

# Desmids (Conjugatophyceae, Viridiplantae) from the Czech Republic; new and rare taxa, distribution, ecology

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**Abstract:** The present work summarizes the current diversity, distribution and autecology of desmids found within the Czech Republic; the focus is on the occurrence and autecology of rare taxa. Data are based on the author's extensive sampling from 2003–2009, during work for both his master's degree, and currently, his Ph.D. dissertation. Over 1 400 samples were collected, from various types of wetland habitats ranging from eutrophic fishponds, diverse bogs and fens, to ephemeral pools and various aerophytic habitats. Altogether, 526 taxa of desmids (401 species) belonging to 27 genera were found, 80 of them newly described in the Czech Republic. In the present work, 169 rare or otherwise noteworthy taxa, belonging to the following genera: *Mesotaenium* (1), *Netrium* (1), *Roya* (2), *Tortitaenia* (1), *Gonatozygon* (2), *Closterium* (14), *Haplotaenium* (2), *Pleurotaenium* (3), *Docidium* (1), *Actinotaenium* (6), *Euastrum* (9), *Micrasterias* (7), *Cosmarium* (78), *Xanthidium* (7), *Staurodesmus* (4), *Staurastrum* (25), *Cosmocladium* (2), *Sphaerozosma* (2), *Hyalotheca* (1) and *Desmidium* (1) are depicted by line drawings and briefly discussed with regard to their ecology, taxonomy or distribution within the Czech Republic or Central Europe. In addition, SEM images are provided for 45 taxa, and, finally, a comprehensive table is included with indicative notations concerning all taxa found.

**Key words:** bioindicators, Czech Republic, desmids, distribution, ecology, rare taxa, species diversity

## Introduction

Although the study of desmids has a very long tradition in the Czech Republic (ŠŤASTNÝ 2005), and many studies carried out in this country have been considered, at least in part, with this group of algae, knowledge of the diversity and distribution of desmids in the Czech Republic remains scarce. This is largely due to the extremely small number of high-quality, specialized publications appearing over the past 40 years, and to the fact that many works, particularly older ones, lack algal illustrations, and therefore, their data must be regarded with much reserve. Moreover, due to the recent negative impact of human activity (acidification, eutrophication), which causes changes in the nature of wetland biotopes (LEDERER 1998; KOUWETS 1999), it is highly probable that the majority of previously acquired data is at present already invalid or obsolete. This, unfortunately, also applies to the localities that were once the most desmid-rich within the Czech Republic (see PASCHER 1903, 1906; LÜTKEMÜLLER 1910; JAPP 1930b; ROSA 1951; RŮŽIČKA 1973) that currently have either been destroyed, or their character has

been completely altered.

The primary objective of the present work was to remedy the above-mentioned lack of reliable data on the occurrence and distribution of desmids in the Czech Republic, and the pragmatic reason for this undertaking is that the material is simply too voluminous to publish in the form of a journal article.

However, the present work was not designed to be a true flora, like e.g. RŮŽIČKA (1977, 1981), LENZENWEGER (1996, 1997, 1999, 2003b) or COESEL & MEESTERS (2007). These works are sufficient for a routine determination of desmids from the Czech Republic, because they are aimed at desmids from climatically similar regions, and, as they are adequate and quite satisfactory I thought it more effective to avoid overlapping descriptions or accounts of common taxa. Instead, it seemed much more consequential to focus in greater detail on rare, often poorly known, taxa, some of them even not mentioned in any of the floras mentioned above.

A fundamental problem in the traditional desmid taxonomy based upon morphology is the frequent descriptions of new taxa based

on unsubstantiated evidence of only slight morphological differences; this fails to take into account the natural morphological plasticity of the particular taxa (RŮŽIČKA 1955b; GRÖNBLAD & RŮŽIČKA 1959; KOUWETS 1988, 2008). Therefore, where possible, all taxa discussed herein (especially little-known taxa), were illustrated by more than one drawing to demonstrate the extent of their morphological variability. Moreover, for every taxon some basal data [dimensions, reference to sampling sites, most frequently used synonym(s)] are listed, and each taxon is briefly discussed with respect to publications reporting it from the Czech Republic, and where available, some notes concerning its taxonomy or autecology are attached.

As an overview of all taxa found and to allow a quick retrieval of basal information concerning a particular species, a comprehensive, notated table is included (Table 1). In this table, analogically to COESEL (1998a), the following aspects of the ecology of every taxon are evaluated:

**Trophic state of the habitat.** Three classes are distinguished: oligotrophic (low concentrations of nutrients, little aquatic biomass), mesotrophic (moderately rich in nutrients) and eutrophic (high concentrations of nutrients, large aquatic biomass).

**Acidity.** Three classes are distinguished: acidophilous (occurring at pH < 6.5), circumneutral (pH 6.5–7.5) and alkaliphilous (pH > 7.5).

**Life form.** Three types are distinguished: atmophytic (living in a thin water film of wet, periodically desiccating substrates), benthic (living on the under-water soil or associated with submerged aquatic plants) and planktonic (living in large water bodies, passively floating).

**Rarity.** Three categories are distinguished: (1) occasional occurrence; (2) rare; (3) very rare. Common and easily confusable species (in particular some small, smooth-walled *Cosmarium* taxa or some *Staurastrum* species with arm-like processes) are not labeled.

**Ecological sensitivity.** This parameter reflects the maturity and degree of inner complexity of the ecosystem that a particular species is indicative of, and, indirectly, also indicates its vulnerability, and the time necessary for its restoration. Clearly, the more complex (internally differentiated) an ecosystem, the more susceptible it becomes to being disturbed, and the more time is required for its restoration (COESEL

1998a, 2001). Marks range from 1 (moderately indicative, occurring also in earlier succession stages) to 3 (most indicative; the species in question seems to be characteristic of highly structured, finely balanced ecosystems). Taxa with a wide ecological amplitude, not being indicative of a vulnerable habitat type, and taxa easily confused with others were not labeled.

Contrary to COESEL (1998a), and to preclude inaccuracies, not only all species, but also all infraspecific taxa have been labeled in Table 1 as to their basic parameters, because they often observably represent separate species having ecological demands completely different from the nominate variety (compare e.g. *Xanthidium antilopaeum* KÜTZ. and its "var." *laeve* SCHMIDLE). Moreover, some infraspecific taxa clearly representing only phenotypical forms of the nominate variety (e.g. *Micrasterias americana* RALFS var. *boldtii* GUTW.) were not included in the table. All values for individual parameters listed (particularly "rarity" values) are based only on the author's personal opinion, records and experience; earlier records were not considered. Therefore, the data reflect only the current situation, but considering the large number of samples they are based upon, and the wide spectrum of habitats they represent, they can be presumed to be representative of the Czech Republic as a whole, although the true current biodiversity of desmids within the Czech Republic is undoubtedly somewhat greater. For instance, ŠTĚPÁNKOVÁ et al. (2008) reported some species from the Jizerské hory Mts not included in Table 1, and the author himself found several taxa that he was unable to identify reliably; some of these will be described as new species elsewhere.

The last-mentioned parameter (ecological sensitivity of the individual species), may provide additional (next to e.g. species diversity), interesting information about the particular habitat sampled. It has been put into practice by Coesel who used the fact that desmids are ecologically highly sensitive bioindicators and developed a complex method for evaluating and quantifying the nature conservation value of a given aquatic site based on the vulnerability of the ecosystem as indicated by the composition of its desmid flora (COESEL 1998a, 2001; see also COESEL 2003 and COESEL & MEESTERS 2007; CD attached). Principally, this method is based on three criteria (species diversity, the occurrence of rare species and the occurrence of ecologically sensitive

species), and has been primarily tailored to Dutch conditions, but, as mentioned by Coesel himself, it might also be applicable in geographically similar areas, which would include the Czech Republic. The very processes of evaluation and collection of the data necessary for the assessment of nature values (particularly the transformation schemes for individual water types) are suitable for Czech conditions, and may be found in the above-mentioned publications (COESEL 1998a, 2001; COESEL & MEESTERS 2007; CD attached) along with some examples of the method's application.

Nevertheless, there are some differences between these two countries, and due to considerable contrast particularly as concerns the rarity of some taxa in both countries, it seemed more accurate to calibrate the species-related data according to the Czech conditions, as summarized in Table 1.

## Material and methods

The samples were taken from various types of wetland habitats ranging from eutrophic fishponds, diverse bogs and fens, to ephemeral pools and various aerophytic habitats. The sampling sites are designated on a map (Fig. 1).

The algal material was collected by squeezing out dominant aquatic plants and mosses and aspirating the algae from the sediment with a syringe. Plankton was sampled using a plankton net with 20 or 40 µm mesh. Environmental variables (pH, conductivity) were measured either with Combo HI 98129 (HANNA, Germany) portable instrument or with a pH-meter WTW 330 and conductometer WTW LF 315 (WTW, Germany). Preparations were made by mixing one drop of material with one drop of glycerin, and drawings were made with the aid of a drawing apparatus. The following abbreviations are used in the text: (Syn.) synonym(s); (Dim.) dimensions; (L) length; (B) breadth; (Ls) length without spines; (Lc) length with spines; (Bs) breadth without spines; (Bc) breadth with spines; (I) isthmus; (Occ.) occurrence; (rr) very rare; (r) occasional; (c) abundant; (cc) very abundant; (m) mass occurrence.

Records of the individual taxa within the Czech Republic were ascertained from the publications of LHOŠTský & ROSA (1955) and POULÍČKOVÁ et al. (2004) and several other sources not included in those works, such as: ROUBAL (1939), LHOŠTský (1954), ŠIMEK (1992, 1997), LEDERER (1998), LEDERER et al. (1998), NEUSTUPA et al. (2002), ŠEJNOHOVÁ et al. (2003), NOVÁKOVÁ (2003, 2004), KITNER et al. (2004), HAŠLER et al. (2008) and ŠTĚPÁNKOVÁ et al. (2008). Taxa that are new for the

Czech desmid flora, are designated with an asterisk (\*) before the species name.

For scanning electron microscopy (SEM) glass coverslips (10 mm in diameter) were washed with acetone, placed on a heating block, and coated three times with a poly-L-lysine solution (1:10 in distilled water) to ensure better adhesion of the desmid cells. After cooling, a drop of the formaldehyde-fixed material was placed on the glass and when almost dry, it was transferred into 30% acetone and dehydrated by an acetone series (30, 50, 70, 90, 95, 99% and 2x in 100%, 10 minutes each). Finally, the cells were dried to critical-point with liquid CO<sub>2</sub>, subsequently sputter coated with gold and examined using Phenom Desktop scanning electron microscope.

## Results and discussion

### *Mesotaenium caldarium (LAGERH.) HANSG. (Fig. 2)*

Dim.: L: 35–48 µm, B: 11.5–12 µm  
Occ.: 36rr, 40rr

Aerophytic species readily distinguished by the conically attenuated and usually slightly asymmetrical (COESEL & MEESTERS 2007) cell poles. It is typically reported from artificial habitats such as rain drain pipes (see COESEL et al. 2006). Its two previous findings from within the territory of the Czech Republic (CZURDA 1946; KOMÁREK & ROSA 1957) were from this type of habitat, however, interestingly, I found it only in natural settings.

### \**Netrium pseudactinotaenium* COESEL (Figs 3–6)

Dim.: L: 36–59 µm, B: 17.5–20 µm  
Occ.: 1rr (at an oligotrophic, acidic site with pH = 4.4), 30r, 102rr

Strictly acidophilous, only very recently described species characterized in particular by plasmatic strings that create the impression of a grooved cell edge (COESEL 2002). To date it has been reported, to my knowledge, only from the type site in The Netherlands; thus, my case constitutes its second global published record. Judging from the nature of my sampling sites, its occurrence is limited to well-preserved biotopes, almost untouched by human activity.

**\**Roya cambrica* W. et G.S.WEST (Fig. 7)**

Dim.: L: 133–171 µm, B: 6.5–7 µm

Occ.: 17rr

*Roya cambrica*, most likely, is a very rare species, reported within Europe only from Great Britain and Norway (KRIEGER 1937), and recently also from The Netherlands (COESEL & MEESTERS 2007).

**\**Roya closterioides* COESEL (Figs 8–12)**

Dim.: L: 50–125 µm, B: 2.5–3.3 µm

Occ.: 1rr, 6rr, 9rr, 13cc, 17m, 24rr, 25r, 47rr, 99rr

This species has only been described very recently by COESEL (2007). Its cells differ from those of the similar *Roya pseudoclosterium* (J.Roy) W. et G.S.WEST described by WEST & WEST (1896) by their fusiform shape, somewhat more irregular curving and, on average, a slightly shorter length. So far, *R. closterioides* is known only from the Dutch type locality, but the frequency of my findings indicates that it is probably not actually rare, but due to its extreme inconspicuousness and insufficient knowledge among researchers it often remains unnoticed or misidentified. From the Czech Republic only *R. pseudoclosterium* has been reported thus far (LÜTKEMÜLLER 1910; ŠTĚPÁNKOVÁ et al. 2008), but the rather short cell length of Lütkemüller's specimens (34–118 µm) indicate that his finding may in fact represent the species in question, rather than *R. pseudoclosterium*.

**\**Tortitaenia bahusiensis* (NORDST. et LÜTKEM.) COESEL (Fig. 13)**Syn.: *Spirotaenia bahusiensis* NORDST. et LÜTKEM.

Dim.: L: 25–45 µm, B: 10–10.5 µm;

Occ.: 91rr

Rare, aerophytic species that appears to be more common on artificial substrates (RIETH 1982; TOMASZEWCZ & HINDÁK 2008; see also ŠŤASTNÝ 2008) than in natural habitats.

***Gonatozygon aculeatum* HASTINGS (Figs 14–15, 340)**

Dim.: L: 87–283 µm, B: 7–11 µm

Occ.: 1r, 4r, 5r, 47rr

In Central Europe, according to RŮŽIČKA (1977), a very rare species, from the Czech Republic previously reported only by RŮŽIČKA (1973). The spines of my specimens were rather short, up to 2.5 µm, the apices typically club-shaped (Fig.

15), only in some specimens from sampling sites no. 1 and 47 similar to that of *G. monotaenium* DE BARY, i.e. slightly dilated (Fig. 14).

**\**Gonatozygon brebissonii* DE BARY var. *alpestre* RŮŽIČKA (Figs 16–18)**

Dim.: L: 25–65 µm, B: 5.5–7.5 µm

Occ.: 36cc, 40rr, 43rr

A rare taxon with a probably arctic-alpine distribution (KOUWETS 1997; ŠŤASTNÝ 2008). To date it has been reported only from the type locality in the High Tatra Mountains (RŮŽIČKA 1967) and from the Eastern Pyrenees (KOUWETS 1997).

***Clasterium archerianum* CLEVE var.*****pseudocynthia* RŮŽIČKA (Figs 19–20)**

Dim.: L: 88–118 µm, B: 11.5–13 µm

Occ.: 8rr, 21r, 25r, 29rr, 47r, 48r, 49r, 86rr, 98r, 123r

Published findings thus far only from the type locality (RŮŽIČKA 1973), from several localities in France (KOUWETS 1997), from Austria (ŠŤASTNÝ & LENZENWEGER 2008) and from the West of Ireland (JOHN & WILLIAMSON 2009). The taxon under discussion, however, is most probably often confused with the frequently co-occurring (KOUWETS 1997; personal observation) and generally much more common *Cl. cynthia* DE NOT., as mentioned by RŮŽIČKA (1977).

***Clasterium braunii* REINSCH (Figs 21–22)**

Dim.: L: 560–634 µm, B: 41–45 µm

Occ.: 47rr

This species is distinguished by its very remarkable cell wall sculpture in combination with the brownish color of the cell wall. In Central Europe is it very rare (RŮŽIČKA 1973), my finding is the first from the Czech Republic. For discussion concerning the characteristic wall-sculpture see KOUWETS (1991).

***Clasterium calosporum* WITTR. var. *brasiliense* BORGES. (Fig. 23)**

Dim.: L: 150–205 µm, B: 9–10 µm

Occ.: 1r, 4r, 17rr

According to RŮŽIČKA (1977) in Central Europe a rather common taxon that, however, seems to be rare in the Czech Republic, being formerly reported only by RŮŽIČKA (1973).

***Closterium cornu* RALFS var. *upsaliense* NORDST.****(Figs 24–25)**

Dim.: L: 42–67 µm, B: 4–5.5 µm

Occ.: 1rr, 4r, 36r, 37r, 43r, 50rr, 54rr, 100r, 118rr

According to RŮŽIČKA (1977), this taxon is rare in Central Europe, but it is possible that it often remains unnoticed because of its small dimensions. So far only one finding has been reported from the Czech Republic (ROUBAL 1958). Interestingly, in my samples the alga in question always grew sub-aerophytically. The specimens depicted by WILLIAMSON (1997, pl. 1, fig. 5) and designated as *Cl. pygmaeum* GUTW. also clearly represent the taxon in question.

***Closterium delpontei* (G.A.KLEBS) WOLLE****(Figs 26–27)**

Dim.: L: 530–813 µm, B: 28–38 µm

Occ.: 1r, 4r, 9r, 25r, 47rr, 48 rr

Rather rare species of well-preserved mesotrophic habitats. Previous findings from the Czech Republic only from Southern Bohemia (ROSA 1951, 1969; ROUBAL 1959; RŮŽIČKA 1973). Note, it was only recently described from Austria (ŠTASTNÝ & LENZENWEGER 2008), which is one of the best explored European countries in regards to desmids. Possibly, this might be due to the fact that it is similar to the closely related *Cl. lineatum* RALFS and the occasionally occurring intermediate forms are very hard to identify (RŮŽIČKA 1977).

***Closterium exile* W. et G.S.WEST (Fig. 28)**

Dim.: L: 80–100 µm, B: 7.5–8 µm

Occ.: 61rr, 113rr, 119rr

This species is readily distinguishable from similar curved *Closterium* species predominantly by a rounded apex that lacks any light-microscopically visible pore (RŮŽIČKA 1977). Its ecology is also very characteristic; it is usually detected at higher altitudes and typically grows sub-aerophytically. Previous reports of this species within the Czech Republic (RŮŽIČKA 1956, 1957a, 1957b), as well as my present findings, have been from this type of habitat.

**\**Closterium nematodes* JOSHUA var. *proboscideum* W.B. TURNER (Figs 29–31)**

Dim.: L: 213–325 µm, B: 22.5–30 µm

Occ.: 4rr, 26rr, 99r

According to KRIEGER (1937) and RŮŽIČKA

(1977) a species found mostly ordinarily in the tropics. Occurrence of the type variety (*Cl. nematodes* JOSHUA var. *nematodes*) is not convincingly documented from Central Europe; var. *proboscideum* is rare in the region (RŮŽIČKA 1977). The characteristic thickening of the cell wall below the apex was well developed in the population from sampling site no. 26 (Fig. 29), on the contrary, in populations from sampling sites no. 4 and 99 it was rather inconspicuous (Figs 30–31).

**\**Closterium pseudopygmaeum* KOUWETS****(Figs 32–33)**

Dim.: L: 28–63 µm, B: 5.8–7 µm

Occ.: 36rr, 43r, 87rr

This species is characterized by its small dimensions, a slanted apex with an apical pore (KOUWETS 2001), and occurrence predominantly in ephemeral pools and on wet substrates. However, the pore is often quite inconspicuous and may be easily overlooked, especially in fixed material. Thus far this alga has only been reported from several sites in France (KOUWETS 2001).

***Closterium pusillum* HANTZSCH (Figs 34–36)**

Dim.: L: 28–59 µm, B: 7.5–12 µm

Occ.: 7r, 38rr, 104c

Rather rare species of ephemeral habitats. Previous records from the Czech Republic include: LÜTKEMÜLLER (1910, *Cl. pusillum* var. *monolithum* WITTR.), ROUBAL (1959), ROSA (1969) and ŠEJNOHOVÁ et al. (2003).

***Closterium subulatum* (KÜTZ.) BRÉB. (Figs 37–38)**

Dim.: L: 149–232 µm, B: 6–9 µm

Occ.: 15r (in the pools), 28rr, 59rr, 121rr

Apparently a quite adaptable species. It is reported most frequently from mesotrophic, slightly acidic to neutral waters (RŮŽIČKA 1977; COESSEL 1979a; LENZENWEGER 1996; COESSEL & MEESTERS 2007), alternatively, FÖRSTER (1965) found it in a peat-bog, most likely a markedly more acidic habitat, and moreover, all of my findings came from more or less eutrophic and alkaline habitats. So far only three findings have been reported from the Czech Republic (ROSA 1951, 1968, 1969).

**\**Closterium tortitaenoides* COESEL (Figs 39–41)**

Dim.: L: 51–68 µm, B: 8–8.5 µm

Occ.: 24c (in a strongly acidic, oligotrophic pool)

This species was previously only reliably known from several sites in The Netherlands, but it is possible that it has been confused with *Cl. navicula* (BRÉB.) LÜTREM. For notes concerning its taxonomy see COESEL (2002, 2007).

***Closterium tumidum* JOHNS. (Figs 42–43)**

Dim.: L: 92–145 µm, B: 14–18 µm

Occ.: 35cc, 52rr, 54rr, 73r, 110rr, 112cc, 113c

This species is considered to be rare in Central Europe (RŮŽIČKA 1977), and is seldom reported even from neighboring countries (GUTOWSKI & MOLLENHAUER 1996; MARHOLD & HINDÁK 1998; LENZENWEGER 2003b). However, it is probably quite abundant in suitable biotopes (oligotrophic, slightly acidic to neutral waters, e.g. mountain brooks or spring areas), where it usually grows sub-aerophytically. This assumption is supported by the relatively numerous findings of this species at such sites in the Czech Republic (DVOŘÁK 1920, 1920/21; FISCHER 1924; ROSA 1939, 1951, 1969; RŮŽIČKA 1954, 1957a) as well as by the relative high number of my own records. At site no. 35, I found a very rare form with clearly recognizable apical pores (Fig. 42), the occurrence of which was only mentioned previously by RŮŽIČKA (1954, 1957a).

***Closterium tumidum* JOHNS. var. *nylandicum*****GRÖNBLAD (Fig. 44)**

Dim.: L: 125–157 µm, B: 10–11.5 µm

Occ.: 23r (growing sub-aerophytically)

A rare alga (RŮŽIČKA 1977) that might be easily confused with the much more common *Cl. cornu* RALFS, whose cells, however, are more slender and lack a distinctly inflated ventral side. To date there have been four documented findings from the Czech Republic (ROSA 1939, 1951, 1969; RYBNÍČEK 1958; as *Cl. tumidum*).

**\**Closterium turgidum* RALFS var. *giganteum* (NORDST.) DE TONI (Fig. 45)**

Dim.: L: 690–812 µm, B: 74–85 µm

Occ.: 9rr, 14rr, 25rr

This species is described as having a cell wall delicately striate, and pyrenoids scattered throughout the chloroplast. In my opinion, it is

debatable whether the taxon in question is related to the “real” *Cl. turgidum* RALFS, because there are considerable differences between both taxa as regards their morphology (see RŮŽIČKA 1977) as well as their ecology; *Cl. turgidum* is a benthic species of slightly acidic, mesotrophic bogs and fens, while, my findings, by contrast, originate from the tychoplankton of greater water bodies.

**\**Haplotaenium indentatum* KOUWETS var. *latius* KOUWETS, *morphe* (Figs 46–53, 341–342)**

Dim.: L: 66–155 µm, B: 14–18 µm

Occ.: 1rr, 3cc, 4c

The taxon in question has only been described rather recently (KOUWETS 1991) from France, but is probably often confused with the similar *Haplotaenium minutum* (RALFS) BANDO that, however, lacks the apical indentation (e.g. pl. 32, fig. 8 in COESEL & MEESTERS 2007 most likely represents *H. indentatum* var. *latius*). My material differs from that of KOUWETS (1991) by a shorter cell length resulting in a lower length/breadth ratio (L/B = 5.5–10, Kouwets reports L/B = 11–15); however, as these characters were often extremely variable, even within populations from the same sampling site, the description of the taxon in question as a new variety of *H. indentatum* may not be justified. Judging from the nature of my sampling sites, *H. indentatum* var. *latius* seems to prefer a distinctly acidic and oligotrophic environment, which is in accordance with the data of KOUWETS (1991). I recently also found it in the desmid-rich “Schwemmb bei Walchsee” bog in Austria in a similar habitat type (ŠŤASTNÝ, unpublished; see also LENZENWEGER 2000b; ŠŤASTNÝ & LENZENWEGER 2008).

***Haplotaenium rectum* (DELPONTE) BANDO (Figs 54–55)**Syn.: *Pleurotaenium rectum* DELPONTE

Dim.: L: 230–310 µm, B: 18.5–21.5 µm

Occ.: 1r, 4r, 5r, 8rr, 19rr, 25r

This species was considered to be quite rare in Central Europe (RŮŽIČKA 1977), and the only previous report of it in the Czech Republic was mentioned by ROUBAL (1939).

**Pleurotaenium eugeneum (W.B.TURNER) W. et G.S.WEST (Figs 56–58)**

Dim.: L: 520–828 µm, B: 37–47 µm  
Occ.: 1r, 9r, 13rr

The only previous finding of this species in the Czech Republic was stated by ROSA (1951), in Central Europe it is considered to be rare (RŮŽIČKA 1977). The specimen from site no. 1 (Fig. 58) differed from “typical” *Pl. eugeneum* (see RŮŽIČKA 1977) as found at sites no. 9 and 13 (Figs 56–57) by, on average, more robust cells slightly tapering toward the apices, and by semicells scarcely having detectable swellings beyond the basal inflation. Nevertheless, their determination as *Pl. eugeneum* appears to be justified enough, particularly due to the presence of the characteristic whorl of spherical granules at the apices, 9–12 granules being visible in face view (RŮŽIČKA 1977).

**\*Pleurotaenium simplicissimum GRÖNBLAD (Figs 59–61, 343)**

Dim.: L: 573–740 µm, B: 32.5–40 µm  
Occ.: 1rr, 4rr, 5rr

A species easily distinguished by rod like cells, a very slight basal inflation of the semicells, and by truncate apices provided with a whorl of tiny, longish, often inconspicuous granules (Figs 60, 343), 8–12 being visible in face view (RŮŽIČKA 1977). Interestingly, at sampling site no. 4, I usually found cells with slightly inflated semicells (Fig. 61) that might be considered an anomaly. According to RŮŽIČKA (1977), *Pleurotaenium simplicissimum* is extremely rare in Central Europe.

**Pleurotaenium tridentulum (WOLLE) W.WEST (Figs 62–64)**

Dim. (dimensions apply to half-cells only): L: 95–131 µm, B: 13.5–15 µm  
Occ.: 30r

A strictly acidophilous, in Central Europe very rare species (RŮŽIČKA 1977), with only one previous finding from the Czech Republic (ROUBAL 1939). I repeatedly found the alga at this site, always in the form of empty half-cells only, but quite abundant in one of the pools; the occurrence of living specimens at this particular site, or at some other high moors location within the “Modravské slatě” complex, is nonetheless likely.

**Docidium baculum RALFS (Figs 65–66)**

Dim.: L: 238–295 µm, B: 13–14.5 µm  
Occ.: 1r

In Central Europe this taxon occurs scattered (RŮŽIČKA 1977), in the Czech Republic it is very rare. Past findings are recorded by PASCHER (1903, 1906), ROUBAL (1939) and, more recently, LEDERER et al. (1998); however, the latter, at site no. 99, was not confirmed by my findings.

**Actinotaenium cruciferum (DE BARY) TEILING (Figs 67–68)**

Syn.: *Cosmarium cruciferum* DE BARY  
*Penium cruciferum* (DE BARY) WITTR.  
Dim.: L: 17.5–20 µm, B: 10–11.5 µm  
Occ.: 3rr, 8r

There are only three earlier findings within the territory of the Czech Republic (ROSA 1951; RŮŽIČKA 1957a; ŠTĚPÁNKOVÁ et al. 2008). *A. cruciferum* might be easily confused with the much more common *Cosmarium goniodes* W. et G.S.WEST var. *subturgidum* W. et G.S.WEST that varies particularly by a somewhat different frontal and lateral view (see Fig. 152).

**Actinotaenium inconspicuum (W. et G.S.WEST) TEILING (Figs 69–70, 344–345)**

Syn.: *Cosmarium bacillare* LÜTKEM.  
*Penium inconspicuum* W. et G.S.WEST  
Dim.: L: 12.5–19 µm, B: 5–6.5 µm  
Occ.: 1r, 4rr, 5rr, 14rr, 24rr, 43cc

To date only two documented findings from the Czech Republic (ROSA 1941; RŮŽIČKA 1973); however, due to its diminutive size it probably often goes unnoticed.

**\*Actinotaenium inconspicuum (W. et G.S.WEST) TEILING var. *curvatum* KOUWETS (Figs 71–72)**

Dim.: L: 13–17 µm, B: 4.5–5 µm  
Occ.: 1r

This taxon is as yet known only from several sites in France (KOUWETS 1991) and Austria (ŠTASTNÝ & LENZENWEGER 2008), however, due to similarity to the nominate variety, it might be easily overlooked. GONTCHAROV (1998) described *A. inconspicuum* var. *curvatum* f. *majus* that, however, is evidently identical to *A. infractum* (MESSIK.) WILLIAMSON (see WILLIAMSON 2007).

**\**Actinotaenium kriegeri* (MESSIK.) KOUWETS  
(Figs 73–74)**

Syn.: *A. adelochondrum* (ELFVING) TEILING var. *kriegeri* (MESSIK.) RŮŽIČKA  
Dim.: L: 24–30 µm, B: 11.5–13.5 µm  
Occ.: 38rr, 43r, 45r, 50rr, 54cc

Rather rare species of oligomesotrophic, ephemeral and hemi-atmophytic habitats (KOUWETS 1997). Its characteristic feature are pores with pore-apparatuses increasingly protruding toward the apices (Fig. 73) rendering them seemingly scrobiculate. However, generally only some apical pores are visible (Fig. 74).

**\**Actinotaenium perminutum* (G.S.WEST)  
TEILING (Figs 75–77)**

Syn.: *Cosmarium perminutum* G.S.WEST  
*Cylindrocystis minutissima* W.B.TURNER  
Dim.: L: 10.5–14 µm, B: 6.5–7.5 µm  
Occ.: 1r, 3rr, 4rr, 5rr

Apparently a rather rare taxon (RŮŽIČKA 1981) that, however, can easily be unnoticed because of its small size.

**\**Actinotaenium subsparsepunctatum*  
(GRÖNBLAD) COESEL (Figs 78–81)**

Syn.: *Cosmarium subtile* (W. et G.S.WEST) LÜTKEM.  
var. *subsparsepunctatum* GRÖNBLAD  
Dim.: L: 14–16 µm, B: 9–10 µm  
Occ.: 37cc

Although I did not find the characteristic zygospores (see COESEL 2002; figs 31–32), there is no doubt that the species in question has been identified correctly, because the cell shape, and the structure of chloroplasts (lobostelloid), as well as the ecology of my find site (in an ephemeral puddle) accurately correspond to Coesel's data.

**\**Euastrum biscrobiculatum* (WOŁOSZ.) COESEL  
(Figs 82–84)**

Dim.: L: 23–33 µm, B: 17–24 µm, I: 5.5–7 µm  
Occ.: 1r, 4rr, 5rr

This species is marked by its striking cell wall sculpture consisting of a combination of tubercles, scrobiculae and grooves (COESEL & MEESTERS 2007). Apparently it is very rare, and judging from the nature of the sampling sites where I found it, its occurrence seems to be limited to well-preserved biotopes with a high desmid diversity. However, it has a complicated taxonomy and might be readily

confused with similar taxa (see COESEL 1984a, 2007). Interestingly, at site no. 1 in general I found exclusively larger cells possessing two central scrobiculae (Figs 82–83), on the other hand, at my other sites I found specimens with distinctly smaller cells having only one central scrobicula (Fig. 84).

**\**Euastrum brevisinuosum* (NORDST.) KOUWETS  
var. *dissimile* (NORDST.) KOUWETS (Figs 85–90)**

Dim.: L: 21–27 µm, B: 16–18.5 µm, I: 9–10 µm  
Occ.: 84c

This rather rarely found taxon (KOUWETS 1984) was from the same sampling site reported already by ŠKALOUD (2004, 2009), but wrongly labeled. For details regarding its taxonomy see KOUWETS (1984).

**\**Euastrum crassicolle* P.LUNDELL (Figs 91–92,  
346)**

Dim.: L: 23.5–27 µm, B: 12.5–14.5 µm, I: 5–6 µm  
Occ.: 43r, 50rr

From the Czech Republic only *E. crassicolle* var. *dentiferum* NORDST. has been reported thus far (LÜTKEMÜLLER 1910; RŮŽIČKA 1973); most likely, however, these two varieties are only deviations caused by atypical ecology, e.g. aerophytic growth, which is quite common in this species (RŮŽIČKA 1981). This hypothesis is also supported by my findings at site no. 50, where transitions between the two varieties could be observed even within a single, not very abundant population with an aerophytic growth habit; similar observations of Grönblad have also been mentioned by RŮŽIČKA (1981).

***Euastrum crassum* RALFS (Fig. 93)**

Dim.: L: 135–147 µm, B: 68–75 µm, I: 22–25 µm  
Occ.: 19rr, 23rr (at site no. 23 only some empty semicells were found)

In Central Europe this species is considered to be rare (RŮŽIČKA 1981), and from the Czech Republic was it recorded only two times at the beginning of the last century (PASCHER 1903, 1906).

***Euastrum germanicum* (SCHMIDLE) WILLI KRIEG.  
(Figs 94–95, 347–349)**

Dim.: L: 52–58 µm, B: 41–48 µm, I: 11–12.5 µm  
Occ.: 1r, 2rr, 9c, 10rr, 11r, 12rr, 25rr (at all sampling sites in the littoral zone among submerged macrophytes,

particularly *Myriophyllum spicatum* L.)

The only previous finding from the Czech Republic was mentioned by ROSA (1951). In Central Europe it is considered a very rare species (RŮŽIČKA 1981; LENZENWEGER 2000a); my findings, together with other recent ones (LENZENWEGER 2000b; LENZENWEGER & WERTL 2001; FEHÉR 2003) indicate, however, that it is somewhat more common than supposed. It evidently prefers naturally slightly eutrophic habitats with luxurious macrophyte vegetation (see also COESEL 1978, 1998a; KOUWETS 1998; LENZENWEGER 2000a; FEHÉR 2003).

**\**Euastrum luetkemuelleri* F.DUCELL. var. *carniolicum* (LÜTKEM.) WILLI KRIEG. (Figs 96–97, 350–352)**

Dim.: L: 22.5–29 µm, B: 16–20 µm, I: 6–7.5 µm  
Occ.: 1r, 3rr, 4r, 5rr, 6rr

New for the Czech flora, according to RŮŽIČKA (1981) and KRIEGER (1937) relatively rare in Central Europe. Not even the nominate variety of this species has been reported from anywhere in the Czech Republic.

***Euastrum montanum* W. et G.S.WEST (Fig. 98)**

Dim.: L: 27–30 µm, B: 18–20 µm, I: 5–6 µm  
Occ.: 31rr, 32rr

There are only two previous reports of this species from the Czech Republic; LÜTKEMÜLLER (1910) and NOVÁKOVÁ (2004).

***Euastrum pinnatum* RALFS (Figs 99–102)**

Dim.: L: 127–144 µm, B: 71–78 µm, I: 21–23 µm  
Occ.: 4rr

I consistently found cells with an open sinus, which RŮŽIČKA (1981, pl. 64, 4–5) regards as an anomaly. However, Scottish (WILLIAMSON 1997) and Dutch (COESEL & MEESTERS 2007) populations of this species were reported only having cells with an open sinus, therefore, it should not be regarded as anomalous, but as a variable character. *E. pinnatum* is very rare in Central Europe (RŮŽIČKA 1981), and in the Czech Republic it has been described only twice (PASCHER 1903, 1906).

***Euastrum turneri* W.WEST (Figs 103, 353)**

Dim.: L: 33.5–38.5 µm, B: 26–28.5 µm, I: 8.5–9 µm  
Occ.: 1rr, 4rr, 8rr, 114rr

A species with scattered distribution in Central

Europe (RŮŽIČKA 1981), in our territory it is now clearly extremely rare. Previous findings: LÜTKEMÜLLER (1910), JAPP (1930b), ROSA (1951) and RŮŽIČKA (1973). At site no. 114, most probably, the alga in question is not autochthonous but scoured from adjacent bogs situated in Zone I of Šumava National Park, as also indicated by its finding in a minimal abundance (one cell).

***Micrasterias apiculata* RALFS (Fig. 104)**

Dim.: L: 192–260 µm, B: 180–220 µm, I: 33–39 µm  
Occ.: 1r, 4r, 5rr, 8rr

Earlier findings from the Czech Republic were reported especially from Southern Bohemia (PASCHER 1903, 1906; DECHANT 1914; CEJP 1929; ROUBAL 1938, 1958; ROSA 1951; RŮŽIČKA 1973), and from certain Moravian sites (FISCHER 1920; JAPP 1930b; DVOŘÁK 1932); Sládeček mentions its presence in Padříské rybníky (SLÁDEČEK 1950–51). At present, however, this species must be considered very rare on our territory. RŮŽIČKA (1981) describes its distribution within Central Europe as scattered.

***Micrasterias brachyptera* P.LUNDELL (Fig. 105)**

Dim.: L: 185–237 µm, B: 144–177 µm, I: 30–37 µm  
Occ.: 1r, 5rr, 20rr, 103rr

The only findings of this rare species (RŮŽIČKA 1981) from within the Czech Republic were recorded by ROUBAL (1939) and LHOTSKÝ (1954). The latter also mentions another, unpublished finding by K. ROSA from Southern Bohemia. There are only two localities known from Austria (LENZENWEGER 1996), in Germany it is considered to be an endangered species (GUTOWSKI & MOLLENHAUER 1996).

***Micrasterias fimbriata* RALFS (Figs 106, 354)**

Dim.: L: 222–273 µm, B: 197–248 µm, I: 30–34 µm  
Occ.: 1r, 4r, 5r, 8r, 17rr, 19r, 20rr, 103r

Findings from the Czech Republic were reported from Southern (PASCHER 1903; KOTEK 1950; RŮŽIČKA 1973) and Northern Bohemia (LHOTSKÝ 1954), and from some sites in Moravia [FISCHER 1920, 1924 – as *M. apiculata* RALFS var. *fimbriata* (RALFS) NORDST., ČERŇAJEV 1931]; recently it appears to be a rare species of slightly acidic, mesotrophic water bodies. In central Europe scattered (RŮŽIČKA 1981).

***Micrasterias furcata* RALFS (Figs 107–108)**

Syn.: *M. radiata* (NÄGELI) W. et G.S.WEST  
Dim.: L: 144–150 µm, B: 123–128 µm, I: 22–23 µm  
Occ.: 5rr

Within Central Europe a very rare species (RŮŽIČKA 1981), from the Czech Republic reported only from three sites (PASCHER 1903; CEJP 1929; JAPP 1930b) so far.

***Micrasterias jenneri* RALFS (Figs 109, 355)**

Dim.: L: 122–145 µm, B: 90–102 µm, I: 20–23 µm  
Occ.: 3c, 4c, 69rr

This rare (RŮŽIČKA 1981), strictly acidophilous species has been reported from the Czech Republic only three times to date; from the Šumava Mts. (PASCHER 1906), from site no. 3 (MATTAUCH 1936), and recently also from site no. 69 (ŠTĚPÁNKOVÁ et al. 2008)

***Micrasterias oscitans* RALFS (Figs 110–111, 356)**

Dim.: L: 125–145 µm, B: 103–138 µm, I: 23–27 µm  
Occ.: 4rr

A strictly acidophilous species, extremely rare in Central Europe (RŮŽIČKA 1981). In the Czech Republic it has been found only in the Šumava Mts (PASCHER 1903, 1906). Moreover, MATTAUCH (1936) mentions, from sampling site no. 3, *M. oscitans* var. *mucronata* (DIX.) WILLE, which, however, falls within the variability of the nominal variety (see also RŮŽIČKA 1981, p. 571) and should not be described as a separate taxon.

***Micrasterias pinnatifida* RALFS (Figs 112, 357)**

Dim.: L: 60–64 µm, B: 62–74 µm, I: 11.5–14 µm  
Occ.: 1r, 5r

Previous findings from the Czech Republic come from Southern Bohemia (PASCHER 1903, 1906; CEJP 1929; ROUBAL 1939; KOTEK 1950; ROSA 1969); in the 19<sup>th</sup> century the species was also found in Moravia (NAVE 1863). In Central Europe it occurs only scattered (RŮŽIČKA 1981), in the Czech Republic it is at present very rare.

**\**Cosmarium angulare* JOHNS. (Figs 113–115)**

Dim.: L: 30.5–35 µm, B: 29–32 µm, I: 9–10 µm  
Occ.: 9rr, 59r

A rarely reported species of naturally eutrophic habitats with a well-developed macrophyte

vegetation (KOUWETS 1991; LENZENWEGER & WERTL 2001) that agrees with the conditions of my finds (samples were collected by squeezing out submerged *Myriophyllum spicatum* and *Ceratophyllum demersum* L., respectively).

**\**Cosmarium basiornatum* (GRÖNBLAD) COESEL (Figs 116–117, 358–360)**

Dim.: L: 38–41.5 µm, B: 28–31 µm, I: 15–16.5 µm  
Occ.: 7r, 38r, 43r, 45rr, 57rr

Thus far only scarcely reported, but most likely not a really rare alga of ephemeral habitats. COESEL & MEESTERS (2007) consider *C. basiornatum* identical to *C. cinctutum* NORDST., as described by NORDSTEDT (1875).

**\**Cosmarium berryense* KOUWETS (Figs 118–119)**

Dim.: L: 20–22 µm, B: 18–20 µm, I: 6–6.5 µm  
Occ.: 2rr, 121r

Very rare species of meso-eutrophic habitats, from the much more common species *C. humile* (F.GAY) NORDST. to be distinguished by differences in general cell shape and cell wall ornamentation. For a detailed discussion concerning its taxonomy see KOUWETS (1998). Most likely, the figure of *C. humile* in LENZENWEGER & WERTL (2001, pl. 2, fig. 14) actually represents *C. berryense*.

***Cosmarium bireme* NORDST. (Figs 120–121)**

Dim.: L: 14–16 µm, B: 13–15.5 µm, I: 3.5–4 µm  
Occ.: 47r

Probably rare, but easily confused with some similar taxa (see discussion concerning *C. cyclops* KOUWETS in KOUWETS 2001). Earlier findings from the Czech Republic mentioned by FISCHER (1924) and RŮŽIČKA (1949, 1973).

**\**Cosmarium botierense* KOUWETS (Figs 122–124)**

Dim.: L: 16–19 µm, B: 14–16.5 µm, I: 4.5–5 µm  
Occ.: 9rr, 10rr

*C. botierense* and its var. *inambitiosum* have been described relatively recently from France (KOUWETS 1998). According to the original diagnosis, the latter taxon differs from the nominal variety only by its smaller dimensions, and by having a more or less distinct median protuberance on either side of the semicells instead of a small papilla. However, this character can be

very similar in both varieties (compare figs 55 and 61 in KOUWETS 1998), moreover, the dimensions of both varieties can also vary quite considerably (see also COESEL & MEESTERS 2007). Therefore, taking into account the very similar ecological preferences of these varieties (KOUWETS 1998), it would be better to consider *C. boitierense* only a single, albeit morphologically quite variable taxon, probably with a wide distribution in meso-eutrophic habitats, as predicted by KOUWETS (1998).

**\**Cosmarium brebissonii* RALFS (Figs 125–126)**

Dim.: L: 82–93 µm, B: 66–75 µm, I: 22–26 µm  
Occ.: 8c, 29rr

Recently very rare, previous reports from the Czech Republic dating mostly from the first half of the last century (PASCHER 1903, 1906; JAPP 1930b; DVOŘÁK 1932; MALOCH 1937; ROUBAL 1939; ROSA 1969).

**\**Cosmarium carinthiacum* LÜTKEM. (Figs 127–128)**

Syn.: *C. cymatonotophorum* W.WEST forma *ornata* Messik.  
*C. messikommeri* COESEL  
Dim.: L: 7.5–8.8 µm, B: 8.8–10.2 µm, I: 3–4 µm  
Occ.: 1r, 4r

An inconspicuous, very rare taxon of well preserved habitats with a high desmid diversity (see also ŠŤASTNÝ & LENZENWEGER 2008).

***Cosmarium ceratophorum* LÜTKEM. (Figs 129, 361–362)**

Dim.: L: 31 µm, B: 25 µm, I: 7.5 µm  
Occ.: 99rr

An extremely rare species, known from the type site in the Šumava Mts (LÜTKEMÜLLER 1910), from eastern Finland (GRÖNBLAD 1921), and from a bog in Austria (LENZENWEGER 2003b) that is a remnant of a glacial lake (LENZENWEGER 2000b). Therefore, it can be generally considered arctic-alpine and a glacial relict at site no. 99, because the latter also arose during the Quaternary (HÁJEK & VÍZDAL 1998).

**\**Cosmarium commissurale* RALFS var. *acutum* BRÉB. (Fig. 130)**

Dim.: L: 30–33 µm, B: 39–42 µm, I: 11–12 µm  
Occ.: 53rr

The taxon in question differs from the nominal variety by the acutely attenuated lateral lobes of the semicells, and a differently shaped apex (COESEL & MEESTERS 2007), but as shown by WILLIAMSON (1997; see also the discussion regarding *C. pseudocommisurale* KOUWETS in KOUWETS 1991), *C. commisurale* is a highly variable taxon and intermediate forms may occur. However, all cells I found represented *C. commisurale* var. *acutum*, which is considered to be rare in WILLIAMSON (1997) and is new for the Czech flora.

**\**Cosmarium contractum* KIRCHN. var. *retusum* (W. et G.S.WEST) WILLI KRIEG. et GERLOFF (Fig. 131)**

Dim.: L: 31–35 µm, B: 30–34 µm, I: 10–11 µm  
Occ.: 1rr, 4rr, 5rr, 8rr, 25r

As indicated already by COESEL & MEESTERS (2007), this taxon is better kept separate from *C. contractum*, as there are considerable differences in the morphology, as well as in the ecology of these two taxa. Whereas *C. contractum* prefers oligo-mesotrophic milieu, the majority of my findings of var. *retusum* were made in mesotrophic habitats, and at site no. 25, as well as in The Netherlands (COESEL & MEESTERS 2007), it was even found in a slightly eutrophic and alkaline habitat.

***Cosmarium davidsonii* J.Roy et BISSET (Figs 132–133)**

Dim.: L: 32.5–37 µm, B: 22–24 µm, I: 13–14 µm  
Occ.: 50rr, 61rr, 116r, 118r

Rather rare aerophytic species; mentioned in records from the Czech Republic by LÜTKEMÜLLER (1910), ROSA (1951) and RŮŽIČKA (1956, 1957a).

**\**Cosmarium decedens* (REINSCH) RACIB. var. *minutum* (GUTW.) WILLI KRIEG. et GERLOFF (Fig. 134)**

Dim.: L: 15.5–18.5 µm, B: 7–9 µm, I: 5.5–7 µm  
Occ.: 43rr, 50rr, 54rr

Like the other varieties of *C. decedens*, this alga, too, occurs rather scarcely in ephemeral puddles and on wet soil (LENZENWEGER 1999).

**\**Cosmarium dentiferum* NORDST. var. *alpinum*  
MESSIK. (Fig. 135)**

Dim.: L: 55–65 µm, B: 44–53 µm, I: 19–21 µm  
Occ.: 61r, 63rr, 73rr, 117rr, 119rr

*C. dentiferum* var. *alpinum* is generally reported from oligotrophic, mountainous biotopes (MESSIKOMMER 1942; LENZENWEGER 1999), which agrees well with my findings and, most likely, the alga discussed is relatively common in such habitats in our territory. No findings of this taxon have been reported from the Czech Republic, but considering the drawing of RYBNÍČEK [1958; pl. 3, fig. 39, as *C. margaritatum* (P.LUNDELL) J.ROY et BISSET], his findings from the Jeseníky Mts probably concern this very alga, a supposition supported by his data on the ecological parameters. Possibly Růžička's record from a very similar habitat (RŮŽIČKA 1956; pl. 3, fig. 29, as *C. margaritatum* forma) also represents *C. dentiferum* var. *alpinum*., in spite of its somewhat greater dimensions.

**\**Cosmarium didymoprotupsum* W. et G.S.WEST (Fig. 136)**

Dim.: L: 60–70 µm, B: 52–55 µm, I: 16–17.5 µm  
Occ.: 1rr, 2r (at both sites in the littoral zone among *Myriophyllum spicatum*)

Apparently a rather rare tychoplanktonic alga of meso-eutrophic water bodies that, however, might be easily confused by non-specialists with other species exhibiting similar ecological parameters (e.g. *C. botrytis* RALFS).

**\**Cosmarium dilatum* JÄRNEFELT et GRÖNBLAD (Figs 137–138)**

Dim.: L: 10.5–11 µm, B: 12–12.5 µm, I: 3.7–4 µm  
Occ.: 22c (in plankton)

Apparently a very rare taxon of meso-eutrophic, larger water bodies, until present known only from several sites within Europe (BEIJERINCK 1926; JÄRNEFELT & GRÖNBLAD 1960; COESEL 1989; KOUWETS 1998), and from Japan and the Russian Far East (GONTCHAROV & WATANABE 1999). However, it might be easily overlooked.

**\**Cosmarium eichlerianum* (GRÖNBLAD) MESSIK. (Figs 139–140)**

Syn.: *C. rectangulare* GRUNOW var. *subrectangulare* (LÜTKEM. et GRÖNBLAD) WILLI KRIEG. et GERLOFF  
Dim.: L: 37–41 µm, B: 30–33 µm, I: 11–12.5 µm  
Occ.: 1r, 5r

Rarely reported taxon of mesotrophic, slightly acidic habitats, new for the Czech Republic. However, the figure of ROSA (1951; pl. 13, fig. 5, as *C. sexangulare* P. LUNDELL) may represent this taxon. The cell wall is often somewhat thickened at the apical and lateral angles, which is not depicted in my drawings.

***Cosmarium fastidiosum* W. et G.S.WEST (Figs 141–143)**

Dim.: L: 40–53 µm, B: 35–50 µm, I: 14–19 µm  
Occ.: 1c

The occurrence of this species is only rarely mentioned in literature (WEST & WEST 1908; SKUJA 1929; ROSA 1951; COESEL 1979b; COESEL & MEESTERS 2007; ŠŤASTNÝ & LENZENWEGER 2008), and most authors point to its rather great variability both in size and the development of the cell wall structure in the central part of the cell. These results are confirmed by my findings that showed extreme variability of the central ornamentation, even when comparing two semi-cells of the same cell. It is comprised of at least four, but sometimes many, irregularly placed flat granules, and the only stable feature is the presence of one supraisthmal granula. *C. fastidiosum* apparently is a very rare species, which seems to prefer mature ecosystems with a great diversity of desmids (see also COESEL 1979b; ŠŤASTNÝ & LENZENWEGER 2008). From the Czech Republic it has only been reported once to date (ROSA 1951).

***Cosmarium fontigenum* NORDST. (Fig. 144)**

Dim.: L: 23–27 µm, B: 23–27 µm, I: 7–8 µm  
Occ.: 9rr, 11rr, 25rr, 82c, 86cc

A rather rare species of mesotrophic to slightly eutrophic habitats (see e.g. COESEL 1998a; LENZENWEGER 2000b; FEHÉR 2003). Previous reports from the Czech Republic: LÜTKEMÜLLER (1910), JAPP (1930b), DVOŘÁK (1932), RŮŽIČKA (1957a, 1973).

***Cosmarium galeritum* NORDST. (Figs 145–146)**

Dim.: L: 55–57 µm, B: 43–45 µm, I: 15–16 µm  
Occ.: 50rr

My specimens differ from forms depicted by COESEL (1991) and LENZENWEGER (1999), in having only one central pyrenoid, not two; however, this characteristic can be quite variable, sometimes even within a single population (see e.g.

KOUWETS 1997; discussion in section dedicated to *Cosmarium homalodermum*; RŮŽIČKA 1973; note at *C. praemorsum*), and therefore, cannot be considered as taxonomically relevant. Also remarkable, and according to the literature, quite rare, was the aerophytic growth habit of my specimens. *C. galeritum*, so far, has been reported from the Czech Republic only by ROUBAL (1938).

***Cosmarium garrolense* J.ROY et BISSET (Figs 147–149)**

Dim.: L: 26.5–32.5 µm, B: 20–25 µm, I: 7.5–10 µm  
Occ.: 72rr, 100cc

Rather rare aerophytic species, from the Czech Republic previously reported only by RŮŽIČKA (1956) and ROSA (1969).

***Cosmarium gibberulum* LÜTKEM. (Figs 150–151)**

Dim.: L: 30.5–34 µm, B: 26.5–29 µm, I: 8.5–9 µm  
Occ.: 1r, 9rr, 21rr, 25rr, 55r, 82c, 121r

The morphology of my specimens corresponds well with the original description by LÜTKEMÜLLER (1910; pl. 2., figs 17–20) from the Šumava Mts. It appears that *C. gibberulum* is a rare tychoplanktonic species of meso-eutrophic, well-preserved habitats (see also LENZENWEGER 2000b, 2003b).

***Cosmarium goniodes* W. et G.S.WEST var. *subturgidum* W. et G.S.WEST (Figs 152–154, 363)**

Syn.: *C. goniodes* W. et G.S.WEST var. *variolatum* W. et G.S.WEST  
Dim.: L: 13–20 µm, B: 7–11 µm, I: 6–10 µm  
Occ.: 1r, 4rr, 5r, 6r, 8rr, 13rr, 21r, 24rr, 25rr, 36rr, 47rr, 48rr, 55r, 85r, 99rr, 103rr

Curiously, in spite of being recently rather common, this taxon has been reported only twice in the Czech Republic (LÜTKEMÜLLER 1910; RŮŽIČKA 1973). A possible explanation appears to be that it is easily confused with some *Actinotaenium* species, particularly *A. cruciferum* and *A. perminutum*, which, however, have omniradiate cells whereas, in frontal view, *C. goniodes* var. *subturgidum* is different from its lateral view (compare Fig. 152).

***Cosmarium homalodermum* NORDST. (Figs 155–156)**

Syn.: *C. hamperi* REIN SCH var. *homalodermum* (NORDST.) W. et G.S.WEST  
Dim.: L: 59–65 µm, B: 52.5–58 µm, I: 17–18 µm  
Occ.: 54r, 61rr

Rather rare aerophytic species with a variable number of pyrenoids (one or two, see KOUWETS 1997), an observation confirmed by my finding from site no. 54, where cells with either number of pyrenoids were found. Previous reports from the Czech Republic: FISCHER (1920, 1922–24), RŮŽIČKA (1956, 1957b).

**\**Cosmarium jaoi* KOUWETS (Figs 157–158)**

Syn.: *C. garrolense* J.ROY et BISSET var. *crassum* C.C.JAO  
Dim.: L: 39–45 µm, B: 32–35 µm, I: 9.5–11.5 µm  
Occ.: 1rr, 2r, 58r, 59r, 120rr, 122r

KOUWETS (1998) considers this species very rare, but as indicated by my, and other recent findings (e.g. LENZENWEGER & WERTL 2001; FEHÉR 2003), it is probably quite abundantly distributed in suitable biotopes (particularly in slightly eutrophic habitats with a copious macrophyte vegetation).

***Cosmarium kirchneri* BORGES. (Figs 159, 364)**

Dim.: L: 57–63 µm, B: 50–55 µm, I: 15–17 µm  
Occ.: 47r

At the sampling site I found this alga together with *C. margaritiferum* RALFS; in the past *C. kirchneri* had been classified as one of the forms of the latter species [*C. margaritiferum* forma *kirchneri* (BORGES.) W. et G.S.WEST]. However, my observation, similarly to that made by COESEL (1979b), showed two clearly distinguishable taxa, especially as regards the cell wall structure. This corroborates that distinguishing them as two separate species was well justified (for a detailed discussion see also COESEL 1991; COESEL & MEESTERS 2007). *C. kirchneri* is a rare species (contrary to *C. margaritiferum*, see also LENZENWEGER 1999; p. 137), reported only by RŮŽIČKA (1973; as *C. margaritiferum* f. *kirchneri*) from the Czech Republic.

**\**Cosmarium klebsii* GUTW. (Figs 160–161)**

Syn.: *C. subtumidum* NORDST. var. *klebsii* (GUTW.) W. et G.S.WEST  
Dim.: L: 27–32 µm, B: 26–30 µm, I: 8–9 µm  
Occ.: 1r, 9r, 11r

Rather rare species of meso-eutrophic habitats with well-developed macrophyte vegetation (see also e.g. LENZEWEGER & WERTL 2001). From the morphologically similar *C. subtumidum*, as a variety of which it has been classified in the past, is *C. klebsii* distinguished by its entirely different ecological demands, and also by greater separation between cell wall pores, often marked by short filaments of produced cell material (COESEL & MEESTERS 2007).

**\**Cosmarium lagerheimii* GUTW. (Figs 162–163)**

Dim.: L: 16–18 µm, B: 13.5–16 µm, I: 4–4.5 µm  
Occ.: 1rr, 9r, 11rr

Very rare species of meso-eutrophic, slightly acidic to alkaline water bodies, new for the Czech flora.

***Cosmarium limnophilum* SCHMIDLE (Figs 164–165)**

Dim.: L: 32–37 µm, B: 26–30 µm, I: 8.5–9.5 µm  
Occ.: 1r, 5r

A rare (KOUWETS 1998) and apparently also morphologically rather variable (see e.g. RŮŽIČKA 1949) species of meso-eutrophic habitats, all of its previous findings within the Czech Republic originate from site no. 15 (RŮŽIČKA 1949, 1973; ŠIMEK 1992, 1997). Intriguingly, the characteristic central ornamentation consisting of three granules arranged in a triangle that is generally considered to be hardly visible in frontal view (see e.g. KOUWETS 1991; as *C. boeckii* WILLE var. *isthmolaeve* SKUJA; KOUWETS 1998), was in my specimens comparatively well recognizable, at least when observing empty cells.

***Cosmarium medioretusum* COESEL (Figs 166–169)**

Dim.: L: 17–20 µm, B: 14–17 µm, I: 4.5–6 µm  
Occ.: 1r

Very rare taxon, previously found only by RŮŽIČKA (1973; as *C. subtransiens* CROASDALE) in the Czech Republic. Interestingly, LENZEWEGER (1986; as *C. umbilicatum* LÜTKEM. var. *borgei* WILLI KRIEG. et GERLOFF) and COESEL (2007) report it from

localities with a slight environmental disturbance, alternatively, both Czech reports, as well as a very recent finding from Austria (ŠŤASTNÝ & LENZEWEGER 2008), originate from well preserved sites almost untouched by human activity.

**\**Cosmarium microsphinctum* NORDST. var. *crispulum* NORDST. (Figs 170, 365)**

Dim.: L: 37–41 µm, B: 25–27.5 µm, I: 14.5–16 µm  
Occ.: 54rr, 66rr

A taxon well distinguished by a thick cell wall, slightly undulate margins and occurrence in hemi-atmophytic habitats, especially at higher altitudes. Only the nominate variety of *C. microsphinctum* has been reported in the Czech Republic (RYBNÍČEK 1958).

***Cosmarium netzerianum* SCHMIDLE (Fig. 171)**

Syn.: *C. reniforme* (RALFS) W.ARCHER var. *apertum* W. et G.S.WEST  
Dim.: L: 49–56 µm, B: 47.5–50 µm, I: 20–21 µm  
Occ.: 61rr

WEST & WEST (1908) consider *C. netzerianum* synonymous with their newly described *C. reniforme* var. *apertum*, and, since that publication, *C. netzerianum* was usually reported in the literature as *C. reniforme* var. *apertum*. However, in spite of a rough resemblance, *C. netzerianum* should not be considered a variety of *C. reniforme*, due to considerable differences between these taxa in the granulation of the cell wall (see MESSIKOMMER 1942; p.156) and significant differences in their ecology. Whereas *C. reniforme* is a typical tychoplanktonic species of meso-eutrophic water-bodies, *C. netzerianum* seems to have a clearly arctic-alpine distribution and often grows sub-aerophytically. SCHMIDLE (1895) described it from a site situated 2 200 m a.s.l., furthermore, other findings (e.g. INSAM & KRIEGER 1936; MESSIKOMMER 1942; LENZEWEGER 1987, 1994, 2002, 2003a) are from sites at altitudes between 1 225 and 2 530 m a.s.l. As for sites in the Czech Republic *C. netzerianum* is only known from the Krkonoše Mts (BECK-MANNAGETA 1926).

**\**Cosmarium norimbergense* REINSCH var. *depressum* (W. et G.S.WEST) WILLI KRIEG. et GERLOFF (Fig. 172)**  
 Dim.: L: 13–16.5 µm, B: 11.5–15 µm, I: 4–5 µm  
 Occ.: 63r

New for the Czech Republic. To date only *C. norimbergense* var. *boldtii* (MESSIK.) RŮŽIČKA has been reported (RŮŽIČKA 1973; pl. 12, figs 6–8), although, when examining Růžička's figures, it appears that a completely different, unrelated taxon is depicted.

***Cosmarium notabile* BRÉB. (Figs 173–174)**  
 Dim.: L: 25–30 µm, B: 18–21 µm, I: 12.5–14 µm  
 Occ.: 36rr, 39rr, 41r, 45rr, 50rr, 61r, 64rr, 73r, 74r, 76r, 77r, 78r, 80rr

Rarely reported, but, judging from the number of my findings, probably a common species of ephemeral, oligo-mesotrophic habitats that, however, usually occurs in small numbers. Earlier reports from the Czech Republic: WÜNSCH (1939), NOVÁČEK (1941).

**\**Cosmarium notatum* (GRÖNBLAD) COESEL (Figs 175–176)**

Syn.: *C. jenisejense* BOLDT var. *notatum* (GRÖNBLAD)  
 KURT FÖRST.  
 Dim.: L: 21.5–25.5 µm, B: 21.5–26.5 µm, I: 8.5–9 µm  
 Occ.: 1r, 5rr

This alga, in all likelihood very rare in Central Europe, prefers colder areas (see e.g. FÖRSTER 1965; LENZENWEGER 1999); it was, therefore, very surprising that it was found at sites only 275 m a.s.l. These sites, however, are portions of ponds that were established in the 14<sup>th</sup> century on the remnants of a glacial lake (NOVÁKOVÁ & POPOVSKÝ 1972) and, perhaps, *C. notatum* might represent a glacial relict.

***Cosmarium novae – semliae* WILLE var. *granulatum* (SCHMIDLE) SCHMIDLE (Fig. 177)**  
 Dim.: L: 14–15 µm, B: 14.5–15.5 µm, I: 7 µm  
 Occ.: 24rr

Previously reported only by LÜTKEMÜLLER (1910) in the Czech Republic, the occurrence of the nominate variety is mentioned by FISCHER (1922–24) and JAPP (1930a).

**\**Cosmarium obsoletum* (HANTZSCH) REINSCH (Figs 178–179, 366–367)**  
 Dim.: L: 40–45 µm, B: 47.5–52.5 µm, I: 22.5–24 µm  
 Occ.: 1r, 4c, 5r

A rare taxon of oligo–mesotrophic, slightly acidic habitats, the occurrence of which seems to be confined to well–preserved biotopes. New for the Czech Republic.

***Cosmarium ocellatum* B.EICHLER et GUTW. (Fig. 180)**

Dim.: L: 28.5–30 µm, B: 25–26 µm, I: 6–6.5 µm  
 Occ.: 25rr

Previous records from the Czech Republic: LÜTKEMÜLLER (1910), MATTUAUCH (1936).

***Cosmarium ocellatum* B.EICHLER et GUTW. var. *notatum* (NORDST.) WILLI KRIEG. et GERLOFF (Figs 181–183)**

Dim.: L: 25–28 µm, B: 23–26.5 µm, I: 6–7 µm  
 Occ.: 1r, 4rr, 8r

A rare taxon of undisturbed habitats, prior report from the Czech Republic only by RŮŽIČKA (1973)

***Cosmarium ordinatum* (BØRGES.) W. et G.S.WEST (Figs 184–185, 368)**

Dim.: L: 19–22.5 µm, B: 18–22.5 µm, I: 6.5–7.5 µm  
 Occ.: 1r, 4r, 8r

A quite rare species, in the Czech Republic, to date, reported only by LÜTKEMÜLLER (1910). However, it has become evident that the findings of ROSA (1939; pl. 3, figs. 56–57) and RŮŽIČKA (1973; pl. 10, fig. 12), both published as *C. orthostichum* P. LUNDELL refer in fact to *C. ordinatum*; *C. orthostichum* has, indeed, a similar cell wall sculpture, but differs in dimension by nearly twofold (see e.g. LENZENWEGER 1999; COESEL & MEESTERS 2007).

**\**Cosmarium ornatulum* COESEL (Figs 186–188)**

Dim.: L: 20–22.5 µm, B: 20–22.5 µm, I: 6.5–7.5 µm  
 Occ.: 96c, 97r, 106c

Euplanktonic, recently described species (COESEL 2002) of eutrophic, alkaline habitats. In suitable habitats most likely quite common, as indicated by the information received from the hydrobiologist R. Geriš (GERIŠ, pers.com.), who regularly finds

it in several eutrophic water reservoirs (Brno, Luhačovice, Mostiště, Plumlov).

**\**Cosmarium ornatulum* COESEL var. *depressum*  
COESEL (Fig. 189)**

Dim.: L: 22–23 µm, B: 25–26 µm, I: 8 µm  
Occ.: 15rr

This variety differs from the type variety only by the greater breadth of its cells; its ecological requirements are similar (COESEL 2002).

***Cosmarium orthopunctatum* SCHMIDLE (Figs 190–191)**

Dim.: L: 26–30.5 µm, B: 25–28.5 µm, I: 9–11 µm  
Occ.: 34c, 56r, 61rr, 62c, 67cc, 75rr, 81rr, 117r

A species with a predominantly arctic-alpine distribution (COESEL 1992), as is corroborated by previous reports of it in the Czech Republic (FISCHER 1924; LHOTSKÝ 1949; RYBNÍČEK 1958), and by the majority of my findings originating from mountainous regions. My other samplings, from ravines in sandstone rock massifs (sites no. 75 and 81), are interesting from an ecological point of view. These ravines are situated only 450–500 m above sea level, but due to the inverse character of their climate, the temperatures at their bottom are often very low, comparable to that of much higher altitudes. The cell wall ornamentation can be variable in this alga, as shown by MESSIKOMMER (1942), on the other hand, a characteristic and stable feature is the rounded rhomboid shape of the cells in apical view (Fig. 190).

***Cosmarium ovale* RALFS (Figs 192, 369–371)**

Dim.: L: 177–195 µm, B: 102–113 µm, I: 34–38 µm  
Occ.: 1cc, 5r

Very rare taxon of well-preserved habitats, in the Czech Republic previously recorded only by PASCHER (1903, as *Cosmaridium ovale* HANSG.) and HOLZER [1931, as *Pleurotaenopsis ovalis* (RALFS) DE TONI].

**\**Cosmarium paragranatoides* SKUJA (Figs 193–197, 372–373)**

Dim.: L: 24–27.5 µm, B: 15–17.5 µm, I: 5–5.5 µm  
Occ.: 1c, 4r, 5r, 25rr, 29rr

Relatively rare species of mesotrophic, slightly acidic habitats, new for the Czech Republic.

**\**Cosmarium parvulum* BRÉB. var. *undulatum*  
SCHMIDLE (Figs 198–200)**

Dim.: L: 24–30 µm, B: 12.5–13.5 µm, I: 10–11 µm  
Occ.: 7r

Rare aerophytic taxon, new for the Czech Republic. The occurrence of the nominal variety of *C. parvulum* in the Czech Republic was mentioned by FISCHER (1922–24, 1924), RYBNÍČEK (1958) and ROUBAL (1959), however, at least Rybníček's finding, from examination of his figure (RYBNÍČEK 1958; pl. 2, figs. 33–34), represents a different species, i.e. *Actinotaenium obcuneatum* (W.WEST) TEILING. The taxon in question might be, if observed in the lateral view, easily confused with *Actinotaenium kriegeri*, that also has a similar ecology (see above).

**\**Cosmarium paucigranulatum* BORGE**

**(Figs 201–203)**

Dim.: L: 10–11 µm, B: 9–10 µm, I: 3–3.5 µm  
Occ.: 51cc, 118cc (in one of the mesotrophic pools)

Initially, my findings were determined to be *Xanthidium robinsonianum* W. ARCHER var. *alpinum* BOURRELLY, described by BOURRELLY (1987) from Austria (see also LENZENWEGER 1997; pl. 18, fig. 10). However, the publication is invalid (KOUWETS 2001) and, moreover, Bourrelly's material differs from *C. paucigranulatum*, as described by BORGE (1923) in that the sides of semicells are angular instead of rounded, and have a slightly differently developed ornamentation (spinules instead of granules). These characters were already considered almost certainly variable by KOUWETS (2001), who regarded both taxa as synonymous, and his conclusion is confirmed by my findings (Figs 201–203). *C. paucigranulatum*, most likely, is a very rare, but inconspicuous species preferring predominantly mesotrophic, slightly acidic habitats (see BOURRELLY 1987).

**\**Cosmarium pericymatium* NORDST. (Figs 204–206, 374–376)**

Dim.: L: 41–51 µm, B: 26.5–31.5 µm, I: 21–24 µm  
Occ.: 7r, 90r, 91m, 92r, 94r, 107r, 111rr, 115rr

A species typical for ephemeral, periodically desiccating habitats (see e.g. WILLIAMSON 2000; BROOK 2001; COESEL et al. 2006; ŠŤASTNÝ 2008) that, however, seems to be much more common on artificial substrates like concrete than on "natural" substrates, such as wet rocks (see ŠŤASTNÝ 2008).

If observed in the lateral view, the taxon in question might be easily confused with certain *Actinotaenium* species.

**\**Cosmarium pericymatum* NORDST. var. *corrugatum* BROOK (Figs 207–208, 377–379)**

Dim.: L: 60–65 µm, B: 34–40 µm, I: 23–26 µm  
Occ.: 91c, 111c

The ecological demands of this taxon are very similar to those of the nominal variety (see ŠŤASTNÝ 2008), thus far it has been exclusively reported from artificial, periodically desiccating substrates (BROOK 2001; WILLIAMSON 2002; ŠŤASTNÝ 2008; ŠŤASTNÝ, unpublished record from The Netherlands). The series of corrugations, being present on each side of the isthmus and giving the taxon in question its name (BROOK 2001) were in my specimen hardly ever visible under the light microscope (Figs 207–208), however, they are clearly distinct if the cells are observed with the aid of a SEM (Figs 377–378). A very similar corrugation along the basis of the semicells, but much more weakly developed than in the var. *corrugatum*, and visible exclusively under SEM, are sometimes present also in the nominate variety of *C. pericymatum* (ŠŤASTNÝ, personal observation).

**\**Cosmarium pericymatum* NORDST. var. *notabiliforme* INSAM et KRIEGER (Figs 209–213)**

Dim.: L: 26–30 µm, B: 15–18 µm, I: 11–12.5 µm  
Occ.: 52cc

Concerning their general morphology, it is very similar to the nominal variety, however, the cells are much smaller and relatively slightly longer. Very rare, and only known from two sites in Austria (INSAM & KRIEGER 1936). Notably, the material did not originate directly from the rocks in the “Pohořský” stream, but was collected by squeezing out mosses growing on a short artificial concrete portion of the bed of the stream close to its outflow from the pond, i.e. in a habitat similar to that, where the nominate and the var. *corrugatum* predominantly occur (see above).

***Cosmarium pokornyanum* (GRUNOW) W. et G.S.WEST (Figs 214–215)**

Dim.: L: 30–31 µm, B: 18–19 µm, I: 10 µm  
Occ.: 29rr

A rather rare aerophytic taxon that within the

Czech Republic was found only by PASCHER (1903) and ROUBAL (1938) (both findings as *Euastrum pokornyanum* GRUNOW).

***Cosmarium prominulum* RACIB. var. *subundulatum* W. et G.S.WEST (Figs 216–217, 380)**

Dim.: L: 14.5–17.5 µm, B: 14–18 µm, I: 6.5–7.5 µm  
Occ.: 1rr, 3rr, 4rr

Very rare, from the Czech Republic previously reported only by MATTIAUCH (1936) from site no. 3.

***Cosmarium pseudoexiguum* RACIB. (Fig. 218)**

Dim.: L: 17–18 µm, B: 8–8.5 µm, I: 2.5 µm  
Occ.: 9rr

Previous findings from the Czech Republic: LÜTKEMÜLLER (1910), RŮŽIČKA (1973).

***Cosmarium pseudoinsigne* PRESCOTT (Figs 219–220, 381)**

Syn.: *C. insigne* SCHMIDLE  
Dim.: L: 48.5–52 µm, B: 38.5–40.5 µm, I: 14–16 µm  
Occ.: 1rr (in the slightly eutrophic littoral zone), 58c

This rather rare tychoplanktonic species of mesotrophic–eutrophic, found in neutral to slightly alkaline habitats (see e.g. COESEL 1974, 1991; LENZENWEGER & WERTL 2001; FEHÉR 2003) has been reported from the Czech Republic only by ROUBAL (1938) so far. Often, the cells of the species in question are covered with bacteria, probably feeding on some products secreted by the cell wall pores (Fig. 381).

***Cosmarium pseudoprotuberans* KIRCHN. (Figs 221, 382–383)**

Dim.: L: 31–32 µm, B: 23–25 µm, I: 7.5–8 µm  
Occ.: 1rr

Very rare species, reported only twice from the Czech Republic thus far (ROSA 1951; RŮŽIČKA 1957a). However, judging from his figures (pl. 2, figs 41–42), Růžička's finding observably represents a completely different species. In addition, LÜTKEMÜLLER (1910) mentions *C. pseudoprotuberans* var. *angustius* NORDST from the Šumava Mts.

**\**Cosmarium pseudoprotuberans* KIRCHN. var. *sulcatum* (NORDST.) COESEL (Fig. 222)**

Dim.: L: 36.5–40 µm, B: 29–31 µm, I: 8–9 µm  
Occ.: 9rr

This variety differs from the nominate only in having the median part of the semicell in apical view triundulate on either long side (COESEL & MEESTERS 2007).

**\**Cosmarium pseudoretusum* F.DUCELL. (Figs 223–225, 384–385)**

Dim.: L: 26–30 µm, B: 20–23 µm, I: 6.5–7.5 µm  
Occ.: 5c

A rare species, from similar taxa distinguished particularly by the papillate outgrowths at the basal angles being commonly present in well developed cells (Figs 223–225).

***Cosmarium pseudowembaerense* KOUWETS (Figs 226–227)**

Syn.: *C. laeve* RABENH. var. *pseudoctangulare* F.E.FRITSCH et M.F.RICH  
Dim.: L: 14–17 µm, B: 13–16 µm, I: 4–5 µm  
Occ.: 1rr, 2rr, 12rr, 15c, 16rr, 120rr

Relatively rare species of larger, eutrophic and alkaline water bodies (COESEL 1998a; KOUWETS 1998; LENZENWEGER & WERTL 2001). In the Czech Republic previously found by ŠIMEK (1992; as *C. cf. meneghinii* RALFS) at site no. 15, and by HAŠLER et al. (2008).

***Cosmarium retusum* (PERTY) RABENH. (Figs 228–230)**

Dim.: L: 35.5–42.5 µm, B: 28–34 µm, I: 8.5–10 µm  
Occ.: 1r, 4rr

A very rare species (e.g., only two records are known from Austria, ŠŤASTNÝ & LENZENWEGER 2008). Findings in the Czech Republic are only by RŮŽIČKA (1949, 1973) from one site in southern Bohemia (forms with greatly reduced ornamentation).

**\**Cosmarium sexnotatum* GUTW.**

**var. *bipunctatum* (WOLOSZ.) COESEL (Fig. 231)**

Dim.: L: 32–35.5 µm, B: 27–29 µm, I: 8.5–9 µm  
Occ.: 1rr

Concerning the general cell shape and ecology, similar to *C. limnophilum* (see above), but clearly distinguished by the entirely different central

ornamentation of the semicells that was usually, contrary to the observations of COESEL (1989) and KOUWETS (1998), quite visible, even in frontal view, if empty cells were examined.

**\**Cosmarium sexnotatum* GUTW. var. *tristriatum* (LÜTKEM.) SCHMIDLE (Figs 232–233, 386)**

Dim.: L: 18.5–22 µm, B: 16–19 µm, I: 6–7.5 µm  
Occ.: 1rr, 4rr

This taxon is, along with the above-mentioned *C. sexnotatum* var. *bipunctatum*, new for the Czech Republic and apparently rather rare; however, it might be confused with, for instance, *C. blytii* WILLE var. *novaes-sylvae* W. et G.S.WEST.

***Cosmarium simplicius* (W. et G.S.WEST) GRÖNBLAD (Figs 234, 387)**

Syn.: *C. elegantissimum* P.LUNDELL var. *simplicius* W. et G.S.WEST

Dim.: L: 44–55 µm, B: 21–24 µm, I: 19–21 µm  
Occ.: 1r, 4rr, 61rr

Previous findings from the Czech Republic reported only by RŮŽIČKA (1949, 1956, 1973) and, evidently, Růžička's findings of *C. elegantissimum* f. *intermedium* KAISER (RŮŽIČKA 1956, 1957b) also correspond to the species in question.

**\**Cosmarium sphyrelatum* COESEL (Figs 235–240)**

Dim.: L: 15–18 µm, B: 11.5–14 µm, I: 4–5 µm  
Occ.: 1cc, 5rr

Relatively recently described species (COESEL 1989), so far known only from The Netherlands, Austria (ŠŤASTNÝ & LENZENWEGER 2008) and from the Orkneys (WILLIAMSON 2003); the latter finding, however, appears to represent a different species. According to the findings of *C. sphyrelatum* thus far, this species seems to prefer mature ecosystems with a high desmid diversity. For SEM images see COESEL (1984b, 1989).

***Cosmarium striolatum* (NÄGELI) W. ARCHER (Fig. 241)**

Syn.: *C. tessellatum* (DELPONTE) NORDST.

Dim.: L: 125–150 µm, B: 67–76 µm, I: 50–60 µm  
Occ.: 1r, 5rr

A very rare species with characteristic cell wall ornamentation that was previously reported from the Czech Republic only by ROSA (1951) and RŮŽIČKA (1973).

**\**Cosmarium subadoxum* GRÖNBLAD (Fig. 242)**

Dim.: L: 9–10 µm, B: 9–10 µm, I: 2–2.5 µm  
Occ.: 1rr

The morphology of my findings corresponds well to the species in question as illustrated by KOUWETS (1987; pl. 13, figs 23–25), as well as COESEL & MEESTERS (2007; pl. 61, figs 35–36). Characteristic is the presence of a small central papilla on either side of the semicells that is fairly distinct, particularly in the apical view.

***Cosmarium subbroomei* SCHMIDLE (Figs 243–244)**

Dim.: L: 35–42 µm, B: 32–37 µm, I: 13–14 µm  
Occ.: 15r (in the pools)

In the Czech Republic this species was only found by ŠIMEK (1992, 1997), however, from examination of his figures (ŠIMEK 1997, Fig. 18), it appears that his material is highly consistent with *C. subbroomei* f. *isthmochondrum* COESEL (see below). It differs from this taxon only by the absence of the prominent supraisthmal granula on each semicell. However, this character is likely quite variable, as also indicated by my findings (Figs 245–246). Therefore, I believe Šimek's findings most likely represent *C. subbroomei* f. *isthmochondrum*. The nominate variety of *C. subbroomei*, on the other hand, is characterized by cells with an almost quadrate outline and a somewhat distinct granulation pattern (see e.g. RŮŽIČKA 1972; ŠŤASTNÝ & LENZENWEGER 2008); see my findings (Figs 243–244).

**\**Cosmarium subbroomei* SCHMIDLE. f. *isthmochondrum* COESEL (Figs 245–246)**

Dim.: L: 35–40 µm, B: 33.5–36 µm, I: 12–13.5 µm  
Occ.: 1r

New for the Czech Republic, however, most likely identical to *C. subbroomei* found by ŠIMEK (1997, Fig. 18) at site no. 15 (see above). Within The Netherlands the taxon in question is predominantly reported from mesotrophic, slightly acidic to neutral habitats (COESEL 1975, as *C. subbroomei*, 1989), and this is consistent with the conditions of my findings. As indicated by COESEL & MEESTERS (2007), the taxon discussed is probably not related to the “real” *C. subbroomei* and is preferably designated as a separate species.

**\**Cosmarium subprotumidum* NORDST. var. *pyramidalis* COESEL (Figs 247–248)**

Dim.: L: 21–23.5 µm, B: 19–21.5 µm, I: 6–6.5 µm  
Occ.: 9r, 11r

This taxon is principally distinguished from the somewhat more common, but often co-occurring nominal variety by cells that are pyramidal in outline (in stead of trapeziform, COESEL & MEESTERS 2007) and have smaller dimensions.

**\**Cosmarium subquadrans* W. et G.S.WEST var. *minor* SYMOENS (Fig. 249)**

Dim.: L: 12.5–14 µm, B: 16–18 µm, I: 4.5–5 µm  
Occ.: 1rr, 3rr, 4rr, 18cc

The taxon in question is distinguished from morphologically similar taxa by its rhomboid shape in apical view, and by its ecology; it prefers strongly acidic, oligotrophic waters. From the Czech Republic, thus far, only the nominal variety of *C. subquadrans* has been reported (ROUBAL 1958).

**\**Cosmarium subspeciosum* NORDST. (Fig. 250)**

Dim.: L: 52.5–57.5 µm, B: 43–46 µm, I: 15–16 µm  
Occ.: 42r

From the Czech Republic only *C. subspeciosum* var. *transiens* has been reported; this, however, represents a completely different, unrelated species. COESEL (1991) labeled a forma that morphologically fully corresponds with my findings *C. subspeciosum* var. *simplicius* JAO, but this variety probably is of little taxonomic significance (see COESEL & MEESTERS 2007).

**\**Cosmarium subtumidum* NORDST. var. *groenbladii* CROASDALE (Figs 251, 388)**

Dim.: L: 35–39 µm, B: 29–32 µm, I: 10–11.5 µm  
Occ.: 1r, 8rr

To date, only the nominal variety of *C. subtumidum* is known from the Czech Republic (BECK-MANNAGETA 1926; JAPP 1930b; DVOŘÁK 1932; ROSA 1933, 1941, 1951, 1969). This differs from the taxon discussed in that the semicells in outline are rounded trapeziform instead of rounded rectangular to hexagonal (COESEL & MEESTERS 2007). In addition, the type variety of *C. subtumidum* lacks the locally thickened cell wall that is usually present and distinct in var. *groenbladii* (Fig. 251).

***Cosmarium taxichondriforme* B.EICHLER et GUTW. (Figs 252–253, 389)**

Dim.: L: 40–43 µm, B: 40–43 µm, I: 14–16 µm  
Occ.: 1c, 5rr

Rare species (RŮŽIČKA 1955a; COESEL 1974), in the Czech Republic found only by LÜTKEMÜLLER (1910) and RŮŽIČKA (1973).

***Cosmarium tetrachondrum* P.LUNDELL forma (Figs 254–255)**

Dim.: L: 20.5–22.5 µm, B: 23.5–26.5 µm, I: 6.5–7.5 µm  
Occ.: 1c, 4rr

Very rare, mentioned in the Czech Republic only by RŮŽIČKA (1949, 1973) from one site in southern Bohemia.

**\**Cosmarium truncatellum* PERTY (Figs 256–261)**

Dim.: L: 9–11 µm, B: 10–12.5 µm, I: 6.5–7.3 µm  
Occ.: 30r, 69cc, 70r, 71rr

The morphology and ecology (occurrence in oligotrophic, strongly acidic milieu) of my findings agree very well with the data of KOUWETS (1987) and COESEL & MEESTERS (2007). The only difference is the shape of the apex that is generally considered to be flat or slightly concave (KOUWETS 1987), but in my material, particularly that from site no. 30, a slight inflation at the top of the apex was often visible.

***Cosmarium ungerianum* (NÄGELI) DE BARY var. *subtriplicatum* W. et G.S.WEST (Figs 262–263)**

Syn.: *C. ungerianum* (NÄGELI) DE BARY var. *nodosum* (ANDERSSON) LÜTKEM.  
Dim.: L: 57–65 µm, B: 51–59 µm, I: 18–22 µm  
Occ.: 1c

A very rare alga, within the Czech Republic found only by RŮŽIČKA (1949, 1973) and ROSA (1951).

**\**Cosmarium variolatum* P.LUNDELL (Figs 264–265, 390–392)**

Dim.: L: 32–35 µm, B: 20–21 µm, I: 7–8 µm  
Occ.: 1r

A rare taxon, well characterized by a coarsely scrobiculated cell wall (each scrobiculation bears a distinct pore; Figs 390–392).

***Cosmarium variolatum* P.LUNDELL var. *cataractarum* RACIB. (Figs 266, 393–395)**

Dim.: L: 37–41.5 µm, B: 26.5–29 µm, I: 7.5–9 µm  
Occ.: 1rr, 9c, 10rr, 11r, 58r

Although (if observed under light microscopy), the cell wall sculpture of this taxon roughly resembles *C. variolatum*, in the SEM (Figs 393–395) it appears completely different. Therefore, and additionally because of the essentially dissimilar ecological demands of these taxa, it appears desirable to distinguish *C. variolatum* var. *cataractarum* as a separate species. This revision, however, will be published elsewhere. The only report of the taxon in question within the Czech Republic was by HAŠLER et al. (2008).

**\**Cosmarium varsoviense* RACIB. (Figs 267, 396–397)**

Dim.: L: 38–45 µm, B: 34–38 µm, I: 16.5–18 µm  
Occ.: 1c, 5r, 6rr, 9rr, 25rr, 26rr, 47rr

From the Czech Republic, only *C. varsoviense* RACIB. var. *tumidum* RŮŽIČKA has been reported (ŠIMEK 1992, 1997), but when studying that author's depiction (ŠIMEK 1997, Fig. 19), his finding has no resemblance to *C. varsoviense*, and might represent *C. rectangulare* GRUNOW. However, LÜTKEMÜLLER (1910) described *C. lomnicense* LÜTKEM. from the Šumava Mts which, most likely, represents the same taxon (see e.g. SKUJA 1934; KRIEGER & GERLOFF 1965). One of the typical features of the nominate variety of *C. varsoviense* is the presence (in the centre of the semi-cell) of a characteristic structure consisting of a rosette of clearly visible scrobiculae (RACIBORSKI 1889). This structure was always clearly recognizable in my material, at least in cases where I could observe empty cells (see Figs 267, 396–397); however, according to LENZENWEGER (1999) and KOUWETS (2001) this feature is often greatly reduced, or even be missing entirely. In the Czech Republic, *C. varsoviense* seems to be a quite rare species of mesotrophic, slightly acidic habitats.

***Cosmarium vogesiacum* LEMAIRE (Figs 268–269)**

Syn.: *C. bipunctatum* BÖRGES.

*C. polonicum* RACIB.

Dim.: L: 22.5–25 µm, B: 20–22.5 µm, I: 6–8 µm  
Occ.: 4rr, 24r, 31cc, 36r

*C. vogesiacum* is a morphologically variable species (especially the central ornamentation,

KOUWETS 1987) that is reported particularly from mountainous regions (COESEL 1998b). In the Czech Republic it has been reported only by LÜTKEMÜLLER (1910) and ROSA (1951) under the synonym *C. bipunctatum*. Another of ROSA's findings of *C. bipunctatum* most probably represents, judging from his figure (ROSA 1939; pl. 3, fig. 52), *C. ordinatum* (see above).

***Xanthidium aculeatum* EHRENB. (Figs 270–271, 398)**

Dim.: Ls: 67–77 µm, Lc: 78–95 µm, Bs: 63–73 µm, Bc: 77–93 µm, I: 18–22 µm  
Occ.: 101cc

An extremely rare alga, to date only reported by NAVÉ (1863) and PASCHER (1903, 1906) from the Czech Republic. *X. aculeatum* differs from the somewhat similar *X. brebissonii* RALFS by having a relatively greater number of spines not arranged in definite pairs, and by the regular presence of an additional, rather variably developed ornamentation between the central ornamentation and the apex. Therefore, I think it likely that the figure of *X. brebissonii* forma in COESEL & MEESTERS (2007; pl. 81; fig. 2), showing a developed subapical ornamentation, actually represents *X. aculeatum*.

***Xanthidium basidentatum* (BØRGES.) COESEL (Fig. 272)**

Syn.: *X. aculeatum* EHRENB. var. *basidentatum* (BØRGES.) W. et G.S.WEST  
Dim.: Ls: 70–72 µm, Lc: 85–88 µm, Bs: 61–63 µm, Bc: 78–82 µm, I: 24–25 µm  
Occ.: 1rr

Very rare, within the Czech Republic reported only twice, by LÜTKEMÜLLER (1910, as *X. brebissonii* RALFS var. *basidentatum* BØRGES.), and by ROSA 1969 [as *X. fasciculatum* var. *basidentatum* (BØRGES.) RŮŽIČKA]. For a detailed discussion of the taxonomy of this species see COESEL (1993).

***Xanthidium bifidum* (BRÉB.) DEFLANDRE (Figs 273–275)**

Syn.: *Arthrodesmus bifidus* BRÉB.  
Dim.: Ls: 12.5–17 µm, Bs: 12.5–17 µm, I: 5–6 µm  
Occ.: 1r, 5r, 8rr, 24r

Very rare, but rather inconspicuous alga, reported from the Czech Republic only by PASCHER (1906), ROSA (1941) and RŮŽIČKA (1973).

***Xanthidium concinnum* W.ARCHER (Figs 276–277)**

Dim.: Ls: 10.5–12.5 µm, Bs: 11.5–13.5 µm, I: 3–3.5 µm  
Occ.: 47c

An inconspicuous, but probably very rare species, the occurrence of which in the Czech Republic is mentioned by LÜTKEMÜLLER (1910), FISCHER (1924) and LEDERER & SOUKUPOVÁ (2002). When observed in frontal view, some specimens seem to have several warts directly under the apex; however, these are probably just rough pores (see also KOUWETS 1987).

***Xanthidium cristatum* RALFS (Figs 278–279, 399)**

Dim.: Ls: 45–50 µm, Lc: 59–66 µm, Bs: 36–42 µm, Bc: 49–57 µm, I: 12–13.5 µm  
Occ.: 1rr, 4rr, 5rr, 8r, 47c, 114rr

Older data on the occurrence of this species in the territory of the Czech Republic are relatively frequent [in Bohemia it was found by PASCHER (1903), ROUBAL (1939), ROSA (1939, 1951), RŮŽIČKA (1973) and LEDERER et al. (1998), in Moravia by DVOŘÁK (1910, 1934), FISCHER (1920), JAPP (1930a, 1930b) and (HOLZER 1931)], recently it has become rare.

**\**Xanthidium cristatum* RALFS var. *uncinatum* RALFS forma *polonicum* GUTW. (Figs 280–281)**

Dim.: Ls: 59–64 µm, Lc: 76–84 µm, Bs: 50–58 µm, Bc: 72–77 µm, I: 17–18 µm  
Occ.: 1r

In the Czech Republic only the nominate forma of *X. cristatum* var. *uncinatum* has been reported (PASCHER 1903; FISCHER 1920; JAPP 1930b; ROSA 1939, 1951, 1969; RŮŽIČKA 1973), which lacks, contrary to the forma *polonicum*, the granulation of the basal angles.

**\**Xanthidium fasciculatum* RALFS var. *oronense* W. et G.S.WEST (Figs 282–283)**

Dim.: Ls: 50–55 µm, Lc: 65–75 µm, Bs: 45–53 µm, Bc: 62–70 µm, I: 15–16.5 µm  
Occ.: 1r

The alga in question is new for the Czech Republic; however, it differs from the nominal variety only by the presence of an additional granula at the semicell base near each of the basal angles (COESEL & MEESTERS 2007) which, with

respect to the rather considerable morphological plasticity of *X. fasciculatum* (see e.g. RŮŽIČKA 1955b), might be considered a dismissible feature. Past findings of the type variety within the Czech Republic are relatively frequent. PASCHER (1903, 1906), DECHANT (1914), WÜNSCH (1939) (last two findings as *Holacanthum fasciculatum* FRANZÉ), ROSA (1939, 1951, 1969), ROUBAL (1958) and RŮŽIČKA (1973) all mention findings from Bohemia, Moravian findings are recorded by FISCHER (1920), JAPP (1930b), DVOŘÁK (1932) and GESSNER (1932). A recent finding from Western Bohemia is mentioned by LEDERER et al. (1998) from site no. 99. However, I could not confirm those records. Of note is that the taxon in question is mentioned by LENZENWEGER (1997; pl. 20, fig. 5) from Austria under the name *X. fasciculatum* var. *basidentatum* (BØRGES.) RŮŽIČKA that, however, is actually synonymous with *X. basidentatum* (see COESEL 1993).

**\**Staurodesmus extensus* (BORGE) TEILING var. *joshuae* (GUTW.) TEILING (Fig. 284)**

Dim.: L: 18–20 µm, Bs: 35–40 µm, I: 6–7  
Occ.: 1rr, 8rr, 24rr, 47rr, 114rr

My specimens correspond very well with one of the figures of this taxon in COESEL & MEESTERS (2007; pl. 86, fig. 22), but considering that all cells observed possessed distinctly convergent spines that are atypical for *Std. extensus*, and, moreover, no intermediate forms (as concerns the orientation of the spines) were found at sites no. 47 and 114, where both taxa mentioned co-occurred, the taxon in question should better be considered a separate species. See also the depiction by RŮŽIČKA (1972; pl. 62, fig. 8, as *Arthrodesmus triangularis* LAGERH.) clearly representing the same alga.

**\**Staurodesmus extensus* (BORGE) TEILING var. *malaccensis* (BERNARD) COESEL (Figs 285–289)**  
Dim.: Ls: 11–14 µm, Lc: 20–24 µm, Bs: 9.5–13 µm,  
Bc: 22–32 µm, I: 4.5–5.5 µm  
Occ.: 24cc (in a strongly acidic, oligotrophic pool)

The morphology and ecology of my findings agree with the data of COESEL & MEESTERS (2007; see pl. 86, fig. 27). This taxon is distinguished from the otherwise very similar *Std. phimus* (W.B.TURNER) THOMASSON predominantly by its more widely rounded sinus.

**\**Staurodesmus lanceolatus* (W.ARCHER)  
CROASDALE var. *compressus* (W. et G.S.WEST) TEILING (Figs 290–292)**

Syn.: *Staurastrum lanceolatum* W.ARCHER. var. *compressum* W. et G.S.WEST  
Dim.: L: 19–22.5 µm, B: 20–23.5 µm, I: 6–7 µm  
Occ.: 17r, 47rr, 49rr 51r, 114rr

A rare alga, new for the Czech Republic. However, the figure in RŮŽIČKA (1973; pl. 14, fig. 8, as *Staurastrum brevispinum* RALFS var. *brevispinum* f. *minimum* LÜTKEM.) most likely represents this same taxon.

**\**Staurodesmus subhexagonus* (W. et G.S.WEST)  
COESEL (Fig. 293)**

Dim.: L: 15–16 µm, Bs: 24–26 µm, I: 8–9  
Occ.: 26rr

Concerning the shape of the cell body, similar to *Std. extensus* var. *joshuae* (see above), but distinguished by a slightly shorter cell length, and in particular by much shorter spines.

***Staurastrum arctiscon* (RALFS) P.LUNDELL (Fig. 294)**

Dim.: L: 90–120 µm, B: 81–118 µm, I: 21–28 µm  
Occ.: 46rr, 47c

This beautiful tychoplanktonic alga is, within Europe, characterized by a marked atlantic–subarctic distribution, but nowhere is it really common (COESEL & KRIENITZ 2008), and in Central Europe is it evidently rare (e.g. LENZENWEGER 1999 mentions the first record from Austria). Only one record has been documented (LÜTKEMÜLLER 1910) from the Czech Republic.

***Staurastrum bloklandiae* COESEL et JOOSTEN (Figs 295–296)**

Dim.: L: 27–45 µm, B: 30–44 µm, I: 5–6 µm  
Occ.: 15c, 16c, 27rr, 28rr, 58rr, 60rr, 108rr, 109rr

Although only described relatively recently (COESEL & JOOSTEN 1996), this species is already known from many European countries, namely: The Netherlands, France, England, Poland, Serbia, Austria (see MEESTERS & COESEL 2007), Germany (SCHARF 1985, as *Staurastrum* cf. *caledonense* HUBER–PESTALOZZI) and Slovakia (TOMASZEWCZ & HINDÁK 2008). In the Czech Republic it was found very recently by HAŠLER et al. (2008) and, according to my findings, it seems to be rather common in the plankton of eutrophic water

bodies.

***Staurastrum bohlinianum* SCHMIDLE (Figs 297–298)**

Dim.: L: 22.5–25 µm, B: 22.5–25 µm, I: 9–10 µm  
Occ.: 61rr, 68rr

According to LENZENWEGER (1997), a species with an arctic–alpine distribution, which agrees with my data, as well as with the only previous finding in the Czech Republic recorded from the Krkonoše Mts by Nováková (2004). *St. bohlinianum* might be easily confused with reduction forms of *St. polymorphum* RALFS var. *pygmaeum* GRÖNBLAD that, however, has a different ecology preferring mesotrophic, only slightly acidic habitats situated mostly at lower altitudes.

**\**Staurastrum crassangulatum* COESEL (Figs 299, 400–402)**

Syn.: *St. kaiseri* RŮŽIČKA (invalid homonym of *St. kaiseri* PEVALEK)  
Dim.: L: 36–40 µm, B: 31.5–37 µm, I: 9–10 µm  
Occ.: 1rr, 5c

From similar, but more common *St. bieneanum* RABENH. distinguished particularly by the usually thickened cell wall at the lateral angles (Fig. 299).

**\**Staurastrum cristatum* (NÄGELI) W.ARCHER var. *cuneatum* HINODE (Figs 300–301)**

Dim.: L: 43–48 µm, B: 45–53 µm, I: 22–23 µm  
Occ.: 1rr, 5r, 114rr

My specimens are identical with those reported under the name *St. cristatum* var. *navigiolum* (GRÖNBLAD) COESEL from a very similar, well-preserved habitat in Austria by LENZENWEGER (2000a, 2000b). However, both his material, as well as mine, correspond slightly better with *St. cristatum* var. *cuneatum*, as the differences between these two taxa are rather small (see COESEL & MEESTERS 2007). On site no. 114, most likely, the alga discussed was scoured from neighbouring bogs situated in Zone I of Šumava National Park.

***Staurastrum erasum* BRÉB. (Figs 302, 403–404)**

Dim.: L: 33–37.5 µm, B: 37–40 µm, I: 10–11.5 µm  
Occ.: 21r, 46rr, 47rr, 49rr, 51r, 79rr, 86r, 98rr, 114rr

In the Czech Republic there has been only one previous finding of this alga (RŮŽIČKA 1957a) that

is well distinguished from similar taxa by bowl-shaped semicells. Judging from my findings, it seems to be typical in relatively undisturbed, mesotrophic, slightly acidic to neutral ponds and pools, where it usually occurs among submerged macrophytes; it has often been reported in the literature from similar habitats (see e.g. MESSIKOMMER 1942; RŮŽIČKA 1957a; LENZENWEGER 1997, 2000b).

**\**Staurastrum eurycerum* SKUJA (Figs 303–304)**

Syn.: *St. dybowskii* WOŁOSZ.  
Dim.: L: 18–26 µm, B: 32–52 µm, I: 6–8 µm  
Occ.: 1c, 2rr, 9r, 10rr, 11r, 86r

SKUJA (1948) considers this species euplanktonic, but from the data on its ecology provided by LENZENWEGER (1997), and also from the conditions of my findings (on all sites found in plankton, but at sites no. 1, 9, 10 and 86 also found in the littoral zone associated with submerged macrophyte vegetation) it would be better described as a tychoplanktonic alga.

**\**Staurastrum habeebense* IRÉNÉ–MARIE (Figs 305–307, 405–406)**

Dim.: L: 36–45 µm, B: 24–31 µm, I: 21–23 µm  
Occ.: 91r, 93cc

A remarkable species, preferring (unlike most desmids) artificial, periodically desiccating substrata, like roof and drainage gutters or garden ornaments, where it is probably widely distributed, as indicated by its relatively frequent recent findings (BELCHER & SWALE 1984; WILLIAMSON 2002; COESEL & HINDÁK 2003; COESEL et al. 2006). For a more detailed discussion of the ecology of *Staurastrum habeebense* see COESEL & HINDÁK (2003) and ŠŤASTNÝ (2008).

***Staurastrum hystrix* RALFS (Figs 308–309)**

Dim.: Ls: 30–35 µm, Bs: 26.5–30 µm, I: 10–11.5 µm  
Occ.: 4r, 24c (at both sites in a strongly acidic, oligotrophic milieu)

Rather rare, strictly acidophilous taxon, from the Czech Republic previously reported only from the Šumava Mts by LÜTKEMÜLLER (1910) and by MATTAUCH (1936) from sampling site no. 3.

**\**Staurastrum lapponicum* (SCHMIDLE) GRÖNBLAD  
(Figs 310–311, 407–409)**

Dim.: L: 31–38 µm, B: 31–37 µm, I: 10–13 µm  
Occ.: 1r, 4rr, 5c, 8r, 9rr, 13r, 14r, 17rr, 24c, 25c, 44rr,  
47rr, 48rr, 49rr, 53rr, 86r, 89c, 99c, 105rr

Considering the relatively high frequency of my findings, it is somewhat surprising that this species has not previously been mentioned in the Czech Republic. Possibly, however, it has been mistaken for some forms close to *St. punctulatum* RALFS. At present it seems to be relatively common in mesotrophic, slightly acidic habitats.

***Staurastrum meriani* REINSCH (Fig. 312)**

Dim.: L: 42–45 µm, B: 24–25 µm, I: 15 µm  
Occ.: 50r, 117r

Rather rare species of ephemeral habitats. Previous records from the Czech Republic: PASCHER (1906), FISCHER (1922–24), BECK–MANNAGETA (1929), RŮŽIČKA (1956, 1957b), ROUBAL (1958). Apical view usually regularly hexagonal.

**\**Staurastrum minimum* COESEL (Fig. 313)**

Dim.: L: 15–20 µm, B: 16–22 µm, I: 4–5 µm  
Occ.: 1cc, 4c, 24cc

To date, this species has been reported only from The Netherlands (COESEL 1996) and France (KOUWETS 2001). It has only a few specific morphological features (COESEL & MEESTERS 2007), however, rather characteristic seems to be its ecology; it prefers more or less oligotrophic, acidic habitats, which corresponds well with the circumstances of my findings.

**\**Staurastrum oligacanthum* W.ARCHER (Figs 314–315)**

Dim.: L: 37.5–42.5 µm, B: 42–45 µm, I: 20–22 µm  
Occ.: 1r

New for the Czech flora; however, COESEL (1997) and LENZENWEGER (1997) point to the considerable similarity and relationship between this species and *St. cristatum*; it is therefore possible that some findings of *St. cristatum* within the Czech Republic refer in fact to the alga in question, particularly ROSA (1969; pl. 13, fig. 18) and RŮŽIČKA (1973; pl. 16, fig. 2).

***Staurastrum orbiculare* RALFS var. *ralfii* W. et G.S.WEST (Fig. 316)**

Dim.: L: 31–37.5 µm, B: 27–31 µm, I: 8.5–9.5 µm  
Occ.: 44r, 114rr

Previous records from the Czech Republic: JAPP (1930b), ROSA (1939), ROUBAL (1958).

***Staurastrum oxyacanthum* W.ARCHER (Fig. 317)**

Dim.: L: 26–30 µm, B: 37–48 µm, I: 9–11 µm  
Occ.: 1r

This species is usually considered to be rather common (see e.g. LENZENWEGER 1997, 2003b; COESEL & MEESTERS 2007); in the Czech Republic, however, it seems to be very rare, having been reported only twice thus far (LÜTKEMÜLLER 1910, as *S. oxyacantha* W.ARCHER, HOLZER 1931).

**\**Staurastrum pentasterias* GRÖNBLAD (Fig. 318)**

Dim.: L: 29–31.5 µm, B: 35.5–39 µm, I: 10–13 µm  
Occ.: 1rr, 14rr

A rather variable taxon, as concerns its arm-length and thickness, and cell wall ornamentation, on the other hand, the cell length and particularly the radiation of the cells (5–radiate) seem to be quite constant (RŮŽIČKA 1972) and may therefore be used as distinguishing features.

**\**Staurastrum podlachicum* B.EICHLER et GUTW.  
(Figs 319–321)**

Dim.: L: 33–39 µm, B: 37–40 µm, I: 13–15 µm  
Occ.: 1rr, 114rr

Poorly known species that is considered doubtful by COESEL & MEESTERS (2007). However, the morphological characteristics of my specimens were very consistent. Moreover, no intermediate forms were found between this taxon and, for instance, the at site no.1 co-occurring *St. oligacanthum* (compare Figs 314–315 and 319–321), a variety of which *St. podlachicum* has been previously described (GRÖNBLAD 1920). Therefore, in my opinion, *St. podlachicum* represents a “good” species. Most probably, on site no. 114 the alga in question was scoured from adjacent bogs situated in Zone I of Šumava National Park, as also indicated by its finding in a minimal abundance (one cell).

***Staurastrum pungens* RALFS (Fig. 322)**

Dim.: Ls: 39–46 µm, Bs: 33–40 µm, I: 11–12.5 µm  
Occ.: 1rr

A very rare taxon, in the Czech Republic found only by PASCHER (1903, 1906).

**\**Staurastrum quadrispinatum* W.B.TURNER (Fig. 323)**

Dim.: Ls: 28.5–35 µm, Bs: 27.5–29 µm, I: 9 µm  
Occ.: 30rr

A rather rare species of oligotrophic, strongly acidic high moors (PÉTERFI 1974; LENZENWEGER 1997). Most likely, the alga occurs also in some of the high moors within the “Modravské slatě” complex.

***Staurastrum sebaldi* REINSCH (Fig. 324)**

Dim.: L: 73–87 µm, B: 75–110 µm, I: 18–22 µm  
Occ.: 1rr

In the Czech Republic *St. sebaldi* is a rare species, previously reported only from four localities (LÜTKEMÜLLER 1910; DVOŘÁK 1932; ROUBAL 1939; ROSA 1951). In addition, RŮŽIČKA (1973) found the very closely related *St. traunsteineri* HUSTEDT that might be considered *St. sebaldi* as well (see e.g. LENZENWEGER 1997; p. 125 and 138).

**\**Staurastrum setigerum* CLEVE (Fig. 325)**

Dim.: Ls: 50–56 µm, Lc: 57–66 µm, Bs: 43–52 µm,  
Bc: 57–68 µm, I: 14–17 µm  
Occ.: 17c, 114r

This species is easily to be distinguished from taxa with a similar ornamentation and ecology by their dimensions; *St. teliferum* RALFS is distinctly smaller, *St. polytrichum* (PERTY) RABENH. noticeably larger. Moreover, both those taxa are much more common than *St. setigerum*. At site no. 114, most likely, the alga in question is not autochthonous but scoured from adjacent bogs situated in Zone I of Šumava National Park.

***Staurastrum smithii* (G.M.SMITH) TEILING (Fig. 326)**

Syn.: *St. contortum* G.M.SMITH  
Dim.: L: 37–48 µm, B: 43–54 µm, I: 6–7 µm  
Occ.: 15c, 16r, 124r

Probably a quite rare plankton, preferring eutrophic waters (COESEL 1997; LENZENWEGER 2003b) that, however, is quite probably generally

confused with other planktonic *Staurastrum* species. From the Czech Republic there have been only two findings (PASCHER 1903, 1906).

***Staurastrum trapezicum* BOLDT (Figs 327–328, 410)**

Dim.: L: 50–62 µm, B: 55–63 µm, I: 14–16 µm  
Occ.: 1r, 103r

Previously, this species was reported from the Czech Republic only by FISCHER (1922–24, 1924), HOLZER (1931), RŮŽIČKA (1956) and NEUSTUPA et. al. (2002), but at least Růžička's finding, from examination of his figure (RŮŽIČKA 1956; pl. 5, fig. 41), represents a different species, related to *St. hirsutum* RALFS or its var. *muricatum* (RALFS) KURT FÖRST.

**\**Staurastrum varians* RACIB. (Figs 329, 411)**

Dim.: L: 32–35 µm, B: 30–34 µm, I: 15–16 µm  
Occ.: 1r

From the Czech Republic only the closely related *St. acutum* BRÉB. has been reported [RABENHORST 1868, as *St. granulosum* RALFS var. *acutum* (BRÉB.) W. et G.S.WEST], which differs in that it has acute lateral angles, instead of rounded as in *St. varians* (COESEL & MEESTERS 2007).

***Staurastrum vestitum* RALFS (Figs 330–331)**

Syn.: *St. anatinum* COOKE et WILLS f. *vestitum* (RALFS)  
BROOK  
Dim.: L: 32–42 µm, B: 47–84 µm, I: 12–15 µm  
Occ.: 1c, 4rr, 5r, 8rr, 47r

A rare, morphologically highly variable taxon of well-preserved habitats, closely related to *St. aculeatum* RALFS as well as to *St. anatinum* (COESEL & MEESTERS 2007). Its only previous finding in the Czech Republic was mentioned by JAPP (1930b).

***Cosmocladium constrictum* W.ARCHER (Fig. 332)**

Dim.: L: 13.5–15 µm, B: 8.5–9 µm, I: 7.5–8 µm  
Occ.: 9c (in plankton)

Notably, in my samplings many large colonies were present, although they only seldom are built up due to the extreme delicacy of their interconnecting slime strands. It is likely that *C. constrictum* is a very rare species, but considering the fragility of their interconnecting strands they may easily be disintegrated in fixed material (COESEL

1994), and, therefore, a subsequent confusion of individual cells with some representatives of the genus *Actinotaenium* cannot be ruled out. The only previous finding of this species in the Czech Republic was mentioned by LÜTKEMÜLLER (1910).

***Cosmocladium saxonicum* DE BARY (Figs 333–335)**

Dim.: L: 22–24 µm, B: 16–17.5 µm, I: 7–7.5 µm

Occ.: 98m (in plankton)

There is only one previous record of this species in the Czech Republic (LÜTKEMÜLLER 1910). It is probably very rare (for instance, it was only recently, see LENZENWEGER 2002, 2003a, found for the first time in Austria), but, as in the case of *C. constrictum*, fixing with alcohol or formaldehyde causes, in approximately 24 hours (COESEL 2004), a degradation of the colonies due to the disintegration of the interconnecting strands, and individual cells can then be easily mistaken for some smooth-walled representatives of the genus *Cosmarium*. Interestingly, the occurrence of the representatives of the genus *Cosmocladium* seems to be markedly ephemeral; both *C. saxonicum* as well as *C. constrictum* were sampled in large numbers in the autumn of 2005, but had already completely disappeared from the sampling sites by 2006; a similar observation was mentioned by Kouwets (KOUWETS, pers. com.) for *C. perissum* J.ROY et BISSET.

***Sphaerozosma aubertianum* W.WEST (Figs 336, 412–413)**

Dim.: L: 14–18 µm, B: 19–27 µm, I: 5.5–7.5 µm

Occ.: 47c, 83r, 88r

A rare species preferring mesotrophic, slightly acidic habitats (RŮŽIČKA 1973; KOUWETS 1987), from the Czech Republic until now reported only by LÜTKEMÜLLER (1910) and RŮŽIČKA (1973).

***Sphaerozosma filiforme* RALFS (Figs 337, 414–415)**

Syn.: *Onychonema filiforme* (EHRENB.) J.ROY et BISSET

Dim.: L: 10.5–12.5 µm, B: 11.5–14.5 µm, I: 4–5 µm

Occ.: 1r, 4rr, 5r, 8rr, 9rr

This species appears to have a relatively broad ecological range; in literature it is usually described from mesotrophic, slightly acidic habitats (see e.g. RŮŽIČKA 1973; COESEL 1994, 1998a; LENZENWEGER 2000b), however it can also withstand slightly

eutrophic and weakly alkaline conditions (FEHÉR 2003). I found it in a similar, slightly eutrophic environment at sampling site no. 1. Previous findings from the Czech Republic: ROUBAL (1939), ROSA (1969) and RŮŽIČKA (1973). ROUBAL (1958) also mentions its nineteenth-century findings by Corda and Hansgirg in Western Bohemia.

***Hyalotheca mucosa* RALFS (Fig. 338)**

Dim.: L: 14–20 µm, B: 17–20 µm

Occ.: 26c, 33rr, 42 r, 46cc, 47r

Much less common than *Hyalotheca dissiliens* RALFS. Previous findings from the Czech Republic: PASCHER (1903, 1906), DVOŘÁK (1919), JAPP (1930a), DVOŘÁK (1932), MALOCH (1937), ROUBAL (1939), WÜNSCH (1939) and ROSA (1951).

**\**Desmidium baileyi* (RALFS) NORDST. var. *caelatum* (KIRCHN.) NORDST. (Figs 339, 416–417)**

Dim.: L: 16–18 µm, B: 22–24 µm

Occ.: 1r, 4rr, 5r

A rare taxon; for instance, LENZENWEGER (2000a) mentions the first finding in Austria, and notes only two known sites from Switzerland; GUTOWSKI & MOLLENHAUER (1996) describe it, probably by mistake, as “a very abundant species, currently not endangered”. The nominate variety of *D. baileyi* differs in having cells about as long as they are broad with almost straight lateral sides, and it is particularly known from tropical regions (COESEL & MEESTERS 2007).

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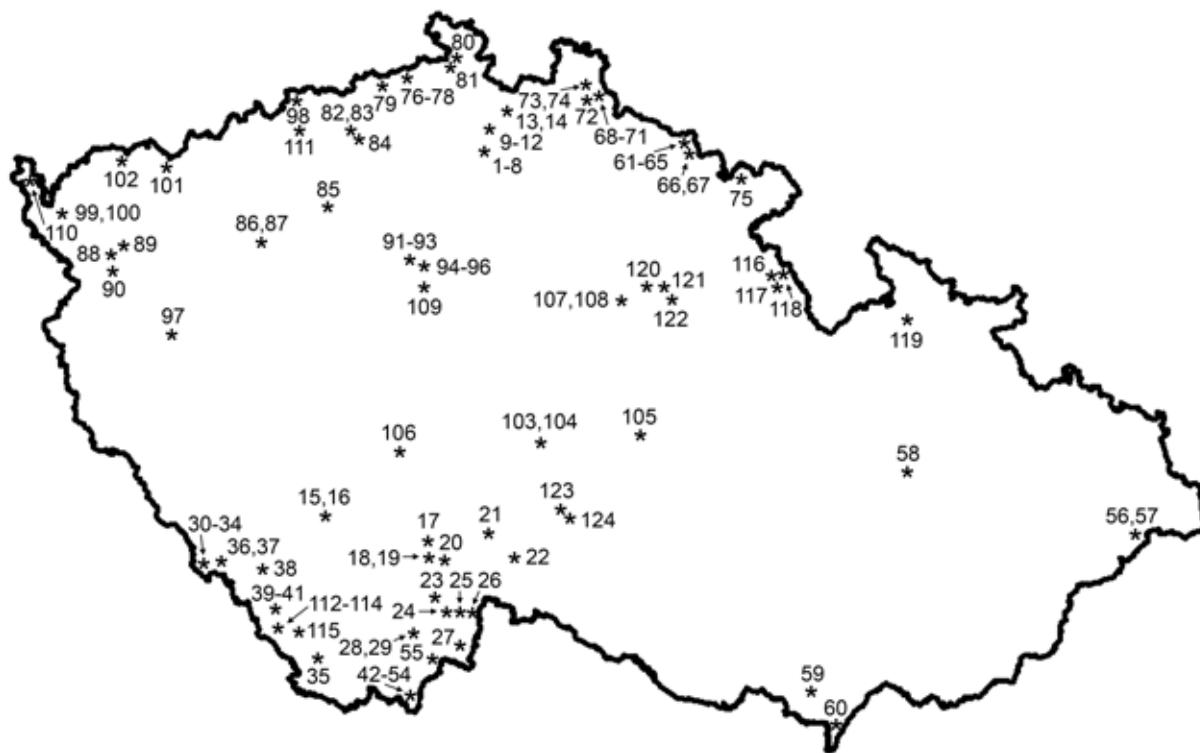


Fig. 1. Location of the sampling sites in the territory of the Czech Republic.

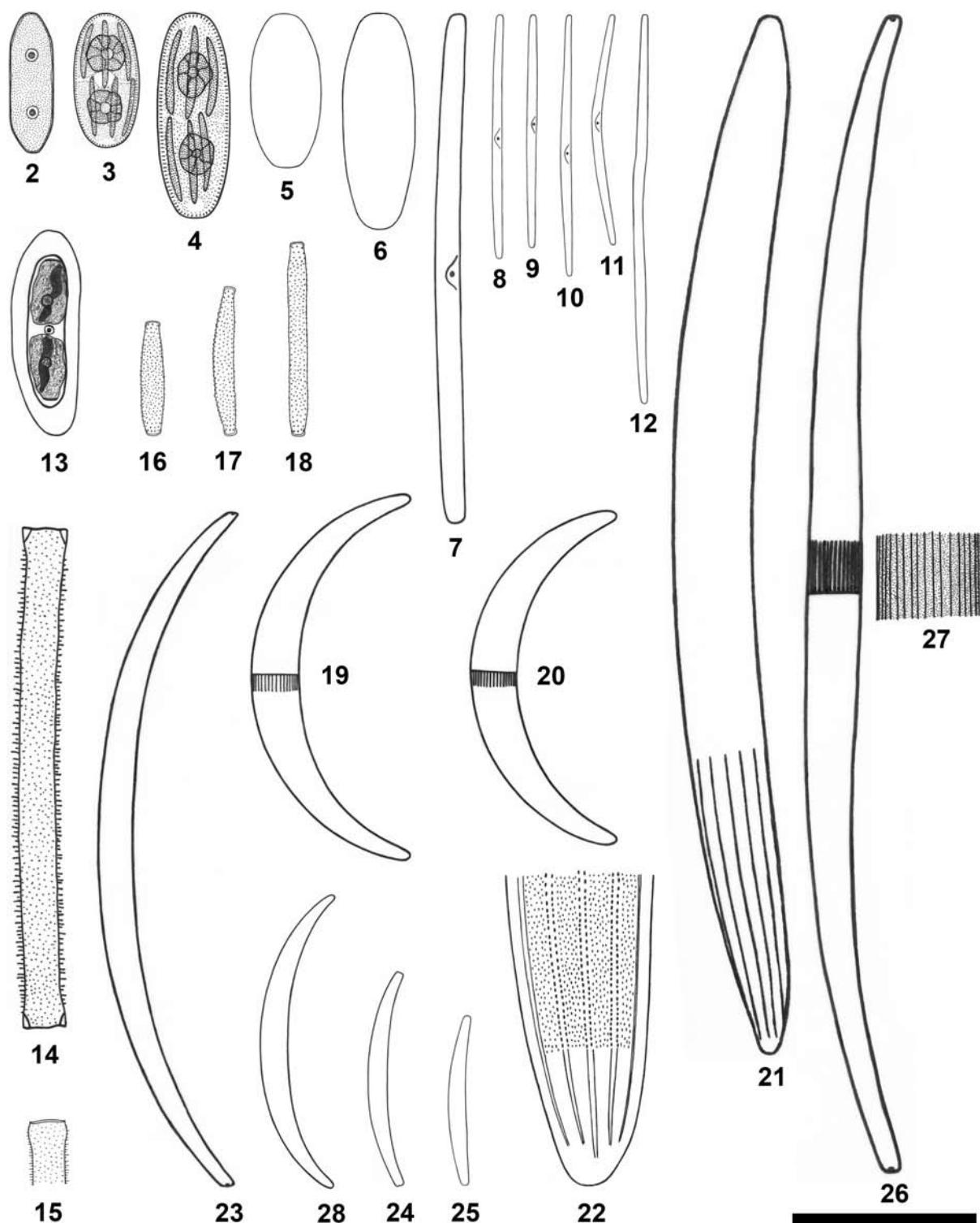
#### List of sampling sites

1. Nature reserve "Břehyně – Pecopala" – slightly eutrophic pond ( $50^{\circ}34'2.38''$  N,  $14^{\circ}40'56.05''$  E; pH = 7.5–7.7, cond. =  $220\text{--}234 \mu\text{S}\cdot\text{cm}^{-1}$ ) surrounded with a large complex of bogs and fens (pH at most sampling sites = 5.5–6.5, cond. = 70–220  $\mu\text{S}\cdot\text{cm}^{-1}$ ).
2. Máchovo jezero ( $50^{\circ}35'2.13''$  N,  $14^{\circ}38'59.31''$  E) – eutrophic pond; pH = 7.5–8.0, cond. =  $212\text{--}276 \mu\text{S}\cdot\text{cm}^{-1}$ .
3. Nature reserve "Swamp" ( $50^{\circ}34'48.19''$  N,  $14^{\circ}40'4.77''$  E) – transition bog; pH = 3.5–5.4, cond. =  $88\text{--}174 \mu\text{S}\cdot\text{cm}^{-1}$ .
4. Unnamed transition bog about 350 m south-southeast from the "Swamp" Nature Reserve ( $50^{\circ}34'34.44''$  N,  $14^{\circ}40'14.45''$  E); pH = 3.4–6.3, cond. =  $54\text{--}156 \mu\text{S}\cdot\text{cm}^{-1}$ .
5. Unnamed boggy pool on the southern side of "Máchovo jezero" fishpond ( $50^{\circ}34'39.25''$  N,  $14^{\circ}39'44.68''$  E); pH = 5.7–6.5, cond. =  $198\text{--}307 \mu\text{S}\cdot\text{cm}^{-1}$ .
6. Unnamed transition bog on the northern side of "Máchovo jezero" fishpond ( $50^{\circ}35'38.69''$  N,  $14^{\circ}38'37.01''$  E).
7. Ephemeral pool near "Břehyňský" pond ( $50^{\circ}34'32.27''$  N,  $14^{\circ}40'49.55''$  E); pH = 5.8, cond. =  $98 \mu\text{S}\cdot\text{cm}^{-1}$ .
8. Nature reserve "Mariánský rybník" ( $50^{\circ}32'43.59''$  N,  $14^{\circ}40'42.71''$  E) – oligomesotrophic boggy pond.
9. Držník ( $50^{\circ}36'39.32''$  N,  $14^{\circ}43'23.26''$  E) – mesotrophic pond (part of the "Hradčanské rybníky" Nature Reserve; pH = 6.0–6.1, cond. =  $185\text{--}285 \mu\text{S}\cdot\text{cm}^{-1}$ ) with a neighboring transition bog; pH = 5.5–5.8, cond. =  $120\text{--}168 \mu\text{S}\cdot\text{cm}^{-1}$ .
10. Strážovský rybník ( $50^{\circ}36'35.08''$  N,  $14^{\circ}45'4.03''$  E) – slightly eutrophic pond (part of the "Hradčanské rybníky" Nature Reserve); pH = 6.1–6.6, cond. =  $334\text{--}362 \mu\text{S}\cdot\text{cm}^{-1}$ .
11. Hradčanský rybník ( $50^{\circ}37'1.55''$  N,  $14^{\circ}42'38.55''$  E) – slightly eutrophic pond; pH = 6.4–6.6, cond. =  $225\text{--}265 \mu\text{S}\cdot\text{cm}^{-1}$ .
12. Hvězdovský rybník ( $50^{\circ}38'31.72''$  N,  $14^{\circ}47'27.09''$  E) – slightly eutrophic pond.
13. Nature reserve "Rašeliniště Černého rybníka" ( $50^{\circ}41'22.43''$  N,  $14^{\circ}50'30.93''$  E) – mesotrophic pond (pH = 6.7, cond. =  $96 \mu\text{S}\cdot\text{cm}^{-1}$ ) with a neighboring transition bog.
14. Děvinský rybník ( $50^{\circ}41'35.67''$  N,  $14^{\circ}51'47.64''$  E) – mesotrophic pond. Leg. Ladislav Hodač, Charles University, Prague.
15. Nature reserve "Řežabinec a Řežabinecké tůně" ( $49^{\circ}15'10.75''$  N,  $14^{\circ}5'31.99''$  E) – eutrophic fishpond (pH = 8.1–10.2, cond. =  $312\text{--}499 \mu\text{S}\cdot\text{cm}^{-1}$ ) with neighboring pools (pH = 6.1–7.4, cond. =  $396\text{--}827 \mu\text{S}\cdot\text{cm}^{-1}$ ).
16. Podkostelní rybník ( $49^{\circ}15'53.63''$  N,  $14^{\circ}7'30.95''$  E) – eutrophic fishpond; pH = 7.7, cond. =  $357 \mu\text{S}\cdot\text{cm}^{-1}$ .
17. Nature reserve "Borkovická blata" ( $49^{\circ}14'9.36''$  N,  $14^{\circ}37'24.84''$  E) – transition bog; pH = 5.5–6.5, cond. =  $60\text{--}160 \mu\text{S}\cdot\text{cm}^{-1}$ .
18. Oligotrophic, acidic pool in the "Ruda" Nature Reserve ( $49^{\circ}9'8.29''$  N,  $14^{\circ}41'30.66''$  E).
19. Nature reserve "Hliníř" ( $49^{\circ}8'9.2''$  N,  $14^{\circ}40'46.54''$  E) – transition bog; pH = 4.4–5.8, cond. =  $65\text{--}106 \mu\text{S}\cdot\text{cm}^{-1}$ .
20. Nature reserve "Rod" ( $49^{\circ}7'15.94''$  N,  $14^{\circ}44'59.42''$  E) – transition bog; pH = 5.5–6.2, cond. =  $116\text{--}178 \mu\text{S}\cdot\text{cm}^{-1}$ .
21. Nature reserve "Luží u Lovětína" ( $49^{\circ}12'20.77''$  N,  $15^{\circ}3'18.68''$  E) – complex of several mesotrophic and slightly eutrophic pools.
22. Dolní Lomský rybník ( $49^{\circ}6'24.77''$  N,  $15^{\circ}9'41.59''$  E) – slightly eutrophic fishpond.
23. Nature reserve "V Rájích" ( $48^{\circ}59'10.35''$  N,  $14^{\circ}42'31.63''$  E) – mesotrophic spring area; pH = 5.9–7.2, cond. =  $233\text{--}240 \mu\text{S}\cdot\text{cm}^{-1}$ .

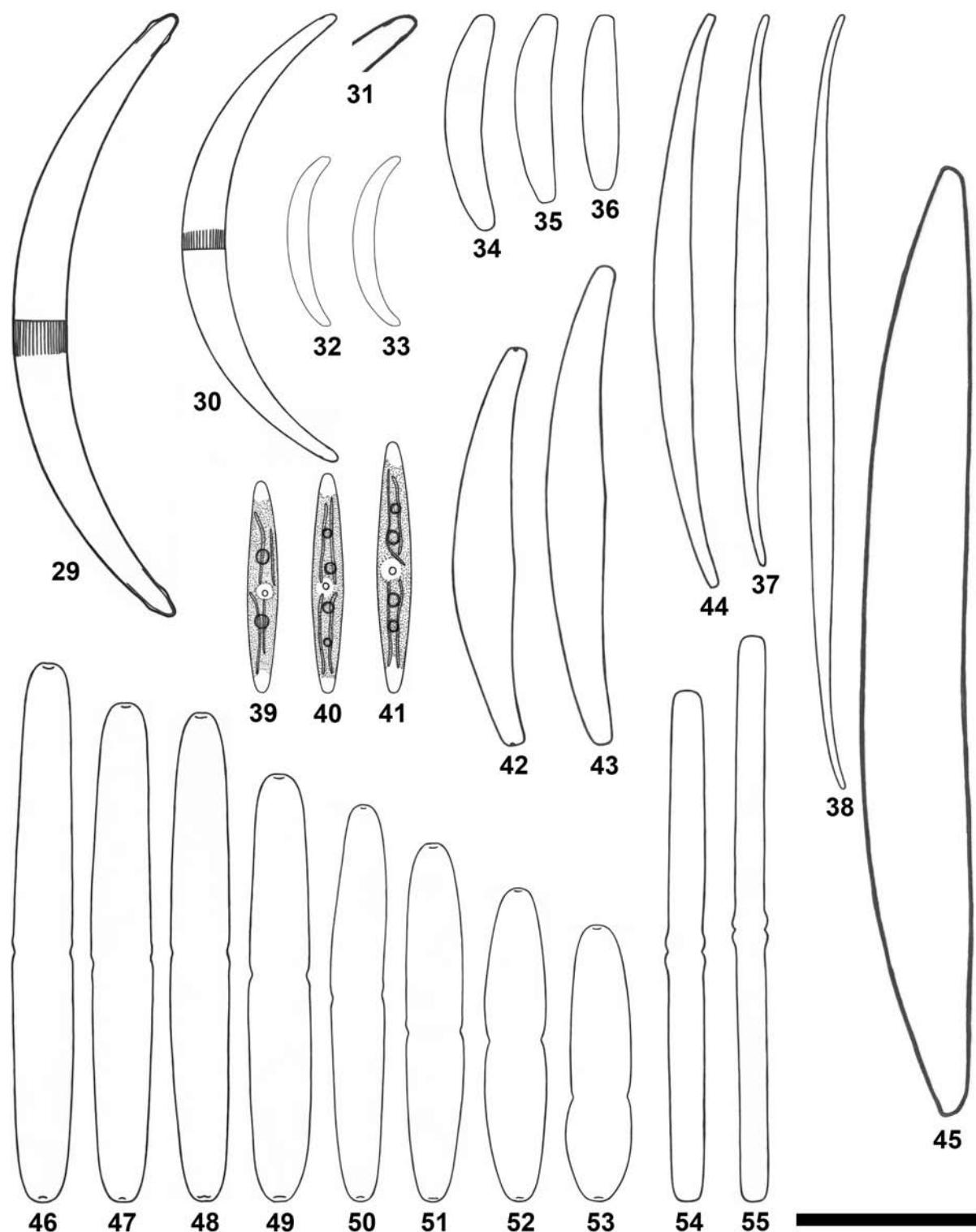
- 330  $\mu\text{S}\cdot\text{cm}^{-1}$ .
24. Pískovny Cep ( $48^{\circ}55'24.19''$  N,  $14^{\circ}50'19.34''$  E) – complex of several oligotrophic and mesotrophic pools; pH = 4,3–7,0, cond. = 22–50  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  25. Nature reserve “Vizir” ( $48^{\circ}57'46.87''$  N,  $14^{\circ}53'13.01''$  E) – slightly eutrophic pond (pH = 6,5–7,5, cond. = 110–185  $\mu\text{S}\cdot\text{cm}^{-1}$ ) with a neighboring transition bog (pH = 4,0–5,5, cond. = 95–131  $\mu\text{S}\cdot\text{cm}^{-1}$ ).
  26. Nature reserve “Rašelinisko Pele” ( $48^{\circ}57'36.69''$  N,  $14^{\circ}57'25.92''$  E) – transition bog; pH = 5,3–5,9, cond. = 74–112  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  27. Eutrophic pool in the “Horní Lužnice” Nature Reserve ( $48^{\circ}51'3.72''$  N,  $14^{\circ}54'28.76''$  E); pH = 7,8, cond. = 212  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  28. Krčín ( $48^{\circ}53'55.42''$  N,  $14^{\circ}39'53.04''$  E) – eutrophic fishpond.
  29. Nature reserve “Žemlička” ( $48^{\circ}53'29.09''$  N,  $14^{\circ}41'21.74''$  E) – mesotrophic pond with a neighboring spring fen (pH = 6,3–6,8, cond. = 139–241  $\mu\text{S}\cdot\text{cm}^{-1}$ ).
  30. Nature reserve “Přední Mlynářská slat” ( $49^{\circ}1'21.30''$  N,  $13^{\circ}27'29.53''$  E) – oligotrophic high moor; Zone I of Šumava National Park; pH = 3,7–4,1, cond. = 37–93  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  31. Shallow pool near the way from Přední Mlynářská slat to the “Roklanský” stream ( $49^{\circ}1'20.31''$  N,  $13^{\circ}27'9.67''$  E); Zone I of Šumava National Park; pH = 5,8, cond. = 27  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  32. Mesotrophic pool near “Roklanský” stream ( $49^{\circ}1'30.06''$  N,  $13^{\circ}26'44.74''$  E); Zone I of Šumava National Park.
  33. Mesotrophic ditch near “Roklanský” stream ( $49^{\circ}1'42.71''$  N,  $13^{\circ}26'49.47''$  E); Zone I of Šumava National Park.
  34. Shallow, water-filled ditch near the way from Novohuťské močály to the “Březník” mountain ( $48^{\circ}58'18.90''$  N,  $13^{\circ}28'3.80''$  E; Šumava National Park); pH = 5,3, cond. = 17  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  35. Small spring area near the “Pláničský rybník” Nature Reserve ( $48^{\circ}43'21.61''$  N,  $14^{\circ}9'42.77''$  E); pH = 5,7–6,2, cond. = 96–115  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  36. Oligomesotrophic ephemeral pool near the “Zhůří” village ( $49^{\circ}4'44.18''$  N,  $13^{\circ}34'13.35''$  E); Šumava National Park.
  37. Oligomesotrophic ephemeral pool near the “Olšinka” stream ( $49^{\circ}1'15.28''$  N,  $13^{\circ}36'38.59''$  E); Šumava National Park.
  38. Oligomesotrophic ephemeral pool near the “Solovec” mountain ( $48^{\circ}58'34.79''$  N,  $13^{\circ}51'16.33''$  E); Šumava Protected Landscape Area.
  39. Oligomesotrophic ephemeral ditch near the “Spáleniště” mountain ( $48^{\circ}52'31.36''$  N,  $13^{\circ}48'7.95''$  E); Šumava National Park.
  40. Mesotrophic ephemeral ditch near the “Pěkná” village ( $48^{\circ}51'44.32''$  N,  $13^{\circ}57'5.03''$  E); Šumava Protected Landscape Area.
  41. Oligotrophic ephemeral ditch near the “Doupná hora” mountain ( $48^{\circ}53'42.84''$  N,  $13^{\circ}56'6.56''$  E); Šumava Protected Landscape Area.
  42. Mlýnský rybník ( $48^{\circ}42'38.67''$  N,  $14^{\circ}42'43.19''$  E) – mesotrophic pond; Novohradské hory Mts Protected Landscape Area; pH = 5,8–6,7, cond. = 49–108  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  43. Oligomesotrophic ephemeral pool near the “Mlýnský” pond ( $48^{\circ}42'33.09''$  N,  $14^{\circ}42'47.09''$  E); Novohradské hory Mts Protected Landscape Area; pH = 5,6, cond. = 13  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  44. Zlatá Ktiš ( $48^{\circ}40'44.03''$  N,  $14^{\circ}42'35.92''$  E) – mesotrophic pond; Novohradské hory Mts Protected Landscape Area; pH = 6,1–6,9, cond. = 53–81  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  45. Oligomesotrophic ephemeral pool near the “Zlatá Ktiš” pond ( $48^{\circ}40'48.09''$  N,  $14^{\circ}42'32.57''$  E); Novohradské hory Mts Protected Landscape Area.
  46. Small mesotrophic pond near the “Žofín” village ( $48^{\circ}40'32.99''$  N,  $14^{\circ}41'33.61''$  E); Novohradské hory Mts Protected Landscape Area; pH = 6,5 cond. = 104  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  47. Huťský rybník ( $48^{\circ}39'20.99''$  N,  $14^{\circ}40'56.36''$  E) – mesotrophic pond; Novohradské hory Mts Protected Landscape Area; pH = 5,6–6,4, cond. = 32–69  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  48. Uhlištěský rybník ( $48^{\circ}38'48.01''$  N,  $14^{\circ}39'20.55''$  E) – mesotrophic pond; Novohradské hory Mts Protected Landscape Area; pH = 5,5–6,2, cond. = 36–43  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  49. Pohořský rybník ( $48^{\circ}37'4.27''$  N,  $14^{\circ}40'26.86''$  E) – mesotrophic pond; Novohradské hory Mts Protected Landscape Area; pH = 5,1–6,2, cond. = 23–40  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  50. Wet mosses on the margin of “Pohořský” pond ( $48^{\circ}37'3.29''$  N,  $14^{\circ}40'25.81''$  E); Novohradské hory Mts Protected Landscape Area.
  51. Small mesotrophic pool about 400 m southeast from the “Pohořský” pond ( $48^{\circ}36'47.96''$  N,  $14^{\circ}40'52.95''$  E); Novohradské hory Mts Protected Landscape Area; pH = 7,0, cond. = 47  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  52. Moss-covered rocks in the “Pohořský” stream ( $48^{\circ}37'9.25''$  N,  $14^{\circ}40'18.79''$  E); Novohradské hory Mts Protected Landscape Area.
  53. Kapelunk ( $48^{\circ}36'43.92''$  N,  $14^{\circ}42'46.60''$  E) – mesotrophic pond; Novohradské hory Mts Protected Landscape Area; pH = 6,3–6,7, cond. = 34–86  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  54. Shallow ephemeral pool near the “Kapelunk” pond ( $48^{\circ}36'37.22''$  N,  $14^{\circ}42'42.51''$  E); Novohradské hory Mts Protected Landscape Area; pH = 6,2, cond. = 39  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  55. Nature reserve “Přesličkový rybník” ( $48^{\circ}46'15.63''$  N,  $14^{\circ}48'11.14''$  E) – mesotrophic pond; pH = 5,9, cond. = 60  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  56. Oligomesotrophic ephemeral pool near the “Gruň” mountain ( $49^{\circ}29'32.51''$  N,  $18^{\circ}30'22.63''$  E); Beskydy Protected Landscape Area; pH = 5,9, cond. = 80  $\mu\text{S}\cdot\text{cm}^{-1}$ .
  57. Mesotrophic ephemeral ditch ( $49^{\circ}30'41.83''$  N,  $18^{\circ}28'37.53''$  E) near the “Okrouhlíce” mountain; Beskydy Protected Landscape Area.

58. Slightly eutrophic pool near the “Chomoutovské jezero” Nature Reserve ( $49^{\circ}38'46.54''$  N,  $17^{\circ}14'35.12''$  E); pH = 7.9–8.1. Leg. Ludmila Hájková, Masaryk University, Brno.
59. Nature reserve “Zámecký rybník” ( $48^{\circ}48'29.93''$  N,  $16^{\circ}48'34.02''$  E) – eutrophic fishpond; pH = 8.4, cond. =  $528 \mu\text{S.cm}^{-1}$ .
60. Eutrophic ditch near the “Ranšpurk” Nature Reserve ( $48^{\circ}40'53.78''$  N,  $16^{\circ}58'5.40''$  E).
61. Wet, moss covered granite rocks in the “Pančavský” waterfall ( $50^{\circ}45'39.75''$  N,  $15^{\circ}32'42.64''$  E); Zone I of the Krkonoše Mts National Park; pH = 7.0, cond. =  $13 \mu\text{S.cm}^{-1}$ .
62. Wet, sometimes moss-covered granite rocks in the “Úpský” waterfall ( $50^{\circ}43'56.018''$  N,  $15^{\circ}42'44.678''$  E), Zone I of the Krkonoše Mts National Park; pH = 5.6, cond. =  $12 \mu\text{S.cm}^{-1}$ .
63. Wet, moss-covered granite rocks in the “Zelený” stream ( $50^{\circ}42'8.25''$  N,  $15^{\circ}41'54.28''$  E); Krkonoše Mts National Park; pH = 6.6, cond. =  $14 \mu\text{S.cm}^{-1}$ .
64. The “Úpa” river near the town of Pec pod Sněžkou ( $50^{\circ}43'0.41''$  N,  $15^{\circ}43'25.68''$  E); Krkonoše Mts National Park; pH = 6.2, cond. =  $32 \mu\text{S.cm}^{-1}$ .
65. Small peat bog near the locality no. 64 ( $50^{\circ}43'0.51''$  N,  $15^{\circ}43'25.09''$  E); Krkonoše Mts National Park; pH = 5.1, cond. =  $14 \mu\text{S.cm}^{-1}$ .
66. Ephemeral pool near the “Černohorské rašeliniště” peat bog ( $50^{\circ}40'31.574''$  N,  $15^{\circ}43'29.858''$  E); Krkonoše Mts National Park; pH = 5.7, cond. =  $119 \mu\text{S.cm}^{-1}$ .
67. Ephemeral pond near the town of Pec pod Sněžkou ( $50^{\circ}40'51.29''$  N,  $15^{\circ}43'33.93''$  E); Krkonoše Mts National Park
68. Nature reserve “Na Čihadle” ( $50^{\circ}49'57.73''$  N,  $15^{\circ}13'51.68''$  E) – oligotrophic high moor, Jizerské hory Mts Protected Landscape Area; pH = 4.3–4.4, cond. =  $28\text{--}35 \mu\text{S.cm}^{-1}$ .
69. Klugeho louka – part of the “Rašeliniště Jizerky” Nature Reserve ( $50^{\circ}49'45.37''$  N,  $15^{\circ}20'9.86''$  E) – oligotrophic high moor, Jizerské hory Mts Protected Landscape Area; pH = 4.3–4.6, cond. =  $35\text{--}52 \mu\text{S.cm}^{-1}$ .
70. Vyhlídková louka – part of the “Rašeliniště Jizerky” Nature Reserve ( $50^{\circ}49'39.06''$  N,  $15^{\circ}19'40.45''$  E) – oligotrophic high moor, Jizerské hory Mts Protected Landscape Area; pH = 4.5–4.7, cond. =  $32\text{--}44 \mu\text{S.cm}^{-1}$ .
71. Tetřeví louka – part of the “Černá jezírka” Nature Reserve ( $50^{\circ}50'44.92''$  N,  $15^{\circ}18'11.04''$  E) – oligotrophic high moor, Jizerské hory Mts Protected Landscape Area; pH = 4.1–4.5, cond. =  $28\text{--}40 \mu\text{S.cm}^{-1}$ .
72. Oligotrophic ephemeral pool near the “Josefův důl” water reservoir ( $50^{\circ}47'41.90''$  N,  $15^{\circ}11'49.60''$  E); Jizerské hory Mts Protected Landcape Area; pH = 4.9, cond. =  $35 \mu\text{S.cm}^{-1}$ .
73. Wet, moss-covered rocks in the “Sloupenský” stream, near the “Štolpišský” waterfall ( $50^{\circ}51'4.06''$  N,  $15^{\circ}11'39.40''$  E); Jizerské hory Mts Protected Landscape Area.
74. Mucilaginous growths on granite rocks near locality no. 73 ( $50^{\circ}51'1.75''$  N,  $15^{\circ}11'31.41''$  E); Jizerské hory Mts Protected Landscape Area.
75. Ephemeral pool in the “Adršpašsko-Teplické skály” Nature Reserve ( $50^{\circ}36'39.48''$  N,  $16^{\circ}6'35.14''$  E).
76. Nature reserve “Rybniček u Králova mlýna” ( $50^{\circ}50'1.25''$  N,  $14^{\circ}9'20.38''$  E) – mesotrophic fishpond; Labské pískovce Protected Landscape Area; pH = 6.3–6.6, cond. =  $264\text{--}286 \mu\text{S.cm}^{-1}$ .
77. Fire pond near the “Maxičky” village ( $50^{\circ}48'29.04''$  N,  $14^{\circ}10'54.96''$  E); Labské pískovce Protected Landscape Area; pH = 6.5, cond. =  $215 \mu\text{S.cm}^{-1}$ .
78. Wet rocks in an unnamed forest stream ( $50^{\circ}49'1.28''$  N,  $14^{\circ}10'1.63''$  E); Labské pískovce Protected Landscape Area; pH = 6.0, cond. =  $244 \mu\text{S.cm}^{-1}$ .
79. Mesotrophic pond near the “Libouchec” village ( $50^{\circ}45'59.37''$  N,  $14^{\circ}3'32.01''$  E), part of the “Libouchecke rybníčky” Nature Reserve; pH = 6.6, cond. =  $118 \mu\text{S.cm}^{-1}$ . Leg. Sylvie Odstrčilová, Charles University, Prague.
80. Vlčí potok ( $50^{\circ}55'50.25''$  N,  $14^{\circ}25'52.93''$  E) – periodically desiccating stream; National Park Bohemian Switzerland; pH = 6.9–7.3, cond. =  $152\text{--}162 \mu\text{S.cm}^{-1}$ . Leg. Jana Veselá, Charles University, Prague.
81. Wet sandstone rocks in the National Park Bohemian Switzerland ( $50^{\circ}53'20.99''$  N,  $14^{\circ}22'16.91''$  E). Leg. Marie Pažoutová, Charles University, Prague.
82. Rašeliniště pod Bukovým vrchem ( $50^{\circ}32'54.41''$  N,  $13^{\circ}54'18.37''$  E) – mesotrophic peat bog, part of the “Březina” Nature Reserve.
83. Vojenský rybník ( $50^{\circ}32'47.13''$  N,  $13^{\circ}53'47.79''$  E) – mesotrophic pond; České středohoří Protected Landscape Area.
84. Wet, moss covered rocks at the top of the “Borečský vrch” Nature Reserve ( $50^{\circ}30'50.97''$  N,  $13^{\circ}59'19.54''$  E). Leg. Pavel Škaloud, Charles University, Prague.
85. Nature reserve “V Bahnách” ( $50^{\circ}10'30.66''$  N,  $13^{\circ}51'44.37''$  E) – mesotrophic transition bog; pH = 6.0–6.4, cond. =  $132\text{--}211 \mu\text{S.cm}^{-1}$ .
86. Nature reserve “Rybniček u Podbořánek” ( $50^{\circ}2'34.87''$  N,  $13^{\circ}26'27.69''$  E) – two mesotrophic ponds; pH = 6.9–7.5, cond. =  $190\text{--}207 \mu\text{S.cm}^{-1}$ .
87. Oligomesotrophic ephemeral pool near the locality no. 86 ( $50^{\circ}2'35.11''$  N,  $13^{\circ}26'23.49''$  E).
88. Kladský rybník ( $50^{\circ}1'35.88''$  N,  $12^{\circ}40'31.20''$  E) – mesotrophic pond; Slavkovský les Protected Landscape Area; pH = 5.8. Leg. Ladislav Hodač, Charles University, Prague.
89. Mesotrophic pool in the “Upolínová louka” Nature Reserve ( $50^{\circ}3'59.74''$  N,  $12^{\circ}44'43.44''$  E); Slavkovský les Protected Landscape Area. Leg. Ladislav Hodač, Charles University, Prague.
90. Mucilaginous growths on the concrete wall of an artificial pool in the town of Mariánské Lázně ( $49^{\circ}57'30.38''$  N,  $12^{\circ}41'52.41''$  E). Leg. Ladislav Hodač, Charles University, Prague.
91. Periodically desiccating concrete drainage gutter near the railway corridor in the town of Roztoky u Prahy ( $50^{\circ}9'9.57''$  N,  $14^{\circ}23'50.50''$  E); pH = 7.9, cond. =  $175 \mu\text{S.cm}^{-1}$ .
92. Periodically desiccating concrete drainage gutter near the railway corridor in the town of Roztoky u Prahy–Žalov ( $50^{\circ}10'4.53''$  N,  $14^{\circ}21'52.07''$  E).

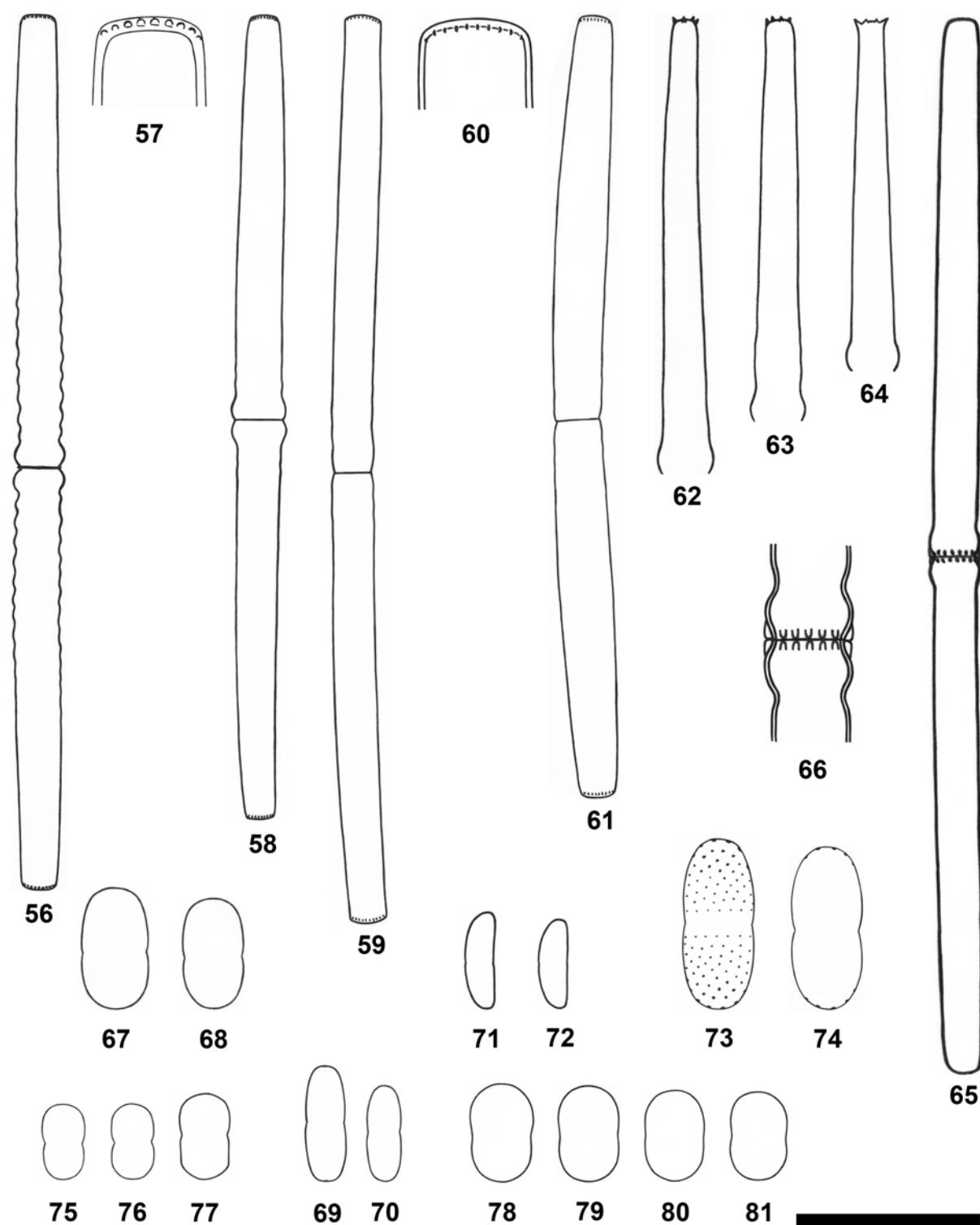
93. Periodically desiccating concrete drainage gutter near the railway station Praha–Sedlec ( $50^{\circ}7'52.84''$  N,  $14^{\circ}23'50.88''$  E).
94. Periodically desiccating concrete drainage gutter near the railway station Praha–Libeň ( $50^{\circ}6'2.19''$  N,  $14^{\circ}30'5.37''$  E); pH = 7.2, cond. =  $129 \mu\text{S.cm}^{-1}$ .
95. Periodically desiccating concrete drainage gutter near the railway station Praha–Běchovice ( $50^{\circ}4'56.17''$  N,  $14^{\circ}35'34.49''$  E).
96. Hostivař ( $50^{\circ}2'31.07''$  N,  $14^{\circ}32'6.21''$  E) – eutrophic water reservoir.
97. Hracholusky ( $49^{\circ}47'35.19''$  N,  $13^{\circ}8'39.81''$  E) – eutrophic water reservoir.
98. Fláje ( $50^{\circ}41'3.30''$  N,  $13^{\circ}35'6.43''$  E) – mesotrophic water reservoir; pH = 7.0, cond. =  $71 \mu\text{S.cm}^{-1}$ .
99. Peat bog near the “Kateřina” village ( $50^{\circ}9'20.33''$  N,  $12^{\circ}24'33.37''$  E); part of the „Soos“ Nature Reserve; pH = 5.0–6.2, cond. =  $65\text{--}126 \mu\text{S.cm}^{-1}$ .
100. Ephemeral pool near the locality no 99. ( $50^{\circ}9'21.77''$  N,  $12^{\circ}24'29.45''$  E).
101. Shallow, oligomesotrophic pool on the margin of the “Božídarské rašeliniště” Nature Reserve ( $50^{\circ}24'24.08''$  N,  $12^{\circ}54'45.18''$  E); pH = 5.4, cond. =  $111 \mu\text{S.cm}^{-1}$ .
102. Nature reserve “Velký močál” ( $50^{\circ}23'41.74''$  N,  $12^{\circ}38'17.23''$  E) – oligotrophic high moor; pH = 3.9, cond. =  $80 \mu\text{S.cm}^{-1}$ . Leg. Jiří Neustupa, Charles University, Prague.
103. Nature reserve “Chvojnov” ( $49^{\circ}24'23.39''$  N,  $15^{\circ}25'10.24''$  E) – mesotrophic spring fen.
104. Desiccating mesotrophic pool in the “Na Oklice” Nature Reserve ( $49^{\circ}24'12.93''$  N,  $15^{\circ}23'39.03''$  E).
105. Shallow mesotrophic pool near the “Babín” fishpond ( $49^{\circ}32'37.67''$  N,  $15^{\circ}53'50.73''$  E). Leg. Helena Bestová, Charles University, Prague.
106. Small eutrophic pond near the “Malšice” village ( $49^{\circ}21'31.49''$  N,  $14^{\circ}34'9.11''$  E).
107. Wet soil and mosses on a concrete platform near the railway station Chvaletice ( $50^{\circ}2'14.52''$  N,  $15^{\circ}25'6.13''$  E).
108. The Labe river near the town of Chvaletice ( $50^{\circ}2'26.07''$  N,  $15^{\circ}21'24.18''$  E).
109. The Sázava river near the town of Píkovice ( $49^{\circ}52'42.43''$  N,  $14^{\circ}25'39.25''$  E).
110. Wet, moss covered rocks in the “Bílý Halštrost” stream near the “Dolní Paseky” village ( $50^{\circ}14'14.02''$  N,  $12^{\circ}14'3.01''$  E).
111. Squeezed mosses from a concrete platform near the inflow of “Mračný potok” stream into the Bílina river ( $50^{\circ}32'36.84''$  N,  $13^{\circ}36'58.34''$  E).
112. Wet, moss covered rocks in the “Kobylí smyk” stream ( $48^{\circ}46'36.36''$  N,  $13^{\circ}54'13.68''$  E); Šumava National Park.
113. Squeezed mosses from the Vltava river near the “Želnava” village ( $48^{\circ}49'2.67''$  N,  $13^{\circ}56'52.62''$  E); Šumava National Park.
114. The “Lipno I” water reservoir near the “Nová Pec” village ( $48^{\circ}47'36.03''$  N,  $13^{\circ}57'5.31''$  E); Šumava National Park.
115. Squeezed mosses from a concrete drainage gutter in the town of Horní Planá ( $48^{\circ}45'48.98''$  N,  $14^{\circ}1'41.02''$  E); Šumava Protected Landscape Area.
116. Oligomesotrophic ephemeral pool near the town of Deštné v Orlických horách ( $50^{\circ}17'45.44''$  N,  $16^{\circ}20'32.79''$  E); Orlické hory Protected Landscape Area.
117. Oligomesotrophic ephemeral pool near the “Karlův vrch” mountain ( $50^{\circ}16'14.89''$  N,  $16^{\circ}22'16.97''$  E); Orlické hory Protected Landscape Area.
118. Nature reserve “Velká louka” ( $50^{\circ}19'8.83''$  N,  $16^{\circ}25'28.46''$  E) – oligomesotrophic spring area with some mesotrophic, artificial pools; Orlické hory Protected Landscape Area.
119. Small spring area near the “Vozka” mountain ( $50^{\circ}9'13.34''$  N,  $17^{\circ}7'4.38''$  E); Jeseníky Protected Landscape Area.
120. Černý Nadýmač ( $50^{\circ}4'25.99''$  N,  $15^{\circ}34'54.08''$  E) – mesoeutrophic pond.
121. Mesoeutrophic sandy pool near the town of Lázně Bohdaneč ( $50^{\circ}4'14.16''$  N,  $15^{\circ}41'47.42''$  E) filled in with *Utricularia australis* R.Br.
122. Mesoeutrophic pool in the town of Pardubice ( $50^{\circ}2'43.32''$  N,  $15^{\circ}46'57.18''$  E) filled in with *Ceratophyllum demersum* L.
123. Nature reserve “Velký Pařezitý rybník” ( $49^{\circ}13'43.59''$  N,  $15^{\circ}22'32.048''$  E) – oligomesotrophic pond with a neighboring transition bog.
124. Štěpnický rybník ( $49^{\circ}11'6.961''$  N,  $15^{\circ}27'26.093''$  E) – eutrophic fishpond.



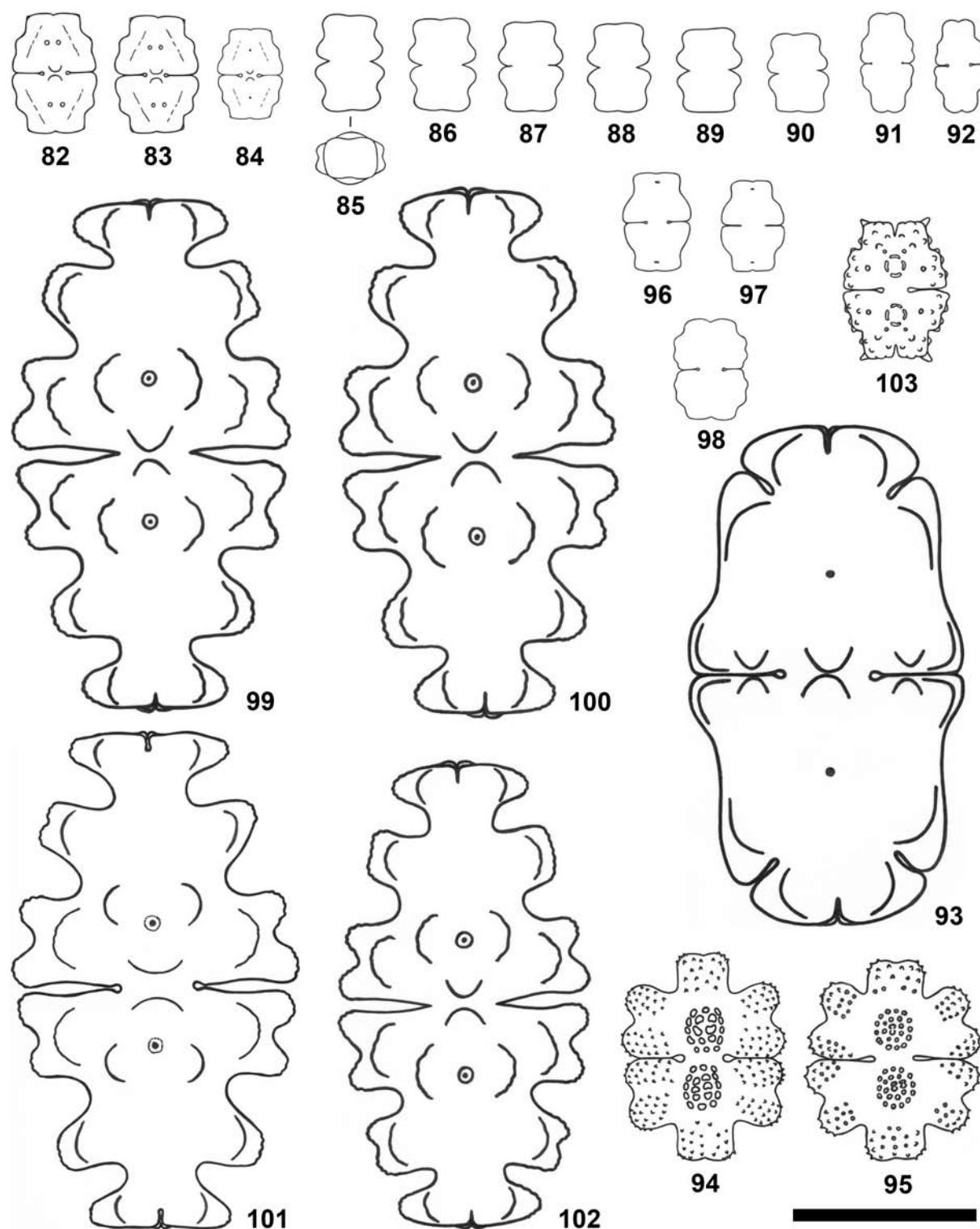
Figs 2–28. (2) *Mesotaenium caldariorum*; (3–6) *Netrium pseudactinotaenium*; (7) *Roya cambrica*; (8–12) *R. closterioides*, (12) dividing cell; (13) *Tortitaenia bahusiensis*; (14–15) *Gonatozygon aculeatum*; (16–18) *G. brebissonii* var. *alpestre*; (19–20) *Closterium archerianum* var. *pseudocynthia*; (21–22) *Cl. braunii*, (22) detail of cell wall sculpture; (23) *Cl. calosporum* var. *brasiliense*; (24–25) *Cl. cornu* var. *upsaliense*; (26–27) *Cl. delponcei*, (27) detail of cell wall sculpture; (28) *Cl. exile*. Scale bar 50 µm, 100 µm (for 21, 26).



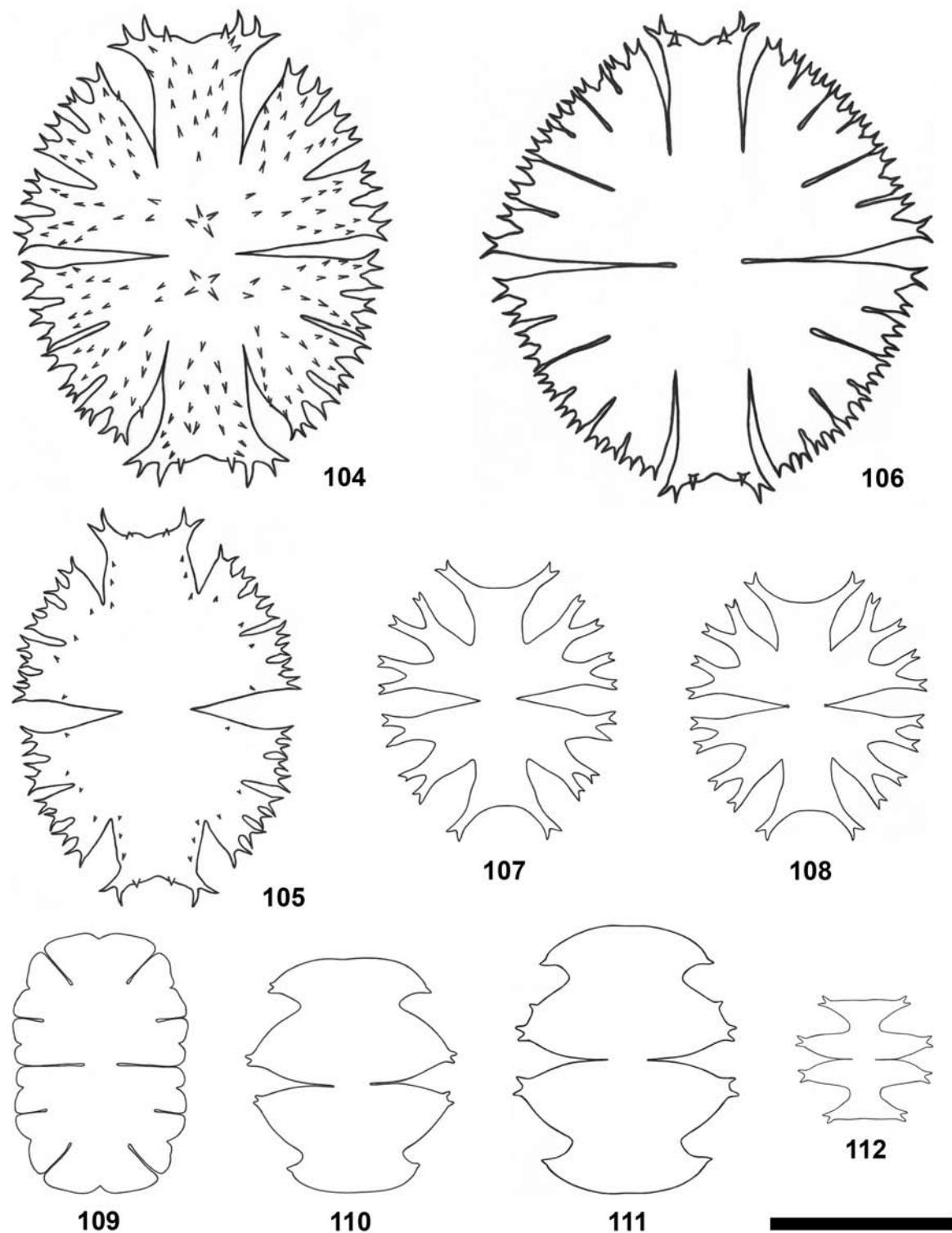
Figs 29–55. (29–31) *Closterium nematodes* var. *proboscideum*, (31) detail of the apex; (32–33) *Cl. pseudopygmaeum*; (34–36) *Cl. pusillum*; (37–38) *Cl. subulatum*; (39–41) *Cl. tortitaenoides*; (42–43) *Cl. tumidum*; (44) *Cl. tumidum* var. *nylandicum*; (45) *Cl. turgidum* var. *giganteum*; (46–53) *Haplotaenium indentatum*, morpha; (54–55) *H. rectum*. Scale bar 50 µm (for 31–44, 46–53), 100 µm (for 29, 30, 54, 55), 150 µm (for 45).



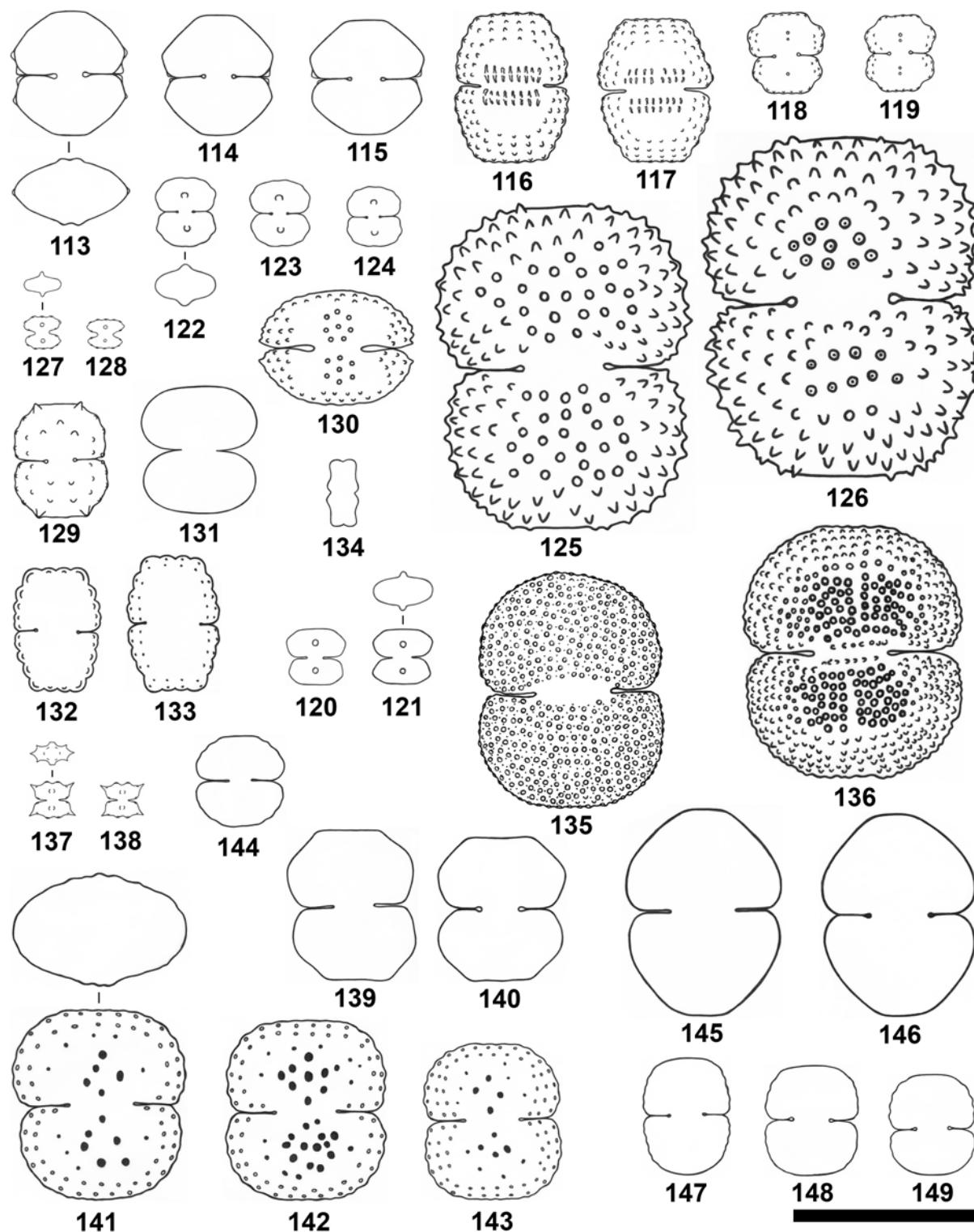
Figs 56–81. (56–58) *Pleurotaenium eugeneum*, (57) detail of the apex; (59–61) *Pl. simplicissimum*, (60) detail of the apex; (62–64) *Pl. tridentulum* (semicells); (65–66) *Docidium baculum*, (66) detail of the central part of the cell; (67–68) *Actinotaenium cruciferum*; (69–70) *A. inconspicuum*; (71–72) *A. inconspicuum* var. *curvatum*; (73–74) *A. kriegeri*; (75–77) *A. permisinutum*; (78–81) *A. subsparsepunctatum*. Scale bar 30 µm (for 66–81), 50 µm (for 57, 60, 62–65), 150 µm (for 56, 58, 59, 61).



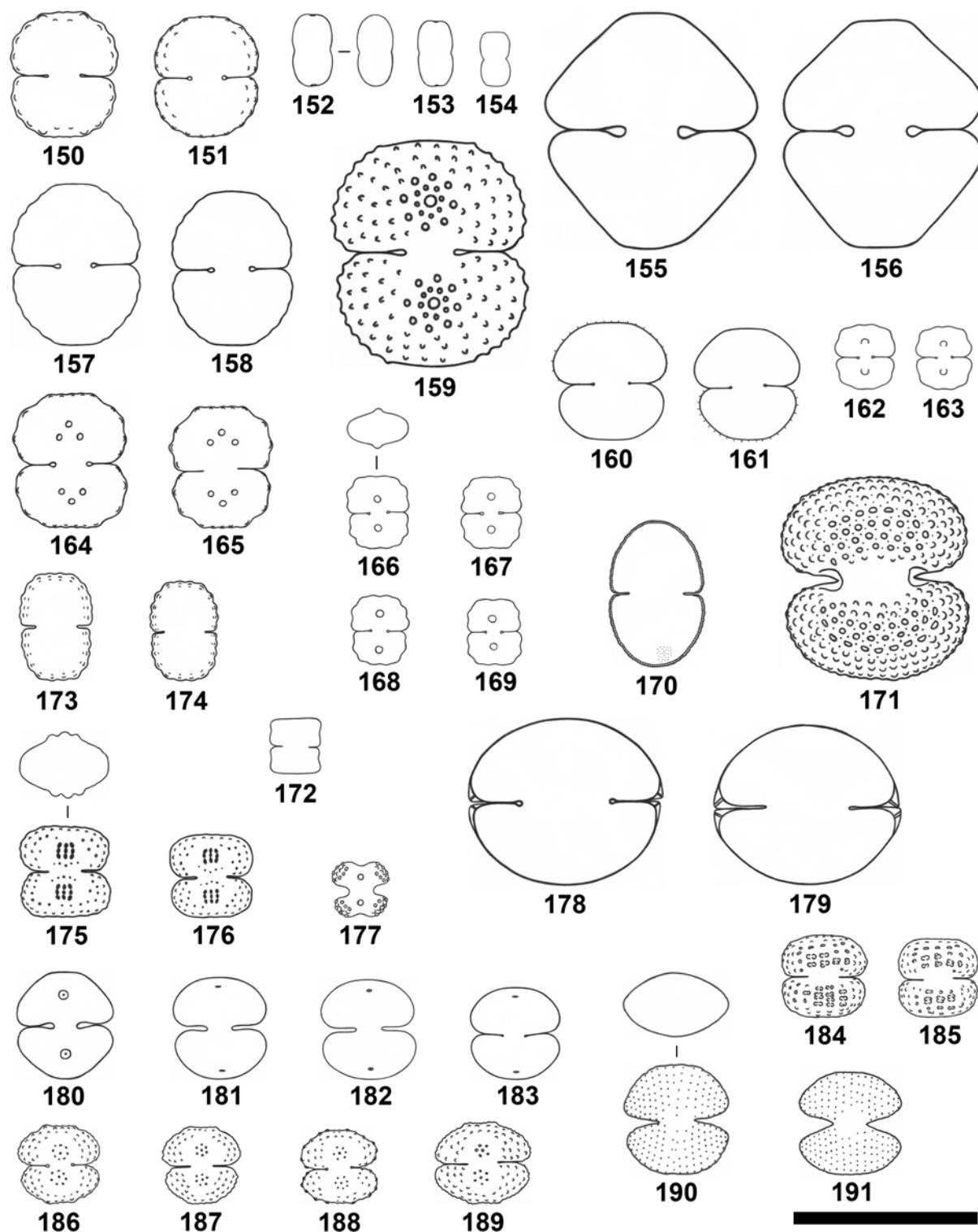
Figs 82–103. (82–84) *Euastrum bicrasiculatum*; (85–90) *E. brevisinuosum* var. *dissimile*; (91–92) *E. crassicolle*; (93) *E. crassum*; (94–95) *E. germanicum*; (96–97) *E. luetkemuelleri* var. *carniolicum*; (98) *E. montanum*; (99–102) *E. pinnatum*; (103) *E. turneri*. Scale bar 50 µm.



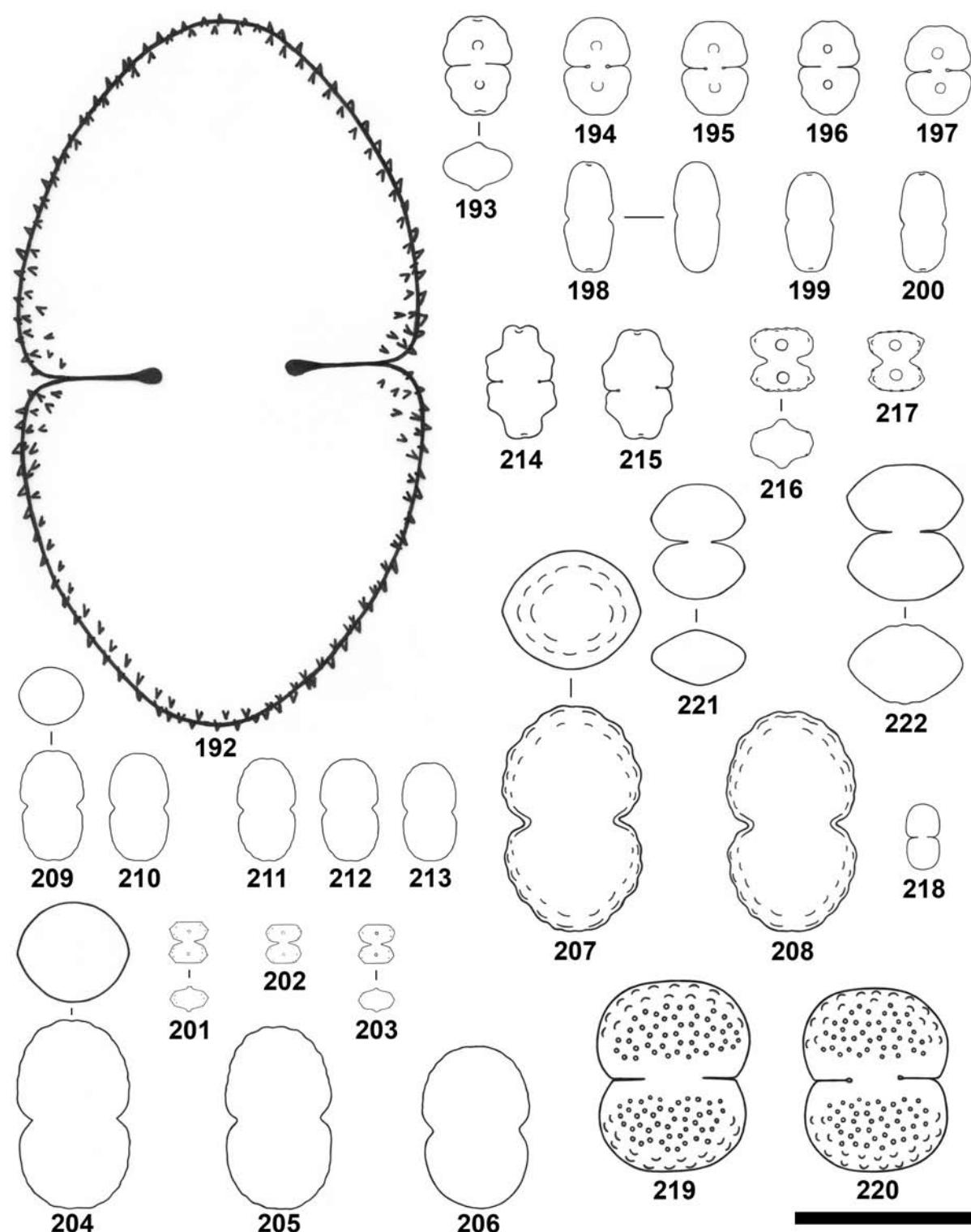
Figs 104–112. (104) *Micrasterias apiculata*; (105) *M. brachyptera*; (106) *M. fimbriata*; (107–108) *M. furcata*; (109) *M. jenneri*; (110–111) *M. oscitans*; (112) *M. pinnatifida*. Scale bar 100 µm.



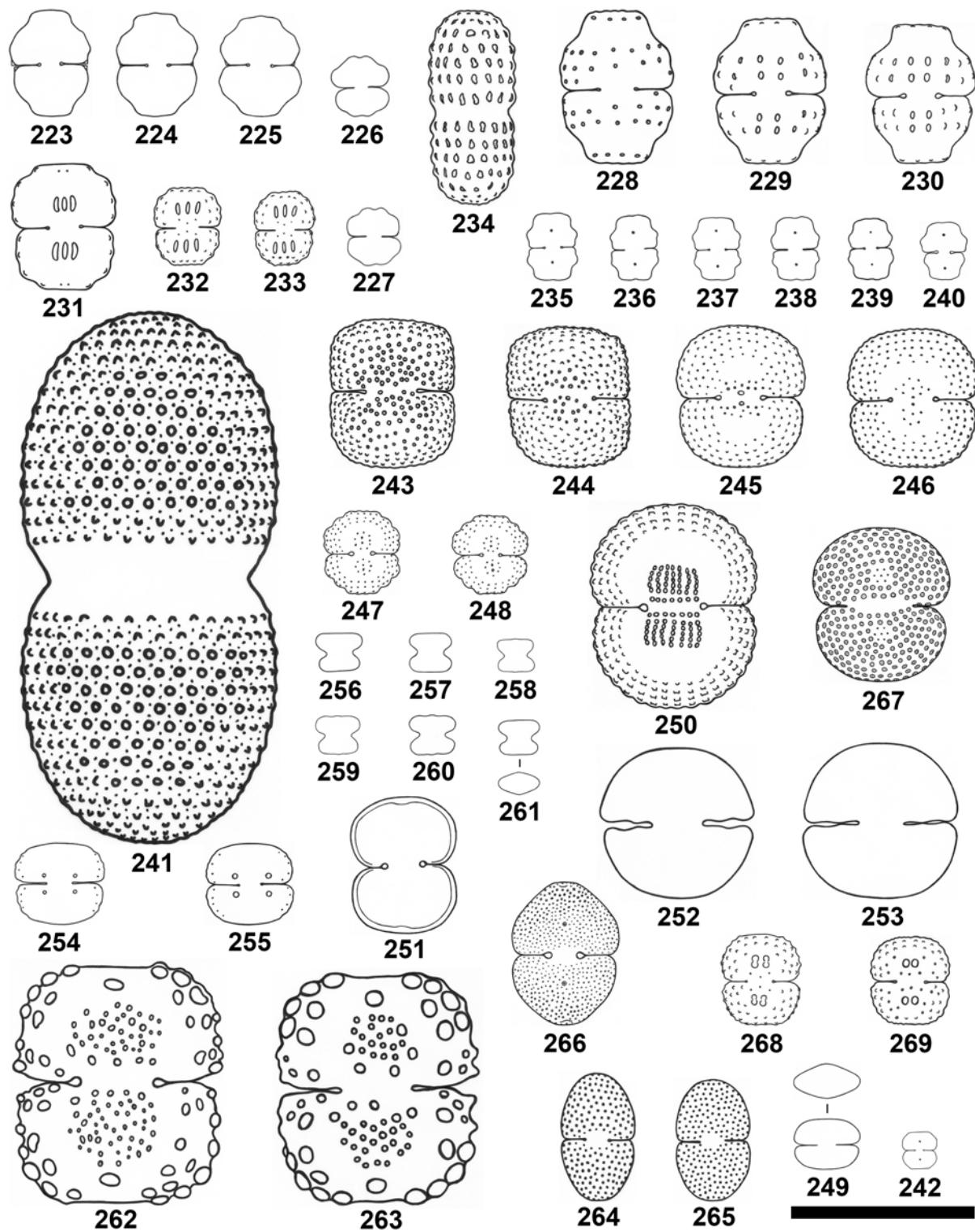
Figs 113–149. (113–115) *Cosmarium angulare*; (116–117) *C. basiornatum*; (118–119) *C. berryense*; (120–121) *C. bireme*; (122–124) *C. boitierense*; (125–126) *C. brebissonii*; (127–128) *C. carinthiacum*; (129) *C. ceratophorum*; (130) *C. commisurale* var. *acutum*; (131) *C. contractum* var. *retusum*; (132–133) *C. davidsonii*; (134) *C. decedens* var. *minutum*; (135) *C. dentiferum* var. *alpinum*; (136) *C. didymoprotupsum*; (137–138) *C. dilatatum*; (139–140) *C. eichlerianum*; (141–143) *C. fastidiosum*; (144) *C. fontigenum*; (145–146) *C. galeritum*; (147–149) *C. garrolense*. Scale bar 50 µm.



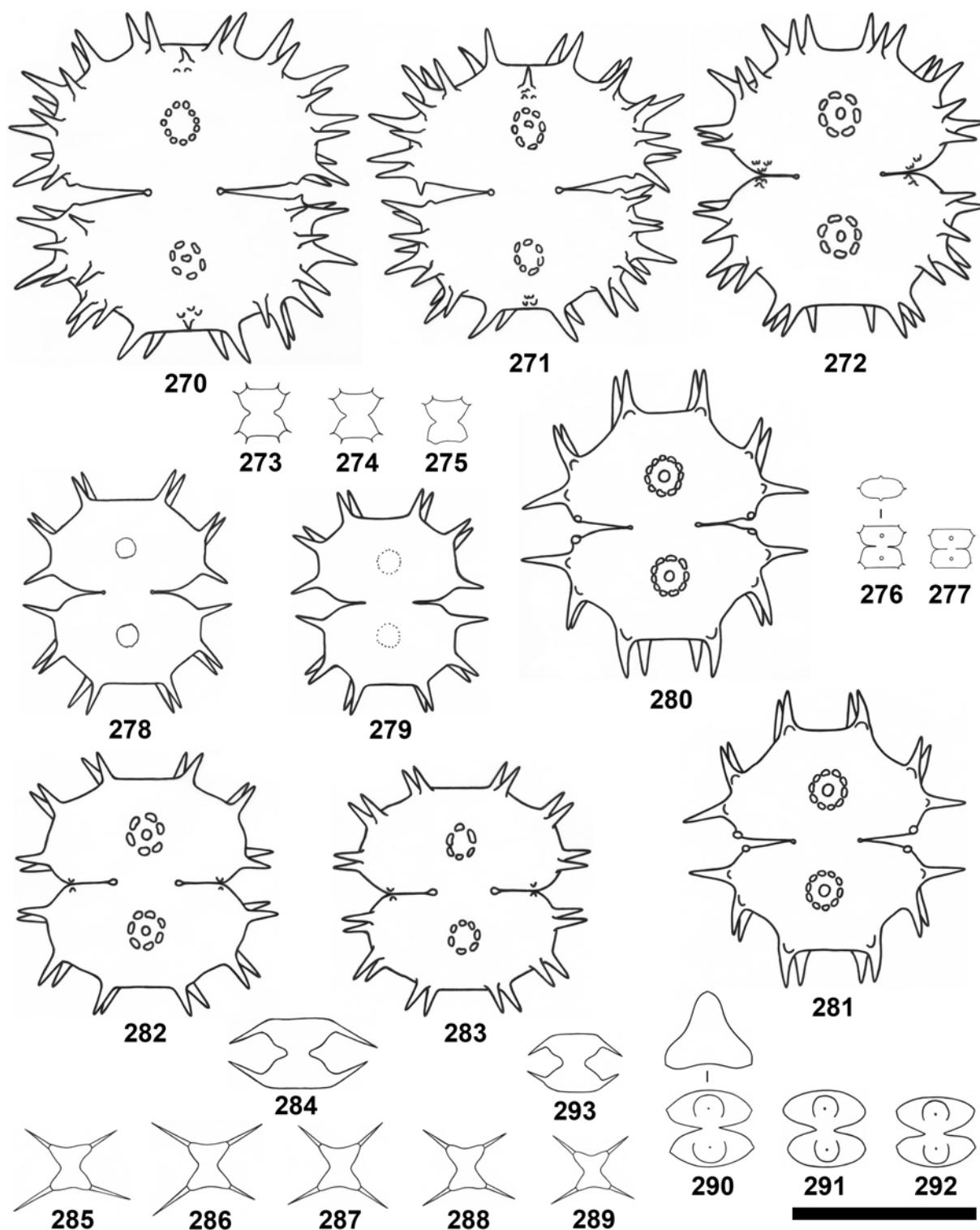
Figs 150–191. (150–151) *Cosmarium gibberulum*; (152–154) *C. goniodes* var. *subturgidum*; (155–156) *C. homalodermum*; (157–158) *C. jaoi*; (159) *C. kirchneri*; (160–161) *C. klebsii*; (162–163) *C. lagerheimii*; (164–165) *C. limnophilum*; (166–169) *C. medioretusum*; (170) *C. microsphinctum* var. *crispulum*; (171) *C. netzerianum*; (172) *C. norimbergense* var. *depressum*; (173–174) *C. notabile*; (175–176) *C. notatum*; (177) *C. novae-semliae* var. *granulatum*; (178–179) *C. obsoletum*; (180) *C. ocellatum*; (181–183) *C. ocellatum* var. *notatum*. (184–185) *C. ordinatum*; (186–188) *C. ornatulum*; (189) *C. ornatulum* var. *depressum*; (190–191) *C. orthopunctulatum*. Scale bar 50  $\mu\text{m}$ .



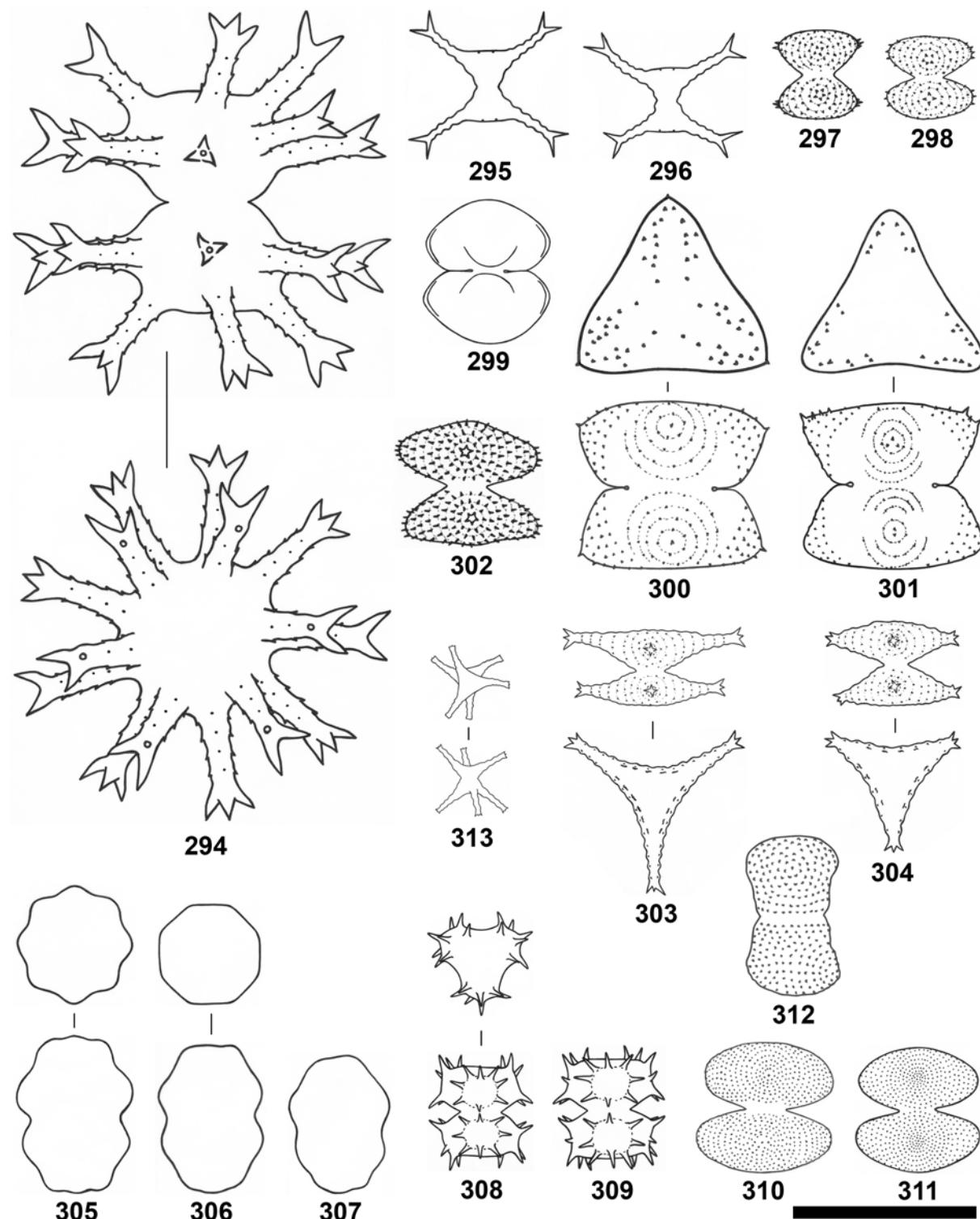
Figs 192–222. (192) *Cosmarium ovale*; (193–197) *C. paragranatoides*; (198–200) *C. parvulum* var. *undulatum*; (201–203) *C. paucigranulatum*; (204–206) *C. pericymatum*; (207–208) *C. pericymatum* var. *corrugatum*; (209–213) *C. pericymatum* var. *notabiliforme*; (214–215) *C. pokornyanum*; (216–217) *C. prominulum* var. *subundulatum*; (218) *C. pseudoexiguum*; (219–220) *C. pseudoinsigne*; (221) *C. pseudoprotuberans*; (222) *C. pseudoprotuberans* var. *sulcatum*. Scale bar 50 µm.



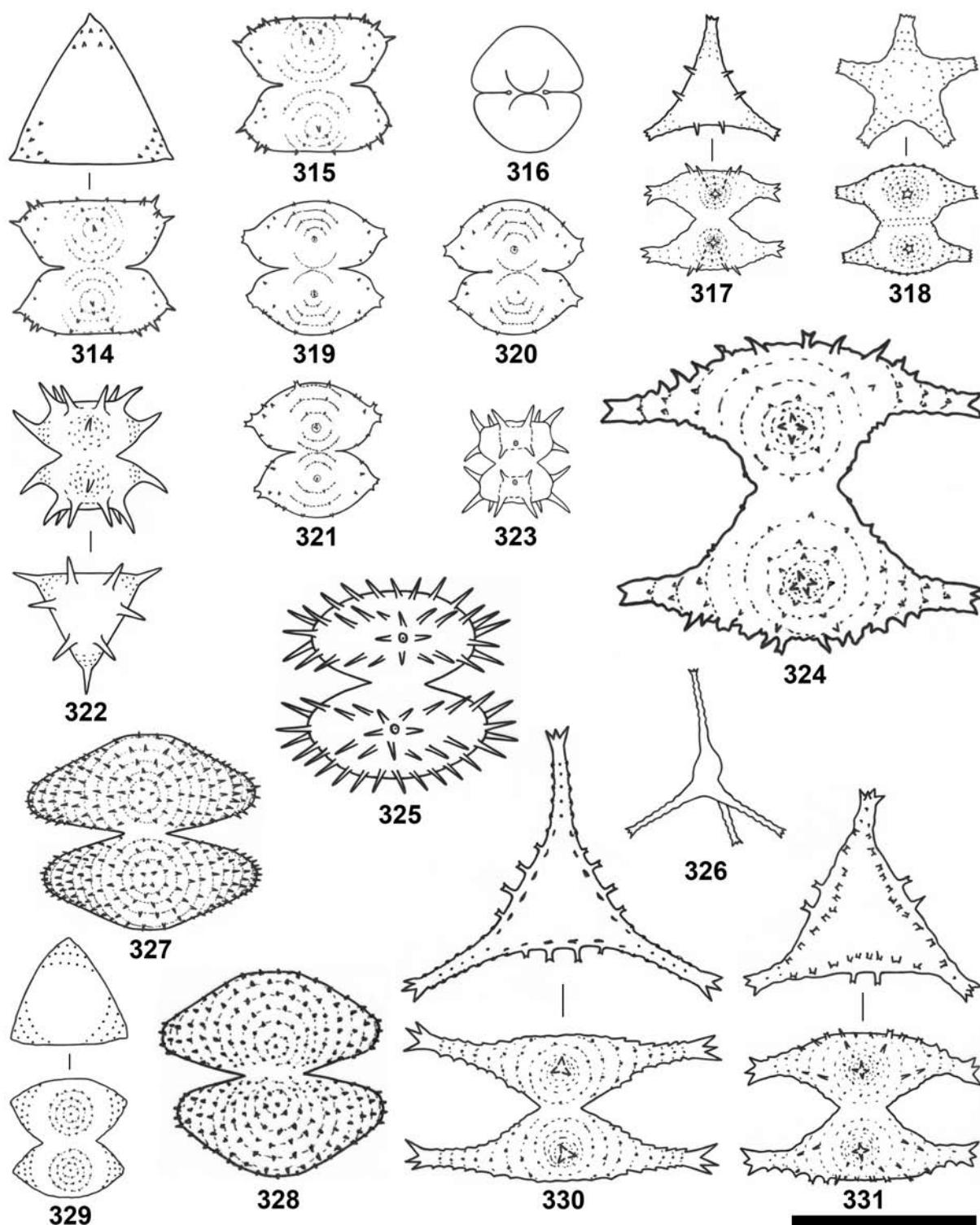
Figs 223–269. (223–225) *Cosmarium pseudoretusum*; (226–227) *C. pseudowembaerense*; (228–230) *C. retusum*; (231) *C. sexnotatum* var. *bipunctatum*; (232–233) *C. sexnotatum* var. *tristriatum*; (234) *C. simplicius*; (235–240) *C. sphyreleatum*; (241) *C. striolatum*; (242) *C. subadoxum*; (243–244) *C. subbroomei*; (245–246) *C. subbroomei* f. *isthmochondrum*; (247–248) *C. subprotumidum* var. *pyramidalis*; (249) *C. subquadrans* var. *minor*; (250) *C. subspeciosum*; (251) *C. subtumidum* var. *groenbladii*; (252–253) *C. taxichondrifforme*; (254–255) *C. tetrachondrum*, forma. (256–261) *C. truncatellum*; (262–263) *C. ungerianum* var. *subtriplicatum*; (264–265) *C. variolatum*; (266) *C. variolatum* var. *cataractarum*; (267) *C. varsoviense*; (268–269) *C. vogesiacum*. Scale bar 50 µm.



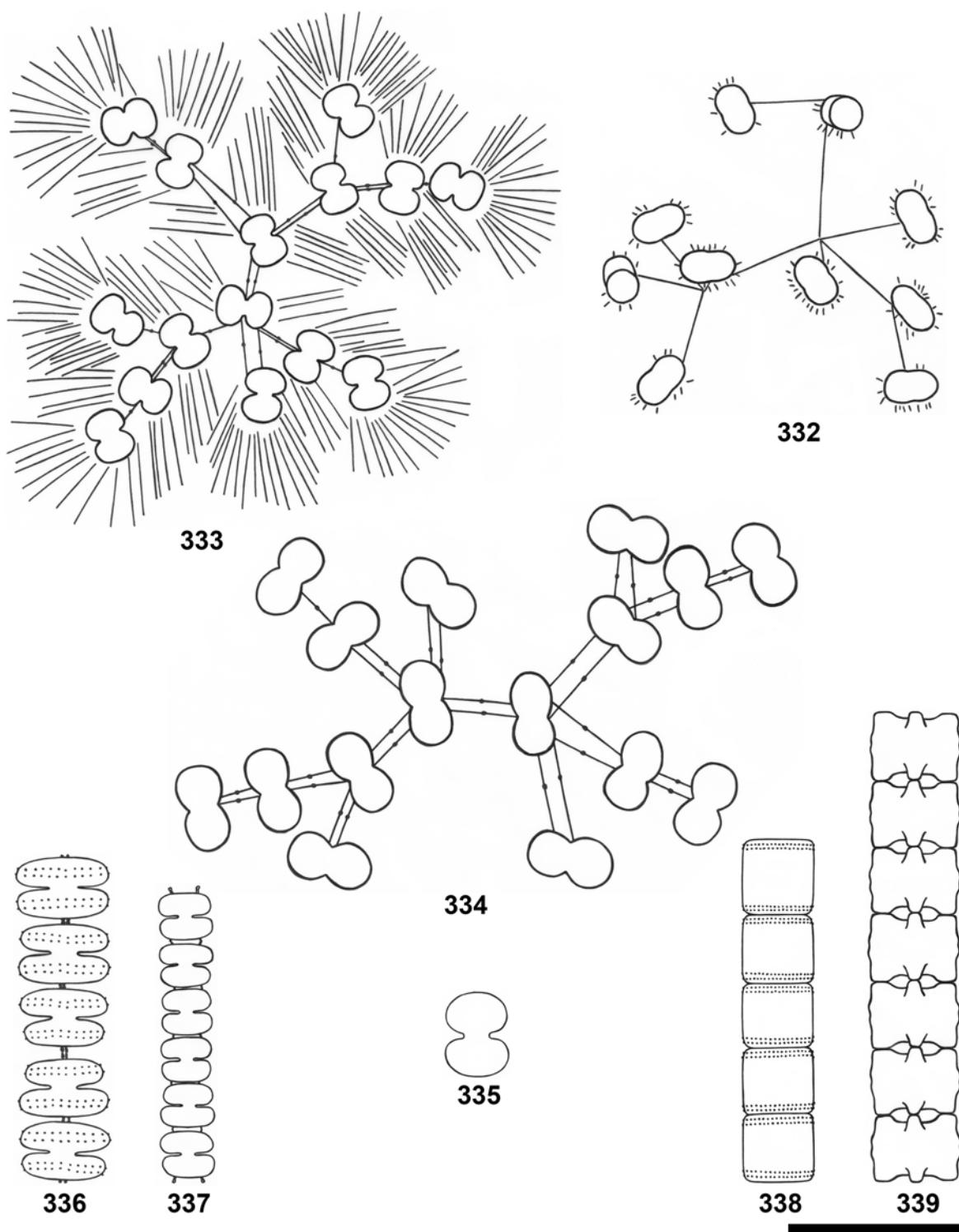
Figs 270–293. (270–271) *Xanthidium aculeatum*; (272) *X. basidentatum*; (273–275) *X. bifidum*. (276–277) *X. concinnum*; (278–279) *X. cristatum*; (280–281) *X. cristatum* var. *uncinatum* f. *polonicum*; (282–283) *X. fasciculatum* var. *oronense*; (284) *Staurodesmus extensus* var. *joshuae*; (285–289) *Std. extensus* var. *malaccensis*; (290–292) *Std. lanceolatus* var. *compressus*; (293) *Std. subhexagonus*. Scale bar 50 µm.



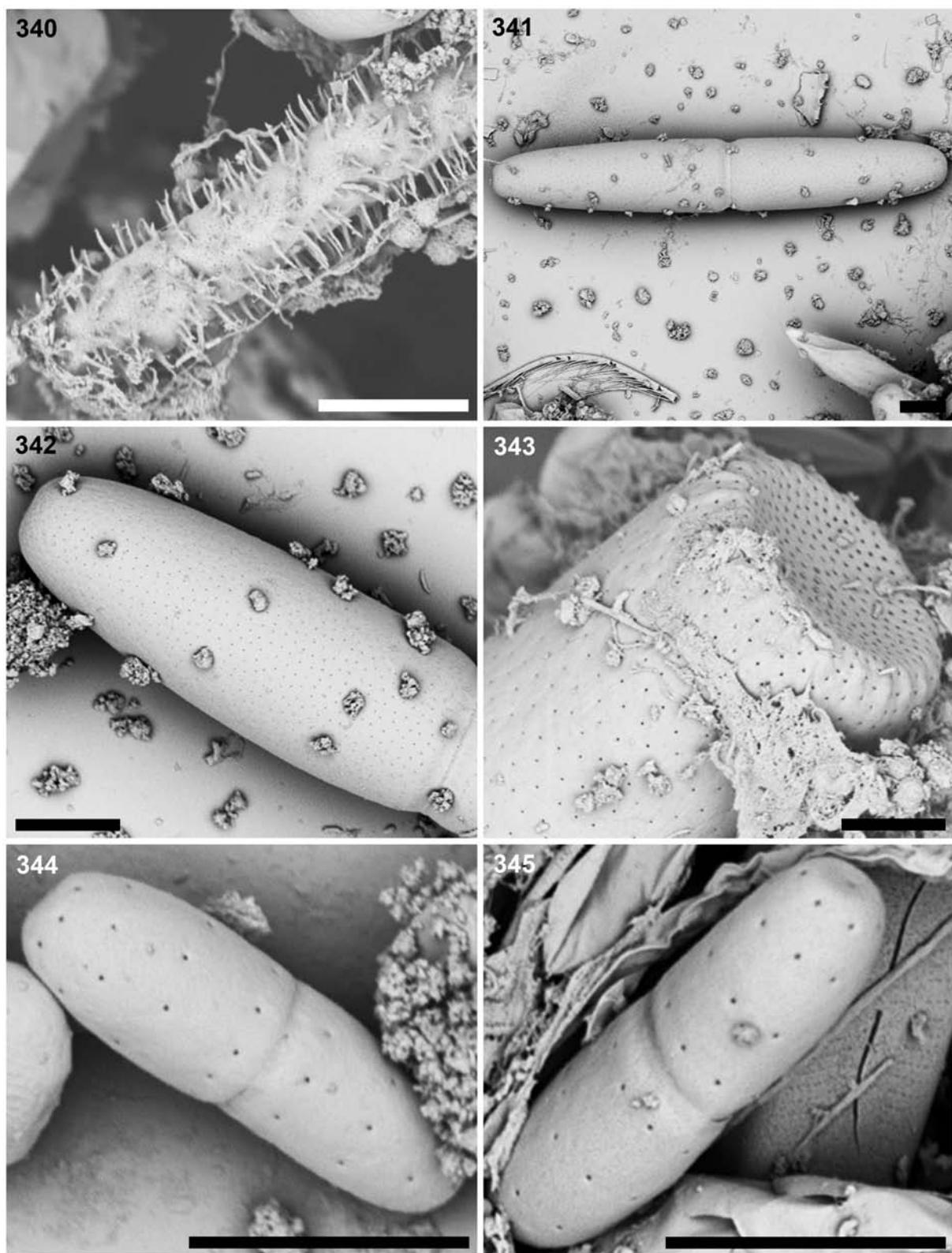
Figs 294–313. (294) *Staurastrum arctiscon*; (295–296) *St. bloklandiae*; (297–298) *St. bohlinianum*; (299) *St. crassangulatum*; (300–301) *St. cristatum* var. *navigiolum*; (302) *St. erasum*; (303–304) *St. eurycerum*; (305–307) *St. habeebense*; (308–309) *St. hystrix*; (310–311) *St. lapponicum*; (312) *St. merianti*; (313) *St. minimum*. Scale bar 50 µm.



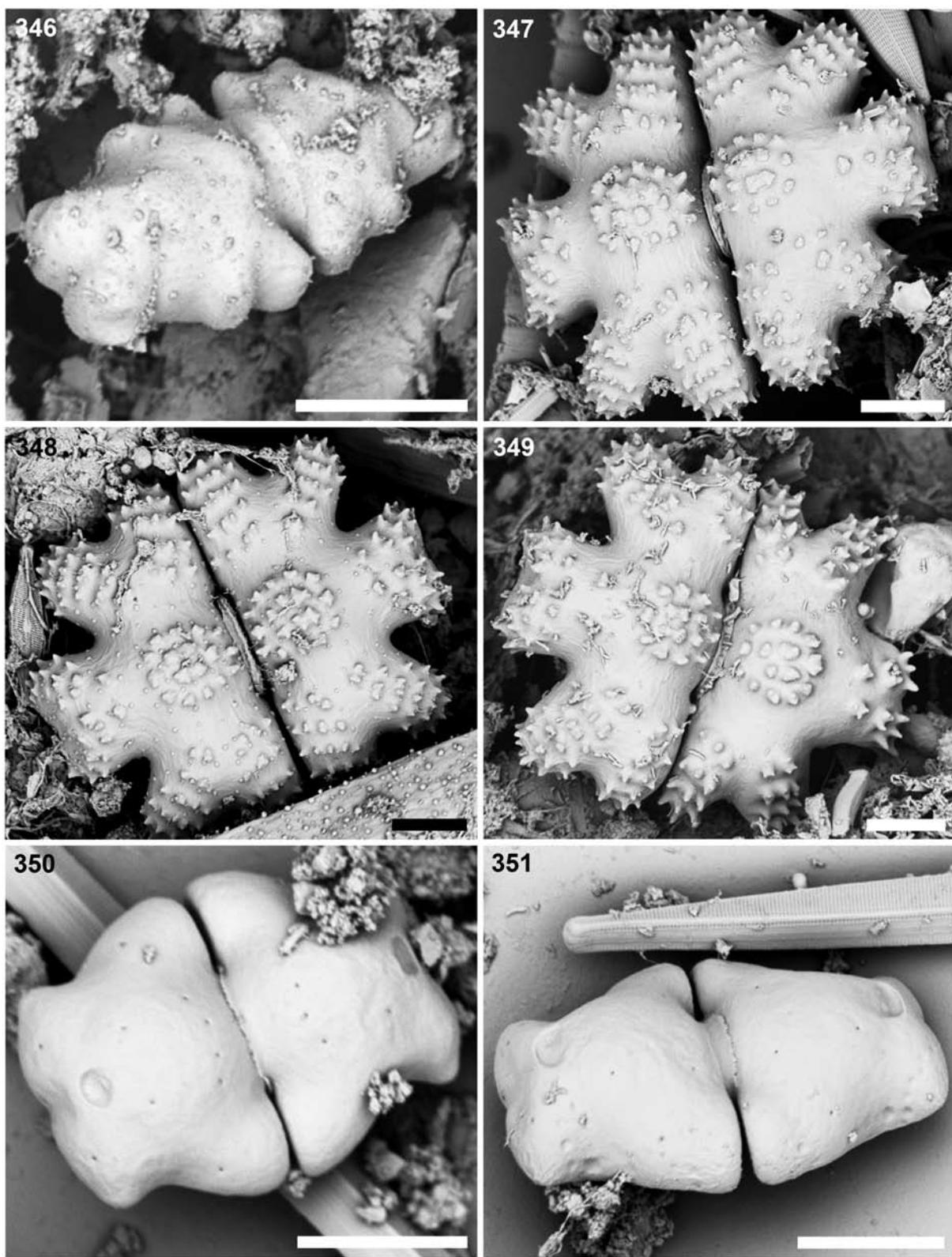
Figs 314–331. (314–315) *Staurastrum oligacanthum*; (316) *St. orbiculare* var. *ralfsii*; (317) *St. oxyacanthum*; (318) *St. pentasterias*; (319–321) *St. podlachicum*; (322) *St. pungens*; (323) *St. quadrispinatum*; (324) *St. sebaldi*; (325) *St. setigerum*; (326) *St. smithii*; (327–328) *St. trapezicum*; (329) *St. varians*; (330–331) *St. vestitum*. Scale bar 50 µm.



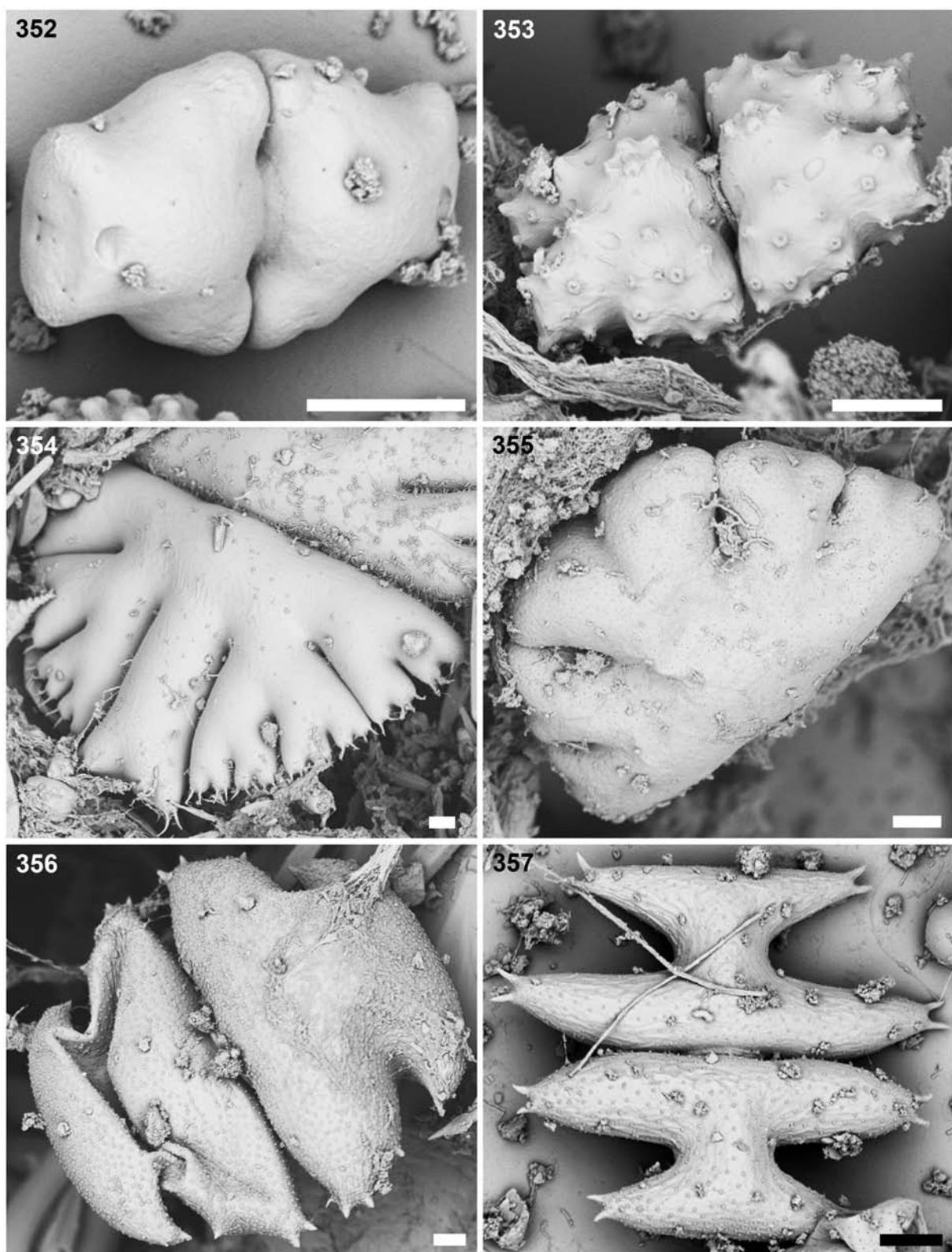
Figs 332–339. (332) *Cosmocladium constrictum*, part of a cell colony; (333–335) *C. saxonicum*; (336) *Sphaerozozma aubertianum*; (337) *Sph. filiforme*; (338) *Hyalotheca mucosa*; (339) *Desmidium baileyi* var. *caelatum*. Scale bar 50 µm, 80 µm (for Fig. 333).



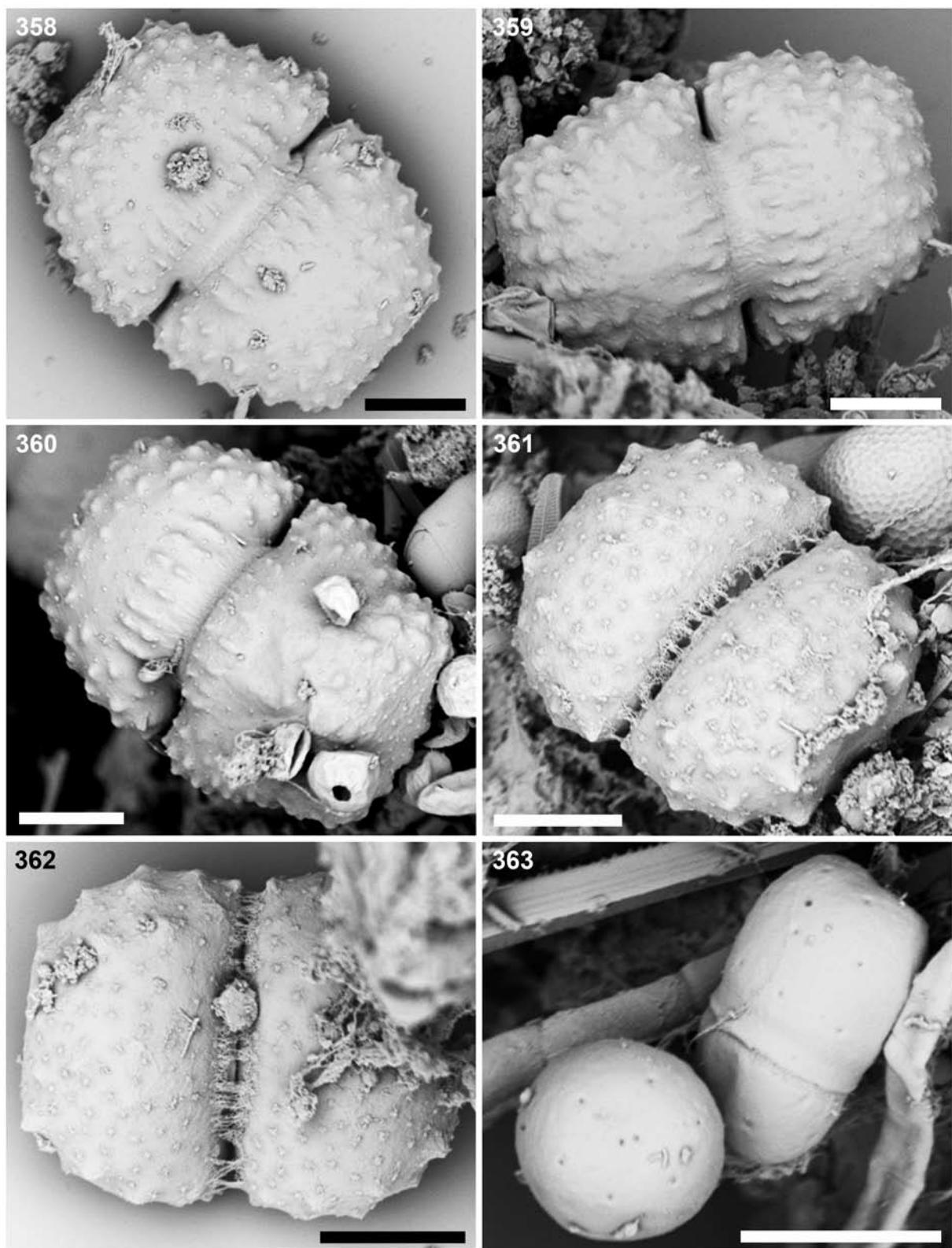
Figs 340–345. (340) *Gonatozygon aculeatum*; (341–342) *Haploaenium indentatum* var. *latius*, morpha; (343) *Pleurotaenium simplicissimum*, apex; (344–345) *Actinotaenium inconspicuum*. Scale bar 10 µm.



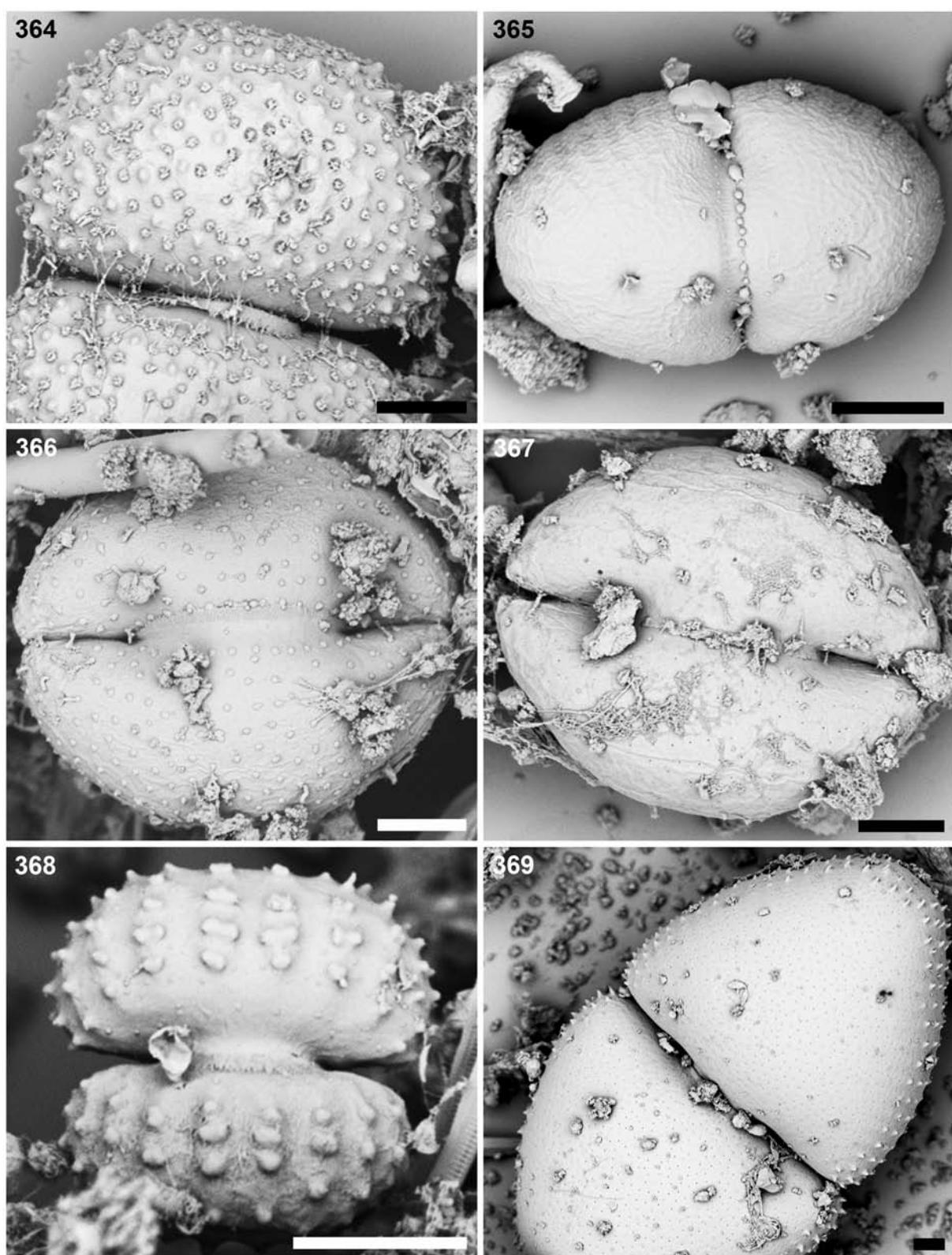
Figs 346–351. (346) *Euastrum crassicolle*; (347–349) *E. germanicum*; (350–351) *E. luetkemuelleri* var. *carniolicum*. Scale bar 10 µm.



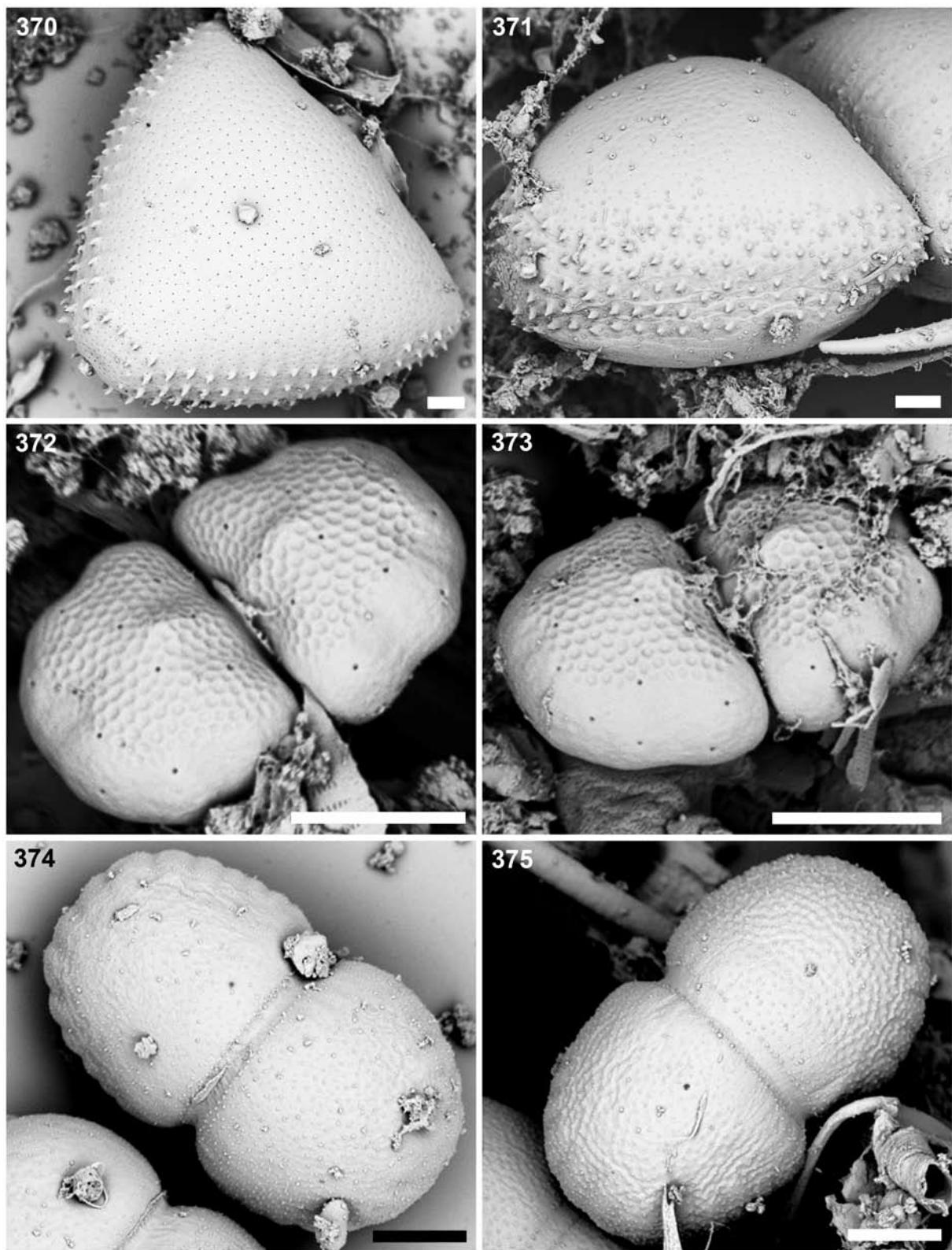
Figs (352–357). (352) *Euastrum luetkemuelleri* var. *carniolicum*; (353) *E. turneri*; (354) *Micrasterias fimbriata*; (355) *M. jenneri*; (356) *M. oscitans*; (357) *M. pinnatifida*. Scale bar 10 µm.



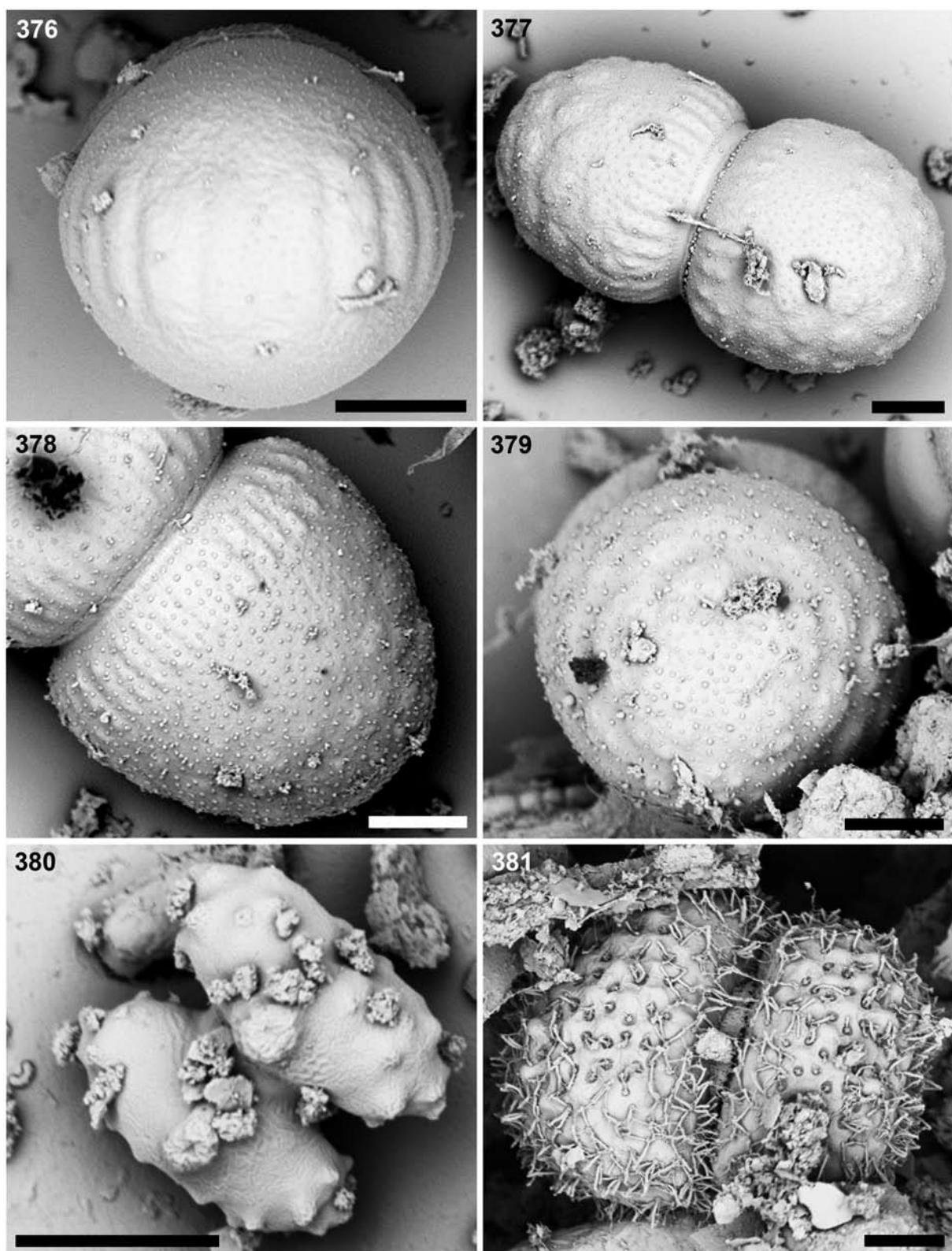
Figs 358–363. (358–360) *Cosmarium basiornatum*; (361–362) *C. ceratophorum*; (363) *C. goniodes* var. *subturgidum*. Scale bar 10 µm.



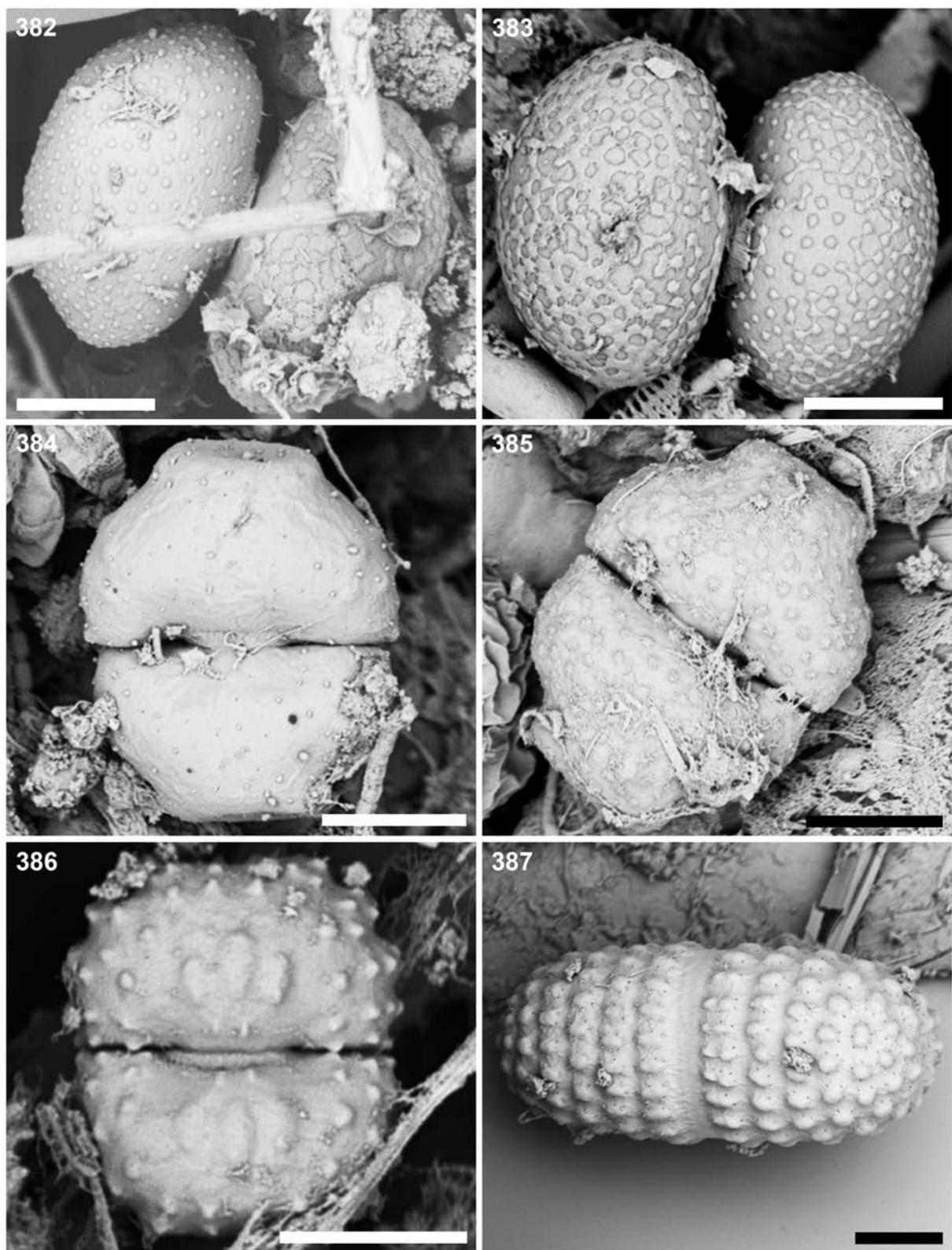
Figs 364–369. (364) *Cosmarium kirchneri*; (365) *C. microsphinctum* var. *crispulum*; (366–367) *C. obsoletum*; (368) *C. ordinatum*; (369) *C. ovale*. Scale bar 10 µm.



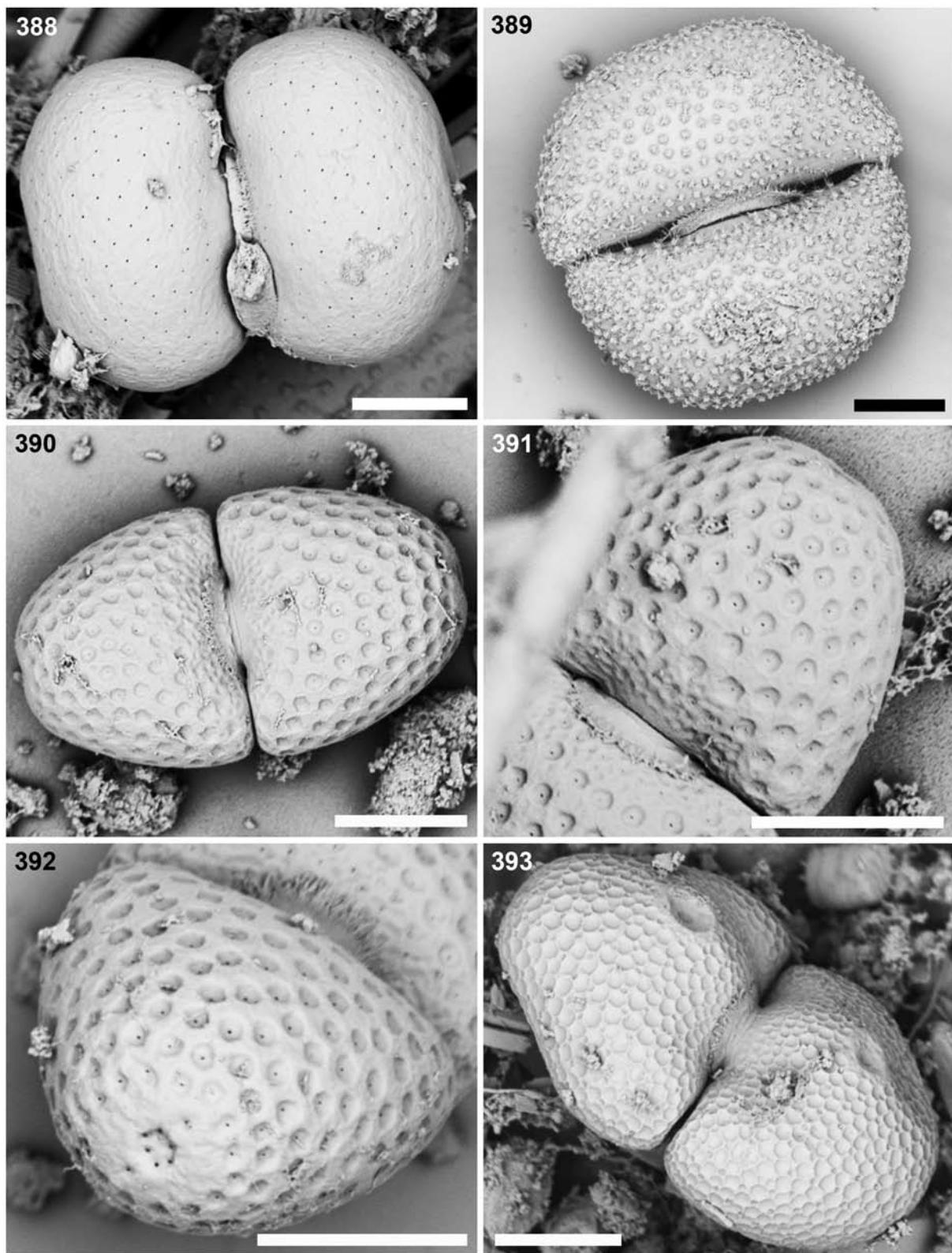
Figs 370–375. (370–371) *Cosmarium ovale*; (372–373) *C. paragranatoides*; (374–375) *C. pericymatum*. Scale bar 10 µm.



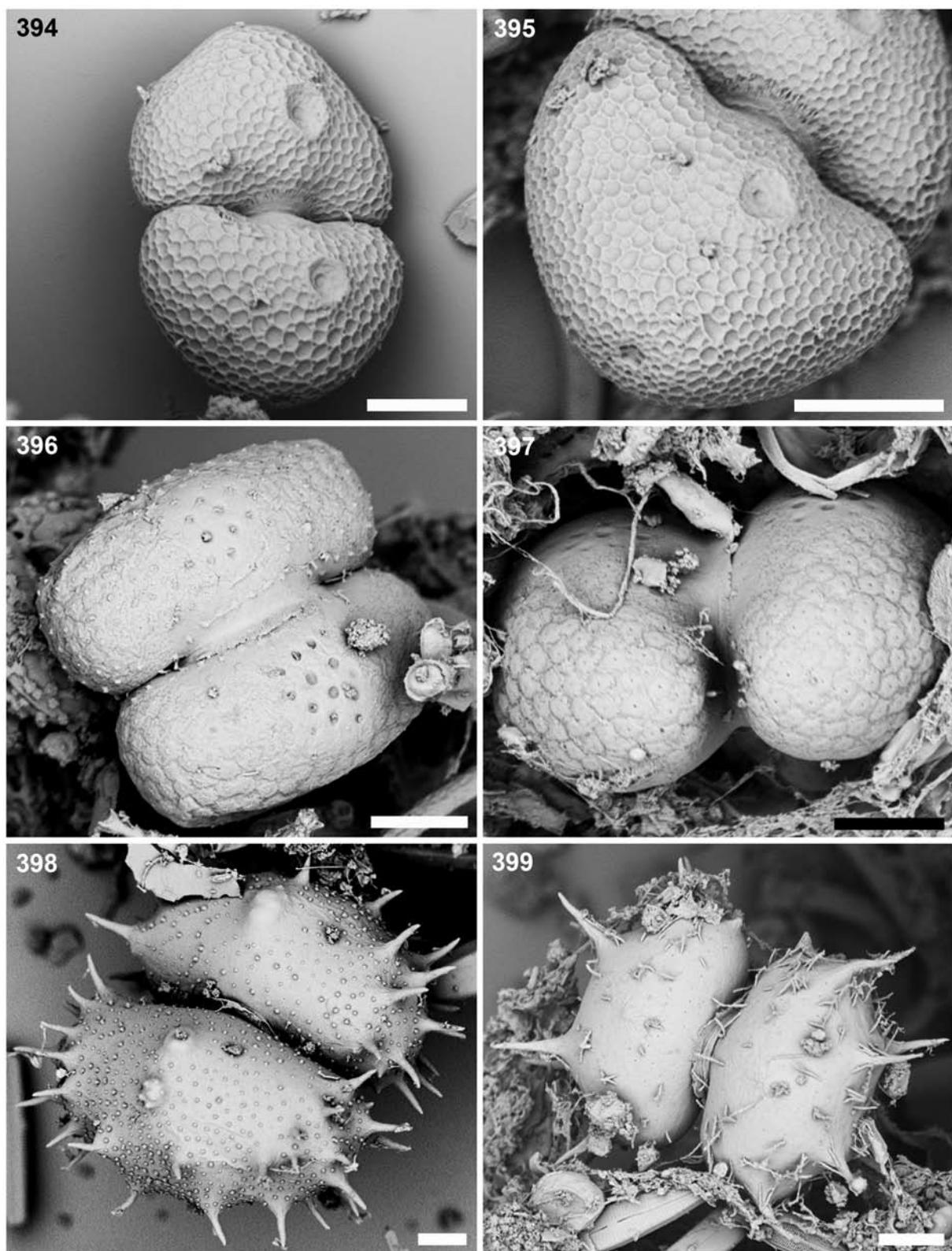
Figs 376–381. (376) *Cosmarium pericymatum*, apical view; (377–379) *C. pericymatum* var. *corrugatum*, (379) apical view; (380) *C. prominulum* var. *subundulatum*; (381) *C. pseudoinsigne*. Scale bar 10 µm.



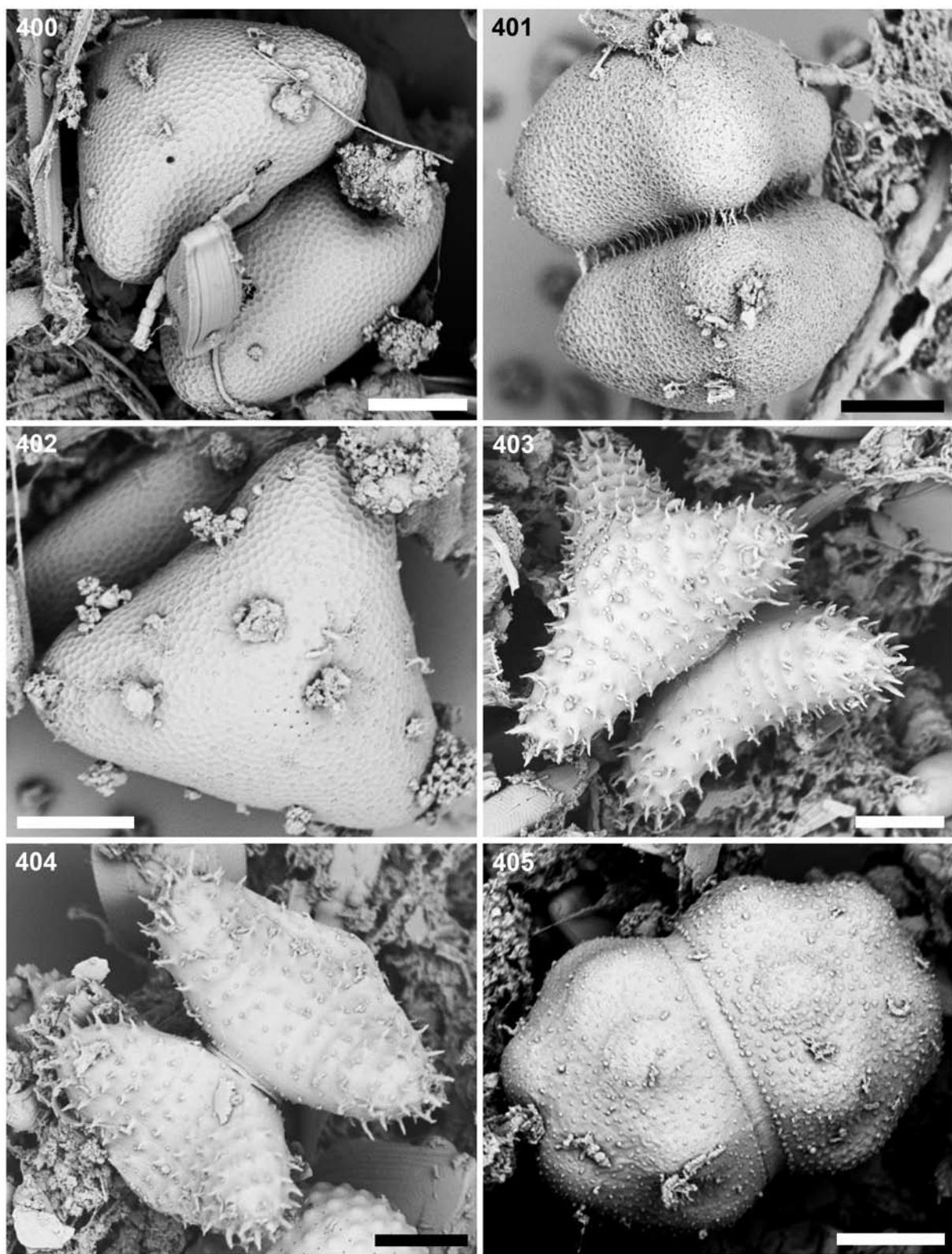
Figs 382–387. (382–383) *Cosmarium pseudoprotuberans*; (384–385) *C. pseudoretusum*; (386) *C. sexnotatum* var. *tristriatum*; (387) *C. simplicius*. Scale bar 10 µm.



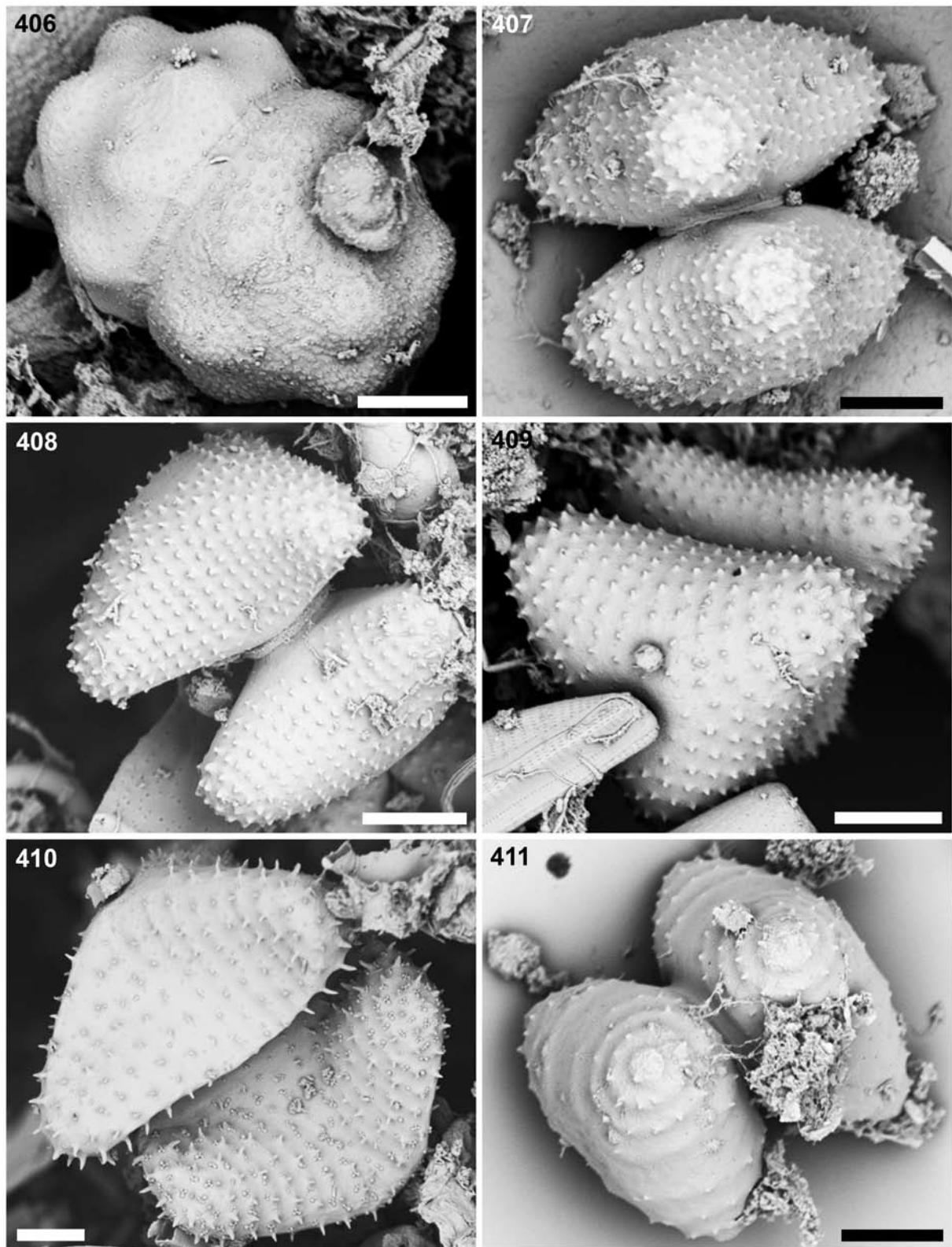
Figs 388–393. (388) *Cosmarium subtumidum* var. *groenbladii*; (389) *C. taxichondriforme*; (390–392) *C. variolatum*; (393) *C. variolatum* var. *cataractarum*. Scale bar 10 µm.



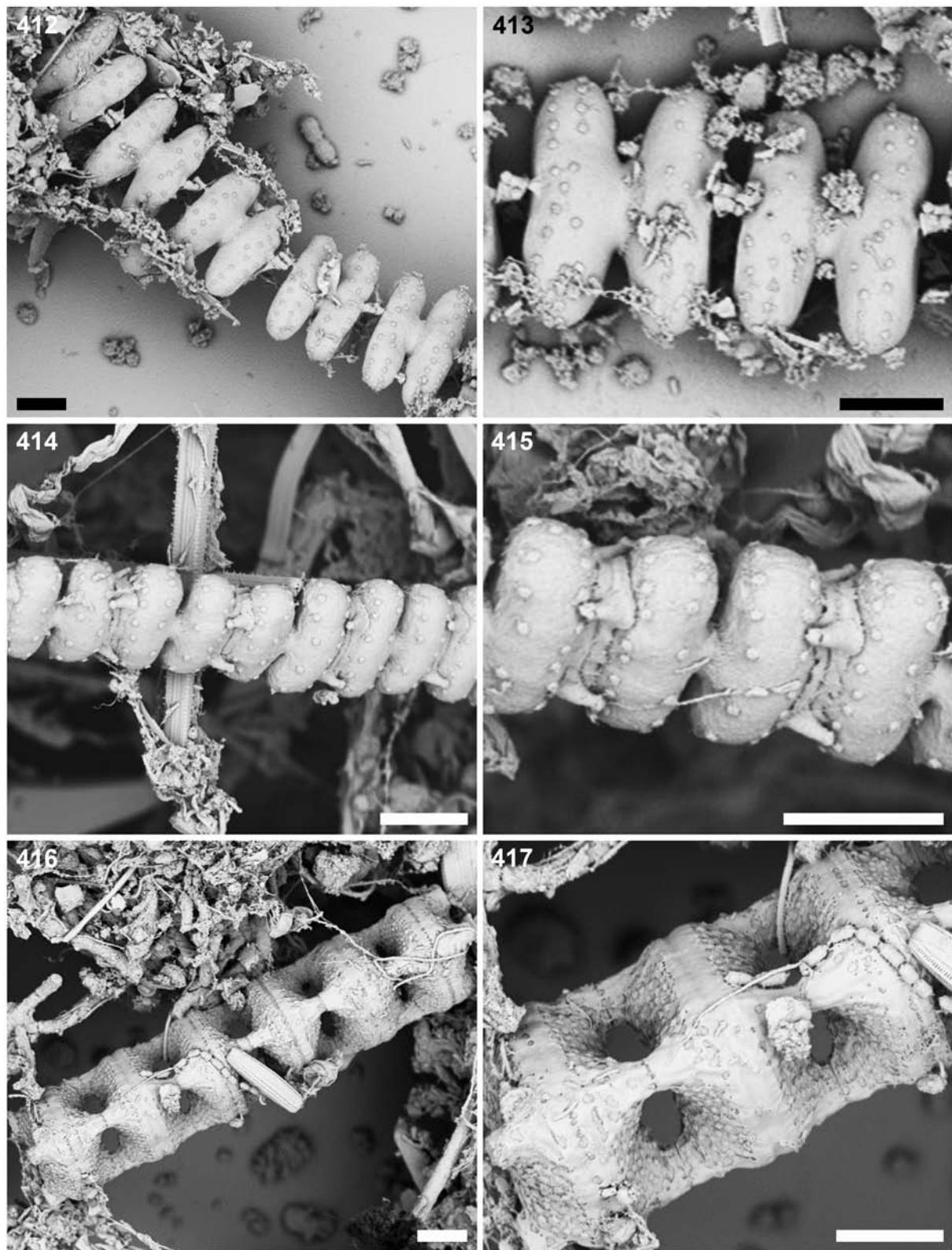
Figs 394–399. (394–395) *Cosmarium variolatum* var. *cataractarum*; (396–397) *C. varsoviense*, (396) cell with collapsed apices; (398) *Xanthidium aculeatum*; (399) *X. cristatum*. Scale bar 10 µm.



Figs 400–405. (400–402) *Staurastrum crassangulatum*, (402) apical view; (403–404) *St. erasum*; (405) *St. habeebense*. Scale bar 10 µm.



Figs 406–411. (406) *Staurastrum habeebense*; (407–409) *St. lapponicum*; (410) *St. trapezicum*. (411) *St. varians*. Scale bar 10 µm.



Figs 412–417. (412–413) *Sphaerozosma aubertianum*; (414–415) *Sph. filiforme*; (416–417) *Desmidium baileyi* var. *caelatum*. Scale bar 10 µm.

Table 1. List of all taxa found with their indicative notations [(TRPH) Trophy, (oli) oligotrophic, (mes) mesotrophic, (eu) eutrophic; (ACID) Acidity, (aci) acidic, (neu) neutral, (alk) alkalic; (LF) life form, (ben) benthic, (atm) atmophytic, (pla) planktonic; (R) rarity within the Czech Republic; (S) ecological sensitivity. For details see Introduction].

	TRPH	ACID	LF	R	S
<i>Actinotaenium cruciferum</i> (DE BARY) TEILING	oli	aci	ben-atm	3	
<i>Actinotaenium cucurbita</i> (RALFS) TEILING	oli	aci	ben-atm		1
<i>Actinotaenium curtum</i> (RALFS) TEILING	mes-oli	aci-neu	atm-ben	1	
<i>Actinotaenium diplosporum</i> (P.LUNDELL) TEILING	mes-oli	aci	ben-atm	1	1
<i>Actinotaenium diplosporum</i> var. <i>americanum</i> (W. et G.S.WEST) TEILING	mes	aci	ben-atm	2	
<i>Actinotaenium inconspicuum</i> (W. et G.S.WEST) TEILING	oli-mes	aci	ben-atm	2	
<i>Actinotaenium inconspicuum</i> var. <i>curvatum</i> KOUWETS	oli-mes	aci	ben-atm	3	
<i>Actinotaenium kriegeri</i> (MESSIK.) KOUWETS	oli-mes	aci	ben-atm	3	
<i>Actinotaenium obcuneatum</i> (W.WEST) TEILING	oli	aci	ben-atm	3	
<i>Actinotaenium perminutum</i> (G.S.WEST) TEILING	oli-mes	aci	ben-atm	3	3
<i>Actinotaenium silvae – nigrae</i> (RABANUS) KOUWETS et COESEL	oli	aci	ben-atm	1	2
<i>Actinotaenium silvae – nigrae</i> var. <i>parallelum</i> (WILLI KRIEG.) KOUWETS et COESEL	oli	aci	ben-atm	2	2
<i>Actinotaenium subsparsepunctatum</i> (GRÖNBLAD) COESEL	oli	aci	ben-atm	3	
<i>Actinotaenium turgidum</i> (RALFS) TEILING	mes	aci	ben		2
<i>Bambusina brebissonii</i> KÜTZ.	oli	aci	ben		2
<i>Closterium abruptum</i> W.WEST	mes-oli	aci	ben-atm	1	
<i>Closterium acerosum</i> RALFS	eu-mes	alk-aci	ben		
<i>Closterium acerosum</i> var. <i>elongatum</i> BRÉB.	eu-mes	alk-aci	ben-pla		
<i>Closterium acerosum</i> var. <i>minus</i> HANTZSCH	eu-mes	aci-alk	ben		
<i>Closterium aciculare</i> T.WEST	eu-mes	alk-neu	pla	1	
<i>Closterium acutum</i> RALFS	oli-eu	aci-alk	ben-pla		
<i>Closterium acutum</i> var. <i>variabile</i> (LEMMERM.) WILLI KRIEG.	eu-mes	neu-alk	pla		
<i>Closterium angustatum</i> RALFS	mes-oli	aci	ben	1	3
<i>Closterium angustatum</i> var. <i>sculptum</i> (RACIB.) RŮŽIČKA	mes-oli	aci	ben	3	3
<i>Closterium archerianum</i> CLEVE	mes	aci	ben	2	2
<i>Closterium archerianum</i> var. <i>pseudocynthia</i> RŮŽIČKA	mes	aci-neu	ben	2	2
<i>Closterium attenuatum</i> RALFS	mes	aci	ben	1	2
<i>Closterium baillyanum</i> (RALFS) BRÉB.	oli-mes	aci	ben	1	2
<i>Closterium baillyanum</i> var. <i>alpinum</i> (VIRET) GRÖNBLAD	oli-mes	aci	ben	1	2
<i>Closterium braunii</i> REINSCH	mes	aci	ben	3	3
<i>Closterium calosporum</i> WITTR.	mes	aci	ben	1	1
<i>Closterium calosporum</i> var. <i>brasiliense</i> BORGES.	mes-oli	aci	ben	3	3
<i>Closterium calosporum</i> var. <i>maiis</i> (W. et G.S.WEST) WILLI KRIEG.	mes-eu	neu	ben	3	
<i>Closterium closterioides</i> (RALFS) A.LOUIS et PEETERS	mes-oli	aci	ben	3	3
<i>Closterium closterioides</i> var. <i>intermedium</i> (J.ROY et BISSET) RŮŽIČKA	mes-oli	aci	ben	3	3
<i>Closterium cornu</i> RALFS	oli-mes	aci	ben-atm		
<i>Closterium cornu</i> var. <i>upsaliense</i> NORDST.	oli-mes	aci	ben-atm	2	
<i>Closterium costatum</i> RALFS	mes	aci	ben	1	2
<i>Closterium costatum</i> var. <i>borgei</i> (WILLI. KRIEG.) RŮŽIČKA	mes	aci	ben	1	2
<i>Closterium cynthia</i> DE NOT.	mes	aci	ben	1	2

Table 1 Cont.

	TRPH	ACID	LF	R	S
<i>Closterium delponsei</i> (G.A.KLEBS) WOLLE	mes	aci	ben	3	3
<i>Closterium dianae</i> RALFS	mes	aci	ben		1
<i>Closterium dianae</i> var. <i>arcuatum</i> (BRÉB.) RABENH.	mes	aci	ben	1	2
<i>Closterium dianae</i> var. <i>minus</i> HIERON.	mes	aci	ben	1	1
<i>Closterium dianae</i> var. <i>pseudodianae</i> (J.ROY) WILLI KRIEG.	mes	aci	ben	3	2
<i>Closterium dianae</i> var. <i>rectius</i> (NORDST.) DE TONI	mes	aci	ben	3	2
<i>Closterium didymotocum</i> RALFS	mes	aci	ben	2	3
<i>Closterium directum</i> W.ARCHER	oli-mes	aci	ben	2	2
<i>Closterium ehrenbergii</i> RALFS	eu-mes	alk-aci	ben		
<i>Closterium exile</i> W. et G.S.WEST	oli	aci-neu	ben-atm	3	
<i>Closterium gracile</i> RALFS	mes-oli	aci	ben		2
<i>Closterium gracile</i> var. <i>elongatum</i> W. et G.S.WEST	mes	aci	ben	2	2
<i>Closterium idiosporum</i> W. et G.S.WEST	mes-eu	aci-neu	ben		1
<i>Closterium incurvum</i> BRÉB.	mes-eu	aci-alk	ben		
<i>Closterium intermedium</i> RALFS	mes-oli	aci	ben		1
<i>Closterium juncidum</i> RALFS	oli-mes	aci	ben	1	2
<i>Closterium juncidum</i> var. <i>brevius</i> (RABENH.) J.ROY	oli-mes	aci	ben	1	2
<i>Closterium kuetzingii</i> BRÉB.	mes	aci-neu	ben		
<i>Closterium leibleinii</i> RALFS var. <i>boergesenii</i> (SCHMIDLE) SKVORTSOV	eu	alk-neu	ben		1
<i>Closterium limneticum</i> LEMMER.	eu	alk-neu	pla		
<i>Closterium limneticum</i> var. <i>fallax</i> RŮŽIČKA	eu	alk-neu	pla	1	
<i>Closterium limneticum</i> var. <i>tenue</i> LEMMER.	eu	alk-neu	pla		
<i>Closterium lineatum</i> RALFS	mes	aci	ben	1	2
<i>Closterium lineatum</i> var. <i>elongatum</i> (ROSA) CROASDALE	mes	aci	ben	1	2
<i>Closterium lineatum</i> var. <i>costatum</i> WOLLE	mes	aci	ben	3	2
<i>Closterium littorale</i> F.GAY	eu-mes	alk-neu	ben-pla	2	
<i>Closterium lunula</i> RALFS	mes	aci	ben		1
<i>Closterium moniliferum</i> RALFS	eu-mes	alk-aci	ben		
<i>Closterium navicula</i> (BRÉB.) LÜTKEM.	mes-oli	aci	ben		
<i>Closterium nematodes</i> JOSHUA var. <i>proboscideum</i> W.B.TURNER	mes	aci	ben	3	2
<i>Closterium parvulum</i> NÄGELI	mes	aci-neu	ben		
<i>Closterium praelongum</i> BRÉB.	mes-eu	aci-alk	ben-pla		
<i>Closterium praelongum</i> var. <i>brevius</i> (NORDST.) WILLI KRIEG.	mes-eu	aci-alk	ben		
<i>Closterium pritchardianum</i> W.ARCHER	mes-eu	aci-neu	ben-pla		
<i>Closterium pronum</i> BRÉB.	oli-mes	aci	ben		1
<i>Closterium pseudolunula</i> BORGE	mes-eu	aci-neu	ben	2	
<i>Closterium pseudopygmaeum</i> KOUWETS	oli-mes	aci	ben-atm	3	
<i>Closterium pusillum</i> HANTZSCH	oli	aci	atm-ben	3	
<i>Closterium ralfsii</i> RALFS	mes	aci	ben	3	2
<i>Closterium ralfsii</i> var. <i>hybridum</i> RABENH.	mes	aci	ben	1	2
<i>Closterium regulare</i> BRÉB.	mes	aci-alk	ben	2	2
<i>Closterium rostratum</i> RALFS	mes	aci	ben-atm		
<i>Closterium setaceum</i> RALFS	oli-mes	aci	ben	1	2

Table 1 Cont.

	<b>TRPH</b>	<b>ACID</b>	<b>LF</b>	<b>R</b>	<b>S</b>
<i>Closterium strigosum</i> BRÉB.	eu-mes	alk-neu	pla-ben	2	
<i>Closterium strigosum</i> var. <i>elegans</i> (G.S.WEST) WILLI KRIEG.	eu-mes	neu	ben	2	
<i>Closterium striolatum</i> RALFS	oli	aci	ben		
<i>Closterium sublaterale</i> Růžička	mes	aci-neu	ben	1	
<i>Closterium submoniliferum</i> WORON.	eu-mes	alk-aci	ben		
<i>Closterium subulatum</i> (KÜTZ.) BRÉB.	eu-mes	neu-alk	ben	3	1
<i>Closterium tortitaenoides</i> COESEL	oli	aci	ben	3	2
<i>Closterium tumidulum</i> F.GAY	eu	alk-neu	ben-pla		
<i>Closterium tumidum</i> JOHNS.	oli	aci	ben-atm	2	
<i>Closterium tumidum</i> var. <i>nylandicum</i> GRÖNBLAD	oli	aci	ben-atm	3	
<i>Closterium turgidum</i> RALFS	mes	aci	ben	1	2
<i>Closterium turgidum</i> var. <i>giganteum</i> (NORDST.) DE TONI	mes	aci-neu	ben-pla	3	2
<i>Closterium venus</i> RALFS	eu-mes	neu-alk	ben-pla		
<i>Cosmarium abbreviatum</i> RACIB.	mes-eu	neu-alk	ben-pla	3	
<i>Cosmarium amoenum</i> RALFS	oli-mes	aci	ben	1	2
<i>Cosmarium anceps</i> P.LUNDELL	oli	aci	atm-ben	1	
<i>Cosmarium angulare</i> JOHNS.	eu	alk	ben	3	2
<i>Cosmarium angulosum</i> BRÉB.	mes	aci	ben	2	3
<i>Cosmarium angulosum</i> var. <i>concinnum</i> (RABENH.) W. et G.S.WEST	mes	aci	ben	3	3
<i>Cosmarium basiornatum</i> (GRÖNBLAD) COESEL	oli-mes	aci	atm-ben	2	
<i>Cosmarium berryense</i> KOUWETS	eu	alk	ben	3	2
<i>Cosmarium bioculatum</i> RALFS	mes	aci	ben		
<i>Cosmarium bioculatum</i> var. <i>depressum</i> (SCHAARSCHM.) SCHMIDLE	mes-eu	aci-alk	ben-pla		
<i>Cosmarium bireme</i> NORDST.	mes	aci	ben	3	3
<i>Cosmarium biretum</i> RALFS	eu	alk	ben-pla	2	
<i>Cosmarium biretum</i> var. <i>trigibberum</i> NORDST.	eu	alk	ben-pla	2	
<i>Cosmarium blyttii</i> WILLE	mes-oli	aci	ben	3	3
<i>Cosmarium blyttii</i> var. <i>novae-sylvae</i> W. et G.S.WEST	mes-oli	aci	ben	1	2
<i>Cosmarium boeckii</i> WILLE	mes-eu	aci-alk	ben	1	
<i>Cosmarium boitierense</i> KOUWETS	mes-eu	aci-neu	ben	3	2
<i>Cosmarium botrytis</i> RALFS	mes-eu	aci-neu	ben	2	
<i>Cosmarium botrytis</i> var. <i>gemmiferum</i> (BRÉB.) NORDST.	mes-eu	neu-aci	ben	2	
<i>Cosmarium botrytis</i> var. <i>mediolaeve</i> W.WEST	mes-eu	aci-neu	ben	1	
<i>Cosmarium botrytis</i> var. <i>tumidum</i> WOLLE	mes-eu	neu	ben	1	2
<i>Cosmarium brebissonii</i> RALFS	mes-oli	aci	ben	3	2
<i>Cosmarium caelatum</i> RALFS	oli-mes	aci	atm-ben		
<i>Cosmarium carinthiacum</i> LÜTKEM.	oli-mes	aci	ben	3	3
<i>Cosmarium ceratophorum</i> LÜTKEM.	mes	aci	ben	3	
<i>Cosmarium commisurale</i> RALFS var. <i>acutum</i> BRÉB.	mes	aci	ben	3	
<i>Cosmarium connatum</i> RALFS	mes	aci	ben	1	2
<i>Comarium conspersum</i> RALFS var. <i>latum</i> (BRÉB.) W. et G.S.WEST	mes	aci	ben	2	3
<i>Cosmarium contractum</i> KIRCHN.	mes-oli	aci	ben	2	3
<i>Cosmarium contractum</i> var. <i>ellipsoideum</i> (ELFVING) W. et G.S. WEST	mes-oli	aci	ben	2	3

Table 1 Cont.

	TRPH	ACID	LF	R	S
<i>Cosmarium contractum</i> var. <i>minutum</i> (DELPONTE) COESEL	mes–eu	aci–alk	ben		
<i>Cosmarium contractum</i> var. <i>retusum</i> (W. ET G.S.WEST) WILLI KRIEG. et GERLOFF	mes	aci	ben	3	3
<i>Cosmarium contractum</i> var. <i>rotundatum</i> BORGE	mes–oli	aci	ben	3	3
<i>Cosmarium crenatum</i> RALFS	oli–mes	aci	atm–ben	1	
<i>Cosmarium crenatum</i> var. <i>bicrenatum</i> NORDST.	oli–mes	aci	atm–ben	2	
<i>Cosmarium crenulatum</i> NÄGELI	mes	aci–neu	ben	1	1
<i>Cosmarium cucumis</i> RALFS	mes	aci	ben	2	3
<i>Cosmarium cyclicum</i> P.LUNDELL	mes–oli	aci	atm–ben	2	
<i>Cosmarium cyclicum</i> var. <i>arcticum</i> NORDST.	mes–oli	aci	atm–ben	2	
<i>Cosmarium davidsonii</i> J.ROY et BISSET	oli	aci	atm–ben	3	
<i>Cosmarium debaryi</i> W.ARCHER	mes	aci	ben	1	2
<i>Cosmarium decadens</i> (REINSCH) RACIB.	oli	aci	atm–ben	3	
<i>Cosmarium decadens</i> var. <i>apertum</i> WILLI KRIEG. et GERLOFF	oli	aci	atm–ben	3	
<i>Cosmarium decadens</i> var. <i>minutum</i> (GUTW.) WILLI KRIEG. et GERLOFF	oli–mes	aci	atm–ben	3	
<i>Cosmarium denboeri</i> MEESTERS et COESEL	eu	neu–alk	pla–ben	2	
<i>Cosmarium dentiferum</i> NORDST. var. <i>alpinum</i> MESSIK.	oli	aci	ben–atm	3	
<i>Cosmarium depressum</i> (NÄGELI) P.LUNDELL	mes	aci–neu	ben	1	2
<i>Cosmarium depressum</i> var. <i>planctonicum</i> REVERDIN	mes	neu	pla–ben	2	
<i>Cosmarium dickii</i> COESEL	mes	aci–neu	ben	1	2
<i>Cosmarium didymoprotupsum</i> W. et G.S. WEST	eu–mes	neu–eu	ben	3	2
<i>Cosmarium difficile</i> LÜTKEM.	mes	aci	ben		1
<i>Cosmarium dilatatum</i> JÄRNEFELT et GRÖNBLAD	eu–mes	neu	pla	3	
<i>Cosmarium eichlerianum</i> (GRÖNBLAD) MESSIK.	mes	aci	ben	3	3
<i>Cosmarium fastidiosum</i> W. et G.S. WEST	mes	aci	ben	3	3
<i>Cosmarium fontigenum</i> NORDST.	mes	aci–neu	ben	3	2
<i>Cosmarium formosulum</i> HOFF	eu–mes	aci–alk	ben–pla		
<i>Cosmarium furcatospermum</i> W. et G.S. WEST	mes–eu	neu	ben	3	
<i>Cosmarium galeritum</i> NORDST.	oli–mes	aci	ben–atm	3	
<i>Cosmarium garrolense</i> J.ROY et BISSET	oli–mes	aci	ben–atm	3	
<i>Cosmarium gibberulum</i> LÜTKEM.	mes	neu–aci	ben	2	2
<i>Cosmarium goniodes</i> W. et G.S. WEST var. <i>subturgidum</i> W. et G.S. WEST	mes–oli	aci	ben	1	2
<i>Cosmarium granatum</i> RALFS	mes–eu	neu–aci	ben		
<i>Cosmarium holmiense</i> P.LUNDELL	mes	aci	ben	3	
<i>Cosmarium holmiense</i> var. <i>hibernicum</i> (W.WEST) SCHMIDLE	mes–oli	aci	ben–atm	3	
<i>Cosmarium holmiense</i> var. <i>integrum</i> P.LUNDELL	mes–oli	aci	atm–ben		
<i>Cosmarium homalodermum</i> NORDST.	oli–mes	aci	ben–atm	3	
<i>Cosmarium hornavanense</i> GUTW.	mes–oli	aci	ben–atm	3	
<i>Cosmarium hornavanense</i> var. <i>dubovianum</i> (LÜTKEM.) RÚŽIČKA	mes–eu	neu–alk	ben	2	
<i>Cosmarium humile</i> (F.GAY) NORDST.	mes–eu	aci–alk	ben		2
<i>Cosmarium impressulum</i> ELFVING	mes	aci–neu	ben		
<i>Cosmarium jaoi</i> KOUWETS	eu	alk–neu	ben	3	2
<i>Cosmarium kirchneri</i> BORGES.	mes	aci	ben	3	3

Table 1 Cont.

	<b>TRPH</b>	<b>ACID</b>	<b>LF</b>	<b>R</b>	<b>S</b>
<i>Cosmarium kjellmanii</i> WILLE	eu	alk-neu	ben-pla	2	
<i>Cosmarium klebsii</i> GUTW.	mes-eu	aci-alk	ben	3	2
<i>Cosmarium laeve</i> RABENH.	eu-mes	alk-aci	ben-pla		
<i>Cosmarium laeve</i> var. <i>octangulare</i> (WILLE) W. et G.S. WEST	eu-mes	alk-aci	ben-pla		
<i>Cosmarium lagerheimii</i> GUTW.	mes-eu	aci-neu	ben	3	2
<i>Cosmarium limnophilum</i> SCHMIDLE	mes-eu	aci-neu	ben	3	3
<i>Cosmarium margaritatum</i> (P.LUNDELL) J.ROY et BISSET	mes	aci	ben	3	3
<i>Cosmarium margaritiferum</i> RALFS	mes	aci	ben	1	2
<i>Cosmarium medioretusum</i> COESEL	mes	aci	ben	3	3
<i>Cosmarium meneghinii</i> RALFS	mes-eu	neu-aci	ben	1	
<i>Cosmarium microsphinctum</i> NORDST.	oli-mes	aci	atm-ben	3	
<i>Cosmarium microsphinctum</i> var. <i>crispulum</i> NORDST.	oli-mes	aci	atm-ben	3	
<i>Cosmarium moniliforme</i> RALFS var. <i>panduriforme</i> (HEIMERL) SCHMIDLE	mes	aci	ben	2	2
<i>Cosmarium netzerianum</i> SCHMIDLE	oli	aci	ben-atm	3	
<i>Cosmarium norimbergense</i> REINSCH var. <i>depressum</i> (W. et G.S.WEST) WILLI KRIEG. et GERLOFF	oli-mes	aci-neu	ben	3	
<i>Cosmarium notabile</i> BRÉB.	mes-oli	aci-neu	atm-ben		
<i>Cosmarium notatum</i> (GRÖNBLAD) COESEL	mes	aci	ben	3	3
<i>Cosmarium novae – semliae</i> WILLE var. <i>granulatum</i> (SCHMIDLE) SCHMIDLE	oli-mes	aci	ben	3	
<i>Cosmarium obliquum</i> NORDST.	oli	aci	ben-atm	2	
<i>Cosmarium obsoletum</i> (HANTZSCH) REINSCH	mes-oli	aci	ben	3	3
<i>Cosmarium obtusatum</i> SCHMIDLE	mes-eu	neu-alk	ben		
<i>Cosmarium ocellatum</i> B.EICHLER et GUTW.	mes	aci	ben	3	2
<i>Cosmarium ocellatum</i> var. <i>notatum</i> (NORDST.) WILLI KRIEG. et GERLOFF	mes	aci	ben	3	3
<i>Cosmarium ochthodes</i> NORDST.	mes	aci	ben	1	1
<i>Cosmarium ordinatum</i> (BØRGES.) W. et G.S.WEST	mes-oli	aci	ben	3	3
<i>Cosmarium ornatulum</i> COESEL	eu	alk	pla	1	
<i>Cosmarium ornatulum</i> var. <i>depressum</i> COESEL	eu	alk	pla	3	
<i>Cosmarium ornatum</i> RALFS	mes-oli	aci	ben	1	2
<i>Cosmarium orthopunctatum</i> SCHMIDLE	oli	aci	ben-atm	1	
<i>Cosmarium ovale</i> RALFS	mes	aci	ben	3	3
<i>Cosmarium pachydermum</i> P.LUNDELL	mes	aci	ben	1	2
<i>Cosmarium pachydermum</i> var. <i>aethiopicum</i> W. et G.S.WEST	mes	aci	ben	2	2
<i>Cosmarium paragranatoides</i> SKUJA	mes	aci	ben	3	3
<i>Cosmarium parvulum</i> BRÉB. var. <i>undulatum</i> SCHMIDLE	oli	aci	atm-ben	3	
<i>Cosmarium paucigranulatum</i> BORGE	mes	neu	ben	3	
<i>Cosmarium perforatum</i> P.LUNDELL	mes	aci	ben	3	3
<i>Cosmarium pericymatium</i> NORDST.	oli	neu-aci	atm-ben	2	
<i>Cosmarium pericymatium</i> var. <i>corrugatum</i> BROOK	oli	neu	atm-ben	3	
<i>Cosmarium pericymatium</i> var. <i>notabiliforme</i> INSAM et KRIEGER	oli	neu	atm-ben	3	
<i>Cosmarium phaseolus</i> RALFS	mes	aci	ben	3	
<i>Cosmarium phaseolus</i> var. <i>elevatum</i> NORDST.	mes	aci	ben	3	2
<i>Cosmarium pokornyanum</i> (GRUNOW) W. et G.S.WEST	mes	aci	ben-atm	3	

Table 1 Cont.

	TRPH	ACID	LF	R	S
<i>Cosmarium polygonum</i> (NÄGELI) W.ARCHER var. <i>depressum</i> MESSIK.	mes	aci–neu	ben	1	
<i>Cosmarium portianum</i> W.ARCHER	mes	aci–neu	ben	1	2
<i>Cosmarium praemorsum</i> BRÉB.	mes–eu	neu	ben	3	1
<i>Cosmarium prominulum</i> RACIB. var. <i>subundulatum</i> W. et G.S.WEST	oli–mes	aci	ben	3	3
<i>Cosmarium protractum</i> (NÄGELI) DE BARY	eu	alk	ben	3	2
<i>Cosmarium pseudoexiguum</i> RACIB.	mes	aci	ben	3	2
<i>Cosmarium pseudoinsigne</i> PRESCOTT	eu–mes	alk–neu	ben	3	2
<i>Cosmarium pseudonitidulum</i> NORDST. var. <i>validum</i> W. et G.S.WEST	oli	aci–neu	ben–atm	3	
<i>Cosmarium pseudoornatum</i> B.EICHLER et GUTW.	mes	aci	ben	2	2
<i>Cosmarium pseudoprotuberans</i> KIRCHN.	mes	aci	ben	3	3
<i>Cosmarium pseudoprotuberans</i> var. <i>sulcatum</i> (NORDST.) COESEL	mes	aci	ben	3	3
<i>Cosmarium pseudopyramidatum</i> P.LUNDELL	oli–mes	aci	ben	2	2
<i>Cosmarium pseudoretusum</i> F.DUCCELL	mes	aci	ben	3	3
<i>Cosmarium pseudowembae</i> KOUWETS	eu	alk	pla–ben	3	
<i>Cosmarium punctulatum</i> BRÉB. var. <i>subpunctulatum</i> (NORDST.) BØRGES.	mes–eu	aci–alk	ben		
<i>Cosmarium pygmaeum</i> W.ARCHER	oli	aci	ben	2	2
<i>Cosmarium pyramidatum</i> RALFS	oli–mes	aci	ben	2	2
<i>Cosmarium pyramidatum</i> var. <i>stenonotum</i> (NORDST.) KLEBS	oli–mes	aci	ben	3	2
<i>Cosmarium quadratulum</i> var. <i>boldtii</i> (MESSIK.) WILLI KRIEG. et GERLOFF	mes	aci	ben	1	2
<i>Cosmarium quadratum</i> RALFS	mes	aci	ben		
<i>Cosmarium quadratum</i> P.LUNDELL	mes	aci	ben	1	3
<i>Cosmarium quadratum</i> var. <i>sublatum</i> (NORDST.) W. et G.S.WEST	mes	aci	ben	3	3
<i>Cosmarium ralfsii</i> RALFS	oli	aci	ben	3	3
<i>Cosmarium ralfsii</i> var. <i>montanum</i> RACIB.	oli	aci	ben	3	3
<i>Cosmarium rectangulare</i> GRUNOW	mes	aci	ben	2	2
<i>Cosmarium regnellii</i> WILLE	mes–eu	aci–alk	ben		
<i>Cosmarium regnesii</i> REINSCH	mes	aci	ben	2	2
<i>Cosmarium reniforme</i> (RALFS) W.ARCHER	eu–mes	aci–alk	ben		
<i>Cosmarium reniforme</i> var. <i>compressum</i> NORDST.	eu–mes	aci–alk	ben		
<i>Cosmarium retusum</i> (PERTY) RABENH.	mes	aci	ben	3	3
<i>Cosmarium sexnotatum</i> GUTW. var. <i>bipunctatum</i> (WOLOSZ.) COESEL	mes	aci	ben	3	3
<i>Cosmarium sexnotatum</i> var. <i>tristriatum</i> (LÜTKEM.) SCHMIDLE	oli–mes	aci	ben	3	3
<i>Cosmarium simplicius</i> (W. et G.S.WEST) GRÖNBLAD	mes–oli	aci	atm–ben	3	2
<i>Cosmarium sinostegos</i> SCHAARSCHM. var. <i>obtusius</i> GUTW.	mes	aci	ben	3	2
<i>Cosmarium speciosum</i> P.LUNDELL	oli–mes	aci	atm–ben	3	
<i>Cosmarium speciosum</i> var. <i>simplex</i> NORDST.	oli–mes	aci	atm–ben	1	
<i>Cosmarium speciosum</i> var. <i>tumidum</i> SCHMIDLE	oli–mes	aci	atm–ben	3	
<i>Cosmarium sphagnicolum</i> W. et G.S.WEST	oli	aci	ben	3	2
<i>Cosmarium sphyrelatum</i> COESEL	mes	aci	ben	3	3
<i>Cosmarium sportella</i> BRÉB. var. <i>subnudum</i> W. et G.S.WEST	mes	aci	ben	1	
<i>Cosmarium striolatum</i> (NÄGELI) W.ARCHER	mes	aci	ben	3	3
<i>Cosmarium subadoxum</i> GRÖNBLAD	mes	aci	ben	3	
<i>Cosmarium subbroomei</i> SCHMIDLE	eu–mes	neu–alk	ben	3	
<i>Cosmarium subbroomei</i> f. <i>isthmochondrum</i> COESEL	eu–mes	neu–alk	ben	3	2

Table 1 Cont.

	<b>TRPH</b>	<b>ACID</b>	<b>LF</b>	<b>R</b>	<b>S</b>
<i>Cosmarium subcostatum</i> NORDST.	mes	neu	ben	3	
<i>Cosmarium subcostatum</i> var. <i>minus</i> (W. et G.S.WEST) KURT FÖRST.	mes	aci-alk	ben		
<i>Cosmarium subcrenatum</i> HANTZSCH	mes	aci	ben-atm	3	
<i>Cosmarium subcucumis</i> SCHMIDLE	mes	aci	ben		
<i>Cosmarium subgranatum</i> (NORDST.) LÜTKEM.	mes-eu	aci-alk	ben		
<i>Cosmarium subgranatum</i> var. <i>borgei</i> WILLI KRIEG.	mes-eu	aci-alk	ben		
<i>Cosmarium subprotumidum</i> NORDST.	eu-mes	alk-aci	ben	1	2
<i>Cosmarium subprotumidum</i> var. <i>pyramidalis</i> COESEL	mes-eu	aci-neu	ben	3	2
<i>Cosmarium subquadrans</i> W. et G.S.WEST var. <i>minor</i> SYMOENS	oli	aci	ben	3	3
<i>Cosmarium subspeciosum</i> NORDST.	mes	aci	ben	3	2
<i>Cosmarium subspeciosum</i> var. <i>transiens</i> MESSIK.	oli-mes	aci	ben-atm	1	
<i>Cosmarium subtumidum</i> NORDST.	mes-oli	aci	ben	2	2
<i>Cosmarium subtumidum</i> var. <i>groenbladii</i> CROASDALE	mes	aci	ben	3	3
<i>Cosmarium taxichondriforme</i> B.EICHLER et GUTW.	mes	aci	ben	3	3
<i>Cosmarium tenue</i> W.ARCHER	mes	aci-neu	ben		
<i>Cosmarium tetrachondrum</i> P.LUNDELL forma	mes	aci	ben	3	3
<i>Cosmarium tetraophthalmum</i> RALFS	mes	aci-neu	ben		
<i>Cosmarium thwaitesii</i> RALFS var. <i>penioides</i> KLEBS	mes	aci-neu	ben	1	
<i>Cosmarium tinctum</i> RALFS	oli-mes	aci	ben	1	2
<i>Cosmarium tinctum</i> var. <i>subretusum</i> MESSIK.	oli-mes	aci	ben	2	2
<i>Cosmarium trachyleprum</i> P.LUNDELL var. <i>minus</i> RACIB.	mes	aci	ben	3	3
<i>Cosmarium truncatellum</i> PERTY	oli	aci	ben	3	3
<i>Cosmarium turpinii</i> BRÉB. var. <i>podolicum</i> GUTW.	mes-eu	aci-alk	ben	1	2
<i>Cosmarium ungerianum</i> (NÄGELI) DE BARY var. <i>subtriplicatum</i> W. et G.S.WEST	mes	aci	ben	3	3
<i>Cosmarium variolatum</i> P.LUNDELL	mes	aci	ben	3	3
<i>Cosmarium variolatum</i> var. <i>cataractarum</i> RACIB.	mes-eu	aci-alk	ben	3	2
<i>Cosmarium varsovicense</i> RACIB.	mes	aci	ben	2	2
<i>Cosmarium vexatum</i> W.WEST	mes-eu	neu-alk	ben	2	
<i>Cosmarium vexatum</i> var. <i>concavum</i> SCHMIDLE	mes	aci	ben	3	
<i>Cosmarium vogesiacum</i> LEMAIRE	oli-mes	aci	ben	3	
<i>Cosmarium wittrockii</i> P.LUNDELL	eu-mes	neu-alk	ben	2	2
<i>Cosmocladium constrictum</i> W.ARCHER	mes	aci	pla	3	
<i>Cosmocladium saxonicum</i> J.ROY et BISSET	mes	neu	pla	3	
<i>Cylindrocystis brebissonii</i> DE BARY	oli	aci	ben-atm		
<i>Cylindrocystis crassa</i> DE BARY	oli	aci	atm	3	
<i>Cylindrocystis gracilis</i> I.HIRN	oli	aci	ben-atm		
<i>Desmidium aptogonum</i> KÜTZ.	mes	aci-neu	ben	2	2
<i>Desmidium baileyi</i> (RALFS) NORDST. var. <i>caelatum</i> (KIRCHN.) NORDST.	mes	aci	ben	3	3
<i>Desmidium grevillei</i> (RALFS) DE BARY	mes-oli	aci	ben	2	3
<i>Desmidium swartzii</i> RALFS	mes	aci-neu	ben	1	
<i>Dodidium baculum</i> RALFS	mes-oli	aci	ben	3	3
<i>Euastrum ansatum</i> RALFS	mes-oli	aci	ben	1	
<i>Euastrum ansatum</i> var. <i>rhomboideale</i> F.DUCELL.	mes-oli	aci	ben	3	3

Table 1 Cont.

	TRPH	ACID	LF	R	S
<i>Euastrum bidentatum</i> NÄGELI	mes	aci–neu	ben		
<i>Euastrum bidentatum</i> var. <i>speciosum</i> (BOLDT) SCHMIDLE	mes	aci–neu	ben	1	
<i>Euastrum binale</i> RALFS	oli	aci	ben	3	
<i>Euastrum binale</i> var. <i>gutwinskii</i> (SCHMIDLE) HOMFELD	oli	aci	ben		
<i>Euastrum bicropiculatum</i> (WOLOSZ.) COESEL	mes	aci	ben	3	3
<i>Euastrum brevisinuosum</i> (NORDST.) KOUWETS var. <i>dissimile</i> (NORDST.) KOUWETS	oli	aci	atm–ben	3	
<i>Euastrum crassicolle</i> P.LUNDELL	oli–mes	aci	ben–atm	3	
<i>Euastrum crassum</i> RALFS	oli	aci	ben	3	3
<i>Euastrum denticulatum</i> F.GAY	mes	aci	ben	1	2
<i>Euastrum dubium</i> NÄGELI	oli–mes	aci	ben	3	
<i>Euastrum dubium</i> var. <i>ornatum</i> WOLOSZ.	mes	aci	ben	2	2
<i>Euastrum elegans</i> RALFS	mes	aci	ben	1	2
<i>Euastrum gayanum</i> DE TONI	mes–oli	aci	ben		1
<i>Euastrum germanicum</i> (SCHMIDLE) WILLI KRIEG.	eu–mes	aci–alk	ben–pla	2	2
<i>Euastrum humerosum</i> RALFS	oli–mes	aci	ben		2
<i>Euastrum humerosum</i> var. <i>affine</i> (RALFS) G.C.WALLICH	oli–mes	aci	ben	3	2
<i>Euastrum insigne</i> RALFS	oli	aci	ben	2	3
<i>Euastrum insulare</i> (WITTR.) J.ROY	mes	aci–neu	ben	2	2
<i>Euastrum luetkemuelleri</i> F.DUCELL. var. <i>carniolicum</i> (LÜTKEM.) WILLI KRIEG.	oli–mes	aci	ben	3	3
<i>Euastrum montanum</i> W. et G.S.WEST	mes–oli	aci	ben	3	
<i>Euastrum oblongum</i> RALFS	mes	aci	ben		2
<i>Euastrum pectinatum</i> RALFS	mes	aci	ben	1	2
<i>Euastrum pinnatum</i> RALFS	mes	aci	ben	3	3
<i>Euastrum pulchellum</i> BRÉB.	mes	aci	ben	3	3
<i>Euastrum subalpinum</i> MESSIK.	oli–mes	aci	ben–atm	2	
<i>Euastrum subalpinum</i> var. <i>crassum</i> MESSIK.	oli–mes	aci	ben–atm	3	
<i>Euastrum turneri</i> W.WEST	mes	aci	ben	3	3
<i>Euastrum verrucosum</i> RALFS	mes	aci	ben	1	2
<i>Euastrum verrucosum</i> var. <i>alatum</i> WOLLE	mes	aci	ben	1	2
<i>Gonatozygon aculeatum</i> HASTINGS	mes	aci	ben	3	3
<i>Gonatozygon brebissonii</i> DE BARY	mes	aci	ben	1	2
<i>Gonatozygon brebissonii</i> var. <i>alpestre</i> RUŽIČKA	oli–mes	aci	ben–atm	3	
<i>Gonatozygon kinahanii</i> (W.ARCHER) RABENH.	mes–eu	aci–neu	ben	1	1
<i>Gonatozygon monotaenium</i> DE BARY	mes–eu	aci–neu	ben–pla	1	1
<i>Haploaenium indentatum</i> KOUWETS var. <i>latius</i> KOUWETS morpha	oli	aci	ben	3	3
<i>Haploaenium minutum</i> (RALFS) BANDO	oli	aci	ben	2	3
<i>Haploaenium rectum</i> (DELPONTE) BANDO	oli–mes	aci	ben	2	3
<i>Hyalotheca dissiliens</i> RALFS	mes	aci–neu	ben		
<i>Hyalotheca dissiliens</i> var. <i>tatrica</i> RACIB.	oli	aci	ben	2	2
<i>Hyalotheca mucosa</i> RALFS	mes	aci	ben	2	1
<i>Mesotaenium caldarium</i> (LAGERH.) HANSG.	mes	aci–neu	atm–ben	3	
<i>Mesotaenium degreyi</i> W.B.TURNER	oli	aci	atm–ben	3	
<i>Mesotaenium endlicherianum</i> NÄGELI	oli	aci	atm–ben	2	

Table 1 Cont.

	TRPH	ACID	LF	R	S
<i>Mesotaenium macrococcum</i> (KÜTZ.) J.ROY et BISSET	oli	aci	atm		
<i>Mesotaenium macrococcum</i> var. <i>minus</i> (DE BARY) COMPÈRE	oli	aci	atm-ben	1	
<i>Micrasterias americana</i> RALFS	mes	aci	ben-pla	1	2
<i>Micrasterias apiculata</i> RALFS	mes	aci	ben	3	3
<i>Micrasterias brachyptera</i> P.LUNDELL	mes	aci	ben	3	3
<i>Micrasterias crux – melitensis</i> RALFS	mes	aci-neu	ben-pla	1	2
<i>Micrasterias denticulata</i> RALFS	mes	aci	ben	3	2
<i>Micrasterias denticulata</i> var. <i>angulosa</i> (HANTZSCH) W. et G.S.WEST	mes	aci	ben	2	2
<i>Micrasterias fimbriata</i> RALFS	mes	aci	ben	2	3
<i>Micrasterias furcata</i> RALFS	mes	aci	ben	3	3
<i>Micrasterias jenneri</i> RALFS	oli	aci	ben	3	3
<i>Micrasterias oscitans</i> RALFS	oli	aci	ben	3	3
<i>Micrasterias papillifera</i> RALFS	mes	aci	ben	1	2
<i>Micrasterias papillifera</i> var. <i>pseudomurrayi</i> LAPORTE	mes	aci	ben	3	2
<i>Micrasterias pinnatifida</i> RALFS	mes	aci	ben	3	3
<i>Micrasterias rotata</i> RALFS	mes	aci	ben	1	2
<i>Micrasterias thomasiana</i> W.ARCHER	mes-oli	aci	ben	3	1
<i>Micrasterias thomasiana</i> var. <i>notata</i> (NORDST.) GRÖNBLAD	mes-oli	aci	ben		1
<i>Micrasterias truncata</i> RALFS	oli-mes	aci	ben		1
<i>Micrasterias truncata</i> var. <i>bahuensis</i> WITTR.	oli-mes	aci	ben	2	1
<i>Micrasterias truncata</i> var. <i>quadrata</i> BULNH.	oli	aci	ben	3	1
<i>Micrasterias truncata</i> var. <i>semiradiata</i> (NÄGELI) WOLLE	oli-mes	aci	ben	1	1
<i>Netrium digitus</i> ITZIGS. et ROTHE	oli-mes	aci	ben		
<i>Netrium interruptum</i> (RALFS) LÜTKEM.	mes	aci	ben	2	2
<i>Netrium interruptum</i> var. <i>minor</i> (BORGE) WILLI KRIEG.	oli-mes	aci	ben-atm	3	
<i>Netrium oblongum</i> (DE BARY) LÜTKEM.	oli	aci	ben-atm	1	1
<i>Netrium pseudactinotaenium</i> COESEL	oli	aci	ben	3	3
<i>Penium cylindrus</i> RALFS	oli-mes	aci	ben		
<i>Penium exiguum</i> W.WEST	mes-oli	aci	ben	3	3
<i>Penium margaritaceum</i> RALFS	mes-oli	aci	ben	1	1
<i>Penium polymorphum</i> PERTY	oli	aci	ben	2	2
<i>Penium spirostriolatum</i> J.BARKER	mes-oli	aci	ben	1	2
<i>Pleurotaenium archeri</i> DELPONTE	mes	aci	ben	3	2
<i>Pleurotaenium coronatum</i> (RALFS) RABENH.	mes	aci	ben	3	2
<i>Pleurotaenium coronatum</i> var. <i>fluctuatum</i> W.WEST	mes	aci	ben	2	2
<i>Pleurotaenium crenulatum</i> (RALFS) RABENH.	mes	aci	ben		
<i>Pleurotaenium ehrenbergii</i> (RALFS) DE BARY	mes	aci	ben		1
<i>Pleurotaenium eugeneum</i> (W.B.TURNER) W. et G.S.WEST	mes	aci	ben	3	2
<i>Pleurotaenium nodulosum</i> (RALFS) DE BARY	mes	aci	ben	3	3
<i>Pleurotaenium simplicissimum</i> GRÖNBLAD	mes	aci	ben	3	3
<i>Pleurotaenium trabecula</i> NÄGELI	mes	aci-neu	ben	1	1
<i>Pleurotaenium tridentulum</i> (WOLLE) W.WEST	oli	aci	ben	3	3
<i>Pleurotaenium truncatum</i> (RALFS) NÄGELI	mes	aci	ben	1	2
<i>Roya cambrica</i> W. et G.S.WEST	mes	aci	ben		3
<i>Roya closterioides</i> COESEL	mes	aci	ben	2	2

Table 1 Cont.

	TRPH	ACID	LF	R	S
<i>Roya obtusa</i> (BRÉB.) W. et G.S.WEST	oli	aci	atm–ben		
<i>Roya obtusa</i> var. <i>anglica</i> (G.S.WEST) WILLI KRIEG.	oli	aci	atm–ben		
<i>Sphaerozosma aubertianum</i> W.WEST	mes	aci	ben	3	3
<i>Sphaerozosma filiforme</i> RALFS	mes	aci–neu	ben	3	3
<i>Spirotaenia condensata</i> RALFS	mes–oli	aci	atm–ben		
<i>Spirotaenia endospira</i> (BRÉB.) W.ARCHER	oli–mes	aci	atm–ben	3	
<i>Spirotaenia erythrocephala</i> ITZIGS.	oli–mes	aci	atm–ben	3	
<i>Spondylosium planum</i> (WOLLE) W. et G.S.WEST	mes–eu	neu	pla–ben	3	
<i>Spondylosium pulchellum</i> W.ARCHER	oli–mes	aci	ben	1	2
<i>Staurastrum aculeatum</i> RALFS	mes	aci	ben	3	3
<i>Staurastrum alternans</i> RALFS	mes	aci–neu	ben		1
<i>Staurastrum arctiscon</i> (RALFS) P.LUNDELL	mes	aci	pla	3	3
<i>Staurastrum arcuatum</i> NÖRST.	eu–mes	alk–neu	pla	3	
<i>Staurastrum avicula</i> RALFS	mes–eu	aci–neu	ben–pla	1	1
<i>Staurastrum bieneanum</i> RABENH.	mes	aci	ben	1	1
<i>Staurastrum bloklandiae</i> COESEL et JOOSTEN	eu	alk	pla	1	
<i>Staurastrum bohlinianum</i> SCHMIDLE	oli	aci	ben	3	
<i>Staurastrum boreale</i> W. et G.S.WEST	mes	aci	ben		
<i>Staurastrum borgeanum</i> SCHMIDLE	oli–mes	aci	ben	3	
<i>Staurastrum brachiatum</i> RALFS	oli–mes	aci	ben	2	2
<i>Staurastrum brebissonii</i> W.ARCHER in A.PRITCH.	mes	aci	ben	3	3
<i>Staurastrum capitulum</i> RALFS	oli–mes	aci	ben–atm	2	
<i>Staurastrum chaetoceras</i> (SCHRÖDER) G.M.SMITH	eu	alk	pla		
<i>Staurastrum controversum</i> RALFS	mes	aci	ben	1	2
<i>Staurastrum crassangulatum</i> COESEL	mes	aci	ben	3	3
<i>Staurastrum cristatum</i> (NÄGELI) W.ARCHER	mes	aci	ben	2	2
<i>Staurastrum cristatum</i> var. <i>cuneatum</i> HINODE	mes	aci	ben	3	3
<i>Staurastrum cyrtocerum</i> (BRÉB.) RALFS	mes	aci	ben	2	1
<i>Staurastrum dilatatum</i> RALFS	mes	aci	ben	3	2
<i>Staurastrum dispar</i> BRÉB.	mes	aci	ben		1
<i>Staurastrum echinatum</i> RALFS	oli	aci	ben–atm	3	
<i>Staurastrum erasum</i> BRÉB.	mes	aci–neu	ben	2	2
<i>Staurastrum eurycerum</i> SKUJA	eu–mes	neu–alk	pla–ben	2	2
<i>Staurastrum furcatum</i> (RALFS) BRÉB.	oli	aci	ben	2	2
<i>Staurastrum furcatum</i> var. <i>aciculiferum</i> (W.WEST) COESEL	oli	aci	ben	2	2
<i>Staurastrum furcigerum</i> (RALFS) W.ARCHER	mes	aci–neu	ben–pla	1	2
<i>Staurastrum gracile</i> RALFS	mes	aci	ben		
<i>Staurastrum habeebense</i> IRÉNÉE-MARIE	oli	neu	atm–ben	3	
<i>Staurastrum hirsutum</i> RALFS	oli	aci	ben		
<i>Staurastrum hirsutum</i> var. <i>arnellii</i> (BOLDT) COESEL	oli	aci	ben	3	
<i>Staurastrum hirsutum</i> var. <i>muricatum</i> (RALFS) KURT FÖRST.	oli	aci	ben		
<i>Staurastrum hystrix</i> RALFS	oli	aci	ben	3	3
<i>Staurastrum inflexum</i> BRÉB.	mes–oli	aci–neu	ben		1

Table 1 Cont.

	TRPH	ACID	LF	R	S
<i>Staurastrum kouwetsii</i> COESEL	mes	aci	ben	1	2
<i>Staurastrum lapponicum</i> (SCHMIDLE) GRÖNBLAD	mes	aci	ben	1	2
<i>Staurastrum lunatum</i> RALFS	mes	aci	ben	2	1
<i>Staurastrum manfeldtii</i> DELPONTE	mes	aci-neu	ben	2	2
<i>Staurastrum margaritaceum</i> RALFS	oli	aci	ben		
<i>Staurastrum meriani</i> REINSCH	oli	aci	ben-atm	3	
<i>Staurastrum micron</i> W. et G.S.WEST	oli-mes	aci	ben	2	1
<i>Staurastrum minimum</i> COESEL	oli-mes	aci	ben	3	3
<i>Staurastrum muticum</i> RALFS	mes	aci	ben	1	2
<i>Staurastrum oligacanthum</i> W.ARCHER	mes	aci	ben	3	3
<i>Staurastrum orbiculare</i> RALFS	mes	aci	ben	3	3
<i>Staurastrum orbiculare</i> var. <i>depressum</i> J.ROY et BISSET	mes-eu	neu-aci	ben		
<i>Staurastrum orbiculare</i> var. <i>extensum</i> NORDST.	oli-mes	aci	ben-atm	2	
<i>Staurastrum orbiculare</i> var. <i>ralfsii</i> W. et G.S.WEST	mes	aci	ben	3	
<i>Staurastrum oxyacanthum</i> W.ARCHER	mes	aci	ben	3	3
<i>Staurastrum pentasterias</i> GRÖNBLAD	mes	aci	ben	3	2
<i>Staurastrum pileolatum</i> BRÉB.	oli	aci	ben-atm	2	
<i>Staurastrum pingue</i> TEILING	eu-mes	alk-neu	pla		
<i>Staurastrum planctonicum</i> TEILING	eu-mes	alk-neu	pla		
<i>Staurastrum podlachicum</i> B.EICHLER et GUTW.	mes	aci	ben	3	3
<i>Staurastrum polymorphum</i> RALFS	mes	aci	ben		
<i>Staurastrum polymorphum</i> var. <i>pygmaeum</i> GRÖNBLAD	mes	aci	ben	1	2
<i>Staurastrum polytrichum</i> (PERTY) RABENH.	mes	aci	ben	1	2
<i>Staurastrum proboscideum</i> (RALFS) W.ARCHER var. <i>productum</i> MESSIK.	mes	aci	ben	2	1
<i>Staurastrum punctulatum</i> RALFS	oli	aci	ben		
<i>Staurastrum punctulatum</i> var. <i>muricatiforme</i> SCHMIDLE	oli	aci	ben-atm	2	
<i>Staurastrum punctulatum</i> var. <i>pygmaeum</i> (RALFS) W. et G.S.WEST	oli	aci	ben-atm	3	
<i>Staurastrum pungens</i> RALFS	mes	aci	ben	3	3
<i>Staurastrum pyramidatum</i> W.WEST	oli	aci	ben	3	3
<i>Staurastrum quadrispinatum</i> W.B.TURNER	oli	aci	ben	3	3
<i>Staurastrum retusum</i> W.B.TURNER var. <i>boreale</i> W. et G.S.WEST	eu-mes	neu-alk	ben	3	2
<i>Staurastrum scabrum</i> RALFS	oli	aci	ben	3	3
<i>Staurastrum sebaldi</i> REINSCH	mes	aci	ben	3	3
<i>Staurastrum sebaldi</i> var. <i>gracile</i> MESSIK.	mes	aci	ben	3	3
<i>Staurastrum senarium</i> RALFS	mes	aci	ben	3	2
<i>Staurastrum setigerum</i> CLEVE	mes	aci	ben	3	2
<i>Staurastrum sexcostatum</i> RALFS	oli-mes	aci	ben-atm	2	
<i>Staurastrum sexcostatum</i> var. <i>productum</i> W.WEST	mes	aci	ben	1	
<i>Staurastrum simonyi</i> HEIMERL	oli	aci	ben	1	2
<i>Staurastrum simonyi</i> var. <i>gracile</i> LÜTKEM.	oli	aci	ben	3	2
<i>Staurastrum simonyi</i> var. <i>semicirculare</i> COESEL	oli	aci	ben	1	2
<i>Staurastrum smithii</i> (G.M.SMITH) TEILING	eu	alk	pla	3	
<i>Staurastrum spongiosum</i> RALFS	oli-mes	aci	ben-atm	3	2
<i>Staurastrum spongiosum</i> var. <i>perbifidum</i> W.WEST	oli-mes	aci	ben-atm	3	2

Table 1 Cont.

	TRPH	ACID	LF	R	S
<i>Staurastrum striatum</i> (W. et G.S.WEST) RŮŽIČKA	mes	aci–neu	ben		
<i>Staurastrum striolatum</i> (NÄGELI) W.ARCHER	mes	aci	ben	2	2
<i>Staurastrum subarcuatum</i> WOLLE	mes	aci	ben–pla	3	2
<i>Staurastrum subavicula</i> (W.WEST) W. et G.S.WEST	mes–oli	aci	ben	2	2
<i>Staurastrum teliferum</i> RALFS	mes	aci	ben		2
<i>Staurastrum tetracerum</i> RALFS	mes–eu	neu–aci	ben		1
<i>Staurastrum tetracerum</i> var. <i>subexcavatum</i> GRÖNBLAD	eu	alk	pla	2	
<i>Staurastrum trapezicum</i> BOLDT	mes	aci	ben	3	3
<i>Staurastrum varians</i> RACIB.	mes	aci	ben	3	3
<i>Staurastrum vestitum</i> RALFS	mes	aci	ben	3	3
<i>Staurodesmus brevispina</i> (RALFS) CROASDALE	mes	aci–neu	ben	3	2
<i>Staurodesmus convergens</i> (RALFS) S.LILL.	mes	aci	ben	1	2
<i>Staurodesmus cuspidatus</i> (RALFS) TEILING	mes	aci–neu	ben–pla	1	1
<i>Staurodesmus cuspidatus</i> var. <i>divergens</i> (NORDST.) COESEL	eu–mes	alk–neu	pla–ben		
<i>Staurodesmus dejectus</i> (RALFS) TEILING	mes	aci–neu	ben	1	1
<i>Staurodesmus dejectus</i> var. <i>apiculatus</i> (BRÉB.) TEILING	mes	aci–neu	ben	1	1
<i>Staurodesmus dejectus</i> var. <i>robustus</i> (MESSIK.) COESEL	mes	neu	ben	3	1
<i>Staurodesmus dickiei</i> (RALFS) S.LILL.	mes	aci	ben	2	2
<i>Staurodesmus dickiei</i> var. <i>circularis</i> (W.B.TURNER) CROASDALE	mes	aci	ben	3	2
<i>Staurodesmus extensus</i> (BORGE) TEILING	mes	aci–neu	ben–pla	1	1
<i>Staurodesmus extensus</i> var. <i>isthmosus</i> (HEIMERL) COESEL	oli–mes	aci	ben	2	2
<i>Staurodesmus extensus</i> var. <i>joshuae</i> (GUTW.) TEILING	oli–mes	aci	ben	3	2
<i>Staurodesmus extensus</i> var. <i>malaccensis</i> (BERNARD) COESEL	oli	aci	ben	3	2
<i>Staurodesmus extensus</i> var. <i>vulgaris</i> (B.EICHLER et RACIB.) CROASDALE	mes	aci	ben		1
<i>Staurodesmus glaber</i> (RALFS) TEILING	mes–oli	aci	ben		2
<i>Staurodesmus incus</i> (BRÉB.) TEILING	oli–mes	aci	ben	1	
<i>Staurodesmus lanceolatus</i> (W.ARCHER) CROASDALE var. <i>compressus</i> (W. et G.S.WEST) TEILING	mes–oli	aci	ben	3	3
<i>Staurodesmus mucronatus</i> (BRÉB.) CROASDALE	mes	aci	ben	3	2
<i>Staurodesmus omeareae</i> (W.ARCHER) TEILING	mes–oli	aci	ben		
<i>Staurodesmus patens</i> (NORDST.) CROASDALE	mes	neu–aci	ben	1	2
<i>Staurodesmus spencerianus</i> (MASK.) TEILING	oli	aci	ben	3	2
<i>Staurodesmus subhexagonus</i> (W. et G.S.WEST) COESEL	oli–mes	aci	ben	3	2
<i>Teilingia excavata</i> (RALFS) BOURR.	mes	aci	ben	1	1
<i>Teilingia granulata</i> (J.ROY et BISSET) BOURR.	mes–eu	aci–alk	ben–pla		1
<i>Tetmemorus brebissonii</i> RALFS	oli	aci	ben	2	2
<i>Tetmemorus brebissonii</i> var. <i>minor</i> DE BARY	oli	aci	ben	2	2
<i>Tetmemorus granulatus</i> RALFS	mes–oli	aci	ben		1
<i>Tetmemorus laevis</i> RALFS	oli	aci	ben–atm		
<i>Tetmemorus laevis</i> var. <i>minutus</i> (DE BARY) WILLI KRIEG.	oli	aci	ben–atm	1	
<i>Tortitaenia bahusiensis</i> (NORDST. et LÜTKEM.) COESEL	oli–mes	neu	atm–ben	3	
<i>Tortitaenia obscura</i> (RALFS) BROOK	oli–mes	aci	atm–ben		
<i>Xanthidium aculeatum</i> EHRENB.	mes–oli	aci	ben	3	
<i>Xanthidium antilopaeum</i> KÜTZ.	mes	aci–neu	ben–pla	1	1
<i>Xanthidium antilopaeum</i> var. <i>laeve</i> SCHMIDLE	oli	aci	ben–pla	2	3

Table 1 Cont.

	<b>TRPH</b>	<b>ACID</b>	<b>LF</b>	<b>R</b>	<b>S</b>
<i>Xanthidium antilopaeum</i> var. <i>herbidarum</i> W. et G.S.WEST forma <i>javanicum</i> (NORDST.) COESEL	mes	aci-neu	ben-pla	2	1
<i>Xanthidium antilopaeum</i> var. <i>planum</i> ROLL	mes	aci	ben-pla	2	1
<i>Xanthidium armatum</i> RALFS	oli	aci	ben	2	3
<i>Xanthidium basidentatum</i> (BORGES.) COESEL	mes	aci	ben	3	3
<i>Xanthidium bifidum</i> (BRÉB.) DEFLANDRE	mes	aci	ben	3	3
<i>Xanthidium concinnum</i> W.ARCHER	mes	aci	ben	3	3
<i>Xanthidium cristatum</i> RALFS	mes	aci	ben	3	3
<i>Xanthidium cristatum</i> var. <i>uncinatum</i> RALFS forma <i>polonicum</i> GUTW.	mes	neu	ben	3	3
<i>Xanthidium fasciculatum</i> RALFS var. <i>oronense</i> W. et G.S.WEST	mes	aci	ben	3	3
<i>Xanthidium octocorne</i> RALFS	mes-oli	aci	ben	1	2

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