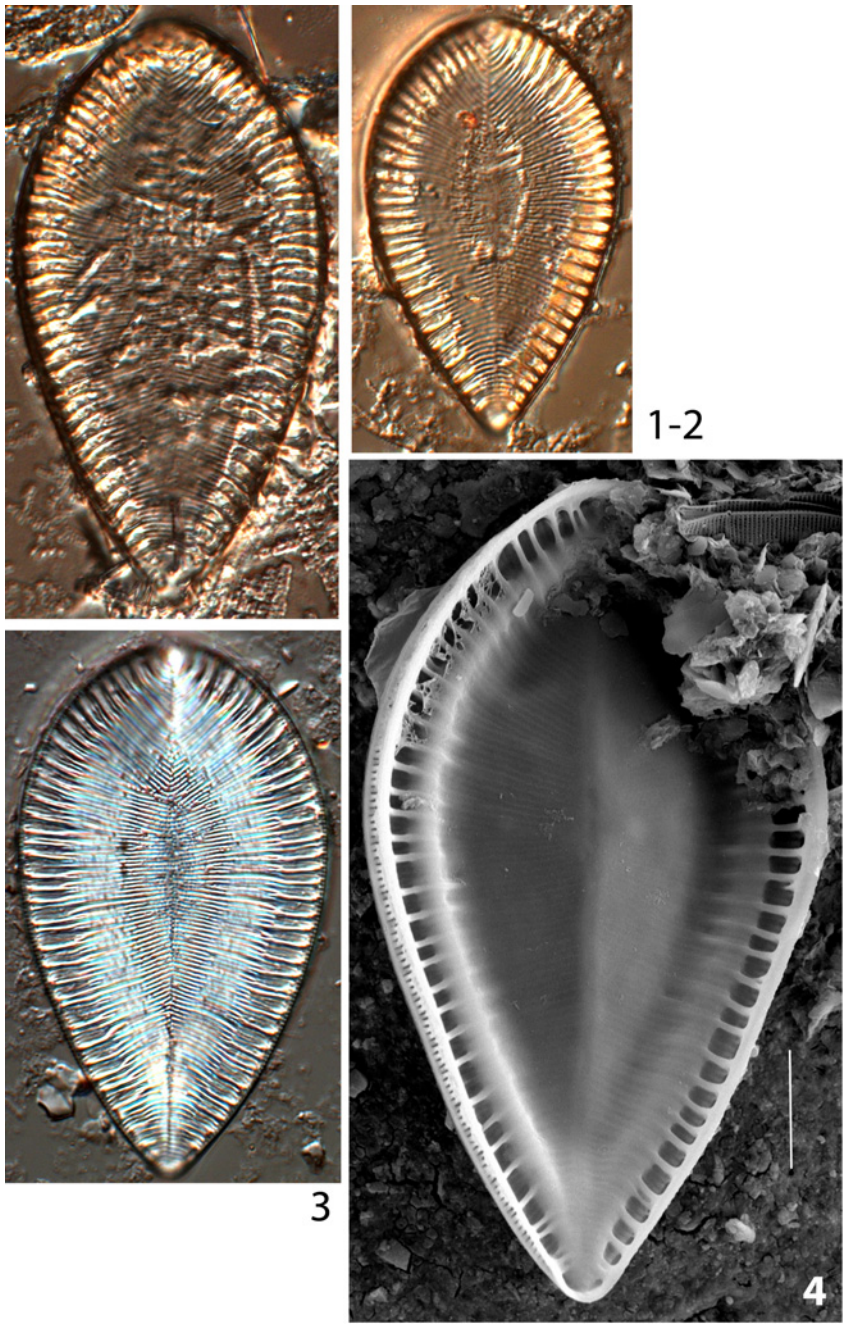


Plate 85: *Surirella ovalis*. **Figs 1–2, 4**: Legény-tó; **Fig 3**: Borsodi-dűlő. – **Figs 1–4**: valve view; **Fig. 4**: internal view of the valve (SEM).

Surirella peisonis Pantocsek 1902
(Plate 86: Figs 1–5)

References: Pantocsek (1902: 123, pl. 12: 288), Pantocsek (1912: 39, pl. 4: 186), Krammer and Lange-Bertalot (1999: 183, pl. 131: 1–3), Witkowski *et al.* (2000: 416, pl. 218: 7).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	60–120	51.8–75.9
Width	40–70	35.9–54.4
Striae	15–18/10	15–16/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Kelemen-szék, Legény-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Untersee
Mean / max. abundance	0.3% / 0.5%
Constancy	1 (8.5%)

Ecology: The species prefers inland waters with high conductivity (Lake Fertő (Neusiedler See), Balaton, Seewinkel).

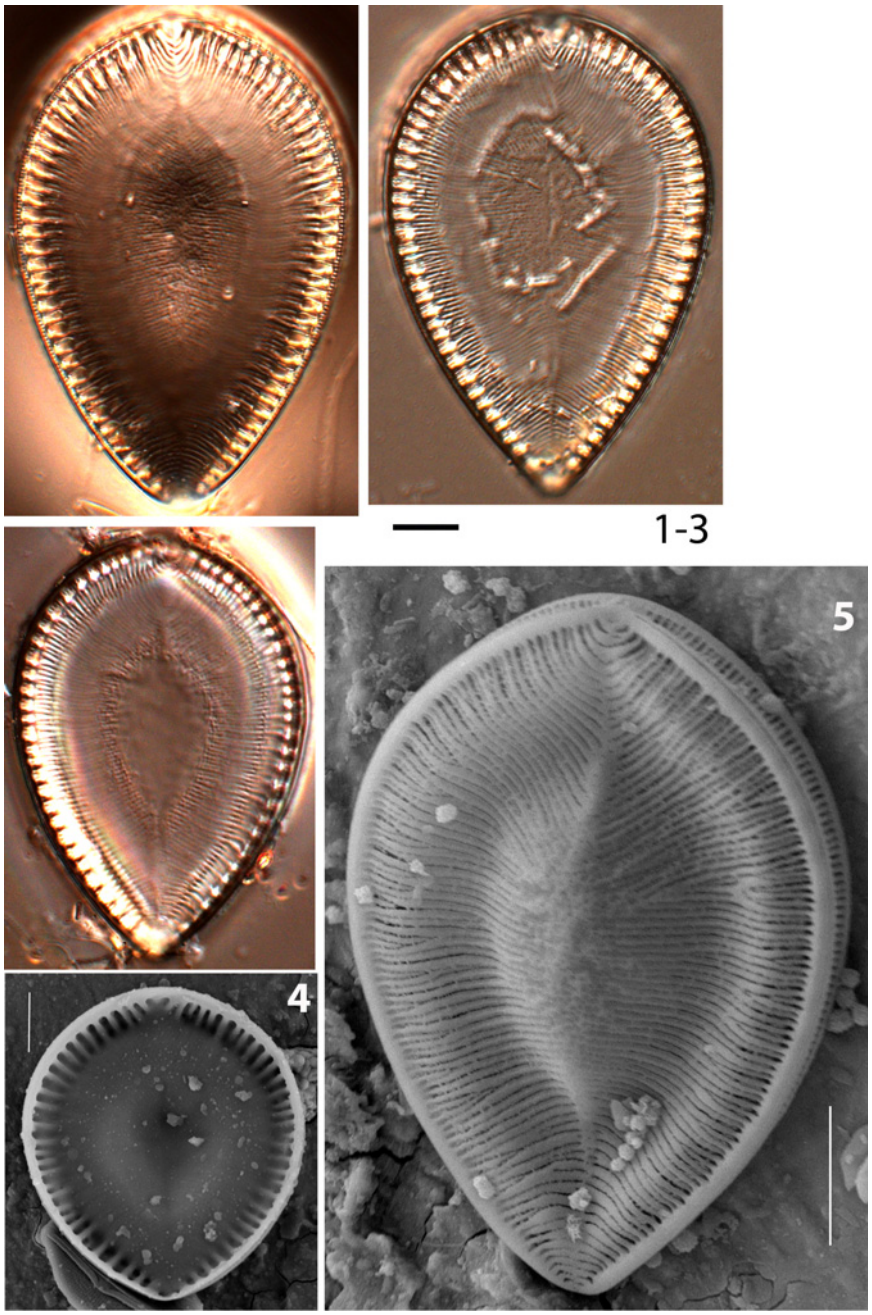


Plate 86: *Surirella peisonis*. **Figs 1–2**: Legény-tó; **Fig. 3**: Kelemen-szék; **Fig. 4**: Untersee; **Fig. 5**: Nyéki-szállás. – **Figs 1–5**: valve view; **Fig. 4**: internal view of the valve (SEM); **Fig. 5**: external view of the valve (SEM).

Surirella sp. 1
(Plate 87: Figs 1–14)

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	–	21–48.6
Width	–	13.4–20.7
Striae	–	16–19/10
Infundibula	–	4–6/10

Distribution in soda pans of the Carpathian Basin

Lakes	Böddi-szék, Büdös-szék, Kelemen-szék, Zab-szék
Mean / max. abundance	1.2% / 2.6%
Constancy	1 (5%)

Taxonomical note: This species is longer than *Surirella hoefleri* (length: 15–40 μm) and less rotated.

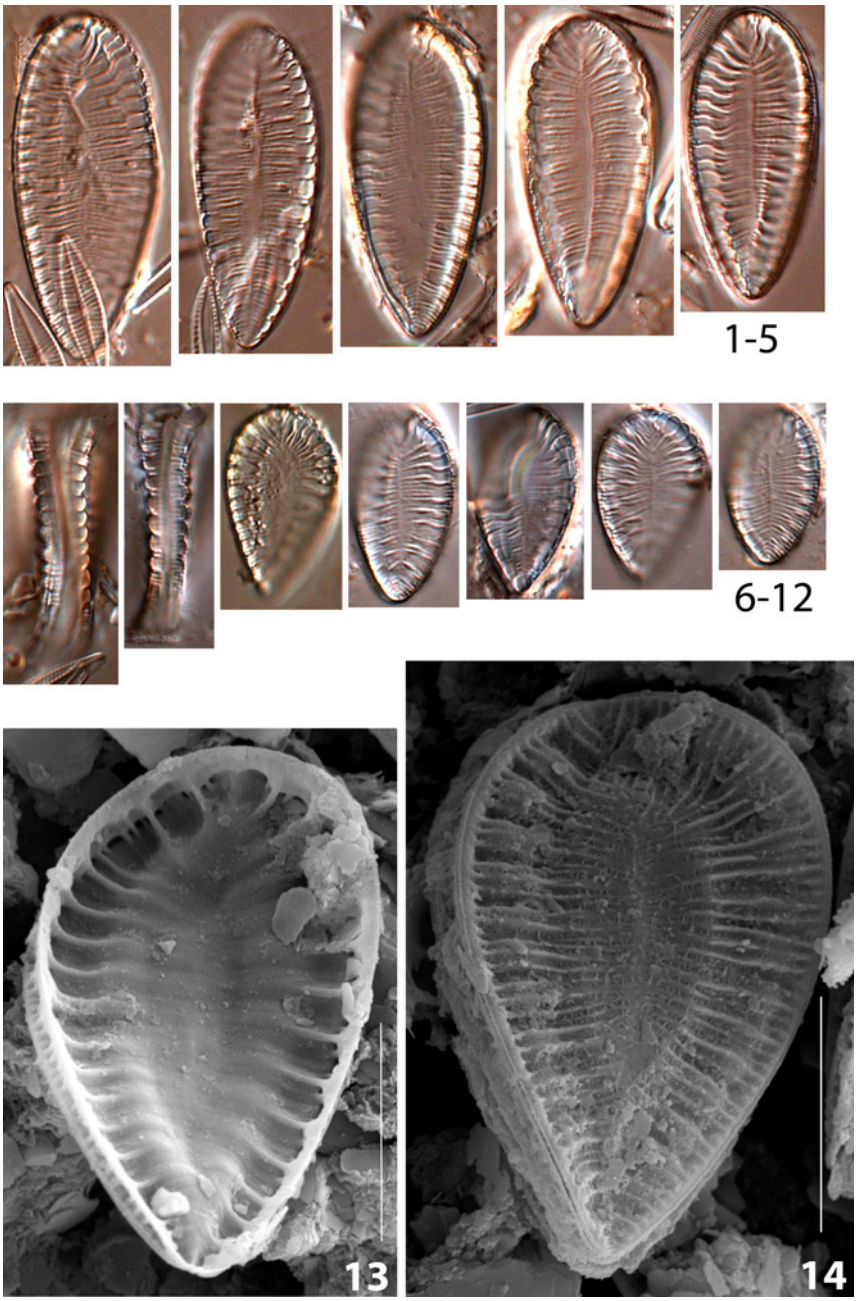


Plate 87: *Surirella* sp. 1. **Figs 1–5, 7**: Zab-szék; **Figs 6, 9–12**: Büdös-szék; **Figs 8, 13–14**: Böddis-szék. – **Figs 1–14**: valve view; **Figs 6–7**: girdle view; **Fig. 13**: internal view of the valve (SEM); **Fig. 14**: external view of the valve (SEM).

Tabularia fasciculata (Agardh) D. W. Williams et Round 1986 (Plate 88: Figs 1–14)

References: Krammer and Lange-Bertalot (2000: 150, pl. 135: 1–18 (*Fragilaria fasciculate*)), Bey and Ector (2013: 278–279), Hofmann *et al.* (2013: 564, pl. 4: 3–7), Taylor *et al.* (2007).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	22–176	56.2–118.2
Width	4.5–8	4–5.1
Striae	9–14/10	13–14/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Böddi-szék, Büdös-szék (Pusztaszer), Cikes, Fehér-szék, Herrnsee, Legény-tó, Nyéki-szállás, Pap-rét, Szarvas-tó, Untersee, Zicklacke
Mean / max. abundance	5.2% / 49.7%
Constancy	2 (23.1%)

Ecology: Cosmopolitan species with extremely wide ecological spectrum. Abundant in brackish waters, marine and freshwaters with moderate and high conductivity.

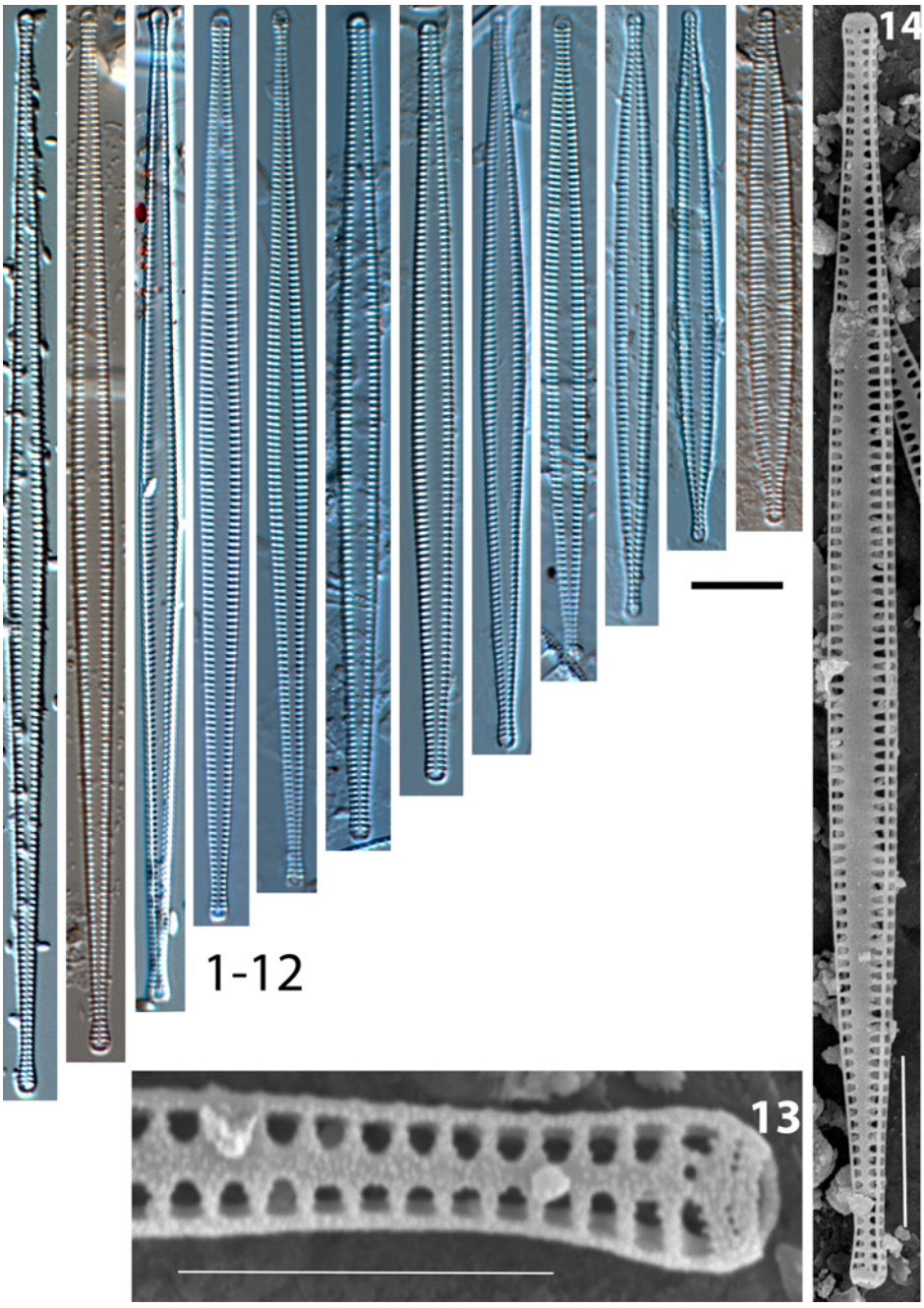


Plate 88: *Tabularia fasciculata*. **Figs 1–14**: Borsodi-dűlő. – **Figs 1–14**: valve view; **Fig. 13**: apex of the valve (SEM); **Fig. 14**: external view of the valve (SEM).

Tryblionella apiculata W. Gregory 1857
(Plate 89: Figs 1–16)

References: Krammer and Lange-Bertalot (1999: 43, pl. 35: 1–6 (*Nitzschia constricta*)), Bey and Ector (2013: 1108–1109), Hofmann *et al.* (2013: 439, pl. 104: 18–22 (*Nitzschia constricta*)), Taylor *et al.* (2007: pl. 138), Witkowski *et al.* (2000: 377, pl. 187: 8–12 (*Nitzschia constricta*)).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	20–58	31.7–51.3
Width	4.5–8.5	5.4–8.1
Striae	15–20/10	16–17/10
Fibulae	15–20/10	16–17/10

Distribution in soda pans of the Carpathian Basin

Lakes	Albersee, Borsodi-dűlő, Büdös-szék (Pusztaszer), Hernsee, Kirchsee, Legény-tó, Nyéki-szállás, Ősze-szék, Pap-rét, Untersee, Zicklacke
Mean / max. abundance	5.7% / 29.8%
Constancy	3 (40.2%)

Ecology: Cosmopolitan species in electrolyte-rich waters. Tolerant to α-mesosaprobic level.

Taxonomical note: *Tryblionella hungarica* can be longer (maximal length: 130 μm), its fibulae density is smaller (7–12/10 μm), and two striae belong to a single fibula.

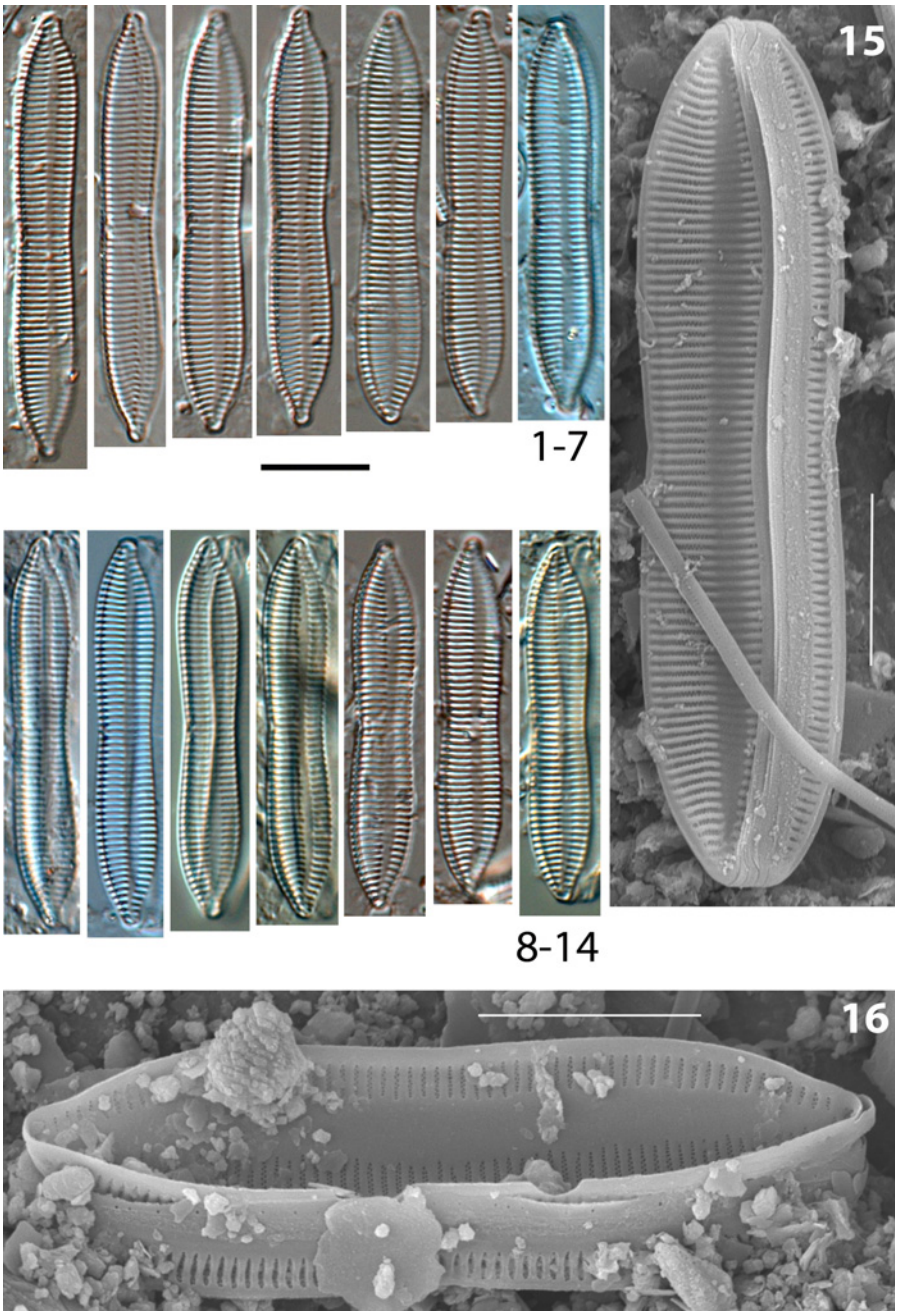


Plate 89: *Tryblionella apiculata*. **Figs 1–10, 16**: Borsodi-dűlő; **Figs 11–14**: Nyéki-szállás; **Fig. 15**: Legény-tó. – **Figs 1–16**: valve view; **Fig. 15**: external view of the valve (SEM); **Fig. 16**: internal view of the valve (SEM).

Tryblionella gracilis W. Smith 1853
(Plate 90: Figs 1–5)

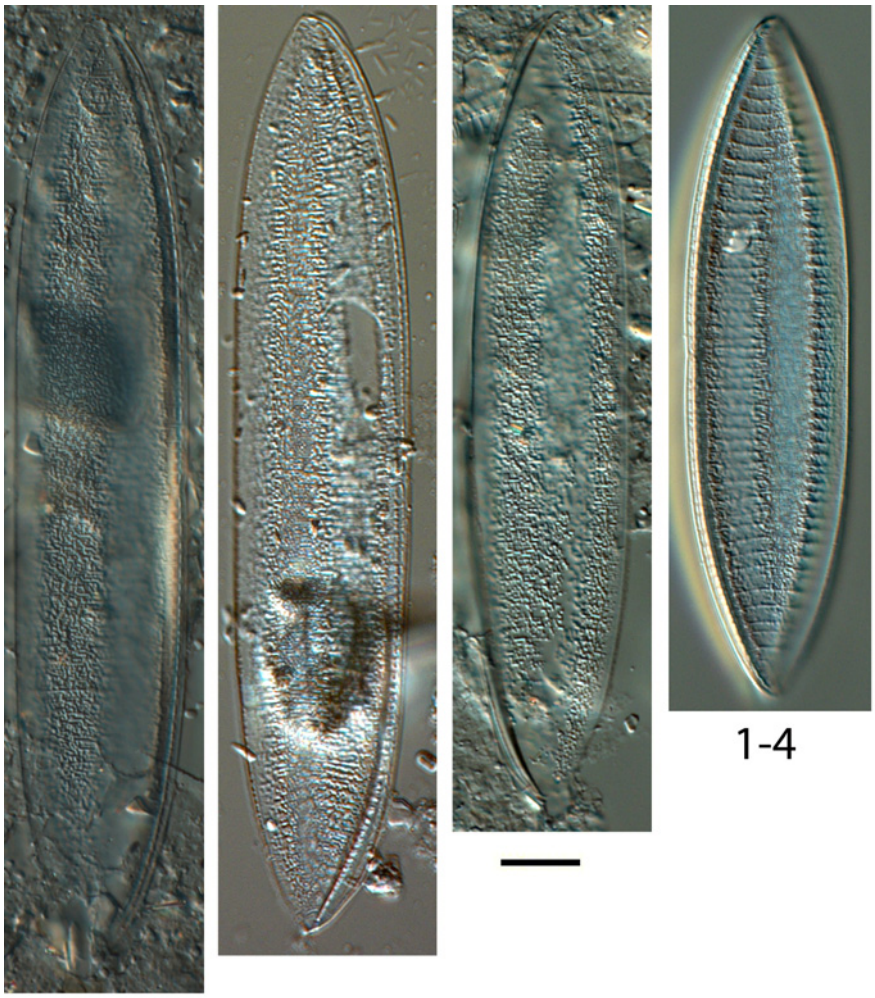
References: Krammer and Lange-Bertalot (1999: 37, pl. 27: 1–4 (*Nitzschia tryblionella*)), Bey and Ector (2013: 1112–1113), Hofmann *et al.* (2013: 466, pl. 103: 14 (*Nitzschia tryblionella*)), Taylor *et al.* (2007: pl. 141).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	50–180	70.7–181.8
Width	16–35	16.6–23
Fibulae	5–9/10	6–8/10

Distribution in soda pans of the Carpathian Basin (Fertő–Hanság region)

Lakes	Borsodi-dülő, Legény-tó, Nyéki-szállás
Mean / max. abundance	1.4% / 9%
Constancy	2 (21.1%)

Ecology: Species is abundant in brackish waters, in marine coasts and in electrolyte-rich, alkaline waters with high organic and inorganic nutrients.



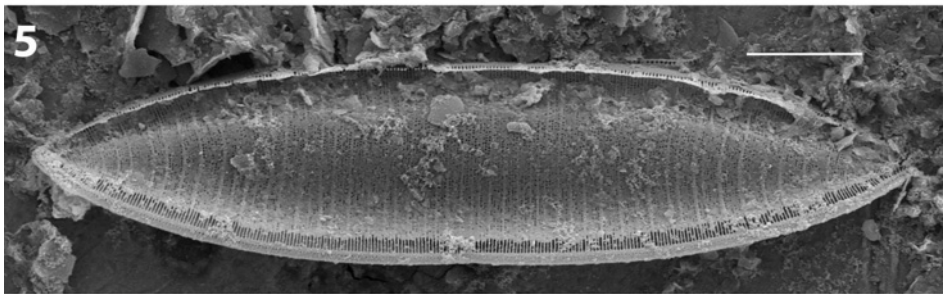


Plate 90: *Tryblionella gracilis*. **Figs 1–5**: Legény-tó. – **Figs 1–5**: valve view; **Fig. 5**: external view of the valve (SEM).

Tryblionella hungarica (Grunow) Frenguelli 1942 (Plate 91: Figs 1–16)

References: Krammer and Lange-Bertalot (1999: 42, pl. 34: 1–3 (*Nitzschia hungarica*)), Bey and Ector (2013: 1114–1115), Hofmann *et al.* (2013: 449, pl. 104: 3–7 (*Nitzschia hungarica*)), Taylor *et al.* (2007: pl. 139), Witkowski *et al.* (2000: 385, pl. 88: 10–11 (*Nitzschia hungarica*)).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	35–130	35.6–123.5
Width	5–9	6.8–9.2
Striae	16–22/10	16–18/10
Fibulae	7–12/10	8–10/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Borsodi-dűlő, Büdös-szék (Pusztaszer), Nyéki-szállás
Mean / max. abundance	1.5% / 3.6%
Constancy	1 (2.6%)

Ecology: The species is abundant in electrolyte-rich waters, in inland waters with moderate and high electrolyte content. Tolerant to α-mesosaprobic level.

Taxonomical note: *Tryblionella apiculata* is shorter (maximal length: 58 μm) and one stria belongs to a single fibula.

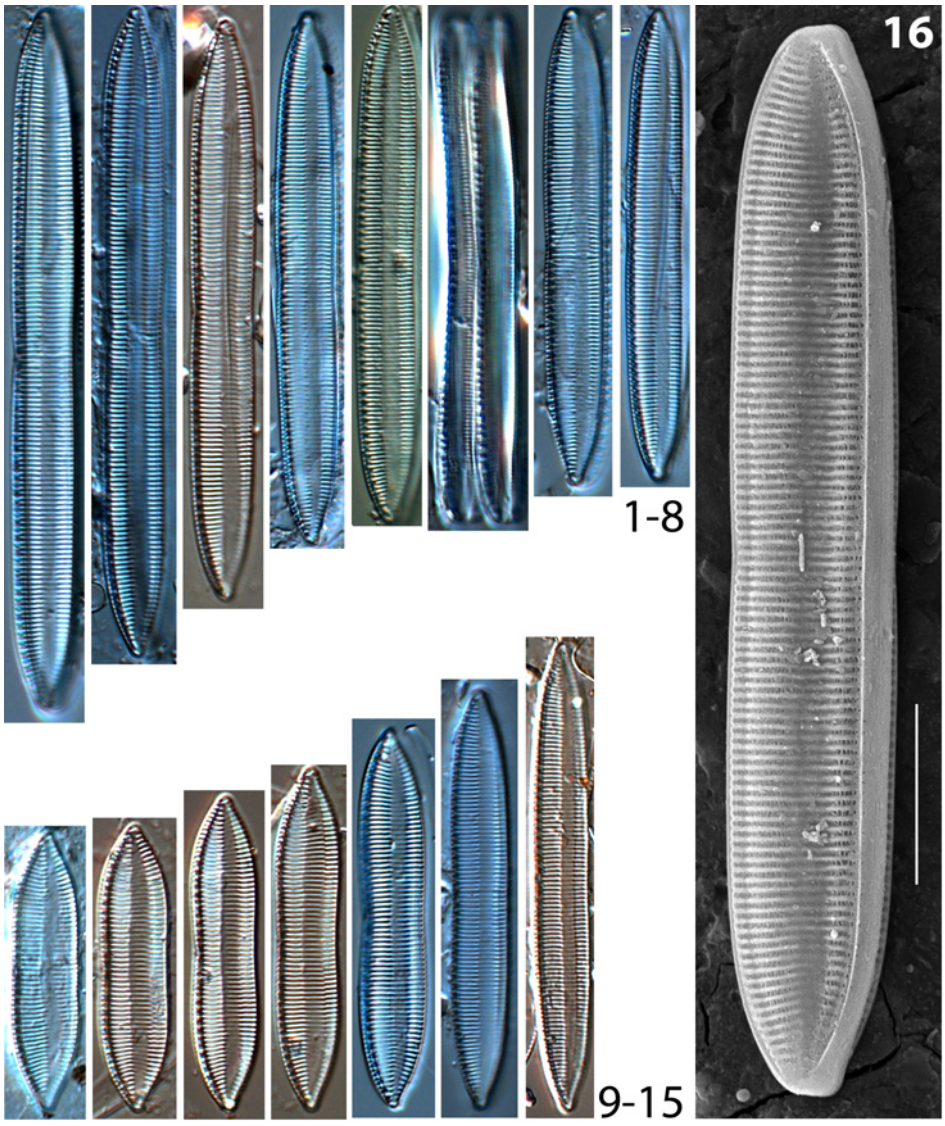


Plate 91: *Tryblionella hungarica*. **Figs 1–5, 7–9, 13–14, 16**: Borsodi-dűlő; **Figs 6, 10–12, 15**: Nyéki-szállás. – **Figs 1–16**: valve view; **Fig. 16**: external view of the valve (SEM).

Ulnaria acus (Kützing) Aboal 2003
(Plate 92: Figs 1–11)

References: KRAMMER and LANGE-BERTALOT (2000: 144, pl. 119:8, pl. 122: 11–13 (*Fragilaria ulna* var. *acus*)), HOFMANN *et al.* (2013: 256, pl. 5: 1–5 (*Fragilaria acus*)), BEY and ECTOR (2013: 282–283), TAYLOR *et al.* (2007: pl. 12 (*Fragilaria ulna* var. *acus*)).

	Morphological parameters (µm)	Observations in soda pans (µm)
Length	~27–600	90.5–224.3
Width	~2–9	3.1–4.5
Striae	12–18/10	12–15/10

Distribution in soda pans of the Carpathian Basin

Lakes	Borsodi-dűlő, Csárda-szék, Kardoskúti Fehér-tó, Kondor-tó, Legény-tó, Ősze-szék, Pirtói Nagy-tó, Szarvas-tó
Mean / max. abundance	2.2% / 13.2%
Constancy	1 (12.8%)

Ecology: Abundant in alkaline lakes and rivers with moderate and high trophic level.

Taxonomical note: Until 1990 the species had been considered as a member of genus *Synedra*, later *Fragilaria* and since 2003 *Ulnaria*.

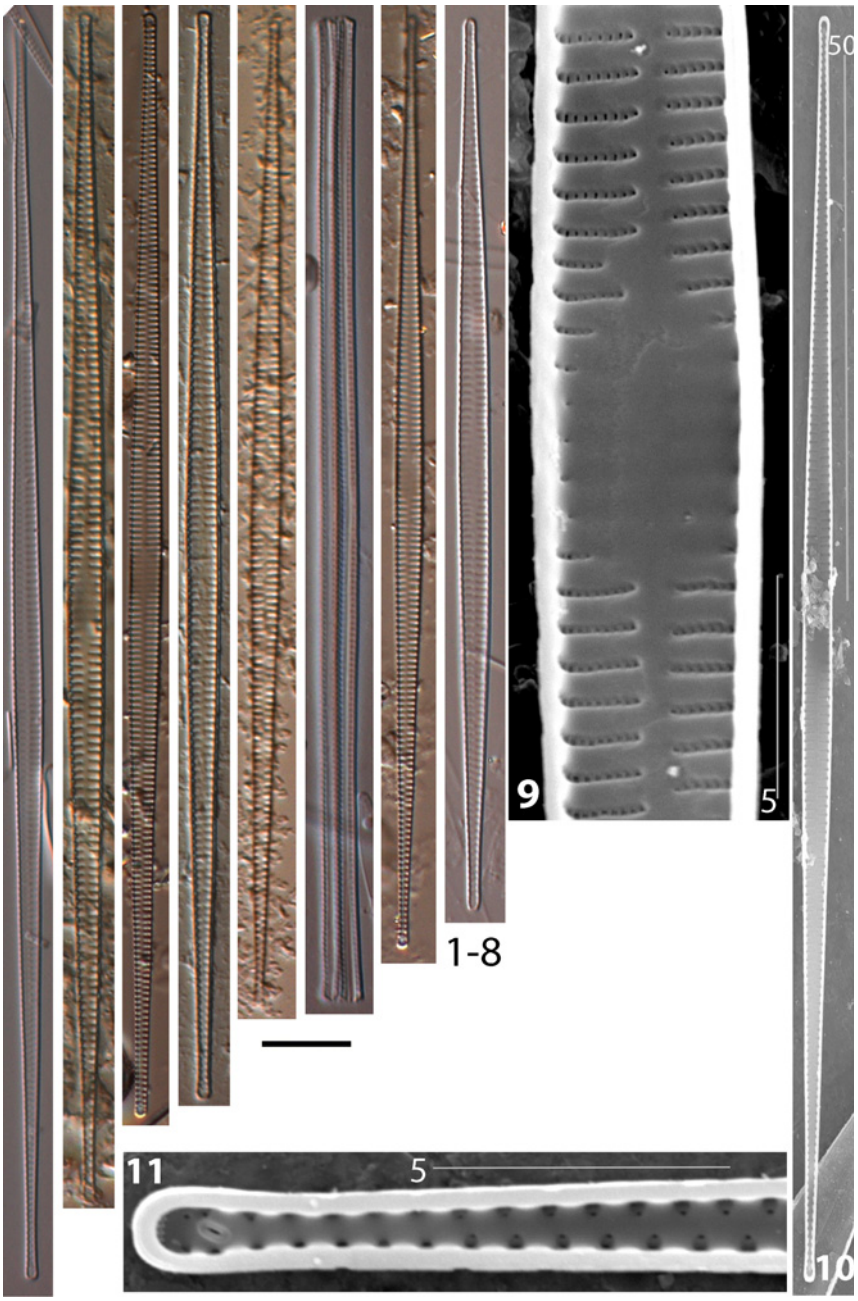


Plate 92: *Ulnaria acus*. **Fig. 1**: Szarvas-tó; **Figs 2–5, 7, 9–11**: Legény-tó; **Figs 6, 8**: Ősze-szék. – **Figs 1–8, 10**: valve view; **Fig. 9**: central area, internal view of the valve (SEM); **Fig. 10**: internal view of the valve (SEM); **Fig. 11**: apex of the valve, internal view (SEM).

Ulnaria ulna (Nitzsch) Compère 2001
(Plate 93: Figs 1–12)

References: Krammer and Lange-Bertalot (2000. 143, pl. 119–122 (*Fragilaria ulna*)), Bey and Ector (2013: 290–291), Hofmann *et al.* (2013: 276, pl. 5: 6–11 (*Fragilaria ulna* var. *ulna*)), Taylor *et al.* (2007: pl. 11 (*Fragilaria ulna*)).

	Morphological parameters (μm)	Observations in soda pans (μm)
Length	~50–250	150–236.6
Width	~3.5–9	5.2–7.7
Striae	7–12/10	9–12/10

Distribution in soda pans of the Carpathian Basin

Lakes	Bíbic-tó, Borsodi-dűlő, Büdös-szék (Pusztaszer), Kardoskúti Fehér-tó, Kirchsee, Legény-tó, Ősze-szék, Pirtói Nagy-tó, Sárkány-tó, Szarvas-tó
Mean / max. abundance	0.6% / 2.2%
Constancy	1 (11.1%)

Ecology: Abundant in waters with oligo- to polytrophic and with oligosaprobic to α-mesosaprobic conditions.

Taxonomical note: Until 1990 the species had been assigned to *Synedra ulna*, later to *Fragilaria ulna* and since 2001 to *Ulnaria ulna*.

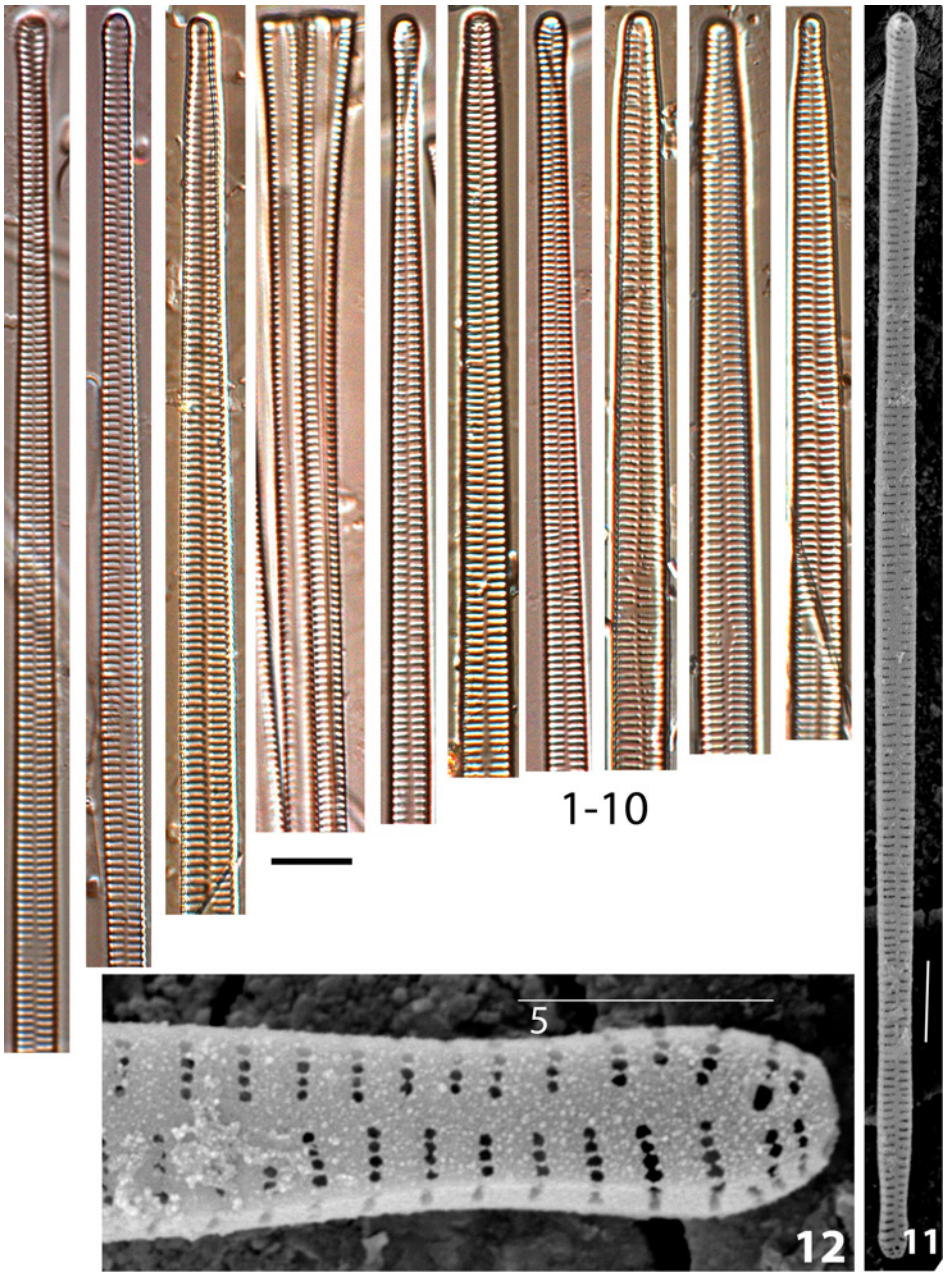


Plate 93: *Ulnaria ulna*. **Figs 1–2, 4–5, 7**: Ősze-szék; **Figs 3, 6, 8–12**: Legény-tó. – **Figs 1–3, 5–11**: valve view; **Fig. 4**: girdle view; **Fig. 11**: external view of the valve (SEM); **Fig. 12**: apex of the valve, external view (SEM).

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Összefoglaló: Szikes tavaink különleges élőhelyek, akár fizikai és kémiai tulajdonságukat, akár élővilágukat tekintjük. Ezen veszélyeztetett élőhelyek megőrzése a következő generációk számára fontos feladatunk, mint ahogy ökológiai állapotuk helyes megítélése is. Ez utóbbi alapja a pontos fajhatározás. Ennek érdekében a Víz Keretirányelvnek köszönhetően egyre több ország jelenteti meg saját kovaalga-ikonográfiáját az európai taxonómiai útmutatókon túl. Ennek ellenére hazánkban bentikus kovaalgákról fotódokumentáció csak elvétve kerül publikálásra, és ha igen, akkor is csak egy-egy faj egyetlen egyedéről. Tanulmányunkat ezért hiánypótlásnak szánjuk, olyan élőhelyek kovaalgáiról, melyek európai szinten, de világviszonylatban is unikálisak. Kis szikes tavainkból (31 tóból) 2005 és 2013 között 207 élőbevonat-mintát gyűjtöttünk, melyekből roncsolás után 400 kovaalgavázat számoltunk meg. Összesen 188 kovaalgataxont azonosítottunk, melyből jó néhány vörös listás faj. Ebben a tanulmányban a 93 leggyakoribb és/vagy domináns taxont mutatjuk be részletesen. A taxonokat populációszinten vizsgáltuk és megadtuk a morfológiai paraméterek szikesekben tapasztalható tartományát. A 93 taxonból 5 faj taxomómiai pozíciója még nem tisztázott. Összesen 1257 fény- és 180 pásztázó elektronmikroszkópos képet közlünk a tisztított valvákról és frusztulomokról, valamint élő sejtekről is. Részletes információt nyújtunk a fajok előfordulásáról, átlagos relatív gyakoriságáról és konstanciájáról.

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