Acta Bot. Neerl. 28 (4/5), August 1979, p. 257–279.

DESMIDS OF THE BROADS AREA OF N.W.-OVERIJSSEL (THE NETHERLANDS) I

P. F. M. COESEL

Hugo de Vries-Laboratorium, Universiteit van Amsterdam, Plantage Middenlaan 2A, 1018 DD Amsterdam

SUMMARY

An extensive investigation of the distribution and ecology of the desmids occurring in the broads area in the NW corner of the Dutch province of Overijssel revealed the presence of 245 taxa belonging to 206 species of which about 40 had not previously been recorded from the Netherlands. The present paper is the first of two sequential contributions forming an annotated list with corresponding figures of the recognised taxa.

1. INTRODUCTION

The most extensive Holocene lowland marsh area of the Netherlands lies in the NW corner of the province of Overijssel. By peat digging since the Middle Ages a fine-meshed landscape pattern originated consisting of numerous more or less rectangular peat pits separated by more elevated, narrow strips of land. In places where the size of these pits became very large and the separating strips, relatively speaking, too narrow, erosion by wave action resulted in the formation of larger lakes by the confluence of peat pits. On the other hand, old peat pits gradually became filled in again by hydrosere vegetation after which such plots came into use as exploited reed land or for hay-making.

Since 1970 the present author has been investigating the desmid flora of this region. As far as the sampling for the study of the desmid flora is concerned one can, roughly speaking, distinguish two principal habitats, viz.,

(1) Shallow peat-excavated pools and lakes with a depth of up to several metres. Especially when weakly eutrophic, oligosaprobic conditions prevail, a rich tychoplanktonic desmid flora (containing sometimes over 50 species per collected plankton net sample) may occur among diversified and copiously developed stands of aquatic vegetation (with, e.g., *Stratiotes aloides*, *Hydrocharis morsus-ranae*, *Utricularia vulgaris*, *Ceratophyllum demersum*, *Potamogeton* spp.).

(2) Quivering fen plots with hollows in the mat of vegetation containing open water more or less permanently. The water depth in these hollows, which usually have a surface area not exceeding a few square metres, varies from a few centrimetres to several decimetres. As characteristic macrophytes of such mesotrophic, weakly acid pools, e.g., *Menyanthes trifoliata*, *Carex lasiocarpa*, *C. diandra*, *Juncus subnodulosus*, *Utricularia intermedia*, *U. minor*, and the moss *Scorpidium scorpioides* may be mentioned. A more detailed description of this habitat will be given in a forthcoming publication (Coesel, in the press) in which

also a number of ecological characteristics are mentioned of the rich benthic desmid flora in such sites (sometimes containing up to about 100 species per sample of squeezed substrate).

As a taxonomic basis of the above-mentioned and future ecological studies concerning the desmids of this lowland marsh area, it seemed recommendable to compile an annotated list of all desmid taxa recorded by the present author in a total of nearly 400 samples during the period 1970–1978. Within the scope of the study carried out it is unfortunately impossible to attempt a separate systematic evaluation of each of the recognised taxa, so that only an enumeration can be given of the critical or "problematic", with the relevant literature references, and sometimes elucidated by critical notes based on personal observations. In addition, a rough indication is given of the distribution of each taxon within the area studied.

2. THE STUDY AREA

The area studied consists of two geographically separated parts, called "De Weerribben" and "De Wieden", which were formerly connected by peat marshes (drained and reclaimed between the "thirties and the fifties"). The greater part of the passable fen areas is now covered by marsh carr, reed, and tall herbs. Only in those parts where the floating meshwork of roots and rhizomes is thin and soft and which were systematically exploited for hay-making during the summer season for a considerable length of time is the characteristic, sparse Caricetum diandrae vegetation developed in which there is enough free water and light for the development of a well-developed desmid flora. These sites, varying in surface area from several hundreds square metres to several hectares, are indicated in *fig. 1*.

3. MATERIAL AND METHODS

Plankton samples from the larger lakes and dikes without macrophyte growth were obtained by means of a plankton net with a mesh width of 50 μm. Tychoplankton was partly gathered with such a net and partly collected by squeezing out handfuls of submerged marcrophytes, and benthic forms were taken from the fen hollows by means of squeezes of submerged aquatics, mosses, and mats of filamentous algae.

Drawings of the recognised desmid taxa made with the aid of a drawing tube are shown on separate full-page plates, on each plate the scale of magnification being indicated by a measure, the latter having kept as constant as possible so as to render an easy comparison, at least within each individual genus. Cell contents and cell wall thickness are, generally speaking, not drawn in. Pyrenoids are indicated by means of hatched circles – following the recommendation in FÖRSTER (1966) – but only where their number or specific position are crucial for purposes of identication. The structure of the chloroplast is, likewise, only shown when it is necessary for the identification of the taxon.

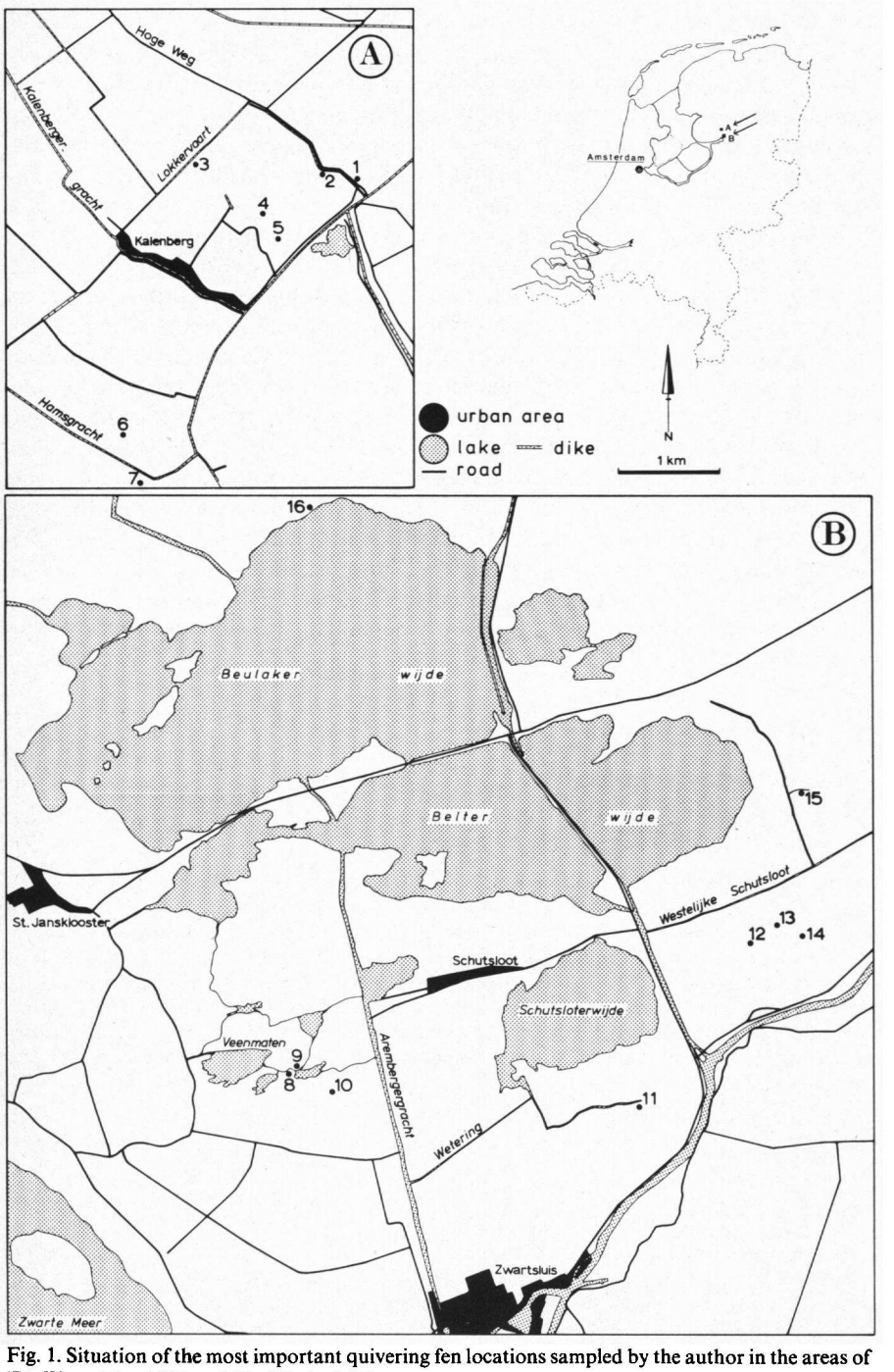


Fig. 1. Situation of the most important quivering fen locations sampled by the author in the areas of 'De Weerribben' (A) and 'De Wieden' (B).

For traditional reasons not only the true desmidiaceous forms (= Desmidiaceae placodermae) were included in this study, but also the mesotaeniaceous ones (= Desmidiaceae saccodermae). The annotated enumeration of the placoderm desmids reflects the systematic classification of RŮŽIČKA (1977). The arrangement of the species of one genus is alphabetical. Taxa which had not previously been recorded from the Netherlands are marked with an asterisk. For some taxa a frequently used synonym is mentioned so as to avoid a possible confusion. As far as possible the nomenclature has been brought into agreement with the International Code of Botanical Nomenclature (STAFLEU et al. 1972). The numbers following after each name refer to the number of the figure(s) in the present paper. Below the name of every recognised taxon, reference is made to the monograph or other publication used for the identification. In cases of little known or taxonomically problematic species the reference is replaced or augmented by a brief discussion in which the taxonomically relevant literature is cited. In a few instances the present author is still not certain of the identification, which is indicated by the question mark placed before the scientific name given.

After the nomenclatural and systematic notes relating to a given taxon some information regarding its distributional range in the area studied is given. The phytosociological term "(Hydrocharito-)Stratiotetum" as an indication of the habitat indicates a preference for the water quality of the optimum environment of this plant community rather than a dependance of desmid taxa on this vegetation type.

4. ANNOTATED LIST OF DESMID SPECIES

Fam. MESOTAENIACEAE Oltm.

Mesotaenium Näg.

M. endlicherianum Näg. var. *minimum* (Cushm.) Krieg. *T.1:1–2*

The only species of *Mesotaenium* recorded in the area was characterised by its strikingly small size: length 12–25 µm, width 4.5–5.5 µm. According to the literature studies only *M. minimum* Cushm. has such dimensions. CUSHMAN's (1906, p. 347) description, although extremely meagre, was sufficient reason for KRIEGER (1933) to reduce this taxon to subspecific rank under *M. endlicherianum*. Subsequent records are extremely scarce. KOLKWITZ & KRIEGER (1936, p. 84, t.9:16) found it in Java, atmophytically on rocks and in moss cushions. It is striking that the "typical" variety *endlicherianum* was never encountered during the present study, although the var. *minimum* is wide-spread in the area studied and locally occurs abundantly as an atmophytic alga in *Sphagnum* cushions.

Spirotaenia Bréb.

**S. erythrocephala* Itzigs. *T.1:4*

KRIEGER 1933, p. 188, t.2:11.

Rather rare in fen hollows.

**S. minuta* Thur. *T.1:3*

KRIEGER 1933, p. 186, t.2:8.

In our material the coils of the chloroplast are rather close for *S. minuta*. Taking the presence of paired reddish-brown granules in both cell extremities into account, one might consider an identification as *S. kirchneri* Lütkem. forma *erythropuncta* Lagerh. The chloroplast band is much broader and more closely coiled in *S. kirchneri*, however, and the occurrence of reddish-brown granules at the ends of the chloroplast is, according to LÜTKEMÜLLER (1903, p. 403), not at all unusual in several of

the smaller species of *Spirotaenia*. According to this author also in Brébisson's water colour of *S. minuta* Thur. a brown dot is present at the cell extremities. Unfortunately LAGERHEIM (1883, p. 52) did not figure his fa. *erythropunctata*, and he did not mention any features of the chloroplast either, so that it is not quite certain whether he indeed described a form of *S. kirchneri* (in his publication as *S. minuta* var. *minutissima* Kirchn.).

Rare in fen hollows (e.g., in locality no. 1).

S. obscura Ralfs *T.1:5*

KRIEGER 1933, p. 180, t.1:5,6.

Rather rare in fen hollows.

Cylindrocystis (Menegh. ex Ralfs) De Bary

C. brebissonii (Menegh. ex Ralfs) De Bary

var. *brebissonii* *T.1:6–7*

KRIEGER 1933, p. 207, t.6:4–7.

Common in benthos of fen hollows with *Sphagnum* vegetation. Also atmophytic in emergent *Sphagnum* cushions.

Found in frequent conjugation in locality no. 1 in March-April 1978; zygospores agreeing with the description by KRIEGER (1933, t.6:6).

?var. *minor* W. & G. S. West *T.1:8–10*

The specimens tentatively referred to this taxon here differ strikingly and consistently from typical *C. brebissonii*, as figured in *T.1:6–7*. It differs in the cell width (12.5–13 μm in var. *minor* as against 21–23 μm in the var. *brebissonii*), in the shape of the chloroplast (which has a few undivided radially arranged plates as against a larger number of multifid plates with smaller lobes in the var. *brebissonii*), the shape of the pyrenoid (orbicular as against more oblong in the var. *brebissonii*), and the absence of the concentration of granules at the periphery of the cytoplast as found in the var. *brebissonii*. Exactly the same differences were described earlier by HIRN (1953). She also noticed a different reaction to several vital stains: 'Typical' *C. brebissonii* shows a bluish-green discolouration of the vacuole sap and – more strongly so – of the peripherally situated Kopetzky granules upon treatment with toluidine blue or brilliant cresyl blue, whereas the smaller form under discussion reacted with a purple discolouration of the vacuole. All these differences caused HIRN to recognise the smaller taxon as a separate species which she named '*C. gracilis*' ad interim. There can be no doubt that the form depicted in *T.1:8–10* is identical with *C. gracilis* Hirn (see HIRN, l.c., figs. 1–3). The above-mentioned differences in staining behaviour could be confirmed in our material, albeit less convincingly as a rule. The question remains in how far *C. gracilis* Hirn agrees with the var. *minor* W. & G. S. West of *C. brebissonii*. HIRN (l.c.) already poses this question, hence her provisional naming of the taxon concerned. Unfortunately WEST & WEST (1902) do not include any details of the chloroplast morphology in their description of their var. *minor*. GRÖNBLAD & RŮŽIČKA (1959, figs. 21–31) point to an appreciable variation in the chloroplast shape in this var. *minor*,however. They depict a gradual transition from the chloroplast type with a few undivided radially arranged plates and that with a larger number of multilobed plates. They also indicate a variation in pyrenoid shape from orbicular to oblong. In how far the other differentiating characteristics justify a separate status of *C. gracilis* at the (sub) specific level will have to be decided after a more detailed investigation.

C. brebissonii var. *minor* occurs in the area studied in the same habitats as the 'typical' var. *brebissonii*. Although of more common occurrence than the nominal variety, it was never found with zygotes, not even when found mixed with conjugating populations of the var. *brebissonii*.

Netrium (Näg.) Itzigs. & Rothe

N. digitus (Ehr. ex Bréb.) Itzigs. & Rothe *T.1:11*

KRIEGER 1933, p. 214, t.7:1, t.8:1.

Common in benthos of fen hollows.

Fam. GONATOZYGACEAE (Lütkem.) G. S. West & F. E. Fritsch

Gonatozygon De Bary

G. brebissonii De Bary *T.1:14–15*

RŮŽIČKA 1977, p. 51, t.2:1–7.

Rare in benthos of fen hollows and in tychoplankton of peat pits.

G. kinahanii (Arch.) Rab. *T.1:12*

RŮŽIČKA 1977, p. 45, t.1:1–4.

Rather rare in (tycho)plankton.

G. monotaenium De Bary *T.1:13*

RŮŽIČKA 1977, p. 46, t.1:5–7.

Rather common in tychoplankton, especially in stands of Stratiotetum vegetation.

Fam. PENIACEAE Haeck.

Penium Bréb.

**P. spinospermum* Josh. *T.1:16–17*

RŮŽIČKA 1977, p. 72, t.5:12–18.

The longitudinal rows of pores in the cell wall were only observed, and only vaguely so, in exceptional cases.

Fairly common in fen hollows, in a number of cases with zygospores.

P. spirostriolatum Bark. *T.1:18*

RŮŽIČKA 1977, p. 60, t.3:1–6.

Rare in fen hollows (e.g., in locality no. 12).

Fam. CLOSTERIACEAE Pritch.

Closterium Nitzsch ex Ralfs

C. acerosum (Schrank) Ehr. ex Ralfs *T.4:3*

var. *acerosum*

RŮŽIČKA 1977, p. 157, t.18:1–4.

Common in tychoplankton.

var. *elongatum* Bréb. *T.4:4*

RŮŽIČKA 1977, p. 158, t.18:10.

In our study area connected with var. *acerosum* by intermediate forms.

Common in tychoplankton, rather rare in fen hollows.

C. aciculare T. West *T.2:13–14*

RŮŽIČKA 1977, p. 108, t.8:21–24.

Common in plankton of larger pools and lakes.

C. acutum Bréb. *T.2:3*

var. *acutum*

RŮŽIČKA 1977, p. 96, t.6:16–22.

Rather common in benthos of fen hollows, less common in tychoplankton.

var. *variabile* (Lemm.) Krieg. *T.2:4–5*

RŮŽIČKA 1977, p. 97, t.6:32–37.

Common in plankton of larger pools and lakes.

C. attenuatum Ralfs *T.5:8*

RŮŽIČKA 1977, p. 194, t.26:1–8.

In study area not always easily distinguishable from *C. ralfsii* var. *hybridum*.

Rather rare in fen hollows.

C. baillyanum (Bréb.) Bréb. *T.6:1*

RŮŽIČKA 1977, p. 179, t.23:1–6.

Rare in fen hollows, but locally abundant (e.g., in locality no. 1).

C. calosporum Wittr. *T.2:24*
RŮŽIČKA 1977, p. 129, t.12:24–27.
Rather rare in fen hollows.

C. closterioides (Ralfs) Louis & Peeters
var. *intermedium* (Roy & Biss.) Růz°. *T.2:1*
Syn.: *C. libellula* Focke var. *intermedium* (Roy & Biss.) G. S. West
RŮŽIČKA 1977, p. 93, T.6:3–6.
Rare in fen hollows (e.g., in locality no. 12).

C. costatum Corda ex Ralfs
var. *costatum* *T.6:2*
RŮŽIČKA 1977, p. 197, t.27:1–6.
Rather rare in fen hollows.
var. *borgei* (Krieg.) Růž. *T.6:3*
RŮŽIČKA 1977, p. 197, t.27:7–13.
Rare in fen hollows (locality nos. 2 and 12).

C. cynthia De Not. *T.6:8–9*
RŮŽIČKA 1977, p. 232, t.28:18–22.
Rare in fen hollows (e.g., in locality no. 12).

C. dianae Ehr. ex Ralfs
var. *dianae* *T.2:23*
RŮŽIČKA 1977, p. 134, t.13:1–6.
Rather common in fen hollows; a pair in conjugation recorded only once.
var. *arcuatum* (Bréb.) Rab. *T.2:21*
RŮŽIČKA 1977, p. 134, t.13:19–21.
Rather rare in fen hollows.
var. *rectius* (Nordst.) De Toni *T.2:22*
RŮŽIČKA 1977, p. 135, t.13:13–14
Very rare in fen hollows (locality no. 4)

C. ehrenbergii Menegh. ex Ralfs
var. *ehrenbergii* *T.3:1*
RŮŽIČKA 1977, p. 143, t.15:1–3.
Common in tychoplankton of pools, dikes and ditches.
var. *malinvernianum* (De Not.) Rab. *T.3:2*
RŮŽIČKA 1977, p. 143, t.15:4.
Rather rare in benthos of fen hollows.

C. gracile Bréb. ex Ralfs *T.5:1*
RŮŽIČKA 1977, p. 168, t.21:1–4.
Rather are in fen hollows.

C. idiosporum W. & G. S. West *T.2:16*
RŮŽIČKA 1977, p. 98, t.7:4–9.
Rather common in tychoplankton of pools and ditches.

C. incurvum Bréb. *T.2:6*
RŮŽIČKA 1977, p. 118, t.10:35–42.
Rather rare in benthos of fen hollows; rather common in tychoplankton of pools with Stratiotetum. In the latter habitat connected with *C. venus* by intermediate forms.

C. intermedium Ralfs *T.6:4–7*
RŮŽIČKA 1977, p. 214, t.32:1–5.
Rather common in fen hollows.

C. kuetzingii Bréb. *T.5:10*
RŮŽIČKA 1977, p. 207, t.30:9–14.
Rather common in fen hollows, occasionally found with zygospores.

C. leibleinii Kütz. ex Ralfs *T.2:18–20*

RŮŽIČKA 1977, p. 215, t.12:11–18.

Connected with *C. tumidulum* by intermediate forms. Rather common in tychoplankton.

C. limneticum Lemm.

var. *limneticum* *T.5:2*

RŮŽIČKA 1977, p. 173, t.21:9–11.

Rather common in (tycho)plankton.

var. *fallax* Růž. *T.5:3*

RŮŽIČKA 1977, p. 173, t.21:15–17.

In study area connected with var. *limneticum* by intermediate forms. Distribution as of the typical variety.

C. lineatum Ehr. ex Ralfs *T.5:6*

RŮŽIČKA 1977, p. 182, t.24:1–3.

Rare in fen hollows (e.g., in locality no. 12).

C. lunula (Müll.) Nitzsch ex Ralfs *T.3:4*

RŮŽIČKA 1977, p. 145, t.16:1–3.

Rather common in fen hollows.

C. moniliferum (Bory) Ehr. ex Ralfs *T.3:5–6*

RŮŽIČKA 1977, p. 147, t.14:3–6.

Very common in tychoplankton in pools, dikes and ditches; less common benthos of fen hollows.

C. navicula (Bréb.) Lütkem. var. *crassum* (W. & G. S. West) Grönbl. *T.2:2*

RŮŽIČKA 1977, p. 95, t.6:12–15.

Rare in fen hollows (e.g., in locality no. 2).

C. parvulum Näg. *T.2:9–10*

RŮŽIČKA 1977, p. 121, t.11:12–17.

Common in benthos of fen hollows; also of common occurrence in tychoplankton of pools and ditches, where it is connected by intermediate forms with both *C. venus* and *C. tumidulum*.

C. praelongum Bréb.

var. *praelongum* *T.4:1*

RŮŽIČKA 1977, p. 164, t.20:1–3.

Rather common in tychoplankton.

var. *brevius* (Nordst.) Krieg. *T.4:2*

RŮŽIČKA 1977, p. 165, t.20:4–13.

In area studied connected with var. *praelongum* by intermediate forms; distribution as of the typical variety.

C. pritchardianum Arch. *T.4:5–6*

RŮŽIČKA 1977, p. 159, t.19:1–4.

Rather common in fen hollows.

C. pronum Brȩb. *T.2:15*

RŮŽIČKA 1977, p. 102, t.7:23–26.

Rather rare in tychoplankton.

C. pseudolunula Borge *T.3:3*

RŮŽIČKA 1977, p. 148, t.16:7–15.

Rare in fen hollows (e.g., in locality nos. 4 and 12).

C. ralfsii Bréb. ex Bréb. var *hybridum* Rab. *T.5:7*

RŮŽIČKA 1977, p. 192, t.25:10–13.

Rather rare in fen hollows.

C. rostratum Ehr. ex Ralfs *T.5:9*

RŮŽIČKA 1977, p. 209, t.31:1–6.

Rather common in fen hollows.

C. setaceum Ehr. ex Ralfs *T.5:11*

RŮŽIČKA 1977, p. 205, t.30:1–3.
In study area not always easily to distinguish from *C. kuetzingii.*
Rare in fen hollows (e.g. in locality no. 1).

C. strigosum Bréb. *T.5:4–5*

RŮŽIČKA 1977, p. 173, t.21:18–26.
Rather common in tychoplankton.

**C. subulatum* (Kütz.) Bréb. *T.2:17*

RŮŽIČKA 1977, p. 109, t.9:23–26.
Rather rare in tychoplankton.

**C. tumidulum* Gay *T.2:11–12*

RŮŽIČKA 1977, p. 124, t.12:1–10.
Connected with both *C. parvulum* and *C. leibleinii* by intermediate forms.
Rather common in tychoplankton.

C. turgidum Ehr. ex Ralfs *T.4:7*

RŮŽIČKA 1977, p. 166, t.19:11.
Rather rare in fen hollows.

C. venus Kütz. ex Ralfs *T.2:7–8*

RŮŽIČKA 1977, p. 119, t.11:1–7.
Connected with *C. parvulum* by intermediate forms. Common in tychoplankton of pools and ditches, less common in fen hollows.

Fam. DESMIDIACEAE Ralfs

Pleurotaenium Näg.

**P. crenulatum* ([Ehr.] ex Ralfs) Rab. *T.8:5–6*

RŮŽIČKA 1977, p. 281, t.42:7–13.
Rare in fen hollows.

P. ehrenbergii (Bréb.) De Bary *T.8:4*

RŮŽIČKA 1977, p. 274, t.40:1–10.
Rather common in fen hollows.

P. nodulosum (Bréb.) De Bary *T.7:3–4*

RŮŽIČKA 1977, p. 279, t.42:1–6.
The number of undulations in the cell wall is greater than in Růžička's figures. Our material agrees better with the figure in KRIEGER (1937, t.48:4) under *P. coronatum* var. *nodulosum.* Although our figure T.7:3 tends towards *P. coronatum* (Bréb.) Rab., the latter taxon must be excluded because the cell shape is not sufficiently cylindric and especially because the protuberances on the apex are not so strongly developed. Our figures in T.7:3–4 were drawn from specimens found in the same sample and connected by a series of intermediate forms.
Rather rare in fen hollows, locally abundant.

P. trabecula (Ehr.) ex Näg. *T.8:1–3*

RŮŽIČKA 1977, p. 265, t.38:1–5.
Common in both tychoplankton of pools and ditches, and benthos of fen hollows.

P. truncatum (Bréb.) Näg. *T.7:1–2*

RŮŽIČKA 1977, p. 282, t.43:1–3.
Common in fen hollows.

Tetmemorus Ralfs ex Ralfs

T. granulatus (Bréb.) Ralfs ex Ralfs *T.8:7*

KRIEGER 1937, p. 458, t.55:1–5.

Rather common in fen hollows, locally abundant.

T. laevis (Kütz.) ex Ralfs *T.8:8*

KRIEGER 1937, p. 455, t. 54:9–12.

Rather rare in fen hollows, locally abundant. Regularly producing zygospores (see COESEL 1974).

Euastrum Ehr. ex Ralfs

E. ansatum Ehr. ex Ralfs *T.9:3*

KRIEGER 1937, p. 484, t.58:1–3.

Rare in fen hollows (e.g., in locality nos. 1, 8 and 12).

E. bidentatum Näg. *T.9:4*

KRIEGER 1937, p. 601, t.85:1–2.

Rather common in fen hollows.

E. binale (Turp.) Ehr. ex Ralfs var. *gutwinskii* (Schmidle) Krieg.

forma *ornatum* (Bourr. & Leb.) Růž. *T.9:13*

RŮŽIČKA 1955, p. 594, t.1:9–11.

Fairly common in the Wieden area, in fen hollows.

**E. bipapillatum* Grönbl. forma *biscrobiculata* Wolosz. *T.9:11*

Our specimens – of very constant shape and dimensions – agree very closely with the fa. *biscrobiculata* of *E. bipapillatum* Grönbl. described by WOLOSZYNSKA (1950, p. 138, t.4:49–53, t.5:63–64, t.31:337). However, they also show much resemblance to the var. *groenbladii* of *E. doliforme* W. & G. S. West described by CROASDALE (1956, p. 4, t.1:6), and to some figures of *Cosmarium trilobulatum* Reinsch var. *basichondrum* Nordst. (see, e.g. BORGE 1936, p. 39, t.2:37). Compare also '*C. trilobulatum* Reinsch fa.' of CEDERCREUTZ & GRÖNBLAD (1936, p. 3, t.1:8). In how far these taxa are identical, and what the correct nomenclature will have to be, awaits further investigation.

Rather common in fen hollows.

E. denticulatum (Kirchn.) Gay var. *quadrifarium* Krieg. *T.9:8*

KRIEGER 1937, p. 585, t.80:20–21.

Very rare in fen hollows (locality no. 5).

E. dubium Näg. var. *ornatum* Wolosz. *T.9:9*

KRIEGER 1937, p. 572, t. 79:10

Ornamentation and outline of our specimens deviate somewhat from the figures in the above-cited reference, but on the other hand agree very closely with the figure in RŮŽIČKA (1973, t.8:3).

Rather rare in fen hollows.

E. elegans (Bréb.) Kütz. ex Ralfs *T.9:10*

KRIEGER 1937, p. 591, t.81:14–18.

Very rare in fen hollows (locality no. 5).

E. insulare (Wittr.) Roy *T.9:14–16*

WEST & WEST 1905, p- 68, t.40:11–13.

Rather common in fen hollows.

E. mononcylum (Nordst.) Racib. var. *germanicum* Schmidle *T.9:5*

SCHMIDLE 1895, p. 80, t.1:17a–c.

Very rare in tychoplankton of lakes. See also COESEL (1978).

E. oblongum (Grev.) Ralfs ex Ralfs *T.9:1*

KRIEGER 1937, p. 526, t.70:3–6.

Common in fen hollows. Once found with zygospore.

E. pectinatum (Bréb.) ex Bréb. *T.9:2*

WEST & WEST 1905, p. 60, t.39:10–12.

Fairly common in fen hollows.

E. pulchellum Bréb. *T.9:7*

KRIEGER 1937, p. 587, t.81:8–11.
Fairly common in fen hollows.

**E. subalpinum* Messik. *T.9:12*

KRIEGER 1937, p. 569, t.77:35–37.
Rare in fen hollows (e.g., in locality no. 9).

E. verrucosum Ehr. ex Ralfs *T.9:6*

KRIEGER 1937, p. 643, t.94:1–3.
Fairly common in fen hollows.

Micrasterias Agh. ex Ralfs

M. americana (Ehr.) ex Ralfs var. *boldtii* Gutw. *T.11:2–3*

KRIEGER 1939, p. 47, t.109:1–3.
Fairly common in fen hollows in the Wieden area.

M. brachyptera Lund. *T.11:6*

KRIEGER 1939, p. 83, t.125:3–6.
Fairly common in fen hollows in the Weerribben area.

M. crux-melitensis (Ehr.) Hass. ex Ralfs

var. *crux-melitensis* *T.10:6*

KRIEGER 1939, p. 62, t.114:5–8.
Fairly common in benthos of fen hollows, and in tychoplankton of Stratiotetum pools.

var. *janeira* (Racib.) Grönbl. *T.10:7*

KRIEGER 1939, p. 64, t.114:9–10.
In area under study connected with the typical variety by intermediate forms. Rather rare in fen hollows.

M. denticulata Bréb. ex Ralfs

var. *angulosa* (Hantzsch) W. & G. S. West *T.10:4–5*

KRIEGER 1939, p. 107, t.138:4–6.
Rather rare in fen hollows.

M. fimbriata Ralfs var. *spinosa* Biss. *T.11:5*

KRIEGER 1939, p. 81, t.123:3–5.
Rather rare in fen hollows.

M. papillifera Bréb. *T.11:4*

KRIEGER 1939, p. 87, t.129:2–5.
Rather rare in fen hollows. Some finds of zygospores.

M. rotata (Grev.) Ralfs ex Ralfs *T.11:1*

KRIEGER 1939, p. 100, t.136:1.
Rather rare in fen hollows.

M. thomasiana Arch. var. *notata* (Nordst.) Grönbl. *T.10:4–5*

KRIEGER 1939, p. 111, t.140:1–4.
Fairly common in fen hollows, especially the form without the characteristic basal projections as depicted in our *T.10:5*.

M. truncata (Corda) ex Bréb.

var. *semiradiata* (Näg.) Cleve *T.10:2*

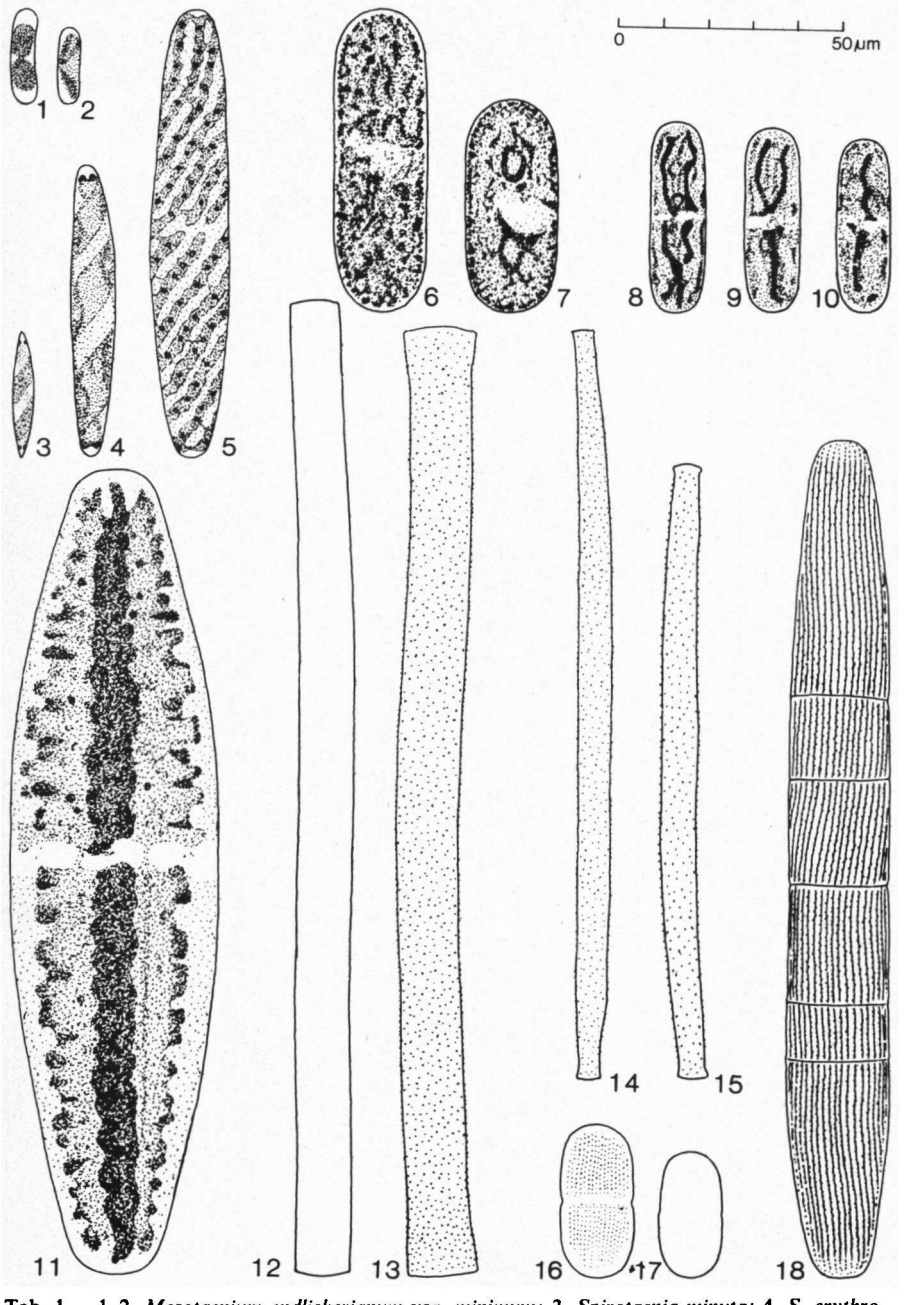
KRIEGER 1939, p. 32, t.103:9.
Common in fen hollows.

var. *crenata* (Bréb.) Grönbl. *T.10:1*

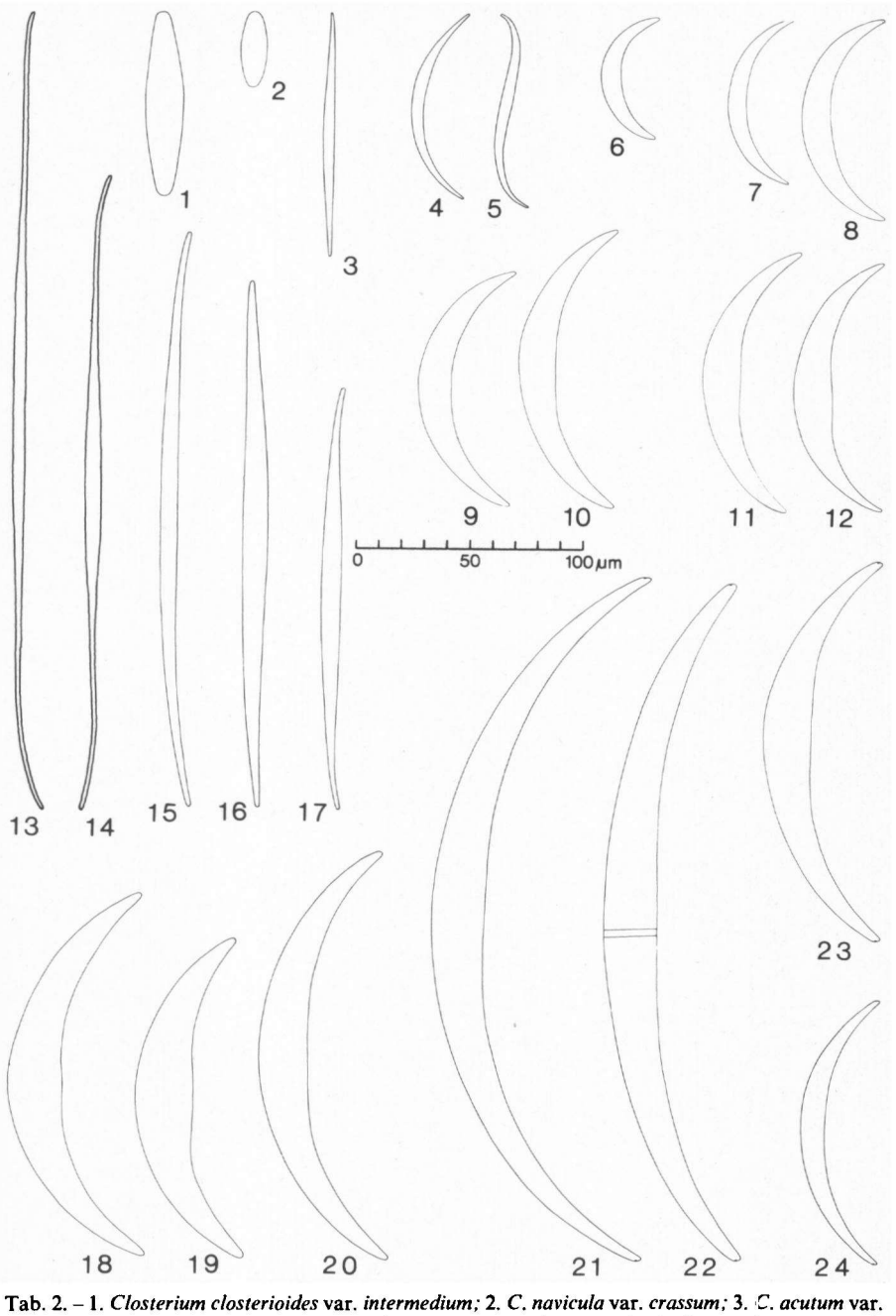
KRIEGER 1939, p. 29, t.103:3.
Rare in fen hollows (locality no. 2).

REFERENCES

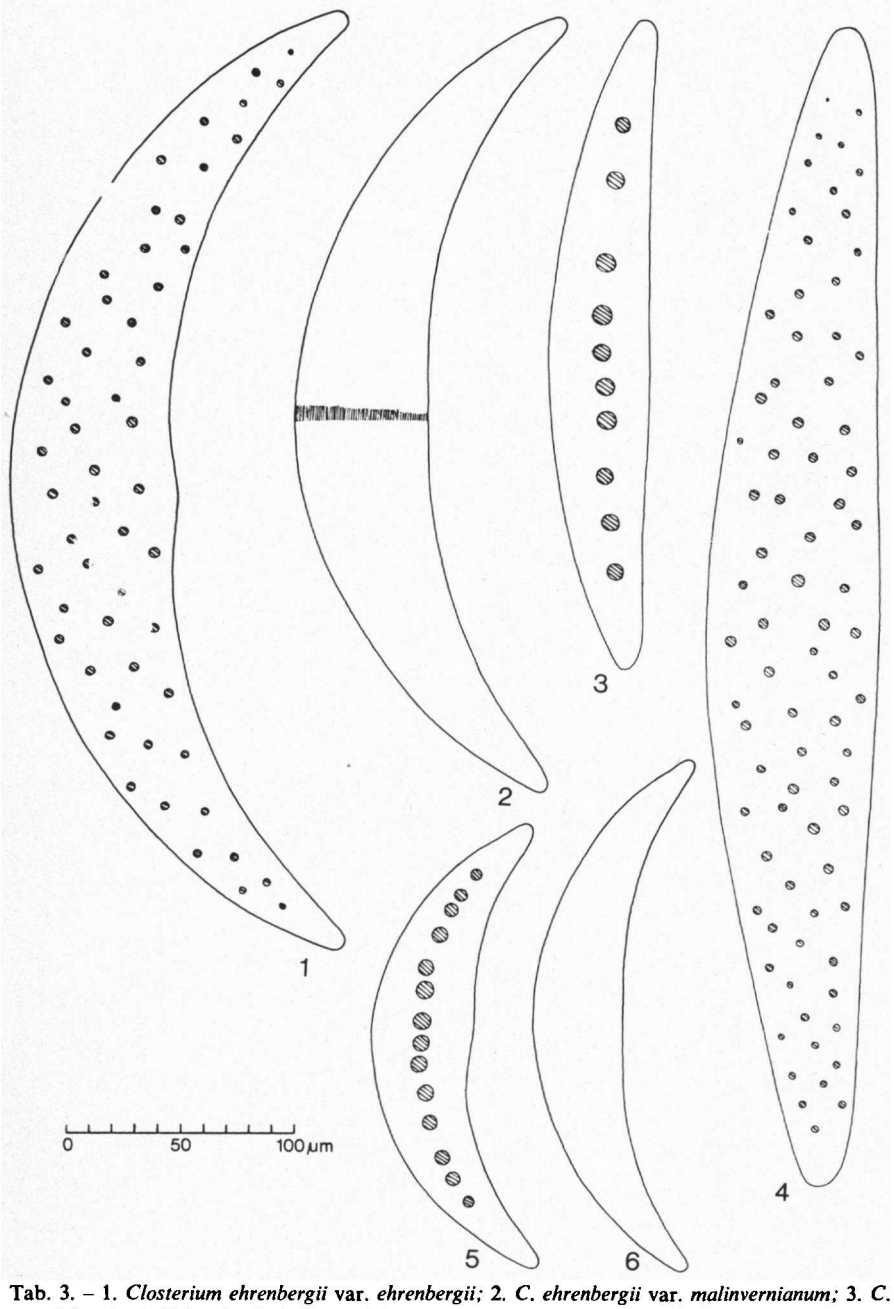
BORGE, O. (1936): Beiträge zur Algenflora von Schweden. 5. *Ark. Bot.* **28A** (6): 1–58.
CEDERCREUTZ, C. & R. GRÖNBLAD (1936): Bemerkungen über einige Desmidiaceen von Åland. *Commentat. Biol.* **7**, 2:1–9.
COESEL, P. F. M. (1974): Notes on sexual reproduction in desmids. I. Zygospore formation in nature (with special reference to some unusual records of zygotes). *Acta Bot. Neerl.* **23**(4): 361–368.
— (1978): Taxonomical, geographical and ecological notes on Euastrum mononcylum var. germanicum Schmidle (Chlorophyta, Desmidiaceae). *Arch. Protistenk.* **120**: 436–445.
— Structure and dynamics of desmid communities in hydrosere vegetation in a mesotrophic quivering bog. *Beih. Nova Hedwigia* **56** (in press).
CROASDALE, H. (1956): Freshwater algae of Alaska. I. Some desmids from the interior. Part 2: Actinotaenium, Micrasterias and Cosmarium. *Trans. Amer. Microscop. Soc.* **75**(1): 1–70.
CUSHMAN, J. A. (1906): New England desmids in the sub-family Saccodermae. *Bull. Torrey Bot. Club.* **33**: 341–351.
FÖRSTER, K. (1966): Ein Vorschlag zur einheitlichen zeichnerischen Darstellung von Desmidiaceen. *Nova Hedwigia* **10**(3/4): 463–479.
GRÖNBLAD, R. & J. RŮŽIČKA (1959): Zur Systematik der Desmidiaceen. *Bot. Not.* **112**(2): 205–226.
HIRN, I. (1953): Vitalfärbungsstudien an Desmidiaceen. *Flora* **140**: 453–473.
KOLKWITZ, R. & W. KRIEGER (1936): Zur Ökologie der Pflanzenwelt insbesondere der Algen, des Vulkans Pangerango in West-Java. *Ber. Deutsch. Bot. Ges.* **54**: 65–91.
KRIEGER, W. (1933–1939): Die Desmidiaceen Europas, mit Berücksichtigung der aussereuropäischen Arten. *Rabenhorst's Kryptogam.-Fl. Deutschl., Öst., Schweiz* **13**(1). 1. Teil (1933, 1935, 1937); 2. Teil (1939).
LAGERHEIM, G. (1883): Bidrag till Sveriges algflora. *Öfvers. Förh. Kongl. Svenska Vetensk. Akad.* **40**(2): 37–78.
LÜTKEMÜLLER, J. (1903): Über die Gattung Spirotaenia Bréb. II. Beschreibung neuer Arten und Bemerkungen über bekannte. *Oesterr. Bot. Z.* **53**(10): 396–405.
RŮŽIČKA, J. (1955): Interessante Desmidiaceen vom oberen Oravagebiet. *Biologia* (Bratislava) **10**(5): 590–604.
— (1973): Die Zieralgen des Naturschutzgebietes 'Rezabinec' (Südbohmen). *Preslia* **45**: 193–241.
— (1977): *Die Desmidiaceen Mitteleuropas. Band 1, 1. Lieferung*. E. Schweizerbart, Stuttgart.
SCHMIDLE, W. (1895): Weitere Beiträge zur Algenflora der Rheinebene und des Schwarzwaldes. *Hedwigia* **34**: 66–83.
STAFLEU, F. A. et al. (1972): *International Code of Botanical Nomenclature, adopted by the Eleventh International Botanical Congress Seattle, August 1969*. A. Oosthoek, Utrecht.
WEST, W. & G. S. WEST (1902): A Contribution to the Freshwater Algae of the North of Ireland. *Trans. Roy. Irish Acad.* **32**, Sect. B: 1–100.
— (1905): *A Monograph of the British Desmidiaceae*. Vol. **2**. Ray Society, London.
WOLOSZYNSKA, J. (1950): De Desmidiaceis fossilibus quae in Roztoki ad Jaslo inventae Sunt. 1. *Polska Akad. Umiejetn. Rozpr. Wydz. Mat.- Przyr., Dzial B, Nauki Biol.* **74**(3): 93–150.



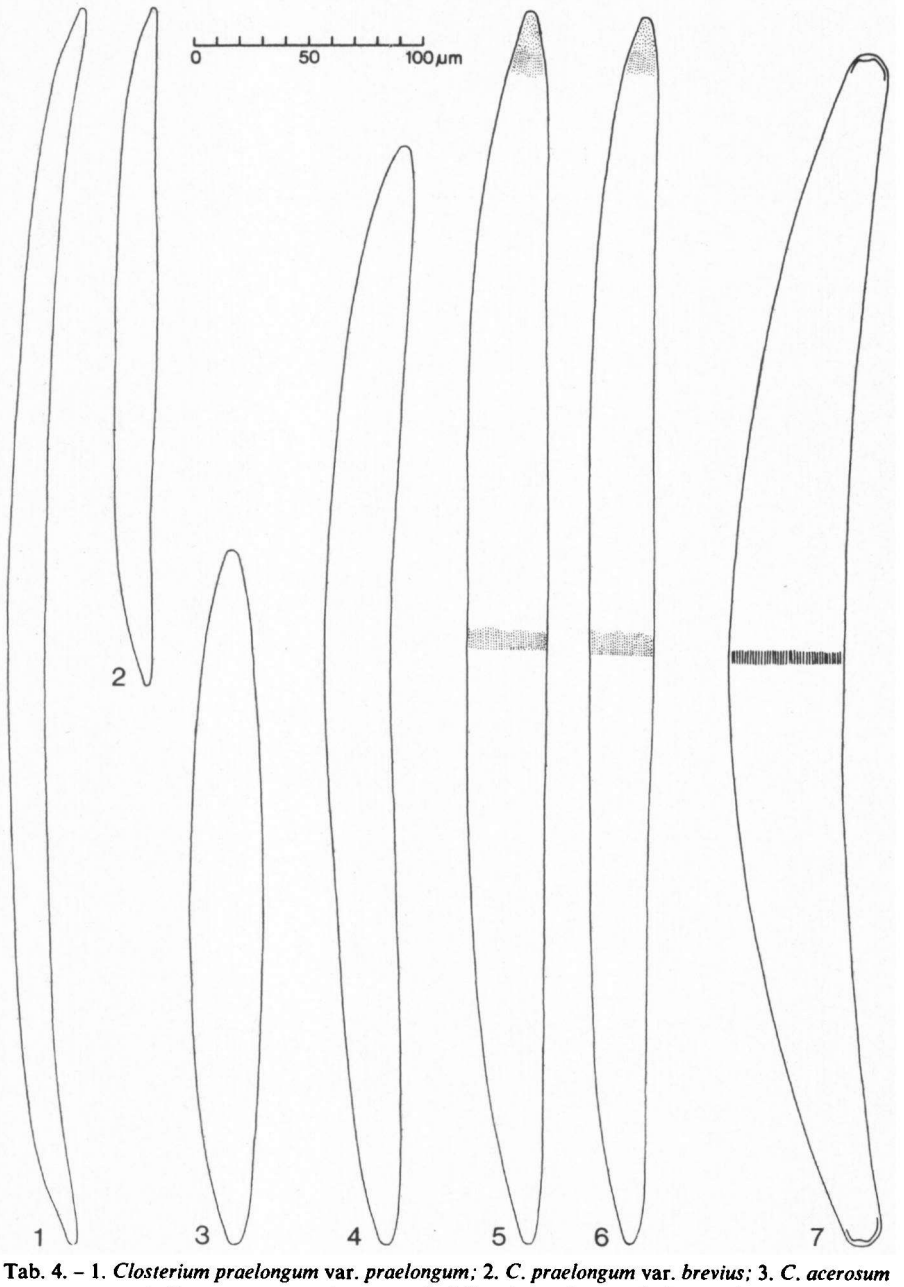
Tab. 1. – 1–2. *Mesotaenium endlicherianum* var. *minimum*; 3. *Spirotaenia minuta;* 4. *S. erythrocephala;* 5. *S. obscura;* 6–7. *Cylindrocystis brebissonii* var. *brebissonii;* 8–10. ? *C. brebissonii* var. *minimum;* 11. *Netrium digitus;* 12. *Gonatozygon kinahanii;* 13. *G. monotaenium;* 14–15. *G. brebissonii;* 16–17. *Penium spinospermum;* 18. *P. spirostriolatum.*



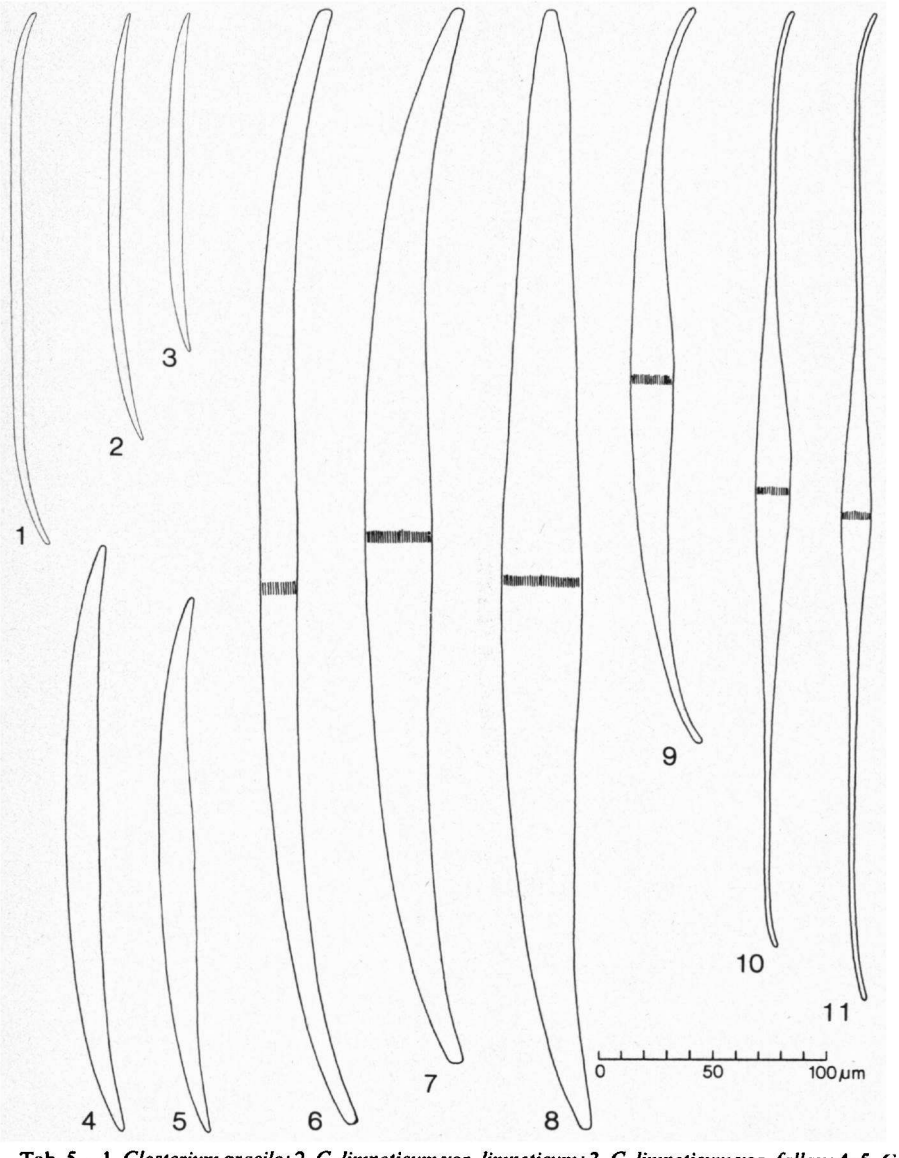
Tab. 2. – 1. *Closterium closterioides* var. *intermedium;* 2. *C. navicula* var. *crassum;* 3. *C. acutum* var. *acutum;* 4–5. *C. acutum* var. *variabile;* 6. *C. incurvum;* 7–8. *C. venus;* 9–10. *C. parvulum;* 11–12. *C. tumidulum;* 13–14. *C. aciculare;* 15. *C. pronum;* 16. *C. idiosporum;* 17. *C. subulatum;* 18–20. *C. leibleinii;* 21. *C. dianae* var. *arcuatum;* 22. *C. dianae* var. *rectius;* 23. *C. dianae* var. *dianae;* 24. *C. calosporum.*



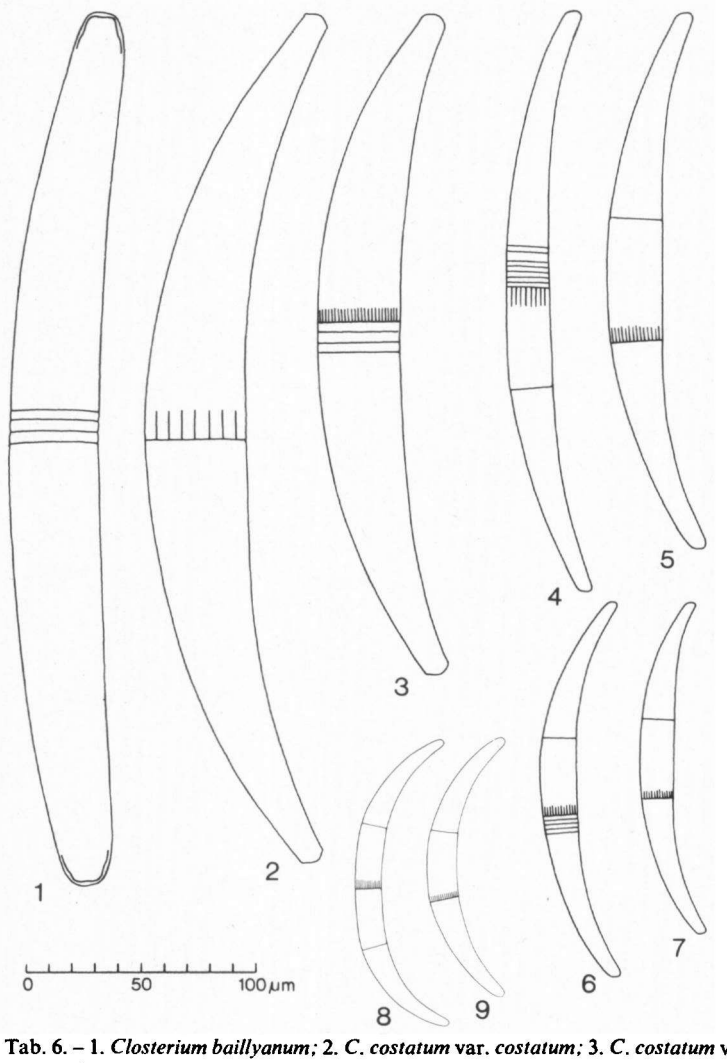
Tab. 3. – 1. *Closterium ehrenbergii* var. *ehrenbergii*; 2. *C. ehrenbergii* var. *malinvernianum*; 3. *C. pseudolunula*; 4. *C. lunula*; 5–6. *C. moniliferum*.



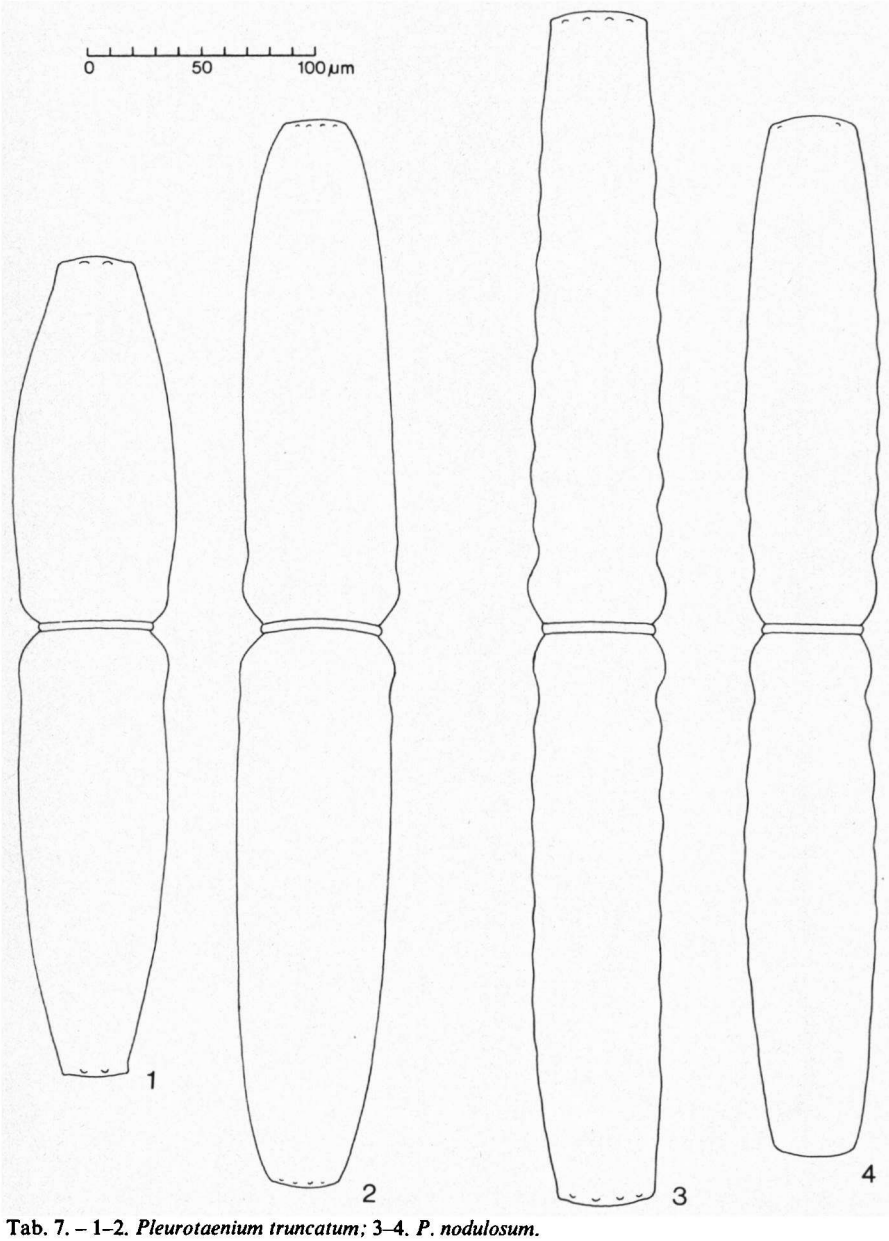
Tab. 4. – 1. *Closterium praelongum* var. *praelongum*; 2. *C. praelongum* var. *brevius*; 3. *C. acerosum* var. *acerosum*; 4. *C. acerosum* var. *elongatum*; 5–6 *C. pritchardianum*; 7. *C. turgidum*.



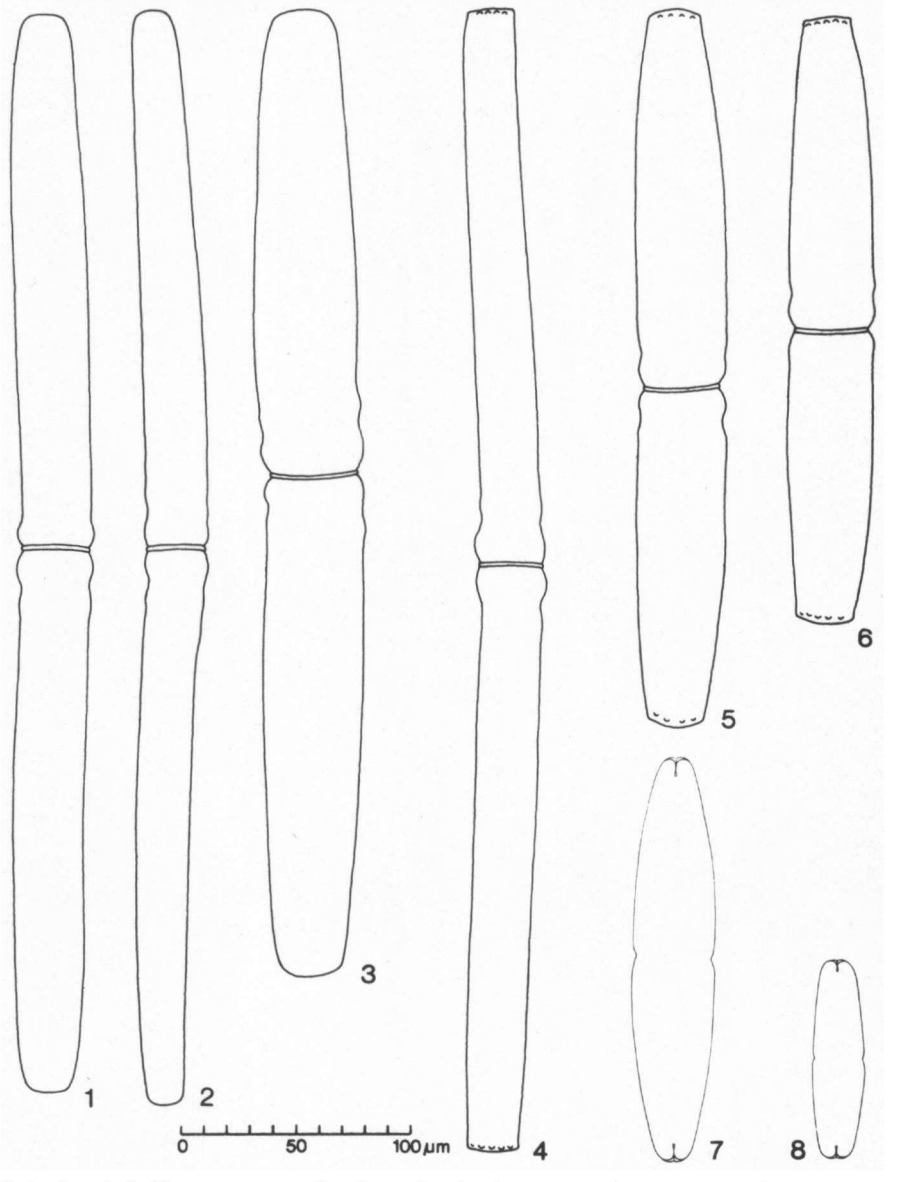
Tab. 5. – 1. *Closterium gracile;* 2. *C. limneticum* var. *limneticum;* 3. *C. limneticum* var. *fallax;* 4–5. *C. strigosum;* 6. *C. lineatum* var. *elongatum;* 7. *C. ralfsii* var. *hybridum;* 8. *C. attenuatum;* 9. *C. rostratum;* 10. *C. kuetzingii;* 11. *C. setaceum.*



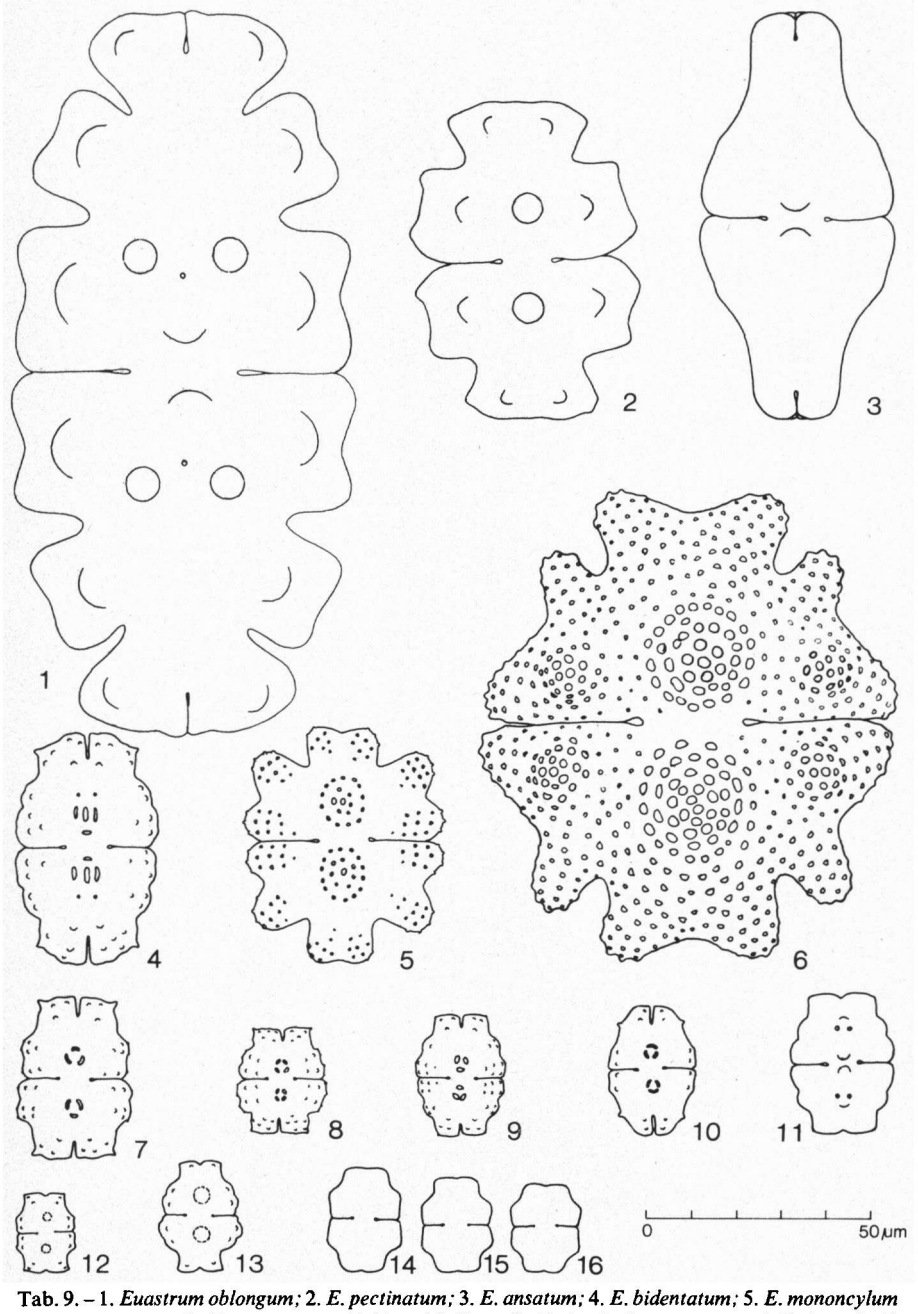
Tab. 6. – 1. *Closterium baillyanum;* 2. *C. costatum* var. *costatum;* 3. *C. costatum* var. *borgei;* 4–7. *C. intermedium;* 8–9. *C. cynthia.*



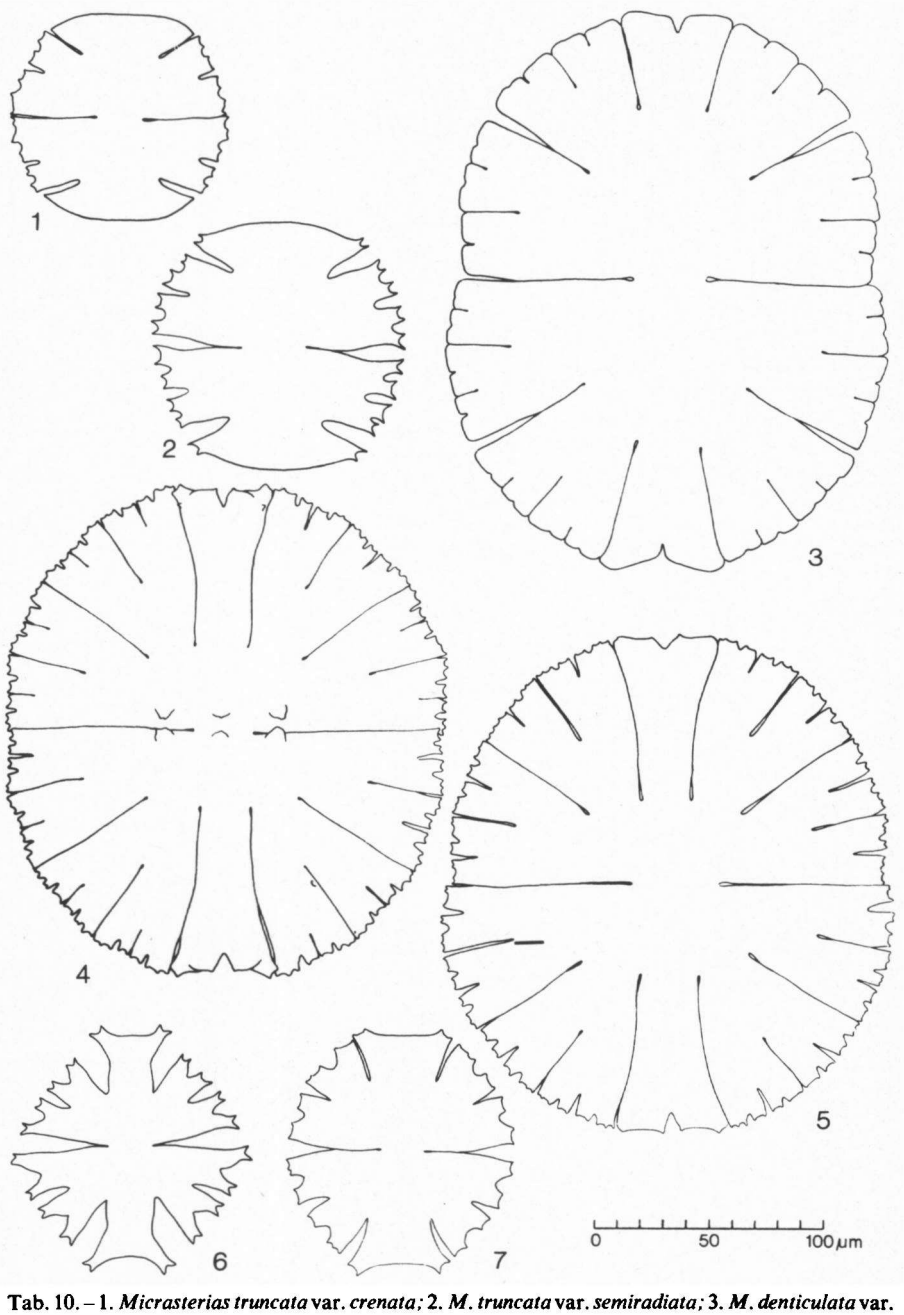
Tab. 7. – 1–2. *Pleurotaenium truncatum;* 3–4. *P. nodulosum.*



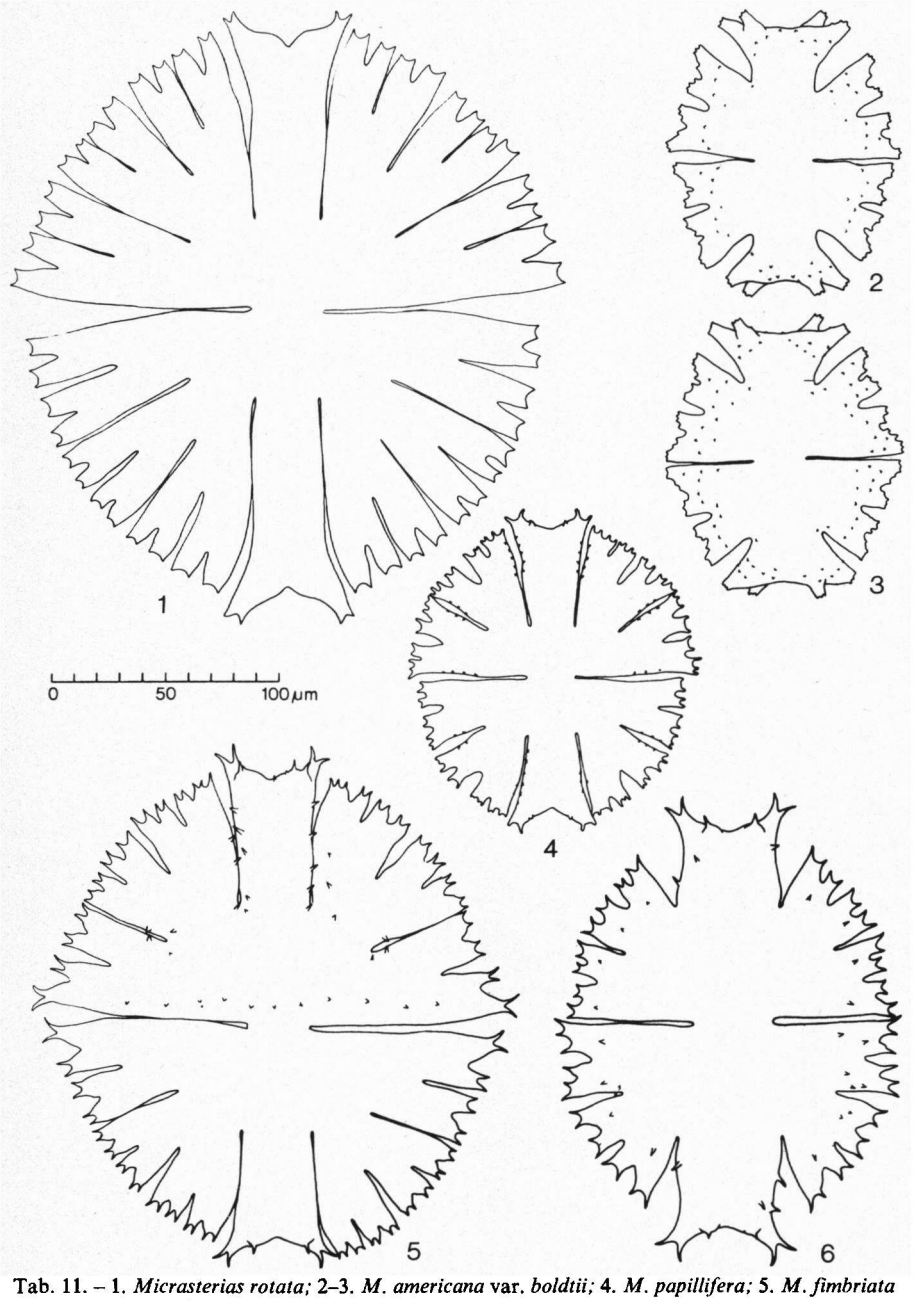
Tab. 8. – 1–3. *Pleurotaenium trabecula;* 4. *P. ehrenbergii;* 5–6. *P. crenulatum;* 7. *Tetmemorus granulatus;* 8. *T. laevis.*



Tab. 9. – 1. *Euastrum oblongum;* 2. *E. pectinatum;* 3. *E. ansatum;* 4. *E. bidentatum;* 5. *E. mononcylum* var. *germanicum;* 6. *E. verrucosum;* 7. *E. pulchellum;* 8. *E. denticulatum* var. *quadrifarium;* 9. *E. dubium* var. *ornatum;* 10. *E. elegans;* 11. *E. bipapillatum* var. *biscrobiculata;* 12. *E. subalpinum;* 13. *E. binale* var. *gutwinskii;* 14–16. *E. insulare.*



Tab. 10. – 1. *Micrasterias truncata* var. *crenata*; 2. *M. truncata* var. *semiradiata*; 3. *M. denticulata* var. *angulosa*; 4–5. *M. thomassiana* var. *notata*; 6. *M. crux-melitensis* var. *crux-melitensis*; 7. *M. crux-melitensis* var. *janeira*.



Tab. 11. – 1. *Micrasterias rotata;* 2–3. *M. americana* var. *boldtii;* 4. *M. papillifera;* 5. *M. fimbriata* var. *spinosa;* 6. *M. brachyptera.*