Desmids (Zygnematophyceae) of the spring fens of a part of West Carpathians

Krásivky pramenišť části západních Karpat

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Abstract

The occurrence, morphology and autecology of Desmidiales were studied in the Bílé Karpaty Mts. and Moravskoslezské Beskydy Mts., on the border between the Czech and Slovak Republic. A total of 40 taxa were found; species *Actinotaenium cucurbitinum*, *Closterium cynthia* var. *latum*, *Cosmarium tetraophtalmum*, *Euastrum ansatum* var. *pyxidatum*, *Staurastrum senarium*, *Staurodesmus cuspidatus* were recorded for the first time from the territory of the Czech Republic; species *Closterium costatum*, *Cl. cynthia*, *Cl. lunula*, *Cosmarium cucumis*, *C. nasutum* f. *granulata*, *C. pachydermum*, *C. plicatum*, *Euastrum dubium* var. *dubium*, *E. dubium* var. *ornatum*, *E. insulare* var. *insulare*, *E. insulare* var. *silesiacum*, *Micrasterias papillifera, M. rotata*, *Netrium digitus* var. *latum*, *Pleurotaenium crenulatum*, *Staurastrum punctulatum* were recorded for the first time from Moravia and five new taxa for Slovak Republic were identified - *Cosmarium plicatum*, *C. depressum* f. *minutum*, *C. nasutum* f. *granulata*, *Mesotaenium de greyi*, *Netrium digitus* var. *latum*. Interesting taxa were documented in drawings or SEM microphotographs.

Introduction

Rich, diverse desmid floras are particularly characteristic of relatively unpolluted freshwaters of low pH (4-7), such as occur in bog pools or in acid ponds. Most species are benthic and live on or between higher plants around the margins of the water-body.

Spring fens represent a special environment. Algae are very often living there as epiphytes on mosses. The variation in environmental conditions directly influenced vegetation of bryophytes, vascular plants (HÁJEK et al. 2002), diatom and cyanobacteria assemblages (POULÍČKOVÁ et al. 2001, HAŠLER & POULÍČKOVÁ in prep.). HÁJEK & HÁBEROVÁ (2001) distinguished four types of spring fen vegetation in West Carpathians – two types of mineral-rich alkaline

spring fens with and without tufa formation, moderately rich Sphagnum - fens with *Sphagnum teres* and *S. warnstorfii* and mineral-poor acidic fens dominated by peat mosses (*Carici echinatae - Sphagnetum*). The latter two types were found to be colonized by desmids.

Desmidiales of the Czech Republic were previously studied by several authors (e.g. PASCHER 1906, ROSA 1951, ROUBAL 1938, RŮŽIČKA 1973). The floristic research was performed both in Bohemia (e.g ROSA 1933, LÜTKEMÜLLER 1910) and Moravia (e.g. FISCHER 1925, LHOTSKÝ 1949, RYBNÍČEK 1958, RŮŽIČKA 1954, 1956, 1957a). Published records of Desmidiales occurring in the Czech Republic have been summarized in the database (POULÍČKOVÁ et al. 2004); the list of algae reported in the Slovak Republic is awailable too (MARHOLD & HINDÁK eds. 1998).

This paper deals with the occurrence and species composition of Desmidiales in spring fens of the Western Carpathians.

Methods and investigated sites

Investigated localities lies in Beskydy Mts. on the border between the Czech Republic and the Slovak Republic (Fig 1), the list of localities with environmental variables are summarized in Table 1.

Samples were collected during years 2001 – 2003 mainly from peaty pools and fresh bryophytes to plastic bottles (250 ml). The original samples were preserved with 4% formaldehyde and investigated in light and scanning electron microscopes.

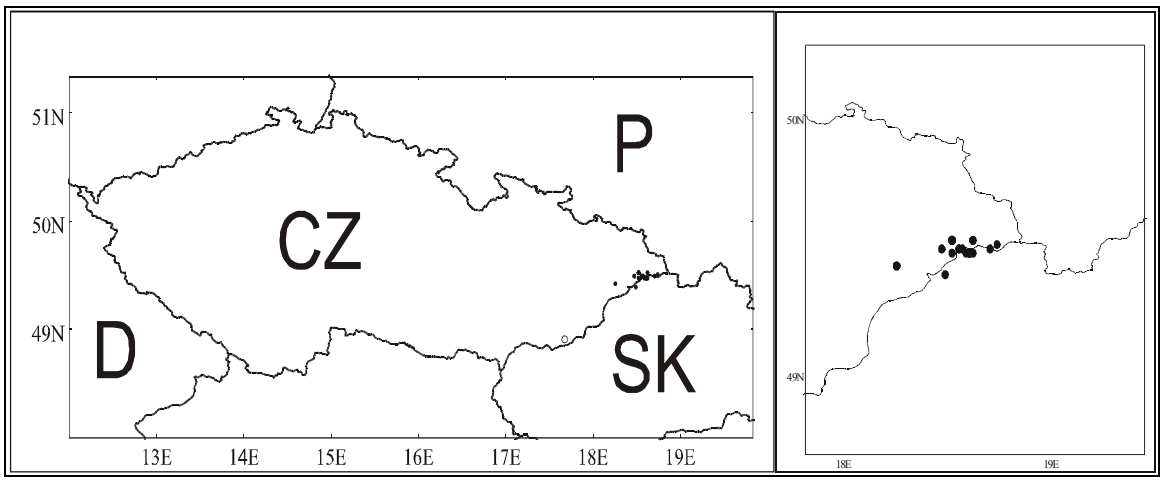
The samples were determined according to the following publications: COESEL (1982, 1991, 1997), LENZENWEGER (1996, 1997, 1999), RŮŽIČKA (1977, 1981).

The fixation for SEM was performed by a mixture of 10% formaldehyde followed by dehydration in a graded acetone series. Samples were dried using a critical-point drier CPD–030 (Bal–tec), coated with a 5 nm layer of gold and palladium in a Polaron E 5100 sputter coater and were observed under the TESLA BS 340 scanning electron microscope.

Abbreviations:

CR – the Czech Republic
SR – the Slovak Republic
L. = Length
Br. = Breadth
W. = Width
Isth. = Isthmus
L.:Br. = length/breadth ratio

Fig 1: Geographical position of investigated localities



Results and discussion

Taxonomic remarks

Family Mesotaeniaceae
Cylindrocystis brebissonii MENEGH. var. **brebissonii**
L. 36.0-62.0 µm, Br. 12-21.0 µm, L.:Br. 2.06-4.75
Localities: 4B, 5A, 5B, 13, 14B, 14D
Occurrence in CR: Previously reported only from Northern Moravia – Hrubý Jeseník (RŮŽIČKA 1957).
Species was already recorded in SR.

Cylindrocystis brebissonii var. **minor** W. et G.S. WEST
L. 25.0 µm, Br. 11.0 µm, L.:Br. 2.27
Locality: 14C
Occurrence in CR: Previously reported only from Northern Moravia – localities Hrubý Jeseník (RŮŽIČKA 1957) and Velká Kotlina (RŮŽIČKA 1956).
Species was already recorded in SR.

Mesotaenium de greyi TURN.
L. 80.0 µm, Br. 20.0 µm, L.:Br. 4.00
Locality: 14D
Occurrence in CR: Bohemia – refered from localities near Jindřichův Hradec (ROSA 1933, 1941) and Šumava Mts. (ROSA 1941); *M. de greyi* var. *breve*, *M. de greyi* var. *laeve* and *M. de greyi* var.

tenuis were refered from localities Dářko, Krkonoše Mts. and Šumava Mts. (ROSA 1941, ROUBAL 1958).
Moravia – recorded in Jeseníky Mts. (RYBNÍČEK 1958) and Bílá Opava river (POULÍČKOVÁ 1998).
Occurrence in SR: a new record

Netrium digitus (EHRENB.) ITZIGS. et ROTHE var. **digitus**
L. 150.0-183.0 µm, Br. 43.0-60.0 µm, L.:Br. 3.05-3.49
Localities: 5B, 7B, 14A
Occurrence in CR: Bohemia – common
Moravia – three records from Jeseníky Mts. (RŮŽIČKA 1956, 1957, RYBNÍČEK 1958).
Species was already recorded in SR.

Netrium digitus (EHRENB.) ITZIGS. et ROTHE var. **latum** HUSTEDT **Fig. 2/4**
L. 135.0-205.0 µm, Br. 50.0-86.0 µm, L.:Br. 1.88-3.25
Localities: 1A, 5B, 7A, 7B
Occurrence in CR: Bohemia – one record from Šumava Mts. (ROUBAL 1958).
Moravia – a new varietal record
Occurrence in SR: a new varietal record

Family Closteriaceae
Closterium closterioides (RALFS) LOUIS et PEETERS
L. 117.0 µm, Br. 40.0 µm, L.:Br. 2.93
Localities: 14A, 14C
Occurrence in CR: Bohemia – reported from locality Řežabinec - S. Bohemia (RŮŽIČKA 1973).
Moravia – no record
Species was already recorded in SR.

Closterium costatum CORDA ex RALFS
L. 260.0-345.0 µm, Br. 40.0-45.0 µm, St. 2, L.:Br.6.5-8.63
Localities: 7A, 11A
Occurrence in CR: Bohemia – common (e.g. PASCHER 1906, ROSA 1969, ROUBAL 1958).
Moravia – a new record
Species was already recorded in SR.

Closterium cynthia DE NOT. **Fig. 2/3a**
L. 88.0-125.0 µm, Br. 14.0-15.0 µm, L.:Br. 6.29-8.33

Localities: 4A, 4B, 7B, 7E, 13
Occurrence in CR: Bohemia – common species, previously reported together with *C. cynthia* var. *jeneri* and *C. cynthia* var. *robustum* (e.g. ROSA 1951, 1969).
Moravia – a new record

Closterium cynthia DE NOT var. **latum** (SCHMIDLE) KRIEG. **Fig. 2/3b**
L. 85.0 µm, Br. 17.0 µm, St. 20-22, L.:Br. 5.00
Locality: 4A
Occurrence in CR: a new varietal record

Closterium lunula SCHMIDLE
L. 563.0 µm, Br. 87.5 µm, L.:Br. 6.43
Locality: 7C
Occurrence in CR: Bohemia – *C. lunula* var. *lunula* is common in the Czech Republic; *C. lunula* var. *biconvexum* was recorded from Šumava Mts. (ROUBAL 1958);*C. lunula* var. *coloratum* was recorded near Vlašim (ROSA 1969); *C. lunula* var. *intermedium* was reported from Liberec (ROUBAL 1958) and Plzeň (MALOCH 1937).
Moravia – a new record.

Closterium rostratum EHRENB. ex RALFS **Fig. 2/1**
L. 280.0-300.0 µm, Br. 15.0-28.0 µm, L.:Br. 10.71-18.67
Localities: 4B, 14B
Occurrence in CR: Bohemia – common; also recorded variety *C. rostratum* var. *brevirostratum* by MALOCH (1937)
Moravia – reported from localities Černý Brook (LOSOS & MARVAN 1957) and Moravice River (RŮŽIČKA 1954, LOSOS & MARVAN 1957).
Species was already recorded in SR.

Closterium striolatum EHRENB. ex RALFS **Fig. 2/2**
L. 166.0-347.0 µm, Br. 30.0 µm, L.:Br. 5.63-11.57
Localities: 1B, 4B, 9, 13
Occurrence in CR: Bohemia – common; two other varieties - *C. striolatum* var. *latior* (ROSA 1951) and *C. striolatum* var. *subtruncatum* (ROSA 1969, ROUBAL 1958) - were recorded.
Moravia – reported by MARVAN (1998) near Dukovany.
Species was recorded in SR, *C. striolatum* var. *subtruncatum* was recorded too (MARHOLD & HINDÁK eds. 1998).

Family Desmidiaceae

Actinotaenium cucurbita (BRÉB.) TEIL.
L. 42.0-45.0 µm, Br. 16.0-25.0.0 µm, L.:Br. 1.80-2.33
Localities: 4B, 7B, 7E, 7F,
Occurrence in CR: Bohemia - recorded near Most (LUKEŠOVÁ & KOMÁREK 1987), Sušice (LUKEŠOVÁ 1993); Vlašim (ROSA 1969).
Moravia – Dukovany (MARVAN 1998).

Actinotaenium cucurbitinum (BISS.) TEIL. **Fig. 2/8**
L. 52.0-60.0 µm, Br. 21.0-26.0 µm, Isth. 19.0-25.0 µm, L.:Br. 2.12-2.50
Localities: 1A, 3, 4B, 8, 10, 12, 14A, 14D
Occurrence in CR: a new record
Species was already recorded in SR.

Cosmarium botrytis MENEGH. ex RALFS
L. 66.0-80.0 µm, Br. 56.0-70.0 µm, Isth. 20.0-21.0 µm, L.:Br. 1.14-1.21
Localities: 4A, 5B, 7B, 7F
Occurrence in CR: Bohemia – common
Moravia – recorded near Dukovany (MARVAN 1998) and Moravice River (LOSOS & MARVAN 1957).
Species was already recorded in SR.

Cosmarium caelatum RALFS **Fig. 4/13; Fig. 5/1a, 1b**
L. 40.0-47.0 µm, Br. 35.0-42.0 µm, Isth. 10.0-15.0 µm, L.:Br. 1.00-1.40
Localities: 1A, 5B, 7B, 14C, 14D
Occurrence in CR: Bohemia – previously recorded in Jizerské Mts. (WÜNSCH 1939), Krkonoše Mts. and Šumava Mts. (ROUBAL 1958).
Moravia – refered from Jeseníky Mts. (RŮŽIČKA 1956, RYBNÍČEK 1958).
Species was already recorded in SR.

Cosmarium cucumis (CORDA) ex RALFS **Fig. 4/14**
L. 63.0 µm, Br. 36.0 µm, Isth. 19.0 µm, L.:Br. 1.75
Localities: 7B, 7C
Occurrence in CR: Bohemia – previously recorded in Krkonoše Mts. (BECK-MANNAGETTA 1926) and locality Řežabinec (RŮŽIČKA 1973); *C. cucumis* var. *helveticum* is reported from S. Bohemia (ROSA 1933, ROUBAL 1958).
Moravia – a new record

Cosmarium depressum HEIMERL f. **minutum** HEIMERL
L. 13.0 µm, Br. 18.0 µm, Isth. 8.0 µm, L.:Br. 0.72

Locality: 14C
Occurrence in CR: Bohemia – ROSA (1951) reported *C. depressum* and *C. depressum* var. *achondrum* from locality Blatná.
Occurrence in SR: a new record of „forma"; only *C. deppressum* was recorded.

Cosmarium difficile LÜTKEM.
L. 30.0 µm, Br. 20.0 µm, Isth. 5.0 µm, L.:Br. 1.50
Locality: 7A
Occurrence in CR: Bohemia – previously reported from locality Řežabinec (RŮŽIČKA 1973), Šumava Mts., Třeboň area (LÜTKEMÜLLER 1910), peat bogs in Bohemian-Saxonican Switzerland (NOVÁKOVÁ 2003).
Moravia – Jeseníky Mts. (RŮŽIČKA 1956, 1957).

Cosmarium laeve RABENH.
L. 30.0 µm, Br. 10.0 µm, Isth. 7.5 µm, L.:Br. 3.00
Locality: 7F
Occurrence in CR: Bohemia – common (e.g. NOVÁKOVÁ 2003).
Moravia – reported from Dukovany (MARVAN 1998), Jeseníky Mts. (RŮŽIČKA 1956) and Moravice River (LOSOS & MARVAN 1957; RŮŽIČKA 1954).

Cosmarium nasutum NORDST. f. **granulata** NORDST **Fig. 4/15**
L. 33.0 µm, Br. 25.0-28.0 µm, Isth. 10.0-11.0 µm, L.:Br. 1.18-1.32
Localities: 7A, 14A
Occurrence in CR: Bohemia – reported from Krkonoše Mts. with varieties *C. nasutum* var. *crenatilobum, C. nasutum* var. *decemlobum* and *C. nasutum* var. *enastriforme* (BECK-MANNAGETTA 1926); *C. nasutum* was recorded from Šumava Mts. (LÜTKEMÜLLER 1910).
Moravia – a new record
Occurrence in SR: a new record of „forma"; *C. nasutum* var. *nasutum* and *C. nasutum* var. *simplex* were recorded too (MARHOLD & HINDÁK eds. 1998).

Cosmarium pachydermum LUND.
L. 75.0-102.0 µm, Br. 60.0-77.0 µm, Isth. 22.0-37.0 µm, L.:Br. 1.25-1.32
The lenght of observed cells was a bit lower than in literature (80-125µm; COESEL 1991).
Localities: 1A, 4B, 7D, 7F
Occurrence in CR: Bohemia – common
Moravia – a new record

Cosmarium plicatum REINSCH
L. 48.0-60.0 µm, Br. 26.0-36.0 µm, Isth. 15.0-17.0 µm, L.:Br. 1.67-1.85
Localities: 4B, 6
Occurrence in CR: Bohemia – reported from Šumava Mts. (ROUBAL 1958) and Vlašim (ROSA 1969).
Moravia – a new record
Occurrence in SR: a new record

Cosmarium quadratum RALFS ex RALFS **Fig. 4/16**
L. 63.0 µm, Br. 35.0 µm, Isth. 18.0 µm, L.:Br. 1.80
Locality: 6
Occurrence in CR: Bohemia – common
Moravia – recorded in Jeseníky Mts. (RŮŽIČKA 1956, RYBNÍČEK 1958) and fishponds „pod Nesytem" – Southern Moravia (LOSOS & HETEŠA 1972).
Species was already recorded in SR.

Cosmarium subcucumis SCHMIDLE
L. 50.0-63.0 µm, Br. 30.0-36.0 µm, Isth. 15.0-17.0 µm, L.:Br. 1.67-1.75
Locality: 14C
Occurrence in CR: Bohemia – common
Moravia – Jeseníky Mts. (RŮŽIČKA 1956, 1957, RYBNÍČEK 1958) and Moravice River (LOSOS & MARVAN 1957, RŮŽIČKA 1954).
Species was already recorded in SR.

Cosmarium tetraophtalmum BRÉB. in RALFS
L. 90.0-110.0 µm, Br. 63.0-78.0 µm, Isth. 24.0-30.0 µm, L.:Br. 1.25-1.54
Localities: 7A, 7B
Occurrence in CR: a new record

Euastrum ansatum RALFS var. **pyxidatum** DELP. **Fig. 2/6; Fig. 5/2**
L. 80.0-89.0 µm, Br. 40.0-46.0 µm, Isth. 11.0-13.0 µm, L.:Br. 1.93-2.00
Localities: 7A, 7C
Occurrence in CR: a new varietal record; *E. ansatum* var. *ansatum* is common in Bohemia, also *E. ansatum* var. *dideltiforme* was reported from four localities in Bohemia (POULÍČKOVÁ et al. 2004)

Euastrum dubium NÄG. var. **dubium** **Fig. 2/7**
L. 33.0-35.0 µm, Br. 21.0-24.0 µm, Isth. 5.0-8.0 µm, L.:Br. 1.42-1.67
Localities: 7B, 7C, 14C
Occurrence in CR: Bohemia – common (POULÍČKOVÁ et al. 2004)

Moravia – a new record
Species was already recorded in SR.

Euastrum dubium NÄG. var. **ornatum** **Fig. 5/3**
L. 34.0-35.0 µm, Br. 22.0-24.0 µm, Isth. 5.0-7.0 µm, L.:Br. 1.45-1.54
Localities: 7B, 14C
Occurrence in CR: Bohemia – reported by RŮŽIČKA (1973) from South Bohemia.
Moravia – a new record
Species was already recorded in SR.

Euastrum insulare (WITTR.) ROY var. **insulare**
L. 16.0-17.0 µm, Br. 13.0 µm, Isth. 4.0 µm, L.:Br. 1.23-1.31
Locality: 4A
Occurrence in CR: Bohemia – common species (e.g. Sušice – LUKEŠOVÁ 1993 - Šumava Mts. and Krkonoše Mts. – ROUBAL 1958)
Moravia – a new record

Euastrum insulare (WITTR.) ROY var. **silesiacum** (GRÖNBL.) W.KRIEG
L. 17.0 µm, Br. 12.0 µm, Isth. 4.0 µm, L.:Br. 1.42
The dimensions of observed cells were a bit lower than in literature (18-22x14-19; RŮŽIČKA 1981).
Locality: 7B
Occurrence in CR: Bohemia – common (e.g. localities Blatná, Brdy, Krkonoše Mts. – ROSA 1951).
Moravia – a new varietal record

Euastrum oblongum (GREV.) RALFS ex RALFS **Fig. 2/5**
L. 126.0-165.0 µm, Br. 67.0-75.0 µm, Isth. 20.0 µm, L.:Br. 1.88-2.20
Locality: 14A
Occurrence in CR: Bohemia – common
Moravia – Jeseníky Mts. – locality Hrubý Jeseník (RŮŽIČKA 1957).
Species was already recorded in SR.

Micrasterias papillifera BRÉB. **Fig. 3/10**
L. 116.0-150.0 µm, Br. 100.0-127.0 µm, Isth. 11.0-20.0 µm, L.:Br. 1.12-1.28
Localities: 7B, 7C
Occurrence in CR: Bohemia – common
Moravia – a new record

Micrasterias rotata (GREV.) RALFS ex RALFS **Fig. 3/11**
L. 260.0-307.5 µm, Br. 225.0-265.0 µm, Isth. 37.5-39.0 µm, W. 38.0, L.:Br. 1.08-1.26
Locality: 7C
Occurrence in CR: Bohemia – common; M. *rotata* var. *evoluta* was reported from Blatná and Šumava Mts. by ROSA (1951); PASCHER (1906) reported *M. rotata* var. *pulchra* from Šumava Mts.
Moravia – a new record

Micrasterias truncata (CORDA) ex BRÉB. **Fig. 3/12**
L. 83.0-100.0 µm, Br. 83.0-93.0 µm, Isth.. 22.0-23.0 µm, L.:Br. 1.00-1.11
Locality: 7C
Occurrence in CR: Bohemia – common (e.g. Šumava Mts. – ŠEJNOHOVÁ 2003)
Moravia – reported from the locality Velká Kotlina in Jeseníky Mts. (Northern Moravia) by RŮŽIČKA (1956).

Pleurotaenium crenulatum (EHRENB. ex RALFS) RABENH **Fig. 2/9**
L. 407.5-492.5 µm, Br. 45.0-50.0 µm, Isth. 37.5-45.0 µm, L.:Br. 8.15-10.37
Locality: 7B
Occurrence in CR: Bohemia – one record from lokality Řežabinec – S. Bohemia (RŮŽIČKA 1973); common species are *P. coronatum*, *P. ehrenbergii*, *P. trabecula*, *P. truncatum* and *P. minutum* (POULÍČKOVÁ et al. 2004).
Moravia – a new record; *P. trabecula* was recorded from localities Ludkovice (SLÁDEČKOVÁ et al. 1985) and Dukovany (MARVAN 1998).

Staurastrum punctulatum BRÉB. **Fig. 4/19**
L. 33.0 µm, Br. 26.0 µm, Isth. 12.0 µm, L.:Br. 1.27
Localities: 5A, 13
Occurrence in CR: Bohemia – common (e.g. NOVÁKOVÁ 2003)
Moravia – a new record
Species was already recorded in SR.

Staurastrum senarium (EHRENB.) RALFS **Fig. 4/18**
L. 29.0-30.0 µm, Br. 32.0-40.0µm, Isth. 13.0-14.5 µm, L.:Br. 1.10-1.33
Locality: 7A
Occurrence in CR: a new record

Staurodesmus cuspidatus (BRÉB. ex RALFS) TEIL **Fig. 4/17**
L. 20.0-21.0 µm, Br. 20.0 µm, Isth. 7.0-8.0 µm, L.:Br. 1.00-1.05
Localities: 7A, 7B

Occurrence in CR: a new record

Tetmemorus granulatus (BRÉB.) RALFS ex RALFS
L. 180.0 µm, Br. 50.0 µm, Isth. 35.0 µm, L.:Br. 3.60
Localities: 7B, 11B, 14A
Occurrence in CR: Bohemia – common
Moravia – common (LHOTSKÝ 1949).
Species was already recorded in SR.

Tetmemorus laevis (KÜTZ.) ex RALFS
L. 72.0-123.0 µm, Br. 28.0-33.0 µm, Isth. 17.5-30.0 µm, L.:Br. 2.57-4.24
Localities: 5A, 5B, 7B, 7C, 9, 14C, 14D,
Occurrence in CR: Bohemia – common
Moravia – Jeseníky Mts. (RŮŽIČKA 1956, 1957), Bílá Opava (POULÍČKOVÁ 1998).
Species was already recorded in SR.

Tetmemorus laevis (KÜTZ.) ex RALFS var. **minutus** (DE BARY) KRIEG.
L. 58.0 µm, Br. 20.0 µm, L.:Br. 2.90
Locality: 14D
Occurrence in CR: Bohemia – reported from localities near Borkovice, Novosedly (S. Bohemia) and Šumava Mts. (ROUBAL 1958, 1959, ROSA 1941).
Moravia – no record
Species was already recorded in SR.

Ecological remarks

Spring fen mooses in Western Carpathians are inhabited by specific cyanobacterial and algal assemblages. Their abunance and species composition are significantly influenced by environmental variables, especially pH, conductivity and moisture (POULÍČKOVÁ et al. 2001, POULÍČKOVÁ et al. in press.). These biotopes are dominated by diatoms (POULÍČKOVÁ et al. 2001), cyanobacteria were observed at neutral and alkalic fens (HAŠLER & POULÍČKOVÁ in prep.) and green algae were found at acidic sites thanks to Desmidiales in 2001. It must be mentioned, that species richness of Desmidiales was influenced by an unusual dry weather in 2003. The lowest species richness (1-2) was observed at sites with very low pH 3.9–5.0 (e.g. *Actinotaenium cucurbitinum*, *Closterium striolatum*) and the highest species richness was found at localities with pH 5.3-6.0 (e.g. *Actinotaenium cucurbita*, *Closterium cynthia*, *Netrium digitus* var. *latum*).

A total of 40 Desmid taxa were found in spring fens of a part of Western Carpathians. Species *Actinotaenium cucurbita*, *A. cucurbitinum, Cylindrocystis brebissonii*, *Closterium cynthia*, *Cl. striolatum*, *Cosmarium botrytis*, *C. caelatum*, *C. pachydermum* and *Netrium digitus* were found as the most frequent in this area.

Several taxa were found for the first time in the Czech Republic: *Actinotaenium cucurbitinum*, *Closterium cynthia* var. *latum*, *Cosmarium tetraophtalmum*, *Euastrum ansatum* var. *pyxidatum*, *Staurastrum senarium*, *Staurodesmus cuspidatus*.

The taxa *Closterium costatum*, *Cl. cynthia*, *Cl. lunula*, *Cosmarium cucumis*, *C. nasutum* f. *granulata*, *C. pachydermum*, *C. plicatum*, *Euastrum dubium*, *E. dubium* var. *ornatum*, *E. insulare* var. *insulare*, *E. insulare* var. *silesiacum*, *Micrasterias papillifera, M. rotata*, *Netrium digitus* var. *latum*, *Pleurotaenium crenulatum*, *Staurastrum punctulatum* were recorded for the first time from Moravia.

The taxa *Cosmarium plicatum*, *C. depressum* f. *minutum*, *C. nasutum* f. *granulata*, *Mesotaenium de greyi* and *Netrium digitus* var. *latum* are new for Slovak Republic.

As we mentioned above there are a few articles aimed firstly to Moravian desmid flora, and some desmid records are mentioned in another floristical papers (e.g. LOSOS & MARVAN 1957, MARVAN 1998, POULÍČKOVÁ 1998). The insuffiency of desmid investigation in the territory of Moravia is evident in number of newly recovered species in this paper. It can be assumed that in the many Moravan localities lay many interesting species avaiting to be discovered and recorded.

Acknowledgement

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Table 1: List of investigated localities and selected enviromental variables

Locality	Sample	Coordinates	Geographic position	Species richness	pH	Conductivity ($\mu S \cdot cm^{-1}$)
Adámky	1-A	181508/492532	CZ	4	4.8	51
Adámky	1-B	181508/492532	CZ	1	4.8	51
Biely Kríž	2	183247/492955	SK	1	4.7	31
Černá Ostravice	3	183103/492812	CZ	1	3.9	14
Horní Lomná	4-A	183751/493111	CZ	4	5.3	90
Horní Lomná	4-B	183751/493117	CZ	9	6.0	82
Jančíkovci	5-A	183322/492925	SK	3	5.3	36
Jančíkovci	5-B	183322/492926	SK	6	5.3	36
Kelčov	6	182922/492347	SK	2	7.1	430
Obidová	7-A	183103/493124	CZ	7	5.4	48
Obidová	7-B	183103/493124	CZ	8	5.4	48
Obidová	7-C	183105/493124	CZ	4	5.4	48
Obidová	7-D	183120/493110	CZ	1	5.6	48
Obidová	7-E	183120/493111	CZ	2	5.0	44
Obidová	7-F	183120/493112	CZ	5	5.4	48
Podgruň	8	182830/492907	CZ	1	5.7	68
Polková	9	183550/492822	SK	2	5.4	53
Soglovci	10	184242/492920	SK	1	6.1	150
U Padišáka	11-A		SK	1	5.5	47
U Padišáka	11-B		SK	1	5.5	47
Vrch Predmier	12	183406/492848	SK	2	5.7	70
Vrch Predmier	13	184444/493016	CZ	5	5.8	54
Zajacovci	14-A	183656/492839	SK	6	5.6	40
Zajacovci	14-B	183656/492840	SK	2	5.6	40
Zajacovci	14-C	183704/492843	SK	7	5.2	40
Zajacovci	14-D	183656/492842	SK	6	4.5	27

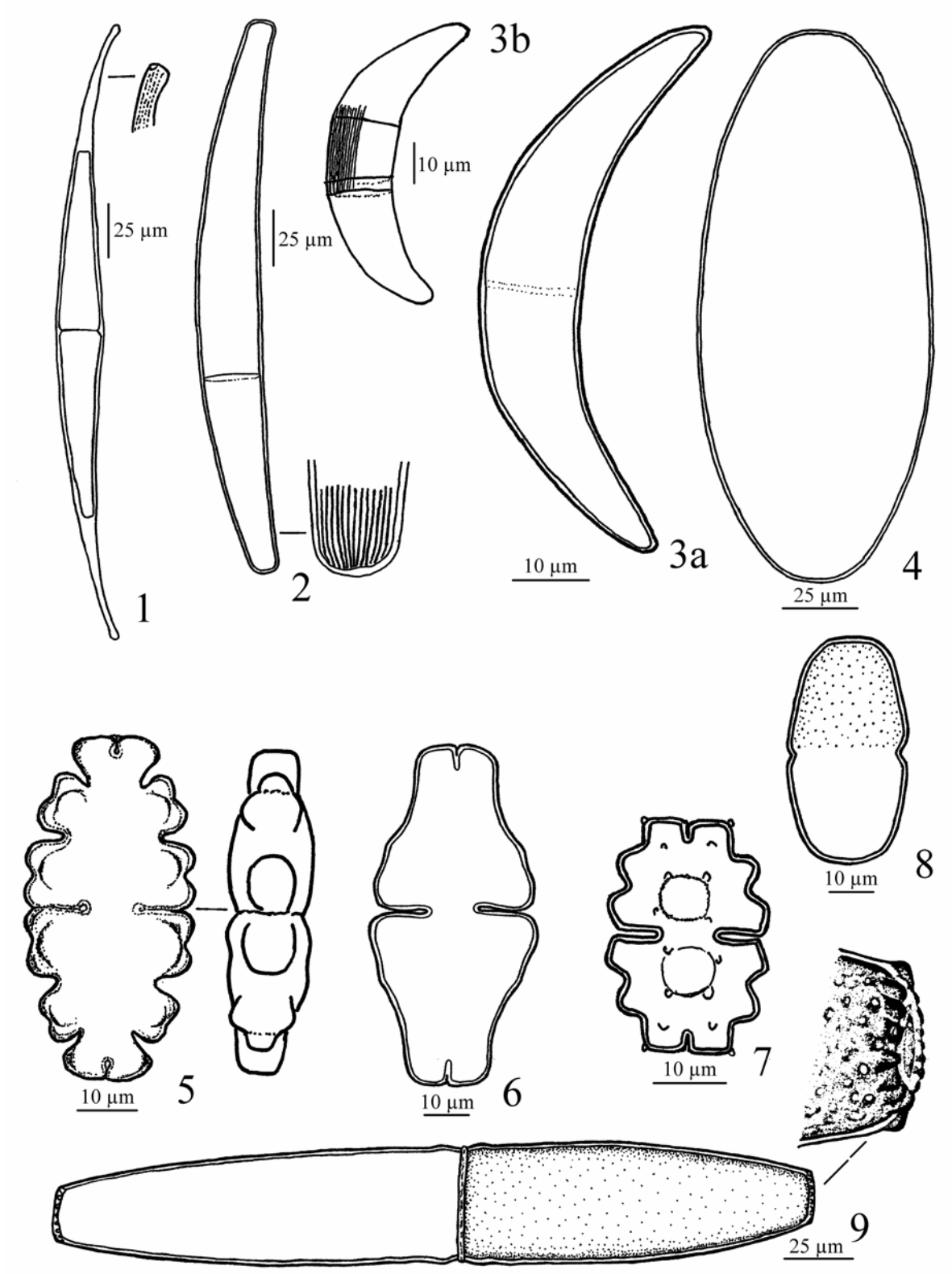


Figure 2: 1 – *Closterium rostratum*, 2 – *Cl. striolatum*, 3a – *Cl. cynthia*, 3b – *Cl. cynthia* var. *latum*, 4 – *Netrium digitus* var. *latum*, 5 – *Euastrum oblongum*, 6 – *E. ansatum* var. *pyxidatum*, 7 – *E. dubium*, 8 – *Actinotaenium cucurbitinum*, 9 – *Pleurotaenium crenulatum*

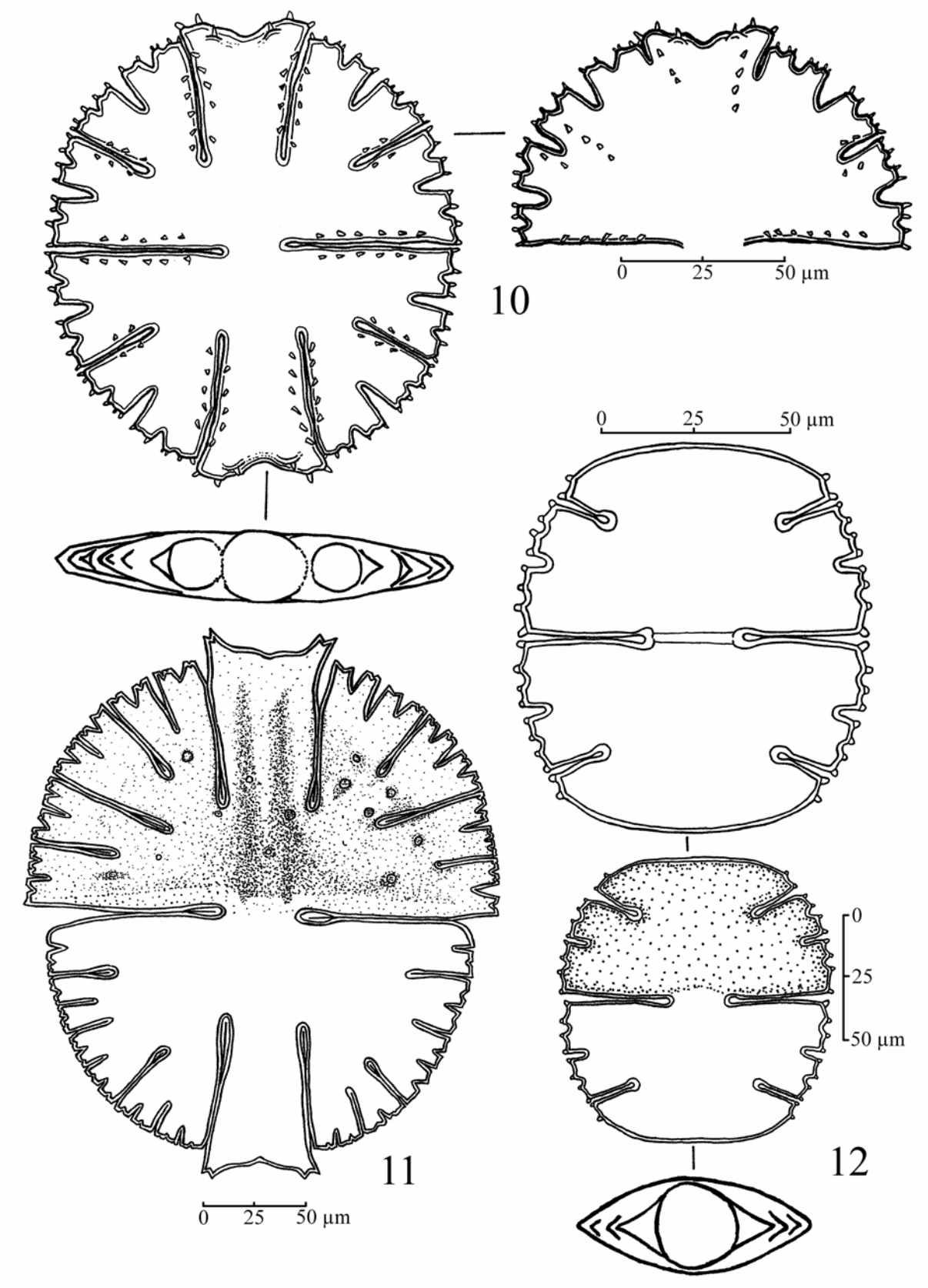


Figure 3: 10 – *Micrasterias papillifera*, 11 – *M. rotata*, 12 – *M. truncata*

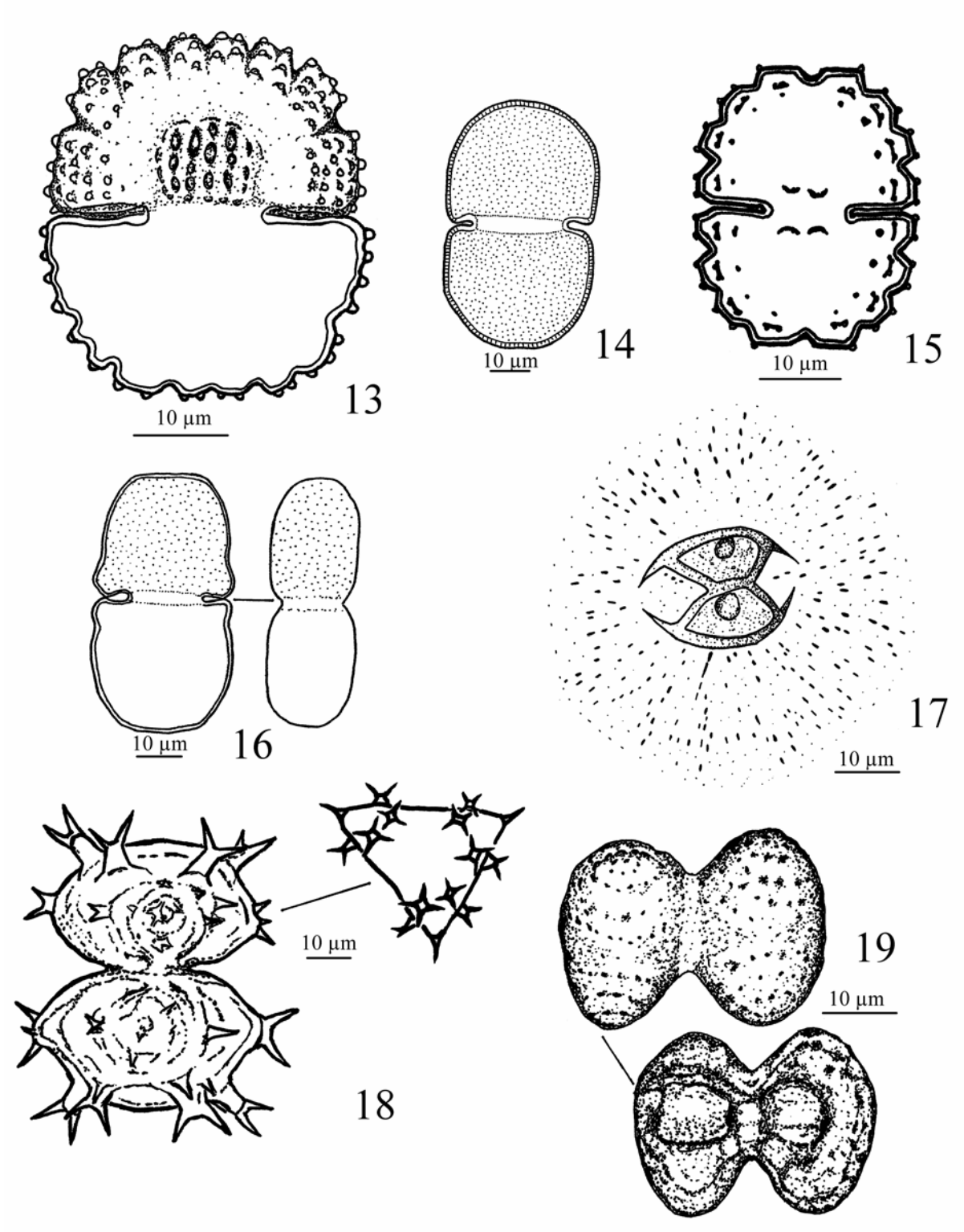
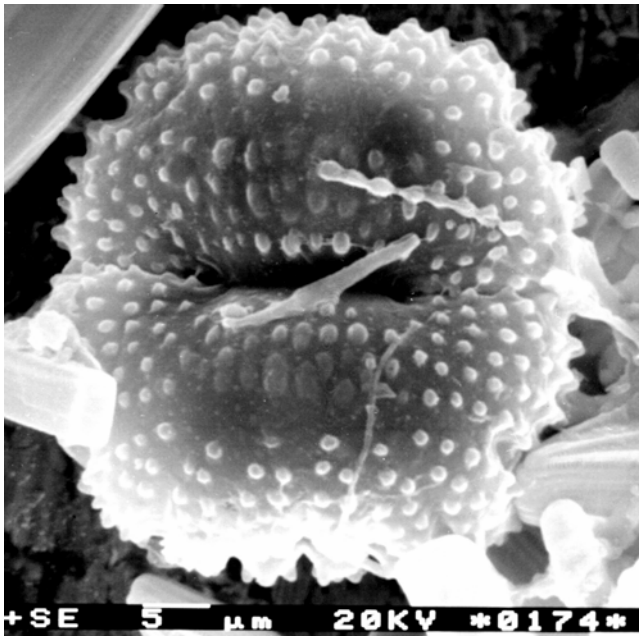
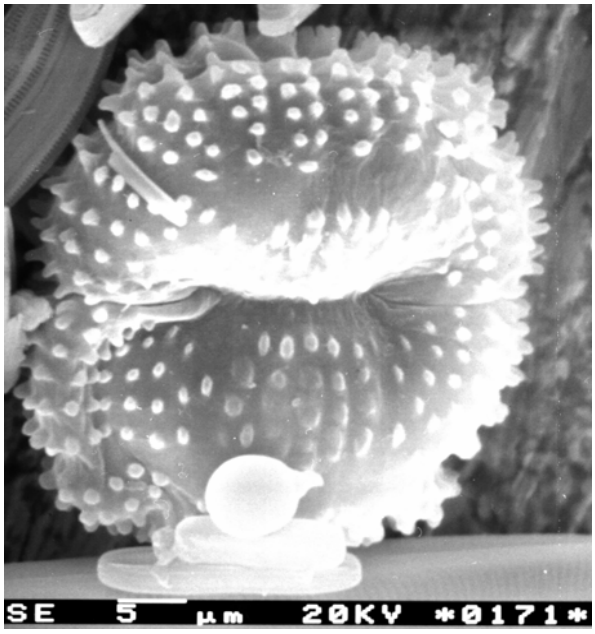
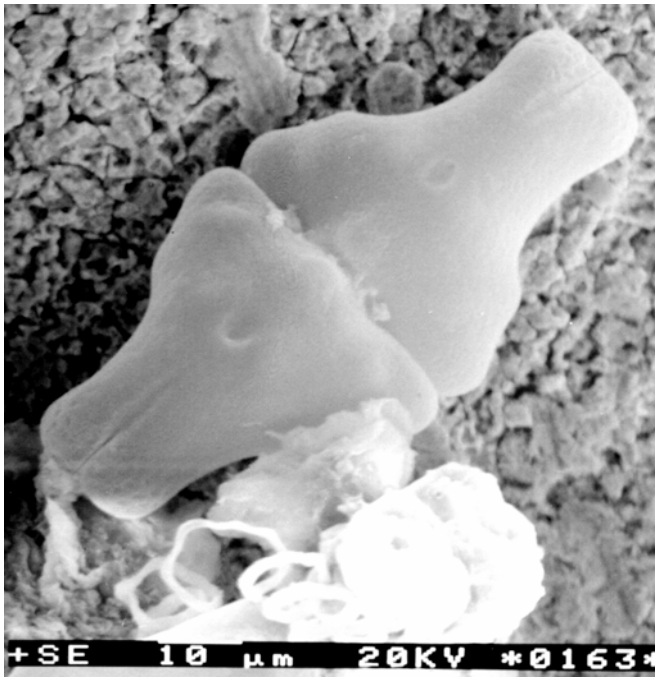


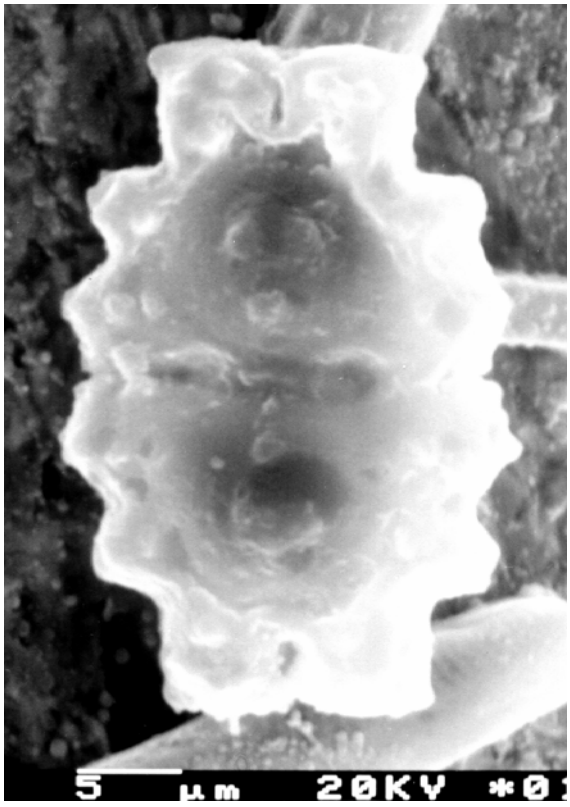
Figure 4: 13 – *Cosmarium caelatum*, 14 – *C. cucumis*, 15 – *C. nasutum* f. *granulata*, 16 – *C. quadratum*, 17 – *Staurodesmus cuspidatus*, 18 – *Staurastrum senarium*, 19 – *S. punctulatum*





1a 1b





2 3

Figure 5: 1a, b – *Cosmarium caelatum*, 2 – *Euastrum ansatum*, 3 – *E. dubium* var. *ornatum*