Research Report 3

A limnological survey of the Alligator Rivers Region

II. Freshwater algae, exclusive of diatoms

H. U. Ling and P. A. Tyler

Supervising Scientist for the Alligator Rivers Region

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ABSTRACT

Ling, H.U. & Tyler, P.A. (1986). A limnological survey of the Alligator Rivers Region. II. Freshwater algae, exclusive of diatoms. Research Report 3, Part II, Supervising Scientist for the Alligator Rivers Region.

The billabongs of the Alligator Rivers Region contain a rich and diverse algal flora which shows strong affinities with that of tropical South-East Asia and the Indian subcontinent. Descriptions and figures of more than 530 taxa are given, mostly identified to species level or better. Some new species, though illustrated and described, require formal taxonomic description. This publication should allow ready identification of most of the freshwater algae of the Alligator Rivers Region.

1

Introduction

When proposals were put to the Australian Government to sanction the mining and milling of uranium in the Alligator Rivers Region of the Northern Territory, a Commission of Inquiry was appointed to enquire into all environmental aspects of the proposals. One of the Commission's recommendations (Fox et al. 1977) was that a comprehensive monitoring program be designed to detect any deleterious effects of the operation on the ecosystems of the area which, the Commission recognised, were delicate and sensitive. The Office of the Supervising Scientist for the Alligator Rivers Region was established to carry out the Commission's recommendations and it was under these auspices that this investigation, commissioned and funded by the Supervising Scientist, was carried out.

The Commission's Second Report (Fox et al. 1977) recognised that there was scant knowledge or understanding of aquatic ecosystems in the area. These ecosystems would bear the brunt of any toxic effluents and the Commission conceded (p. 293) that:

> It is difficult in the present state of knowledge of the Region to specify those physical and biological features of the environment which are likely to prove of most practical value in a continuing monitoring program, and to indicate precisely how they can be reliably sampled and most usefully measured. These aspects will require considerable investigation of a research nature if an efficient and informative monitoring program is to be achieved.

The Commission recognised the enormousness of the task of designing a monitoring program in a tropical region, characteristically rich in flora and fauna which had seen few investigations (in some fields none), and stated (Fox et al. 1977, p. 70) that:

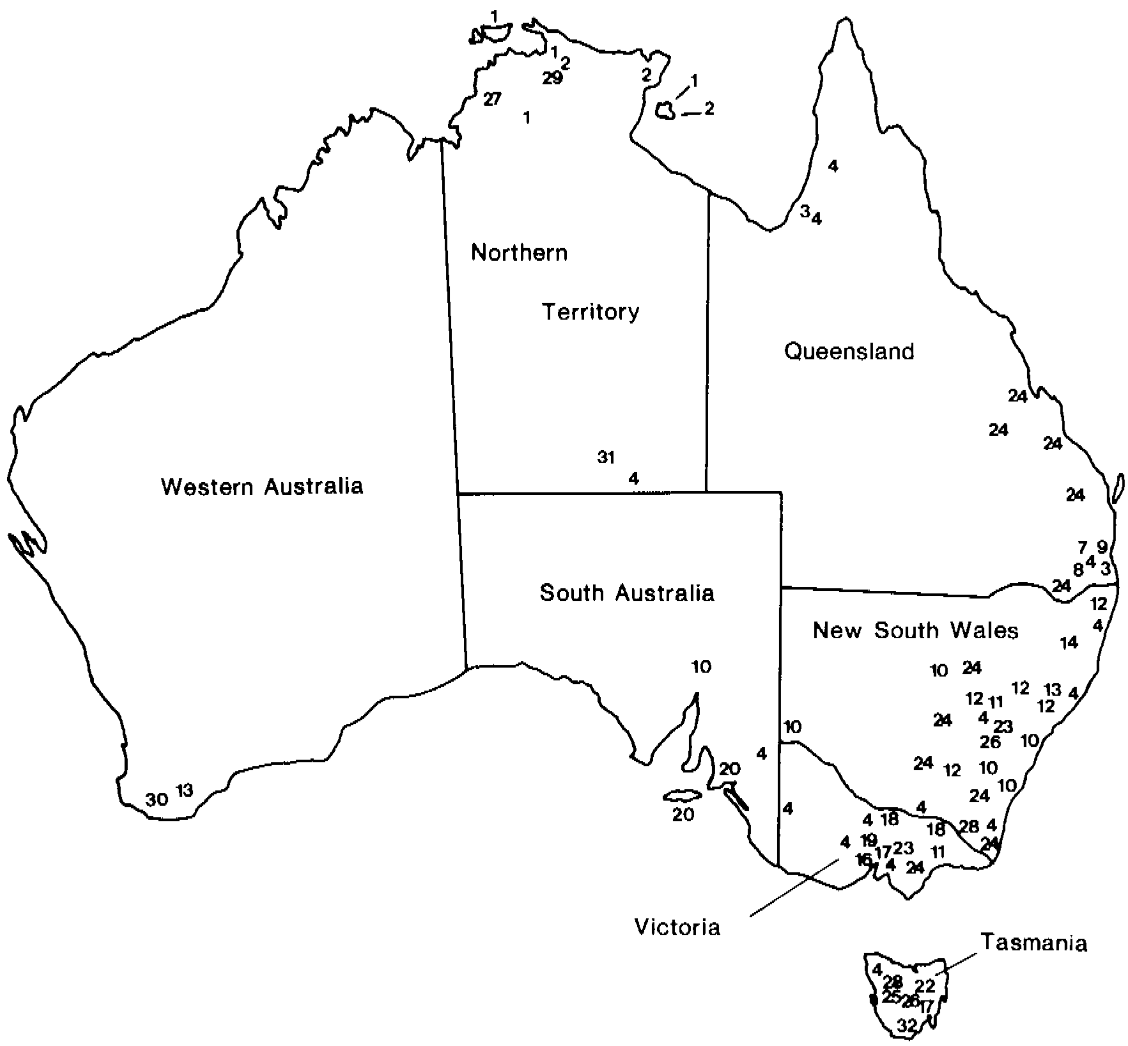
> We believe that the information sought should include: additional biological data, e.g. fuller inventories of species of aquatic plants and animals, including lower organisms . . .

The acknowledgment of lower organisms, often neglected in such considerations, was appropriate. First, algae (either planktonic or attached) are universal components of all natural aquatic ecosystems and are responsible for a major portion of the total carbon fixation on Earth. Their position at the base of many food webs underlies their immense ecological importance; any perturbation of the environment which seriously impairs algal communities may severely affect a host of other communities complexly dependent upon the algae. Secondly, algae have been used in many parts of the world as indicators of heavy metal pollution, and other man-made disturbances, and clearly held promise in this role in the monitoring program envisaged by the Commission. For monitoring of algae to be possible, the daunting task of identification of the multitude of tropical species would have to be overcome. Therein lay the rationale for this study of freshwater algae of the Alligator Rivers Region. Freshwater diatoms were investigated separately (Thomas 1983).

Compared with land plants, and terrestrial and aquatic invertebrates, freshwater algae are comparatively cosmopolitan. Many species of planktonic green algae and of diatoms and chrysophytes are common throughout the temperate world, and a flora published in the Soviet Union is of considerable value in the identification of common algae in Patagonia or Portugal. However, in the tropics there is more endemism. The flora is much richer and more diverse than that of higher latitudes, and there is no text book which is anywhere near adequate. Even the monographs of particular groups of algae are biased towards temperate lands, and to identify local species it is necessary to have reference to a literature more immense, dispersed and obscure than any regional laboratory can reasonably carry. It is there that the need for a regional flora is most felt. Preparation of this usually means access to, or possession of, a privately assembled collection of descriptions and illustrations — an iconotheca.

Australia has not fared well in the production of local algal floras. Figure 1 shows the sites of the few previous studies of freshwater algae and shows how inadequately they cover the continent. Much of the published data comes from itinerant Europeans of the 19th century, or represents the fragmentary results of examining a single sample sent from Australia to Europe. The paucity of data for the tropical parts of Australia is particularly obvious, and it is fortunate that collections made during the 1948 American–Australian Scientific Expedition to Arnhem Land were studied (Scott & Prescott 1958*a*; Croasdale & Scott 1976). Prior to that, the only published records of freshwater algae from the Northern Territory were of 24 species of desmids from among filaments of the green alga *Cladophora* from the back of a tortoise collected near the Daly River in 1894 (Ström 1921), and an unidentified species of *Oedogonium* from the Finke River (Borge 1896).

The aim of this study was to provide a means of ready identification for most of the bewildering array of freshwater algae, exclusive of the diatoms, encountered in large numbers in the waterholes of the Magela Creek system and its near neighbours. The ecology of their populations and the nature of their environment have been discussed elsewhere (Kessell & Tyler 1982; Walker et al. 1981; Walker et al. 1982; Walker & Tyler 1982). Researchers designing a monitoring program, or carrying out ecological studies of the aquatic ecosystem of the Magela, will have frequent contact with this rich and diverse microflora. This paper should remove a major taxonomic hurdle from their path.



1. Croasdale & Scott (1976)
2. Scott & Prescott (1958a)
3. Bailey (1893, 1985, 1898)
4. Borge (1896, 1911)
5. Krieger (1937, 1939)
6. Krieger & Gerloff (1962)
7. McLeod (1975)
8. Möbius (1892, 1894)
9. Schmidle (1896)
10. May (1970, 1972, 1973, 1978)
11. Nordstedt (1888)
12. Playfair (1907, 1908, 1910, 1912, 1914, 1915a,b, 1916a,b, 1917, 1918, 1919, 1921, 1923)
13. Raciborski (1892)
14. Skinner (1980)
15. Thomasson (1973)
16. Hardy (1905, 1906)
17. Tyler (1970)
18. Viyakornvilas (1974)
19. West (1905, 1909a)
20. Prescott & Scott (1952)
21. Harrop (1896)
22. Thomasson & Tyler (1971)
23. Wood, Crosby & Cassie (1959)
24. Foged (1978)
25. Hustedt (1955)
26. Wood (1961)
27. Ström (1921)
28. Powling (1970)
29. Brady (1979)
30. Takahashi (1978)
31. Berg (1953)
32. Couté & Tell (1981)

Figure 1. Locations of previous taxonomic studies on Australian freshwater algae. Numbers indicate sites where specified authors, as listed, have sampled.

2

Methods

Samples were taken with a plankton net (25 μm pore size) or by squeezing macrophytes or scraping rocks, soil, buoys and sticks. They were fixed with 4% formalin or Lugol's Solution (= Lugol) (Lind 1974).

Drawings and measurements were made using a Zeiss (Oberkochen) RA microscope fitted with a camera lucida with internally reflected image, allowing binocular viewing while drawing, and rapid, simple methods of measurement (Tyler 1971). In order to make measurements of bilaterally symmetrical desmids it is sometimes necessary to view them in several planes (Fig. 2). The nomenclature used in desmid mensuration is shown in Fig. 2, and the following abbreviations are used throughout the text:

L. = length
W. = width
csp. = with spines
ssp. = without spines
cpr. = with processes
spr. = without processes
I. = isthmus
T. = thickness
Zygo. = zygospore
A. = apex
D. = diameter
C. = curvature
S. = spine
c. = circa

(The abbreviation Bb. is used throughout for Billabong, also.)

Specimens for scanning electron microscopy were prepared by critical point drying followed by shadowing with gold/palladium.

Sampling sites are shown in Figs 3 and 4 and in Table 1. The sites of all known previous samplings are shown in Fig. 1. For each taxon described in this paper, all known Australian records are given and referenced. Monographs are quoted for distributions outside Australia, and a given form may have been more widely recorded since the appearance of a monograph.

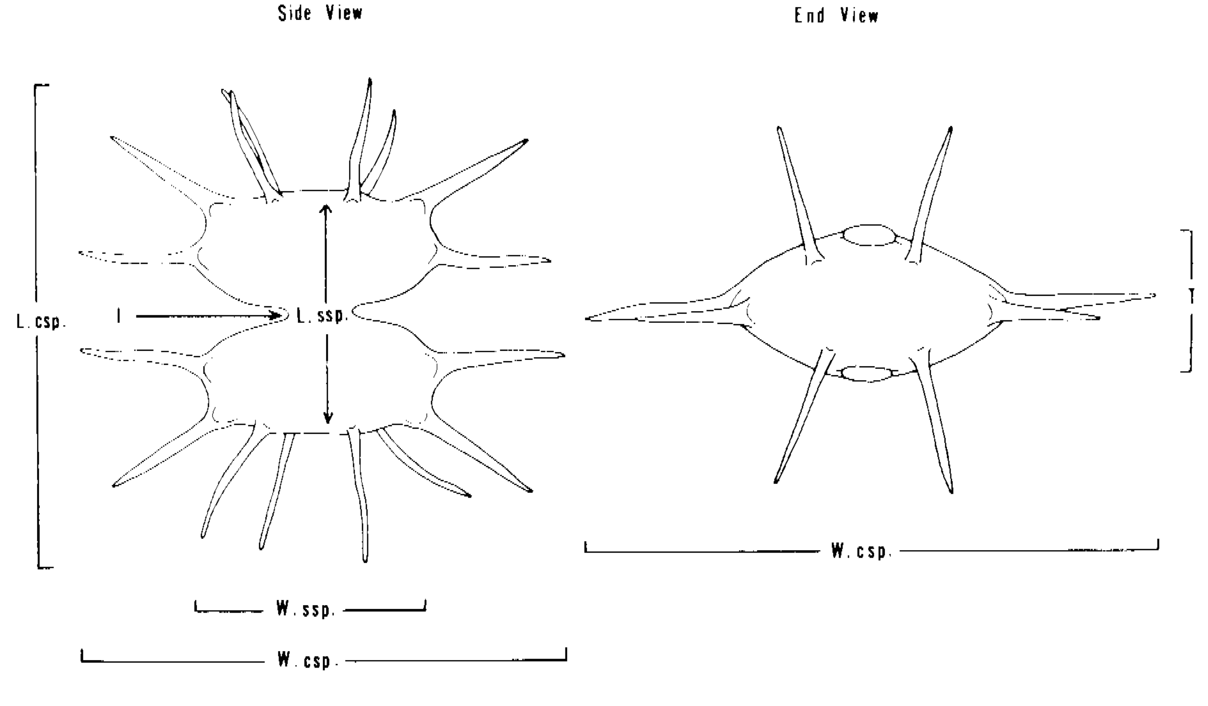


Figure 2. The desmid *Xanthidium hastiferum* var. *javanicum* in side and end view, showing principal axes of mensuration.

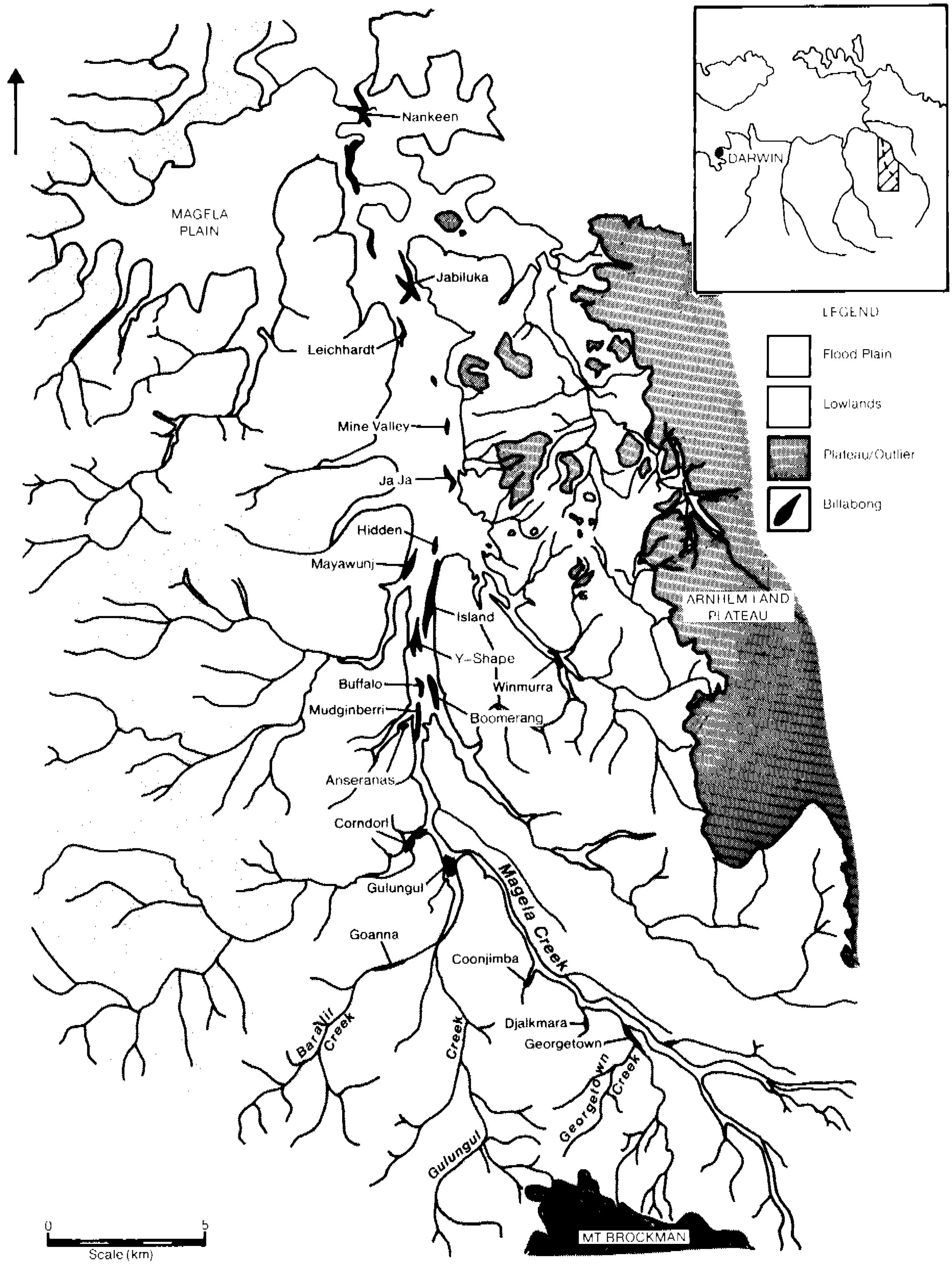


Figure 3. Magela Creek system, showing location of sampling sites. Bowerbird Billabong is off the map to the bottom right, at the headwaters of Magela Creek.

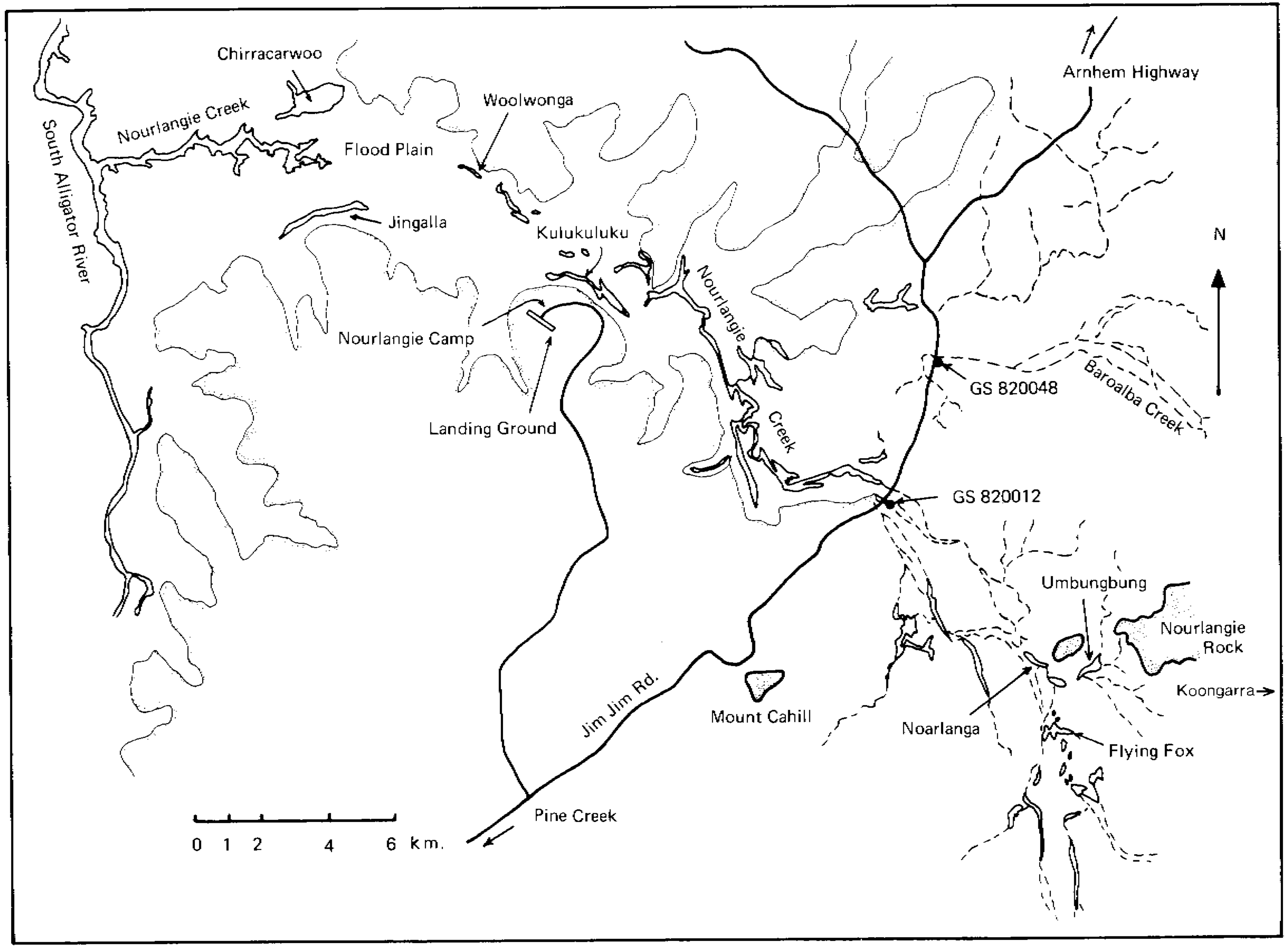


Figure 4. Nourlangie Creek system, showing location of sampling sites.

Table 1. Location, date and brief ecological details for samples

Location	*Date*	*Brief details*
Magela System		
Backflow Billabong	11.iv.78	net tow
	22.vii.80	periphyton
Baralil Creek	3.vi.79	*Chara* periphyton
	14.ii.80	road-culvert, plankton
Bowerbird Billabong	9.x.80	net tow and periphyton
Buffalo Billabong	11.vii.78	net tow
	29.xii.78	net tow
Coonjimba Billabong	15.v.78	net tow
	30.ix.80	net tow and periphyton
Corndorl Billabong	2.ii.79	net tow
	8.iii.79	net tow
	23.viii.79	periphyton
Djalkmara Billabong	3.vi.79	periphyton
Magela crossing	5.ii.79	periphyton
	5.ii.79	drift
Floodplain at Ja Ja	4.ii.79	periphyton
Georgetown Billabong	13.v.78	net tow
	7.vii.78	net tow
	28.viii.78	red scum
	31.xii.78	net tow
Goanna Billabong	15.v.78	net tow
	30.i.79	net tow
	12.iii.80	net tow
	16.iii.81	net tow
Gulungul Billabong	7.vii.78	net tow
	2.ii.79	net tow
	7.iii.79	bony bream stomach contents
	1.vi.79	periphyton
	8.viii.79	net tow
	21.vii.80	periphyton
Hidden Billabong	8.iv.78	net tow
Island Billabong	7.vii.78	net tow
	3.i.79	net tow
	22.vii.80	net tow
Ja Ja Billabong	7.iv.78	net tow
	18.vii.78	net tow
	29.viii.78	net tow
	3.i.79	net tow
	14.iii.79	net tow
	4.vii.79	periphyton
Jabiluka Billabong	6.iv.78	net tow
	20.vii.78	net tow
	13.iii.79	net tow
	4.vi.79	periphyton
OSS laboratory	5.ii.79	puddle
Leichhardt Billabong	6.iv.78	net tow
	8.vii.78	net tow
	2.x.80	net tow and periphyton
Mine Valley Billabong	10.iv.78	net tow and periphyton
	26.viii.78	periphyton
	31.v.79	periphyton
	4.vi.79	periphyton
Mudginberri Billabong	23.viii.79	periphyton
Nankeen Billabong	13.iii.79	net tow
Winmurra Billabong	31.v.79	periphyton
Nourlangie system		
Flying Fox Billabong	2.vi.79	net tow
Jingalla Billabong	23.iii.80	net tow

Table 1. Location, date and brief ecological details for samples (continued)

Location	*Date*	*Brief details*
Kulukuluku Billabong	8.x.80	net tow
	24.ii.81	net tow
near Kulukuluku Billabong	4.vii.80	periphyton
Noarlanga Billabong	30.v.79	periphyton
Umbungbung Billabong	30.v.79	periphyton
	8.viii.80	net tow
Koongarra	29.v.79	drill pool, periphyton
Mary River		
Annaburro Billabong	7.x.80	net tow and periphyton
Darwin		
downstream of Darwin River Dam	7.x.80	net tow and periphyton
Fogg Dam	28.vii.80	net tow
Ironstone Lagoon	22.i.79	net tow
McMinns Lagoon	22.i.79	net tow
Arnhem Land		
Yirrkala	5.viii.80	net tow and periphyton

3

Identification of freshwater algae

The way of the algal taxonomist is not always that of the higher plant, or animal, taxonomist. In particular, greater reliance is placed on illustrations than on descriptions and keys. This is understandable when one ponders the difficulties of describing, without illustrations, such algae as those illustrated in Plate 2:12, Plate 9:31, Plate 11:3, Plate 20:3, or Plate 33:1. By comparison, description of a forget-me-not is simple. Accordingly, the first step in the identification process is, frequently, to hunt through the illustrations for something resembling the specimen beneath the microscope, a process known as comparative iconography, or irreverently as playing snap with pictures. This paper should allow identification of a large number of Magela algae by that simple process alone. However, the text has been kept terse, and users unfamiliar with the algae would do well to refer to some of the more general texts on algae, their taxonomy, and their identification (e.g. Bold & Wynne 1978; Bourrelly 1966–70; Hindak 1978; Hoek 1978; Lee 1980; Prescott 1962, 1978; Smith 1950). Modern reviews of the various algal classes are given by the contributors to Cox (1980), and of selected classes by Tappan (1980). The characteristics of families and genera are given by Bourrelly (1966–70) and Prescott (1962). The book by Prescott (1978) is a particularly useful manual for identification of freshwater algae. The arrangement of classes and families adopted here follows that of Prescott (1962).

The examination of algae should, wherever possible, be carried out on live algae. Particular note should be taken of such features as the number of flagella, colour, number and shape of chloroplasts, evidence for division, and so on. Electron microscopy may or may not assist. For the desmids it gives little more than an aesthetic advance on the light microscope. By contrast, identification of the scaly chrysophyte flagellates (Plates 43 and 45) demands it. For the dinoflagellates it aids delineation of the armour plates.

Most of the desmids and many other algae of the Region can be identified from Plates 1–45. Small flagellates, some blue-green algae and small, round members of the Chlorococcales ('unidentified round, green objects' — URGOs) will always pose problems even for the most experienced workers.

Systematic account

Division CHLOROPHYTA
Class CHLOROPHYCEAE
Order CHAETOPHORALES

Family CHAETOPHORACEAE

Genus *Stigeoclonium* Kützing

S. flagelliferum **Kützing**
Plate 4:17

Prescott (1962, p. 115, plate 11:1,2); Islam (1963, p. 114, plate 16:1–7, plate 20:2,3,7,8).

Branches terminating in long, flagelliform, setiferous tips or colourless multicellular hairs.

Cell L. 35–43 μm; W. 10–12 μm.

Distribution: *Magela crossing 5.ii.79 (attached to aquatic plants and in stomach contents of fish)*; worldwide.

Family CHAETOSPHAERIDIACEAE

Genus *Chaetosphaeridium* Klebahn

C. globosum **(Nordstedt) Klebahn**
Plate 1:3

Prescott (1962, p. 131, plate 14:7).

Cells clustered and enclosed by a common mucilaginous envelope. Each cell is flask-like, with a long, fine seta extending from the neck of the flask. Lateral cells are cut off from the base.

Cell L. 14–17 μm; W. 11–14 μm.

Distribution: *Winmurra Bb. 31.v.79*; USA.

Order CHLOROCOCCALES

Family CHLOROCOCCACEAE

Genus *Tetraedron* Kützing

T. gracile **(Reinsch) Hansgirg**
Plate 2:1–3

Prescott (1962, p. 265, plate 60:1).

Cells flat, cruciform, the angles extended into narrow 1–3-furcated processes which are tipped with short spines. A range of sizes, and complexity in branching of the processes were observed.

Cell D. cpr. 31–54 μm.

Distribution: *Jabiluka Bb. 20.vii.78, Coonjimba Bb. 30.ix.80*; Vic. (Viyakornvilas 1974); Japan, India, China, Europe, North America.

T. hastatum **Reinsch**
Plate 2:4,5

Scott & Prescott (1958*a*, p. 16, fig. 24:16); Prescott (1962, p. 265, plate 59:26).

Cells pyramidal, the angles extended to form long, narrow processes which are bifid or trifid at the ends.

Cell D. 36–40 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; N.T. (Scott & Prescott 1958*a*), Vic. (Viyakornvilas 1974); Japan, North America, Asia.

T. limneticum **Borge**
Plate 2:6–8

Prescott (1962, p. 266, plate 60:2–4); Philipose (1967, p. 158, fig. 73).

Cells tetragonal, angles produced into processes having one to two dichotomous branchings. Margins of the cell concave to straight between the angles.

Cell D. 32–40 μm.

Distribution: *Mine Valley Bb. 26.viii. 78, Coonjimba Bb. 30.ix.80*; Japan, Asia, Europe, North America, Central Africa.

T. regulare **Kützing var. *incus* Teiling fa. *major* Prescott**
Plate 2:10,11

Prescott (1962, p. 269, plate 61:13).

Cells tetragonal, pyramidal, the margins straight or slightly convex, the angles produced to form long, stout spines.

Cell D. ssp. 20 μm, csp. 50 μm.

Distribution: *Gulungul Bb. 7.vii.78*; North America, Africa.

T. victoriae **var. *major*** **Smith**
Plate 2:9

Smith (1920, p. 119, plate 24:19–22); Prescott (1962, p. 271, plate 61:28,29).

Cells 4-sided, with two deeply emarginate sides dividing the cell into two cruciately arranged halves. Angles of cells have a single stout spine.

Cell L. csp. 65 μm; W. 23 μm.

Distribution: *Gulungul Bb. 7.vii.78*; Qld (McLeod 1975), Vic. (Viyakornvilas 1974); North America.

***Tetraedron* sp.**
Plate 2:12

Cell tetragonal, each angle produced into a tapering process ending in one or two points. Cell wall with granular striae.

Cell D. 70 μm.

Distribution: *Ja Ja Bb. 7.iv.78.*

Family DICTYOSPHAERIACEAE

Genus *Botryococcus* Kützing

Some authors place this genus in a family of its own — Botryococcaceae.

***B. braunii* Kützing**
Plate 3:1,2

Philipose (1967, p. 195, fig. 108).

Cells pear-shaped, embedded in tough mucilage, forming colonies. Several colonies held together by interconnecting strands of mucilage. Colonies are free-floating. In fixed material, cells are often expelled from the colonies and appear as individuals capped by a small amount of mucilage.

Cell L. 6–14 μm; W. 3–8 μm.

Distribution: *Djalkmara Bb. 3.vi.79, Coonjimba Bb. 30.ix.80*; Qld (Möbius 1892; Bailey 1893; Borge 1911), N.S.W. (Playfair 1923), Vic. (Hardy 1906; West 1909*a*; Viyakornvilas 1974); Papua New Guinea (Thomasson 1967), cosmopolitan.

Genus *Dictyosphaerium* Nägeli

***D. pulchellum* Wood**
Plate 1:11,12

Prescott (1962, p. 238, plate 51:5–7).

Colony composed of up to 32 spherical cells arranged in series of 4 on branched threads, enclosed in mucilage.

Cell D. 4–7 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; Qld (Schmidle 1896; Bailey 1898, McLeod 1975), N.S.W. (May 1972; Thomasson 1973), Vic. (Hardy 1906; West 1909*a*; Viyakornvilas 1974); Japan, North America, Africa, Europe.

***D. tetrachotomum* Printz**
Plate 1:13,14

Komarek & Perman (1978, p. 267, figs 43–49).

Colonies free-floating, generally of 4–32 cells. Adult cells from oval to almost spherical, attached to stalks with more narrow ends.

Cell L. 7–8 μm; W. 5–6 μm.

Distribution: *Bowerbird Bb. 9.x.80*; Indonesia, Europe, USA, Ukraine (USSR).

Genus *Dimorphococcus* Braun

***D. lunatus* Braun**
Plate 2:13–16

Prescott (1962, p. 252, plate 55:8).

Cells in groups of 4 on the ends of fine, branched threads composed of the fragments of the mother cell wall, the 2 inner cells of the quartet ovate or subcylindric, the 2 outer cells cordate.

Cell L. 7–15 μm; W. 5–7 μm.

Distribution: *Ja Ja Bb. 4.vi.79, Mine Valley Bb. 26.viii.78*; N.T. (Scott & Prescott 1958*a*), Qld (McLeod 1975); Japan, North America, Africa, Europe, New Zealand, Asia.

Family HYDRODICTYACEAE

Genus *Pediastrum* Meyen

***P. araneosum* (Raciborski) Smith**
Plate 1:8

Smith (1920, p. 168, plate 45:11); Prescott (1962, p. 221, plate 47:4).

Surface of cell covered with reticulate ridges.

Cell D. c. 15 μm.

Distribution: *Backflow Bb. 11.iv.78*; Papua New Guinea (Thomasson 1967), Japan, North America.

***P. duplex* var. *gracillimum* West & West**
Plate 1:9

Scott & Prescott (1958*a*, p. 15, fig. 24:4); Prescott 1962, p. 224, plate 48:12).

Colony with large perforations; body of cells narrow.

Cell D. 10–12 μm.

Distribution: *Gulungul Bb. 7.vii.78*; N.T. (Scott & Prescott 1958*a*), Vic. (Viyakornvilas 1974); Japan, North America.

***P. tetras* (Ehrenberg) Ralfs**
Plate 1:7

Scott & Prescott (1958*a*, p. 15, fig. 24:7,14); Prescott (1962, p. 227, plate 50:3,6).

Colony entire; inner cell with 4–6 sides, one margin deeply incised; peripheral cells crenate, with a deep incision.

Cell D. 9 μm.

Distribution: *Umbungbung Bb. 30.v.79*; N.T. (Scott & Prescott 1958*a*), Qld (Bailey 1893; Borge 1911; McLeod 1975), N.S.W. (May 1972), Vic. (Hardy 1906; West 1909*a*; Viyakornvilas 1974); Japan, Asia, Africa, North America, Europe, New Zealand.

Family MICRACTINIACEAE

Genus *Micractinium* Fresenius

M. pusillum **Fresenius**
Plate 1:6

Prescott (1962, p. 287, plate 66:8).

Free-floating colony of 4–16 spherical cells arranged in a pyramid or a square, groups of 4 in association with other similar groups; free walls with 1–5 long, hyaline setae.

Cell D. 4–5 μm.

Distribution: *Kulukuluku Bb. 8.x.80*; Indonesia, Japan, Asia, Europe, North America, Africa.

Family OOCYSTACEAE

Genus *Ankistrodesmus* Corda

A. falcatus **(Corda) Ralfs**
Plate 3:4

Prescott (1962, p. 253, plate 56:6).

Cells needle-like in clusters of 2–32 individuals. Our plants are at the lower end of the size range for this species.

Cell L. 20–25 μm; W. 1–2 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; Qld (Bailey 1893), N.S.W. (May 1972, 1978), Vic. (Hardy 1906; West 1909*a*; Viyakornvilas 1974); Papua New Guinea (Thomasson 1967), Japan, Asia, Africa, North America, Europe.

A. spiralis **(Turner) Lemmermann**
Plate 3:3

Prescott (1962, p. 254, plate 55:11,12).

Cells spindle-shaped, spirally twisted into bundles of 4–16 cells.

L. 40 μm; W. 2–3 μm.

Distribution: *Umbungbung Bb. 30.v.79*; Japan, North America, British Isles, Europe.

Genus *Chodatella* Lemmermann emend. Fott

See comments by Philipose (1967, pp. 167, 170) on *Chodatella* versus *Lagerheimia*.

C. subsala **Lemmermann**
Plate 3:8

Prescott (1962, p. 251, plate 55:7, *Lagerheimia subsala*).

Cells ovate, with a tuft of 2–4 setae at the poles.

Cell L. 8 μm; W. 14 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; Europe, North America.

Genus *Kirchneriella* Schmidle

K. lunaris **(Kirchner) Möbius**
Plate 1:25

Prescott (1962, p. 258, plate 58:2).

Colony composed of cells arranged in groups of 4–16 within a close, gelatinous envelope; cells strongly curved crescents.

Cell L. 9–14 μm; W. 4–6 μm.

Distribution: *Backflow Bb. 11.iv.78*; Qld (Möbius 1894; Bailey 1895, 1898; Schmidle 1896; McLeod 1975), N.S.W. (Thomasson 1973), Vic. (Hardy 1906; West 1909*a*; Viyakornvilas (1974); Japan, Asia, Africa, North America, Europe, New Zealand.

K. obesa **(W. West) Schmidle**
Plate 1:24

Prescott (1962, p. 259, plate 58:5).

Colony of many, irregularly arranged, strongly lunate cells in a wide gelatinous envelope.

Cell L. 6–10 μm; W. 3–6 μm.

Distribution: *Island Bb. 22.vii.80*; Qld (McLeod 1975); New Zealand, Europe, North America, Asia, Africa.

Genus *Nephrocytium* Nägeli

N. lunatum **W. West**
Plate 1:16–18

Prescott (1962, p. 249, plate 54:19).

Colony ovate, consisting of 4–8 lunate, bluntly-pointed cells enclosed by a thin, hyaline membrane and arranged so that the concave wall is directed toward the centre of the colony.

Cell L. 14–20 μm; W. 4–7 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; Vic. (West 1909*a*); Papua New Guinea (Thomasson 1967), Japan, Africa, North America, Europe.

Genus *Oocystis* Nägeli

O. borgei **Snow**
Plate 3:7

Philipose (1967, p. 183, fig. 93).

Cells broadly ellipsoid with rounded ends. Poles not thickened. Chloroplasts 1–4, parietal, each with a pyrenoid. Colonies of 2–8 cells, enclosing envelope more or less round.

Cell L. 10–16 μm; W. 7–11 μm.

Distribution: *Coonjimba Bb. 30.ix.80, Kulukuluku Bb. 8.x.80*; Qld (McLeod 1975); Indonesia, India, Japan, Europe, North America, Africa.

Genus *Selenastrum* Reinsch

S. bibraianum **Reinsch**
Plate 1:26

Prescott (1962, p. 256, plate 57:9).

Ovate colony of 4–16 lunate or sickle-shaped cells with sharp apices and arranged so that the convex surfaces are opposed and directed toward the centre of the colony.

Cell L. 20–24 μm; W. 5–7 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (McLeod 1975), N.S.W. (May 1972); Japan, North America, Europe.

S. gracile Reinsch
Plate 1:20,21

We are uncertain about the position of our plants. They agree with *S. bibraianum* in shape but not in size. They also agree with *S. gracile* (Philipose 1967, p. 219, fig. 128) but the apices are slightly rounded rather than sharp.

Cell D. 3–4 μm; 7–20 μm between apices.

Distribution: *Leichhardt Bb. 6.iv.78, Mine Valley Bb. 26.viii.78.*

S. westii Smith
Plate 1:22

Colonies of 4–8 slender, arcuate cells arranged with their convex walls apposed. Our plant appears to be intermediate between *S. gracile* and *S. westii* (Prescott 1962, p. 257, plates 57:11 and 57:10 respectively).

Cell D. 2.5–3 μm; 13–18 μm between apices.

Distribution: *Backflow Bb. 11.iv.78.*

Genus *Treubaria* Bernard

T. triappendiculata Bernard
Plate 3:11,12

Philipose (1967, p. 107, fig. 32).

Cells 3–4-angled, each angle produced into a long, stout, hyaline spine, making the cells inconspicuous. Care should be taken to distinguish this green alga from the chrysophyte genus *Bitrichia* (Reymond & Cronberg 1981).

Cell ssp. 9–10 μm, csp. 48–51 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; Indonesia, India, Europe, North America.

Family PALMELLACEAE

Genus *Sphaerocystis* Chodat

S. schroeteri Chodat
Plate 43:1–4

Prescott (1962, p. 83, plate 3:6,7).

Free-floating, globose colony of 4–64 spherical cells enclosed in a gelatinous envelope. Both undivided and recently divided cells occur in the same colony. Occasionally a sheath is discernible around each cell.

Cell D. 2–9 μm. Colony D. 30–70 μm.

Distribution: *Annaburroo Bb. 7.x.80, Kulukuluku Bb. 24.ii.81*; cosmopolitan.

Family RADIOCOCCACEAE

Genus *Coenochloris* Korsikov

C. pyrenoidosa Korsikov
Plate 2:17–21

Hindak (1977, p. 19, plate 3).

Colonies of 4–64 cells enclosed in mucilage. Cells spherical, with single pyrenoids. Usually has 4 or 8 autospores, which are released by the cracking or splitting in two of the mother cell wall.

Cell D. 7–9 μm. Colony D. up to 60 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; Czechoslovakia, Sierra Leone (Africa).

Family SCENEDESMACEAE

Genus *Actinastrum* Lagerheim

A. gracillimum Smith
Plate 3:10

Smith (1920, p. 164, plate 43:3–5).

Cells cylindrical, arranged radially to form stellate colonies of 4 or 8 individuals.

Cell L. 15 μm; W. 3 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; North America.

A. hantzschii Lagerheim
Plate 3:9

Prescott (1962, p. 281, plate 64:10,11); Scott & Prescott (1958*a*, p. 18, fig. 25:18).

Cells spindle-shaped.

L. 23 μm; W. 3 μm.

Distribution: *Gulungul Bb. 7.vii.78*; N.T. (Scott & Prescott 1958*a*), N.S.W. (Playfair 1916*a*; May 1972, 1978), Vic. (Viyakornvilas 1974); Japan, North America, Africa, Europe, New Zealand, Korea.

Genus *Coelastrum* Nägeli

C. intermedium (Bohlin) Korsikov
Plate 1:19

Our plant agrees with *C. microporum* Nägeli as described by Smith (1920, p. 160, plates 41:12 and 42:1); however, Thomasson (pers. comm.) states that Smith's plant should be identified as *C. intermedium* (Bohlin) Korsikov, which was originally *C. pulchrum* Schmidle var. *intermedium* Bohlin. Philipose (1967, p. 231) quoted *C. intermedium* as a synonym of *C. cambricum* Archer var. *intermedium* (Bohlin) G.S. West but, in a recent article, Hindak (1977, p. 177, plate 72:8) has called his plants *C. intermedium*.

A hollow, spherical colony of 8–64 cells. Cells spherical, enclosed by a delicate gelatinous sheath and connected to one another by short, stout, gelatinous processes.

Cell D. (including sheath) 8–12 μm.

Distribution: *Backflow Bb. 11.iv.78*; Asia, Europe, North America.

Genus *Crucigenia* Morren

C. quadrata Morren var. secta Playfair
Plate 3:5

Playfair (1916*a*, p. 832, plate 57:5).

Colony of 4 cells, each cell occupying the quadrant of a circle. Cells separated from one another by a small gap.

Cell D. c. 4 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; N.S.W. (Playfair 1916*a*), Japan, North America.

***Crucigenia* sp.**
Plate 3:6

Cell L. 5–7 μm; W. 3–4 μm.

Distribution: *Djalkmara Bb. 3.vi.79.*

Genus *Scenedesmus* Meyen

***S. bernardii* Smith forma**
Plate 3:21

Prescott (1962, p. 276, plate 63:1).

Cells fusiform, adjoined alternately by the apex of one cell to the midregion of the next. Our plant differs in that the wall is faintly granular and wrinkled.

Cell L. 18–22 μm; W. 4 μm.

Distribution: *Fogg Dam 28.vii.80.*

***S. bijuga* (Turpin) var. *alternans* (Reinsch) Hansgirg**
Plate 3:17

Prescott (1962, p. 277, plate 63:3,4).

Cells ovate or elliptic, regularly arranged in 2 alternating series.

Cell L. 10–11 μm; W. 6 μm.

Distribution: *Ja Ja Bb. 4.vi.79*; Qld (McLeod 1975); Japan, North America, Europe, Korea.

***S. brasiliensis* Bohlin**
Plate 3:14

Scott & Prescott (1958*a*, p. 17, fig. 25:8); Philipose (1967, p. 261, fig. 170).

Cell L. 23–27 μm; W. 7–8 μm.

Distribution: *Kulukuluku Bb. 4.vii.80*; N.T. (Scott & Prescott 1958*a*), Qld (Bailey 1913; McLeod 1975); cosmopolitan.

***S. dimorphus* (Turpin) Kützing**
Plate 3:22

Scott & Prescott (1958*a*, p. 18, fig. 25:16); Prescott (1962, p. 277, plate 63:8,9).

Colony of 4 or 8 cells, in single or alternating series, outer cells lunate, inner cells fusiform.

Cell L. 28–40 μm; W. 4–5 μm.

Distribution: *Umbungbung Bb. 30.v.79*; N.T. (Scott & Prescott 1958*a*), Qld (McLeod 1975), Vic. (Viyakornvilas 1974); Japan, North America, Europe, Africa, New Zealand, Korea.

***S. perforatus* Lemmermann**
Plate 3:15,16

Scott & Prescott (1958*a*, p. 18, fig. 25:7); Prescott (1962, p. 279, plate 46:24,25).

Colony with biconvex intercellular spaces; end cells bearing a long, curved spine at each pole.

Cell L. 14–21 μm; W. 4–7 μm.

Distribution: *Hidden Bb. 8.iv.78, Mine Valley Bb. 26.viii.78*; N.T. (Scott & Prescott 1958*a*), Qld (McLeod 1975); Asia, North America, South America, Europe.

***S. quadricauda* (Turpin) Brébisson**
Plate 3:20, Plate 45:1

Scott & Prescott (1958*a*, p. 18, fig. 25:10,14).

Terminal cells have a long curved spine at each pole.

Cell L. 20–23 μm; W. 7 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; N.T. (Scott & Prescott 1958*a*), Qld (Möbius 1892; Bailey 1893; McLeod 1975), N.S.W. (Borge 1896; May 1972, 1978), Vic. (Hardy 1906; West 1909*a*; Viyakornvilas 1974); Japan, Asia, North America, Africa, Europe, Korea.

***S. quadricauda* forma**
Plate 3:19

Probably a small growth form.

Cell L. 14 μm; W. 6–8 μm.

Distribution: *Mine Valley Bb. 26.viii.78.*

***Scenedesmus* sp.**
Plate 3:18

Our plant appears to be intermediate between *S. denticulatus* Lagerheim (Philipose 1967, p. 268, fig. 176) and *S. smithii* Teiling (Philipose 1967, p. 272, fig. 178).

Cell L. 14–16 μm; W. 8–9 μm; S. 4–6 μm.

Distribution: *Mine Valley Bb. 26.viii.78.*

Genus *Tetrallantos* Teiling

***T. lagerheimii* Teiling**
Plate 1:23

Prescott (1962, p. 287, plate 66:4–6).

Colony of 4 crescent- or sausage-shaped cells arranged in 2 pairs and in 2 planes. One pair face each other and are in contact at their poles, the other pair lie at right angles to these, in a longitudinal plane, arranged so that each member has 1 pole at the point of contact of the poles of the other pair.

Cell L. 9–10 μm; W. 3–4 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; Qld (McLeod 1975), N.S.W. (Playfair 1916*a*); Indonesia, Philippines, India, North America, Europe, New Zealand, South Africa.

Genus *Tetrastrum* Chodat

***T. heteracanthum* (Nordstedt) Chodat**
Plate 3:13

Philipose (1967, p. 244, fig. 156); Hindak (1977, p. 165, plate 68:10).

Colonies 4-celled and flat, cells quadrately arranged. Cells with a long and short seta from the outer surface.

Cell D. 5–7 μm. L. long seta 8–15 μm; L. short seta 3–4 μm.

Distribution: *Umbungbung Bb. 8.viii.80*; Indonesia, India, China, Japan, Europe, North America, Africa.

Order OEDOGONIALES

Family OEDOGONIACEAE

Genus *Bulbochaete* Agardh

Thallus a unilaterally branched filament arising from a basal cell which has a holdfast organ. Plants characteristically bear setae with bulbous bases. We were unable to identify the two vegetative plants observed, as sexual characteristics are essential in the identification of species.

***Bulbochaete* sp. 1**
Plate 4:15

Plant with very long setae.

Distribution: *Umbungbung Bb. 30.v.79.*

***Bulbochaete* sp. 2**
Plate 4:16

Plants forming fluffy, globose clusters.

Distribution: *Mudginberri Bb. 23.viii.79.*

Genus *Oedogonium* Link

***O. pusillum* Kirchner**
Plate 4:13

Skuja (1949, p. 86, plate 8:1–8).

Cell L. 22–30 μm; W. 4 μm. Oogonium L. 20–23 μm; W. 15 μm.

Distribution: *Jabiluka Bb. 4.vi.79*; Asia, Africa.

***O. undulatum* (Brébisson) Braun**
Plate 4:14

Prescott (1962, p. 209, plate 40:3–5).

Cell L. 65 μm; W. 14–16 μm.

Distribution: *Gulungul Bb. 7.iii.79 (fish stomach contents)*; N.T. (Scott and Prescott 1958*a*), Qld (Möbius 1892, 1894; Bailey 1893, 1895, 1989; Borge 1896; Schmidle 1896), N.S.W. (Borge 1896; May 1972), Vic. (Borge 1896; Hardy 1906; West 1909*a*); Japan, Africa, North and South America, British Isles, Europe, Russia, New Zealand, Korea.

Order TETRASPORALES

Family GLOEOCYSTACEAE

Genus *Gloeocystis* Nägeli

***G. gigas* (Kützing) Lagerheim**
Plate 1:10

Prescott (1962, p. 84, plate 3:16).

Colony of 1, 4 or 8 spherical or slightly oblong individuals enclosed by a copious, gelatinous, lamellate envelope.

Cell D. 11–18 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (McLeod 1975), N.S.W. (Playfair 1916*a*), Vic. (Hardy 1906; West 1909*a*); Japan, Africa, Asia, North America, New Zealand, Europe.

Family TETRASPORACEAE

Genus *Paulschulzia* Skuja

***P. pseudovolvox* (Schulz) Skuja**
Plate 1:1,2

Lund (1956, p. 601, figs 4 and 5, especially 5E).

Globose to broadly ellipsoid colonies of groups of 2 to 4 cells, each group within a clearly visible, separate envelope. Entire colony is bounded by a similar envelope. Cells are globose and each bears two long pseudocilia.

Cell D. at maturity 9–10 μm.

Distribution: *Ironstone Lagoon 22.i.79*; Europe.

Genus *Schizochlamys* Braun

***S. gelatinosa* Braun**
Plate 1:5

Scott & Prescott (1958*a*, p. 14, fig. 24:1); Prescott (1962, p. 90, plate 4:15).

Thallus an amorphous, soft gelatinous mass, often macroscopic; usually attached to twigs but may be free-floating. Cells spherical, irregularly arranged. Mother cell wall fragments 2 or 4 persisting in the colonial mucilage. Pseudocilia evident.

Cell D. 11–12 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*), Qld (Bailey 1913; McLeod 1975); Europe, North America.

***Schizochlamys* sp.**
Plate 1:4

This is probably a new species. Cells occur in tetrads enclosed in mucilage. Pseudocilia evident.

Cell D. 17–19 μm. Tetrad D. 22–30 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

Order ULOTRICHALES

Family ULOTRICHACEAE

Genus *Geminella* Turpin

***G. ordinata* (West & West) Heering**
Plate 43:8,9

Prescott (1962, p. 101, plate 24:9).

Our plant differs in that the cells are ovate to globose and are about a cell's length or less from one another. Also, each cell has its own mucilage envelope. The envelopes are adjoined to form a filament within a wide gelatinous sheath.

Cell L. 4.5–5.5 μm; W. 3–4 μm. Sheath 17–18 μm.

Distribution: *Djalkmara Bb. 3.vi.79*; North America.

***Geminella* sp.**
Plate 43:7

Cells short, cylindrical. Our plants should be compared with *G. minor* (Nägeli) Heering (Prescott 1962, p. 100, plate 6:17).

Cell 4–6 by 10–12 μm. Sheath 29–31 μm.
Distribution: *Djalkmara Bb. 3.vi.79.*

Genus *Radiofilum* Schmidle

***R. irregulare* (Wille) Brunnthaler**
Plate 1:15

Prescott (1962, p. 104, plate 7:5).

Filaments long, irregularly branched; branches often anastomosing to form a series of chain-like links. Cells transversely ellipsoid and appearing in more than one series within the wide gelatinous sheath. The plants were found in shallow, flowing water, together with *Spirogyra* and are similar to it in colour and feel.

Cell D. 7–8 μm; L. 10–12 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

Order VOLVOCALES

Family PYRAMIMONACEAE

Genus *Pyramimonas* (*Pyramidomonas*) Schmarda

This, with other genera, is often placed in a separate class, Prasinophyceae, or even division, Prasinophyta. There is doubt as to the wisdom of this (Norris, in Cox (1980)).

***Pyramimonas* sp.**
Plate 43:30

Prescott (1962, p. 68).

Cells 4-lobed when seen in end view, 4 flagella attached in the apical depression.

Cell L. 18 μm; W. 8 μm.

Distribution: *Georgetown Bb. 13.xi.80.*

Family VOLVOCACEAE

Genus *Chlamydomonas* Ehrenberg

***C. bicocca* Pascher**
Plate 42:25–27

Huber-Pestalozzi (1961, p. 279, plate 56:336).

Cells ovate to spherical with an anterior papilla and 2 pyrenoids.

Cell L. 12–19 μm; W. 17–20 μm.

Distribution: *Ex-culture of sample from Georgetown Bb.*; Europe.

Genus *Eudorina* Ehrenberg

***E. elegans* Ehrenberg**
Plate 41:4,5

Prescott (1962, p. 76, plate 1:24–26).

Colony spherical or ovate with 16–64 ovoid cells evenly disposed within a gelatinous envelope, the cells usually lying near the periphery. Two forms were observed; one has a homogeneous envelope, while the other has an envelope that is differentiated into two layers, the outer appearing denser than the inner.

Cell D. 9–15 μm. Colony D. 103–140 μm.

Distribution: *Jabiluka Bb. 20.vii.78*; N.S.W. (Thomasson 1973), Vic. (Hardy 1906; West 1909*a*; Viyakornvilas 1974); cosmopolitan.

Genus *Gonium* Müller emend. Prescott

***G. formosum* Pascher**
Plate 41:1

Prescott (1962, p. 74); Huber-Pestalozzi (1961, p. 624, plate 128:878).

A free-swimming, plate-like, quadrangular colony of 16 ovoid cells enclosed in relatively wide individual sheaths, which are joined to neighbouring sheaths by narrow extensions. There is a large, circular, open space in the centre of the plate.

Cell L. 10–12 μm; W. 8–10 μm.
Distribution: *Ironstone Lagoon 22.i.79*; Europe, North America.

Genus *Pandorina* Bory

Contrary to expectations, *Pandorina* is extremely rare in our samples. Only two colonies were observed and the plants could not be identified with certainty.

***P. morum* (Müller) Bory?**
Plate 41:2

Prescott (1962, p. 74, plate 1:23).

Small, atypical colony.

Cell L. 7 μm; W. 5 μm.

Distribution: *Leichhardt Bb. 6.iv.78.*

***Pandorina* sp.**
Plate 41:3

Colony oblong to ovate with 16 pyriform cells compactly arranged in four alternating whorls, each composed of four cells.

Cell D. 8–10 μm. Colony L. 39 μm; W. 28 μm.
Distribution: *Mine Valley Bb. 26.viii.78.*

Genus *Volvox* Linnaeus

***V. aureus* Ehrenberg**
Plate 41:6,7

Prescott (1962, p. 78, plate 2:4).

Free-swimming, spherical colony of one to three thousand cells arranged at the periphery of a gelatinous sphere. Cells all directed outward, each with 2 equal flagella. Fine cytoplasmic strands interconnect the cells.

Cell D. 5–7 μm.

Distribution: *Annaburroo Bb. 7.x.80*; Qld (Bailey 1895, 1913; McLeod 1975); New Zealand, North America, Europe, South Africa.

Order ZYGNEMATALES

Family DESMIDIACEAE

Genus *Actinotaenium* Teiling

The genus is characterised by omniradiate (circular in end view) cells, with smooth cell walls and stellate, lobo-stellate or taenio-parietal chloroplasts. The sinus is generally a shallow furrow. Most of its species were previously classified under *Cosmarium* or *Penium*.

A. capax **(Joshua) Teiling var. *minus* (Schmidle) Teiling ex Ruzicka & Pouzar**
Plate 23:20

Ruzicka & Pouzar (1978, p. 42); West & West (1908, p. 117, plate 74:22–23, *Cosmarium subturgidum* (Turner) Schmidle fa. *minor* Schmidle).

Cell L. 69 μm; W. 46 μm; I. 44 μm.

Distribution: *Goanna Bb. 30.i.79*; N.T. (Croasdale & Scott 1976), Qld (Schmidle 1896); Southeastern Asia, Europe, Africa.

A. cucurbita **(Brébisson) Teiling ex Ruzicka & Pouzar**
Plate 23:22

Ruzicka & Pouzar (1978, p. 44); Scott and Prescott (1958*a*, p. 45, fig. 12:25, *Cosmarium curcurbita* Brébisson fa. *rotundatum* Krieger).

C. cucurbita and its various forms are synonymous.

Cell L. 28 μm; W. 17 μm; I. 16 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*); cosmopolitan.

A. cucurbitinum **(Bissett) Teiling**
Plate 23:19

Teiling (1954, p. 399, fig. 36).

Penium cucurbitinum Bissett and *Cosmarium cucurbitinum* (Bissett) Lütkemuller are synonymous.

Cell L. 64 μm; W. 25 μm; I. 24 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; S.A. (Prescott & Scott 1952); cosmopolitan.

A. diplosporum **(Lundell) Teiling**
Plate 5:35

Teiling (1954, p. 411, fig. 74); Lundell (1871, p. 83, plate 5:7, *Cylindrocystis diplospora*).

Cell L. 63 μm; W. 27 μm; I. 26 μm.

Distribution: *Goanna Bb. 30.i.79*; New Zealand, India, Europe, USA.

A. elongatum **(Raciborski) Teiling forma**
Plate 23:21

Croasdale & Scott (1976, p. 529, plate 8:3).

Cell L. 169–181 μm; W. 45–54 μm; A. 20 μm; I. 43–47 μm.

Distribution: *Hidden Bb. 8.iv.78, Gulungul Bb. 21.vii.80*; N.T. (Croasdale & Scott 1976).

Genus *Arthrodesmus* (Ehrenberg) Ralfs

A. octocornis **Ehrenberg**
Plate 27:25

West & West (1911, p. 111, plate 117:6–10).

A slender species with needle-like spines.

Cell L. ssp. 17 μm, csp. 42 μm; W. ssp. 15 μm, csp. 38 μm; I. 5 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*), Vic. (Hardy 1905); widespread around the world.

Genus *Bambusina* (Kützing) Ralfs

B. brebissonii **Kützing**
Plate 9:1

West et al. (1923, p. 225, plate 165:8,9, *Gymnozyga moniliformis* Ehrenberg); Scott & Prescott (1961, p. 123, plate 62:1).

Zygospore oval and smooth.

Cell L. 25–29 μm; W. 15–16 μm; I. 15 μm; A. 10–11 μm. Zygo. L. c. 23 μm; W. 17 μm.

Distribution: *Hidden Bb. 8.iv.78, Goanna Bb. 15.v.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976), Qld (Bailey 1893, 1898; Möbius 1894; Borge 1896; McLeod 1975), N.S.W. (Skinner 1976), Vic. (Hardy 1905); Asia, Europe, Africa, North and South America.

B. sphaerospora **Scott & Grönblad**
Plate 9:2

Scott & Grönblad (1957, p. 50, plate 35:26,27).

Cell L. 46–47 μm; W. 15–16 μm; A. 12 μm.

Distribution: *Bowerbird Bb. 9.x.80*; Florida (USA).

Genus *Closterium* (Nitzsch) Ralfs

The taxonomy of the genus *Closterium* is difficult. The major characteristics used to distinguish species are:

(a) presence or absence of girdle bands, which are transverse lines resulting from the method of cell division adopted by some species (Fritsch 1948, pp. 347–9) (Plate 7:10);
(b) presence or absence of fine longitudinal striae (Plate 7:8); and
(c) degree of curvature, determined with a closteriometer (Heimans 1946).

Observation of the presence of the first two characteristics is difficult. It is aided by squashing cells by coverslip pressure to expel chloroplast material, by the use of stains (gentian violet, methylene blue) or by differential interference contrast microscopy.

***Cl. acerosum* (Schrank) Ehrenberg**
Plate 8:5–7

West & West (1904, p. 146, plate 18:2–5).

Outer margin slightly curved (C. 10–20°) inner margin almost straight or slightly convex; often suddenly attenuated near the apices, apex usually truncate, slightly thickened.

Cell L. 342–410 μm; W. 35–36 μm; A. 9 μm.

Distribution: *Goanna Bb. 12.iii.80*; N.T. (Scott & Prescott 1958*a*), Qld (Bailey 1893), N.S.W. (Playfair 1914), S.A. (Borge 1896); almost cosmopolitan.

***Cl. biclavatum* Börgesen fa. *australiense* Scott ex Croasdale**
Plate 5:11,12

Croasdale & Scott (1976, p. 507, plate 1:5).

The *Closterium biclavatum* described by Scott & Prescott (1958*a*, p. 22, fig. 20:9; 1961, p. 10, plate 2:1) and Thomasson (1966, p. 19, plate 20:4) are synonymous. Our plant is shorter than those previously described.

Cell L. 296 μm, W. 6 μm.

Distribution: *Backflow Bb. 22.vii.80*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976); Indonesia, Rhodesia.

***Cl. cynthia* De Notaris forma**
Plate 5:21

We have tentatively placed our plant as a form of *Cl. cynthia* as described by West & West (1904, p. 113, plate 11:1–3). It is smaller and has more striations (25 per 10 μm) on the light-brown cell wall.

Cell L. 58 μm; W. 9 μm; A. 3 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

***Cl. dianae* Ehrenberg**
Plate 5:23

The plant is identical to that described by Scott & Prescott (1958*a*, fig. 1:3). It has 3 narrow girdle bands (Prescott et al. 1975, p. 46 stated that girdle bands are not present in *Cl. dianae*) and the apex has a conspicuous inner granular thickening of the wall.

Cell C. 160°; L. 220 μm; W. 25 μm; A. 4 μm.

Distribution: *Corndorl Bb. 2.ii.79*; N.T. (Scott & Prescott 1958*a*), Qld (Möbius 1892; Bailey 1893; Schmidle 1896; McLeod 1975), N.S.W. (Krieger 1937), S.A. (Prescott & Scott 1952), Vic. (Hardy 1905; West 1909*a*); Papua New Guinea (Thomasson 1967), New Zealand, Asia, Europe, Africa, North and South America.

***C. dianae* var. *arcuatum* (Brébisson) Rabenhorst**
Plate 5:22

Scott & Prescott (1958*a*, fig. 1:4); Prescott et al. (1975, p. 46, plate 23:7).

A variety more strongly curved than the typical.

Cell C. 183°; L. 210 μm; W. 20 μm; A. 3 μm.

Distribution: *Jabiluka Bb. 13.iii.79*; N.T. (Scott & Prescott 1958*a*), S.A. (Prescott & Scott 1952); New Zealand, Asia, Europe, East Africa, North America.

***Cl. dianae* var. *brevius* (Wittrock) Petkoff**
Plate 5:17

A variety that is stouter than the typical. Our plant is less curved than those described by Prescott et al. (1975, p. 47, plate 23:9,13).

Cell C. 95°; L. 148 μm; W. 22 μm; L.:W. 6.7; A. 6 μm.

Distribution: *Goanna Bb. 30.i.79*; North and South America, East Indies, Europe.

***Cl. ehrenbergii* Meneghini var. *malinvernianum* (De Notaris) Rabenhorst**
Plate 5:18

Scott & Prescott (1958*a*, p. 23, fig. 1:9); Prescott et al. (1975, p. 50, plate 21:7).

Cells bowed, slightly tumid in the mid-region; pyrenoids numerous and scattered; cell wall straw-coloured and finely striated (visible under oil immersion), about 15 striae in 10 μm. West & West (1904, p. 145, plate 17:5,6) have placed this variety under *Cl. malinvernianum* De Notaris.

Cell L. 323–350 μm; W. 62–64 μm.

Distribution: *Near Kulukuluku Bb. 4.vii.80*; N.T. (Scott & Prescott 1958*a*); Asia, North America, Europe, Africa, arctic.

***Cl. incurvum* Brébisson**
Plate 5:20

West & West (1904, p. 136, plate 15:28–30); Prescott et al. (1975, p. 53, plate 36:5,6).

Poles acutely pointed, wall smooth and light brown.

Cell C. 180°; L. 47 μm; W. 8 μm.

Distribution: *Winmurra Bb. 31.v.79*; Vic. (West 1909*a*); cosmopolitan.

***Cl. infractum* Messikommer**
Plate 8:8,9

Prescott et al. (1975, p. 54, plate 19:11); Croasdale & Scott (1976, p. 507, plate 1:3).

Cells curved, with a very slight median incision and an inner thickening at the poles.

Cell L. 23–25 μm; W. 7–8 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Croasdale & Scott 1976); Indonesia, Europe, North America.

***Cl. kuetzingii* Brébisson**
Plate 7:1

Scott & Prescott (1958*a*, p. 23, fig. 1:14); Prescott et al. (1975, p. 58, plate 31:6,7,15).

Wall has about five striae across the cell.

Cell L. 515 μm; W. 18 μm; A. 3 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; N.T. (Borge 1896; Scott & Prescott 1958*a*), Qld (Möbius 1892; Bailey 1893, 1898; Schmidle 1896; McLeod 1975), Vic. (Hardy 1905; West 1909*a*; Powling 1970; Viyakornvilas 1974), S.A. (Prescott & Scott 1952); Papua New Guinea (Thomasson 1967), New

Zealand, Asia, Europe, North and South America, Africa.

***Cl. leibleinii* Kützing var. *minimum* Schmidle**
Plate 5:6

Prescott et al. (1975, p. 60, plate 28:1).

Cells small, wall smooth, colourless.

Cell C. 140°; L. 76 μm; W. 14 μm; A. 1.5 μm.

Distribution: *Winmurra Bb. 31.v.79*; Alaska, Europe.

***Cl. libellula* Focke var. *intermedium* (Roy & Bissett) G.S. West.**
Plate 5:3

Prescott et al. (1975, p. 61, plate 12:1).

This plant was known as *Penium libellula* var. *intermedium* Roy & Bissett.

Cell L. 178 μm; W. 26 μm; A. 10 μm.

Distribution: *Hidden Bb. 8.iv.78*; Papua New Guinea (Watanabe et al. 1979), New Zealand, Asia, Europe, Africa, North and South America.

***Cl. libellula* var. *interruptum* (West & West) Donat**
Plate 5:4,5

Scott & Prescott (1958*a*, p. 24, fig. 1:6); Prescott et al. (1975, p. 62, plate 12:14).

Cells with chloroplast plates interrupted at about the mid-length of each semicell.

Cell L. 100–162 μm; W. 19–23 μm; A. 8–10 μm.

Distribution: *Goanna Bb. 30.i.79, Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*); cosmopolitan.

***Cl. lunula* (Müller) Nitzsch var. *intermedium* Gutwinski**
Plate 8:3

Croasdale & Scott (1976, p. 508, plate 1:4).

The plants should also be compared with *Cl. lunula* var. *massartii* fa. *nasutum* Scott & Prescott (1961, p. 12, plate 1:30) from Indonesia.

Cell L. 542–583 μm; W. 106–113 μm; A. 17–18 μm.

Distribution: *Coonjimba Bb. 13.v.78*; N.T. (Croasdale & Scott 1976); Asia, Europe, North and South America.

***Cl. nematodes* Joshua**
Plate 6:11

Joshua (1886, p. 652, plate 22:7–9); Scott & Prescott (1958*a*, fig. 1:12); Prescott et al. (1975, p. 72, plate 34:10).

Cells thickened just below the apex.

Cell L. 116–237 μm; W. 14–35 μm; A. 7 μm.

Distribution: *Gulungul Bb. 7.iii.79 (fish stomach contents), Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*); Asia, North America, Africa.

***Cl. parvulum* Nägeli**
Plate 5:7,8,24–26

This is a problematical taxon, as it intergrades with the numerous small forms of *Cl. dianae* classified under var. *minor* Hieronymus. According to Prescott et al. (1975, p. 73), *Cl. parvulum* has a symmetrically tapered apical region, whereas the apex of *Cl. dianae* var. *minor* is obliquely truncate. Cook (1963), however, found that the apices in *Cl. dianae* var. *minor* were variable within all clones studied, ranging from acutely rounded to clearly truncate. Our plants exhibit a range of sizes and curvatures.

Cell C. 90°–150°; L. 80–125 μm; W. 9–15 μm; A. 2–3 μm.

Distribution: *Corndorl Bb. 2.ii.79, Winmurra Bb. 31.v.79, Ja Ja Bb. 4.vi.79, Bowerbird Bb. 9.x.80*; Qld (Bailey 1893; Borge 1911), Vic. (West 1909*a*); cosmopolitan.

***Cl. parvulum* var. *tortum* (Griffiths) Skuja**
Plate 7:9

Prescott et al. (1975, p. 75, plate 24:13).

Cells small, helicoid in shape. Our plant is narrower than usual.

Cell L. 92 μm; W. 5 μm.

Distribution: *Gulungul Bb. 7.vii.78*; Sweden, Britain, Michigan (USA).

***Cl. porrectum* Nordstedt var. *angustatum* West & West**
Plate 5:27

West & West (1904, p. 116, plate 11:13); Prescott et al. (1975, p. 76, plate 35:17).

Our plant is slightly smaller than usual and has a brown wall with 7 strong striae across the cell.

Cell C. 138°.

Distribution: *Bowerbird Bb. 9.x.80*; USA, East Indies, South America, Europe.

***Cl. pronum* Brébisson**
Plate 8:1,2

Scott & Prescott (1958*a*, p. 24, fig. 1:10); Prescott et al. (1975, p. 79, plate 15:3-5).

Wall smooth and colourless. Sigmoid forms observed occasionally.

Cell L. 98–287 μm; W. 3–5 μm; A. 1–1.5 μm.

Distribution: *Backflow Bb. 22.vii.80, Bowerbird Bb. 9.x.80, Winmurra Bb. 31.v.79*; N.T. (Scott & Prescott 1958*a*), N.S.W. (Thomasson 1973); cosmopolitan.

***Cl. ralfsii* Brébisson var. *hybridum* Rabenhorst**
Plate 7:2

Scott & Prescott (1958*a*, fig. 1:13; 1961, plate 1:25); Prescott et al. (1975, p. 81, plate 30:7,9,13,16).

Cell L. 520–548 μm; W. 28–32 μm; A. 5–7 μm.

Distribution: *Jabiluka Bb. 6.iv.78, 13.iii.79*; N.T. (Scott & Prescott 1958*a*); Sumatra, New Zealand, Asia, Europe, Africa, North and South America.

***Cl. rectimarginatum* Scott & Prescott**
Plate 5:31

Scott & Prescott (1961, p. 13, plate 1:27–28).

Cells spindle-shaped, lateral margins almost straight from near the centre to the narrowly rounded poles.

Cell wall smooth, colourless.

Cell L. 168 μm; W. 20 μm; A. 4 μm.

Distribution: *Backflow Bb. 22.vii.80*; Indonesia.

Cl. rectimarginatum forma
Plate 8:4

A form that is larger than the species, and differs from it in that it has girdle bands.

Cell L. 300 μm; W. 42 μm; A. 6 μm.

Distribution: *Near Kulukuluku Bb. 4.vii.80.*

Cl. semicirculare Krieger & Scott forma
Plate 5:19

Except for its smaller size, our plant agrees with the description by Prescott et al. (1975, p. 84, plate 36:3).

Cell C. 170°; L. 171 μm; W. 27 μm.

Distribution: *Goanna Bb. 12.iii.80*; Virginia (USA), Peru.

Cl. striolatum Ehrenberg
Plate 7:6–8

West & West (1904, p. 122, plate 13:7–16); Prescott et al. (1975, p. 87, plates 27:3 and 28:4).

Cells moderately curved; wall thickened at the apex and appearing slightly swollen, rusty coloured, about 6 striae in 10 μm; girdle bands usually evident.

Cell C. 70–77°; L. 239–300 μm; W. 25–27 μm; A. 11 μm.

Distribution: *Bowerbird Bb. 9.x.80*; Qld (Schmidle 1896; Bailey 1898), S.A. (Prescott & Scott 1952).

Cl. turgidum Ehrenberg
Plate 7:3–5

Prescott et al. (1975, p. 93, plate 25:10).

Cells slightly curved, ventral and dorsal margins nearly equally curved; poles obliquely truncate, thickened and appearing swollen; wall brown, darker in the apical region. There is considerable variation in cell wall sculpturing. In some cells, there are striations at the apices and prominent dashes on the rest of the cell, while in other cells the wall is smooth. Most cells are punctate throughout, the punctae arranged in linear series especially towards the apex. Occasional cells are punctate only near the apical region. There is usually a thickened subapical band.

Cell L. 750–1298 μm; W. 37–60 μm; A. 15–18 μm.

Distribution: *Nourlangie Creek 15.ix.78 (fish stomach contents), McMinns Lagoon 22.i.79*; Asia, Europe, North America, Angola.

Cl. turgidum forma
Plate 7:10

A form that is more attenuated towards the apices than the typical. It also lacks the subapical thickened band. About 10 striae in 10 μm.

Cell L. 476–648 μm; W. 39–41 μm; A. 10 μm.

Distribution: *Goanna Bb. 30.i.79, Umbungbung Bb. 39.v.79.*

Closterium sp. 1
Plate 5:37,38

Our plants agree well with *Cl. subcompactum* West & West (1902, p. 137, plate 18:1) in dimensions and shape, but lack the median constriction characteristic of this species. They should also be compared with *Cl. compactum* Nordstedt (1888, p. 68, plate 3:25).

Cell L. 102–110 μm; W. 26–27 μm; A. 15–16 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

Closterium sp. 2
Plate 5:9,10

Cells slender, curved. Cell wall smooth, straw-coloured, with a narrow, thickened band just below the apices. Girdle bands were not observed. Pyrenoids 5–8 in linear series.

Cell C. 100–110°; L. 102–123 μm; W. 8–9 μm; A. 1.5–2 μm.

Distribution: *Winmurra Bb. 31.v.79.*

Genus *Cosmarium* (Corda) Ralfs

The genus *Cosmarium* is taxonomically difficult, and a number of taxa from the Magela system require further work. The genus has been partly monographed by Krieger & Gerloff (1962–69).

C. amoenum Ralfs forma
Plate 16:11,12

A form that differs from the typical (West & West 1911, p. 29, plate 102:1–4) in that the semicells are slightly inflated, with a clear median space, and granules arranged roughly in horizontal series. Pyrenoids 2 per semicell. The plants should also be compared with the variety *mediolaeve* Nordstedt (1888, p. 50, plate 5:12).

Cell L. 47–59 μm; W. 29–32 μm; I. 15–17 μm; T. 20–25 μm.

Distribution: *McMinns Lagoon 22.i.79, Gulungul Bb. 8.viii.79.*

C. amoenum var. *mediolaeve* Nordstedt
Plate 16:10

Nordstedt (1888, p. 50, plate 5:12); West & West (1911, p. 31, plate 102:5,6).

Our plant agrees with previous descriptions of the variety, except it has a single row of granules (instead of the usual two) just above the isthmus. It is also practically identical to a plant identified as *C. amoenum* var. *intumescens* Nordstedt by Scott & Prescott (1958*a*, p. 43, fig. 14:1) which, because of its cell size and the disposition of granules, is closer to *mediolaeve* than *intumescens*.

Cell L. 43 μm; W. 26 μm; I. 12 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958), Vic. (West 1909*a*), New Zealand, Britain, Patagonia.

C. askenasyi Schmidle
Plate 17:6,7,15,18

This is a variable taxon. We have observed a range of intergrading forms that encompasses the typical as described by Krieger (1932, p. 170, plate 13:5) and Scott & Prescott (1961, p. 54, plate 23:5), as well as the forma *latum* Scott & Prescott (1958*a*, p. 43, fig. 13:1).

Semicells L. 54–70 μm; W. ssp. 79–187 μm, csp. 83–194 μm; I. 38–59 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Coonjimba Bb. 13.v.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976); Indonesia.

C. askenasyi **forma**
Plate 17:10

Differs from the typical in that it has a larger length to width ratio, a more hemispherical semicell and fewer spines.

Cell L. 131 μm; W. 76–78 μm; I. 44 μm.

Distribution: *Baralil Creek 14.ii.80.*

C. binum **Nordstedt**
Plate 17:11

West & West (1908, p. 246, plate 88:10–14).

The principal features of *C. binum* are its conspicuous tumour, ornamented with 6–8 vertical granulate ridges, and a horizontal series of 5–8 rounded granules between this tumour and the isthmus.

Cell L. 64 μm; W. 45 μm; I. 12–21 μm.

Distribution: *Coonjimba Bb. 30.ix.80*; Indonesia, Ceylon, Japan, Europe, Brazil, USA, Africa.

C. bioculatum **Brébisson var. *hians* West & West**
Plate 15:24–26

West & West (1905, p. 166, plate 61:10,11); Scott & Prescott (1961, p. 55, plate 31:19).

Cell L. 19.5 μm; W. 17 μm; I. 4 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; Indonesia, England.

C. ceylanicum **West & West fa. *minus***
Scott & Prescott
Plate 18:36–38

Scott & Prescott (1961, p. 56, plate 31:5).

Except for minor differences in ornamentation, our plant is identical to those described by Scott & Prescott (loc. cit.). The plants should also be compared with *Xanthidium lepidum* West & West (1902, p. 159, plate 20:22,23).

Cell L. 31 μm; W. 25 μm; I. 9 μm; T. 18 μm.

Distribution: *Hidden Bb. 8.iv.78*; Indonesia.

C. connatum **Brébisson**
Plate 17:1,2

Scott & Prescott (1958*a*, p. 44, fig. 13:5).

Cells, of different size, were observed in two samples. The dimensions quoted by Scott & Prescott are intermediate between ours.

Cells from Goanna Billabong (Plate 17:1):
Cell L. 74 μm; W. 59–62 μm; I. 56 μm.

Cells from Annaburroo Billabong (Plate 17:2):
Cell L. 117 μm; W. 98 μm; I. 89 μm.

Distribution: *Goanna Bb. 12.iii.80, Annaburroo Bb. 7.x.80*; N.T. (Scott & Prescott 1958*a*); cosmopolitan.

C. contractiforme **Grönblad & Scott forma**
Plate 15:1,2

The plant is very similar to the form described by Thomasson (1960, p. 16, fig. 9:5) but the semicell lacks the distinctly porous central part of the wall.

Cell L. 47 μm; W. 31–33 μm; I. 8 μm.

Distribution: *Jabiluka 6.iv.78.*

C. contractum **Kirchner var. *incrassatum***
Scott & Prescott
Plate 15:3

Scott & Prescott (1958*a*, p. 44, fig. 13:13) based this variety on the presence of a yellowish, circular, coarsely punctate, internal thickening of the wall in the midregion of the semicells; otherwise the plants are identical to the previously described *C. contractum* var. *ellipsoideum* (Elfving) West & West (1905, p. 172, plate 61:28,35). The validity of the median thickening as a taxonomic character requires further research. We have observed varying degrees of thickening in our plants, as well as in several other species of *Cosmarium* and *Xanthidium*.

Cell L. 38 μm; W. 25–27 μm; I. 8.5 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*); Indonesia.

C. contractum **var. *minutum* (Delponte)**
West & West
Plate 15:7–10

Krieger & Gerloff (1962, p. 75, plate 17:8).

Semicells elliptical. There appears to be a wide range in size.

Cell L. 13–20 μm; W. 10–19 μm; I. 3–5 μm.

Distribution: *Djalkmara Bb. 3.vi.79*; Qld (Krieger & Gerloff 1962); Europe, Asia, Africa, North and South America.

C. contractum **var. *pachydermum***
Scott & Prescott
Plate 15:4–6

Scott & Prescott (1958*a*, p. 44, fig. 12:8).

The plants should also be compared with the larger, but very similar *C. contractum* var. *incrassatum* Scott & Prescott (1958*a*, 13:13).

Cell L. 26 μm; W. 20 μm; I. 5.5 μm; T. 14 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*).

C. cucumis **(Corda) Ralfs var.**
magnum **Raciborski**
Plate 16:16

Messikommer (1942, p. 151, plates 8:17 and 9:10); Krieger & Gerloff (1962, p. 87, plate 19:13).

Our plant is slightly larger than usual.

Cell L. 142 μm; W. 80–83 μm; I. 54 μm.

Distribution: *Ja Ja Bb. 4.vi.79*; China, Europe, Greenland.

C. denticulatum **Borge**
Plate 17:14

Borge (1896, p. 19, plate 3:31); Scott & Prescott (1958*a*, fig. 13:4).

Semicell L. ssp. 95 μm; W. ssp. 130 μm; S. 5–9 μm; I. 40 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896).

C. depressum (Nägeli) Lundell var. minutum (Heimerl) Krieger & Gerloff
Plate 15:11,12

Krieger & Gerloff (1962, p. 24, plate 8:8).

Our plants are at the large end of the size range quoted for this variety.

Cell L. 23–25 μm; W. 22–25 μm; I. 7–8 μm.

Distribution: *Djalkmara Bb. 3.vi.79*; Indonesia, Europe, North and South America.

C. exasperatum Joshua
Plate 18:43

Joshua (1886, p. 649, plate 25:1,2); Scott & Prescott (1961, plate 31:10).

Cell L. cpr. 35 μm; W. cpr. 37 μm; I. 12 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; Indonesia, Asia.

C. excavatum Nordstedt forma
Plate 14:11–14

Except for its smaller size the plant (Plate 14:11) is identical to one described as *C. excavatum* by Scott & Prescott (1958*a*, fig. 14:2). However, Scott & Prescott's plant is at least twice as big as the original (Nordstedt 1870, p. 214, plate 3:25) and is comparable to the very similar *C. isthmium* W. West (West & West 1908, p. 145, plate 77:7–10 and plate 94:2) in size, though *C. isthmium* semicells have subrectangular basal angles and more granules. Except for a narrower isthmus, our plant is also identifiable with *C. excavatum* fa. *duplo-major* Lundell (West & West 1908, p. 148, plate 94:3).

Cell L. 37 μm; W. 21 μm; I. 10 μm.

Distribution: *Djalkmara Bb. 3.vi.79.*

A smaller, but very similar, form (Plate 14:12–14) was observed from the Nourlangie system. These plants have 4–5 rows of granules and a smooth apex. The zygospore is sub-globose and ornamented with blunt conical spines.

Cell L. 24–30 μm; W. 15–18 μm; I. 7–8.5 μm. Zygo. 20 × 25 μm, S. 2–3 μm.

Distribution: *Umbungbung Bb. 30.v.79.*

C. favum West & West
Plate 17:13

West & West (1896, p. 250, plate 15:5,6).

Our plant differs from the typical in having wider semicells and small points on the granules.

Cell L. 70 μm; W. 68 μm; I. 17 μm.

Distribution: *Bowerbird Bb. 9.x.80*; USA.

C. geminatum Lundell fa. ornatum Behre
Plate 18:39

Our plant is identical to one from Oenpelli described as *C. geminatum* (Scott & Prescott 1958*a*, figs 6:21 and 14:9). However, in the grouping of the facial granules into two tumours, the plant is more closely identifiable with fa. *ornatum* Behre (1956, p. 61, plate 5:5).

Cell L. 25 μm; W. 27–29 μm; I. 10 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; Indonesia, Philippines.

C. glyptodermum W. West var. tuberculatum Scott & Prescott
Plate 17:5

Scott & Prescott (1958*a*, p. 46, fig. 13:14).

A variety which differs from the typical by having large tubercular granules interspersed with small pits, each granule being surrounded by a pattern of 6 pits.

Cell L. 90 μm; W. 54 μm; I. 36 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*).

C. granatum Brébisson
Plate 14:16

Ralfs (1848, p. 96, plate 32:6); West & West (1905, p. 186, plate 63:1–3).

Cell L. 27 μm; W. 20 μm; I. 7 μm.

Distribution: *Backflow Bb. 22.vii.80*; Qld (Bailey 1898; Borge 1896; McLeod 1975; Schmidle 1896), S.A. (Prescott & Scott 1952), N.S.W. and Tas. (Borge 1896), W.A. (Krieger & Gerloff 1962); cosmopolitan.

C. indentatum Grönblad var. ellipticum Scott & Grönblad
Plate 15:37

Scott & Grönblad (1957, p. 18, plate 8:15); Scott & Prescott (1961, p. 59, plate 27:7).

The plants agree well with previous descriptions of the variety but they lack the characteristic indentation at the middle of the isthmus.

Cell L. 28–30 μm; W. 23–26 μm; I. 5 μm.

Distribution: *Ironstone Lagoon 22.i.79*; Indonesia, USA.

C. javanicum Nordstedt forma
Plate 16:8

Our plants differ from those described by Krieger & Gerloff (1962, p. 88, plate 19:14) in that they are wider at the base of both the semicell and the isthmus. Except for a smaller length to width ratio and a wider isthmus, they are closely identifiable with a form of *C. javanicum* described by Croasdale & Scott (1976, p. 352, plate 8:8).

Cell L. 150–154 μm; W. 87–95 μm; I. 62–65 μm.

Distribution: *Mine Valley Bb. 31.v.79, Umbungbung Bb. 30.v.79.*

C. lundellii Delponte var. corruptum (Turner) West & West
Plate 23:16,17

West & West (1905, p. 139, plate 57:5,6); Krieger & Gerloff (1962, p. 3, plate 1:7).

Except for a shallower sinus, our plants agree well with previous descriptions of the variety. The forms described by Borge (1911, p. 200, plate 2:3) and

Scott & Prescott (1958*a*, p. 47, fig. 12:19) probably belong to this variety.

Cell L. 60–62 μm; W. 50–57 μm; I. 34–41 μm.

Distribution: *Fogg Dam 28.vii.80*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1911); Indonesia, Asia, Europe, Africa.

C. *lundellii* var. *ellipticum* W. West
Plate 17:8

Our plants agree with descriptions by West & West (1905, p. 139, plate 57:3,4), though some of our plants have larger punctae round the basal angles. As such, they should be compared with a form of *C. pachydermum* Lundell described by Scott & Prescott (1961, p. 64, plate 25:5). Chloroplasts axial, with prominent ridges and two large pyrenoids.

Cell L. 64 μm; W. 56 μm; I. 18 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*); Indonesia, Japan, Europe, North America.

C. *moniliforme* (Turpin) Ralfs
Plate 15:34–36

West & West (1908, p. 20, plate 67:103).

Our plants tend to have walls thicker than normal.

Cell L. 33–35 μm; W. 17 μm; I. 5 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; Qld (Schmidle 1896; Bailey 1898; McLeod 1975), Vic. (West 1909); cosmopolitan.

C. *moniliforme* var. *ellipticum* (Lagerheim) Krieger & Gerloff
Plate 15:27–31

Krieger & Gerloff (1969, p. 338, plate 54:5); Lagerheim (1885, p. 240, plate 27:13, *C. moniliforme* fa. *elliptica*).

Semicells elliptical to almost spherical.

Cell L. 44–47 μm; W. 24–30 μm; I. 9–11 μm; T. 21–23 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; Qld (Krieger & Gerloff 1969); New Zealand, Indonesia, Japan, Europe, USA.

C. *moniliforme* var. *indentatum* Scott & Grönblad
Plate 15:21

Scott & Grönblad (1957, p. 19, plate 5:7); Scott & Prescott (1961, p. 63, plate 27:10).

A variety characterised by an elongated isthmus with sloping margins and a sharp constriction.

Cell L. 39 μm; W. 21 μm; I. 5 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; Indonesia, Africa, North America.

C. *moniliforme* var. *limneticum* West & West
Plate 15:32,33

West & West (1908, p. 23, plate 67:6,7,); Scott & Prescott (1961, p. 63, plate 27:11,12).

Cells sometimes form short chains.

Cell L. 31–33 μm; W. 16–19 μm; I. 12–13 μm.

Distribution: *Downstream of Darwin River Dam 7.x.80*; Vic. (West 1909); Indonesia, Britain, Sweden, Alaska, Wisconsin (USA), Brazil.

C. *moniliforme* var. *panduriforme* (Heimerl) Schmidle
Plate 15:40

West & West (1908, p. 22, plate 67:8,9); Krieger & Gerloff (1969, p. 340, plate 51:5).

Cell L. 20 μm; W. 13–14 μm; I. 10 μm.

Distribution: *Djalkmara Bb. 3.vi.79*; Australia (West & West 1908); Asia, Europe, North America, Africa, USSR, Indonesia.

C. *norimbergense* Reinsch fa. *depressa* West & West
Plate 8:17

West & West (1908, p. 53, plate 69:28,29).

A form with cells about as long as broad, semicells depressed. Occasionally form short chains of up to four cells.

Cell L. 10–11.5 μm; W. 9–11 μm; I. 3–4 μm.

Distribution: *Winmurra Bb. 31.v.79*; cosmopolitan.

C. *nudum* (Turner) Gutwinski
Plate 16:1–3

Scott & Prescott (1961, plate 30:1,2); Croasdale & Scott (1976, plate 9:1).

The plant from Oenpelli identified as *C. obsoletum* (Hantzsch) Reinsch by Scott & Prescott (1958*a*, fig. 12:17) should have been classified with *C. nudum*. The two granules at the basal angles are usually brown.

Cell L. 47–51 μm; W. 50–52 μm; I. 15 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a* Croasdale & Scott 1976); Indonesia, Asia.

C. *obsoletum* (Hantzsch) Reinsch
Plate 17:3

Except for a wider isthmus, our plant agrees with those described by Scott & Prescott (1961, p. 63, plate 26:1). It also has a wall composed of two layers, rather like those of the variety *sitvense* Gutwinski.

Cell L. 58 μm; W. 54 μm; I. 37 μm.

Distribution: *Coonjimba Bb. 13.v.78*; Qld (Bailey 1893; Borge 1896, 1911; McLeod 1975), Vic. (West 1909*a*), N.S.W. (Krieger & Gerloff 1962), cosmopolitan.

C. *obsoletum* forma
Plate 23:12,13

Much larger than normal, with the wall apparently in two layers. There is a very slight indentation at the apex of the semicell. The cell should also be compared with *C. pachydermum* Lundell as described by Scott & Prescott (1958*a*, p. 48, fig. 19:10).

Cell L. 71 μm; W. 62 μm; I. 38 μm.

Distribution: *Coonjimba Bb. 13.v.78, Umbungbung Bb. 30.v.79*.

C. obsoletum var. sitvense Gutwinski
Plate 17:4

Gutwinski (1902, p. 594, plate 38:39); Scott & Prescott (1958*a*, p. 47, fig. 12:18; 1961, p. 63, plates 25:11 and 26:2).

The wall is in two layers, the outer often thin and hyaline; basal angles with a small spine extending from the inner to the outer layer.

Cell L. 40–59 μm; W. 48–72 μm; I. 28–37 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Hidden Bb. 8.iv.78, Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*), Qld (Krieger & Gerloff 1962; McLeod 1975), N.S.W. (Krieger & Gerloff 1962); Indo-Malayan region.

C. pachydermum Lundell
Plate 17:9

Lundell (1871, p. 39, plate 2:15); Scott & Prescott (1958*a*, p. 48, plate 19:10).

Cell wall thinner than usual, especially towards the apex. Chloroplasts axial, each with two pyrenoids.

Cell L. 90 μm; W. 64–67 μm; I. 38 μm.

Distribution: *Mine Valley Bb. 10.iv.78, McMinns Lagoon 22.i.79*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896; Schmidle 1896; Bailey 1898; McLeod 1975); Asia, Europe, USA, South America.

C. perminutum G.S. West var. australe (Raciborski) Krieger & Gerloff
Plate 15:22,23

Krieger & Gerloff (1969, p. 397, plate 68:3); Raciborski (1892, p. 363, plate 6:22, *C. subarctoum* Lagerheim fa. *australis*).

Cell L. 13–16 μm; W. 8–10 μm; I. 7–9 μm.

Distribution: *Coonjimba Bb. 13.v.78, Goanna Bb. 30.i.79*; W.A. (Raciborski 1892); Thailand.

C. pseudophaseolus Brühl & Biswas var. tithophoroides (Krieger) Krieger & Gerloff
Plate 15:13–15

Krieger & Gerloff (1962, p. 77, plate 17:13).

Semicells oval to spindle-shaped, with varying degrees of incrassation on the facial walls.

Cell L. 22–26 μm; W. 16–19 μm; I. 4–4.5 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; Indonesia.

C. pseudopyramidatum Lundell
Plate 16:9

In size, our plants agree with *C. pseudopyramidatum* var. *major* Lundell (1871, p. 41), but according to West & West (1905, p. 202) the 'forma *major*' should really be included with the species.

Cell L. 59 μm; W. 37 μm; I. 15 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.S.W. (Krieger & Gerloff 1965), S.A. (Prescott & Scott 1952); cosmopolitan.

C. pseudoscenedesmus West & West
Plate 15:39

West & West (1902, p. 164, plate 20:34).

Our plants are slightly smaller, with the cell wall thickened at the basal angles. West (1909*a*, p. 59) discusses the differences between this species and the very similar *C. dorsitruncatum* (Nordstedt) G.S. West.

Cell L. 23–26 μm; W. 33–37 μm; I. 5–7 μm.

Distribution: *Backflow Bb. 11.iv.78, Ja Ja Bb. 4.vi.79*; Sri Lanka.

C. punctulatum Brébisson var. subpunctulatum (Nordstedt) Boergesen
Plate 18:34,35

West & West (1908, p. 209, plate 84:15–20); Scott & Prescott (1958*a*, p. 50, fig. 14:7).

The arrangement of the central granules is very variable.

Cell L. 28–32 μm; W. 29–30 μm; I. 8–10 μm.

Distribution: *McMinns Lagoon 22.i.79, Goanna Bb. 30.i.79, Umbungbung Bb. 30.v.79*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1911), N.S.W. (Borge 1896), Vic. (Viyakornvilas 1974), S.A. (Prescott & Scott 1952); New Zealand, Europe, South America, USSR.

C. quadrifarium Lundell forma
Plate 16:15

This is a difficult plant to identify. It has a large central tumour dotted with small granules and is probably a variety of *C. quadrifarium*.

Cell L. 49 μm; W. 37 μm; I. 17 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

C. quadrifarium var. gemmulatum Maskell
Plate 16:13,14

A plant characterised by a central tumour of granules which are connected by a network of fine rays. Our plants (Plate 16:14) have broader tumours than those originally described by Maskell (1889, p. 20, plate 3:32).

Cell L. 42 μm; W. 34 μm; I. 17 μm.

Distribution: *Bowerbird Bb. 9.x.80*; New Zealand.

A small form (Plate 16:13) with rows of less prominent, peripheral granules was also observed.

Cell L. 32 μm, W. 25 μm, I. 13 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

C. retusiforme (Wille) Gutwinski
Plate 14:15

West & West (1905, p. 180, plate 62:17,18); Krieger & Gerloff (1962, p. 93, plate 20:11).

Cell L. 27 μm; W. 22 μm; I. 8 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.S.W. (Krieger & Gerloff 1962); Asia, Europe, Africa, North America.

C. securiforme Borge
Plate 17:16

Borge (1896, p. 20, plate 3:33).

The wall appears to be in two layers, with the lateral spines arising from the inner layer.

Cell L. 138–145 μm; W. ssp. 138–150 μm, csp. 146–161 μm; I. 43–50 μm.

Distribution: *Goanna Bb. 12.iii.80, 16.iii.81*; Qld (Borge 1896).

C. spinuliferum West & West
Plate 18:44

Though the facial ornamentation differs somewhat from the original (West & West 1902, p. 174, plate 21:12,13) our plant agrees with the description by Scott & Prescott (1961, p. 69, plate 29:6).

Cell L. 35 μm; W. 32–33 μm; I. 12 μm.

Distribution: *Goanna Bb. 16.iii.81*; Indonesia, Ceylon.

C. subspeciosum Nordstedt forma
Plate 17:12,17

The vertical ridges on the central tumour are barely outlined. It is very similar to a plant identified as *C. subspeciosum* var. *validius* Nordstedt by Taylor (1935; Fritsch Coll. Bl.26).

Cell L. 46 μm: W. 31–35 μm; I. 15 μm.

Distribution: *Goanna Bb. 30.i.79.*

C. subtumidum Nordstedt var. pachydermum Prescott & Scott
Plate 15:16–18

Prescott & Scott (1952, p. 13, fig. 1:18).

Semicells transversely oval-pyramidate. *C. contractum* var. *pachydermum* Scott & Prescott (1961, p. 56, plate 27:6) has almost the same dimensions as one of our plants.

Cell L. 31–40 μm; W. 25–33 μm; I. 7–9 μm.

Distribution: *Jabiluka Bb. 5.iv.78*; S.A. (Prescott & Scott 1952).

C. tjibenongense Gutwinski fa. minus G.S. West
Plate 15:19,20

West (1909*a*, p. 60, plate 4:3); Scott & Prescott (1958*a*, fig. 12:9; 1961, plate 27:8).

Cell L. 30 μm; W. 17 μm; I. 4 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*), Vic. (West; 1909*a*); Indonesia.

C. trilobulatum Reinsch var. depressum Printz
Plate 14:18

Our plant most resembles this variety as described by Krieger & Gerloff (1962, p. 99, plate 21:3).

Cell L. 15 μm; W. 11 μm; I. 3.5 μm.

Distribution: *Ja Ja Bb. 4.vi.79*; Europe.

C. zonatum Lundell
Plate 23:18

In the original description (Lundell 1871, p. 50, plate 3:18) there are five annular series of punctulations, with the two across the widest part of the semicell close together. Our plants are identical to plants described by Scott & Prescott (1958*a*, p. 47, fig. 13:10) as *C. oenpelliense*, but we feel that they should be identified with *C. zonatum*, especially the descriptions by Scott and Prescott (1961, p. 73, plate 28:5), though our semicells are more ovate.

Cell L. 48–52 μm; W. 19–21 μm; I. 8–11 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*); Indonesia, Ceylon, Japan, Europe, Canada, Sudan (Africa).

Cosmarium sp. 1
Plate 23:14,15

Semicells balloon shaped, the narrow ends joined to form an elongated isthmus with gradually sloping sides and an abrupt constriction. Cell wall smooth. It comes closest to *C. moniliforme* var. *indentatum* Scott & Grönblad (1957, p. 19, plate 5:7) which, however, is much smaller and has steeper sloping sides at the isthmus. Zygospore (Plate 23:14) is spherical, brown in colour and ornamented with numerous rounded conical warts. The outer wall is finely granular.

Cell L. 74–82 μm; W. 33–36 μm; I. 6–7 μm. Zygo. D. 59–63 μm.

Distribution: *Backflow Bb. 11.iv.78, Mine Valley Bb. 10.iv.78.*

Cosmarium sp. 2
Plate 16:4–7

The plants are practically identical to the form described by Croasdale and Scott (1976, p. 533, plate 9:2). Except for their unusually thick walls, our plants are similar, both in size and shape, to a form of *C. pseudopyramidatum* described by Thomasson (1960, p. 18, fig. 9:16). However, the plants are sufficiently different from *C. pseudopyramidatum* (Lundell 1871, p. 41, plate 2:18) to be classified as a separate species. See comments by Croasdale & Scott (op. cit.).

Cell L. 57–65 μm; W. 35–41 μm; I. 13–15 μm; T. 35 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Coonjimba Bb. 13.v.78, Baralil Creek 14.ii.80*; N.T. (Croasdale & Scott 1976).

Cosmarium sp. 3
Plate 15:38

Small plants with obpyriform semicells that are circular in end view.

Cell L. 26–31 μm; W. 12–14 μm; I. 5–6 μm.

Distribution: *Backflow Bb. 11.iv.78, Winmurra Bb. 31.v.79.*

Cosmarium sp. 4
Plate 14:17

Semicells triangular with rounded corners, walls thin.

Cell L. 16–18 μm; W. 21–28 μm; I. 4–6 μm.

Distribution: *Winmurra Bb. 31.v.79.*

Genus *Desmidium* (Agardh) Ralfs

D. aequale West & West
Plate 9:14–16

West & West (1896, p. 233, plate 12:27).

The dimensions of our plants agree with the original, but the plants are slightly shorter than those from Yirrkala described by Scott & Prescott (1958*a*, p. 69, fig. 21:12). The plants are also identical to Indonesian specimens identified as *D. quadratum* Nordstedt by Scott & Prescott (1961, p. 125, plate 63:5,6). From the original description, *D. quadratum* (Nordstedt 1873, p. 49, plate 1:24) has narrower cells and much narrower apices than *D. aequale*. The former has globose and smooth zygospores while those of the latter are globose and undulate-nodulose (West et al. 1923). Zygospores have not been observed in the Magela Creek plants. What appear like rows of granules on some cells are probably mucilage plugs on the pore organelles.

Cell L. 19–24 μm; W. 30–32 μm; I. 28 μm; A. 19–23 μm.

Distribution: *Hidden Bb. 8.iv.78, Jabiluka Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*); USA.

D. aptogonum Brébisson
Plate 9:3,4

The plants agree well with descriptions of the species by West et al. (1923, p. 242, plate 164:1–3). They are also very similar to plants identified as *D. bengalicum* Turner by Scott & Prescott (1958*a*, p. 70, fig. 21:7,8). The filaments are twisted and there are large and distinct spaces between adjacent cells.

Cell L. 20–28 μm; W. 27–30 μm; A. 18–23 μm; I. 20 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896; Bailey 1898), Vic. (West 1909*a*); New Zealand, Asia, Europe, Africa, North and South America.

D. aptogonum var. *tetragonum* West & West
Plate 9:6,7

West & West (1902, p. 193); Scott & Prescott (1958*a*, p. 69, fig. 21:4; 1961, p. 124, plate 62:5–7).

Cell L. 18–20 μm; W. 32 μm; I. 27 μm; A. 28–30 μm.

Distribution: *Gulungul Bb. 7.iii.79 (fish stomach contents)*; N.T. (Scott & Prescott 1958*a*); Indonesia, Sri Lanka.

D. baileyi (Ralfs) Nordstedt
Plate 9:10

Scott & Prescott (1958*a*, p. 69, fig. 21:5).

Triangular in end view.

Cell L. spr. 16 μm, cpr. 20–21 μm; W. 26 μm; I. 25 μm.

Distribution: *Goanna Bb. 30.i.79*; N.T. (Scott & Prescott 1958*a*), Qld (Möbius 1894; Bailey 1895; Borge 1896; Schmidle 1896; McLeod 1975), S.A. (Prescott & Scott 1952); Sri Lanka, Japan, Europe, North America, Africa.

D. baileyi fa. *tetragonum* Nordstedt
Plate 9:11–13

Nordstedt (1888, p. 25, plate 2:5); Scott & Prescott (1958*a*, p. 70, fig. 21:6; 1961, p. 124, plate 62:8,9).

Cell L. spr. 14 μm, cpr. 20 μm; W. 20 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; N.T. (Scott & Prescott 1958*a*); Indonesia, Burma, Japan.

D. coarctatum Nordstedt formae
Plate 9:19–23

Three different forms were observed. The first (Plate 9:19,20) agrees well with the description by Scott & Grönblad (1957, p. 50, plate 36:4,5) but is slightly larger. It is considerably larger than plants described by other authors, e.g. Krieger (1932, p. 220, plate 26:7).

L. 40–43 μm; W. 40–42 μm; I. 35 μm; A. 20–23 μm; T. 32 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

The second form (Plate 9:21) resembles *D. coarctatum* as described by Nordstedt (1888, p. 25, plate 2:3) and West et al. (1923, p. 252, plate 165:1,2), but our plant is longer than it is wide and in this respect it resembles *D. graciliceps* (Nordstedt) Lagerheim (West et al. 1923, p. 253, plate 166:5). Unlike the latter, it has light brown, lightly pock-marked and globose zygospores.

Cell L. 30–32 μm; W. 25 μm; I. 22 μm; A. 12–14μm. Zygo. T. 25 × 30 μm.

Distribution: *Jabiluka Bb. 6.iv.78, Corndorl Bb. 2.ii.79.*

The third form (Plate 9:22,23) is small and is almost circular in face view.

Cell L. 22–23 μm; W. 24 μm; I. 21 μm; A. 14 μm; T. 20 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

D. suboccidentale Scott & Prescott
Plate 9:5

Scott & Prescott (1958*a*, p. 70, fig. 21:9; 1961, p. 125, plate 63:7).

Cell L. 15 μm; W. 26 μm; I. 23 μm; A. 21 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*), N.S.W. (Skinner 1976); Indonesia.

D. swartzii Agardh
Plate 9:8

West et al. (1923, p. 246, plate 163:5–8); Scott & Prescott (1961, p. 125, plate 63:8).

D. swartzii is the commonest species of *Desmidium*. The plant from Oenpelli, described by Scott & Prescott (1958*a*, p. 70, fig. 21:13), seems atypical because of the ridge girdling the semicell.

Cell L. 13 μm; W. 40–43 μm; I. 35 μm; A. 35 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896; Bailey 1898), N.S.W. (Skinner 1976), Vic. (West 1909*a*); Asia, Europe, North and South America.

***D. swartzii* forma**
Plate 9:9

Has distinct spaces (c. 3 μm) between the cells. In the typical, spaces between the cells are either not visible or recognised only with difficulty.

Cell L. 18 μm; W. 50 μm; I. 38 μm; A. 42 μm.

Distribution: *Hidden Bb. 8.iv.78.*

Genus *Docidium* (Brébisson) Ralfs

Docidium can be distinguished from the closely related genus *Pleurotaenium* by the folds (plications) at the base of the semicell and by an axial chloroplast.

***D. baculum* Brébisson emend. Lundell**
Plate 14:10

Lundell (1871, p. 88); Prescott et al. (1975, p. 102, plate 37:1–4).

This is the most common and most widely distributed species of the genus.

Cell L. 168 μm; W. 11 μm; I. 10 μm; A. 7–8 μm.

Distribution: *Winmurra Bb. 31.v.79*; cosmopolitan.

***D. baculum* var. *inflatum* Scott & Prescott**
Plate 14:9

This variety has inflated semicells. Our plant is slightly smaller than those described by Scott & Prescott (1958*a*, p. 27, fig. 2:1).

Cell L. 141 μm; W. max. 15 μm; I. 11 μm; A. 8 μm.

Distribution: *Winmurra Bb. 31.v.79*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976).

Genus *Euastrum* (Ehrenberg) Ralfs

***E. ansatum* (Ehrenberg) Ralfs forma**
Plate 18:4

Our plant agrees with forms of *E. ansatum* described by Croasdale & Scott (1976, p. 513, plate 3:10–12). Both their plants and ours lack the three facial swellings usually found on semicells of *E. ansatum*. The cell wall is finely punctate.

Cell L. 114 μm; W. 32–35 μm; A. 17–20 μm; I. 14 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; N.T. (Croasdale & Scott 1976).

***E. ansatum* var. *triporum* Krieger**
Plate 18:7,8

Krieger (1937, p. 492, plate 59:8); Croasdale & Scott (1976, plate 3:9).

Minor variations in shape were observed.

Cell L. 66–84 μm; W. 32–44 μm; I. 11–13 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Bowerbird Bb. 9.x.80*; N.T. (Croasdale & Scott 1976); Asia, Europe, USA.

***E. asperum* Borge**
Plate 18:25

Scott & Prescott (1958*a*, fig. 5:10); Croasdale & Scott (1976, plate 6:1).

Our plants are slightly larger than the original (Borge 1896, p. 11, plate 1:12) and the median supra-isthmian protuberances are prominent and bifid.

Cell L. 96 μm; W. 50–52 μm; A. csp. 33 μm.

Distribution: *Backflow Bb. 11.iv.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976), Qld (Borge 1896; Bailey 1898; Krieger 1937); Burma.

***E. borgeanum* Scott & Prescott**
Plate 18:24

Borge (1896, p. 14, plate 4:63, *Euastrum* sp.); Scott & Prescott (1958*a*, p. 31, fig. 5:11).

Cell L. 75 μm; W. 41 μm; I. 10 μm.

Distribution: *Coonjimba Bb. 13.v.78*; N.T. (Scott & Prescott 1958*a*), Qld (Borge, 1896).

***E. denticulatum* (Kirchner) Gay var. *quadrifarium* Krieger**
Plate 18:41

Krieger (1937, p. 585, plate 80:20,21).

Cell L. 23 μm; W. 18 μm; I. 18 μm.

Distribution: *Bowerbird Bb. 9.x.80*; Indonesia.

***E. denticulatum* var. *quadrifarium* fa. *incisum* Scott & Prescott**
Plate 18:42

Scott & Prescott (1958*a*, p. 32, fig. 6:1; 1961, p. 25, plate 13:12).

Cell L. csp. 33 μm; W. 23 μm; I. 8 μm.

Distribution: *Winmurra Bb. 31.v.79*; N.T. (Scott & Prescott 1958*a*); Indonesia.

***E. didelta* Ralfs forma**
Plate 19:9

Ralfs (1848, p. 84, plate 14:1); Krieger (1937, p. 517, plate 67:1–3).

The typical has a pore in the centre of each semicell. We missed the pore, probably because of the cell contents.

Cell L. 137 μm; W. 77 μm; I. 23 μm.

Distribution: *Hidden Bb. 8.iv.78.*

***E. didelta* var. *bengalicum* Lagerheim**
Plate 18:20,21

Lagerheim (1888, p. 6, plate 1:3); Krieger (1937, p. 519, plate 67:4–6).

Cell L. 120–126 μm; W. 55–72 μm; W. A. 24–31 μm; I. 15–18.5 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Coonjimba Bb. 13.v.78*; N.T. (Scott & Prescott 1958*a*), N.S.W. (Krieger 1937); Asia.

***E. didelta* var. *bengalicum* fa. *minus* Scott & Prescott**
Plate 18:18,19

Two kinds of plants were observed. One, identical to plants described by Scott & Prescott (1958*a*, p. 33, fig. 4:7), has a triangular pattern of mucilage pores, while the other has only the two pores characteristic of the variety *bengalicum*.

Cell L. 84–86 μm; W. 42–44 μm; W. A. 18–19 μm; I. 12–13 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Gulungul Bb. 21.vii.80*; N.T. (Scott & Prescott 1958*a*).

E. diplostauron **Skuja**
Plate 18:28

Borge (1896, p. 14, plate 4:64, *Euastrum* sp.); Skuja (1949, p. 112, plate 24:1); Hirano (1951, p. 69, fig. 8, *E. australiense*).

Cell L. 26 μm; W. 32 μm; I. 7 μm.

Distribution: *Umbungbung Bb. 30.v.79*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896); Burma, Japan.

E. divergens **Joshua**
Plate 18:27

Joshua (1886, p. 640, plate 23:8,9); Borge (1896, p. 12, plate 2:15, *E. divergens* var. *australianum*); Krieger (1937, p. 642, plate 92:15–18).

Our plants are slightly larger than the typical.

Cell L. 60 μm; W. csp. 56–60 μm; I. 12 μm; A. ssp. 16 μm.

Distribution: *Hidden Bb. 8.iv.78, Winmurra Bb. 31.v.79*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896; Bailey 1898), Vic. (Viyakornvilas 1974); Burma.

E. divergens **var.** ***rhodesiense*** **Rich fa.** ***coronulum*** **Scott & Prescott**
Plate 18:33

Scott & Prescott (1958*a*, fig. 5:5).

Cell L. 45 μm; W. max. 47 μm, base 34 μm; I. 11 μm; A. ssp. 12 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; N.T. (Scott & Prescott 1958*a*).

E. horikawae **Hinode**
Plate 18:11,12

Prowse (1957, fig. 7h, *E. turgidum* Wallich forma); Hinode (1960); Scott & Prescott (1961, p. 34, plate 15:1, *E. prowsei*).

Cell L. csp. 75 μm; W. 57 μm; I. 23 μm; T. 38–39 μm.

Distribution: *Hidden Bb. 8.iv.78, Goanna Bb. 12.iii.80*; Indonesia, Malaysia, Bangladesh, Japan.

E. intermedium **Cleve var.** ***poriferum*** **Scott & Prescott**
Plate 18:17

Scott & Prescott (1958*a*, p. 35, fig. 3:1,2).

Cell L. 66 μm; W. 41 μm; I. 13 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*).

E. intermedium **var.** ***speciosum*** **Croasdale**
Plate 18:16

Croasdale & Scott (1976, plate 4:7,8).

This is the second record of this variety.

Cell L. 65 μm; W. 51–53 μm; I. 12 μm; A. 22 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Croasdale & Scott 1976).

E. latipediforme **Scott ex Croasdale**
Plate 19:10

Croasdale & Scott (1976, plate 3:4–6).

Our plant is slightly larger than the original.

Semicell L. 110 μm; W. 144 μm; I. 24 μm; A. 44 μm.

Distribution: *Gulungul Bb. 7.iii.79 (fish stomach contents)*; N.T. (Croasdale & Scott 1976).

E. latipediforme **forma**
Plate 19:11

Smaller than the type; two pores on the face of each semicell.

Semicell L. 78 μm; W. 88 μm; I. 19 μm.

Distribution: *Bowerbird Bb. 9.x.80*.

E. longicolle **Nordstedt var.** ***capitatum*** **West & West**
Plate 18:3,13

West & West (1902, p. 148, plate 19:24).

Cell L. 110 μm; W. 38 μm; W. A. 22–24 μm; I. 12 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976); Sri Lanka, India.

A form (Plate 18:13) in which the polar and upper lateral lobes are more developed was also observed. The plant corresponds to Croasdale & Scott's description (1976, p. 518, plate 4:1) of the variety.

Cell L. 95 μm; W. max. 45–47 μm, base 35–37 μm; polar lobe 22 μm; I. 11 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Croasdale & Scott 1976).

E. longicolle **var.** ***capitatum*** **fa.** ***minus*** **Scott & Prescott**
Plate 18:1,2

Scott & Prescott (1958, p. 36, fig. 22:7; 1961, p.29, plate 8:4,5).

Cell L. 64–73 μm; W. 27–35 μm; W. A. 17–20 μm; I. 9–10 μm.

Distribution: *Goanna Bb. 30.i.79, Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*), Indonesia.

E. moebii **(Borge) Scott & Prescott**

This problematical species has had a chequered history (Scott & Prescott 1960). It has, from time to time, been assigned to *E. verrucosum* forma, *E. verrucosum* var. *moebii*, *Micrasterias moebii* and, at present, to *E. moebii*. Scott & Prescott (1960) listed seven varieties and two formae for this species. The Magela Creek forms can be classified into four varieties and two formae which are morphologically similar, and we feel that further research may show that some of the differences may only be environmental variations.

E. moebii **forma**
Plate 19:8

The lateral lobes are plain, single and divergent.

Cell L. spr. 92 μm, cpr. 97 μm; W. 90–92 μm; I. 29 μm; polar lobe 77–80 μm.

Distribution: *Mine Valley Bb. 10.iv.78.*

E. moebii var. burmense West & West
Plate 19:2

Scott and Prescott (1961, plate 12:1).

See also *M. moebii* var. *luzonensis* Behre (1956, p. 85, plate 9:5). The apical lobes project slightly downward in contrast to the other varieties found in the Magela Creek system, in which the lobes project upward.

Cell L. 103 μm; W. 98–102 μm; I. 36 μm; polar lobe 76 μm.
Distribution: *Hidden Bb. 8.iv.78*; Indonesia, Burma, India.

E. moebii var. diplocanthylum Scott & Prescott
Plate 19:3

Scott & Prescott (1960, p. 328, fig. 1).

The main distinguishing feature is the central tumour, the lower margin of which is divided into two truncate parts which project downward toward those of the other semicell.

Cell L. 105 μm; W. 108 μm; I. 35 μm; polar lobe 81 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*).

E. moebii var. insolitum Scott & Prescott
Plate 19:4

Scott & Prescott (1958*a*, fig. 8:5,6, *M. moebii* var. *insolitum*); Croasdale & Scott (1976, plate 6:4).

Cell L. spr. 93 μm, cpr. 102 μm; W. 100–104 μm; I. 29 μm; polar lobe 76–80 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976).

E. moebii var. tetrachastriforme West & West
Plate 19:5

West & West (1901, p. 170, plate 3:22, *M. moebii* var. *tetrachastriformis*).

See also *E. moebii* var. *tetrachastriforme* fa. *latum* Scott & Prescott (1960, fig. 2).

Cell L. spr. 95 μm, cpr. 101 μm; W. 85–90 μm; I. 28 μm; polar lobe 73 μm.

Distribution: *Hidden Bb. 8.iv.78*; Thailand.

E. moebii var. tetrachastriforme forma
Plate 19:6,7

A smaller and less developed form (Plate 19:6).

Cell L. spr. 84 μm, cpr. 89 μm; W. 84–86 μm; I. 27 μm; polar lobe 69–75 μm.

Distribution: *Hidden Bb. 8.iv.78.*

One of the semicells is unusually small (Plate 19:7). It is not a deformity for, apparently, the majority of the cells go through a pre-conjugation division which produces semicells that are small and like *Cosmarium*. The zygospore (Plate 19:7) is spherical and ornamented with long, sharp and sometimes crooked spines. It is very similar to zygospores of *Micrasterias* spp. (Krieger 1939). We believe this is the first report of zygospores in the species and its varieties.

Zygo. D. 60 μm; S. 30–37 μm.
Distribution: *Mine Valley Bb. 10.iv.78.*

E. obesum Joshua var. tetmemoroides Croasdale
Plate 18:9,10

Croasdale & Scott (1976, p. 519, plate 4:4,5).

Cell L. 124–131 μm; W. 34–43 μm; A. 22 μm; T. 31 μm; I. 17 μm.

Distribution: *Flood plain, near Ja Ja Bb. 4.ii.79, Bowerbird Bb. 9.x.80*; N.T. (Croasdale & Scott 1976).

E. praemorsum (Nordstedt) Schmidle forma
Plate 18:32

Croasdale & Scott (1976, p. 519, plate 5:1).

Cell L. 61 μm; W. max. 37 μm; I. 9 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; N.T. (Croasdale & Scott 1976).

E. pulcherrimum West & West forma
Plate 18:30,31

The plant (Plate 18:30) is identical to *E. pulcherrimum* var. *pulcherrimum* forma described by Croasdale & Scott (1976, plate 5:4). It is smaller, and has a wider apical notch than the typical (West & West 1902, p. 153, plate 20:11). The zygospore (Plate 18:31) is spherical and bears short mammillate spines.

Cell L. 42 μm; W. 27 μm; I. 7 μm; polar lobe ssp. 23 μm. Zygo. D. 35 μm; S. 8–11 μm.

Distribution: *Backflow Bb. 11.iv.78*; N.T. (Croasdale & Scott 1976); Ceylon.

E. pulcherrimum var. menggalense
Scott & Prescott
Plate 18:40

Scott & Prescott (1961, p. 36, plate 7:7).

Cell L. 62 μm; W. 37 μm; I. 10 μm.

Distribution: *Gulungul Bb. 21.vii.80*; Indonesia.

E. sinuosum Lenorm var. subjenneri
West & West
Plate 18:15

Our plant agrees with Croasdale & Scott's (1976, plate 3:8) description of the variety. It is slightly longer and has a more dilated apex and fewer pores on the face of the semicell than the typical (West & West 1902, p. 148, plate 19:17).

Cell L. 61–66 μm; W. 33–38 μm; I. 12–13 μm, A. 17–18 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Bowerbird Bb. 9.x.80*; N.T. (Croasdale & Scott 1976); Sri Lanka, Burma.

E. spinulosum Delponte var. burmense
(West & West) Krieger
Plate 18:26

Our plants agree well with Skuja's description (1949, p. 115, plate 24:9–11) of the variety.

Cell L. csp. 65 μm; W. csp. 57 μm; A. csp. 26 μm; I. 13 μm.

Distribution: *Goanna Bb. 12.iii.80*; N.T. (Scott & Prescott 1958*a*); Burma.

E. validum **West & West forma**
Plate 18:23

Except for the absence of a mucilage pore (which we probably missed because of the cell contents) in the middle of the semicell, our plant is identical to a form of *E. subvalidum* Behre described by Scott & Prescott (1961, p. 44, plate 14:15). Behre's plant (1956, p. 81, plate 9:3) has a single tooth immediately above the isthmus, whereas ours has an extra tooth asymmetrically placed on one side of the semicell and it probably links Behre's plant with *E. validum*, which has two extra teeth, one on each side of the semicell.

Cell L. 25 μm; W. 17 μm; I. 4 μm.

Distribution: *Winmurra Bb. 13.v.79*; Indonesia.

Euastrum **sp. 1**
Plate 18:5,6

The plants are similar to those which we have assigned to *E. ansatum* var. *triporum*, but lack the three pores on the face of the semicell. They are also similar to *E. obesum* Joshua as described by Prescott et al. (1977, p. 83, plate 60:7).

Cell L. 83–91 μm; W. 25–33 μm; I. 11 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

Euastrum **sp. 2**
Plate 18:14

Number and arrangement of facial pores is identical to *E. sinuosum* var. *subjenneri* (Plate 18:15), however, the plants lack the upper lateral lobes normally found on these cells. Perhaps it is a reduced form of the variety.

Cell L. 59 μm; W. 30 μm; W. A. 15–17 μm; I. 11 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

Euastrum **sp. 3.**
Plate 18:22

Cell wall punctate.

Cell L. 78 μm; W. 41 μm; I. 14 μm.

Distribution: *Goanna Bb. 30.i.79.*

Genus *Groenbladia* Teiling

G. neglecta **(Raciborski) Teiling**
Plate 9:26

Scott & Prescott (1961, p. 122, plate 61:7).

Cell L. 28–32 μm; W. 10 μm; A. 8–9.5 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; Indonesia, Sri Lanka, Norway, Britain, USA, Guiana.

Genus *Hyalotheca* (Ehrenberg) Ralfs

H. dissiliens **(Smith) Brébisson var. *hians* Wolle**
Plate 9:25

West et al. (1923, p. 234, plate 162:16–18); Scott & Prescott (1961, p. 122, plate 61:2).

Cell L. 15–18 μm; W. 13–14 μm; I. 12–13 μm; A. 10–11 μm.

Distribution: *Hidden Bb. 8.iv.78*; Indonesia, New Zealand, Sri Lanka, Britain, USA.

H. mucosa **(Mertens) Ehrenberg var. *minor* Roy & Bisset**
Plate 9:24

West et al. (1923, p. 236, plate 162:5).

Cell L. 13–18 μm; W. 10 μm.

Distribution: *Jabiluka Bb. 13.iii.79*; Sri Lanka, Scotland.

H. undulata **Nordstedt**
Plate 8:10

West et al. (1923, p. 239, plate 162:6–9); Scott & Prescott (1961, p. 122, plate 61:3).

Cell L. 11–13 μm; W. 8–9 μm; A. 6–7 μm; I. 6–7 μm.

Distribution: *Djalkmara Bb. 3.vi.79*; Indonesia, Thailand, Sri Lanka, Britain, Sweden, Finland, USA.

H. undulata **forma**
Plate 8:11

Our plant appears to be an elongated form of the species. It is very similar to *H. undulata* var. *perundulata* Grönblad as described by Scott & Prescott (1961, p. 122, plate 61:4), but it has only a single undulation per semicell.

Cell L. 16–22 μm; W. 7–8 μm; A. 5–6 μm; I. 6 μm.

Distribution: *Jabiluka Bb. 6.iv.78.*

Genus *Ichthyodontum* Scott & Prescott

I. sachlanii **Scott & Prescott**
Plate 5:14,32

Scott & Prescott (1956*b*, p. 105, fig. 1–7; 1961, plate 7:3–5).

This is an unusual plant described previously only from Sumatra. Each semicell bears a ring of 10 supra-isthmian teeth which intermesh with those of the other semicell. Our plants (Plate 5:14) are slightly larger than typical, straight and with a more spreading apex. The two semicells are usually twisted at a slight angle to one another. Of a total of 12 cells observed, only two were normal *sachlanii* cells. The rest were dichotypical (Plate 5:32), with one semicell belonging to *I. sachlanii* and the other belonging to *I. sachlanii* var. *parorthium* Scott & Prescott (loc. cit.). We did not observe any normal var. *parorthium* cells. Scott & Prescott (1956*b*) noted 59 dichotypical, but only five *sachlanii* and four var. *parorthium* specimens. It appears that the dichotypical cells are the normal cell type.

Normal cell L. csp. 162 μm; W. 23 μm; I. 21 μm; A. csp. 39 μm.

Dichotypical cell L. csp. 146 μm; W. 24 μm; I. 18 μm.

Distribution: *Backflow Bb. 11.iv.78, Leichhardt Bb. 6.iv.78, Jabiluka Bb. 6.iv.78; Mine Valley 10.iv.78*; Sumatra.

Genus *Micrasterias* (Agardh) Ralfs

M. alata Wallich
Plate 22:6

Our plants are much larger than the typical (Wallich 1860, p. 279, plate 13:11). In Australia, the species has been recorded from northern Australia, Tasmania and Victoria and the only dimensions quoted (Scott & Prescott 1958*a*, p. 39) are also much smaller than the typical.

Cell L. spr. 167–171 μm, cpr. 288–310 μm; W. max. 230–260 μm; I. 21–26 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896; Bailey 1898; Krieger 1939), Vic. and Tas. (Tyler 1970); Africa, Brazil, Cuba, Lower Bengal, Indonesia, Japan.

M. alata forma
Plate 22:8

Croasdale & Scott (1976, p. 622, plate 7:8).

Our plant is larger than that described by Croasdale & Scott (loc. cit.).

Cell L. spr. 141 μm, cpr. 195 μm, W. 180 μm; I. 20 μm.

Distribution: *Gulungul Bb. 2.ii.79*; N.T. (Croasdale & Scott 1976).

M. alata var. *parallela* Scott ex Croasdale
Plate 22:7

Croasdale & Scott (1976, p. 522, plate 7:9.10).

This variety was first described from Oenpelli.

Cell L. spr. 140 μm, cpr. 185 μm; W. 186 μm; I. 18 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; Oenpelli (N.T.) (Croasdale & Scott 1976).

M. anomala Turner var. *bifurcata* (Borge) Scott & Prescott
Plate 22:9,10

Borge (1896, p. 16, plate 2:24, *Xanthidium bifurcatum*).

This plant's resemblance to species of *Xanthidium*, such as *X. armatum* var. *anguliferum* Krieger (our Plate 23:3), is evident. Scott & Prescott (1961, p. 46) transferred it to *Micrasterias* because of its size and structure. The Magela Creek plants are larger, but otherwise agree well with those described by Croasdale & Scott (1976, p. 523, plate 8:5). A variable number (6–10) of facial processes were observed.

L. spr. 252–294 μm, cpr. 297–346 μm; W. spr. 135–140 μm, cpr. 230–238 μm; I. 40–43 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Croasdale & Scott 1976), Qld (Borge 1896; Bailey 1898), Vic. (Hardy 1905).

M. apiculata Ehrenberg) Meneghini var. *lacerata* Turner
Plate 22:3

Turner (1892, p. 94, plate 22:3).

Our plants are identical to one from Oenpelli described as *M. apiculata* var. *lacerata* fa. *australiensis* by Scott & Prescott (1958*a*, p. 39, fig. 8:3). We feel that these plants are not significantly different from the variety and do not warrant the creation of a new forma.

Semicell L. ssp. 226–248 μm, csp. 247–275 μm; W. ssp. 186–200 μm, csp. 197–215 μm; I. 36–37 μm.

Distribution: *Near Kulukuluku Bb. 4.vii.80*; N.T. (Scott & Prescott 1958*a*); Malaysia, Sri Lanka, India, East Africa.

M. ceratofera Joshua
Plate 22:12

Croasdale & Scott (1976, p. 523, plate 6:7).

L. spr. 163–183 μm, cpr. 223–249 μm; W. spr. 88–107 μm, cpr. 136–165 μm; I. 26–27 μm.

Distribution: *Corndorl Bb. 23.viii.79*; N.T. (Croasdale & Scott 1976), Indonesia.

M. decemdentata (Nägeli) Archer var. *intermedia* Schmidle
Plate 21:14

Schmidle (1896, p.310, plate 9:18); Krieger (1939, p. 36, plate 105:3,4); Croasdale & Scott (1976, p. 524, plate 6:9).

Cell L. 102 μm; W. 107 μm; I. 15 μm.

Distribution: *Noarlanga Bb. 30.v.79, Djalkmara Bb. 3.vi.79*; N.T. (Croasdale & Scott 1976), Qld (Krieger 1939), N.S.W. (Krieger 1939).

M. doveri Biswas
Plate 20:1

Biswas (1929, plate 12:36).

A large, beautiful desmid, first described from Malacca. Chloroplasts are usually a bright, light green. Krieger (1939, p. 98) assigned it as a variety of *M. torreyi* (Bailey) Ralfs, Thomasson (1960, p. 23) however, re-established *M. doveri*.

Semicell L. 404–425 μm; W. 245–258 μm; I. 39–40 μm.

Distribution: *Hidden Bb. 8.iv.78*; Malaysia, Indonesia.

M. foliaceae Bailey
Plate 22:13

Ralfs (1848, p. 210, plate 35:3).

The plants occur in filaments.

Cell L. spr. 64 μm, cpr. 81 μm; W. 79 μm, W. A. 28–31 μm; I. 11 μm.

Distribution: *Backflow Bb. 11.iv.78*; Qld (Borge 1896; Bailey 1898; Krieger 1939; McLeod 1975), N.S.W. (Krieger 1939); Asia, Africa, North America.

M. foliaceae formae
Plate 22:4,5

Simpler forms of *M. foliaceae*, with less divided lateral lobes and one, instead of the usual two, triangular process on the face of the polar lobe.

Cell L. spr. 66–67 μm, cpr. 91–95 μm; W. 102–109 μm; W. A. 38–43 μm; I. 14–15 μm.

Distribution: *Ironstone Lagoon 22.i.79*.

***M. foliaceae* var. *ornata* Nordstedt**
Plate 22:14

This variety was first described from Brazil by Nordstedt (1870, p. 221, plate 2:16) and is common in South-East Asia. Scott & Prescott (1961, p. 48) noted that some of the filaments collected in Indonesia were warped along the surface, so that, in side view the filament appeared as a sinusoidal wave. The Magela Creek plants exhibit the same peculiarity, though some filaments are sinusoidal in part only.

Cell L. spr. 65 μm, cpr. 88 μm; W. 88 μm; W. A. 41 μm; I. 17 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*); SE Asia, North and South America, Africa.

***M. lux* Joshua**
Plate 20:14

Our plants agree with a form described by Scott & Prescott (1958*a*, p. 40, fig. 8:2); they differ from the typical (Joshua 1886, p. 636, plate 22:12) in that they have a series of small teeth at the base of the semicell and on the subapical lobes. They have fewer teeth than, and the lobules are not as tapered as in, *M. lux* var. *spinosa* Scott ex Croasdale described from Oenpelli by Croasdale & Scott (1976, p. 525, plate 7:1,2). A Victorian form (Tyler 1970, p. 228, fig. 22) has 15 lobules, instead of the usual 8, on each side of the semicell.

Cell L. 180–195 μm; W. 167–193 μm; I. 20–22 μm.

Distribution: *Mine Valley Bb. 31.v.79*; N.T. (Scott & Prescott 1958*a*), Vic. (Tyler 1970); Indonesia, Burma, India.

***M. lux* var. *longibracchiata* Behre forma**
Plate 20:11–13

Our plants agree with the single semicell described by Croasdale & Scott (1976, p. 527, plate 7:5) as *M. torreyi* (Bailey) Ralfs forma. However, the plants are more appropriately classified as a form of *M. lux* var. *longibracchiata* Behre (1956, p. 85, plate 10:3) even though they are larger than the latter and have 6 lateral lobes instead of 8.

Cell L. 300–355 μm; W. 270–335 μm; I. 32–35 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Ja Ja Bb. 7.iv.78, 4.vi.79*; N.T. (Croasdale & Scott 1976).

***M. mahabuleshwarensis* Hobson var. *reducta* G.S. West**
Plate 21:6

Our plants agree well with those described by Croasdale & Scott (1976, p. 525, plate 8:1,2). Both their plants and ours are more ornate, and more open in the outer sinus than the typical (Hardy 1905, p. 70, fig. 4).

Cell L. spr. 110 μm, cpr. 148 μm; W. 117 μm; I. 19 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976), Vic. (Hardy 1905; Krieger 1939).

***M. mahabuleshwarensis* var. *surculifera* Lagerheim**
Plate 21:5

Lagerheim (1888, p. 5, plate 1:1); Scott & Prescott (1961, p. 50, plate 16:1,2); Prescott et al. (1977, p. 166, plate 142:7).

Cell L. spr. 113 μm, cpr. 152 μm; W. 150 μm; I. 23 μm.

Distribution: *Hidden Bb. 8.iv.78*; Bengal, Indonesia, Florida, South America, Africa.

***M. mahabuleshwarensis* var. *tetradonta* Scott ex Croasdale**
Plate 21:7

Croasdale & Scott (1976, p. 526, plate 8:4).

A variety previously found only at Unawahlurk, Northern Territory. Its distinguishing feature is the pair of supra-isthmian teeth.

Cell L. spr. 106 μm, cpr. 137 μm; W. 95 μm; I. 18 μm.

Distribution: *Backflow Bb. 11.iv.78*; N.T. (Croasdale & Scott 1976).

***M. pinnatifida* (Kützing) Ralfs**
Plate 21:17–19

According to Prescott et al. (1977, p. 173) plants of this species are exceedingly variable. Three forms were observed. The first form (Plate 21:17) has all lobes bidentate and agrees with the original description by Ralfs (1848, p. 77, plate 10:3). The second form (Plate 21:18) is an intermediate between forms 1 and 3. In the third form (Plate 21:19) all the lobes end in single spines (Croasdale & Scott 1976, p. 527, plate 6:10).

Form 1 cells:

Cell L. 55 μm; W. 62–65 μm; I. 12 μm.

Distribution: *Noarlanga Bb. 30.v.79.*

Form 2 cells:

Cell L. 60 μm; W. 69A74 μm; I. 11 μm.

Distribution: *Noarlanga Bb. 30.v.79.*

Form 3 cells:

Cell L. 67 μm; W. 75–76 μm; I. 10 μm.

Distribution: *Djalkmara Bb. 3.vi.79.*

Distribution (overall): N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976); North and South America, Britain, Europe, Asia, New Zealand, Africa, Faeroe Islands.

***M. radians* Turner**
Plate 22:11

Turner (1892, p. 91, plate 5:6); Krieger (1939, p. 67, plate 115:8); Croasdale & Scott (1976, p. 527, plate 8:6).

Semicell L. 65 μm; W. 109 μm; I. 15 μm.

Distribution: *Baralil Creek 3.vi.79*; N.T. (Croasdale & Scott 1976), SE Asia, USA, South America.

M. radiosa Ralfs var. _evoluta_ (Nordstedt) Ungaretti forma
Plate 22:1

Our plants are much larger than those described by Ungaretti (1981, p. 22, fig. 25a-e) and Nordstedt (1888, p. 29, plate 2:14, *M. papillifera* Brébisson var. *evoluta*). Instead of a row of intramarginal teeth on either side of the polar lobe, they have one subapical tooth that projects against the lateral lobe.

L. 330–378 μm; W. 293–360 μm; I. 30–33 μm.

Distribution: *Mine Valley Bb. 10.iv.78.*

M. radiosa var. _ornata_ Nordstedt fa. _aculeata_ (Krieger) Croasdale
Plate 19:1

Krieger (1939, p. 94, plate 131:2, *M. sol* (Ehrenberg) Kützing var. *aculeata*); Prescott et al. (1977, p. 183, plate 131:1–3).

A form with long, stout and numerous intramarginal spines along the primary and secondary incisions. Krieger based his variety on one of Borge's (1925, p. 26, plate 5:18) figures of *M. sol* var. *ornata* Nordstedt. We regard the plants from Oenpelli, identified as *M. sol* var. *elegantior* G.S. West by Scott & Prescott (1958*a*, p. 42, fig. 8:1), as being almost identical to the Magela Creek ones.

Cell L. 190 μm; W. 184 μm; I. 18.5 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*); USA, South America.

M. suboblonga Nordstedt var. _australis_ Krieger
Plate 18:29

Kreiger (1939, p. 41, plate 105:13) mentioned the uncertain position of this variety, as well as its close relationship to *Euastrum*. We feel that the plant should have been placed in the latter genus. This is supported by the presence of a small, nodular thickening on the face of the semicell of our plant. Except for a narrower width, our plant is identical to a Queensland plant identified as '*Micrasterias* spec.' by Borge (1896, p. 11, plate 4:62).

Cell L. 46 μm; W. 25 μm; I. 5 μm.

Distribution: *Winmurra Bb. 31.v.79*; Qld (Borge 1896; Bailey 1898).

M. thomasiana Archer var. _evoluta_ Krieger
Plate 20:15,16

Krieger (1939, p. 110, plate 141:2); Scott & Prescott (1961, p. 52, plate 22:5,6).

The plants agree with previous descriptions of the variety except for the wide incisions and the absence of a supra-isthmian tumour. Two forms were observed. The first form (Plate 20:15) has two double lateral projections at the base of the semicell. This agrees with the typical as described by Krieger (loc. cit.) and Scott & Prescott (loc. cit.). In the second form (Plate 20:16), the lateral projections are single. Rarely, dichotypical specimens were seen.

Form 1 cells:

Cell L. 244 μm; W. 195 μm; I. 25 μm.

Distribution: *Gulungul Bb. 7.iii.79 (fish stomach contents), Mine Valley Bb. 10.iv.78*; Indonesia.

Form 2 cells:

Cell L. 240 μm; W. 183 μm; I. 27 μm.

Distribution: *Leichhardt Bb. 6.iv.78.*

M. thomasiana var. _notata_ (Nordstedt) Grönblad
Plate 20:4

Nordstedt (1888, p. 29, plate 2:13, *M. denticulata* Brébisson var. *notata*).

Except for some slight differences in the apical notch, the plant agrees with the typical. Grönblad (1920, p. 38) points out that this variety seems to be intermediate between *M. thomasiana* and *M. denticulata*, but more closely resembles the former. The cell wall is granular.

Cell L. 272 μm; W. 230 μm; I. 28 μm.

Distribution: *Baralil Creek 3.vi.79*; Qld (Krieger 1939), Vic. (Viyakornvilas 1974); Papua New Guinea (Watanabe et al. 1979), New Zealand, North and South America, Europe, Asia, arctic.

M. thomasiana var. _torneensis_ Krieger
Plate 22:2

Borge (1913, p. 54, plate 3:41, *M. denticulata* Brébisson var. *notata* Nordstedt forma); Krieger (1939, p. 112, plate 141:3).

This appears to be the only other record of the variety since its discovery in Sweden by Borge. Our plant is slightly smaller.

Semicell L. 91 μm; W. 158 μm; I. 21 μm; polar lobe 44 μm.

Distribution: *Coonjimba Bb. 13.v.78*; Sweden.

M. torreyi Bailey var. _crameri_ (Bernard) Krieger
Plate 20:5–10

Krieger (1939, p. 98, plate 134:2); Bernard (1909, p. 64, plate 5:115, *M. lux* Joshua var. *crameri*).

A range of forms was observed beginning with a plant that has 7 lateral lobes, linking the 6-lobed *M. torreyi* var. *nordstedtiana* (Hieronymus) Schmidle (Krieger p. 99, plate 133:1,4) to the 8-lobed form, which is typical *crameri*. A small version of this 8-lobed form bridges the size gap between *crameri* and its forma *minor* Irenee-Marie (Prescott et al. 1977, p. 192, plate 112:2). As the number of incisions on the lateral lobes increases, a form that is comparable, but not identical, to *M. rotata* (Greville) Ralfs fa. *evoluta* Turner (Krieger 1939, p. 102, plate 136:2) is reached. Some plants have one semicell 8-lobed and the other much incised, while others have an additional supra-isthmian swelling and a pair of spines in the apical notch.

Thomasson (1960, p. 24) and Prescott et al. (1977, p. 192) have suggested that *M. hieronymusii* Schmidle be re-established as a species with *crameri* as its variety. We are uncertain about the validity of such a name used by Croasdale & Scott (1976, p. 524) quoting Thomasson (who did not actually make the transfer) as the authority. Nevertheless, from the evidence presented above we suggest that *M. torreyi* var. *crameri* be reduced to a synonym of *M. torreyi* var. *nordstedtiana* which was initially called *M. nordstedtiana* Hieronymus and has *M. hieronymusii* Schmidle as a synonym (Schmidle, 1898, p. 49). If we follow Thomasson's (loc. cit.) suggestion that these varieties be dissociated from *M. torreyi* then, since *M. norsdstedtiana* Hieronymus is invalidated by *M. nordstedtiana* Wolle (Schmidle 1898, p.49), *M. hieronymusii* remains the only choice.

Cell L. 262–376 μm; W. 240–334 μm; I. 27–40 μm.

Distribution: *Hidden Bb. 8.iv.78, Backflow Bb. 11.iv.78, Gulungul Bb. 7.iii.79 (fish stomach contents), Mine Valley Bb. 4.vi.79, Ja Ja Bb. 4.vi.79, Goanna Bb. 12.iii.80*; N.T. (Croasdale & Scott 1976, *M. hieronymusii* Schmidle var. *crameri* (Bernard) Thomasson); Singapore, Indonesia.

M. torreyi Bailey var. curvata Krieger
Plate 20:2,3

Our plants are larger than the typical (Krieger 1939, p. 98, plate 134:3; Borge 1925, p. 28, fig. 2,3, *M. torreyi* var. *nordstedtiana* (Hieronymus) Schmidle fa.), have a greater number of lobules and, usually, have spines in the apical notch. One cell had a pair of spines at the base of each semicell. A sample from a drill pool at Koongarra was almost a monoculture of this variety. This variety should probably be assigned to *M. doveri*.

Cell L. 365–370 μm; W. 270–275 μm; I. 28–31 μm.

Distribution: *Hidden Bb. 8.iv.78, Koongarra 29.v.79, Ja Ja Bb. 4.vi.79*; Brazil.

M. tropica Nordstedt var. polonica Eichler & Raciborski
Plate 21:1–4

This is a variable taxon. The plants observed ranged from stouter forms, which agree well with previous descriptions of the variety *polonica* (Eichler & Raciborski 1893, plate 3:9; Krieger 1939, p. 60, plate 113:2–4), to slender forms which intergrade into forma *australiansis* which Scott & Prescott (1958*a*, p. 42, fig. 7:7) described from Oenpelli.

Cell L. spr. 102–123 μm, cpr. 123–178 μm; W. (71)–94–129 μm; I. 18–20 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Backflow Bb. 22.vii.80*; N.T. (Scott & Prescott 1958*a*); Eastern Europe, Central Asia, Japan.

M. truncata (Corda) Brébisson
Plate 21:15

Ralfs (1848, plates 8:4 and 10:56); Scott & Prescott (1958*a*, p. 42, fig. 10:1).

This is one of the most common species of *Micrasterias*, occurring in a large number of confusing varieties and forms (Prescott et al. 1977, p. 194). The Magela Creek cells are smaller than normal.

Cell L. 61 μm; W. 71 μm; I. 15 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*), N.S.W. (Skinner 1976), Vic. (Powling 1970), Tas. (Tyler 1970); world-wide.

M. zeylanica Fritsch formae
Plate 21:8–13

Three forms were observed. Forma 1 (Plate 21:9) is a small plant that has affinities with the forma 1 described by Croasdale & Scott (1976, p. 529, plate 6:5), and the varieties *rectangularis* Scott & Prescott (1961, p. 53, plate 21:5–7) and *wallichiana* (Turner) Krieger (1939, p. 38, plate 101:14,15). Forma 2 (Plate 21:8) differs from the typical (Fritsch 1907, p. 246, fig. 4c) in that it is wider than long (rather than being approx. circular) and it has longer spines. It is identical to a form described by Scott & Prescott (1958*a*, p. 43, fig. 7:5). Forma 3 (Plate 21:10–13) is an intergrading series of plants that are much larger than previously described forms.

Forma 1 cells:

Cell L. 40 μm; W. 53 μm; I. 8 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

Forma 2 cells:

Cell L. 52 μm; W. 70 μm; I. 11 μm.

Distribution: *Ja Ja Bb. 7.iv.78*; N.T. (Scott & Prescott 1958*a*).

Forma 3 cells:

Cell L. 70–75 μm; W. csp. 86–105 μm; I. 12–14.5 μm.

Distribution: *Goanna Bb. 30.i.79, 12.iii.80.*

***Micrasterias* sp.**
Plate 21:16

The plant is probably allied to *M. jenneri* Ralfs, especially the variety *simplex* W. West (West & West 1905, p. 88, plate 43:3); however, it is smaller, it has deeper incisions and the lobes are further apart.

Semicell L. 53 μm; W. 79 μm; I. 19 μm.

Distribution: *Goanna Bb. 30.i.79.*

Genus *Onychonema* Wallich

O. laeve Nordstedt forma
Plate 9:39

A form with an acute but open sinus and short lateral spines.

Cell L. 20–22 μm; W. ssp. 27–29 μm, csp. 31–34 μm; I. 7–8 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

O. laeve Nordstedt var. constrictum Scott & Prescott
Plate 9:40

Scott & Prescott (1961, p. 121, plate 60:12).

A variety with an elongated isthmus. Compare with *O. laeve* var. *oscitans* Scott & Prescott (1958*a*, p. 69, fig. 21:3).

Cell L. 19–20 μm; W. ssp. 20–23 μm, csp. 25–30 μm; I. 5–6.

Distribution: *Mine Valley Bb. 10.iv.78*; Indonesia.

***O. laeve* var. *latum* West & West**
Plate 9:41

West & West (1896, p. 232, plate 12:18); Scott & Prescott (1958*a*, p. 69, fig. 21:2; 1961, p. 121, plate 60:13).

Cell L. 19 μm; W. ssp. 27–29 μm, csp. 32–34 μm; I. 4 μm.

Distribution: *Hidden Bb. 8.iv.78;* N.T. (Scott & Prescott 1958*a*); Indonesia, USA.

***O. laeve* var. *micracanthum* Nordstedt**
Plate 9:27,28

Scott & Prescott (1958*a*, p. 69, fig. 20:15; 1961, p. 121, plate 60:14).

The zygospore is globose and ornamented with long, sharp spines. West et al. (1923, plate 160:17) figured a zygospore with more numerous, but much shorter spines.

Cell L. 14 μm; W. ssp. 18 μm, csp. 24–26 μm; I. 4 μm. Zygo. D. 15 μm; S. 10–12 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; N.T. (Scott & Prescott 1958*a*); Indonesia.

Genus *Penium* (Brébisson) Ralfs

***P. cylindrus* (Ehrenberg) Brébisson**
Plate 6:13,14

West & West (1904, p. 84, plate 6:1–3); Scott & Prescott (1961, p. 9, plate 1:11).

Cells small; cell wall reddish brown, covered with minute granules. Zygospore globose and smooth.

Cell L. 24–50 μm; W. 7–9 μm. Zygo. D. 19 μm.

Distribution: *Backflow Bb. 11.iv.78;* N.T. (Scott & Prescott 1958*a*), Qld (Bailey 1893), N.S.W. (Skinner 1976); Papua New Guinea (Thomasson 1967), Japan, Sumatra, New Zealand, Europe, North and South America.

***P. spirostriolatiforme* West & West fa. *rectispirum* (Grönblad) Croasdale**
Plate 5:13,28–30

Croasdale & Scott (1976, p. 506, plate 1:1,2).

Striae slightly twisted, and extending the length of the cell.

Cell L. 192–308 μm; W. middle 10 μm; A. 8–9.

Distribution: *Djalkmara Bb. 3.vi.79, Goanna Bb. 30.i.79*; N.T. (Croasdale & Scott 1976).

***Penium* sp. 1**
Plate 6:12

Plant is short and cylindrical, apices rounded. Chloroplast has about 7 ridges and 2 pyrenoids.

Cell L. 40 μm; W. 12 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

***Penium* sp. 2**
Plate 6:10

The plant has a median constriction and thick cell walls. Chloroplast is axial with about 8 ridges and a central row of 5 pyrenoids. We are uncertain about its position; it is very much like an *Actinotaenium* except for the axial row of pyrenoids.

Cell L. 188 μm; W. 60 μm; I. 155 μm.

Distribution: *Mine Valley Bb. 10.iv.78.*

Genus *Phymatodocis* Nordstedt

***P. irregularis* Schmidle var. *intermedia* Gutwinski**
Plate 9:29,30

Scott & Prescott (1961, p. 123, plate 61:11–15); Croasdale & Scott (1976, p. 554, plate 17:10).

Cell L. 30–32 μm; W. 55–60 μm; I. 20 μm.

Distribution: *Hidden Bb. 8.iv.78;* N.T. (Croasdale & Scott 1976); Indonesia.

Genus *Pleurotaenium* Nägeli

***Pl. australianum* (Borge) Scott formae**
Plate 11:4–10C

Borge (1896, p. 29, plate 4:60,61, *Docidium australianum*); Krieger (1937, p. 448, plate 53:3, *Triploceras australianum*); Scott & Prescott (1958*a*, p. 25, fig. 2:16); Croasdale & Scott (1976, p. 509, plate 2:3).

This species resembles *Triploceras* in possessing lateral spines, but was placed in *Pleurotaenium* by Scott (Scott & Prescott 1958*a*) because of the smoothly rounded and truncate apex. *Triploceras* has divided apices. In this study three forms were seen.

Forma 1 (Plate 11:4–6) has 6–7 spines in the apical whorl and 12 in each of the other 4 whorls of the semicell. The spines in the basal whorl curve downwards, all the other spines curve upwards. The plants correspond to forma 2 of Croasdale & Scott (loc. cit). The down-curving spines of the basal whorl resemble the 'forma' of Borge (op. cit., fig. 61) but the plants differ in having more spines in the upper whorls.

Forma 2 (Plate 11:7–9) is very much larger, with 9–11 apical spines and 14–16 spines in each of the other whorls. The spines curve slightly upwards, except those in the basal whorl which are horizontal. The plants are slightly larger than the ones described by Scott & Prescott (loc. cit.). The two forms usually occur together in varying numbers.

Forma 1 cells:

Cell L. ssp. 320–420 μm, csp. 336–432 μm; W. base ssp. 37–42 μm, csp. 58–65 μm; A. ssp. 25–28 μm, csp. 42–55 μm; I. 22–24 μm.

Forma 2 cells:

Cell L. ssp. 456–594 μm, csp 466–600 μm; W. ssp. 50–62 μm, csp. 90–105 μm; A. ssp. 32–36 μm, csp. 63–77 μm; I. 30–35 μm.

Distribution: *Ja Ja Bb. 7.iv.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976), Qld (Borge 1896).

Forma 3 (Plate 11:10) has only three whorls of spines below the apex. There are 6–7 apical spines and 8–10 spines in each of the other whorls. It corresponds to form 1 described by Croasdale & Scott (1976, p. 510, plate 2:4) but is larger. It is rare; only two cells were observed.

Cell L. 448–518 μm, csp. 456–535 μm; W. csp. 105–126 μm; I. 27–28 μm; A. 35–39 μm, csp. 68– 84 μm.

Distribution: *Ironstone Lagoon 22.i.79, Goanna Bb. 12.iii.80*; N.T. (Croasdale & Scott 1976).

Pl. *burmense* (Joshua) Krieger forma
Plate 14:1,2

The plants are much longer than those previously described (Krieger 1937, p. 416, plate 45:4; Scott & Prescott 1958*a*, p. 25, fig. 2:8). Each semicell has 14–17 undulations and 12–14 apical tubercles.

Semicell L. 510–630 μm; W. base 41–45 μm; I. 32– 36 μm; A. 30–33 μm.

Distribution: *Coonjimba Bb. 13.v.78;* N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896).

Pl. *burmense* var. *curtum* Scott & Prescott
Plate 12:17

Scott & Prescott (1958*a*, p. 25, fig. 2:9–10).

Cell L. 294 μm; W. 25 μm; I. 16 μm; A. 19 μm.

Distribution: *Magela crossing 14.ii.80*; N.T. (Scott & Prescott 1958*a*).

Pl. *coronatum* (Brébisson) Rabenhorst forma
Plate 12:18

The plant is very similar to one described by Prescott & Scott (1952, p. 5, fig. 2:2). Their plant, as well as ours, is much smaller than typical (West & West 1904, p. 199). Also, our plant is slightly constricted just above the basal inflation and has faint apical tubercles.

Semicell L. 222 μm; W. 28 μm; I. 21 μm; A. 18 μm.

Distribution: *Backflow Bb. 22.vii.80.*

Pl. *coroniferum* (Borge) Krieger var. *multinodosum* Scott & Prescott
Plate 12:16

Scott & Prescott (1958*a*, p. 26, fig. 2:11).

Each semicell has 14–16 small apical tubercles.

Cell L. 384–434 μm; W. 34–37 μm; I. 20–24 μm; A. 18–20 μm.

Distribution: *Ja Ja Bb. 4.vi.79*; N.T. (Scott & Prescott 1958*a*); Indonesia.

Pl. *coroniferum* var. *multinodosum* forma
Not figured

There is little doubt that the plant is a growth form of the variety. It differs from the typical (Scott & Prescott 1958*a*, p. 26, fig. 2:11) only in that it lacks the ring of apical tubercles.

Cell L. 470–506 μm; W. 32–36 μm; I. 20 μm; A. 17–20 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

Pl. *ehrenbergii* (Brébisson) de Bary
Plate 13:15,16

West & West (1904, p. 205, plates 29, fig. 9–11); Prescott et al. (1975, p. 114, plate 45:1–5).

Semicell L. 117–149 μm; W. 21–24 μm; I. 17–21 μm; A. 15–16 μm.

Distribution: *Jabiluka Bb. 6.iv.78;* widely distributed round the world.

Pl. *ehrenbergii* var. *crenulatum* (Ehrenberg) Krieger
Plate 14:5,6

Playfair (1910, plate 11:13, plate 12:21, *Docidium trabecula* (Ehrenberg) Reinsch var. *crenulatum* (Roy & Bissett) Playfair); Krieger (1937, p. 413, plate 4:36).

Semicell L. 270 μm; W. 34 μm; I. 27 μm; A. 22 μm.

Distribution: *Jabiluka Bb. 6.iv.78;* N.S.W. (Playfair 1910); Japan, Europe, South America.

Pl. *ehrenbergii* var. *elongatum* W. West
Plate 13:13

West & West (1904, p. 207, plate 30:3); Prescott et al. (1975, p. 117, plate 46:1–3).

Straight, evenly tapered, elongated semicells each with a small basal swelling and 2 or 3 smaller swellings beyond it; apex with 3 to 6 visible tubercles.

Semicell L. 324 μm; W. 22 μm; I. 18 μm; A. 14 μm.

Distribution: *Corndorl Bb. 8.iii.79;* Qld (Borge 1911); Asia, Europe, Africa, North and South America.

Pl. *ehrenbergii* var. *quantillum* (Turner) Krieger
Plate 13:7

Krieger (1932, p. 166, plate 6:10); Turner (1892, p. 28, plate 2:9, plate 4:12, *Docidium quantillum*).

Semicell small, with a basal inflation and 5 apical tubercles.

Semicell L. 97 μm; W. 12 μm; I. 10 μm; A. 9 μm.

Distribution: *Jabiluka Bb. 6.iv.78;* Indonesia, India.

Pl. *ehrenbergii* var. *undulatum* Schaarschmidt
Plate 14:7,8

Prescott et al. (1975, p. 117, plate 46:5,6,18).

Margin of semicells gently and symmetrically undulate halfway up the semicell or to the apex.

Semicell L. 275 μm; W. 31 μm; I. 23 μm; A. 18 μm.

Distribution *Gulungul Bb. 7.iii.79 (fish stomach contents*); Vic. (Viyakornvilas 1974), S.A. (Prescott & Scott 1952); Asia, Europe, Africa, North and South America.

Pl. *elatum* (Turner) Borge forma
Plate 12:1–11

Large plants generally with undulate margins, though some cells have more or less straight margins while the occasional cell may be slightly inflated. In spite of these variations, the general shape of the apex and the disposition of the tubercles remain constant. The apex is straight to slightly bulbous, especially in the more undulate plants, and ornamented with a corona of 27–35 conical to rounded tubercles. The cell is punctate. The plants, especially the undulate ones, agree well, both in shape and size, with *Pl. elatum* as described by Krieger (1937, p.

425, plate 46:3). However, the apical tubercles on our plants are smaller, more conical than round and less tightly arranged; much more like those of *Pl. cylindricum* (Turner) West & West var. *stuhlmannii* (Hieronymus) Krieger (1937, p. 420, plate 45:3), which has straight sides above the basal inflation.

Semicell L. 293–457 μm; W. 41–63 μm; I. 36–50 μm; A. 36–49 μm.

Distribution: *Coonjimba Bb. 13.v.78, Ironstone Lagoon 22.i.79, Gulungul Bb. 25.xii.79 (fish stomach contents).*

Pl. excelsum (Turner) Gutwinski
Plate 13:17

Krieger (1937, p. 416, plate 43:8,9); Scott & Prescott (1958*a*, p. 26, fig. 2:3).

Semicell L. 157 μm; W. 15 μm; I. 14 μm; A. 12 μm.

Distribution: *Corndorl Bb. 8.iii.79;* N.T. (Scott & Prescott 1958*a*); SE Asia, USA.

Pl. excelsum var. rhomphaeum (Turner) Krieger
Plate 13:18

Krieger (1937, p. 416, plate 43:10).

A slender variety.

Semicell L. 148 μm; W. 11 μm; I. 10 μm; A. 9 μm.

Distribution: *Jabiluka Bb. 6.iv.78;* Ceylon, India.

Pl. kayei (Archer) Rabenhorst
Plate 10:7,8

Scott & Prescott (1958*a*, p. 26, fig. 2:15).

Slightly smaller than the typical (Krieger 1937, p. 440, plate 51:8), with four, instead of the usual five, whorls of paired spines per semicell.

Semicell L. 132 μm; W. csp. 58 μm; I. 25 μm; A. ssp. 30 μm, csp. 51 μm.

Distribution: *Coonjimba Bb. 13.v.78;* N.T. (Scott & Prescott 1958*a*, Croasdale & Scott 1976); eastern Asia.

Pl. minutum (Ralfs) Delponte
Plate 13:8

Scott & Prescott (1961, p. 16, plate 2:24); Prescott et al. (1975, p. 121, plate 38:9–12).

Base of semicell may be very slightly swollen.

Cell L. 123 μm; W. 12–13 μm; I. 11 μm; A. 7 μm.

Distribution: *Jabiluka Bb. 13.iii.79;* Asia, Europe, North and South America, Africa, Arctic.

Pl. minutum (Ralfs) Delponte var. excavatum Scott & Grönblad
Plate 14:4

Scott & Grönblad (1957, p. 11, plate 2:3,4); Scott & Prescott (1961, p. 16, plate 2:27).

Cells thin, elongated; basal swellings small; slight constriction at the isthmus; apices excavated. Our plant differs in that it has slight indentations on the slightly oblique apices.

Cell L. 204 μm; W. base 8.5 μm; I. 7.5 μm; A. 4 μm.

Distribution: *Djalkmara Bb. 3.vi.79;* Indonesia, North America.

Pl. minutum var. latum Kaiser
Plate 13:14

Scott & Prescott (1961, p. 16, plate 2:25).

Prescott et al. (1975, p. 121–2) have stated that there is considerable overlap between this variety and var. *gracile* and fa. *maius*.

Semicell L. 130 μm; W. 17 μm; I. 4 μm; A. 11 μm.

Distribution: *Jabiluka Bb. 6.iv.78;* Asia, Europe, North and South America, arctic.

Pl. nodosum forma
Plate 13:1–3

A form similar to var. *gutwinskii* in shape and size, though it is more drawn out lengthwise. The apical tubercles are not hooked but curve slightly upwards. Perhaps the major feature is the bifid nodules, which brings it very close to *Pl. nodosum* var. *mamillatum* (Borge) Krieger (1937, p. 437, plate 47:3) described initially from Queensland as *Docidium nodosum* Bailey var. *mamillatum* by Borge (1896, p. 27, plate 4:52). This form, and var. *gutwinskii*, need further investigation.

Semicell L. 272 μm; W. 101 μm; I. 37 μm; A. ssp. 44 μm, csp. 62 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

Pl. nodosum (Bailey) Lundell var. borgei Grönblad
Plate 13:5

Grönblad (1920, p. 27, plate 4:28); Croasdale & Scott (1976, p. 510, plate 1:12).

Semicell L. 114 μm; W. 44 μm; I. 18 μm; A. 17 μm.

Distribution: *Coonjimba Bb. 13.v.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976); Asia, Europe, North America.

Pl. nodosum var. gutwinskii Krieger
Plate 13:4

Krieger (1937, p. 437, plate 47:2); Prescott et al. (1975, p. 126, plate 44:10).

A broad form with strongly projecting nodules and a short apical region. Our plants have strongly tapered and hooked apical tubercles.

Cell L. 373–397 μm; W. 77–92 μm; I. 28–30 μm; A. 27–33 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Coonjimba Bb. 13.v.75;* Qld (Krieger 1937); Indonesia, Ceylon, USA, South America.

Pl. ovatum Nordstedt var. inermius Möbius
Plate 13:11

Möbius (1894, p. 339, plate 2:18–19); Krieger (1937, p. 435, plate 50:5).

The plant is wider than those previously described.

L. 360 μm; W. 141–144 μm; I. 63 μm.

Distribution: *Gulungul Bb. 2.ii.79*; Qld (Möbius 1894; Bailey 1895; McLeod 1975), Vic. (Hardy 1905); Borneo, Formosa, Japan, South America.

***Pl. ovatum* Nordstedt var. *tumidum* (Maskell) G.S. West**
Plate 13:10

Hardy (1906, p. 21); Krieger (1937, p. 435, plate 50:2,3).

Each semicell has 7–8 apical tubercles.

L. 300 μm; W. 120–130 μm; I. 72 μm.

Distribution: *Gulungul Bb. 2.ii.79*; Vic. (Hardy 1906; West 1909*a*); New Zealand, Asia, Africa.

***Pl. sceptrum* (Roy) West & West forma**
Plate 14:3

Prescott et al. (1975, p. 130, plate 42:3–10).

Cells small, narrow and elongated. Our plants have 2 apical teeth per semicell instead of the usual 4. This may seem insignificant, but the number of apical teeth had been used by Prescott et al. (loc. cit.) to separate varieties of *Pl. sceptrum*.

Cell L. 178–197 μm; W. 7–8 μm; I. 6 μm; A. 3–4 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

***Pl. subcoronulatum* (Turner) West & West**
Plate 12:12,13,19–24

Turner (1892, p. 29, plate 3:1, *Docidium subcoronulatum*); West & West (1895, p. 44, plate 5:33); Prescott et al. (1975, p. 132, plate 49:2–4).

We have found this to be a variable taxon, ranging from slender plants with about 14 apical tubercles to robust plants that are nearly 3 times larger and have about 35 apical tubercles. The plants characteristically form short filaments, usually of up to 4 cells. The cell wall is generally covered with bordered pits, often with mucilaginous plugs. Apical tubercles occur as prominent rounded nodules and, especially in the larger plants, have tails that extend centripetally when observed in end view.

The plants in the middle of the range agree well with descriptions of *Pl. subcoronulatum* (loc. cit.), whereas those at the top of the range are practically identical to *Pl. elatum* (Turner) Borge var. *conjunctum* (Turner) West & West fa. *duplo-major* West & West (1902, p. 144, plate 18:29–32) which Krieger (1937, p. 425, plate 46:3) has reduced to synonymy with *Pl. elatum*.

Semicell L. 184–354 μm; W. 20–58 μm; I. 17–50 μm; A. 21–56 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Ironstone Lagoon 22.i.79, Corndorl Bb. 8.iii.79, Gulungul Bb. 25.xii.79 (fish stomach contents)*; Australia (Krieger 1937); Asia, Africa, North and South America.

***Pl. trabecula* (Ehrenberg) Nägeli var. *elongatum* Cedergren**
Plate 13:12

Prescott et al. (1975, p. 134, plate 40:10,11).

Semicell has a definite basal inflation with 1–3 swellings beyond it. The plant is slightly smaller than normal.

Semicell L. 287 μm; W. base 23 μm; I. 17 μm; A. 15 μm.

Distribution: *Gulungul Bb. 7.iii.79 (fish stomach contents)*; Europe, USA, Africa, West Indies.

***Pl. verrucosum* (Bailey) Lundell**
Plate 13:6

Scott & Prescott (1958*a*, p. 27, fig. 2:14); Prescott et al. (1975, p. 138, plate 50:13–16).

Semicell L. ssp. 178 μm, csp. 182 μm; W. 34 μm; I. 27 μm; A. 24 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*), Qld (Krieger 1937); Asia, Africa, North and South America.

***Pleurotaenium* sp.**
Plate 13:9

Cell large, 7 times longer than broad; semicells have basal inflation and a large, globose, median swelling. Apex bulbousNswollen with 11–12 conical tubercles. Semicells joined at isthmus by projecting suture. Chloroplasts in parietal bands. The median ballooning of the semicells makes this a very distinctive *Pleurotaenium*. It is unlike any described species. Only one cell was seen.

Cell L. 275 μm; W. base 38 μm, W. max. 62–63 μm; I. without suture 27 μm; A. ssp. 30–32 μm, csp. 35–38 μm.

Distribution: *Gulungul Bb. 8.iii.79.*

Genus *Sphaerozosma* (Corda) Ralfs

***S. excavatum* Ralfs. var. *subquadratum* West, West & Carter**
Plate 8:16

West et al. (1923, p. 213, plate 160:4,5).

A tiny variety first reported from England.

Cell L. 6–7 μm; W. 8 μm; I. 3–4 μm.

Distribution: *Umbungbung Bb. 30.v.79*; England.

***S. granulatum* Roy & Bisset forma**
Plate 8:12

Differs from the description of the species by West et al. (1923, p. 213, plate 160:6,7) in that it has a slightly elongated isthmus. The plant described by Scott & Prescott (1958*a*, p. 68, fig. 20:14) has only 3 granules on each side of the semicell and is identifiable with var. *trigranulatum* West & West (West et al. 1923, p. 214, plate 160:8).

Cell L. 11–12 μm; W. 11–12.5 μm; I. 4.5–5.5 μm.

Distribution: *Jabiluka Bb. 6.iv.78.*

***Sphaerozosma* sp. 1**
Plate 8:13

An undescribed species with an elongated isthmus, truncated apex and a pair of granules on each side of the semicell. The two semicells of a single cell are often at an angle to one another.

Cell L. 11–12 μm; W. 9–11 μm; I. 5 μm.

Distribution: *Jabiluka Bb. 6.4.78.*

***Sphaerozosma* sp. 2**
Plate 8:15

Cell L. 12–13 μm; W. 14–17 μm; I. 6 μm.

Distribution: *Flying Fox Bb. 2.vi.79.*

***Sphaerozosma* sp. 3**
Plate 8:14

Apex flat with a conspicuous concavity in the middle.

Cell L. 16 μm; W. 12–14 μm; I. 7–8 μm.

Distribution: *Goanna Bb. 30.i.79.*

Genus *Spinoclosterium* Bernard

Spinoclosterium is a monotypic genus created to accommodate a *Closterium*-like plant which has poles that bear a straight, stout spine.

***Sp. cuspidatum* (Bailey) Hirano**
Plate 6:9, Plate 43:14

Prescott et al. (1975, p. 100, plate 36:16).

Synonymous with *Closterium cuspidatum* Bailey, *Spinoclosterium curvatum* Bernard and a plant from the Northern Territory identified as *Sp. curvatum* var. *spinosum* Prescott (Scott & Prescott 1958*a*, p. 25, fig. 1:17).

Cell L. 114–132 μm; W. 48 μm; S. 12–17 μm.

Distribution: *Bowerbird Bb. 9.x.80;* N.T. (Scott & Prescott 1958*a*); Asia, North and South America.

A plant (Plate 6:9) from Jabiluka Billabong (13.iii.79) had a pair of granules on the ventral side of each semicell.

Cell L. 142 μm; W. 50 μm; A. 17 μm; S. 17–19 μm.

Genus *Spondylosium* (Brébisson) Ralfs

***S. nitens* (Wallich) Archer fa. *major* Turner**
Plate 9:17,18

Scott & Prescott (1961, p. 120, plate 60:9).

Cell L. 23–25 μm; W. 28–31 μm; I. 8 μm; T. 11–12 μm.

Distribution: *Downstream of Darwin Dam 7.x.80*; Indonesia, India.

***S. nitens* forma**
Plate 9:37,38

Four- and five-radiate forms with elongated isthmuses and apices, and finger-like lobes.

Four-radiate form (Plate 9:37):

Cell L. 47 μm; W. 36–38 μm; I. 6.7 μm.

Five-radiate form (Plate 9:38):

Cell L. 38 μm; W. 29–30 μm; I. 7 μm.

Distribution: *Ironstone Lagoon 22.i.79.*

***S. nitens* var. *triangulare* Turner fa. *javanicum* Gutwinski**
Plate 9:34–36

The shape and dimensions of our plants (Plate 9:34,35) are in good agreement with the description by Scott & Prescott (1961, p. 121, plate 60:10) and support their contention that the width measurements given by Gutwinski (1902, p. 579, plate 36:3) are erroneous. This name was changed to *S. javanicum* by Grönblad (1945, p. 33), mentioned by Scott & Grönblad (1957, p. 49), and apparently abandoned since. The comments by Scott & Prescott (loc. cit.) may be relevant.

Cell L. 30–31 μm; W. 30–32 μm; I. 7 μm.

Distribution: *Hidden Bb. 8.iv.78*; Indonesia, East Pakistan.

A variant (Plate 9:36) with both isthmus and apices elongated was also observed.

Cell L. 33–35 μm; W. 26–28 μm; I. 6 μm.

Distribution: *Jingalla Bb. 23.iii.80.*

Genus *Staurastrum* (Meyen) Ralfs

A difficult genus with many intergrading species and forms.

***St. acestrophorum* West & West**
Plate 30:3–5

West & West (1902), p. 184, plate 22:3).

Except for the absence of spines on the ventral side of the base of the processes, the plants agree well with the original description.

Cell L. cpr. 24–27 μm, spr. 18–19 μm; W. cpr. 27–33 μm; I. 5–6 μm.

Distribution: *Bowerbird Bb. 9.x.80*; Sri Lanka.

***St. anisacanthum* Scott & Prescott**
Plate 39:51–53

Scott & Prescott (1961, plate 56:4).

The plant was originally described from Java and Sumatra. This is the second known record.

Cell L. 22 μm; W. cpr. 66 μm; I. 6 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; Indonesia.

***St. avicula* Brébisson**
Plate 39:55,56

West et al. (1923, p. 40, plate 133:8–10).

The plant should also be compared with *St. pelagicum* West & West fa. *bifidum* Scott & Prescott (1958*a*, p. 63, fig. 16:11).

Cell L. 35 μm; W. ssp. 33 μm, csp. 44 μm; I. 10 μm.

Distribution: *Coonjimba Bb. 13.v.78;* Japan, Europe, North and South America.

***St. bifidum* (Ehrenberg) Brébisson**
Plate 28:17,18

Ralfs (1848, p. 215); West et al. (1923, plate 134:4).

Cell L. 28–33 μm; W. ssp. 31–35 μm, csp. 47–52 μm; I. 12–14 μm.

Distribution: *Hidden Bb. 8.iv.78, Coonjimba Bb. 13.v.78*; N.T. (Scott & Prescott 1958*a*); Europe, SE Asia.

***St. boergesenii* Raciborski var. *gracilis* Scott ex Croasdale**
Plate 38:20,22

Croasdale & Scott (1976, p. 544, plate 16:4).

The plants have an unusual set of twelve, apical, bifid spines. Large spines alternate with smaller ones, and in each spine the point that faces into the gap between the large arms is very much reduced.

Cell L. spr. 28 μm; W. cpr. 82–94 μm; I. 11 μm.

Distribution: *Gulungul Bb. 2.ii.79, Corndorl Bb. 8.iii.79*; N.T. (Croasdale & Scott 1976).

St. botanense **Playfair formae**
Plate 33:21–26

The least morphologically developed of our variable group of plants are linked to *St. botanense* Playfair (1907, p. 191, plate 4:19) by a dichotypical cell described by Croasdale & Scott (1976, p. 544, plate 13:3). The more developed ones approach *St. freemanii* West & West (1902, p. 177, plate 21:22).

Cell L. ssp. 15–18 μm, csp. 25–27 μm; W. ssp. 18–23 μm, csp. 36–46 μm; I. 7–9 μm.

Distribution: *Leichhardt Bb. 6.iv.78, McMinns Lagoon 22.i.79, Goanna Bb. 12.iii.80.*

St. cerastes **Lundell var. *pulchrum*
Scott & Grönblad
Plate 39:12,13**

Scott & Grönblad (1957, p. 33, plate 20:5).

Our plant is very similar to the original described from Florida. It also resembles plants identified as *St. cerastes* var. *coronatum* Krieger fa. *inflatum* by Scott & Prescott (1958*a*, fig. 20:4; and especially 1961, plate 56:6). See also var. *pulchrum* in the latter publication.

Cell L. 45–47 μm; W. 55–61 μm; I. 9 μm.

Distribution: *Hidden Bb. 8.iv.79, Umbungbung Bb. 30.v.79*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976); Indonesia, North America.

St. ceylanicum **West & West
Plate 32:18–23**

The plants (Plate 32:18–21) are identical to those described by Krieger (1932, p. 195, plate 16:5) and differ from the original (West & West 1902, p. 183, plate 22:2) only by the presence of the apical granules. The unusual nature of the processes readily distinguishes this species from other *Staurastrum*. Both 5-radiate and 6-radiate cells were observed. An unusual plant (Plate 32:22,23) was observed in the sample from Flying Fox Billabong. One of its semicells was 5-radiate and normal, but the other was 4-radiate and the processes had lost their characteristic feature.

Cell L. 18–20 μm; W. 24–26 μm; I. 7 μm.

Distribution: *Goanna Bb. 30.i.79, Flying Fox Bb. 2.vi.79, Backflow Bb. 22.vii.80*; Indonesia, Sri Lanka.

St. clepsydra **Nordstedt var. *minimum*
Scott & Prescott
Plate 29:17,18**

Scott & Prescott (1958*a*, p. 58, fig. 14:15).

Cell L. 19 μm; W. 23 μm; I. 6 μm.

Distribution: *Djalkmara Bb. 3.vi.79*; N.T. (Scott & Prescott 1958*a*).

St. clevei **(Wittrock) Roy & Bissett forma
Plate 33:8,9**

The plant agrees well with those described by West et al. (1923, p. 177, plate 156:6) but is only half the size.

Cell L. 16.5 μm, cpr. 24 μm; W. spr. 21 μm; I. 7 μm.

Distribution: *Goanna Bb. 30.i.79.*

St. coarctatum **Brébisson var. *horii* Förster
Plate 29:23**

Förster (1972, p. 571, plate 23:7).

Cell triangular in end view, wall thickened at the angles.

Cell L. 15 μm; W. 16 μm; I. 6 μm.

Distribution: *Djalkmara Bb. 3.vi.79*; Florida.

St. coarctatum **Brébisson var. *subcurtum*
Nordstedt
Plate 29:19,20**

Our plant appears to be intermediate between *St. coarctatum* var. *subcurtum* as described by West & West (1911 p. 139, plate 119:9,10) and Scott & Prescott (1961 p. 87, plate 52:15) and *St. muticum* Brébisson forma *minor* Rabenhorst (West & West 1911, p. 135, plate 119:1), but because of its slightly elongated isthmus is placed with the former.

Cell L. 19 μm; W. 16 μm; I. 7 μm.

Distribution: *Coonjimba Bb. 13.v.78*; New Zealand, Indonesia, Norway, Britain.

St. columbetoides **West & West var.
intermedium Krieger
Plate 31:18**

Krieger (1932, p. 195, plate 15:21).

Except for minor differences in the four sets of intermeshing protuberances astride the isthmus, the plant is identifiable with Krieger's (loc. cit.) description.

Cell L. spr. 15 μm, cpr. 80 μm; W. spr. 13–14 μm, cpr. 53 μm; I. 6 μm.

Distribution: *Jabiluka Bb. 6.iv.78;* Indonesia.

St. contectum **Turner forma
Plate 33:28,29**

Our plant is identifiable with a form described by Scott & Prescott (1961, p. 88, plate 54:6). Lengths of the spine and processes are the same as in the type (Turner 1892, p. 111, plate 15:20) but the size is the same as that of the variety *inevolutum* Turner (1892, p. 111, plate 22:11).

Cell L. 25 μm; W. spr. 42–44 μm; I. 11 μm.

Distribution: *Flying Fox Bb. 2.vi.79;* Indonesia.

St. cyclacanthum **West & West var.
subacanthum Grönblad
Plate 39:21,22**

Grönblad (1962, p. 10, plate 3:30).

Except for slight differences in ornamentation at the base of the processes and a smaller size, our plants correspond to the original description of the variety.

Cell L. 33 μm; W. 61 μm; I. 9 μm.

Distribution: *Umbungbung Bb. 30.v.79;* Sudan.

St. distentum **Wolle**
Plate 30:13,14

Scott & Prescott (1958*a*, p. 60, fig. 15:18).

Cell L. spr. 24 μm, cpr. 30 μm; W. cpr. 40 μm; I. 10 μm.

Distribution: *Gulungul Bb. 21.vii.80*; N.T. (Scott & Prescott 1958*a*); North America, Africa.

St. elegans **Borge**
Plate 35:1–7, Plate 36:1,2

Borge (1896, p.15, plate 2:21).

This species is now known to occur in 4-, 5-, 6-, 7- and 8-radiate forms. The 6-, 7- and 8-radiate forms are longer than the 4- and 5-radiate and, especially if the extra processes are taken into account, their cell volumes would be substantially bigger. Only the 5-radiate form is common. The original description of the species was based on a 4-radiate form collected from Queensland by Borge (loc. cit.). Gutwinski (1902, p. 606, plate 40:63), not knowing the extent of variation in this species, described a 6-radiate form collected from Java as *St. sexangulare* (Bulnheim) Rabenhorst var. *bidentatum*. Subsequent authors, e.g. Scott & Prescott (1958*a*, p. 65), have used this latter synonym instead of the more correct *St. elegans*.

Four-radiate (Plate 35:1,2) form:

Cell L. spr. 52–54 μm, cpr. 131–154 μm; W. cpr. 131–137 μm; I. 18–20 μm.

Distribution: *Hidden Bb. 8.vi.78, Kulukuluku Bb. 24.ii.81.*

Five-radiate (Plate 35:3,4) form:

Cell L. spr. 45–50 μm, cpr. 85–96 μm; W. cpr. 124–137 μm; I. 17–18 μm.

Distribution: *Ja Ja Bb. 7.iv.78, Coonjimba Bb. 13.v.78, Goanna Bb. 30.i.79, McMinns Lagoon 22.i.79.*

Six-radiate (Plate 35:5) from:

D. cpr. of cell in end view 210 μm.

Distribution: *Kulukuluku Bb. 24.ii.81.*

Seven-radiate (Plate 35:6,7) form:

Cell L. spr. 69 μm, cpr, 140 μm; W. cpr. 170 μm; I. 27 μm.

Distribution: *Ja Ja Bb. 7.iv.78, Kulukuluku Bb. 24.ii.81.*

A new, 8-radiate form (Plate 36:1,2) was observed in a sample from Annaburroo Billabong (7.x.80).

Cell L. spr. 65 μm, cpr. 158 μm; W. cpr. 185 μm; I. 28 μm.

Distribution (overall): N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896; Bailey 1898); Indonesia.

St. emaciatum **Scott & Prescott**
Plate 30:2

Scott & Prescott (1961, plate 58:7).

This unusual plant, with an elongated body, was first described from Borneo. Our plant is smaller than the typical and has sharply tapering processes which end in a single point.

Cell L. 29 μm; W. 26 μm; I. 3.5 μm.

Distribution: *Gulungul Bb. 7.vii.78*; Borneo.

St. ensiferum **Turner**
Plate 39:23–26

Turner (1892, p. 109, plate 14:22).

Our plants agree well with the original description and also with a plant called *St. formosum* Bernard (Scott & Prescott 1961, plate 43:8–10). West (1909*b*) considered *St. formosum* to be a synonym of *St. ensiferum*. The processes end in two or three spines.

Cell L. spr. 38–40 μm, cpr. 55–60 μm; W. spr. 35–42 μm, cpr. 51–67 μm; I. 12–13 μm.

Distribution: *Mine Valley Bb. 4.vi.79*; Qld (McLeod 1975); Indonesia, Sri Lanka, India.

St. excavatum **West & West**
Plate 32:1,2

West & West (1895, p. 78, plate 8:42); Scott & Prescott (1958*a*, fig. 15:1); Thomasson & Tyler (1971).

Cell L. 9 μm; W. 33–37 μm; I. 6 μm; T. 6 μm.

Distribution: *Umbungbung Bb. 30.v.79*; N.T. (Ström 1921; Scott & Prescott (1958*a*), N.S.W. (Playfair 1907), Vic. (West 1909*a*), Tas. (Thomasson & Tyler 1971); Madagascar, Sri Lanka.

St. exporrectum **Scott & Prescott**
Plate 30:19

Scott & Prescott (1961, plate 50:4).

The plant was described initially from Sumatra. Our plants lack the two apical granules of the typical form.

Cell L. spr. 30 μm, cpr. 65 μm; W. shoulder 14 μm; I. 7 μm.

Distribution: *Hidden Bb. 8.iv.78*; Indonesia.

St. floriferum **West & West**
Plate 39:10,11,19,20

West & West (1896, p. 267, plate 18:1); Krieger (1932, p. 199, plate 19:6).

Our plants agree well with previous descriptions (loc. cit.), but some differences in apical ornamentation were observed. The plants should also be compared with *St. anatinoides* Scott & Prescott (1958*a*, p. 56, fig. 18:11).

Cell L. 24–32 μm; W. 37–60 μm; I. 8–10 μm.

Distribution: *Backflow Bb. 22.vii.80, Fogg Dam 28.vii.80*; Indonesia, USA.

St. forficulatum **Lundell**
Plate 39:36–46,54

St. forficulatum can be distinguished from *St. freemanii* by its processes, which are hollow. *St. freemanii* processes are solid. Included here is a polymorphic group of plants agreeing with descriptions by Scott & Prescott (1958*a*, fig. 15:19–20) and extending to plants called *St. furcatum* (Ehrenberg) Brébisson var. *aristeron* by Scott & Prescott (1961, plate 57:4–6) but referred to as *St. forficulatum* var. *aristeron* in their figure captions. They also agree with *St. gutwinskii* Bernard fa. *gutwinskii* as described by Croasdale & Scott (1976, plate 16:3), who commented that 'it is possible that *St. gutwinskii* should be united to the variable *St. forficulatum*'.

Cell L. spr. 27–33 μm, cpr. 32–47 μm; W. spr. 30–38 μm, cpr. 35–58 μm; I. 10–12 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Mine Valley Bb. 10.iv.78, Djalkmara Bb. 3.vi.79*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976), Indonesia.

St. freemanii West & West
Plate 39:29–35

This was originally described from Ceylon by West & West (1902, p. 177, plate 21:21). Their type plant was biradiate and a triradiate plant (fig. 22) occurring with it was concurrently described as the variety *triquetrum*. Subsequently, Scott & Prescott (1958*b*) added two new varieties and three new formae to it. The taxonomy of these varieties and formae was revised by Brook & Hine (1966) after they had examined a polymorphic population of *St. freemanii* from New Guinea.

In the Magela Creek samples, two main forms were observed. The first (Plate 39:29,30) is identical to a plant from Yirrkala which Scott & Prescott (1958*a*, fig. 17:5) named *St. formosum* Bernard. Their figure seems indistinguishable from an Indonesian plant they had described as *St. freemanii* var. *nudiceps* (Scott & Prescott 1958*b*, fig. 3; 1961, plate 43:3). Brook & Hine (1966) relegated this plant to *St. freemanii* fa. *nudiceps*.

Cell L. spr. 32 μm, cpr. 60 μm; W. spr. 32 μm, cpr. 72 μm; I. 13 μm.

Distribution: *Leichhardt Bb. 6.iv.78.*

The second form (Plate 39:32,33) agrees well with the variety *triquetrum* of West & West (loc. cit.). Brook & Hine (1966) proposed *St. freemanii* facies *triquetrum* for this form. A dichotypical cell (Plate 39:31) combining the features of both these forms was observed in the sample from Leichhardt Billabong.

Cell L. spr. 30 μm, cpr. 62 μm; W. spr. 32 μm, cpr. 70 μm; I. 12 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Hidden Bb. 8.iv.78.*

A third, rare form (Plate 39:34,35), matches *St. freemanii* var. *evolutum* Scott & Prescott fa. *trispinatum* Scott & Prescott (1958*b*). Brook & Hine (1966) proposed the name *St. freemanii* fa. *evolutum-trispinatum*.

Cell L. spr. 30 μm, cpr. 41 μm; W. spr. 28 μm, cpr. 53 μm; I. 11 μm.

Distribution: *Hidden Bb. 8.iv.78, Bowerbird Bb. 9.x.80.*

Distribution (overall): Indo-Australasian region.

St. galeatum Turner forma
Plate 30:9,10

Our plants are smaller than those described by West & West (1902, p. 190, plate 22:19) and, whereas each of the six apical spines on their plant has a smaller spine projecting upwards, ours do not.

Cell L. 18–22 μm; W. 29–33 μm; I. 6–7 μm.

Distribution: *Coonjimba Bb. 13.v.78, Umbungbung Bb. 30.v.79.*

St. gladiosum Turner
Plate 32:24,25

Scott & Prescott (1961, p. 93, plate 56:1).

Cell L. ssp. 37 μm, csp. 45 μm; W. ssp. 35 μm, csp. 50 μm; I. 12 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; Indonesia.

St. gracile Ralfs fa. _kriegeri_ Scott & Prescott
Plate 32:13,14

Krieger (1932, p. 200, plate 18:12); Scott & Prescott (1961, p. 94, plate 57:11).

The name *Staurastrum gracile* is probably a *nomen dubium* (Brook 1960); reasons for its retention are explained by Thomasson & Tyler (1971). Cells 3-radiate; processes slightly convergent, each with two rows of fine verrucae on the dorsal surface.

Cell L. 22 μm; W. 33 μm; I. 6 μm.

Distribution: *Djalkmara Bb. 3.vi.79, Winmurra Bb. 31.v.79*; Indonesia.

St. gracile var. _elongatum_ Scott & Prescott
Plate 32:16

Scott & Prescott (1958*a*, p. 61, fig. 17:9; 1961, p. 94, plate 57:10).

Cell L. 27 μm; W. 64–76 μm; I. 8 μm.

Distribution: *Winmurra Bb. 31.v.78*; N.T. (Scott & Prescott 1958*a*); Indonesia.

St. heimii Bourrelly
Plate 34:20,21

Bourrelly (1957, p. 1084, plate 15:131,132).

The validity of this name is doubtful. There was no Latin diagnosis in the original description. All our plants are 4-radiate.

Cell L. spr. 30 μm, cpr. 101 μm; W. cpr. 115 μm; I. 11 μm.

Distribution: *Annaburroo Bb. 7.x.80*; Sudan.

St. hypacanthum Scott & Prescott
Plate 23:11

Scott & Prescott (1961, p. 96, plate 49:5).

Unfortunately only a single drawing, of a cell in end view, was made.

W. ssp. 48 μm, csp. 71 μm.

Distribution: *Hidden Bb. 8.iv.78*; Borneo.

St. inconspicuum Nordstedt
Plate 33:27

Nordstedt (1873, p. 26, fig. 11); Scott & Prescott (1961, p. 96, plate 59:11).

Cell L. spr. 13 μm, cpr. 16 μm; W. spr. 19 μm: I. 6 μm.

Distribution: *Winmurra Bb. 31.v.79;* Indonesia, Norway.

St. *indentatum* West & West forma
Plate 31:22,23

Our plants agree well with the forms described by Scott & Prescott (1958*a*, p. 61, fig. 16:4, wrongly identified as *St. longebrachiatum* (Borge) Gutwinski var. *pseudoanchora* Krieger; 1961, p. 96, plate 50:6,7). They should also be compared with forms of *St. longebrachiatum* (Thomasson 1973, p. 387). Some plants have a ring of granules on either side of the isthmus.

Cell L. 35–42 μm; W. spr. 58–78 μm; I. 7–8 μm.

Distribution: *Djalkmara Bb. 3.vi.79, Leichhardt Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*); Indonesia.

St. *javanicum* (Nordstedt) Turner var. *apiculiferum* (Turner) Krieger
Plate 39:14,15

Krieger (1932, p. 201, plate 20:3); Scott & Prescott (1961, plate 44:6).

A distinguishing feature is the prominent, hollow, conical protuberance on the dorsal side of the base of each process. The plant has been observed in the Nourlangie system but not in the Magela Creek system.

L. spr. 50 μm, cpr. 57 μm; W. 80–98 μm; I. 15 μm.

Distribution: *Umbungbung Bb. 30.v.79*; Indonesia.

St. *laeve* Ralfs
Plate 33:10,11

Ralfs (1848, p. 131, plate 23:10); West et al. (1923, p. 92, plate 141:1AA3).

Cell L. 15 μm; W. cpr. 20 μm; I. 7 μm.

Distribution: *Goanna Bb. 30.i.79*; Australia, Indonesia, Europe, USA, Brazil.

St. *laeve* forma
Plate 33:19,20

A form in which both the arms and their terminal bifid processes are elongated. The plants have either 6 or 9 arms per semicell. An occasional cell may have 6 arms on one semicell and 9 on the other.

Six-armed form:

Cell L. 16 μm, cpr. 28 μm; W. cpr. 33 μm; I. 6 μm.

Nine-armed form:

Cell L. 17 μm, cpr. 28 μm; W. cpr. 27 μm; I. 6 μm.

Distribution: *McMinns Lagoon 22.i.79.*

St. *leptocladum* Nordstedt
Plate 31:21

Nordstedt (1870, p. 228, plate 4:57).

The wall of the face of the semicell may be thickened.

Cell L. 40–43 μm, W. cpr. 96–105 μm, I. 6–6.5 μm.

Distribution: *Annaburroo Bb. 7.x.80, Bowerbird Bb. 9.x.80*; Brazil.

St. *leptopus* Krieger var. *variabile* Skuja
Plate 34:17–19

Skuja (1949, p. 159, plate 35:12).

The semicells are twisted about 45° with respect to one another. Mostly 3-radiate, rarely 4-radiate.

Cell L. 19 μm, cpr. 59 μm; W. cpr. 57 μm; I. 7 μm.

Distribution: *McMinns Lagoon 22.i.79*; Burma.

St. *longebrachiatum* (Borge) Gutwinski
Plate 31:24–28

Borge (1896, p. 15, plate 2:22, *St. bicorne* Hauptfleisch var. *longebrachiatum*); Gutwinski (1902, p. 605).

This is a variable taxon (Thomasson 1973, p. 387). Our plants (Plate 31:24–26) agree with the original description by Borge (loc. cit.).

Cell L. at apex 35–42 μm; W. cpr. 70–86 μm; I. 8–9 μm.

A form with a few apical spines (Plate 31:27,28), previously identified as *St. bicorne* var. *longebrachiatum* fa. *evolutum* Scott & Prescott (1958*a*, p. 57, fig. 16:2) was also observed. It intergrades with the typical.

Cell L. csp. 38–44 μm; W. cpr. 70–87 μm; I. 9 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Hidden Bb. 8.iv.78, Island Bb. 22.vii.80*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896), N.S.W. (Thomasson 1973); Indonesia.

St. *longebrachiatum* forma
Plate 31:15,16

Our plants are identical to a form described by Croasdale & Scott (1976, p. 547, plate 15:5).

Cell L. 28–34 μm; W. cpr. 50–68 μm; I. 8 μm.

Distribution: *Djalkmara Bb. 3.vi.79, Winmurra Bb. 31.v.79;* N.T. (Croasdale & Scott 1976).

St. *longebrachiatum* var. *australe* (Raciborski) Krieger forma
Plate 31:29

In dimension, shape and the central incrassation on the semicell, our plant agrees well with the description of the variety by Krieger (1933, p. 202, plate 16:2), however, Krieger's plant has spiny apical granules, whereas the apical granules in our plants have no spines.

Cell L. 39 μm; W. cpr. 82 μm; I. 9 μm.

Distribution: *Goanna Bb. 30.i.79.*

St. *longispinum* (Bailey) Archer var. *bidentatum* (Wittrock) West & West
Plate 26:1

Our plant has a slightly greater width to length ratio than the one described by West et al. (1923, p. 34, plate 134:1–3). Also, in our plant, the upper of the pair of spines is shorter than the lower.

Cell L. 89 μm; W. ssp. 83–92 μm, csp. 105–115 μm; I. 39 μm.

Distribution: *Baralil Creek 3.vi.79*; Europe, USA.

St. *maskellii* Turner
Plate 30:20,21

Turner (1892, p. 131, plate 16:21).

This seems to be the only record of the plant since its discovery. The cell wall is very thin and finely granular or wrinkled.

Cell L. spr. 26–27 μm, cpr. 43 μm; W. cpr. 25–33 μm; I. 7–8 μm.

Distribution: *Jingalla Bb. 23.iii.80*; India.

***St. multinodulosum* Grönblad**
Plate 32:17

Grönblad (1926, p. 30, plate 3:113–114).

Cell L. 22 μm, cpr. 40–43 μm; W. cpr. 68–73 μm; I. 6 μm.

Distribution: *Island Bb. 22.vii.80*; Poland.

***St. muticum* Brébisson**
Plate 29:8,9

Ling (1977, p. 126) has shown that plants resembling *St. muticum* and *St. orbiculare* Ralfs and its varieties cannot be identified with certainty in the absence of zygospores. As zygospores were not seen, we have tentatively identified our plants on the basis of descriptions by West & West (1911, p. 133, plate 118:16–19).

Cell L. 38 μm; W. 32 μm; I. 9 μm.

Distribution: *Goanna Bb. 30.i.79*; Qld (Möbius 1894, Bailey 1895, McLeod 1975), S.A. (Prescott & Scott 1952), N.S.W. (Thomasson 1973), Vic. (West 1905); cosmopolitan.

***St. nodulosum* Prescott**
Plate 32:26

Prescott (1936, p. 508, plate 64:2,3); Thomasson & Tyler (1971, p. 309, fig. 12).

Cell L. 24 μm, cpr. 45–47 μm; W. cpr. 54 μm, I. 5 μm.

Distribution: *Island Bb. 22.vii.80;* Tas. (Thomasson & Tyler 1971); Panama.

***St. orbiculare* Ralfs var. *denticulatum* Nordstedt**
Plate 29:3,4

Nordstedt (1870, p. 224, plate 4:42); Scott & Prescott (1958*a*, p. 62, fig. 14:20; 1961, p. 100, plate 49:7,8).

Teiling (1967, p. 602, plate 30:10) transferred this variety to *Staurodesmus dickiei* var. *denticulatum*. However, the pair of nodules at each angle of the semicell precludes it from *Staurodesmus*.

Cell L. 40–52 μm; W. 36–46 μm; I. 10–16 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976, zygospore only), Qld (Borge 1896; Bailey 1898), N.S.W. (Playfair 1907); Indonesia, Brazil.

***St. orbiculare* var. *denticulatum* forma**
Plate 29:5

A form that differs from the typical in having an acute instead of a linear sinus. There is a possibility that this plant, as well as the typical, are 3-radiate forms of *Cosmarium nudum* (Plate 16:1–3).

Cell L. 44–53 μm; W. 41–50 μm; I. 13–16 μm.

Distribution: *Hidden Bb. 8.iv.78, Goanna Bb. 30.i.79.*

***St. orbiculare* var. *denticulatum* fa. *minor* West & West**
Plate 29:6,7

West & West (1895, p. 74, plate 8:40,41).

The plants have more prominent nodules which occur singly or in pairs.

Cell L. 31–34 μm; W. 30–35 μm; I. 10–12 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; Madagascar.

***St. orbiculare* var. *protractum* Playfair**
Plate 29:10–14

Playfair (1912, p. 532, plate 54:25); Scott & Prescott (1958*a*, p. 63, fig. 14:6).

According to West & West (1911, p. 155), *St. orbiculare* and its varieties have a narrowly linear sinus. Ours has an open, acute-angled sinus and could, perhaps, be more closely identified with *St. muticum* Brébisson as described by West & West (1911, p. 133, plate 118:16–19). See our comments on these two species under *St. muticum*.

Cell L. 20–38 μm; W. 20–38 μm; I. 7–12 μm.

Distribution: *Coonjimba Bb. 13.v.78, Djalkmara Bb. 3.vi.79, Winmurra Bb. 31.v.78*; N.T. (Scott & Prescott 1958*a*), N.S.W. (Playfair 1912); Papua New Guinea (Watanabe et al. 1979).

***St. pachyrhynchum* Nordstedt**
Plate 29:15,16

West & West (1911, p. 151, plate 121:8,9).

Cell wall very strongly thickened at the angles.

Cell L. 40 μm; W. 38–41 μm; I. 10 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Goanna Bb. 30.i.79*; Japan, Europe, USA.

***St. pentacerum* (Wolle) Smith fa. *curvatum* Thomasson**
Plate 38:14–19

Thomasson (1957, p. 14, fig. 47,48).

Plants with slightly elongate bodies, relatively straight sides and flexuous processes which first curve up, then downward. Five-, six- and seven-radiate forms were observed. The 5-radiate plants agree well with the description by Thomasson (loc. cit.), whereas the 7-radiate are identifiable with *St. sagittarium* Nordstedt var. *scottii* Croasdale (Croasdale & Scott 1976, p. 549, plate 14:5), which we regard as synonymous. Whether the plants are more closely allied to *St. pentacerum* or *St. sagittarium* is debatable.

Cell L. spr. 42–45 μm, cpr. 50–52 μm; W. spr. 18–20 μm, cpr. 76–112 μm, occasionally up to 164 μm; I. 16 μm.

Distribution: *Hidden Bb. 8.iv.78, Umbungbung Bb. 30.v.79, Flying Fox Bb. 2.vi.79*; N.T. (Croasdale & Scott 1976); Zambia.

St. peristephes Scott & Prescott
Plate 39:5,6

Scott & Prescott (1961, p. 100, plate 59:5).

In side view the plants are very similar to *St. sonthalianum* Turner (1892, P. 124, plate 14:27) but in end view the differences are obvious.

Cell L. 39 μm; W. cpr. 68–72 μm; I. 11 μm.

Distribution: *Goanna Bb. 30.i.79*; N.T. (Croasdale & Scott 1976); Indonesia.

St. pinnatum Turner var. subpinnatum (Schmidle) West & West
Plate 37:15–17

Schmidle (1896, plate 9:20, *St. subpinnatum*); West & West (1902, plate 21:33).

Cell L. 29 μm; W. 38–45 μm; I. 10 μm.

Distribution: *Jabiluka Bb. 6.iv.78, Backflow Bb. 11.iv.78*; Qld (Schmidle 1896; McLeod 1975).

St. pinnatum var. subpinnatum fa. robustum Krieger
Plate 37:18–21

Krieger (1932, p. 205, plate 16:7); Scott & Prescott (1958*a*, fig. 18:1; 1961 plate 46:9,10).

Both 5- and 6-radiate cells were observed.

Cell L. 32–35 μm; W. 53–60 μm; I. 12–13 μm.

Distribution: *Flood plain near Ja Ja Bb. 4.ii.79, Backflow Bb. 11.iv.78*; N.T. (Scott & Prescott 1958*a*); Indonesia.

St. protectum West & West var. rangoonense (Skuja) Scott & Prescott
Plate 39:27,28

Scott & Prescott (1961, p. 103, plate 44:1,2); Skuja (1949, p. 158, plate 35:22, *St. lacustre* Smith var. *rangoonense*).

The plant should also be compared with *St. gutwinskii* Bernard fa. *reductum* Scott ex Croasdale (Croasdale & Scott 1976, p. 546, plate 16:2).

Cell L. spr. 28 μm, cpr. 44 μm; W. cpr. 51–58 μm; I. 10 μm.

Distribution: *Flying Fox Bb. 2.vi.79*; Indonesia, Burma.

St. pseudosebaldi (Wille) fa. latum Scott & Prescott
Plate 36:6,7

Scott & Prescott (1958*a*, p. 63, fig. 17:1).

Cell L. 58 μm; W. cpr. 100–140 μm; I. 12 μm.

Distribution: *Corndorl Bb. 5.ii.79, Annaburroo Bb. 7.x.80*; N.T. (Scott & Prescott 1958*a*).

St. pseudotetracerum (Nordstedt) West & West
Plate 34:30

Nordstedt (1888, p. 37, plate 4:9, *St. contortum* var. *pseudotetracerum*); West et al. (1923, p. 122, plate 149:11).

Cell L. spr. 13 μm; cpr. 21 μm; W. cpr. 29 μm; I. 4 μm.

Distribution: *Bowerbird Bb. 9.x.80*; New Zealand, Sri Lanka, Britain, USA, Azores, Madagascar.

St. rectangulare Borge var. verrucosum Scott & Prescott
Plate 39:57

Scott & Prescott (1958*a*, p. 64, fig. 17:11).

Originally described from Yirrkala. It has several more granules than the typical described by Borge (1896, p. 16, plate 4:65) from Queensland.

Cell L. spr. 32 μm, cpr. 54 μm; W. cpr. 31 μm; I. 10 μm.

Distribution: *Noarlanga Bb. 30.v.79. Winmurra Bb. 31.v.79*; N.T. (Scott & Prescott 1958*a*).

St. retusum Turner
Plate 29:24–28

Turner (1892, p. 104, plate 13:13); Scott & Prescott (1958*a*, p. 64, fig. 14:14).

Our plants have thickened, punctate walls about the apices of the lobes. Cells of two sizes, large (Plate 29:27,28) and small (Plate 29:24,25), corresponding to the top and bottom ends of the size range quoted by Turner, were observed. Zygospores of the small cells (Plate 29:26) are globose and ornamented with short, sharp spines. They were only observed in the sample from Umbungbung Billabong. Dimensions given by Scott & Prescott (loc. cit.) are those of the small form.

Large form:

Cell L. 28–29 μm; W. 28–31 μm; I. 7–9 μm.

Distribution: *Djalkmara Bb. 3.vi.79, Umbungbung Bb. 30.v.79*; India.

Small form:

Cell L. 20 μm; W. 21 μm; I. 6 μm. Zygo. D. 23–25 μm, sp. 4–8 μm.

Distribution: *Djalkmara Bb. 3.vi.79, Umbungbung Bb. 30.v.79*; N.T. (Scott & Prescott 1958*a*); India.

St. retusum var. boreale West & West
Plate 29:21,22

West & West (1911, p. 160, plate 125:8).

Cells smaller than the type species, semicells more rounded, cell wall smooth.

Cell L. 15 μm; W. 16 μm; I. 5 μm.

Distribution: *Coonjimba Bb. 13.v.78*; Scotland.

St. rosei Playfair
Plate 39:48

Playfair (1907, p. 188, plate 5:6); Scott & Prescott (1958*a*, p. 64, fig. 18:8; 1961, p. 105, plate 58:1,2).

Cell L. spr. 21–23 μm, cpr. 46 μm; W. 45–54 μm; I. 8–10 μm.

Distribution: *Umbungbung Bb. 30.v.79, Downstream of Darwin Dam 7.x.80*; N.T. (Scott & Prescott 1958*a*), N.S.W. (Playfair 1907); Indonesia.

St. rosei var. elongatum Scott ex Croasdale
Plate 39:47

Scott & Croasdale (1976, p. 548, plate 17:3).

Our plants differ from the typical in that they lack the few, minute denticulations on the margins of the apical processes.

Cell L. spr. 14 μm, cpr. 60 μm; W. cpr. 31 μm; I. 5 μm.

Distribution: *Backflow Bb. 11.iv.78*; N.T. (Croasdale & Scott 1976).

St. sagittarium Nordstedt
Plate 38:1–5

Nordstedt (1888, p. 37, plate 4:6,7).

Plants ranging from the typical to forms with relatively long spines on the margins of the processes were observed. Nine-, ten- and eleven-radiate forms were seen.

Cell L. spr. 29 μm, cpr, 33 μm; W. spr. 22–26 μm, cpr. 71–92 μm; I. 15 μm.

Distribution: *Bowerbird Bb. 9.x.80, Yirrkala 5.viii. 80*; N.T. (Scott & Prescott 1958*a*), Qld (McLeod 1975), S.A. (Prescott & Scott 1952), N.S.W. (Thomasson 1973), Vic. (West 1909*a*), Tas. (Thomasson & Tyler 1971); New Zealand.

***St. sagittarium* var. *longispinum* Scott ex Croasdale**
Plate 38:6–8

Croasdale & Scott (1976, p. 549, plate 14:4).

The plants have larger apical warts but shorter spines on the margins of the processes than those described by Croasdale & Scott (loc. cit.). Variations in spine length were observed in the typical and it appears that the only distinguishing feature of this variety is its apical ring of teeth.

Cell L. ssp. 30 μm, csp. 35 μm; W. spr. 23–25 μm, cpr. 76–83 μm; I. 19 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Yirrkala 5.viii.80*; N.T. (Croasdale & Scott 1976).

***St. saltans* Joshua var. *sumatranum* Scott & Prescott — St. saltans var. *polycharax* Scott & Prescott series**
Plate 31:1–14

Several forms were observed. Some of these forms, when combined with previously described plants, form an intergrading series spanning *St. saltans* var. *sumatranum* and *St. saltans* var. *polycharax* and extending beyond.

Forma 1 (Plate 31:1) agrees well with *St. saltans* var. *sumatranum* described from Indonesia by Scott & Prescott (1958*b*, p. 6, fig. 8). *St. saltans* forma described from Oenpelli by the same authors (1958*a*, p. 65, fig. 16:3) is synonymous.

L. ssp. 33 μm, csp. 37 μm; W. ssp. 62–66 μm, csp. 71 μm; I. 8 μm.

Distribution: *Gulungul Bb. 7.vii.78.*

Forma 2 (Plate 31:2) is the most common form. It is an intermediate between forms 1 and 3.

L. ssp. 37 μm, csp. 46 μm; W. ssp. 71–76 μm, csp. 79–83 μm; I. 8 μm.

Distribution: *Leichhardt Bb. 6.iv.78.*

Forma 3 (Plate 31:3) agrees well with a northern Australian plant identified as *St. saltans* var. *polycharax* by Scott & Prescott (1958*b*, p. 9, fig. 18). These plants are less developed than the Javanese forms of var. *polycharax* described by the same authors (Scott & Prescott 1958*b*, p. 9, figs 16,17; reproduced here as Plate 31:4–6) and actually link them to var. *sumatranum* through forma 2.

L. ssp. 32 μm, csp. 43 μm; W. ssp. 53–59 μm, csp. 59–67 μm; I. 9 μm.

Distribution: *Winmurra Bb. 31.v.79.*

Forma 4 (Plate 31:7–9) is even more highly developed than the Javanese *polycharax.*

L. ssp. 39 μm, csp. 58–61 μm; W. ssp. 53–56 μm, csp. 75–81 μm; I. 11–13 μm; T. 28 μm.

Distribution: *Hidden Bb. 8.iv.78, Goanna Bb. 30.i.79.*

Thus there is a morphological series beginning with the least developed *sumatranum* followed by forma 2 from Magela Creek, the northern Australian *polycharax*, the Javanese *polycharax* and finally forma 3 from Magela Creek.

Forma 5 (Plate 31:11–14) cells are intermediate between formae 1 and 2 in morphology, but are very much larger.

L. ssp. 43 μm, csp. 47–53 μm; W. ssp. 111–135 μm, csp. 116–140 μm; I. 10–11 μm; T. 20–24 μm.

Distribution: *Jabiluka Bb. 6.iv.78, Leichhardt Bb. 6.iv.78.*

A cell (Plate 31:10) from Kulukuluku Billabong (24.ii.81) had one semicell normal but the other was large.

***St. scottii* Grönblad**
Plate 25:7,8

There are a few minor differences between our plants and the typical as described by Scott & Grönblad (1957, p. 45, plate 29:1). In end view, our plants have slightly concave sides with more broadly rounded angles and the isthmus is broader.

Cell L. 142 μm; W. ssp. 146–153 μm, csp. 183–195 μm; I. 50 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Island Bb. 3.i.79;* Florida (USA).

***St. sexangulare* (Bulnheim) Rabenhorst**
Plate 34:7–10

St. sexangulare and its numerous varieties constitute a confusing group of intergrading forms. As a result of some preliminary research we have already reduced its variety *bidentatum* to a synonym of *St. elegans* (see p. 40). However, the major problems remain unresolved and further intensive investigation is required.

Forma 1 (Plate 34:7,8) agrees with the small 4-radiate forms described by Scott & Prescott (1958*a*, p. 65, fig. 18:9) and Croasdale & Scott (1976, p. 500, plate 16:6).

Cell L. spr. 28 μm, cpr, 48 μm; W. cpr. 57 μm; I. 8.5 μm.

Distribution: *Umbungbung Bb. 30.v.79;* N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976).

Forma 2 (Plate 34:9,10) has no ornamentation on the cell body or processes. Each bifurcate process is at an oblique angle to the semicell which is 5-radiate and has a flat apex.

Cell L. spr. 25–29 μm, cpr. 47–56 μm; W. cpr. 61–73 μm; I. 11.5–13 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Backflow Bb. 11.iv.75, Coonjimba Bb. 13.v.78.*

St. sexangulare var. asperum Playfair
Plate 37:3–5

Playfair (1910, p. 489, plate 12:13); Scott & Prescott (1961, p. 107, plate 45:1–3).

Five- or six-radiate. The horizontal processes usually end in 4 spines while the secondary, vertical processes, end in 3 spines.

Six-radiate form:

Cell L. spr. 48 μm, cpr. 84 μm; W. cpr. 95 μm; I. 17 μm.

Distribution: *Flood plain, Ja Ja Bb. 4.ii.79, Goanna Bb. 16.iii.81, Kulukuluku Bb. 24.ii.81;* N.T. (Croasdale & Scott 1976), N.S.W. (Playfair 1910); Indonesia, Thailand.

St. sexangulare var. asperum forma
Plate 37:1,2

More slender, with longer processes than the variety. Five- or six-radiate.

Cell L. spr. 50–56 μm, cpr. 117–141 μm; W. cpr. 124–145 μm; I. 19 μm.

Distribution: *Kulukuluku Bb. 24.ii.81, Annaburroo Bb. 7.x.80.B*

St. sexangulare var. subglabrum West & West
Plate 34:11–16,22–29

West & West (1902, p. 181, plate 21:35).

In the original description, the plants are characterised by a ring of apical granules, corrugated (from small spines) primary and smooth secondary processes. According to Scott & Prescott (1958*a*, p. 66, fig. 19:1–4) this variety occurs in a number of intergrading forms, and in addition to the typical (Plate 34:11,12) we have observed similar, if not identical, forms to those described by them. The simplest of these forms (Plate 34:15,16,22–25) lack secondary processes and except for the absence of a ring of apical granules are identifiable with *St. acanthastrum* West & West (1902, p. 183, plate 22:1). They are connected by intermediates (Plate 34:26) to elaborate forms (Plate 34:27–29) which have secondary processes. These processes may have corrugated, half-smooth-half-corrugated (as in the type), or entirely smooth margins (Plate 34:13, 14).

Type:

Cell L. spr. 33 μm, cpr. 59 μm; W. cpr. 75 μm; I. 13 μm.

Simple form:

Cell L. 27–32 μm; W. cpr. 59–68 μm; I. 7–10 μm.

Elaborate form:

Cell L. spr. 43 μm, cpr. 60 μm; W. cpr 70–82 μm; I. 11 μm.

Distribution: *Jabiluka Bb. 6.iv.78, Coonjimba Bb. 13.v.78, McMinns Lagoon 22.i.79, Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*); Indonesia, Ceylon, Japan, mainland Asia.

St. sonthalianum Turner
Plate 39:1–4

Turner (1892, p. 124, plate 14:27); Krieger (1932, p. 207, plate 19:11).

The plants are perhaps best classified with *St. sonthalianum* though they are between *St. sebaldi* Reinsch as described by Scott & Prescott (1958*a*, p. 65, fig. 17:12) and its variety *ventriverrucosum* Scott & Prescott (1961, p. 106, plate 44:5).

Cell L. 35–37 μm, W. cpr. 52–57 μm; I. 8–11 μm.

Distribution: *Coonjimba Bb. 13.v.78, Leichhardt Bb. 6.iv.78, Jabiluka Bb. 6.iv.78, Fogg Dam 28.vii.80*; N.T. (Ström 1921); Indonesia, India, Japan.

St. spinipendens Scott & Prescott
Plate 39:49,50

Scott & Prescott (1961, p. 108, plate 44:3); Croasdale & Scott (1976, p. 551, plate 14:1).

Cell L. 27 μm; W. cpr. 64 μm; I. 9 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; N.T. (Croasdale & Scott 1976); Indonesia.

St. subgracillimum West & West forma
Plate 32:3,4

The plant resembles a form described by Scott & Prescott (1958*a*, p. 66, fig. 15:14) but has much shorter processes.

Cell L. 11 μm; W. cpr. 26–28 μm; I. 5 μm.

Distribution: *Gulungul Bb. 7.vii.78*; N.T. (Scott & Prescott 1958*a*).

St. subgracillimum var. tortum
Scott & Grönblad
Plate 32:10–12

Scott & Grönblad (1957, p. 47, plate 31:21); Scott & Prescott (1961, p. 110, plate 53:7).

In end view, the arms are twisted in an anticlockwise direction.

Cell L. spr. 11 μm, cpr. 13 μm; D. in end view 40 μm; I. 5 μm.

Distribution: *Goanna Bb. 30.i.79, Winmurra Bb. 31.v.79*; Indonesia, USA.

St. submanfeldtii West & West formae
Plate 39:7–9,16–18

Forma 1 plants (Plate 39:7–9) range from *St. cyclacanthum* West & West as described by Scott & Prescott (1958*a*, p. 59, plate 15:1–3) to *St. sebaldi* Reinsch var. *ornatum* Nordstedt (Scott & Prescott 1958*a*, p. 65, fig. 18:10; 1961, p. 106, plate 44:4). In side view the plants are identical to *St. submanfeldtii* West & West (1902, p. 188, plate 22:16) in both shape and size, and the dilemma begins when the apical ornamentation is examined in end view. *St. submanfeldtii* is depicted as having paired granules running adjacent to the edges while *St. cyclacanthum* (West & West 1902, p. 189, plate 22:18) has a central ring of 6 trifid verrucae with additional, mostly bifid, verrucae at the base of the processes. The apical ornamentation on our plants range from the *St. cyclacanthum* type to the type where the central verrucae are arranged nearer the margin. In side view, our plants are different from *St. cyclacanthum* and a comparison of the figures by Scott & Prescott (1958*a*, fig. 16:13) with those of West & West (1902, plate 22:16) suggests that perhaps the paired granules depicted in the latter figure are only the tips of bifid verrucae and that the bases of the verrucae have been omitted. Thus a re-examination of West & West's plants would probably help solve the problem.

Cell L. 38–58 μm; W. 50–86 μm; I. 9–16 μm.

Distribution: *Hidden Bb. 6.iv.78; Leichhardt Bb. 6.iv.78, Fogg Dam 28.vii.80.*

Forma 2 (Plate 39:16–18) appears to be a small and slim form with the same taxonomic problem as forma 1. It should be compared with *St. submanfeldtii* var. *elegans* West & West (1902, p. 189, plate 22:17) and *St. cyclacanthum* var. *submanfeldtoides* Scott & Prescott (1958*a*, p. 59, fig. 20:2).

Cell L. 32–34 μm; W. 58–67 μm; I. 8–9.5 μm.

Distribution: *Bowerbird Bb. 9.x.80, Annaburroo Bb. 7.x.80.*

***St. tangaroaii* Thomasson**
Plate 32:15

Our plant resembles the smaller form of this taxon as described by Thomasson (1960, p. 239, fig. 34,35). It differs in having shorter and less divergent processes.

Cell L. spr. 21 μm; cpr. 27 μm; W. cpr. 33–39 μm; I. 4 μm.

Distribution: *Flying Fox Bb. 2.vi.79*; New Zealand.

***St. tauphorum* West & West**
Plate 36:8–10

West & West (1902, p. 191, plate 22:23–25); Scott & Prescott (1961, p. 112, plate 47:1–11); Croasdale & Scott (1976, p. 551, plate 17:2).

Cell L. 42–51 μm; W. cpr. 57–122 μm; I. 10–11 μm.

Distribution: *Ja Ja Bb. 4.vi.79, Goanna Bb. 30.i.79*; N.T. (Croasdale & Scott 1976); Indonesia, Burma, Ceylon.

***St. tetracerum* Ralfs**
Plate 32:5

West et al. (1923, p. 118, plate 149:2,3).

Cells minute, about as long as broad.

Cell L. spr. 8 μm, cpr. 20–22 μm; W. cpr. 18–22 μm; I. 5 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896), N.S.W. (Thomasson 1973), S.A. (Prescott & Scott 1952), Vic. (West 1909*a*; Viyakornvilas 1974); worldwide.

***St. tetracerum* forma**
Plate 32:6–9

The plants (Plate 32:6) are very similar to *St. tetracerum* but are twice as large. Twisting around the isthmus has not been observed. Janus 2+3 and 3-radiate cells (Plate 32:7–9) were also observed.

Cell L. spr. 16–17 μm, cpr. 29–37 μm; W. cpr. 37–47 μm; I. 5 μm.

Distribution: *Gulungul Bb. 7.vii.78.*

***St. tohopekaligense* Wolle**
Plate 34:3–6

Our plants fit descriptions of the species by West et al. (1923, p. 178, plate 155:12). They also agree with forms of *St. leptacanthum* Nordstedt described by Scott et al. (1965, p. 54, plate 18:228-229) whose plants were twice the size of Nordstedt's (1870, p. 229, plate 4:46). *St. tohopekaligense* and *St. leptacanthum* are very similar (West & West 1902, p. 180) and further research is required to clear up the considerable confusion between them. The plants have 9 (Plate 34:3,4) or 15 (Plate 34:5,6) processes per semicell. Each process is slightly dilated at the end and is usually bifurcate. The lobes are hollow to the tip.

Cells with 9 processes:
Cell L. spr. 44 μm, cpr. 80 μm; W. spr. 30–33 μm, cpr. 87–95 μm; I. 20 μm.
Distribution: *Mine Valley Bb. 10.iv.78.*

Cells with 15 processes:
Cell L. spr. 42–51 μm, cpr. 97–112 μm; W. spr. 30–35 μm; cpr. 90–114 μm; I. 18–22 μm.

Distribution: *Ja Ja Bb. 7.iv.78, Leichhardt Bb. 6.ix.78, Mine Valley Bb. 10.iv.78, Corndorl Bb. 8.iii.79*; N.T. (Scott & Prescott 1958*a*), N.S.W. (Thomasson 1973), Vic. (Powling 1970; Viyakornvilas 1974); India, Central Africa, USA, Finland.

***St. tohopekaligense* forma**
Plate 33:5–7

The plants are identical to *St. furcatum* (Ehrenberg) Brébisson as described by West et al. (1923, p.173, plate 155:1–4), Smith (1924, p. 118, plate 83:1–3) and Behre (1956, p. 72, plate 7:1). They also exhibit the same 9- and 15-armed dimorphism as *St. tohopekaligense* var. *minus* and are identical to it, except for size. We feel they belong with *St. tohopekaligense* in a logical sequence of size ranges. This however, could cause taxonomical complications, since *St. furcatum* pre-dates *St. tohopekaligense*.

Cell L. spr. 16–19 μm, cpr. 28–32 μm; W. spr. 13–17 μm, cpr. 23–30 μm; I. 7–8 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Djalkmara Bb. 3.vi.79.*

***St. tohopekaligense* fa. *minus* (Turner) Scott & Prescott**
Plate 33:1–4,14–18

Three forms were observed. Two of these (Plate 33:1–4) appear more robust than those described previously (Scott & Prescott 1961, p. 114, plate 48:4–6; Croasdale & Scott 1976, p. 551, plate 16:5), and each semicell has either 9 or 15 processes, agreeing with observations made by Scott & Prescott.

Cell L. spr. 25–27 μm, cpr. 41–43 μm; W. spr. 20–22 μm, cpr. 38–42 μm; I. 12–13 μm.

Distribution: *Djalkmara Bb. 3.vi.79.* N.T. (Croasdale & Scott 1976), Indonesia.

The third variant (Plate 33:14,15) has slender, elongated processes. One of the cells (Plate 33:16–18) had one semicell normal while the other had only six processes, three main and three subsidiary, resembling *St. clevei* (Wittrock) Roy & Bissett (West et al. 1923, p. 177, plate 156:6).

Cell L. spr. 17 μm, cpr. 38 μm; W. spr. 16 μm, cpr. 40 μm; I. 7 μm.

Distribution: *Jabiluka Bb. 6.iv.78, 13.iii.79; Goanna Bb. 30.i.79, Corndorl Bb. 8.iii.79.*

St. tohopekaligense var. _trifurcatum_ West & West
Plate 34:1,2

West et al. (1923, p. 179, plate 155:13,14).

A variety characterised by slightly shorter processes, with strong, trifid, spreading apices. See also *St. tohopekaligense* var. *robustum* Scott & Prescott (1961, p. 114, plate 48:1). Some of the processes are bifurcate.

Cell L. spr. 40 μm, cpr. 77 μm; W. sspr. 31 μm, cpr. 78–80 μm; I. 20 μm.

Distribution: *Ja Ja Bb. 7.iv.78*; N.T. (Scott & Prescott 1958*a*); Borneo, Ceylon, Madagascar.

St. victoriense G.S. West
Plate 36:3–5

West (1909*a*, p. 67, plate 5:13–15).

Except for a larger size and more processes, the plants agree well with those described from Victoria by West (loc. cit.). His plants have 10–11 processes per semicell whereas ours have 11–14.

Cell L. 60–71 μm, cpr. 93–99 μm; W. 45–52 μm, cpr. 125–132 μm; I. 36–38 μm.

Distribution: *Kulukuluku Bb. 24.ii.81, McMinns Lagoon 22.i.79, Ironstone Lagoon 22.i.79*; Vic. (West 1909*a*), Tas. (Thomasson & Tyler 1971).

St. wildemanii Gutwinski
Plate 28:1–10

This is undoubtedly a polymorphic taxon and forms of it have been called *St. subtrifurcatum* (Schmidle 1898), *St. subtrifurcatum* fa. *bidens* (Schmidle 1902), *St. subtrifurcatum* fa. *major* (West & West 1900) and *St. subtrifurcatum* var. *majus* (West & West 1907). Scott & Prescott (1956*a*) transferred it to *St. wildemanii*. We have observed three main forms which are connected by intermediates.

The simplest form (Plate 28:7,8) has a single spine in each angle of the semicell and as such has all the characteristics of a *Staurodesmus*, though Teiling (1967, p. 486) regards it as a false *Staurodesmus*. This form has been named *St. wildemanii* var. *unispiniferum* by Scott & Prescott (1956*a*, p. 356, fig. 19,20).

The next form (Plate 28:5,6) has 2 spines in each angle of the semicell and is identical to the original plants described by Gutwinski (1902, p. 605 plate 40:61).

The form with three spines (Plate 28:1–3) at each angle of the semicell has been renamed *St. wildemanii* var. *majus* (West & West) Scott & Prescott (1956*a*, p. 353, fig. 8–12).

In addition to the above 3 forms, intermediates (Plate 28:4,9,10) were common. These cells have one semicell of one form and the other semicell of another form.

Most of the samples contained only the 3-spined form with a few 2-spined and rarely a 2/3 cell. The single spined form has been observed only in a sample from Bowerbird Billabong (9.x.80). An analysis of 61 cells from this sample gave the following results:

Cell Type	1/1	1/2	1/3	2/2	2/3	3/3
No. of cells	5	12	7	15	9	13

Simple form:

Cell L. 45 μm; W. ssp. 45–53 μm, csp. 70–78 μm; I. 17–20 μm.

Two-spined form:

Cell L. 55 μm; W. ssp. 55 μm; csp. 120 μm; I. 23 μm.

Three-spined form:

Cell L. 44–47 μm; W. ssp. 43 μm, csp. 80–99 μm; I. 18–20 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Mine Valley Bb. 10.iv.78, Nankeen Bb. 13.iii.79, Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*); Indonesia, Burma, Finland, Africa.

St. wildemanii forma
Plate 28:11–15

Some of the plants (Plate 28:14,15) correspond to three specimens incompletely described as forma and morpha of *St. wildemanii* by Scott & Prescott (1958*a*, p. 67, fig. 16:8) and Croasdale & Scott (1976, p. 552, plate 13:4) respectively. The plants are larger than *St. wildemanii* and have three additional spines on the apex of each semicell. In end view, these spines are slightly offset towards the right of the angles.

Cell L. ssp. 70 μm, csp. 133 μm; W. ssp. 73 μm, csp. 152 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Coonjimba Bb. 13.v.78, Backflow Bb. 11.iv.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976).

The 3-spined form discussed above is connected by intermediates (Plate 28:13), to a 2-spined expression (Plate 28:11,12) which is slightly larger and has a more convex apex than the 2-spined form of *St. wildemanii*. The latter two cannot be separated with certainty.

Cell L. ssp. 63 μm, csp. 92–97 μm; W. ssp. 56–60 μm, csp. 116–128 μm; I. 27 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

A 4-radiate cell (Plate 28:16) was observed from Backflow Billabong (11.iv.78).

Two inferences can be drawn from the results. Either this forma is another offshoot of the variable *St. wildemanii* and linked to it via the 2-spined form or it is another species, one of the morphological expressions of which is practically identical to the 2-spined form of *St. wildemanii*.

***St. zonatum* Börgesen var. *ceylanicum* West & West forma**
Plate 30:15–18

Our plants are smaller than Scott & Prescott's description (1961, p. 119, plate 48:9 & 52:2) of the variety, and lack the small teeth on the arms, apex and the base of the semicell.

Cell L. spr. 25 μm, cpr. 35 μm; W. cpr. 35 μm; I. 9 μm.

Distribution: *Backflow Bb. 11.iv.78.*

***St. zonatum* var. *majus* Scott & Prescott**
Plate 37:13,14

Scott & Prescott (1961, p. 119, plates 46:8, 48:7,8).

Our plants are smaller than those described by Scott & Prescott (loc. cit.).

Cell L. 28 μm, cpr. 33–44 μm; W. cpr. 59 μm; I. 11 μm.

Distribution: *Island Bb. 22.vii.80*; Indonesia.

***Staurastrum* sp. 1**[1]
Plate 38:9–13

Cells large, twice as long as broad without the processes; constricted, sinus open and acute-angled; semicells subglobose, apex flat or slightly convex, upper angles produced to form long, slender processes. Dorsal margin of process with two rows of denticulations, lower margin smooth; process gradually tapering to three spines, the median one longer than the others. Semicell with an apical ring of conical tubercles in apposition to the processes. Semicells of a single cell different from one another. In the top semicell the processes arch downwards, past the isthmus, extending to or slightly beyond the apex of the bottom semicell. The processes are denticulate throughout. The processes on the bottom semicell extend downwards, in the same direction as those of the top semicell, and from the base are smooth for about 1/4–1/3 of their length. The apical tubercles on the lower semicell are twice the size of those on the upper semicell. Cells from the Magela Creek system are 8- or 9-radiate, occasionally a single cell may have one semicell 8-radiate while the other is 9-radiate. The few cells observed from Yirrkala are all 10-radiate.

This is the most interesting and significant plant we have found in the Northern Territory. It is, without doubt, a new species. There are some grounds for allying it with *Amscottia* (Grönblad & Kallio 1954) but until it can be studied further we retain it as a species of *Staurastrum*.

Cell L. spr. 44–47 μm, cpr. 92–102 μm; W. spr. 29– 33 μm, cpr. 107–112 μm; I. 20–22 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Backflow Bb. 11.iv.78, 26.viii.78, Gulungul Bb. 2.ii.79, Yirrkala 5.viii.80.*

[1] This species has now been formally described as *Amscottia gulungulana* in the British Phycological Journal (in press). [ed.]

***Staurastrum* sp. 2**
Plate 29:1,2

Semicell elongate-hemispherical in side view with small secondary lateral processes. End view triangular, with slightly convex sides.

Cell L. 61–63 μm; W. base 48–50 μm, cpr. 51–53 μm; I. 15–18 μm.

Distribution: *Leichhardt Bb. 6.iv.78.*

***Staurastrum* sp. 3**
Plate 30:22–24

Cells 4- or 5-radiate, processes more or less parallel; ring of granules round base of semicell. The plants are probably reduced forms of *St. pinnatum* var. *subpinnatum* (see p. 44).

Cell L. 26 μm; W. 37–40 μm; I. 8 μm.

Distribution: *Mine Valley Bb. 26.viii.78.*

***Staurastrum* sp. 4**
Plate 33:12,13

Cell 3-radiate with two arms arising from each angle. Cell wall more or less smooth.

Cell L. spr. 19 μm, cpr. 28 μm; W. spr. 18 μm, cpr. 40 μm; I. 8 μm.

Distribution: *Coonjimba Bb. 13.v.78, Winmurra Bb. 31.v.79.*

***Staurastrum* sp. 5**
Plate 30:1

Cells elongated, 3-radiate; processes end in a single down-turned point.

Cell L. 28 μm; W. 24 μm; I. 4 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

***Staurastrum* sp. 6**
Plate 30:7,8

Small 3-radiate plant with an elongated body.

Cell L. 24.5 μm, W. 24 μm, I. 3 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

***Staurastrum* sp. 7**
Plate 30:11,12

Small 3-radiate plant with 6 small processes radiating from a raised apex.

Cell L. 19–23 μm; W. 27–29 μm; I. 5–6 μm.

Distribution: *Goanna Bb. 30.i.79, Umbungbung Bb. 30.v.79.*

***Staurastrum* sp. 8**
Plate 30:6

Cells small, 3-radiate; processes slightly divergent each ending in two spines.

Cell L. 18 μm; W. 28 μm; I. 6 μm.

Distribution: *Mine Valley Bb. 26.viii.78.*

***Staurastrum* sp. 9**
Plate 31:17

Our plant resembles a form of *St. lepidum* var. *latecurvatum* Grönblad described by Thomasson (1957, p. 12, fig. 1a). Considering comments by Thomasson (loc. cit.) on the identity of var.

latecurvatum and the absence of an end view of our plant, we have not named it.

Cell L. spr. 25 µm, cpr. 73–84 µm; W. spr. 15–16 µm, cpr. 78 µm; I. 8 µm.

Distribution: *Flying Fox Bb. 2.vi.79.*

***Staurastrum* sp. 10**
Plate 31:19,20

Biradiate plant with elongated and strongly divergent processes ornamented with small spines. Semicells are slightly twisted with respect to one another.

Cell L. spr. 26 µm, cpr. 95 µm; W. 101 µm; I. 8 µm.

Distribution: *Flying Fox Bb. 2.vi.79.*

***Staurastrum* sp. 11**
Plate 37:6–12

A variable group of plants which can be divided into two main types. The less ornate (Plate 37:9–12) has three sets of apical ornamentation, each set consisting of four bifid or trifid spines. They are identifiable with the New Zealand plants described as *St. longiradiatum* West & West var. *major* West & West by Thomasson (1960, p. 226, fig. 6,7,13). In the original description West & West (1896, p. 267) gave the breadth of fa. *major* as 119 µm. No other measurements, or any drawings, were given. Under these circumstances, and since Thomasson's and our plants are different from *St. longiradiatum* West & West (1896, p. 267, plate 17:23) especially in the apices of the arms, it may be expedient to dissociate the two.

In the more ornate type (Plate 37:6–8) the base of each of the arms bears thin, hollow processes on both the dorsal and ventral sides. A conspicuous feature common to both types, and their intermediates, is the talon-like endings of the arms.

The plants from Annaburroo Billabong exhibit the greatest variation, with semicells showing varying degrees of ornamentation. Dichotypical cells are common. Plants from McMinns Lagoon are practically all highly ornate, whereas the few observed from Bowerbird Billabong are not.

Plants from Annaburroo Billabong:

Cell L. spr. 40–45 µm; W. cpr. 140–158 µm; I. 12– 14 µm.

Plants from McMinns Lagoon:

Cell L. spr. 32–36 µm; W. cpr. 87–114 µm; I. 11–12 µm.

Distribution: *McMinns Lagoon 22.i.79, Annaburroo Bb. 7.x.80, Bowerbird Bb. 9.x.80.*

Genus *Staurodesmus* Teiling

The creation of this genus and its relationships to *Staurastrum* and *Arthrodesmus* are explained by Teiling (1948, 1967).

***Std. arcuatus* (Joshua) Teiling**
Plate 26:9

Teiling (1967, p. 594, plate 28:9,12); Joshua (1886, plate 24:14, *Arthrodesmus arcuatus*).

A species found, so far, only in the tropics.

Cell L. ssp. 43 µm, csp. 59–63 µm; W. ssp. 40–43 µm, csp. 67–70 µm; I. 13 µm.

Distribution: *Gulungul Bb. 7.iii.79 (fish stomach contents), Leichhardt Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*); Indonesia, Burma, Madagascar, Florida.

***Std. arcuatus* var. *octospinatus* (Scott & Prescott) Teiling**
Plate 26:10–12

Teiling (1967, p. 595, plate 28:10; Scott & Prescott (1958*a*, p. 53, fig. 11:7 and fig. 22:9, *A. arcuatus* var. *octospinatus*).

A variety with two pairs of apical spines which may be as big as the lateral ones, but are usually smaller (Plate 26:11). The zygospore (Plate 26:12), observed in the sample from Umbungbung Billabong, is spherical and ornamented with spines which are minutely bifid at the ends.

Cell L. ssp. 44 µm, csp. 59 µm; W. ssp. 41 µm, csp. 65 µm; I. 12 µm. Zygo. D. 37 µm, sp. 15–18 µm.

Distribution: *Gulungul Bb. 7.iii.79 (fish stomach contents), Umbungbung Bb. 30.v.79*; N.T. (Scott & Prescott 1958*a* Croasdale & Scott 1976); Borneo.

Rarely, dichotypical (Plate 26:10) cells were observed indicating that the typical and the variety are forms of one another. Scott & Prescott (1958*a*, fig. 22:10) observed an identical cell from Borneo.

Distribution: *Leichhardt Bb. 6.iv.78*; Borneo.

***Std. arcuatus* forma**
Plate 26:13–15

A previously undescribed form that exhibits the same variation in apical spine ornamentation as the typical, but has its lateral spines pointing almost horizontally. Only this form occurs in Annaburroo Billabong. It has not been observed elsewhere, nor have intermediates been found. It is tempting to cite the difference as an excellent example of environmental variation, but the difference could be genetic. It would be most interesting to find out how the form behaves under culture.

Cell L. ssp. 45–48 µm, csp. 52–58 µm; W. csp. 81– 88 µm; I. 13–14 µm.

Distribution: *Annaburroo Bb. 7.x.80.*

***Std. bulnheimii* (Raciborski) Brook var. *huitfeldtii* (Ström) Teiling**
Plate 30:25,26

Teiling (1967, p. 566, plate 17:7).

A graceful plant, with a narrow isthmus.

Cell L. ssp. 20–22 µm, csp. 35–38 µm; W. ssp. 20– 22 µm, csp. 40–50 µm; I. 4.5–5.5 µm; sp. 14–17 µm.

Distribution: *Jabiluka Bb. 6.iv.78*; Norway, USA.

***Std. connatus* (Lundell) Thomasson**
Plate 26:19–23

The plant is identical to *St. curvatum* W. West as described by Scott & Prescott (1958*a*, p. 59, fig. 16:6). Teiling (1967, p. 541–542, plate 11:15) transferred it to *Std. connatus*, retaining Scott & Prescott's (loc. cit.) figure. The original *St. curvatum* was also transferred by Teiling, not to *Std. connatus*, but to *Std. cuspidatus* (Brébisson) Teiling var. *curvatus* (W. West) Teiling (1967, p. 535). Included in this is a plant figured by Scott & Prescott (1958*a*, fig. 15:6, *St. curvatus*!). The odd thing is that in Scott & Prescott (1958*a*), fig. 15:6 is *St. cuspidatum* Brébisson, whereas fig. 16:6 is *St. curvatum*. The zygospore (Plate 26:23), observed in a sample from Mine Valley Billabong on 10.iv.78, is spherical, with long, sharp spines.

Cell L. ssp. 27–33 μm, csp. 52–60 μm; W. ssp. 30– 35 μm, csp. 55–58 μm; I. 9–10 μm. Zygo. D. 32 μm; sp. 20–24 μm.

Distribution: *Jabiluka Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*); East Asia, Europe, Africa, North America.

***Std. connatus* forma**
Plate 26:30,31

A small form with short spines.

Cell L. ssp. 18 μm, csp. 23 μm; W. ssp. 20–24 μm, csp. 28–30 μm; I. 5–7 μm.

Distribution: *Jabiluka Bb. 6.iv.78, Winmurra Bb. 31.v.79.*

***Std. curvatus* (Turner) Thomasson var. *borgei* (Scott & Prescott) Teiling**
Plate 26:36

Teiling (1967, p. 596, plate 28:2); Scott & Prescott (1961, p. 75, plate 34:2,3, *A. curvatus* var. *borgei*).

Cell L. 29 μm; W. ssp. 31 μm, csp. 85 μm; I. 8 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; N.T. (Croasdale & Scott 1976); Indonesia, East Africa.

***Std. curvatus* var. *latus* (Scott & Prescott) Thomasson**
Plate 26:37

Thomasson (1965, p. 22, fig. 10:7); Scott & Prescott (1958*a*, p. 53, fig. 9:7, *A. convergens* var. *depressum* 1961, p. 76, plate 33:1–3, *A. curvatus* var. *latus*). The spines are straight at the base but subsequently curve towards the isthmus.

Cell L. 46 μm; W. ssp. 45 μm, csp. 82–93 μm; I. 15 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; N.T. (Scott & Prescott 1958*a*); Indonesia, Africa.

***Std. curvatus* var. *latus* forma**
Plate 26:38,39

A slightly smaller form with spines positioned more down the side of the semicell was also observed. Its zygospore is brown and smooth.

Cell L. 34 μm; W. ssp. 31 μm, csp. 57 μm; I. 11 μm. Zygo. D. 32 μm.

Distribution: *Coonjimba Bb. 13.v.78, Mine Valley Bb. 10.iv.78.*

***Std. cuspidatus* (Brébisson) Teiling var. *curvatus* (West) Teiling**
Plate 26:24–27

Teiling (1967, p. 535, plate 10:3,4); West et al. (1923, p. 19, plate 130:15,16, *St. curvatum* W. West).

The plant (Plate 26:24–26) has longer spines and a slightly more elongate isthmus than *Std. connatus* (Plate 26:19–22). In the sample from Kulukuluku Billabong, a few cells had one semicell normal while the spines on the other were directed horizontally (Plate 26:27).

Cell L. ssp. 34–35 μm, csp. 72–78 μm; W. ssp. 33– 35 μm, csp. 73–97 μm; sp. 35–42 μm; I. 8–10 μm.

Distribution: *Ja Ja Bb. 14.iii.79, Jingalla Bb. 23.iii.80, Kulukuluku Bb. 24.ii.81*; N.T. (Scott & Prescott 1958*a*); Europe, Africa, North America.

***Std. cuspidatus* var. *divergens* (Nordstedt) Teiling**
Plate 26:32,33

Teiling (1967), p. 534, plate 9:15); Nordstedt (1870, p. 225, plate 4:49, *St. cuspidatum* Brébisson var. *divergens*).

The validity of this name is doubtful. Teiling (1967, plate 9:15) labelled his figure as var. *divergens* but did not make the transfer in the text. The plant has an elongated isthmus.

Cell L. ssp. 27 μm, csp. 50 μm; W. ssp. 23 μm, csp. 40–43 μm; I. 7 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*); cosmopolitan.

***Std. cuspidatus* var. *divergens* forma**
Plate 26:28,29

The plant is identical to those described as *St. cuspidatum* var. *divergens* fa. *minus* by Scott & Prescott (1961, p. 89, plate 53:16). It is identical to the variety in shape, but is much smaller. Teiling (1967, p. 534) has placed it with the type species.

Cell L. ssp. 16 μm; csp. 25 μm; W. ssp. 15 μm, csp. 21 μm; I. 4 μm.

Distribution: *Jabiluka Bb. 13.iii.79*; Indonesia.

***Std. dickiei* (Ralfs) Lillier forma**
Plate 27:15–18

The plant (Plate 27:15,16) is the same as one that Scott & Prescott (1958*a*, p. 60, fig. 14:19) considered to be a small form of *Staurastrum dickiei* (Ralfs) var. *maximum* W. West. Except for its smaller size, the plant is identical to a form of *Std. dickiei* var. *circularis* (Turner) Croasdale described by Croasdale & Scott (1976, p. 541, plate 12:8). The majority of plants in a sample from Flying Fox Billabong (2.vi.79) were biradiate (Plate 27:17,18). Biradiate forms have not been observed in other samples.

Cell L. 25 μm; W. ssp. 30 μm, csp. 32 μm; I. 7 μm.

Biradiate cell L. 30 μm; W. ssp. 32 μm, csp. 36 μm; I. 7 μm; T. 7 μm.

Distribution: *Backflow Bb. 11.iv.78, Flying Fox Bb.*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976).

Std. dickiei **var.** ***maximus*** **(W. West) Thomasson**
Plate 26:2

Teiling (1967, p. 600, plate 29:5); West & West (1895, p. 72, plate 8:19, *St. dickiei* var. *maximum* W. West).

Cell L. 63 μm; W. ssp. 59 μm, csp. 67–70 μm; I. 13.5 μm.

Distribution: *Corndorl Bb. 8.iii.79*; N.T. (Scott & Prescott 1958*a*); Papua New Guinea (Thomasson 1967), Indonesia, Japan, Africa, Europe, North and South America.

Std. dickiei **var.** ***maximus*** **fa.** ***grande*** **Prescott**
Plate 26:3,4

Prescott (1966, p. 31, plate 9:38).

A form larger than the typical variety, with the ventral side of the semicell straighter and with more sharply converging margins. The original plant is wider than long, our plants are almost circular.

Cell L. 70–71 μm; W. 69–71 μm; I. 13–14 μm.

Distribution: *Hidden Bb. 8.iv.78, Noarlanga Bb. 30.v.79*; Panama.

Std. extensus **(Borge) Teiling**
Plate 30:27

Teiling (1967, p. 514, plate 31:19).

See also *Std. indentatus* (West & West) Teiling as described by Croasdale & Scott (1976, p. 542, plate 12:1).

Cell L. 20–21 μm; W. ssp. 20–22 μm, csp. 52–58 μm; I. 6 μm.

Distribution: *Jabiluka Bb. 6.iv.78, Mine Valley Bb. 10.iv.78*; N.T. (Croasdale & Scott 1976); Papua New Guinea (Thomasson 1967).

Std. furcatospermus **(Scott & Prescott) Thomasson**
Plate 27: 26–28

Scott & Prescott (1958*a*, p. 54, fig. 12:6,7, *Arthrodesmus furcatospermus*); Thomasson (1966, plate 2:13).

The plants are smaller than those previously described.

Cell L. 14–15 μm; W. ssp. 12–14 μm, csp. 27–44 μm; I. 4 μm; T. 5–6 μm.

Distribution: *Annaburroo Bb. 7.x.80, Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*); Africa.

Std. gibberulus **(Joshua) Teiling**
Plate 25:1

Teiling (1967, p. 594, plate 26:6,7); West & West (1902, p. 192, plate 22:22, *Arthrodesmus gibberulus* Joshua).

Cell L. 31–33 μm; W. ssp. 30–32 μm, csp. 40–44 μm; I. 9 μm.

Distribution: *Annaburroo Bb. 7.x.80, Bowerbird Bb. 9.x.80*; N.S.W. (Playfair 1908); southern Asia, Japan.

Std. gibberulus **forma**
Plate 25:5,6

Semicell has three short diverging spines on the apex. It has only been found in a single sample.

Cell L. 31–33 μm; W. ssp. 28 μm, csp. 37–40 μm; I. 10 μm; T. 18 μm.

Distribution: *Goanna Bb. 12.iii.80.*

Std. gibberulus **var.** ***mucronatus*** **(Borge) Teiling**
Plate 25:2

Teiling (1967, p. 594, plate 26:8,9); Borge (1896, plate 2:27, *Arthrodesmus convergens* Ehrenberg var. *mucronatus*).

The observation of dichotypical cells (Scott & Prescott 1958*a*, fig. 11:11) suggests that this is only a growth form of the type species.

L. 29 μm; W. ssp. 27 μm, csp. 40 μm; I. 8 μm.

Distribution: *Coonjimba Bb. 13.v.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976), Qld (Borge 1896; Bailey 1898).

Std. gibberulus **var.** ***mucronatus*** **fa.**
bimucronatus **Croasdale**
Plate 25:3,4

Croasdale & Scott (1976, p. 542, plate 12:6,7).

Differs from the variety in having a pair of short, diverging apical spines rather than a single spine. Cells (Plate 25:3) are smaller than the typical. The zygospore (Plate 25:4), observed in a sample from Umbungbung Billabong (30.v.79) is spherical and ornamented with sharp spines.

Cell L. 26 μm; W. ssp. 15 μm, csp. 40 μm; I. 7 μm. Zygo. D. 27 μm; S. 7–10 μm.

Distribution: *Coonjimba Bb. 13.v.78*; N.T. (Croasdale & Scott 1976).

Std. glaber **(Ehrenberg) Teiling formae**
Plate 26:40,41

Forma 1, a biradiate form (Plate 26:40), has wider semicells than the typical (Teiling 1967, p. 557, plate 13:14). It should also be compared with *Std. triangularis* (Lagerheim) Teiling var. *latus* (Irenée-Marie) Teiling (1967, p. 519, plate 6:13).

Cell L. 28 μm; W. ssp. 37 μm, csp. 58 μm; I. 6 μm.

Distribution: *Jingalla Bb. 23.iii.80.*

Forma 2 is 3-radiate (Plate 26:41) and is more robust than the typical (Teiling 1967, p. 557, plate 13:15).

Cell L. 30 μm; W. ssp. 31 μm, csp. 54 μm; I. 9 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

Std. glaber **var.** ***hirudinella*** **(Messikommer) Teiling**
Plate 26:42,43

Teiling (1967, p. 559, plate 14:4).

The plant has longer angles and shorter spines than the one described by Teiling (loc. cit.).

Cell L. 18 μm; W. ssp. 23 μm, csp. 37 μm; I. 7 μm.

Distribution: *Coonjimba Bb. 13.v.78*; Philippines, Switzerland, Finland.

Std. lunatus **(Wolle) Teiling forma**
Plate 27:24

Plant biradiate, apex convex, basal sides of semicell slightly concave, sinus v- to u-shaped. The plant is probably a variety of *Std. lunatus* (Teiling 1967, p. 607, plate 30:19).

Cell L. 38 μm; W. 45 μm; I. 8 μm.

Distribution: *Goanna Bb. 15.v.78.*

Std. mamillatus **(Nordstedt) Teiling forma**
Plate 27:20,21

The plant agrees with *Staurastrum mamillatum* var. *elegans* Tarnogradsky (1960, plate 2:21,22) which Teiling (1967, plate 10:10) has labelled as *Std. mamillatus* var. *elegans*. However, in the text, Teiling did not make a formal transfer of the variety to *Staurodesmus* but included it as a form of *mamillatus*.

Cell L. 19 μm; W. ssp. 18.5 μm, csp. 31 μm; I. 4 μm.

Distribution: *McMinns Lagoon 22.i.79.*

Std. megacanthus **(Lundell) Thunmark forma**
Plate 26:5–7

The plants have slightly converging spines and furcate chloroplasts, each with a central pyrenoid. They are identifiable with a form of *Staurastrum megacanthum* Lundell described by Krieger (1932, p. 203, plate 15:1) and also with *Staurastrum tripyrenoideum* Scott & Prescott (1961, p. 114, plate 49:6). Krieger's forma has a less convex apex and horizontally directed spines while *St. tripyrenoideum* is characterised by having its chloroplast in three parietal plates, each with one pyrenoid. Teiling (1967, p. 600) placed *St. tripyrenoideum* with *Staurodesmus dickiei* var. *maximus* commenting (p. 604) that pyrenoid differences may not be considered of specific character.

Cell L. 43–49 μm; W. ssp. 46–57 μm, csp. 62–73 μm; I. 10–12 μm.

Distribution: *Coonjimba Bb. 13.v.78, Noarlanga Bb. 30.v.79.*

Std. megacanthus **var.** ***orientalis*** **(Scott & Prescott) Teiling**
Plate 26:16–18

Teiling (1967, p. 554, plate 15:9); Scott & Prescott (1961, p. 98, plate 55:5,6, *St. megacanthum* (Lundell) var. *orientale*).

Cell L. 28–30 μm; W. ssp. 34–42 μm, csp. 70–84 μm; I. 11 μm.

Distribution: *Mine Valley Bb. 10.iv.78*; Indonesia, Sweden.

A slightly different cell (Plate 26:18) was observed in a sample from Corndorl Billabong (2.ii.79).

Cell L. 39 μm; W. ssp. 42–47 μm, csp. 70 μm; I. 9.5 μm.

Std. mucronatus **(Ralfs) Croasdale var.** ***delicatulus*** **(G.S. West) Teiling**
Plate 27:1

Teiling (1967, p. 570, plate 18:6); West (1909, p. 66, plate 5:5, *Staurastrum mucronatum* Ralfs var. *delicatulum*).

Our plant agrees well with previous descriptions.

Cell L. 33 μm; W. 40 μm; I. 10 μm.

Distribution: *Gulungul Bb. 21.vii.80*; N.T. (Scott & Prescott 1958*a*); Vic. (West 1909*a*); Finland, Sweden.

Std. mucronatus **var.** ***delicatulus*** **forma**
Plate 27:2–5

Larger than the type and has a flatter apex. It should also be compared with *Std. megacanthus* var. *triangularis* (Grönblad) Teiling (1967; p. 553, plate 16:1).

Cell L. 38 μm; W. ssp. 40–48 μm, csp. 46–56 μm; I. 9 μm.

Distribution: *Ironstone Lagoon 22.i.79, Goanna Bb. 30.i.79.*

Std. psilosporus **(Nordstedt & Löfgren) Teiling forma**
Plate 27:13,14

Our plants agree, both in shape and size, with a form of *Arthrodesmus psilosporus* (Nordstedt & Löfgren) De Toni described by Scott & Prescott (1961, p. 77, plate 36:5,6). Teiling (1967, p. 506) has included this species in *Staurodesmus*. Our plants, however, have exceedingly thin, almost hyaline cell walls and the 4-lobed chloroplast, with its single pyrenoid, is also thin and insignificant. A combination of these two factors renders the plants inconspicuous.

Cell L. spr. 27–30 μm; W. cpr. 32–36 μm; I. 7–8 μm.

Distribution: *Goanna Bb. 12.iii.80.*

Std. spencerianus **(Maskell) Teiling var.** ***triangulatus*** **(Krieger) Teiling**
Plate 27:12

Teiling (1967, p. 555, plate 27:12); Krieger (1932, p. 197 plate 14:12, *Staurastrum dejectum* Brébisson var. *triangulatum*).

Cell L. ssp. 21 μm, csp. 25 μm; W. ssp. 22–25 μm. csp. 26–29 μm; I. 7 μm.

Distribution: *Hidden Bb. 8.iv.78*; Indonesia.

Std. spencerianus **var.** ***triangulatus*** **forma**
Plate 27:10,11

The plant differs from those described by Teiling (loc. cit.) and Krieger (loc. cit.) in having thin walls and convex apices.

Cell L. 19 μm; W. 23 μm; I. 8 μm.

Distribution: *Goanna Bb. 30.i.79.*

Std. unicornis **(Turner) Thomasson var.** ***gracilis*** **(Iyengar & Bai) Teiling**
Plate 27:29–31

Teiling (1967, p. 540, plate 11:3); Croasdale & Scott (1976, p. 543, plate 14:3).

L. 22–25 μm; W. ssp. 23–31 μm, csp. 38–47 μm; I. 5–7 μm.

Distribution: *Djalkmara Bb. 3.vi.79, Umbungbung Bb. 30.v.79*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976); New Zealand, southern Asia, North America.

A small form (Plate 27:30,31) that seems to be intermediate between var. *gracilis* and var. *subscolopacinus* was also observed.

Cell L. 17 μm; W. ssp. 12 μm, csp. 29 μm; I. 4 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

***Std. unicornis* var. *subscolopacinus* (West & West) Teiling**
Plate 27:19

Teiling (1967, p. 541, plate 11:6); West & West (1898, plate 16:11, *Staurastrum subscolopacinum*).

Cell L. 18 μm; W. ssp. 17 μm, csp. 25 μm; I. 4.5 μm.

Distribution: *Umbungbung Bb. 30.v.79*; Japan, North America.

***Std. validus* (West & West) Thomasson**
Plate 26:34

Teiling (1967, p. 566, plate 17:10); West & West (1911, p. 96, plate 114:9, *A. incus* (Brébisson) Hassall var. *validus*).

The base of the spines is hollow.

Cell L. ssp. 36 μm, csp. 82 μm; W. ssp. 36–38 μm, csp. 71–85 μm; I. 9 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; southern and eastern Asia, Europe, Africa, North and South America.

***Std. validus* forma**
Plate 26:35

A small form with a slightly convex apex.

Cell L. ssp. 25 μm, csp. 49 μm; W. ssp. 29 μm, csp. 43 μm; I. 7 μm.

Distribution: *Djalkmara Bb. 3.vi.79.*

***Staurodesmus* sp. 1**
Plate 25:9,10

Large plants with convex apices and slightly converging spines. In each semicell the chloroplast is divided into 6–7 parietal plates, each with 1–3 small pyrenoids. The plants are probably related to *Std. megacanthus* or *Std. dickiei* var. *maximus*, though they are about twice as large as the bigger forms of both taxa.

Cell L. 110–117 μm; W. ssp. 120–124 μm, csp. 160–170 μm; I. 35–38 μm.

Distribution: *Goanna Bb. 12.iii.80.*

***Staurodesmus* sp. 2**
Plate 26:8

Semicell triangular in side view with slightly convex sides, spines convergent. Other than a slight resemblance to *Std. dickiei* var. *maximus* there does not seem to be any other species to which we could refer this plant.

Cell L. 60 μm; W. sp. 60 μm, csp. 75 μm; I. 12 μm.

Distribution: *Mine Valley Bb. 4.vi.79, Jabiluka Bb. 6.iv.78.*

***Staurodesmus* sp. 3**
Plate 27:6,7

Plants with thin walls, probably related to *Std. selenaeus* (Grönblad) Teiling (1967, p. 508, plates 5:3) or *Staurastrum sublaevispinum* West & West (Scott & Prescott 1961, p. 110, plates 53:5).

Cell L. spr. 22 μm, cpr. 32 μm; W. 34–39 μm; I. 7 μm.

Distribution: *Goanna Bb. 30.i.79.*

***Staurodesmus* sp. 4**
Plate 27:8,9

A small plant, probably allied with *Std. dickiei* (Ralfs) Lillieroth (Teiling 1967, p. 598, plate 29:2,3) or *Std. glaber* (Ehrenberg) Teiling var. *debaryanus* (Nordstedt) Teiling (1967, p. 558, plate 14:3).

Cell L. 13 μm; W. 18 μm; I. 5 μm.

Distribution: *Coonjimba Bb. 13.v.78.*

Genus *Streptonema* Wallich

***S. trilobatum* Wallich**
Plate 9:31–33

Scott & Prescott (1958*a*, fig. 21:1; 1961, plate 63:10–16).

Cell L. cpr. 27–29 μm; W. 50 μm; I. 15 μm.

Distribution: *Gulungul Bb. 7.iii.79 (fish stomach contents)*; N.T. (Scott & Prescott 1958*a*); Bengal, Indonesia.

Genus *Tetmemorus* Ralfs

Tetmemorus is distinguished from other, similar looking, genera by its broad apices with median incisions. It is separated from the closely related *Euastrum* by its axial chloroplast with a single, central or an axial row of pyrenoids.

***T. brebissonii* (Meneghini) Ralfs**
Plate 5:15,16

Ralfs (1848, p. 145, plate 24:1); Scott & Prescott (1958*a*, p. 28, fig. 20:11).

Cell L. 152–184 μm; W. 26–27 μm, I. 21–23 μm; A. 18–20 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*); worldwide.

***T. laevis* (Kützing) Ralfs**
Plate 5:33

Ralfs (1848, p. 146, plate 24:3); West & West (1904, p. 222, plate 32:11–16).

Cell L. 113 μm; W. 26 μm; I 24 μm; A. 12 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Croasdale & Scott 1976); worldwide.

Genus *Triploceras* Bailey

***T. gracile* Bailey**

Various authors (Turner 1892, p. 26; West 1909*a*, p. 54; Thomasson 1973, p. 387) have commented on the variability of this taxon and the problems this has generated. In attempting to classify the various forms found in the Magela Creek system we have encountered considerable confusion in the literature, which can only be solved by the examination of type specimens and the comparison of plant populations from various localities. We have assigned our plants to various forms with a short discussion on the affinities of each.

T. gracile
Plate 10:1

Our plant agrees with a form described by West & West (1896, p. 236, plate 13:9–13). West (1909*a*, p. 55) has suggested that, as Bailey's figure is of poor quality, the plants described by West & West (1896) be accepted as the type-form of the species.

Semicell L. 223 μm; W. csp. 27 μm, ssp. 15 μm; I. 15 μm; W. A. csp. 31 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; Qld (Möbius 1892, 1894; Bailey 1893, 1895; Schmidle 1896; McLeod 1975); Asia, North and South America, Europe.

***T. gracile* forma 1**
Plate 10:2

The plant is identical to *T. gracile* var. *undulatum* described by Scott & Prescott (1958*a*, p. 27, fig. 3:8). It has stouter spines than the type.

Semicell L. 241 μm; W. csp. 33 μm, ssp. 18 μm; I. 18 μm.

Distribution: *Bowerbird Bb. 9.x.80*; N.T. (Scott & Prescott 1958*a*).

***T. gracile* forma 2**
Plate 10:3

This form is identical to a long-spined plant that Thomasson (1973, p. 387, plate 33:4) has included in the variety *aculeatum* Nordstedt. The spines on the original plant (Nordstedt 1888, p. 64) are only 6–10 μm long. The plant should also be compared with *T. gracile* var. *aculeatum* fa. *australica* Playfair (1907, p. 163, plate 2:14,15).

Semicell L. 267 μm; W. ssp. 22 μm, csp. 67 μm; S. 18–24 μm; I. 22 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.S.W. (Thomasson 1973).

***T. gracile* forma 3**
Plate 11:1,2

A large and elongated plant with about 19 whorls of hollow processes per semicell. Each process bears two horizontal teeth. It is very similar to *T. gracile* var. *bidentatum* as described by Bourrelly (1957, p. 1059, plate 1:10), but our plant is wider and twice as long. The original *T. gracile* var. *bidentatum* (Nordstedt 1877, p. 18, plate 2:3) has sessile bidentate processes with the teeth orientated vertically. The plant is also similar to two smaller plants, one described as *T. verticillatum* Bailey var. *superbum* (Maskell) Nordstedt by Scott & Prescott (1958*a*, p. 28, fig. 13:11) and the other as *T. verticillatum* var. *superbum* fa. *angustum* Grönblad & Scott by Grönblad et al. (1958, p. 12, fig. 7,8). Both these plants have bifid processes in the upper half of the semicell, but trifid ones in the lower half. The processes on our plant are all bifid.

Semicell L. 395–428 μm; W. cpr. 61–64 μm; I. 29– 31 μm.

Distribution: *Ja Ja Bb. 3.i.79, downstream of Darwin River Dam 7.x.80.*

***T. gracile* var. *elegans* (Borge) Krieger**
Plate 10:4–6

Borge (1896, p. 29, plate 4:66) described his plant from Queensland as *Docidium elegans*. Krieger (1937, p. 445, plate 52:10) subsequently transferred it to *Triploceras*. The plants reported by both Borge (loc. cit.) and Croasdale & Scott (1976, p. 511, plate 2:5–7) have five whorls of mammillate processes per semicell. Our plants have from 5 to 9 whorls per semicell, the 9-whorled cells being almost twice as large as the 5-whorled ones.

Five-whorled cells:

Semicell L. 250 μm; W. max. cpr. 71 μm; I. 21 μm.

Nine-whorled cells:

Semicell L. 470 μm; W. max. cpr. 95 μm; I. 28 μm.

Distribution: *Island Bb. 3.i.79, Ja Ja Bb. 7.iv.78, Leichhardt Bb. 6.iv.78*; N.T. (Croasdale & Scott 1976), Qld (Borge 1896; Bailey 1898).

***T. splendens* Prowse forma**
Plate 12:14,15

This magnificent species had, up till now, been found only in the forest swamp lake Tasek Bera, Malaysia (Prowse 1969, fig. 1c and plate 2). Each semicell has 6–7 whorls of long, prominent spines, those next to the isthmus being shorter. The pole is divided into three projecting parts each of which bears a long terminal spine and four shorter spines arranged in pairs.

Our plant has 8–9 whorls of spines per semicell, those next to the isthmus being shortest, and the next most immediate the longest. It differs from the typical mainly in the apex, where each projecting part bears two long terminal spines and three short spines.

Semicell L. ssp. 220 μm; W. ssp. 30 μm; I. 25 μm; A. csp. 142 μm.

Distribution: *Ja Ja Bb. 3.i.79.*

***T. verticillatum* Bailey var. *superbum* (Maskell) Nordstedt**
Plate 11:3

The plant is identical to Scott & Prescott's description (1958*a*, p. 28, fig. 3:9,10) of the variety but the base of the semicell, the apex and the numerous processes differ from the typical (Nordstedt 1888, p. 63, plate 7:3–7). The plants are more closely identifiable with a *Triploceras* described by Borge (1896, p. 28, plate 4:46) as *Docidium verticillatum* var. *ornatum*. Krieger (1937, p. 447, plate 53:1) has allied this to *T. verticillatum* var. *superbum*, illustrating it with Borge's (loc. cit.) figure. The true identity of the plant needs to be checked carefully in conjunction with Maskell's descriptions. The measurements of basal width quoted by Scott & Prescott (1958*a*, p. 28) appear to be twice as big as normal, and disagree with their illustrations.

Semicell L. spr. 262 μm, cpr. 285 μm; W. base cpr. 48 μm; I. 28 μm.

Distribution: *Ja Ja Bb. 7.iv.78*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896; Bailey 1898), N.S.W. (Playfair 1907).

Genus *Xanthidium* (Ehrenberg) Ralfs

X. *acanthophorum* Nordstedt
Plate 23:4–6

Nordstedt (1880); Scott & Prescott (1958*a*, p. 55, fig. 11:1).

The number and arrangement of the facial pores are variable, as is the number of small lateral spines found between the two rows of large spines.

Cell L. ssp. 37–45 μm, csp. 49–65 μm; W. ssp. 31– 40 μm, csp. 40–63 μm; I. 13–16 μm.

Distribution: *Mine Valley Bb. 10.iv.78, Backflow Bb. 11.iv.78, Gulungul Bb. 21.vii.80, Annaburroo Bb. 7.x.80*; N.T. (Scott & Prescott 1958*a*); Indonesia.

***X. antilopaeum* (Brébisson) Kützing var. *laeve* Schmidle fa. *longispinum* Scott & Prescott**
Plate 23:7–9

Two forms were observed. The first (Plate 23:9) is identical to the original plants from Sumatra (Scott & Prescott 1961, plate 38:2). Scott & Prescott (1961, p. 80) stated that the original is the same as the plant that they described (Scott & Prescott 1958*a*) from northern Australia as *X. antilopaeum* forma.

Cell L. ssp. 81–87 μm, csp. 143–146 μm; W. ssp. 57–60 μm, csp. 116–123 μm; I. 20 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T.; Indonesia.

The second form (Plate 23:7,8) is larger, with wider semicells.

Cell L. ssp. 87–95 μm, csp. 155–162 μm; W. ssp. 72–88 μm, csp. 140–165 μm; I. 24–25 μm, T. 45 μm.

Distribution: *Hidden Bb. 8.iv.78, Leichhardt Bb. 6.iv.78, Coonjimba Bb. 13.v.78.*

***X. apiculatum* (Joshua) Hirano**
Plate 25:11–17

The plants were initially identified as *Arthrodesmus apiculatus* by Joshua (1886, p. 644, plate 24:15) and subsequently transferred to *Xanthidium* by Hirano (1957, p. 217, plate 30:16,17), presumably on the basis of the central incrassation (see West & West 1911, p. 48 or 88). For the same reason, Teiling (1967, p. 485) has excluded the taxon from *Staurodesmus*, but in a recent paper Islam & Haroon (1980, p. 586, plate 19:275–276) have identified their plants as *Staurodesmus apiculatus*. We have observed varying degrees of incrassation, some indistinct.

Cell L. 32–41 μm; W. 29–42 μm; I. 9–11 μm; T. 20–23 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Mine Valley Bb. 10.iv.78, Winmurra Bb. 31.v.79, Backflow Bb. 22.vii.80*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976), Qld (Borge 1896; Bailey 1898); Burma, Japan, Indonesia, Bangladesh.

We have also observed a form (Plate 25:15–17) that is devoid of spines and could be identified as a *Cosmarium*.

Cell L. 39–42 μm; W. 41–43 μm; I. 12 μm.

Distribution: *Winmurra Bb. 31.v.79, Backflow Bb. 22.vii.80.*

A small, dichotypical cell (Plate 25:14) was observed in a sample from Backflow Billabong (22.vii.80).

***X. armatum* (Brébisson) Rabenhorst var. *anguliferum* Krieger**
Plate 23:3

Krieger (1932, plate 14:2).

Two forms were described by Croasdale & Scott (1976, plate 10:4,5). The plants observed correspond to their forma 2.

Cell L. spr. 93 μm, cpr. 124 μm; W. spr. 66–69 μm, cpr. 94–97 μm; I. 29 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Croasdale & Scott 1976); Indonesia.

***X. burkilii* West & West**
Plate 24:24

West & West (1907, p. 210, plate 15:10).

Cell L. 46 μm; csp. 85 μm; W. 48 μm, csp. 91 μm, I. 23 μm.

Distribution: *Goanna Bb. 30.i.79*; Indonesia, Burma, India, Japan.

***X. calcarato-aculeatum* (Hieronymus) Schmidle**
Plate 23:10

Schmidle (1902, plate 2:5); Scott & Prescott (1961, plate 39:3).

Closely related to *X. trilobum* Nordstedt (1870, p. 230, plate 3:35) to which Schmidle (loc. cit.) thought this plant belonged as a variety. Förster (1964, plate 26:2,3) figured an identical plant under the name *X. trilobum*.

Cell L. ssp. 53 μm, csp. 92 μm; W. ssp 55 μm, csp. 80 μm; I. 16 μm.

Distribution: *Ja Ja Bb. 7.iv.78*; eastern Africa, Indonesia, Brazil.

***X. controversum* West & West**
Plate 24:22,23

West & West (1911, p. 59, plate 107:5).

Cell L. 27–35 μm, csp. 50–67 μm; W. 24–31 μm, csp. 45–68 μm; I. 7.5–11 μm.

Distribution: *Coonjimba Bb. 13.v.78, Goanna Bb. 30.i.79*; USA, Pakistan.

X. hastiferum Turner
Plate 24:12

Turner (1892, plate 12:25).

Instead of the usual four apical spines there are only two, placed on opposite sides of the centre-line in vertical view. It was subsequently found that this is the rarer form. The findings agree with those of Scott & Prescott (1961, p. 81).

Cell L. ssp. 35–40 μm, csp. 59–75 μm; W. ssp. 29–33 μm, csp. 61–81 μm; I. 9–10 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Winmurra Bb. 31.v.79*; N.S.W. (Thomasson 1973; Skinner 1976), Vic. (Hardy 1905; West 1909*a*); Borneo, Bengal, Himalayas.

X. hastiferum var. javanicum (Nordstedt) Turner
Plate 24:13,14

Turner (1892, p. 100); Croasdale & Scott (1976, plate 10:7,8); Scott & Prescott (1958*a*, fig. 11:2,3, *X. hastiferum* var. *javanicum* fa. *planum* Turner).

Cell L. ssp. 40 μm, csp. 77 μm; W. ssp. 36 μm, csp. 80 μm; I. 10 μm; T. 25 μm.

Distribution: *Jabiluka Bb. 6.iv.78, Leichhardt Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*; Croasdale & Scott 1976); Indonesia.

X. multicorne Borge series
Plate 24:1–11

A series of intergrading forms was observed beginning with large (form 1) plants (Plate 24:1) that usually have 16 spines (sometimes 14 or 15) per semicell and sinuses that are V-shaped or short Y-shaped. They are identical to plants described as *X. octonarium* Nordstedt by Scott & Prescott (1958*a*, p. 56, fig. 10:6) and *X. octonarium* morpha by Croasdale & Scott (1976, p. 539, plate 11:1). The original *X. octonarium* (Nordstedt 1888, p. 42, plate 4:22) is very much larger and has relatively shorter spines.

Form 1 intergrades with a smaller form (form 2) which has 14–16 spines per semicell (Plate 24:2–4). The 14-spined semicell is the most common and, in face view, has 4 spines on the left hand side but only 3 on the right hand side of the semicell. On the back face of the semicell this situation is reversed. The spine arrangement on the other semicell is a mirror image of this. This 'symmetrical asymmetry' appears to be common in some *Xanthidium* species (Scott & Prescott 1958*a*, fig. 10:5; 1961, plate 41:1,3). The plants agree with previous descriptions of *X. multicorne* (Borge 1896, p. 17, plate 2:25; Croasdale & Scott 1976, p. 538, plate 11:5) except that the apical spines do not usually curve down the face of the semicell. Both forms should be compared with the very similar Sumatran *X. perissacanthum* Scott & Prescott (1961, p. 83, plate 41:1,2) which is slightly thinner and less rounded in end view. The Sumatran plants have 14 (sometimes 12) spines per semicell and also show a 3–4 'symmetrical asymmetry'.

Large (form 1) cells:

Cell L. ssp. 80 μm, csp. 107–113 μm; W. ssp. 56 μm, csp. 97–103 μm; I. 21 μm; T. 40 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Mine Valley Bb. 10.iv.78.*

Smaller (form 2) cells:

Cell L. ssp. 61–63 μm, csp. 75–77 μm; W. ssp. 43–45 μm, csp. 73–78 μm; I. 15–17 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Croasdale & Scott 1976), Qld (Borge 1896; Bailey 1898).

Form 3 (Plate 24:5–7) has 6 pairs of spines per semicell, the apical ones curving downwards. The sinus is usually open within. Except for its larger size, it is identical to *X. multicorne* forma 1 described by Croasdale & Scott (1976, p. 539, plate 11:6). Rarely, cells with slightly curving apical spines, as in the second form, are observed.

Cell L. ssp. 62–64 μm, csp. 67–84 μm; W. ssp. 42–45 μm, csp. 75–78 μm; I. 15–17 μm; T. 34 μm.

Distribution: *Leichhardt Bb. 6.iv.78*; N.T. (Croasdale & Scott 1976).

In the remaining forms (Plate 24:8–11) each semicell has 4–6 (rarely 7) pairs of spines that are perpendicular to the cell surface or are curved away from the sinus. The smaller the number of spines the more curved they are. Some cells exhibit a 3–2 'symmetrical asymmetry' in spine arrangement. The cells form a series of intergrading forms starting from one with 7 pairs of spines per semicell to one with 4 pairs of 'drooping' spines (Plate 24:11).

'Droopy cell' L. ssp. 62 μm, csp. 94 μm; W. ssp. 44 μm, csp. 56–63 μm; I. 14 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Hidden Bb. 8.iv.78, Mine Valley Bb. 10.iv.78, Goanna Bb. 30.i.79.*

X. sexmamillatum West & West var. pulneyense Iyengar & Bai
Plate 24:15

The plant is practically identical to *X. sexmamillatum* var. *pulneyense* as described by Scott & Prescott (1961, plate 39:2) and, except for longer spines, it is identical to *X. bengalicum* Turner as described by the same authors (1958*a*, fig. 11:4). West & West (1907, p. 211), describing *X. sexmamillatum*, stated that the species comes near to *X. bengalicum* Turner (1892, plate 12:32), but is distinguished by its widely open sinus. Our plant is thus identified as *X. sexmamillatum* var. *pulneyense* because it has a relatively open sinus.

Cell L. ssp. 52 μm, csp. 99–107 μm; W. ssp. 44–46 μm, csp. 104–113 μm; I. 15 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Scott & Prescott 1958*a*); Indonesia, South India.

X. subtrilobum West & West
Plate 24:18,19

West & West (1897, p. 88, plate 368:14); Scott & Prescott (1961, p. 84, plate 39:1).

Our plants differ from the typical in the much less elevated polar lobe and in the presence of crenulation, as in the closely related *X. trilobum* Nordstedt (1870, p. 230, plate 3:35), at the lower lateral angles. One semicell had two spines on the lateral angle instead of the usual one.

Cell L. ssp 45–48 μm, csp. 63–66 μm; W. ssp. 42–49 μm, csp. 60–68 μm; I. 13–14 μm.

Distribution: *Hidden Bb. 8.iv.78, Goanna Bb. 30.i.79*; Indonesia, Africa.

***X. subtrilobum* var. *inornatum* Skuja**
Plate 24:20

Skuja (1949, p. 151, plate 33:14); Scott & Prescott (1961, plate 38:4,5); Croasdale & Scott (1976, plate 11:2).

Our plant is slightly smaller.

Cell L. ssp. 42 μm, csp 60 μm; W. ssp. 40 μm, csp. 57 μm; I. 13 μm.

Distribution: *Hidden Bb. 8.iv.78*; N.T. (Croasdale & Scott 1976); Borneo, Burma.

***X. superbum* Elfving**
Plate 23:1,2

Elfving (1881, p. 10, plate 1:6).

In the original description there are 6 (rarely 5) pairs of spines on each side of the semicell and 4–5 pairs of apical verrucae. Our cells have 5 (rarely 6) pairs of spines on each side of the semicell and 2 pairs of apical verrucae. They are identical to plants described by Borge (1896, plate 2:26), Behre (1956, plate 5:8) and Scott & Prescott (1958*a*, fig. 10:5).

Cell L. ssp. 88 μm, csp. 113 μm; W. ssp. 55 μm, csp. 75 μm; I. 20 μm; T. 45 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Jabiluka Bb. 6.iv.78*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1896; Bailey 1898); Sumatra, Phillipines, Finland.

***Xanthidium* sp. 1**
Plate 24:16,17

Cell L. ssp. 48 μm, csp. 73 μm; W. ssp. 45 μm, csp. 92–100 μm; I. 11 μm; T. 24 μm.

Distribution: *McMinns Lagoon 22.i.79, Ironstone Lagoon 22.i.79.*

***Xanthidium* sp. 2**
Plate 24:21

Cell L. ssp. 50 μm, csp. 75 μm; W. ssp. 42 μm, csp. 68–72 μm; I. 12 μm.

Distribution: *Goanna Bb. 30.i.79.*

Family GONATOZYGONACEAE

Genus *Gonatozygon* De Bary

***G. aculeatum* Hastings**
Plate 6:3,4

Scott & Prescott (1958*a*, p. 22, fig. 3:13; 1961, p. 8, plate 1:7).

Cell L. 186 μm; W. middle 12 μm; A. 14 μm; S. 2–6 μm.

Distribution: *Gulungul Bb. 1.vi.79*; N.T. (Scott & Prescott 1958*a*), Qld (Borge 1911); Indonesia, Japan, North America.

***G. brebissonii* de Bary**
Plate 6:6

West & West (1904, p. 31, plate 1:8–11).

Cells narrow, poles subcapitate; cell wall minutely granulate. The plant should be compared with *G. monotaenium* var. *gracile* fa. described below.

Cell L. 124 μm; W. 5 μm; A. 5 μm.

Distribution: *Coonjimba Bb. 13.v.78*; Indonesia, India, Europe, West Africa, USA.

***G. monotaenium* de Bary**
Plate 6:1

West & West (1904, p. 30, plate 1:1–7).

Cells cylindrical, apices slightly dilated, cell wall minutely and densely granulate.

Cell L. 173 μm; W. 12 μm; A. 13 μm.

Distribution: *Umbungbung Bb. 30.v.79*; Qld (Bailey 1895, 1913, *G. ralfsii*; McLeod 1975); SE Asia, New Zealand, Asia, Europe, USA, Brazil.

***G. monotaenium* forma**
Plate 6:2

A slender form.

Cell L. 180 μm; W. 6 μm; A. 7 μm.

Distribution: *Bowerbird Bb. 9.x.80*

***G. monotaenium* var. *gracile* Krieger forma**
Plate 6:5

The cell is much smaller than that described by Krieger (1932, p. 158, plate 3:6). Cell wall scrobiculate, apices truncate and broadened with thick walls.

Cell L. 90 μm; W. 4 μm; A. 6 μm.

Distribution: *Coonjimba Bb. 13.v.78*; Japan, Europe.

Family MESOTAENIACEAE

Genus *Cylindrocystis* (Meneghini) Ralfs

***C. brebissonii* Menegini var. *minor* West & West**
Plate 5:36

West & West (1904, p. 58, plate 4:23–32).

Cell L. 35 μm; W. 14 μm.

Distribution: *Bowerbird Bb. 9.x.80*; Korea, Britain, Poland, Austria.

Genus *Netrium* (Nägeli) Itzigsohn & Rothe

***N. digitus* (Ehrenberg) Itzigsohn & Rothe**
Plate 5:1,2

Slightly narrower than usual (West & West 1904, p. 64, plate 6:14–16). See also *N. digitus* var. *naegelii* (Brébisson) Krieger as described by Scott & Prescott (1958*a*, fig. 4:1). Cells not constricted, elliptic-oblong, walls smooth. Chloroplasts axile with about 6 longitudinal plates, deeply notched at the free margins.

Cell L. 108–161 μm; W. 32–39 μm; A. 16 μm.

Distribution: *Backflow Bb. 11.iv.78*; N.T. (Scott & Prescott 1958*a*), Qld (McLeod 1975), N.S.W.

(Skinner 1976); Asia, North and South America, Europe, Malaysia, New Zealand.

***N. digitus* var. *lamellosum* (Brébisson) Grönblad**
Plate 6:7

Krieger (1937, p. 219, plate 7:6).

The constriction in the median portion of our plant is barely perceptible.

Cell L. 266 μm; W. 50 μm.

Distribution: *Bowerbird Bb. 9.x.80*; Qld (Krieger 1937), N.S.W. (Krieger 1937); New Zealand, SE Asia, China, Europe, USA, Brazil.

***Netrium* sp.**
Plate 6:8

Cells large, margins parallel, becoming suddenly conical near each extremity, apices rounded. The plant resembles a large, drawn-out *N. digitus*.

Cell L. 530–615 μm; W. 56–61 μm.

Distribution: *Goanna Bb. 12.iii.80.*

Genus *Spirotaenium* (Brébisson) Ralfs

***Sp. condensata* Brébisson**
Plate 5:34

West & West (1904, p. 38, plate 2:7–10).

Cells cylindrical with rounded poles; chloroplast broad, parietal and closely spiralled.

Cell L. 97 μm; W. 11 μm.

Distribution: *Goanna Bb. 12.iii.80*; Indonesia, New Zealand, Japan, Europe, North and South America, South Africa.

Family ZYGNEMATACEAE

Genus *Mougeotia* Agardh 1824/*Debarya* (Wittrock) Transeau

Unattached filaments of cylindrical cells. Chloroplast usually a broad axial plate, sometimes 2 plates connected by a bridge, pyrenoids in an axial row or scattered. Reproductive stages are essential in the separation of these two genera and in the identification of species. In *Debarya* the conjugating cells become filled with pectic substances whereas in *Mougeotia* they do not, the latter often contain granular residues instead.

***M. acadiana* Transeau forma**
Plate 4:9

Skuja (1949, p. 97, plate 21:1–4).

Zygospore brown, with a furrow in the middle and a circular flange at each end.

Cell L. 265–305 μm; W. 23–30 μm.

Distribution: *Nankeen Bb. 13.iii.79*; Asia.

***M. poinciana* Transeau**
Plate 4:10

Grönblad (1945, p. 43, fig. 356,357).

Cell L. 170–200 μm; W. 15–17 μm. Zygo. D. 42 μm.

Distribution: *Coonjimba Bb. 13.v.78*; South America.

***Mougeotia/Debarya* sp. 1**
Plate 4:12

An unusual species with chloroplasts in two axial bands connected by a bridge. Each chloroplast band usually has a single twist in it.

Cell L. 247–270 μm; W. 45–58 μm.

Distribution: *Mudginberri Bb. 23.viii.79.*

***Mougeotia/Debarya* sp. 2**
Plate 4:11

Cells in the process of conjugation.

L. 40–70 μm; W. 2–4 μm.

Distribution: *Nankeen Bb. 13.iii.79.*

Genus *Spirogyra* Link

As species identification cannot be made without mature zygospores we have named only 2 species. Nevertheless, we have included illustrations of vegetative cells of a few presumed species (Plate 4:3,4,6) to indicate the variety in size and chloroplast characteristics.

***S. ellipsospora* Transeau**
Plate 4:1,2

Prescott (1962, p. 313, plate 72:12).

Filaments of stout cylindric cells with plane end walls; chloroplasts 5 bands. Conjugation by tubes from both gametangia. Zygospores ellipsoid or cylindric-ellipsoid, yellow-brown, smooth-walled.

Cell L. 180–305 μm; W. 110–120 μm. Zygo. L. 195–203 μm; W. 100–104 μm.

Distribution: *Jabiluka Bb. 4.vi.79*; North America.

***S. inflata* (Vaucher) Kützing**
Plate 4:5

Prescott (1962, p. 316).

Filaments slender, chloroplast solitary. Conjugation scalariform by tubes from both gametangia; fertile cells inflated, fusiform. Zygospore ellipsoid, smooth.

Cell L. 103– μm; W. 17–20 μm; Zygo, 26 × 50–56 μm.

Distribution: *Umbungbung Bb. 30.v.79*; Qld (Borge 1911); Japan, North America, Europe, Asia, Africa.

Genus *Zygnema* Agardh

***Z. pectinatum* (Vaucher) Agardh**
Plate 4:7,8

Prescott (1962, p. 325, plate 69:9,10).

Chloroplasts two axial, stellate masses, each containing a large central pyrenoid. Zygospore formed in the tube, globose; median spore wall brown and pitted.

Cell L. 42–50 μm; W. 25–33 μm. Zygo, 33–37 × 43–46 μm.

Distribution: *Umbungbung Bb. 30.v.79*; Qld (Möbius 1892; Bailey 1893), N.S.W. (Playfair 1915*b*); Japan, North and South America, British Isles, Europe, Asia, New Zealand, Africa.

Division CHLOROMONADOPHYTA

Family CHLOROMONADACEAE

Genus *Gonyostomum* Diesing

***G. latum* Iwanoff**
Plate 43:31

Huber-Pestalozzi (1968, p. 91, figs 70b & 71d).

Vacuolaria depressa Lauterborn and *G. depressum* (Lauterborn) Lemmermann are synonymous. Plants were concentrated in a narrow band about ½ m below the surface of Leichhardt Billabong (Kessell & Tyler 1982). Attempts to preserve the cells in various concentrations of formalin, Lugol, and acetic acid were unsuccessful. Cells are slightly longer than wide.

Cell D. c. 35 μm; T. 10 μm.

Distribution: *Leichhardt Bb. July–August 1980*; USSR, Sweden, USA.

Genus *Merotrichia* Mereschkowsky

***M. bacillata* Mereschkowsky**
Plate 43:32

Huber-Pestalozzi (1968, p. 88, figs 66, 67 & 70c).

M. capitata Skuja is synonymous.

L. 40–50 μm; W. 188–25 μm.

Distribution: *Leichhardt Bb. July–August 1980*; USSR, Czechoslovakia, USA.

Division EUGLENOPHYTA
Order EUGLENALES

Family EUGLENACEAE

Genus *Euglena* Ehrenberg

***E. acus* Ehrenberg**
Plate 41:11

Prescott (1962, p. 390, plate 85:28).

Cell elongate spindle-shaped, produced posteriorly into a long, fine, tapering point. Paramylon bodies 2 to several long rods.

L. 155 μm; W. 10 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (McLeod 1975), N.S.W. (Playfair 1915*a*, 1921); Africa, Asia, Britain, Europe, Japan, North America, New Zealand.

***E. oxyuris* Schmarda**
Plate 41:12

Prescott (1962, p. 393).

Cell elongate-cylindric and twisted, tapering abruptly posteriorly to form a short tail-piece. Periplast longitudinally striated. Paramylon grains 2 large, flattened rings.

L. 395 μm; W. 52 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; N.T. (Scott & Prescott 1958*a*), Qld (McLeod 1975), N.S.W. (Playfair 1915*a*, 1921); Africa, Asia, Britain, Europe, Japan, North America.

***E. sanguinea* Ehrenberg**
Plate 41:9,10

Prescott (1962, p. 394, plate 86:1,2).

Cells ovoid-pyriform, tapering posteriorly to a short, blunt caudus; periplast with faint spiral striations; chloroplasts irregularly notched bands or short ribbons. The cell contents can be more easily observed if the cells are kept in the dark for a few days to reduce the amount of haemotochrome in them.

L. 55–91 μm; W. 29–43 μm.

Distribution: *Georgetown Bb. 8.viii.78 (red scum)*; Asia, Japan, Europe, North America.

***E. spirogyra* Ehrenberg**
Plate 41:8

Prescott (1962, p. 394, plate 86:15).

Periplast brownish, spirally striated with alternating rows of large and small granules. Paramylon bodies 2 flattened rings.

L. 110 μm; W. 22 μm.

Distribution: *Mine Valley Bb. 26.viii.78*; Qld (McLeod 1975), N.S.W. (Playfair 1921); cosmopolitan.

***Euglena* sp.**
Plate 42:28–30

Small cells.

L. 23–33 μm; W. 10–11 μm.

Distribution: *Georgetown Bb. 28.viii.78 (red scum; probably not contributing to the colour of the scum).*

Genus *Lepocinclis* Perty

***L. fusiformis* (Carter) Lemmermann**
Plate 42:1

Prescott (1962, p. 406, plate 89:1–4).

Cells ovoid, with a short caudus. Paramylon bodies 2 to several circular plates or rings.

L. 32 μm; W. 21 μm.

Distribution: *Flying Fox Bb. 2.vi.79*; Qld (McLeod 1975), N.S.W. (Playfair 1921); New Zealand, Europe, USSR, South Africa, Egypt, India, Venezuela, USA.

L. *ovata* (Playfair) Conrad var. *deflandriana* Conrad
Plate 42:6

Our plant is most closely identifiable with the description by Huber-Pestalozzi (1955, p. 155, plate 31:166B).

L. 31 μm; W. 14 μm.

Distribution: *Winmurra Bb. 31.v.79.*

L. *ovum* (Ehrenberg) Lemmermann
Plate 42:2

Prescott (1962, p. 407, plate 89:5,6).

Cells broadly ovate, rounded anteriorly and posteriorly, caudus short and blunt; periplast spirally striated left to right.

L. 34 μm; W. 26 μm.

Distribution: *Coonjimba Bb. 30.vii.80*; Qld (McLeod 1975), N.S.W. (Playfair 1921); New Zealand, Europe, USA, Africa.

L. *ovum* (Ehrenberg) Lemmermann var. *australis* Playfair
Plate 42:3,4

Playfair (1921, p. 126, fig. 3:b,c).

Cells oblong, rounded on all sides with a long, blunt-ended, rod-like caudus; periplast striated left to right; paramylon in the form of a single elongated doughnut situated circumferentially around the cell.

L. 24 μm; W. 20 μm; caudus 10 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (McLeod 1975), N.S.W. (Playfair 1921).

L. *salina* Fritsch
Plate 42:5

Huber-Pestalozzi (1955, p. 157, plate 32:173).

Periplast rigid and spirally striated. Paramylon bodies in the form of granules or discs.

L. 34–38 μm; W. 27–29 μm.

Distribution: *Coonjimba Bb. 30.vii.8*; Australia (Huber-Pestalozzi 1955); Indonesia, Europe, Africa.

Genus *Phacus* Dujardin

P. *curvicauda* Swirenko
Plate 41:13

Scott & Prescott (1958*a*, P. 72, fig. 26:17); Prescott (1962, p. 399, plate 87–14, plate 88:21).

Both striated and smooth forms were observed.

L. 35–44 μm; W. 29–31 μm.

Distribution: *Jabiluka Bb. 6.4.78, Leichhardt Bb. 8.7.78*; N.T. (Scott & Prescott 1958*a*); Africa, Asia, Europe, Japan, North America.

P. *curvicauda* forma
Plate 41:14,15

A form with a notch on each side, about a third down the cell.

L. 40–46 μm; W. 32–34 μm.

Distribution: *Coonjimba Bb. 13.v.78, Goanna Bb. 30.i.79, Bowerbird Bb. 9.x.80.*

P. *helikoides* Pochmann
Plate 41:19

Prescott (1962, p. 400, plate 87:9).

Cell elongate fusiform-pyriform, twisted throughout its entire length; periplast longitudinally and spirally striated.

L. 85 μm; W. 42 μm.

Distribution: *Leichhardt Bb. 8.7.78*; Qld (McLeod 1975); Asia, Europe, Japan, Java, North and South America, USSR.

P. *longicauda* Dujardin
Plate 41:20

Huber-Pestalozzi (1955, p. 220, plate 49:299), Prescott (1962, p. 400, plate 87:1).

Plants on the narrow side.

L. 115 μm; W. 39 μm. Caudus 60 μm.

Distribution: *Coonjimba Bb. 30.ix.80.* Qld (McLeod 1975), N.S.W. (Playfair 1915*a*, 1921; May 1972); probably cosmopolitan.

P. *suecicus* Lemmermann
Plate 42:7

Prescott (1962, p. 403, plate 88:1,2).

Cells broadly ellipsoid or ovate, but not quite symmetrical; periplast longitudinally striated with rows of sharp granules.

L. 30 μm; W. 20 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (McLeod 1975); Asia, Africa, North America, New Zealand.

***Phacus* sp. 1**
Plate 41:17,18

Plants characterised by a row of granules just within the outer boundary and a few short rows radiating from the apex. This is particularly evident in empty periplasts. Caudus up to half the length of the body.

L. 132–136 μm; W. 52–56 μm. Caudus 22–45 μm.

Distribution: *Coonjimba Bb. 13.v.78, 30.ix.80; Ja Ja Bb. 29.viii.78.*

***Phacus* sp. 2**
Plate 41:16

Cells ovoid, extended posteriorly into a long caudus. Two large paramylon bodies per cell.

L. 102–122 μm; W. 36–39 μm. Caudus 40–48 μm.

Distribution: *Gulungul Bb. 7.vii.78, Leichhardt Bb. 2.x.80.*

Genus *Strombomonas* Deflandre

Strombomonas differs from *Trachelomonas* mainly in that it has an envelope which tapers gradually to the apical pore, with no sharply defined neck or collar; mature envelope usually remains colourless, non-brittle and without ornamentation, though deposition of brown particles of manganese peroxide may occur. As described at present, many species of *Trachelomonas* have no necks or collars to their envelopes, and it remains to be seen whether the separation of the two genera is justified. (Leedale 1967.)

***S. fluviatilis* (Lemmermann) Deflandre var. *rugosa* Prescott fa. *major* Yacubson**
Plate 41:22–24

Yacubson (1980, p. 310, plate 15:179).

L. 75–91 μm; W. 30–32 μm. Caudus 20–35 μm.

Distribution: *Coonjimba Bb. 30.ix.80*; Venezuela.

***Strombomonas* sp. 1**
Plate 41:21

Similar to the above taxon, but has a more diamond-shaped lorica and a line across the base of the neck.

L. 73–76 μm; W. 30–33 μm. Caudus 23–25 μm.

Distribution: *Coonjimba Bb. 30.ix.80.*

***Strombomonas* sp. 2**
Plate 42:8

Lorica straw-coloured, obovate, narrowed posteriorly into a caudus; neck short with a slightly flared aperture.

L. 37–53 μm; W. 22–27 μm. Caudus 7–15 μm.

Distribution: *Mine Valley Bb. 26.viii.78, Coonjimba Bb. 30.ix.80.*

***Strombomonas* sp. 3**
Plate 42:9

Lorica with a groove around the middle.

L. 38–42 μm; W. max. 21–23 μm. Caudus 13–15 μm.

Distribution: *Coonjimba Bb. 30.ix.80.*

***Strombomonas* sp. 4**
Plate 42:10

Plant green, with discoid chloroplasts, a red eye-spot and a single flagellum. Lorica transparent to pale coloured with several encircling grooves giving it a concertina appearance; neck arising from a shallow depression.

L. 50–58 μm; W. 25 μm.

Distribution: *Mine Valley Bb. 26.viii.78, Coonjimba Bb. 30.ix.80.*

Genus *Trachelomonas* Ehrenberg

***T. armata* (Ehrenberg) Stein var. *steinii* Lemmermann emend. Deflandre**
Plate 42:16

Our plant resembles a figure by Bourrelly (1961, plate 7:2; Fritsch Coll. D2.11). However, it is quite different from Prescott's (1962, plate 83:26) figure of this variety and is closely identifiable with Prescott's (1962, plate 83:27) figure of *T. armata* var. *longispina* (Playfair) Deflandre.

L. ssp. 45 μm, csp. 56 μm; W. 35 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (McLeod 1975), N.S.W. (Playfair 1915*a*); Asia, Europe, North America.

***T. clavata* Playfair var. *subarmata* Playfair**
Plate 42:21

Playfair (1921, p. 131, plate 6:27).

Our plants agree with those described by Playfair (loc. cit.). In this form, the surface of the lorica is reticulate. A form which has a scrobiculate lorica has also been described (Playfair 1915*a*, p. 18, plate 2:16).

L. 57 μm; W. 23 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (McLeod 1975), N.S.W. (Playfair 1915*a*, 1921).

***T. granulosa* Playfair**
Plate 42:20

Playfair (1915*a*, p. 18, plate 2:18).

Lorica finely granulate.

L. 24 μm; W. 21 μm.

Distribution: *Island Bb. 7.vii.78*; N.S.W. (Playfair 1915*a*).

***T. hispida* (Perty) Stein**
Plate 42:19

Playfair (1915*a*, p. 20, plate 3:8); Prescott (1962, p. 414, plate 83:35).

Our plant is larger than those previously described.

L. 37 μm: W. 24 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (Schmidle 1896; McLeod 1975), N.S.W. (Playfair 1915*a*, 1921); Asia, Britain, Europe, North America.

***T. lismorensis* Playfair**
Plate 42:17,18

Our plant is intermediate between the type and the variety *biseriata* as described by Playfair (1915*a*, p. 26–27, fig. 5,7). The differences probably represent variation in a single species.

L. ssp. 13 μm, csp. 16 μm; W. ssp. 16.5 μm, csp. 25 μm.

Distribution: *Flying Fox Bb. 2.vi.79*; N.S.W. (Playfair 1915), Qld (McLeod 1975).

***T. oblonga* Lemmermann var. *australica* Playfair**
Plate 42:12–14

Playfair (1915*a*, p. 12, plate 1:17–21).

A broad ring-shaped neck is characteristic of this variety. The lorica is smooth and reddish brown. Large size range.

L. 16–27 μm; W. 15–27 μm.

Distribution: *Island Bb. 7.vii.78, Georgetown Bb. 13.v.78, 7.vii.78*; N.S.W. (Playfair 1915*a*).

***T. playfairii* Deflandre**
Plate 42:11

Prescott (1962, p. 416, plate 85:8,9).

Lorica oval, rounded at both ends; wall smooth, almost colourless or light yellow; collar long, deflected to one side.

L. with collar 31 μm; W. 20 μm.

Distribution: *Mine Valley Bb. 26.8.78*; Qld (McLeod 1975); Europe, North America.

***T. splendida* Playfair forma**
Plate 42:15

A form similar to a plant described by Playfair (1921, p. 132, plate 7:1).

L. 48 μm; W. 17 μm.

Distribution: *Gulungul Bb. 7.vii.78.*

***T. superba* Swirenko emend. Deflandre**
Plate 42:23

Huber-Pestalozzi (1955, p. 306, plate 66:569).

Lorica globo-ovate, with spines evenly distributed on the surface.

L. ssp. 42 μm, csp. 48 μm; W. ssp. 32 μm, csp. 39 μm.

Distribution: *Coonjimba Bb. 13.v.78*; Indonesia, Burma, Europe, USA, Venezuela.

***Trachelomonas* sp. 1**
Plate 42:24

Lorica oval, with several large spines grouped round the anterior end; a ring of large spines ⅔ down the cell and 4 large spines on the posterior end; varying numbers of small spines scattered over the surface. We have been unable to identify this plant with any previously described species or variety. It probably belongs to the *T. armata* group.

L. ssp. 45–48 μm, csp. 70–71 μm; W. ssp. 31 μm, csp. 63–65 μm.

Distribution: *Coonjimba Bb. 13.v.78, Ja Ja Bb. 4.vi.79.*

***Trachelomonas* sp. 2**
Plate 42:22

Lorica reddish-brown with a ring of spines around the aperture and a few spines scattered round the neck; surface of lorica granulate, caudus has a blunt end.

L. 64–65 μm; W. 16–17 μm.

Distribution: *Flying Fox Bb. 2.vi.79, Coonjimba Bb. 30.ix.80.*

Division CHRYSOPHYTA
Class CHRYSOPHYCEAE
Order CHROMULINALES

Family CHRYSOCOCCACEAE

Genus *Chrysococcus* Klebs

***C. radians* Conrad**
Plate 43:28,29

Huber-Pestalozzi (1941, p. 66, plate 12:79).

Small cells with a globose, colourless lorica and a collar round the apical pore. Lorica adorned with up to 8 spines. Each cell has two golden-brown chloroplasts.

Cell D. 6–7 μm; sp. 2–6 μm.

Distribution: *Leichhardt Bb. 18.xii.78*; Europe.

Order OCHROMONADALES

Family DINOBRYACEAE

Genus *Dinobryon* Ehrenberg

***D. bavaricum* Imhof**
Plate 43:27

Lateral margins of lorica wavy, length of posterior part shorter than usual. Our plant agrees with figures by Ahlstrom (1939, plate 3:2,12; Fritsch Coll. D1.27).

L. 33–37 μm; W. 8–9 μm.

Distribution: *Coonjimba Bb. 30.ix.80*; northern temperate to cold zone.

***D. divergens* Imhof var. *schauinslandii* (Lemmermann) Brunn**
Plate 43:26

Huber-Pestalozzi (1941, p. 229, plate 67:304).

The margins of the lorica are more undulate than in the type.

L. 46–49 μm; W. 8–10 μm.

Distribution: *Goanna Bb. 12.iii.80;* Europe.

***D. sertularia* Ehrenberg**
Plate 43:24,25

Huber-Pestalozzi (1941, p. 222, plate 59:290); Prescott (1962, p. 378, plate 98:10).

Colonies slightly diverging. Lorica fusiform-campanulate; posterior blunt-pointed, occasionally swollen on one side; lateral margins smooth, convex, narrowed above the midregion and then slightly flaring to a wide mouth. Statocysts (Plate 43:24) globose, with a short collar, usually with opening facing downwards; young statocysts have mucilage(?) plug.

L. 30–36 μm; W. 8–9 μm. Statocyst D. 13–14 μm.

Distribution: *Backflow Bb. 11.iv.78, Buffalo Bb. 11.vii.78, 29.xii.78, Georgetown Bb. 31.xii.78, near Kulukuluku Bb. 4.vii.80;* Qld (McLeod 1975), N.S.W. (Playfair 1912, 1915*b*, 1921; Thomasson 1973), Vic. (Viyakornvilas 1974); New Zealand, Europe, North America.

Distribution (statocyst): *Near Kulukuluku Bb. 4.vii.80.*

Family SYNURACEAE

Genus *Mallomonas* Perty

***M. splendens* (G.S. West) Playfair**
Plate 43:22, Plate 45:7

West (1909*a*, p. 74, plate 6:4–8, *Lagerheimia splendens*); Playfair (1921, p. 108, plate 2:3).

Both the anterior and the posterior ends have 4 setae.

Cell L. 48 μm; W. 13 μm.

Distribution: *Backflow Bb. 11.iv.78, Georgetown Bb. 13.v.78*; Vic. (West 1909*a*; Viyakornvilas 1974), N.S.W. (Playfair 1912, 1921; Thomasson 1973).

Genus *Synura* Ehrenberg

A free-swimming globose colony (Plate 43:23) of pyriform to elongate cells radiating from a common centre, with the broader end directed outward; cell membrane furnished with scales; chromatophores 2 lateral plates; flagella 2, of equal length but dissimilar structure. The majority of *Synura* species can only be identified by observing the morphology of the scales under the electron microscope. The plants can be satisfactorily preserved in Lugol, but not so well in formalin.

***S. echinulata* Korsikov**
Plate 45:6

Huber-Pestalozzi (1941, p. 140, fig. 196); Kristiansen (1975, p. 2710, fig. 1).

Cell L. 17 μm; W. 12 μm.

Distribution: *Kulukuluku Bb. 8.x.80*; USSR, Denmark.

***S. petersenii* Korsikov**
Plate 45:3–5

Huber-Pestalozzi (1941, p. 142, fig. 198); Kristiansen (1975, p. 2710, fig. 1).

According to Kristiansen (loc. cit.) this is the most variable of the *Synura* species. Its scales differ in size, shape, spine length and in complexity of the ornamentation. The cells also vary from pyriform to club-shaped.

Cell L. 75 μm; W. 10 μm.

Distribution: *Kulukuluku Bb. 8.x.80*; USSR, Denmark, France.

Division XANTHOPHYTA
Class XANTHOPHYCEAE
Order MISCHOCOCCALES

Family SCIADACEAE

Genus *Centritractus* Lemmermann

***C. belanophorus* Lemmermann**
Plate 43:16–18

Three plants were observed. The largest is identifiable with *C. belanophorus* as described by Prescott (1962, p. 361, plate 95:37,38) and Scott & Prescott (1958*a*, p. 73, fig. 26:5). The plant with the shortest body agrees with Scott & Prescott's (1958*a*, p. 73, fig. 26:6) description of *C. dubious* Printz. The third plant is intermediate in body length. If one uses the key by Huber-Pestalozzi (1941, p. 323) the plants could also be identified as *C. africanus* Fritsch & Rich. However, a similar range of plants was described by Skuja (1949, p. 174, plate 36:6–9) as *belanophorus*.

L. ssp. 30–65 μm, csp. 87–220 μm; W. 6.5–9 μm.

Distribution: *Gulungul Bb. 7.vii.78, Mine Valley Bb. 26.viii.78*; N.T. (Scott & Prescott 1958*a*); Burma, Europe, USA.

Genus *Ophiocytium* Nägeli

***O. capitatum* Wolle**
Plate 43:19–21

We could identify our plants as *O. capitatum*, *O. capitatum* var. *longispinum* (Möbius) Lemmermann or *O. cochleare* (Eichwald) Braun var. *bicuspidatum* Borge. There is considerable confusion concerning these taxa (and *O. bicuspidatum* (Borge) Lemmermann) (see Fritsch Coll. D1.6) and our plants could be growth forms of a single species.

Cell W. 5–7 μm. S. L. 7–21 μm.

Distribution: *Coonjimba Bb. 13.v.78, Flying Fox Bb. 2.vi.79, near Kulukuluku Bb. 4.vii.80*; Qld (Bailey 1913; McLeod 1975); Europe, North America.

Division DINOPHYTA
Class DINOPHYCEAE
Order PERIDINIALES

Family GLENODINIACEAE

Genus *Glenodinium* (Ehrenberg) Stein

***G. pulvisculus* (Ehrenberg) Stein**
Plate 40:34,35

Prescott (1962, p. 430, plate 90:17,18).

Cells globose with a very thin theca in which there are faintly marked-out plates.

L. 31 μm; W. 30 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (McLeod 1975); North America, New Zealand, Europe.

Family GLENODINIOPSIDACEAE

Genus *Sphaerodinium* Woloszynska

S. *cinctum* Woloszynska var. *limneticum* (Woloszynska) Huber-Pestalozzi
Plate 40:30–33

Huber-Pestalozzi (1968, p. 161, plate 24:146).

Plates smooth.

Cell D. 41 μm.

Distribution: *Coonjimba Bb. 13.v.78*; Poland.

Family PERIDINIACEAE

Genus *Peridinium* Ehrenberg

***P. aciculiferum* (Lemmermann) Lindemann forma**
Plate 40:12–14

Our plants have prominent sculpturing on the plates and are larger than the typical as described by Huber-Pestalozzi (1968, p. 214, plate 41:210).

L. ssp. 55–60 μm, csp. 62–66 μm; W. 53–56 μm.

Distribution: *Flying Fox Bb. 2.vi.79.*

***P. gatunense* Nygaard**
Plate 40:17–21

Prescott (1962, p. 433, plate 90:25,26); Huber-Pestalozzi (1968, p. 202, plate 35:188).

Plates coarsely reticulate.

L. 63–68 μm; W. 70–78 μm.

Distribution: *Coonjimba Bb. 13.v.78*; Europe, Africa, USA, Panama.

***P. gatunense* var. *zonatum* (Playfair) Lefevre**
Plate 40:7–10

Thomasson (1973, p. 386, plate 32:1,2); Playfair (1912, p. 543, plate 55:10–12, *P. tabulatum* Ehrenberg var. *zonatum*; 1919, p. 815, plate 43:3a–d, *P. zonatum*).

The most interesting feature is the ridging on the antapicals, which is radial in contrast to the horizontal ones on the other plates.

L. 48–55 μm; W. 51–61 μm.

Distribution: *Noarlanga Bb. 30.v.79*; N.S.W. (Playfair 1912, 1919; Thomasson 1973); Europe.

***P. gutwinskii* Woloszynska**
Plate 40:1–6, Plate 45:2

Woloszynska (1913, 1930, see Fritsch Coll. D2.25); Huber-Pestalozzi (1968, p. 212, plate 41:208).

Plates coarsely reticulate.

L. 60–65 μm; W. 54–61 μm.

Distribution: *Ja Ja Bb. 18.vii.78*; Indonesia.

***P. inconspicuum* Lemmermann**
Plate 40:24,25

The plant is most closely identified with descriptions by Huber-Pestalozzi (1968, p. 223, plate 45:223). However, further observations are required to confirm this as it may belong to one of the numerous varieties of *P. inconspicuum* Lemmermann described by Huber-Pestalozzi (1950, p. 223, plates 45 and 46).

L. ssp. 30 μm; W. 30 μm.

Distribution: *Hidden Bb. 8.iv.78; Leichhardt Bb. 6.iv.78, 8.vii.78*; N.S.W. (Playfair 1919), Qld (McLeod 1975).

***P. intermedium* Playfair var. *conicum* Playfair**
Plate 40:26,27

The plant agrees with the original description by Playfair (1919, p. 809, text fig. 16f). It should also be compared with forms of *P. inconspicuum* Lemmermann as described by Huber-Pestalozzi (1950, p. 223, plates 45 and 46).

L. ssp. 30 μm; W. 30 μm.

Distribution: *Hidden Bb. 8.iv.78 Leichhardt Bb. 6.iv.78, 8.vii.78*; N.S.W. (Playfair 1919), Qld (McLeod 1975).

***P. palustre* (Lindemann) Lefevre var. *raciborskii* (Woloszynska) Lefevre**
Plate 40:22,23

Huber-Pestalozzi (1968, p. 204, plate 36:195).

Plants slightly compressed in side view; hypotheca produced into two short, blunt conical processes. Odd cells may have bands on some of the hypotheca plates.

L. 80–91 μm; W. 77–85 μm.

Distribution: *Jabiluka Bb. 6.iv.78, 13.iii.79; Leichhardt Bb. 6.iv.78*; Indonesia, Madagascar.

***P. umbonatum* Stein var. *inaequale* (Lemmermann) Lefevre**
Plate 40:28,29

The plant comes closest to the description by Huber-Pestalozzi (1968, p. 221, plate 44:219).

L. 24 μm; W. 21 μm.

Distribution: *Bowerbird Bb. 9.x.80.*

***P. volzii* Lemmermann fa. *vancouverense* (Wailes) Lefevre**
Plate 40:11

Thomasson (1973, p. 386, plate 32:3,4); Playfair (1912, p. 542, plate 55:5–9, *P. tabulatum* var. *westii* Lemmermann fa. *australis*; 1919, p. 814, plate 41:4a–c, plate 42:8a–d, *P. australe*).

There is some doubt as to the taxonomic position of this plant (Thomasson 1973, p. 386).

L. 45 μm; W. 46 μm.

Distribution: *Noarlanga Bb. 30.v.79*; Qld (Playfair 1919), N.S.W. (Playfair 1912, 1919; Thomasson 1973).

***Peridinium* sp. 1**
Plate 40:15,16

A large plant with three posterior horns.

L. 116–118 μm; W. 96–99 μm.

Distribution: *Leichhardt Bb. 6.iv.78, Jabiluka Bb. 6.iv.78.*

Division CYANOPHYTA[1]
Order CHROOCOCCALES

Family CHROOCOCCACEAE

Genus *Aphanocapsa* Nägeli

A. koordersi **Strom**
Plate 44:14

Desikachary (1959, p. 132, plate 23:1).

Colony globular; cells spherical, loosely arranged in groups of two or four.

Cell D. 2–3 µm.

Distribution: *Coonjimba Bb. 13.v.78*; India, Java.

Genus *Chroococcus* Nägeli

C. limneticus **Lemmermann**
Plate 43:5

Prescott (1962, p. 448, plate 100:4,5).

Cells dull to bright blue-green.

Cell D. 4–6 µm.

Distribution: *Kulukuluku Bb. 24.ii.81*; India, Europe, North America.

Genus *Coelosphaerium* Nägeli

C. pallidum **Lemmermann**
Plate 44:15

Prescott (1962, p. 471, plate 106:3).

Irregular to globose colony of ovate to spherical cells evenly and compactly arranged within the periphery of the colonial mucilage.

Cell L. 2–4 µm; W. 1.5–3 µm. Colony D. 20–30 µm.

Distribution: *Djalkmara Bb. 3.vi.79, Kulukuluku Bb. 8.x.80*; Europe, USA.

Genus *Glaucocystis* Itzigsohn emend. Geitler

This interesting plant consists of a eucaryotic unicellular alga harbouring endosymbiotic blue-green algae (cyanellae) (Hoek 1978). The taxonomic position of the eucaryotic host is uncertain and *Glaucocystis* is classified with the Chroococcaceae (Prescott 1962) or in a separate phylum, Glaucophyta (Lee 1980).

Glaucocystis **sp.**
Plate 43:15

Cells ovate, with thickenings of the cell wall at the poles; colonies of 4 cells still enclosed within the mother cell wall. Chromatophore-like bodies vermiform and blue-green.

Cell L. 23 µm; W. 12–13 µm. Colony L. 43 µm; W. 32 µm.

Distribution: *Annaburroo Bb. 7.x.80*

Genus *Merismopedia* Meyen

Merismopedia glauca **(Ehrenberg) Nägeli**
Plate 44:6

Desikachary (1959, p. 155, plate 29:5); Prescott (1962, p. 459, plate 101:2A4).

Cells (mostly 64, sometimes 128) regularly and closely arranged to form quadrangular colonies. Cells oval or spherical, pale blue-green, occasionally containing many large granules.

Cell L. c. 4 µm; W. c. 3 µm.

Distribution: *Backflow Bb. 11.iv.78*; Qld (Möbius 1892); North America, Burma, India, Ceylon.

Merismopedia **sp.**
Plate 43:10–12

Colony is a flat plate with the margins inrolled occasionally. Cells spherical and arranged in four groups of four, forming a square which is widely separated from other such groups in the colony. This unusual pattern of cell arrangement appears to be unique.

Cell D. 1.5–3 µm.

Distribution: *Coonjimba Bb. 13.v.78.*

Genus *Microcystis* Kützing

M. aeruginosa **Kützing emend. Elenkin**
Plate 44:3,4

Prescott (1962, p. 456, plate 102:1–4).

Irregularly lobed colony of numerous spherical cells crowded in a gelatinous matrix. Occur in bloom proportions during the Dry season.

Cell D. 4–5 µm.

Distribution: *Jabiluka Bb. 26.viii.78*; ubiquitous.

[1] In a preliminary investigation of the cyanobacteria of the Magela System, P. A. Broady (University of Melbourne) has listed a number of blue-green algae. The following genera not listed in this report were found by Broady in his study (nomenclature follows Bourrelly 1970, Les algues d'eau douce, Initiation àl la systematique, 3, Les algues bleues et rouges, Boubee et Cie, Paris):

Chroococcaceae: *Synechococcus*	Nostocaceae: *Nostoc*
Hyellaceae: *Pleurocapsa*	Oscillatoriaceae: *Lyngbya*
Clastidiaceae: *Chroococcidiopsis*	*Microcoleus*
Scytonemataceae: *Scytonema*	*Porphyrosiphon*
Tolypothrix	*Schizothrix*
Microchaetaceae: *Microchaete*	Stigonemataceae: *Stigonema.*
Rivulariaceae: *Calothrix*	

[ed.]

Order NOSTOCALES

Family NOSTOCACEAE

Genus *Anabaena* Bory

***A. catenula* (Kützing) Bornet & Flahault**
Plate 43:6, Plate 44:12

Geitler (1932, p. 894); Fukushima (1954).

Trichomes enclosed in a thin, mucilaginous sheath; cells ovate, heterocysts spherical, akinetes cylindrical.

Cell 6–8 μm by 7–10 μm. Heterocyst D. 8–10 μm. Akinete L. 30–52 μm; W. 10–12 μm. Sheath W. 23–27 μm.

Distribution: *Backflow Bb. 11.iv.78*; Japan, Europe, North America, Africa.

***A. flos-aquae* (Lyngbye) Brébisson**
Plate 44:1,2

Prescott (1962, p. 515, plate 116:7).

Trichomes flexuous and contorted, sometimes coiled in an irregular spiral fashion; either solitary or entangled in a twisted mass. Assume bloom proportions during the Dry season, often in association with *M. aeruginosa*.

Cell D. 4–6 μm. Akinete L. 21 μm.

Distribution: *Jabiluka Bb. 26.viii.78*; ubiquitous.

Family OSCILLATORIACEAE

Genus *Oscillatoria* Vaucher

***O. lemmermannii* Woloszynska**
Plate 44:16

Geitler (1932, p. 975, fig. 618i); Desikachary (1959, p.K237).

Our plants agree well with previous descriptions of the species (loc. cit.), but are longer. Trichome pale blue-green, single, straight, slightly bent, ends gradually tapering, curved; septa granulated.

Cell L. 7–12 μm; W. 2 μm.

Distribution: *Gulungul Bb. 1.vi.79*; Java, India.

***O. princeps* Vaucher**
Plate 44:9

Prescott (1962, p. 489, plate 110:1).

Trichomes large, very slightly and briefly tapered at the apex. Apical cell sometimes very slightly capitate.

Cell 30 μm by 3–4 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; Qld (Möbius 1894; McLeod 1975), N.S.W. (Playfair 1915*b*, 1921); middle and southern Europe, India, Ceylon, Indonesia, USA, Guadeloupe, Brazil.

***O. subbrevis* Schmidle fa. *major* G.S. West**
Plate 44:10

Desikachary (1959, p. 209).

Trichomes single, straight, not attenuated at the apices; cells not granulated at the cross walls; end cell rounded.

Cell L. 1–3 μm. Trichome W. 10–11 μm.

Distribution: *Puddle at OSS laboratories 5ii.79*; Africa, India.

***Oscillatoria* sp. 1**
Plate 44:7

Trichomes usually straight, slightly attenuated at the apices; cells have conspicuous gas vacuoles aggregated at the centre.

Cell L. 2–4 μm. Trichome W. 6–7 μm.

Distribution: *Gulungul Bb. 1.vi.79.*

***Oscillatoria* sp. 2**
Plate 44:8

Trichomes generally straight, end cell flatly rounded.

Cell 2–4 μm. Trichome W. 5–6 μm.

Distribution: *Gulungul Bb. 1.vi.79.*

***Oscillatoria* sp. 3**
Plate 44:11

End cell rounded.

Cell L. 3–4 μm. Trichome W. 10 μm.

Distribution: *Gulungul Bb. 1.vi.79.*

Genus *Spirulina* Turpin

***S. princeps* (West & West) G.S. West**
Plate 44:5

Prescott (1962, p. 515, plate 116:7); Scott & Prescott (1958*a*, fig. 23:14).

Helicoid trichome. Our plant is smaller than the typical.

Trichome D. 3 μm; spiral W. 8 μm; distance between spirals 8 μm.

Distribution: *Leichhardt Bb. 8.vii.78*; N.T. (Scott & Prescott 1958*a*), Qld (McLeod 1975); Africa, North America, Europe.

Family RIVULARIACEAE

Genus *Gloeotrichia* J.G. Agardh

***Gloeotrichia* sp.**
Plate 44:13

Colony soft, gelatinous and globose, with somewhat radiate filaments. Trichomes long and tapering from a basal heterocyst; cells barrel-shaped or sub-globose at the base of the trichome, becoming long and cylindrical distally; heterocysts globose or ovate.

Rivularia and *Gloetrichia* are separated on the characteristics of the akinete and its associated sheath, but neither akinetes nor sheaths were present in the several colonies observed. The vegetative characteristics of the cells observed do not resemble any known *Rivularia* species, but are closely identifiable with *Gloeotrichia natans* (Hedwig) Rabenhorst and *G. echinulata* (J.E. Smith) Richter (Prescott 1962, p. 557–559, plate 134:1,2,6,7). *G.*

natans has been recorded from Queensland (Bailey 1895, *Rivularia natans*; McLeod 1975).

Cell W. 5–8 μm. Heterocyst D. 6–9 μm.
Distribution: *Umbungbung Bb. 30.v.79.*

Order STIGONEMATALES

Family STIGONEMATACEAE

Genus *Hapalosiphon* Nägeli emend. Borzi

***Hapalosiphon* sp.**
Plate 43:13

Filaments single among other algae; sheath colourless; cells globose to quadrate, those in the side branches elongate. The plant should be compared to a form of *H. welwitschii* West & West (Desikachary 1959, p. 588, plate 130:4,5).

Cell D. 4–7 μm. Sheath W. c. 10 μm.

Distribution: *Backflow Bb. 11.iv.78.*

Division RHODOPHYTA

Order NEMALIONALES

Family BATRACHOSPERMACEAE

Genus *Batrachospermum* Roth

This is one of the most common of freshwater red algae (it may also be grey-green, bluish green, or olive to tawny in colour). The macroscopic thalli, highly branched and beaded, are encased in copious mucilage.

***B. moniliforme* Roth**
Plate 43:33,34

Prescott (1962, p. 568, plate 136:3).

Plant mass grey to violet-green, richly branched with well-developed whorls of branches; older portions of branches present a distinct beaded appearance macroscopically. Carpogonia developed in inner part of the branch whorls, terminal on short lateral branches in the axils, with a clavate trichogyne.

Distribution: *Magela crossing (drift) 5.ii.79.*

5

Discussion

The 1948 expedition to Arnhem Land took only 5 samples of freshwater algae and found 325 algal taxa (Scott & Prescott 1958*a*) in them. Croasdale & Scott (1976) reported an additional 124 taxa, of which 22 were new to science, from 16 localities. Among those on the turtle's back (Ström 1921) were 21 taxa not recorded in the above reports, making a total of 470 taxa from the localities then sampled.

We collected over 1200 samples during this study and 70 of these, from 35 locations, were intensively studied. From these samples we have recorded over 530 taxa, mostly desmids, of which 66 either are new to science or cannot be identified at present. Of the 470 taxa previously reported from northern Australia, 288 were not detected in this investigation, but about 360 taxa not previously recorded were encountered.

Such floristic richness, especially amongst the desmids, is commonplace in the tropics. Not surprisingly, the algal flora of the Alligator Rivers Region bears considerable resemblance to that of the tropics to the north, Indonesia, Malaysia, Thailand, New Guinea, Burma, Bengal and Sri Lanka, with the exception that the blue-green algae are poorly represented in our sample.

Most algae observed in this study have been identified to species level or better. A few have been allied uncertainly with described taxa and others, obviously new to science, await formal diagnosis and description. They are figured here, but not formally described.

Even a casual glance at the illustrations and their captions will reveal not only a multiplicity of morphological forms and the small differences which separate putative species, but also the obvious intergradation of a number of 'species'. These remarks apply particularly to the Desmidiaceae, which reach the peak of their diversity and endemism in the tropics, and for this reason the word taxon is preferred to the word species, with its inescapable genetic and reproductive connotations. A taxon is a morphological, taxonomic enclosure, something described in Latin by a taxonomist, satisfying the rules of International Botanical Nomenclature. It is any taxonomic category — order, family, genus, species, subspecies, forma — described by a taxonomist, whose own judgement ordains its rank. Unlike a species, it may or may not have genetic reality. It is particularly important to recognise this difference when dealing with algae in general, and desmids in particular, as in very few microalgae are the breeding habits known or the mechanisms of isolation perceived. Taxa in the algae are very much morphologically bounded. Desmid taxonomists, in particular, have traditionally adopted an uncompromisingly morphological approach to the description of 'species'. As long ago as 1894 de Wildeman lamented, 'Quand on considére le nombre de Desmidiés décrites dans ces dernières années, on est en droit de se demander si toutes les espèces crées méritent bien le titre d'espèce?'. On the lack of attempts, or the ability, to study populations, he said, 'Ils sont ainsi arrivés, me semble-t-il, à décrire non plus des espèces, mais des individus'. Scott & Prescott (1958*a*, p. 11) confessed that in their treatment of algae from Arnhem Land 'several of the species were found only as single specimens, even as single semicells'. We have been unable to avoid this malady completely.

It is entirely reasonable then that users of this flora should ponder the reality of some forms, sanctified in Latin as distinct taxa, such as are shown in Plate 15, Plate 26:16–22, and Plate 39:23–26 and 29–35. Plate 31 and the text discussion of the *Staurastrum saltans* var. *sumatranum* — var. *polycharax* series illustrate this point. The same problem attends the taxonomy of the diatoms, dinoflagellates, blue-green algae and probably other groups, with greater or lesser severity.

Whether or not minute morphological differences signify real genetic differences has scarcely been investigated, experimentally or philosophically. For the desmids the results are equivocal. On the one hand, morphological differences more than sufficient to justify description of a new species in classical terms are nullified by a remarkable plasticity of breeding behaviour (Ling & Tyler 1976) which almost flouts the accepted laws of karyology (Fig. 5). On the other hand, work in progress indicates the likelihood that small morphological differences may reflect major genetic discontinuities. That being so, we reach the unavoidable conclusion that we must persist with the burdensome practice of classical taxonomy. We have to accept that this remarkable spectrum of morphological diversity, with all its nuances of intergradation, may be matched by an even subtler genetic diversity, with all that that means for the life style, ecological requirements, and susceptibilities of the multiplicity of taxa inhabiting the billabongs of Magela Creek. It is a sobering realisation for the designers of monitoring programs that they must come to terms with this manifold diversity.

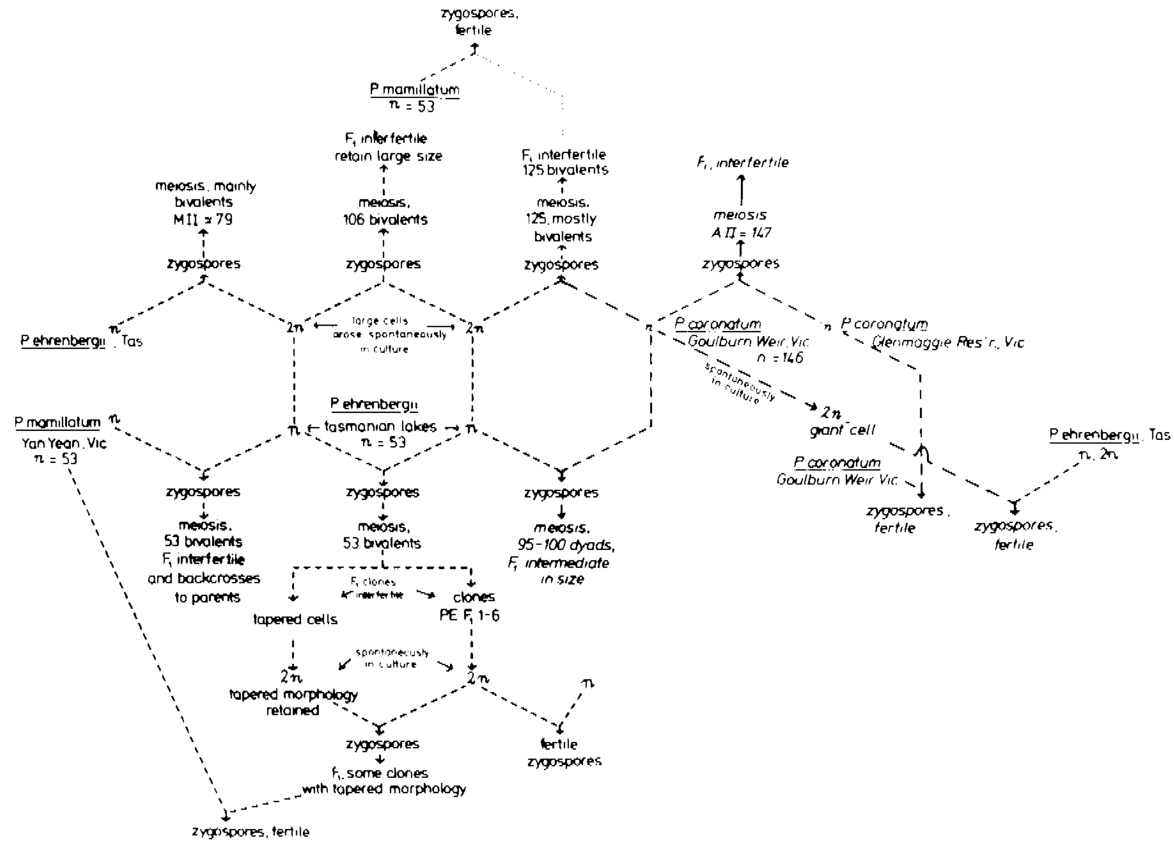


Figure 5. Compatibility, fertility and some chromosome details of the *Pleurotaenium mamillatum* complex of desmids. The figure demonstrates the complex and poorly understood relationship between karyology, compatibility and morphological taxonomy (modified from Ling & Tyler 1976, reproduced by courtesy of the British Phycological Society).

6

References

Ahlstrom, E.H. (1937). Studies on variability in the genus *Dinobryon* (Mastigophora). *Trans. Amer. Micro. Soc.* **56**, 139–159.

Bailey, F.M. (1893). Contributions to the Queensland Flora. Botany Bulletin 6, Queensland Department of Agriculture, Bulletin **20**.

Bailey, F.M. (1895). Contributions to the Queensland Flora. Botany Bulletin II, Queensland Department of Agriculture.

Bailey, F.M. (1898). Contributions to the Queensland Flora. Botany Bulletin 15, Queensland Department of Agriculture.

Bailey, F.M. (1913). Comprehensive catalogue of Queensland plants. Government Printer, Brisbane.

Behre, K. (1956) Die Süsswasseralgen der Wallacea Expedition. *Ach. Hydrobiol. Suppl.* **23(1)**, 1– 104.

Belcher, J. and Swale, E. (1976). A beginner's guide to the freshwater algae. HMSO, London.

Belcher, J. and Swale, E. (1979). An illustrated guide to river phytoplankton. HMSO, London.

Berg, A. (1953). Diatoms of the upper Finke River, Central Australia, collected by Dr. O.H. Selling. *Botaniska Notiser* **106**, 65–72.

Biswas, K. (1929). Papers on Malayan aquatic biology. XI. Freshwater algae. *Jour. Federat. Malay Stat. Mus.*, **14**.

Bold, H. & Wynne, M.J. (1978). Introduction to the algae. Prentice Hall Inc., N.J.

Borge, O. (1896). Australische Süsswasserchlorophyceen. *Bih. t. Kungl. Svenska Vet.-Akad. Handl.* **22(3)**, 1–32.

Borge, O. (1911). Algologische Notizen 6–7. 6. Süsswasseralgen aus Queensland. *Bot. Notiser* **1911**, 197–207.

Borge, O. (1913). Beitrage zur Algenflora von Schweden. 2. Die Algenflora um den Torne-Traskee in Schwedische-Lappland. *Bot. Notiser* **13**, 1–32, 49–109.

Borge, O. (1918). Die von Dr. A. Löfgren in Sao Paulo gesammelten Süsswasseralgen. *Ark. f. Bot.* **15(13)**, 1–108.

Borge, O. (1925). Die von Dr. F.C. Hoehne während der Expedition Roosevelt-Rondon gesammelten Süsswasseralgen. *Ark. f. Bot.* **19(17)**, 1–56.

Bourrelly, P. (1957). Algues d'eau douce du Soudan Francais, region du Macina. *Bull. de l'Ifau* **19(a)**, 1047–1102.

Bourrelly, P. (1961). Algues d'eau douce de la Republique de Côte d'Ivoire. *Bull. Inst. franc. Afr. noire* T. 23, ser. A, No. 2, 283–374.

Bourrelly, P. (1966–1970). Les Algues d'eau douce. Vols 1–3. Boubée et Cie., Paris.

Brady, H.T. (ed.) (1979). The diatom flora of Australia. Report I. Freshwater diatoms of the Northern Territory, especially in the Magela Creek system. Macquarie University Press, Sydney.

Brook, A.J. (1960). The varieties of *Staurastrum paradoxum* Meyen — *nomen dubium*. *Nova Hedwigia* **1**, 431–442.

Brook, A.J. & Hine, A.E. (1966). A population of *Staurastrum freemanii* from the central highlands of New Guinea. *J. Phycol.* **2**, 66–73.

Cook, P.W. (1963). Variation in vegetative and sexual morphology among the small curved species of *Closterium*. *Phycologia* **3**, 1–18.

Coué, A. & Tell, G. (1981). Ultrastructure de la paroi cellulaire des Desmidiacées au microscope electronique a balayage. *Beiheft. Nova Hedwigia* **68**, 1–228.

Cox, E. (ed.) (1980). Phytoflagellates. Elsevier/North Holland, Amsterdam.

Croasdale, H. & Scott, A.M. (1976). New or otherwise interesting desmids from northern Australia. *Nova Hedwigia* **27(3/4)**, 501–596.

Desikachary, T.V. (1959). Cyanophyta. I.C.A.R. New Delhi.

Eichler, B. & Raciborski, M. (1893). Nowe gatunki zielenic. *Rozpr. e Sprawozd Wydz. mat.-przyr. Akad. Umiej. Krakow* **II 26**, 116–126.

Elfving, F. (1881). Anteckingar om Finska Desmidieer. *Acta Soc. Fauna et Flora Fenn.* **2(2)**, 1–18.

Foged, N. (1978). Diatoms in eastern Australia. Bibliotheca Phycologia Band 41. J. Cramer.

Förster, K. (1964). Desmidiaceen aus Brasilien. *Hydrobiologia* **23(3/4)**, 321–505.

Förster, K. (1972). Desmidiaceen aus dem Sudosten der Veremigten Staaten von Amerika. *Nova Hedwigia* **23**, 515–644.

Fox, R.W., Kellcher, C.G. & Kerr, C.B. (1977). Ranger Uranium environmental inquiry, second report. AGPS, Canberra.

Fritsh, F.E. (1907). A general consideration of the subaerial and freshwater algal flora of Ceylon. *Proc. Roy. Soc. London* **(B)79**, 197–254.

Fritsch, F.E. (1948). Structure and reproduction of the algae. Vol. 1. Cambridge University Press.

Fukushima, H. (1954). Further notes on Cyanophyceae of Oze. *Scient. Res. of the Ozegahara Moor*, 1954, pp. 602–624.

Geitler, L. (1932). Cyanophyceae, *in* Rabenhorst (ed.) 'Kryptogamenflora von Deutschland, Österreich und der Schweiz', Vol 14. Akademische Verlagsgesellschaft Leipzig.

Grönblad, R. (1920). Finnländische Desmidiaceen aus Keuru. *Acta Soc. Fauna et Flora Fenn.* **47(4)**, 1–98.

Grönblad, R. (1926). Beitrag zur Kenntnis der Demidiaceen Schlesiens. *Soc. Sci. Fenn. Commentationes Biologicae* **II(5)**, 1–39.

Gröblad, R. (1945). De algis Brasiliensibus, praecipue Desmidiaceis in regione inferiore fluminis Amazonis a Professore August Ginzberger (Wien) anno 1927 collectis. *Acta Soc. Sci. Fenn., n.s., B.* **2(6)**, 1–43.

Grönblad, R. (1962). Sudanese desmids, II. *Acta Bot. Fenn.* **63**, 1–19.

Grönblad, R. & Kallio, P. (1954). A new genus and a new species among the desmids. *Bot. Notiser* **2**, 167–178.

Grönblad, R., Prowse, G.A. & Scott, A.M. (1958). Sudanese desmids. *Acta Bot. Fenn.* **58**, 1–82.

Gutwinski, R. (1902). De Algis a Dre M. Raciborski anno 1899 in insula Java collectis. *Bull. Acad. Sci. Cracovie, Cl. Scie. Math. et Natur. nov.* **1902(9)**, 575–617.

Hardy, A.D. (1905). The freshwater algae of Victoria, II. *Vict. Nat.* **22**, 62–73.

Hardy, A.D. (1906). The freshwater algae of Victoria, III. *Vict. Nat.* **23**, 18–22, 33–42.

Harrop, E.D. (1869). Observations on Desmidiaceae, with a list of species found in Tasmania. *Pap. Proc. Roy. Soc. Tas.* **1869**, 19–22.

Heimans, J. (1946). On closteriometry. *Biol. Jaarb. Dodonea* **13**, 146–154.

Hindak, F. (1977). Studies on the chlorococcal algae. Chlorophyceae I. Veda, Bratislava.

Hindak, F. (ed.) (1978). Sladkovodne riasy. Slovenske Pedagogicke Nakladatel'stuo, Bratislava.

Hinode, T. (1960). On some Japanese desmids. *Hikobia* **2**, part 2 pp. 61–64, part 3 pp. 111– 118.

Hirano, M. (1951). Some new or noteworthy desmids from Japan, III. *Acta Phytotax. Geobot.* **14(3)**, 69–71.

Hirano, M. (1956). Flora desmidiarum Japonicarum. *Contr. Biol. Lab. Kyoto Univ.* **2**, 57–106.

Hirano, M. (1957). Flora desmidiarum Japonicarum. *Contr. Biol. Lab. Kyoto Univ.* **5**, 57–106.

Hoek, C. van den (1978). Algen. Einfuhrüng in die phykologie. Georg Thiem Verlag, Stuttgart.

Huber-Pestalozzi, G. (1941–1961). Die Binnenge wässer. Das Phytoplankton des Süsswassers. Band 16; Teil 2 (1941), Teil 3 (1950), Teil 3, Auflage 2 (1968), Teil 4 (1955), Teil 5 (1961).

Hustedt, F. (1955). Neue und wenig bekannte Diatomeen. *Abh. naturw. Verein Bremen* **34(1)**, 47–68.

Irenée-Marie, F. (1959). Expedition Algologique dans la nord de la Mauricie, bassin de la Mattawin. *Hydrobiologia* **13**, 319–381.

Islam, A.K.M.N. (1963). A revision of the genus *Stigeoclonium*. *Beih. z. Nova Hedwigia* **10**, 1– 164.

Islam, A.K.M.N. & Haroon, A.K.F. (1980). Desmids of Bangladesh. *Int. Revue ges. Hydrobiol.* **65(4)**, 551–604.

Joshua, W. (1886). Burmese Desmidieae, with descriptions of new species occurring in the neighbourhood of Rangoon. *J. Linn. Soc. Bot., London* **21**, 634–655.

Kessell, J. & Tyler, P.A. (1982). A limnological survey of the Alligator Rivers Region. V. Phytoplankton populations of the Magela Creek system. Report to the Supervising Scientist for the Alligator Rivers Region (unpublished).

Kisselev, I.A. (1950). Dinoflagellates of the seas and freshwaters of the USSR. *Isd. Akad. Nauk.* USSR.

Komarek, J. & Perman, J. (1978). Review of the genus *Dictyosphaerium* (Chlorococcales). *Arch. Hydrobiol. Suppl.* **51**, 233–297.

Korsikov, D.A., (1953). Pidklas Protokokovi (Protococcinae). *Vizn. prisnovodn. vodor. SSSR* **5**, 1–436.

Krieger, W. (1932). Die Desmidiaceen der Deutschen Limnologischen Sunda Expedition. *Arch. Hydrobiol. Suppl.* **11**, 129–230.

Krieger, W. (1937). Die Desmidiaceen Europas, mit Berücksichtigung der aussereuropäischen Arten, *in* Rabenhorst (ed.) 'Kryptogamenflora von Deutschland, Österreich und der Schweiz; Vol 13, part 1. Akademische Verlagsgesellschaft Leipzig.

Krieger, W. (1939). Ibid., part 2, 1–117.

Krieger, W. & Gerloff, J. (1962, 1965, 1969). Die Gattung Cosmarium. Parts 1, 2 and 3. J. Cramer, Weinheim, Germany.

Kristiansen, J. (1975). On the occurrence of the species of *Synura* (Chrysophyceae). *Verh. Internat. Verein. Limnol.* **19**, 2709–15.

Lagerheim, G. (1885). Bidrag till Amerikas Desmidie-Flora. *Öfu. K. Sv. Vet.-Akad. Förhandl.* **1885(7)**, 225–255.

Lagerheim, G. (1888). Uber Desmidiaceen aus Bengalen nebst Bemerkungen uber die geographische Verbreitung der Desmidiaceen in Asien. *Bih. t. Kungl. Svenska Vet.-Akad. Handl.* **13**, **111(9)**, 3–12.

Lee, R.E. (1980). Phycology. Cambridge University Press.

Leedale, G.F. (1967). Euglenoid flagellates. Prentice-Hall Inc. N.J.

Lind, O.T. (1974). Handbook of common methods in limnology. The C.V. Mosby Co., St. Louis.

Ling, H.U. (1977). Sexual reproduction, meiosis, polyploidy in the desmids. Unpub. Ph.D. thesis, University of Tasmania.

Ling, H.U. & Tyler P.A. (1976). Meiosis, polyploidy and taxonomy of the *Pleurotaenium mamillatum* complex (Desmidiaceae). *Br. Phycol. J.* **11**, 315–330.

Lund, J.W.G. (1956). On certain planktonic palmelloid green algae. *J. Linn. Soc. London* **55**, 593–613.

Lundell, P.M. (1871). De Desmidiaceis quae in Suecia inventae sunt, observationes criticae. *Nova Acta Reg. Soc. Sci. Upsal.* **III(8)** 1–100.

Maskell, W.M. (1889). Further notes on the Desmidieae of New Zealand, with descriptions of new species. *Trans. N.Z. Inst.* **21**, 3–32.

May, V. (1970). New or interesting algal records from Australia. *Contr. N.S.W. Nat. Herb.* **4(3)**, 79–83.

May, V. (1972). Blue-green algal blooms at Braidwood, New South Wales. Science Bulletin No. 82, N.S.W. Department of Agriculture.

May, V. (1973). The algal genus *Scenedesmus* in Australia. *Contr. N.S.W. Nat. Herb.* **4(7)** 431–452.

May, V. (1978). Areas of recurrence of toxic algae within Burrinjuck Dam, New South Wales, Australia. *Telopea* **1(5)**, 295–313.

McLeod, J.A. (1975). The freshwater algae of south-eastern Queensland. Unpub. Ph.D. thesis, University of Queensland.

Messikommer, E. (1942). Beitrage zur Kenntnis der Algenvegetation des Hochgebirges um Davos. *Beit. Geobot. Landes. der Schweiz* **24**, 1–452.

Möbius, M. (1892). Australische Süsswasseralgen. *Flora* **1892(3)**, 309–347.

Möbius, M. (1894). Australische Süsswasseralgen, II. *Abh. der Senckenb. Naturf. Ges.* **1894**, 310– 350.

Nordstedt, O. (1870). Desmidiaceae, *in* E. Warming, 'Symbolae ad floram Brasilieae centralis cognoscendam. (Particula quinta)'. *Vidensk. Meded. Naturh. Foren. Kbhvn.* **1869, III. 1(14/15)**, 195–234.

Nordstedt, O. (1873). Bidrag till Kännedomen om sydligare Norges Desmidieer. *Lund. Univ. Arsskr.* **9**, 1–51.

Nordstedt, O. (1877). Nonnullae algae aquae dulcis brasilienses. *Öfv. af Kongl. Vet.-Akad. Förhandl.* **1877(3)** 15–28.

Nordstedt, O. (1888). Freshwater algae collected by Dr. S. Berggren in New Zealand and Australia. *Bih. t. Kungl. Svenska Vet.-Akad. Handl.* **22(8)**, 1–98.

Philipose, M.T. (1967). Chlorococcales. I.C.A.R. New Delhi.

Playfair, G.I. (1907). Some new or less known desmids found in New South Wales. *Proc. Linn. Soc. N.S.W.* **32(1)**, 160–201.

Playfair, G.I. (1908). Some Sydney desmids. *Proc. Linn. Soc. N.S.W.* **33(3)**, 603–28.

Playfair, G.I. (1910). Polymorphism and life-history in the Desmidiaceae. *Proc. Linn. Soc. N.S.W.* **35**, 459–95.

Playfair, G.I. (1912). Plankton of the Sydney water-supply. *Proc. Linn. Soc. N.S.W.* **37**, 512–52.

Playfair, G.I. (1914). Contributions to the knowledge of the biology of the Richmond River. *Proc. Linn. Soc. N.S.W.* **39**, 93–151.

Playfair, G.I. (1915*a*). The genus *Trachelomonas*. *Proc. Linn. Soc. N.S.W.* **40**, 1–41.

Playfair, G.I. (1915*b*). Freshwater algae of the Lismore district: with an appendix on the algal fungi and schizomycetes. *Proc. Linn. Soc. N.S.W.* **40**, 310–62.

Playfair, G.I. (1916*a*). Australian freshwater phytoplankton. *Proc. Linn. Soc. N.S.W.* **41**, 823–52.

Playfair, G.I. (1916*b*). *Oocystis* and *Eremosphaera*. *Proc. Linn. Soc. N.S.W.* **41**, 107–147.

Playfair, G.I. (1917). Rhizopods of Sydney and Lismore. *Proc. Linn. Soc. N.S.W.* **42**, 633–675.

Playfair, G.I. (1918). New and rare freshwater algae. *Proc. Linn. Soc. N.S.W.* **43**, 497–543.

Playfair, G.I. (1919). Peridineae of New South Wales. *Proc. Linn. Soc. N.S.W.* **44(4)**, 793–818.

Playfair, G.I. (1921). Australian freshwater flagellates. *Proc. Linn. Soc. N.S.W.* **46**, 99–146.

Playfair, G.I. (1923). Notes on freshwater algae. *Proc. Linn. Soc. N.S.W.* **48**, 206–228.

Powling, I.J. (1970). A note on the phytoplankton of the Mount Kosciusko region. *Australian Society for Limnology* Bulletin No. 3, 29–32.

Prescott, G.W. (1936). Notes on the algae of Gatun Lake, Panama Canal. *Trans. Am. Microsc. Soc.* **55**, 501–509.

Prescott, G.W. (1962). Algae of the Western Great Lakes area. Wm. Brown Co., Iowa.

Prescott, G.W. (1966). Algae of the Panama Canal and its tributaries. II. Conjugales. *Phykos* **5**, 1–49.

Prescott, G.W. (1978). How to know the freshwater algae. 3rd Ed. Wm. Brown Co., Iowa.

Prescott, G.W. & Scott, A.M. (1952). Some South Australian desmids. *Trans. Roy. Soc. S. Aust.* **75**, 55–69.

Prescott, G.W., Croasdale, H.T. & Vinyard, W.C. (1975). A synopsis of North American desmids. Part II. Desmidiaceae Placodermae, Section 1. University of Nebraska Press.

Prescott, G.W., Croasdale, H.T. & Vinyard, W.C. (1977). A synopsis of North American desmids. Part II. Desmidiaceae Placodermae, Section 2. University of Nebraska Press.

Prowse, G.A. (1957). An introduction to the desmids of Malaya. *Malayan Nat. J.* **11**, 42–58.

Prowse, G.A. (1969). Some new desmid taxa from Malaya and Singapore. *The Gardens' Bulletin, Singapore* **24**, 337–346.

Raciborski, M. (1892). Desmidyja zebrane przez Dr. E. Ciastonia, w prodrozy na okolo ziemi. *Rozpraw Akad. Umiej. w Krakowie* **22**, 361–369.

Ralfs, J. (1848). The British Desmidieae. Reeve, Benham & Reeve, London.

Reymond, O, & Cronberg, G. (1981). Etude morphologique aux microscopes optiques et electronique de *Bitrichia ollula* (Fott) Hollande (Chrysophyceae) et comparison avec une algue verte, *Treubaria* Bernard. *Saussurea* **12**, 79–90.

Ruzicka, J. & Pouzar, Z. (1978). Erwägungen über die Taxonomie und Nomenklatur der Gattung *Actinotaenium* Teiling. *Folia Geobot. Phytotax., Praha* **13**, 33–66.

Schmidle, W. (1896). Süsswasseralgen aus Australien. *Flora* C82, 297–313.

Schmidle, W. (1898). Die von Prof. Dr. Volkens und Dr. Stuhlmann in Ost-Afrika gesammelten Desmidiaceen, bearbeitet unter Benutzüng der Vorarbeiten von Prof. G. Hieronymus. *Engler's Bot. Jahrb.* **26**, 1–59.

Schmidle, W. (1902). Algen, insbesondere solche des Plankton aus dem Nyassasee und seiner Umgebung gesammelt von Dr. Fülleborn. *Engler's Bot. Jahrb.* **32**, 56–88.

Scott, A.M. & Grönblad, R. (1957). New and interesting desmids from the south-eastern United States. *Acta Soc. Fenn., n.s. B* **2(8)**, 1–62.

Scott, A.M. & Prescott, G.W. (1956*a*). Notes on Indonesian freshwater algae. I. *Staurastrum wildemanii* Gutwinski (Desmidiaceae). *Reinwardtia* **3(3)**, 351–362.

Scott, A.M. & Prescott, G.W. (1956*b*). Notes on Indonesian freshwater algae. II. *Ichthyodontum*, a new desmid genus from Sumatra. *Reinwardtia* **4(1)**, 105–112.

Scott, A.M. & Prescott, G.W. (1958*a*). Some freshwater algae from Arnhem Land in the Northern Territory of Australia. *Records Amer.-Austr. Sci. Exped. Arnhem Land* **3**, 9–136.

Scott, A.M. & Prescott G.W. (1958*b*). Notes on Indonesian freshwater algae. III. New varieties of some little-known Staurastra (Desmidiaceae). *Reinwardtia* **4(3)**, 1–14.

Scott, A.M. & Prescott, G.W. (1960). Notes on Indonesian freshwater algae. IV. Concerning *Euastrum moebii* (Borge) Scott & Prescott comb. nov. and *Euastrum turgidum* Wallich. *Reinwardtia* **5(3)**, 323–340.

Scott, A.M. & Prescott, G.W. (1961). Indonesian desmids. *Hydrobiologia* **17(1/2)**, 1–132.

Scott, A.M., Grönblad, R. & Croasdale, H. (1965). Desmids from the Amazon Basin, Brazil, collected by Dr. H. Sioli. *Acta Bot. Fenn.* **69**, 1–94.

Skinner, S. (1976). The Zygnemaphyceae of the New England Region. Unpub. M.Sc. thesis, University of New England.

Skinner, S. (1980). New records of Zygnemaphyceae and Oedogoniophyceae (Chlorophyta) from northern New South Wales. *Proc. Linn. Soc. N.S.W.* **104**, 245-263.

Skuja, H. (1949). Zur Süsswasseralgenflora Burmas. *Nova Acta Reg. Soc. Sci. Upsal.* **IV, 14(5)**, 1- 186.

Smith, G.M. (1920). Phytoplankton of the inland lakes of Wisconsin. Part I. *Wis. Geol. Nat. Hist. Surv. Bull.* **57**, 1–243.

Smith, G.M. (1924). Phytoplankton of the inland lakes of Wisconsin. Part II. Desmidiaceae. *Wis. Geol. Nat. Hist. Surv. Bull.* **57(ii)**, 1–227.

Smith, G.M. (1950). The freshwater algae of the United States. McGraw Hill, N.Y.

Ström, K.M. (1921). Algological Notes. I. Some desmids from north Australia. *Nyt. Mag. f. Naturv.* **59**, 1–14.

Takahashi, E. (1978). Electron microscopical studies on the *Synuraceae (Chrysophyceae)* in Japan. Tokai University Press, Tokyo.

Tappan, H. (1980). The palaeobiology of plant protists. W.H. Freeman & Co., San Francisco.

Tarnogradsky, D.A. (1960). Genus *Staurastrum* Meyen (Desmidiaceae) in Lacabus Sakoczavi (Georgia, Caucasus). *Botan. Materialy Sporov. Rast.* **13**, 87–100.

Taylor, W.R. (1935). Alpine algae from the Santa Marta Mountain, Colombia. *Am. J. Bot.* **22**, 763–781.

Teiling, E. (1948). *Staurodesmus*, genus novum. *Bot. Notiser* **1948**, 49–83.

Teiling, E. (1954). *Actinotaenium* genus Desmidiacearum resuscitatum. *Bot. Notiser* **4**, 376–426.

Teiling, E. (1967). The desmid genus *Staurodesmus*. A taxonomic study. *Arkiv für Bot.* **Serv. 2, 6(11)**, 467–629.

Thomas, D.P. (1983). A limnological survey of the Alligator Rivers Region. I. Diatoms (Bacillariophyceae) of the region. Research Report 3, Part I, Supervising Scientist for the Alligator Rivers Region. AGPS, Canberra.

Thomasson, K. (1960). Notes on the plankton of Lake Bangweulu Part 2. *Nova Acta Reg. Soc. Sci. Upsaliensis* **Serv. 4, 17(12)**, 1-43.

Thomasson, K. (1965). Notes on algal vegetation of Lake Kariba. *Nova Acta Reg. Soc. Sci. Upsaliensis* **Serv. 4,19**, 1–34.

Thomasson, K. (1966). Phytoplankton of Lake Shiwa Ngandu. *Explor. Hydrobiol. Bassin du lac Bangweilo et Luapula* **4(2)**, 1–90. Bruxelles.

Thomasson, K. (1967). Phytoplankton from some lakes on Mt. Wilhelm, East New Guinea. *Blumea* **15(2)**, 285–296.

Thomasson, K. (1973). Notes on the plankton of some Sydney reservoirs with descriptions of two interesting desmids. *Contr. N.S.W. Nat. Herb.* **4(6)**, 384–394.

Thomasson, K. & Tyler, P.A. (1971). Taxonomy of Australian freshwater algae. 2. Some planktic *Staurastra* from Tasmania. *Nova Hedwigia* **21**, 287–319.

Turner, W.B. (1892). Algae aquae dulcis Indiae orientalis. The freshwater algae (principally Desmidieae) of East India. *Bih. t. Kungl. Svenska Vet.-Akad. Handl.* **25(5)**, 1–187.

Tyler, P.A. (1970) Taxonomy of Australian freshwater algae. I. The genus *Micrasterias* in south-eastern Australia. *Br. phycol. J.* **5**, 211–234.

Tyler, P.A. (1971). A simple and rapid technique for surveying size and shape variation in desmids and diatoms. *Br. phycol. J.* **6**, 231–33.

Ungaretti, I. (1981). Desmidias (Zygnemaphyceae, Chlorophyta) do Arroio Diluvio, Rio Grande do Sul, Brasil. *Iheringia. Ser. Bot. Porto Alegre* **26**, 9–35.

Viyakornvilas, K. (1974). Some algae in lakes Hume and Mulwala, Victoria. B.Sc.(Hons) thesis, University of Tasmania.

Walker, T.D. & Tyler, P.A. (1982). A limnological survey of the Alligator Rivers Region. Chemical characteristics and nutrient status of billabongs. Report to the Supervising Scientist for the Alligator Rivers Region (unpublished).

Walker, T.D., Waterhouse, J. & Tyler, P.A. (1981). A limnological survey of the Alligator Rivers Region. Thermal stratification and the distribution of dissolved oxygen in billabongs. Report to the Supervising Scientist for the Alligator Rivers Region (unpublished).

Walker, T.D., Kirk, J.T.O. & Tyler, P.A. (1982). A limnological survey of the Alligator Rivers Region. The underwater light climate of billabongs. Report to the Supervising Scientist for the Alligator Rivers Region (unpublished).

Wallich, G.C. (1860). Descriptions of Desmidiaceae from Lower Bengal. *Ann. Mag. Nat. Hist.* **III 5**, 184–197, 273–285.

Watanabe, M., Prescott, G.W. & Yamagishi, T. (1979). Freshwater algae of Papua New Guinea (2). Desmids from Woitape Central District, *in* S. Kurokawa (ed.), 'Studies on Cryptograms of Papua New Guinea'. Academia Scientific Book Inc., Tokyo.

West, G.S. (1905). Desmids from Victoria. *J. Bot.* **43**, 252–254.

West, G.S. (1909*a*). The algae of the Yan Yean Reservoir, Victoria; a biological and ecological study. *J. Linn. Soc. Bot., London* **39**, 1-88.

West, G.S. (1909*b*). Botanical synonyms in the Desmidiaceae and Protococcoideae. *J. Bot.* **47**, 60–64.

West, W. & West, G.S. (1895). A contribution to our knowledge of the freshwater algae of Madagascar. *Trans. Linn. Soc. London, Bot.* **II**, **5**, 41–90.

West, W. & West, G.S. (1896). On some North American Desmidiaceae. *Trans. Linn. Soc. London, Bot.* **II**, **5**, 229–274.

West, W. & West, G.S. (1897). Welwitsch's African freshwater algae. *J. Bot.* **35**, 77–89.

West, W. & West, G.S. (1898). On some Desmids of the United States. *Jour. Linn. Soc. Bot.* **33**, 279–332.

West, W. & West, G.S. (1900). Notes on freshwater algae II. *J. Bot., Lond.* **38**, 330–340.

West, W. & West, G.S. (1901). Freshwater Chlorophyceae, *in* J. Schmidt (ed.) 'Flora of Koh Chang, Gulf of Siam', Part IV. *Bot. Tidsskr.* **24**, 157–186.

West, W. & West, G.S. (1902). A contribution to the freshwater algae of Ceylon. *Trans. Linn. Soc. London, Bot.* **II**, **6**, 123–215.

West, W. & West, G.S. (1904). A monograph of the British Desmidiaceae. Vol. I. The Ray Society, London.

West, W. & West, G.S. (1905). A monograph of the British Desmidiaceae. Vol. II. The Ray Society, London.

West, W. & West, G.S. (1907). Freshwater algae from Burma, including a few from Bengal and Madras. *Ann. Roy. Bot. Gard. Calcutta* **6(2)**, 175–260.

West, W. & West, G.S. (1908). A monograph of the British Desmidiaceae. Vol. III. The Ray Society, London.

West, W. & West, G.S. (1911). A monograph of the British Desmidiaceae. Vol. IV. The Ray Society, London.

West, W., West, G.S. & Carter, N. (1923). A monograph of the British Desmidiaceae. Vol. V. The Ray Society, London.

Wildeman, E. de. (1894). Observations critiques sur quelques espèces de la famille des Desmidiés. *Annls. Soc. belg. Microsc.* **18**, 57–132.

Woloszynska, J. (1913). Das phytoplankton einiger Javanischer Seen mit Berücksichtigung des Sawaplanktons. *Bull. inter. de l'Acad. d. sci. de Cracovie*, **Ser. B. 1912**, 649–709.

Woloszynska, J. (1930). Beitrag zur Kenntnis des Phytoplanktons tropischer Seen. *Arch. Hydrobiol. d'Ichthyologie* T.V. No. **1–2**, 159–69.

Wood, E.J.F. (1961). Studies on Australian and New Zealand diatoms. IV. Descriptions of further sedentary species. *Trans. R. Soc. N.Z.* **88(4)**, 669–698.

Wood, E.J.F., Crosby, L.H. & Cassie, V. (1959). Studies on Australian and New Zealand diatoms. III. Descriptions of further discoid species. *Trans. R. Soc. N.Z.* **87(3–4)**, 211–219.

Yacubson, S. (1980). The phytoplankton of some freshwater bodies from Zulia state (Venezuela). *Nova Hedwigia* **33**, 279–339.

7

Plates

Scale lines are in micrometres (μm) throughout.

PLATE 1

1,2	*Paulschulzia pseudovolvox*
3	*Chaetosphaeridium globosum*
4	*Schizochlamys* sp.
5	*S. gelatinosa*
6	*Micractinium pusillum*
7	*Pediastrum tetras*
8	*P. araneosum*
9	*P. duplex* var. *gracillimum*
10	*Gloeocystis gigas*
11,12	*Dictyosphaerium pulchellum*
13,14	*D. tetrachotomum*
15	*Radiofilum irregulare*
16–18	*Nephrocytium lunatum*
19	*Coelastrum intermedium*
20,21	*Selenastrum gracile*
22	*S. westii*
23	*Tetrallantos lagerheimii*
24	*Kirchneriella obesa*
25	*K. lunaris*
26	*Selenastrum bibraianum*

Scale (a): 1–14, 16–26
Scale (b): 15 only

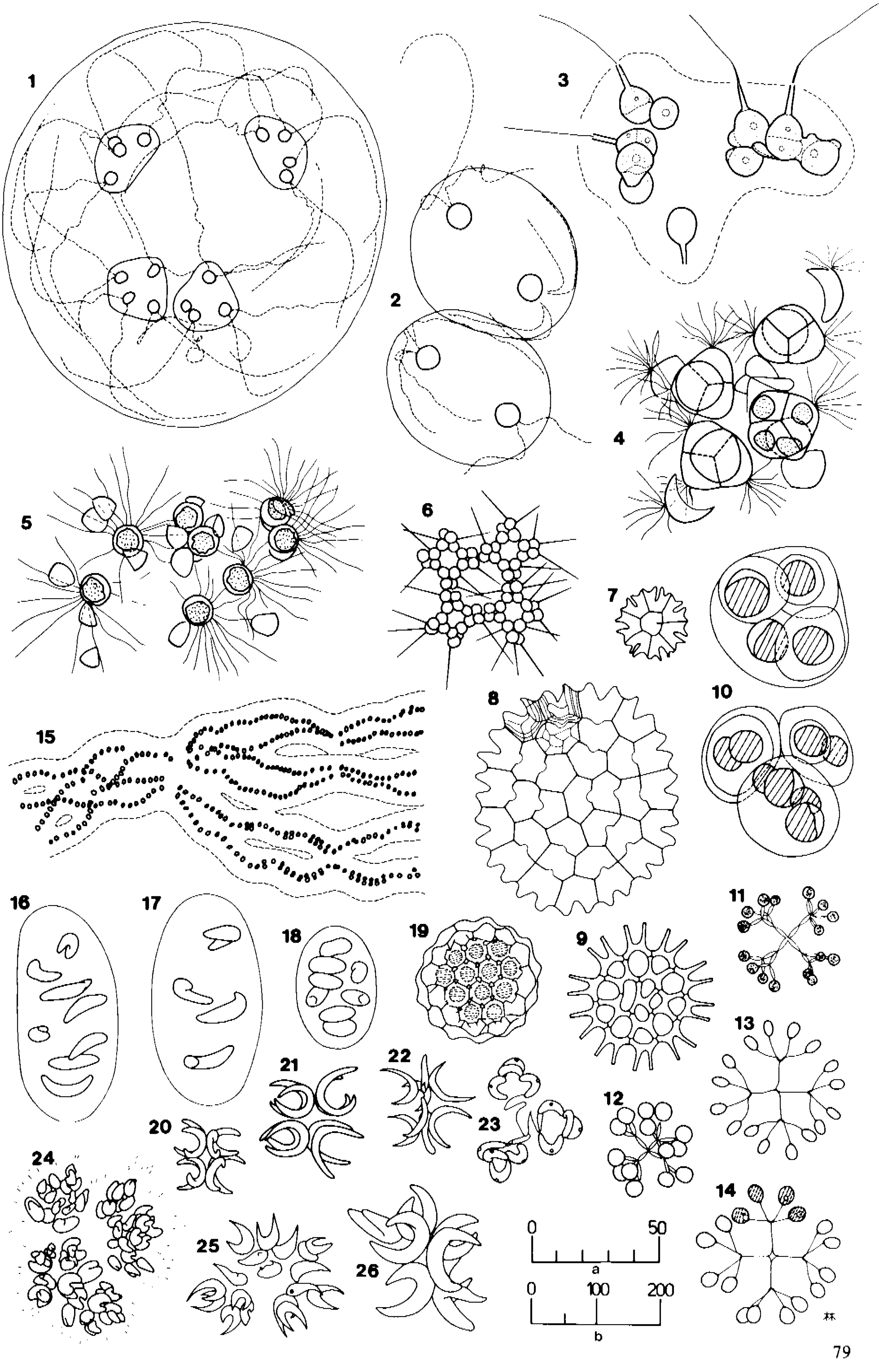

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PLATE 2

1–3	*Tetraedron gracile*
4,5	*T. hastatum*
6–8	*T. limneticum*
9	*T. victoriae* var. *major*
10,11	*T. regulare* var. *incus* fa. *major*
12	*Tetraedron* sp.
13–16	*Dimorphococcus lunatus*
17–21	*Coenochloris pyrenoidosa*

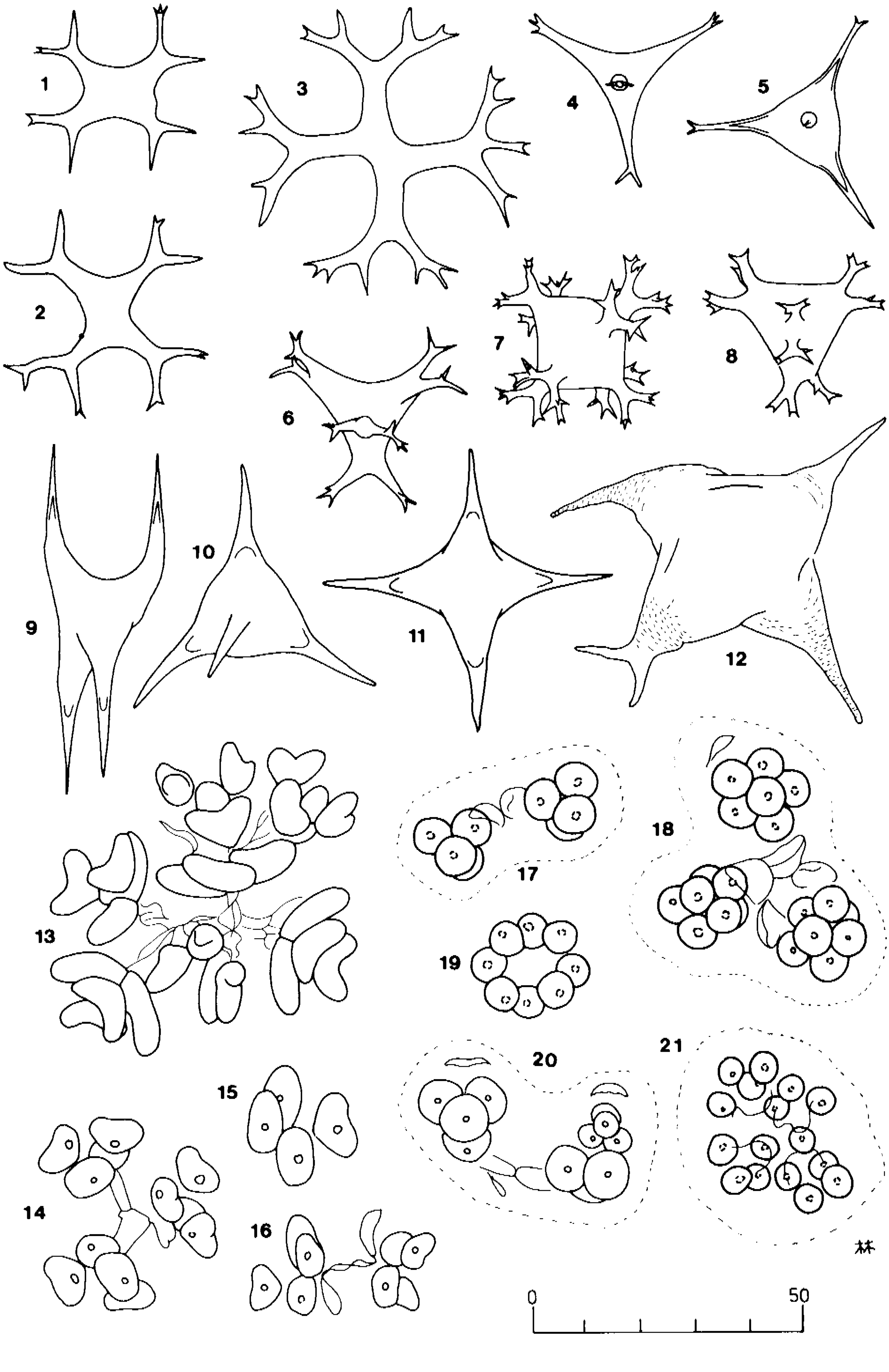
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PLATE 3

1,2	*Botryococcus braunii*, colony and discharged cells
3	*Ankistrodesmus spiralis*
4	*A. falcatus*
5	*Crucigenia quadrata* var. *secta*
6	*Crucigenia* sp.
7	*Oocystis borgei*
8	*Chodatella subsala*
9	*Actinastrum hantzschii*
10	*A. gracillimum*
11,12	*Treubaria triappendiculata*
13	*Tetrastrum heteracanthum*
14	*Scenedesmus brasiliensis*
15,16	*S. perforatus*
17	*S. bijuga* var. *alternans*
18	*Scenedesmus* sp.
19	*S. quadricauda* forma
20	*S. quadricauda*
21	*S. bernardii*
22	*S. dimorphus*

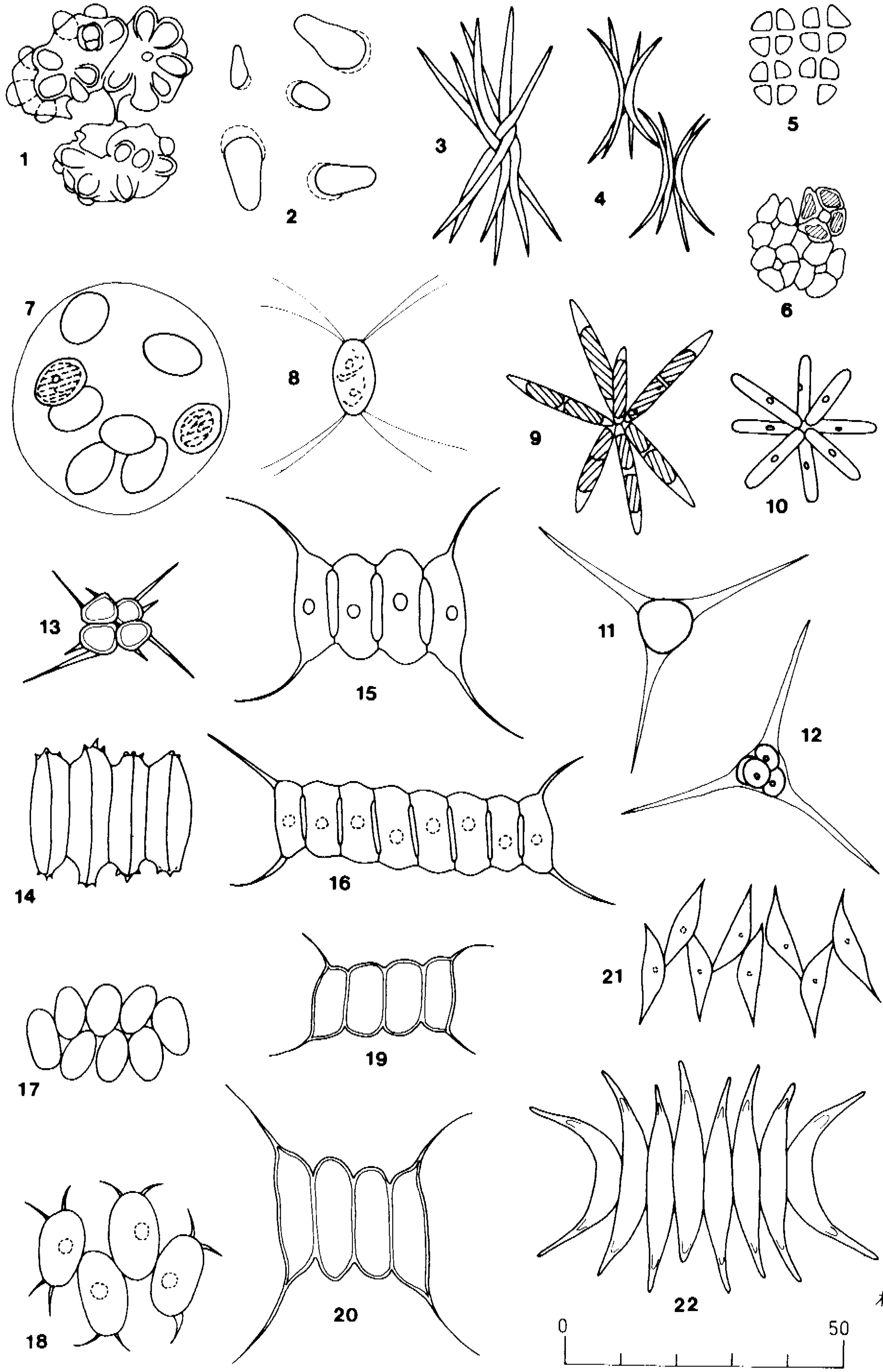
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PLATE 4

1,2	*Spirogyra ellipsospora*
3	*Spirogyra* sp. 1 with nucleus
4	*Spirogyra* sp. 2
5	*S. inflata*
6	*Spirogyra* sp. 3
7,8	*Zygnema pectinatum*, zygospore (enlarged)
9	*Mougeotia acadiana* forma
10	*M. poinciana*
11	*Mougeotia/Debarya* sp. 2
12	*Mougeotia/Debarya* sp. 1
13	*Oedogonium pusillum*
14	*O. undulatum*
15	*Bulbochaete* sp. 1
16	*Bulbochaete* sp. 2
17	*Stigeoclonium flagelliferum*

Scale (a): 2, 12
Scale (b): 1, 3–7, 9, 10, 16, 17 (branch)
Scale (c): 8, 11, 13–15, 17

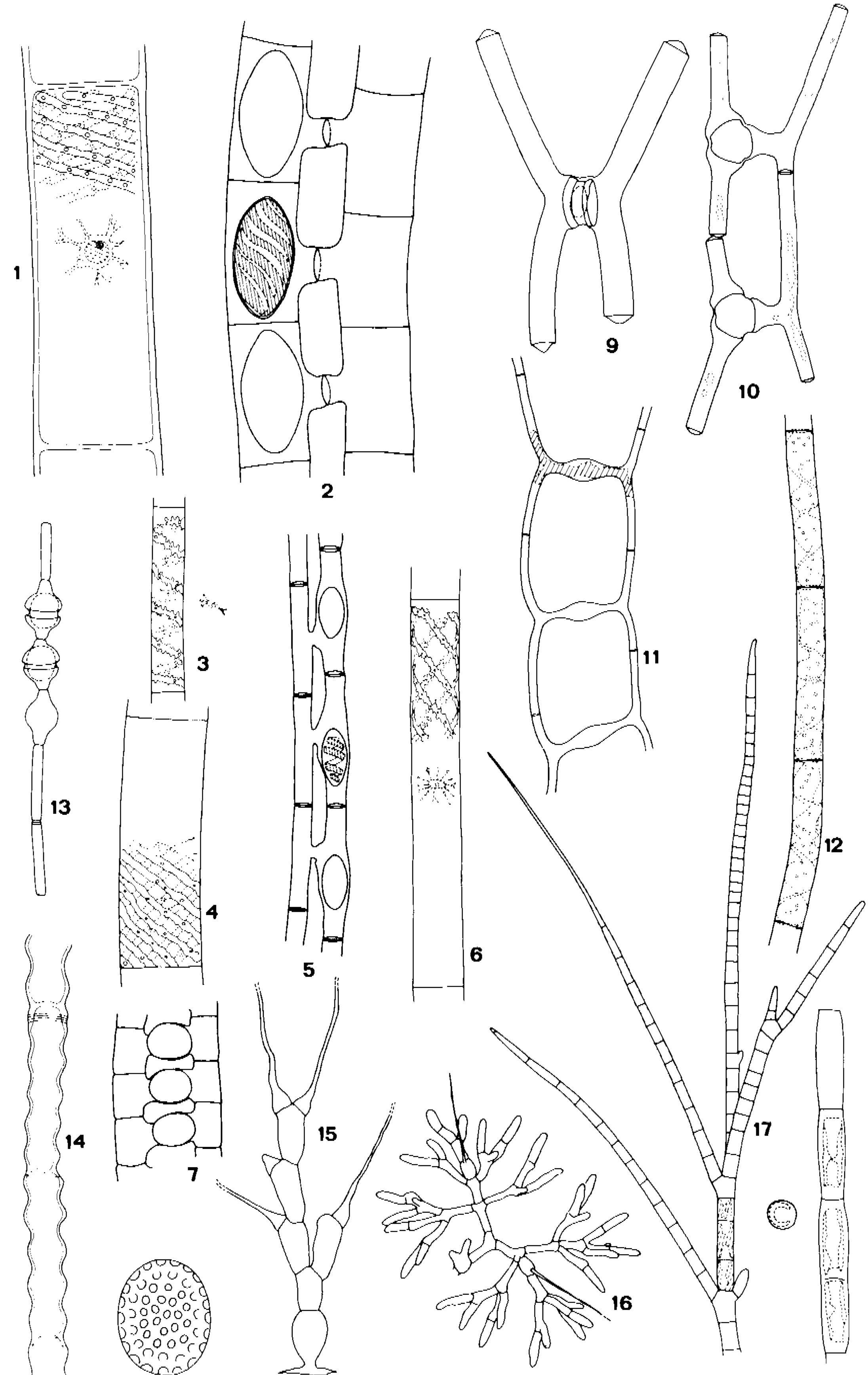
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PLATE 5

1,2	*Netrium digitus*
3	*Closterium libellula* var. *intermedium*
4,5	*Cl. libellula* var. *interruptum*
6	*Cl. leibleinii* var. *minimum*
7,8	*Cl. parvulum*
9,10	*Closterium* sp. 2
11,12	*Cl. biclavatum* fa. *australiense*
13	*Penium spirostriolatiforme* fa. *rectispirum*
14	*Ichthyodontum sachlanii*
15,16	*Tetmemorus brebissonii*
17	*Cl. dianae* var. *brevius*
18	*Cl. ehrenbergii* var. *malinvernianum*
19	*Cl. semicirculare* forma
20	*Cl. incurvum*
21	*Cl. cynthia* forma
22	*Cl. dianae* var. *arcuatum*
23	*Cl. dianae*
24–26	*Cl. parvulum*
27	*Cl. porrectum* var. *angustatum*
28–30	*Penium spirostriolatiforme* fa. *rectispirum*
31	*Cl. rectimarginatum*
32	*Ichthyodontum sachlanii*, dichotypical cell
33	*Tetmemorus laevis*
34	*Spirotaenium condensata*
35	*Actinotaenium diplosporum*
36	*Cylindrocystis brebissonii* var. *minor*
37,38	*Closterium* sp. 1
	Scale (a): 22, 23, 28
	Scale (b): 1–21, 24–27, 29–38

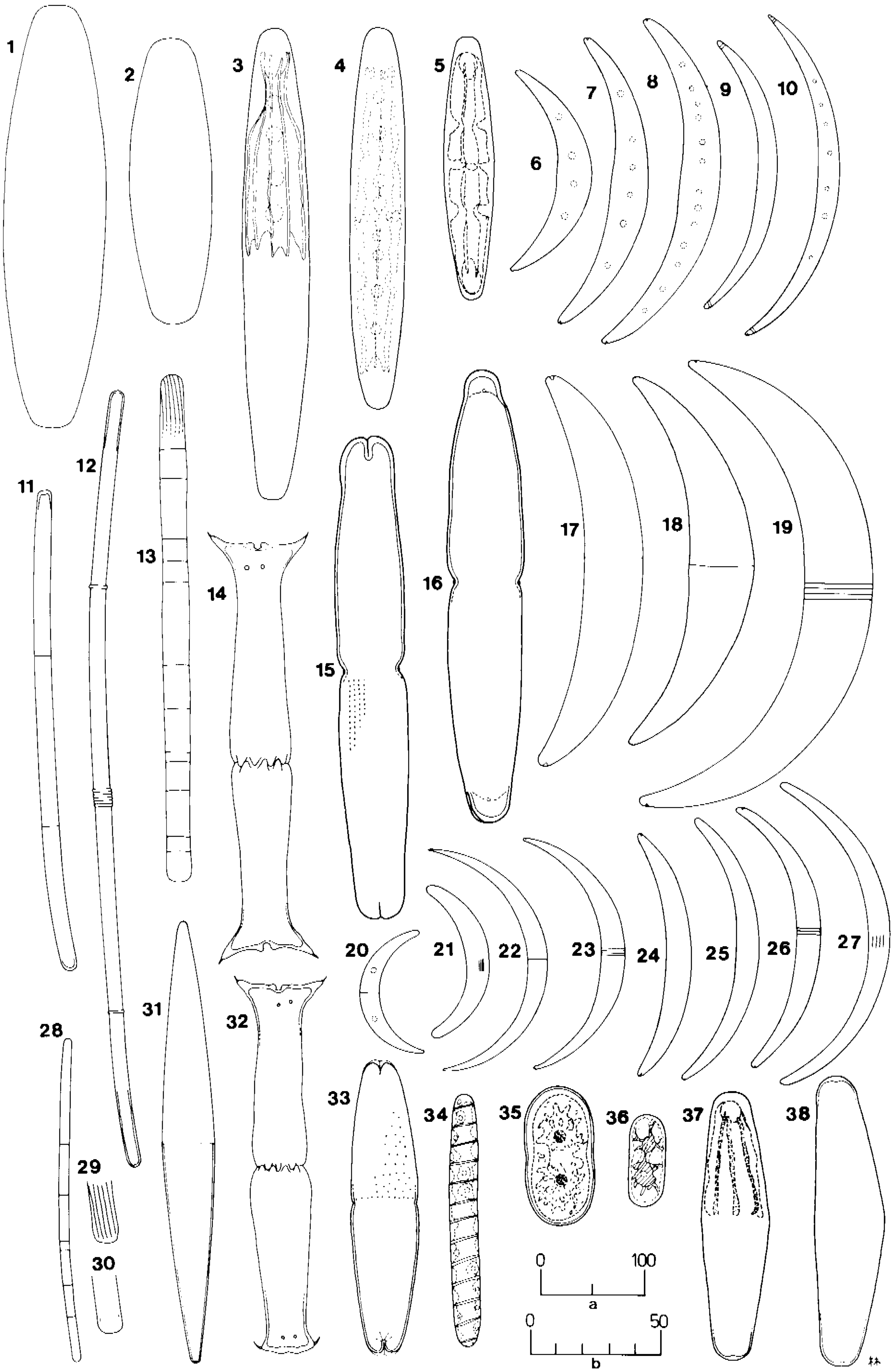
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PLATE 6

1	*Gonatozygon monotaenium*
2	*G. monotaenium* forma
3,4	*G. aculeatum*
5	*G. monotaenium* var. *gracile* forma
6	*G. brebissonii*
7	*Netrium digitus* var. *lamellosum*
8	*Netrium* sp.
9	*Spinoclosterium cuspidatum*
10	*Penium* sp. 2
11	*Closterium nematodes*
12	*Penium* sp. 1
13	*P. cylindrus*
14	*P. cylindrus*, zygospore

Scale (a): 3, 7, 9, 10
Scale (b): 1, 2, 4–6, 11–14
Scale (c): 8 only

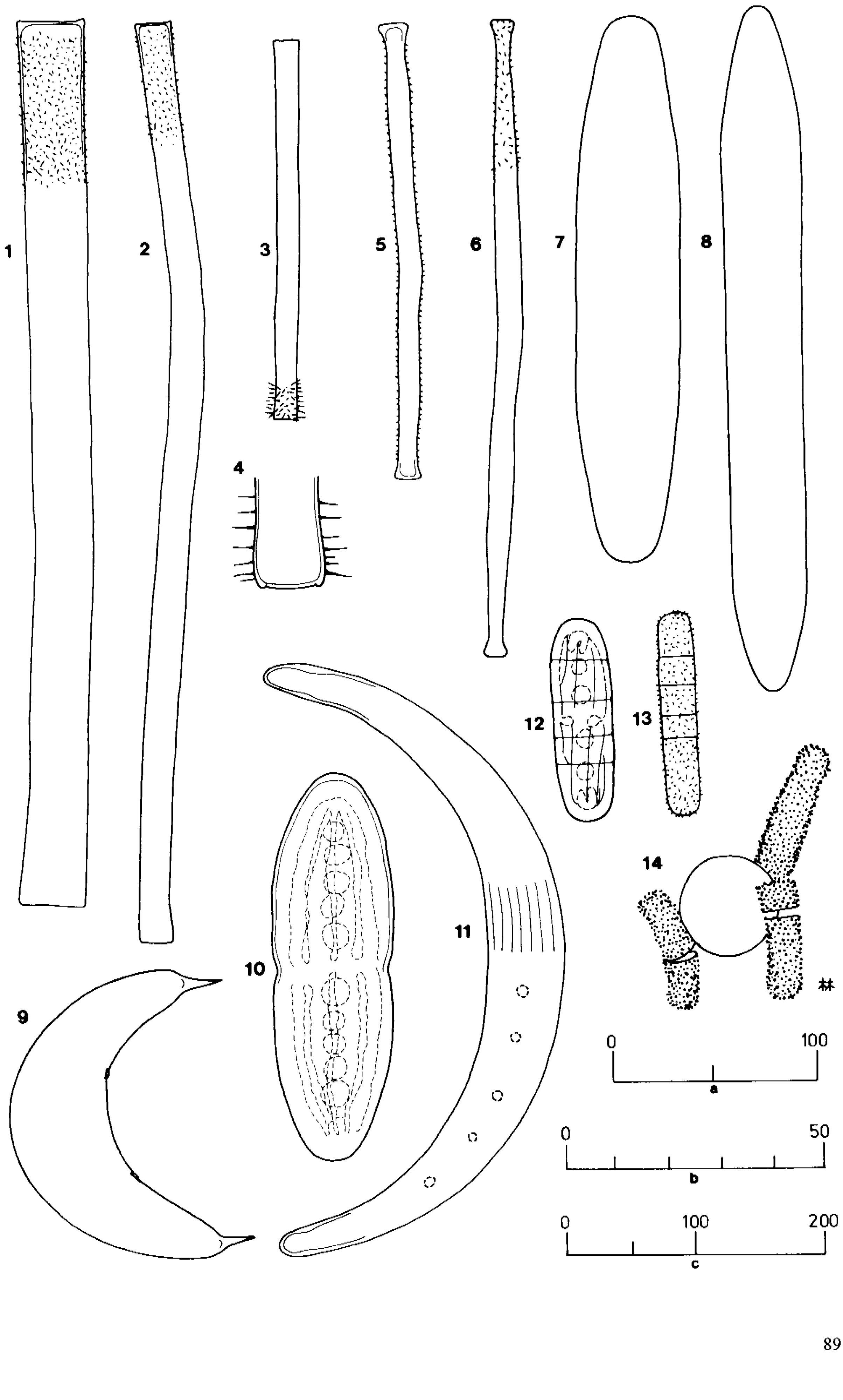
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PLATE 7

1	*Closterium kuetzingii*
2	*Cl. ralfsii* var. *hybridum*
3–5	*Cl. turgidum*
6–8	*Cl. striolatum*
9	*Cl. parvulum* var. *tortum*
10	*Cl. turgidum* forma

Scale (a): 1, 2, 7, 8, 10
Scale (b): 5, 6, 9, 10 (striations)
Scale (c): 3, 4

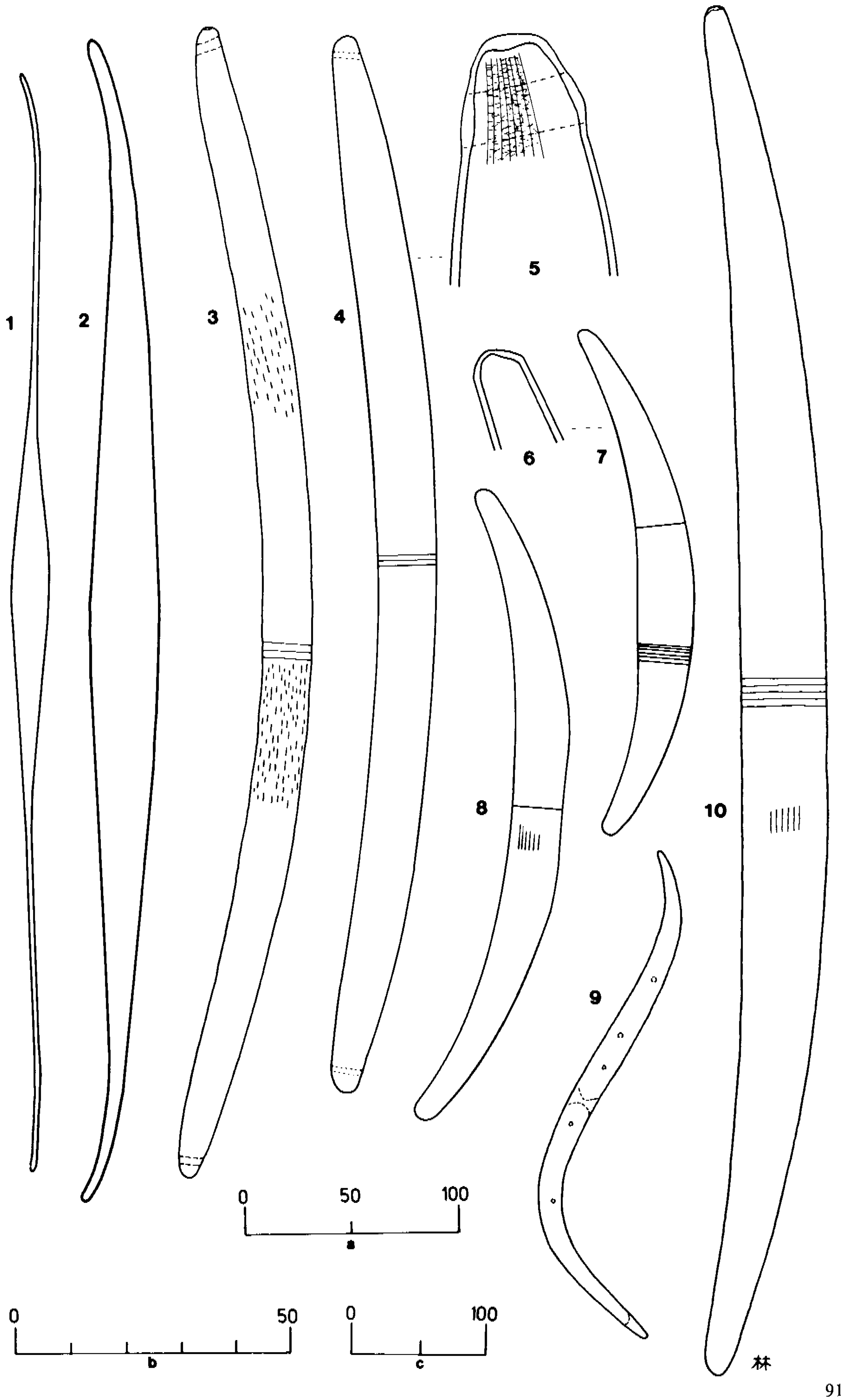
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PLATE 8

1,2	*Closterium pronum*
3	*Cl. lunula* var. *intermedium*
4	*Cl. rectimarginatum* forma
5–7	*Cl. acerosum*
8,9	*Cl. infractum*
10	*Hyalotheca undulata*
11	*H. undulata* forma
12	*Sphaerozosma granulatum* forma
13	*Sphaerozosma* sp. 1
14	*Sphaerozosma* sp. 3
15	*Sphaerozosma* sp. 2
16	*S. excavatum* var. *subquadratum*
17	*Cosmarium norimbergense* fa. *depressa*

Scale (a): 3 only
Scale (b): 2, 4–6
Scale (c): 1, 7–17

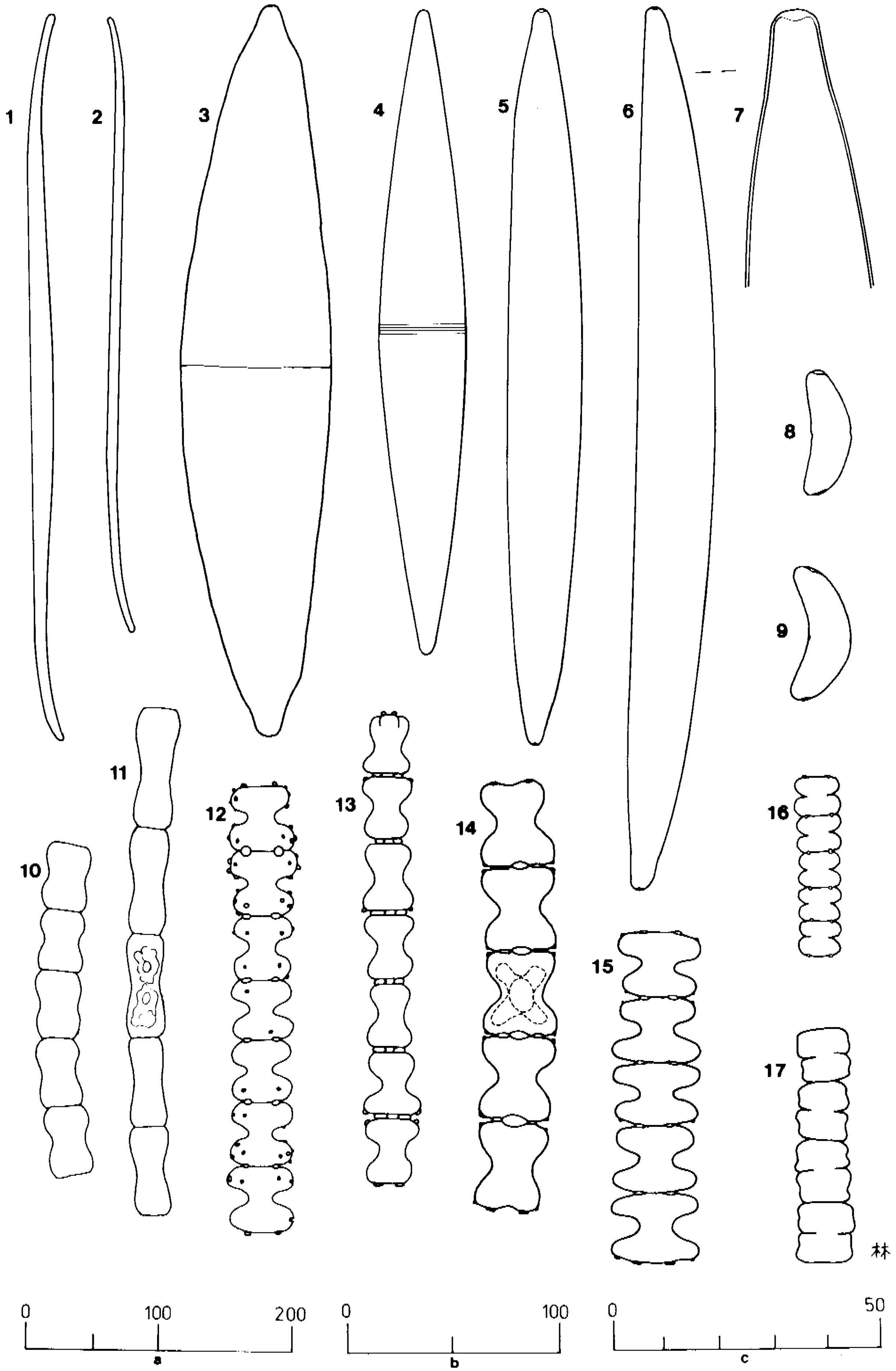
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PLATE 9

1	*Bambusina brebissonii*
2	*B. sphaerospora*
3,4	*Desmidium aptogonum*
5	*D. suboccidentale*
6,7	*D. aptogonum* var. *tetragonum*
8	*D. swartzii*
9	*D. swatzii* forma
10	*D. baileyi*
11–13	*D. baileyi* fa. *tetragonum*
14–16	*D. aequale*
17,18	*Spondylosium nitens* fa. *major*
19–23	*D. coarctatum*, three formae
24	*Hyalotheca mucosa* var. *minor*
25	*H. dissiliens* var. *hians*
26	*Groenbladia neglecta*
27,28	*Onychonema laeve* var. *micracanthum*
29,30	*Phymatodocis irregularis* var. *intermedia*
31–33	*Streptonema trilobatum*
34–36	*Spondylosium nitens* var. *triangulare* fa. *javanicum*
37	*S. nitens* forma, 4-radiate cells
38	*S. nitens* forma, 5-radiate cells
39	*Onychonema laeve* forma
40	*O. laeve* var. *constrictum*
41	*O. laeve* var. *latum*

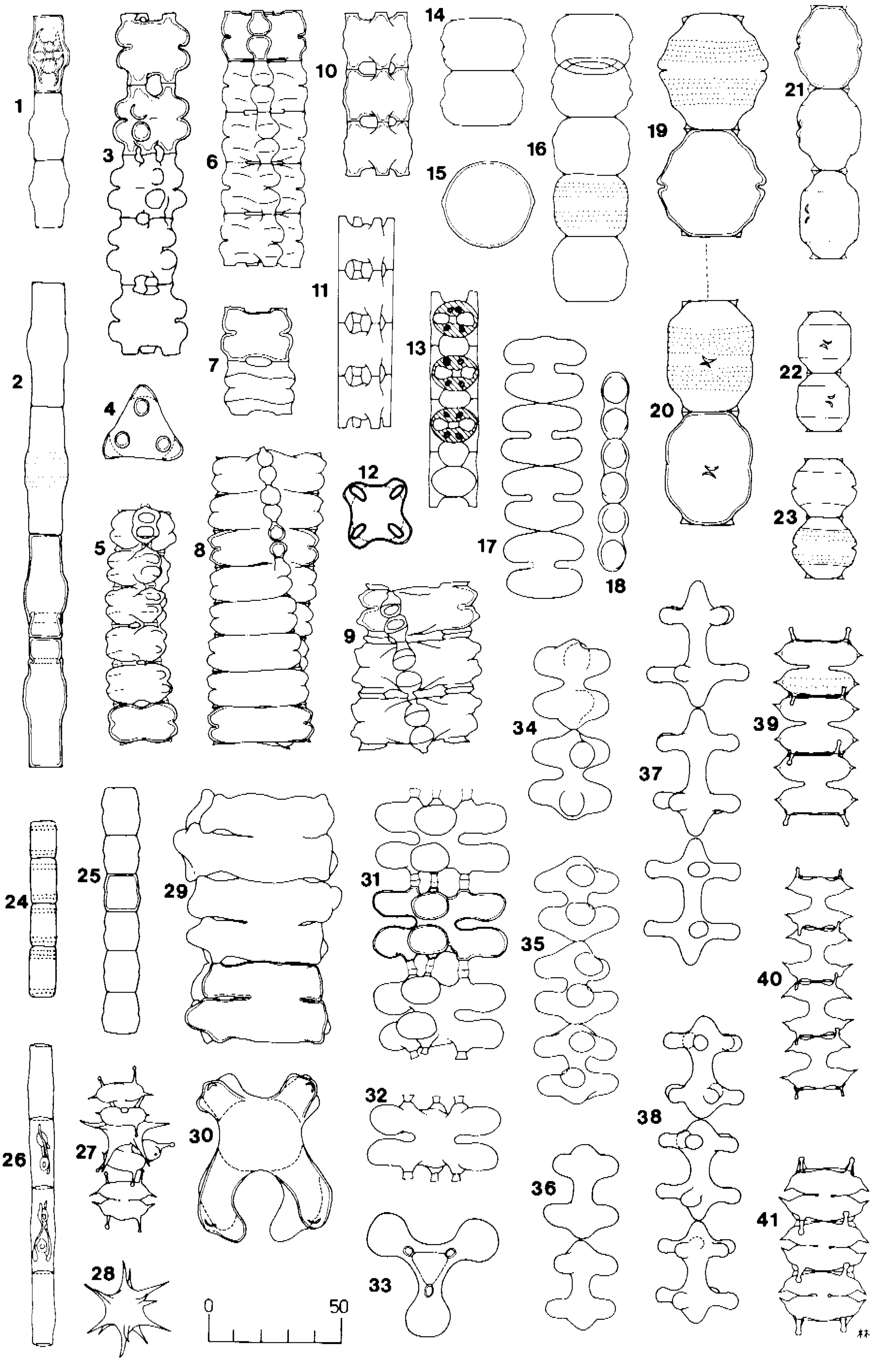
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PLATE 10

1	*Triploceras gracile*
2	*T. gracile* forma 1
3	*T. gracile* forma 2
4–6	*T. gracile* var. *elegans*
7,8	*Pleurotaenium kayei*, end view

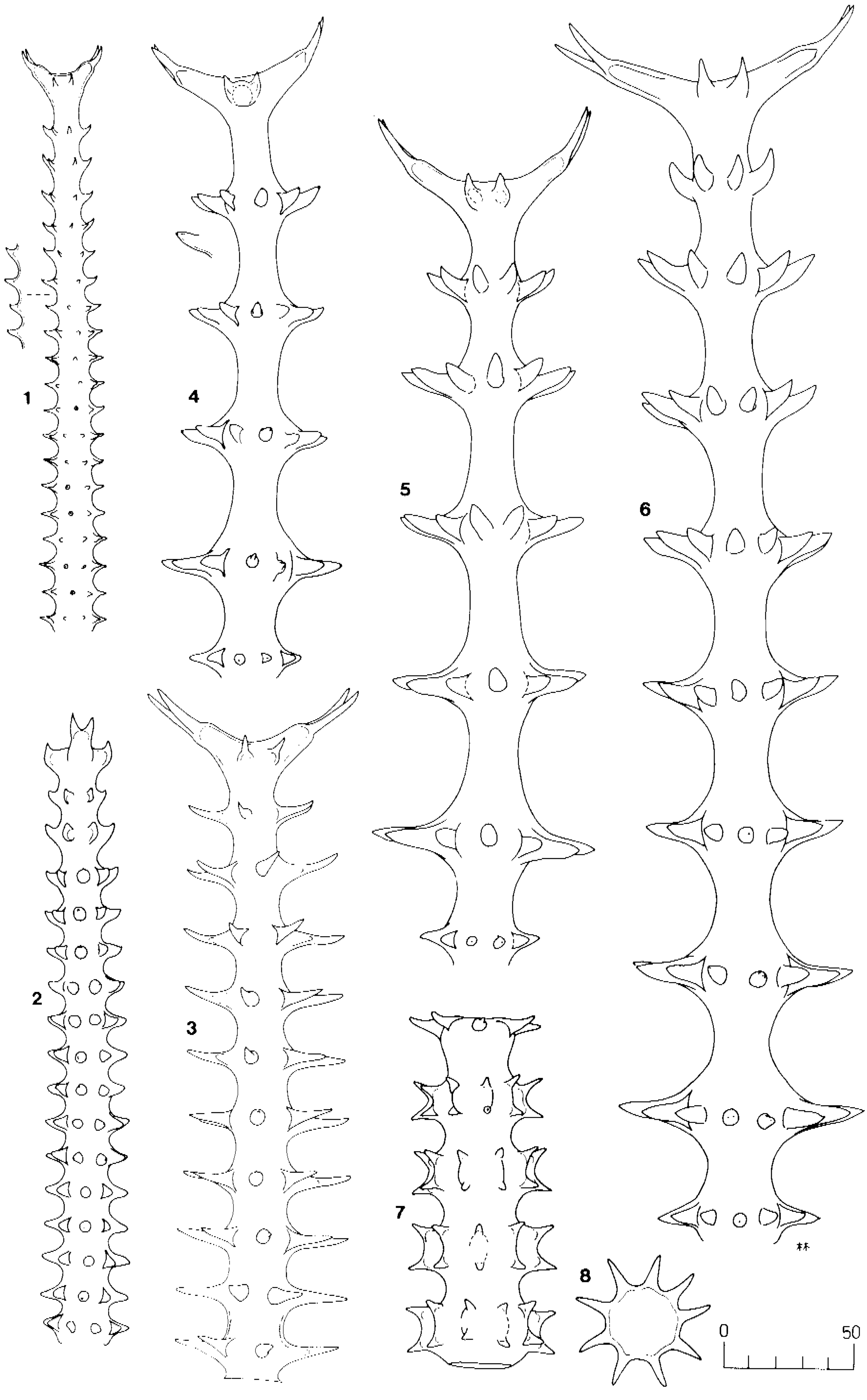
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PLATE 11

1,2	*Triploceras gracile* forma 3
3	*T. verticillatum* var. *superbum*
4–6	*Pleurotaenium australianum* fa. 1: 5: end view
7–9	*Pl. australianum* fa. 2: 8: end view 9: basal whorl of spines
10	*Pl. australianum* fa. 3

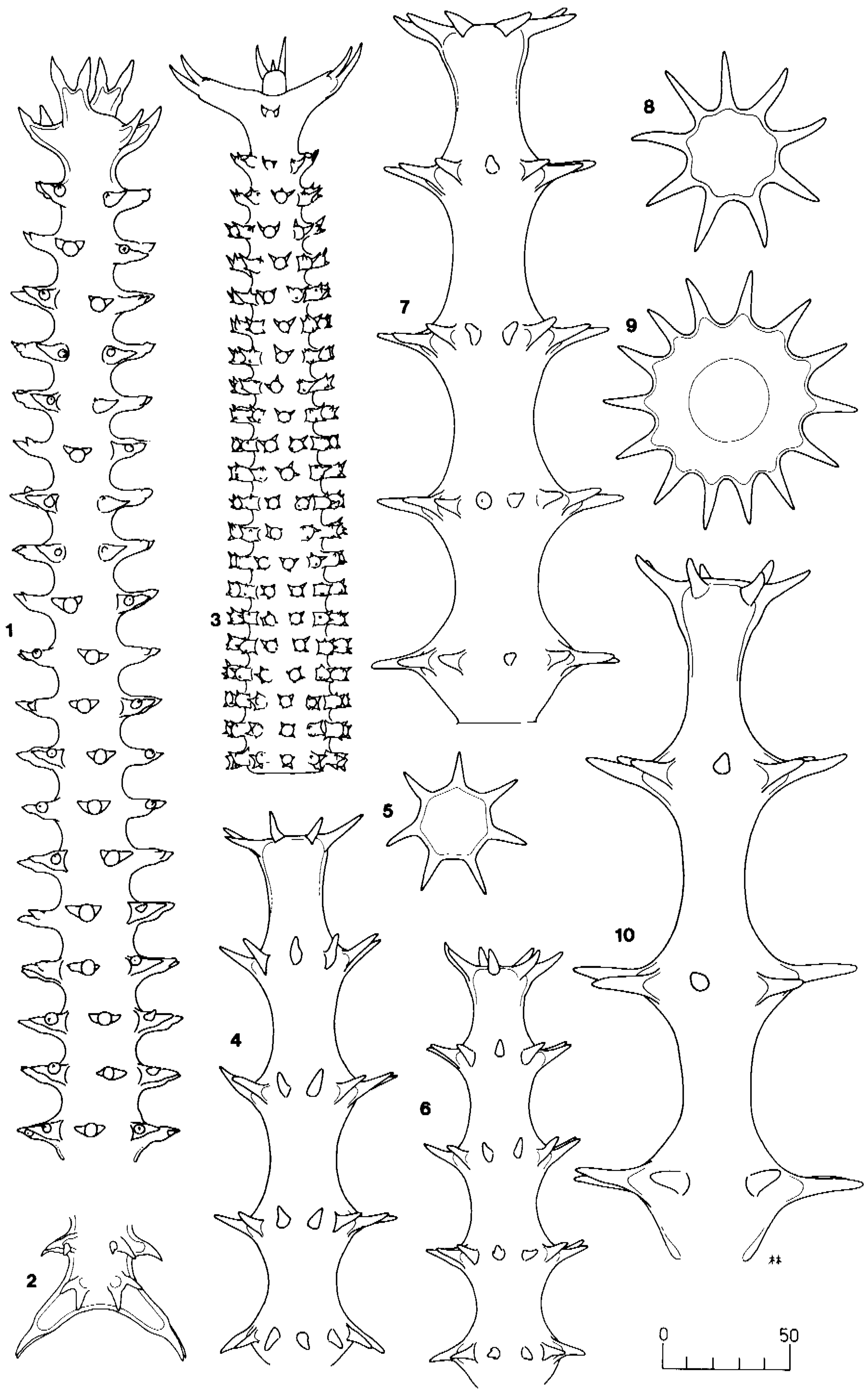

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PLATE 12

1–11	*Pleurotaenium elatum* forma, showing the range of morphological variation
12,13	*Pl. subcoronulatum*, large cell
14,15	*Triploceras splendens*
16	*Pl. coroniferum* var. *multinodosum*
17	*Pl. burmense* var. *curtum*
18	*Pl. coronatum* forma
19–24	*Pl. subcoronulatum*, range of forms
	Scale (a): 1, 3, 5, 8, 10, 12, 20, 21
	Scale (b): 2, 4, 6, 7, 9, 11, 14–19, 22–24

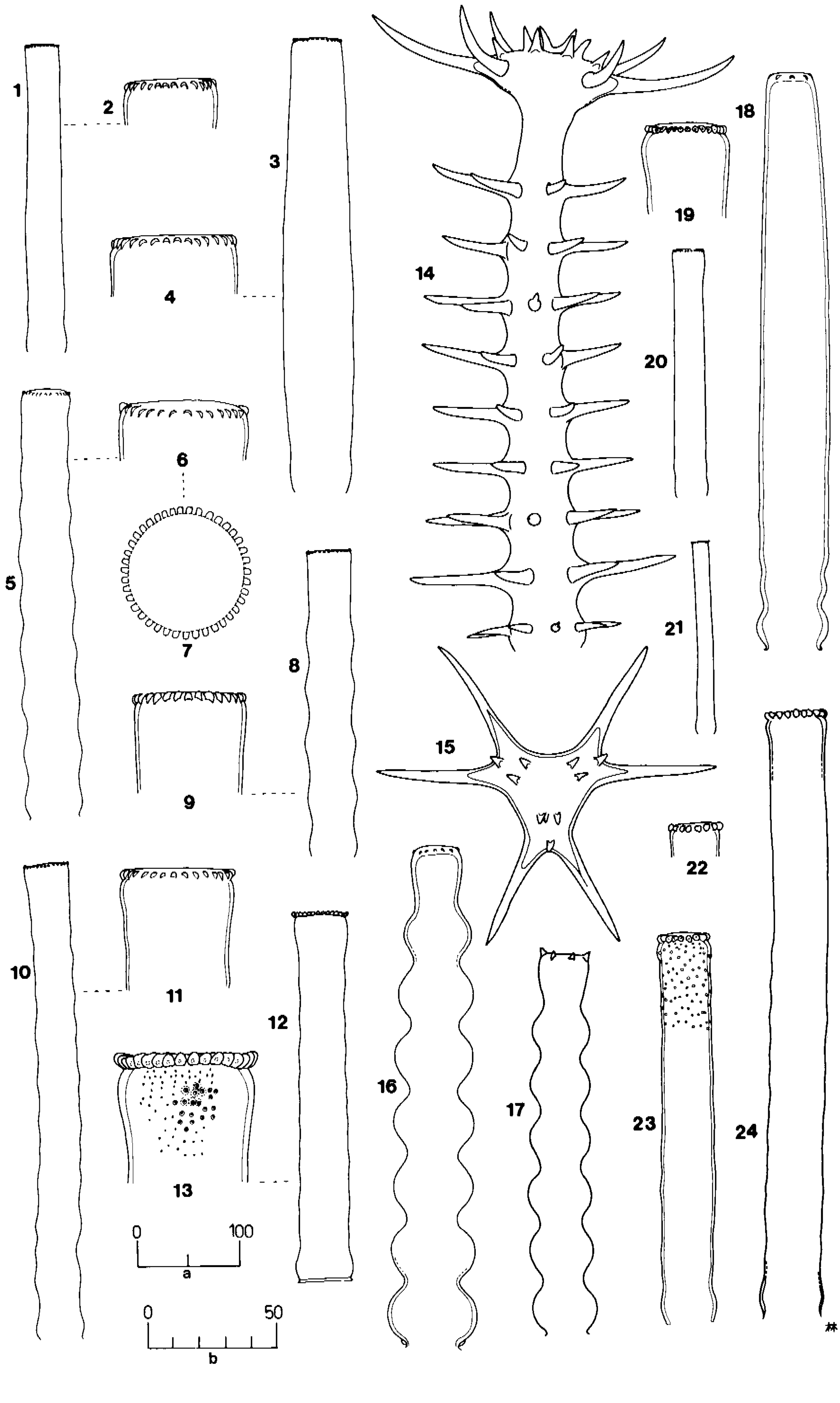
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PLATE 13

1–3	*Pleurotaenium nodosum* forma; semicell, end view and 1st whorl of processes respectively
4	*Pl. nodosum* var. *gutwinskii*
5	*Pl. nodosum* var. *borgei*
6	*Pl. verrucosum*
7	*Pl. ehrenbergii* var. *quantillum*
8	*Pl. minutum*
9	*Pleurotaenium* sp.
10	*Pl. ovatum* var. *tumidum*
11	*Pl. ovatum* var. *inermius*
12	*Pl. trabecula* var. *elongatum*
13	*Pl. ehrenbergii* var. *elongatum*
14	*Pl. minutum* var. *latum*
15–16	*Pl. ehrenbergii*
17	*Pl. excelsum*
18	*Pl. excelsum* var. *rhompaeum*
	Scale (a): 10 and 11 only

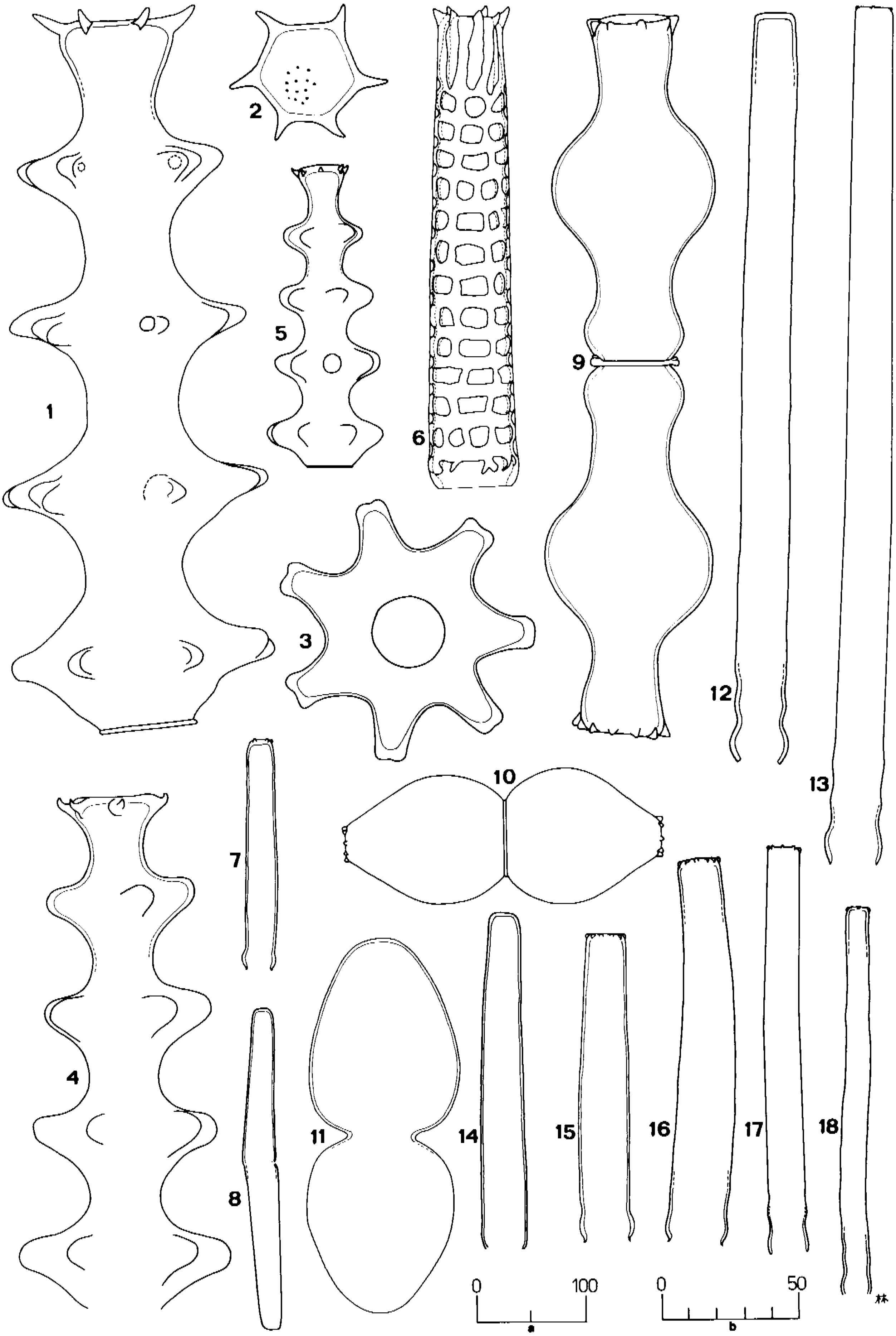
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PLATE 14

1,2	*Pleurotaenium burmense* forma
3	*Pl. sceptrum* forma
4	*Pl. minutum* var. *excavatum*
5,6	*Pl. ehrenbergii* var. *crenulatum*
7,8	*Pl. ehrenbergii* var. *undulatum*
9	*Docidium baculum* var. *inflatum*
10	*D. baculum*
11	*Cosmarium excavatum* forma
12–14	*C. excavatum* forma, small cells and zygospore
15	*C. retusiforme*
16	*C. granatum*
17	*Cosmarium* sp. 4
18	*C. trilobulatum* var. *depressum*
	Scale (a): 2, 6, 8
	Scale (b): 1, 3–5, 7, 9–18

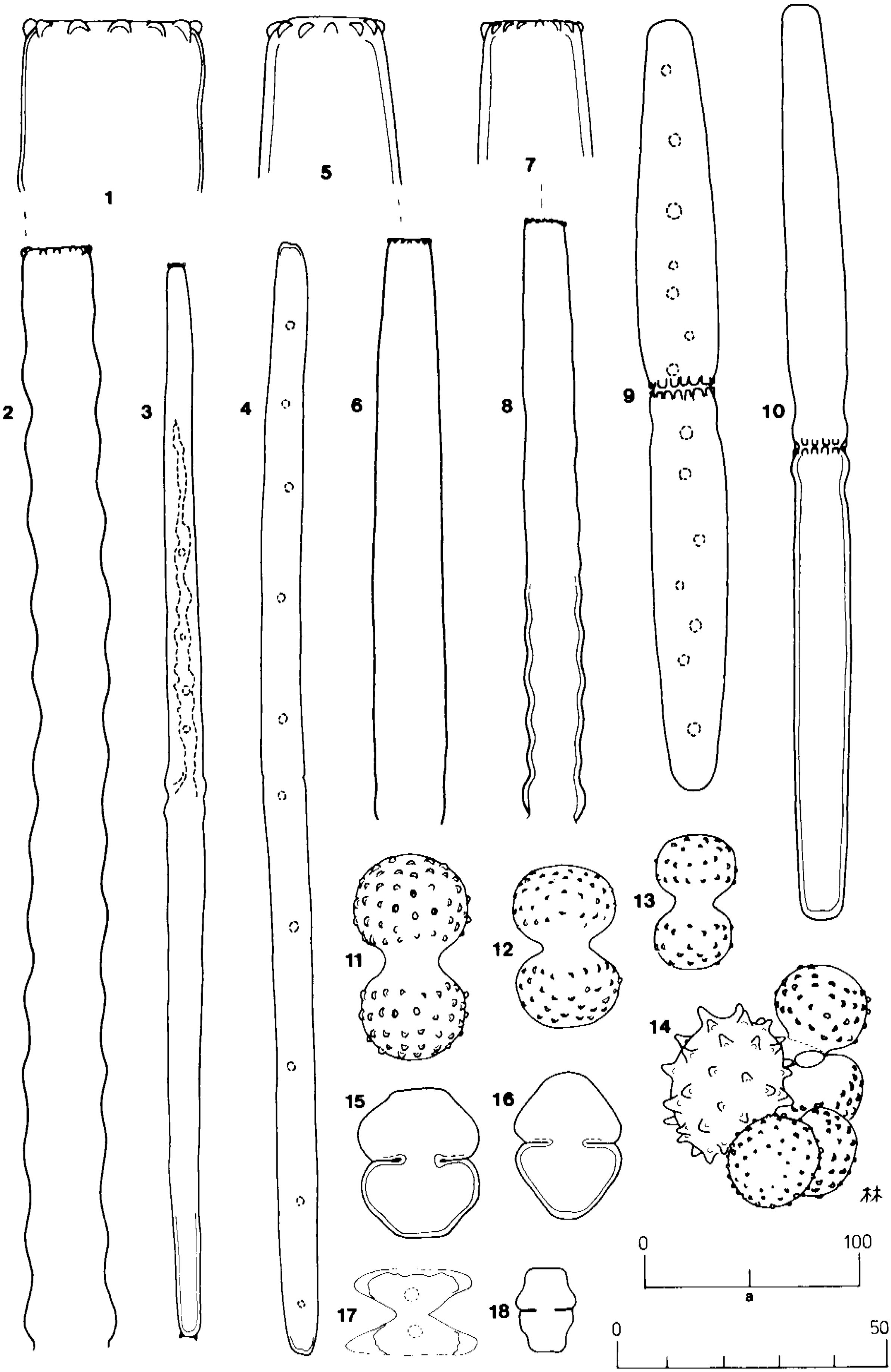
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PLATE 15

1,2	*Cosmarium contractiforme*
3	*C. contractum* var. *incrassatum*
4–6	*C. contractum* var. *pachydermum*
7–10	*C. contractum* var. *minutum*
11,12	*C. depressum* var. *minutum*
13–15	*C. pseudophaseolus* var. *tithophoroides*
16–18	*C. subtumidum* var. *pachydermum*
19,20	*C. tjibenongense* fa. *minus*
21	*C. moniliforme* var. *indentatum*
22,23	*C. perminutum* var. *australe*
24–26	*C. bioculatum* var. *hians*
27–31	*C. moniliforme* var. *ellipticum*
32,33	*C. moniliforme* var. *limneticum*
34–36	*C. moniliforme*
37	*C. indentatum* var. *ellipticum*
38	*Cosmarium* sp. 3
39	*C. pseudoscenedesmus*
40	*C. moniliforme* var. *panduriforme*

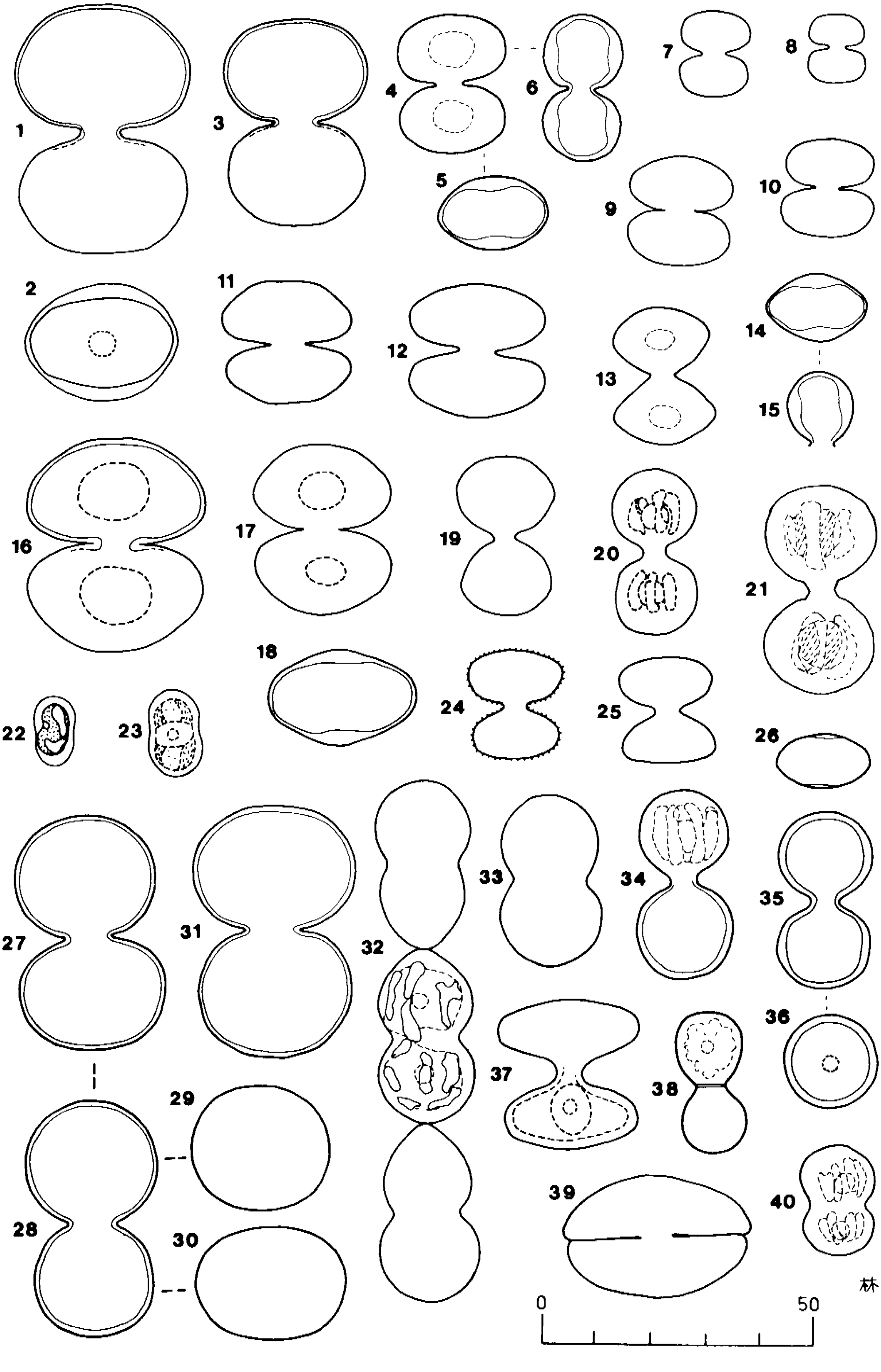

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PLATE 16

1–3	*Cosmarium nudum*
4–7	*Cosmarium* sp. 2
8	*C. javanicum* forma
9	*C. pseudopyramidatum*
10	*C. amoenum* var. *mediolaeve*
11,12	*C. amoenum* forma
13	*C. quadrifarium* var. *gemmulatum*, small form
14	*C. quadrifarium* var. *gemmulatum*
15	*C. quadrifarium* forma
16	*C. cucumis* var. *magnum*
	Scale (a): 1–7, 9–15
	Scale (b): 8 and 16

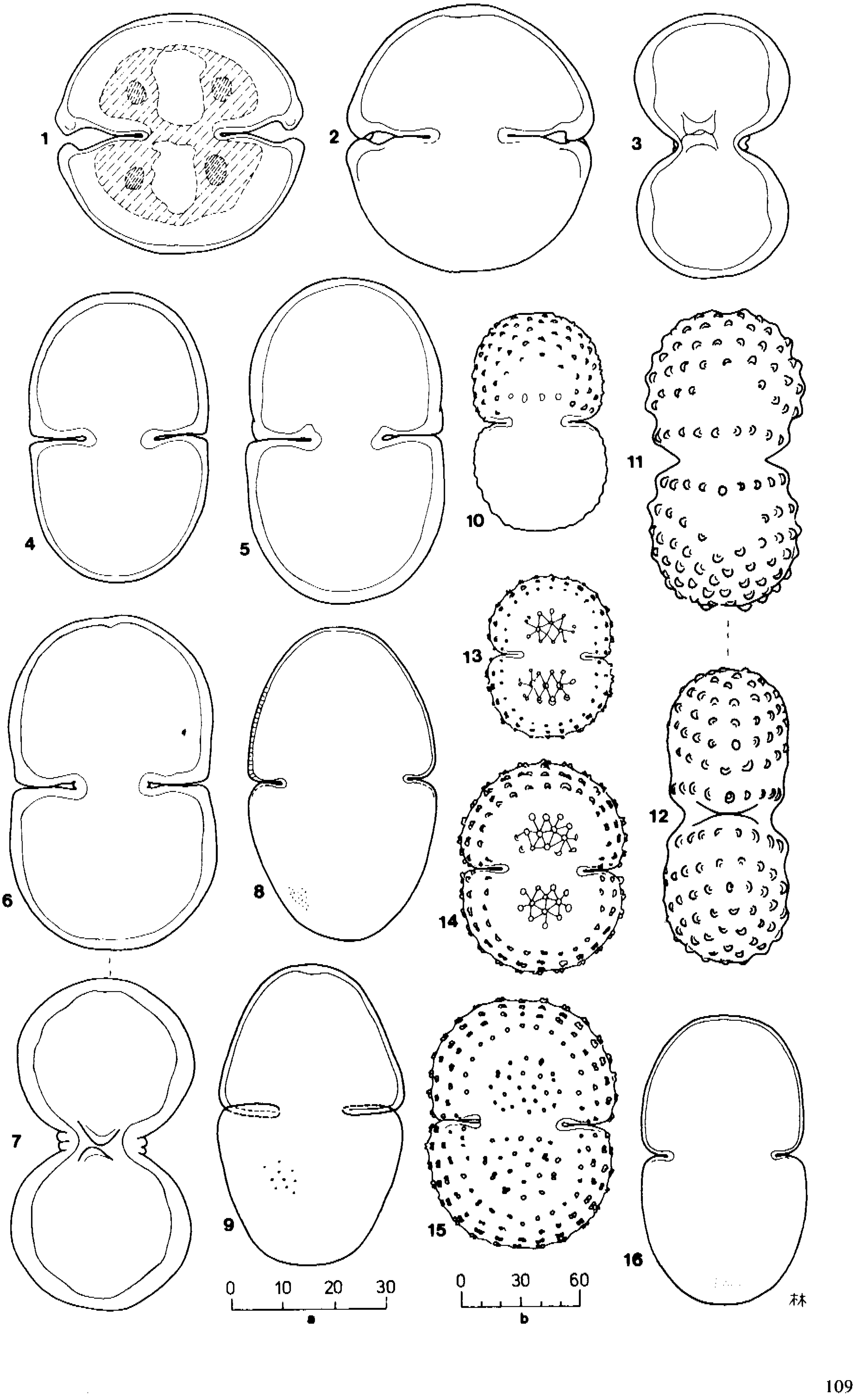
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PLATE 17

1,2	*Cosmarium connatum*
3	*C. obsoletum*
4	*C. obsoletum* var. *sitvense*
5	*C. glyptodermum* var. *tuberculatum*
6,7	*C. askenasyi*
8	*C. lundellii* var. *ellipticum*
9	*C. pachydermum*
10	*C. askenasyi* forma
11	*C. binum*
12	*C. subspeciosum* forma
13	*C. favum*
14	*C. denticulatum*
15	*C. askenasyi*
16	*C. securiforme*
17	*C. subspeciosum* forma
18	*C. askenasyi*

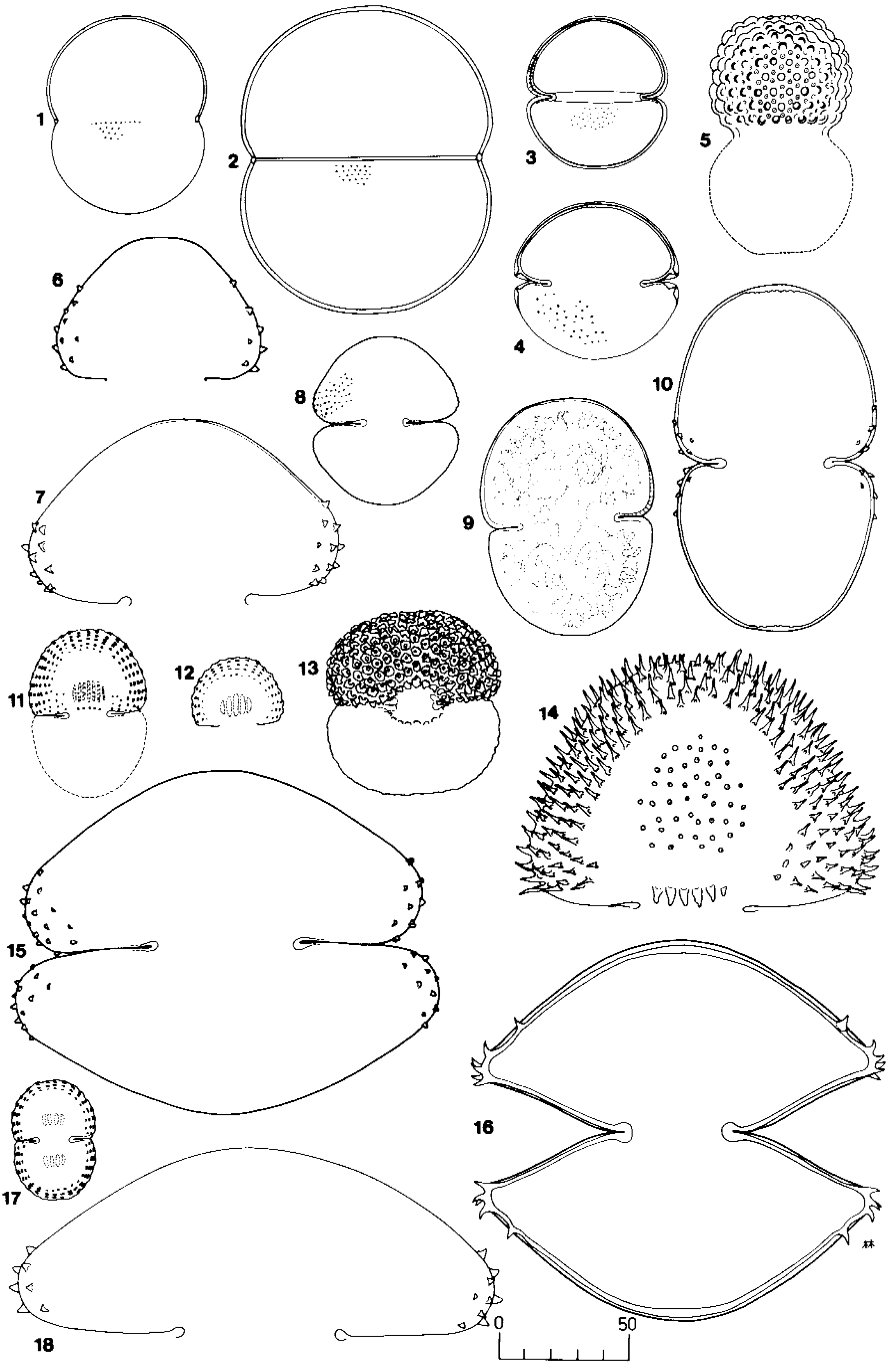
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PLATE 18

1,2	*Euastrum longicolle* var. *capitatum* fa. *minus*
3	*E. longicolle* var. *capitatum*
4	*E. ansatum* forma
5,6	*Euastrum* sp.1
7,8	*E. ansatum* var. *triporum*
9,10	*E. obesum* var. *tetmemoroides*
11,12	*E. horikawae*
13	*E. longicolle* var. *capitatum*, evolute form
14	*Euastrum* sp. 2
15	*E. sinuosum* var. *subjenneri*
16	*E. intermedium* var. *speciosum*
17	*E. intermedium* var. *poriferum*
18,19	*E. didelta* var. *bengalicum* fa. *minus*
20,21	*E. didelta* var. *bengalicum*
22	*Euastrum* sp. 3
23	*E. validum*
24	*E. borgeanum*
25	*E. asperum*
26	*E. spinulosum* var. *burmense*
27	*E. divergens*
28	*E. diplostauron*
29	*Micrasterias suboblonga* var. *australis*
30,31	*E. pulcherrimum* forma
32	*E. praemorsum* forma
33	*E. divergens* var. *rhodesiense* fa. *coronulum*
34,35	*Cosmarium punctulatum* var. *subpunctulatum*
36–38	*C. ceylanicum* fa. *minus*
39	*C. geminatum* fa. *ornatum*
40	*E. pulcherrimum* var. *menggalense*
41	*E. denticulatum* var. *quadrifarium*
42	*E. denticulatum* var. *quadrifarium* fa. *incisum*
43	*C. exasperatum*
44	*C. spinuliferum*

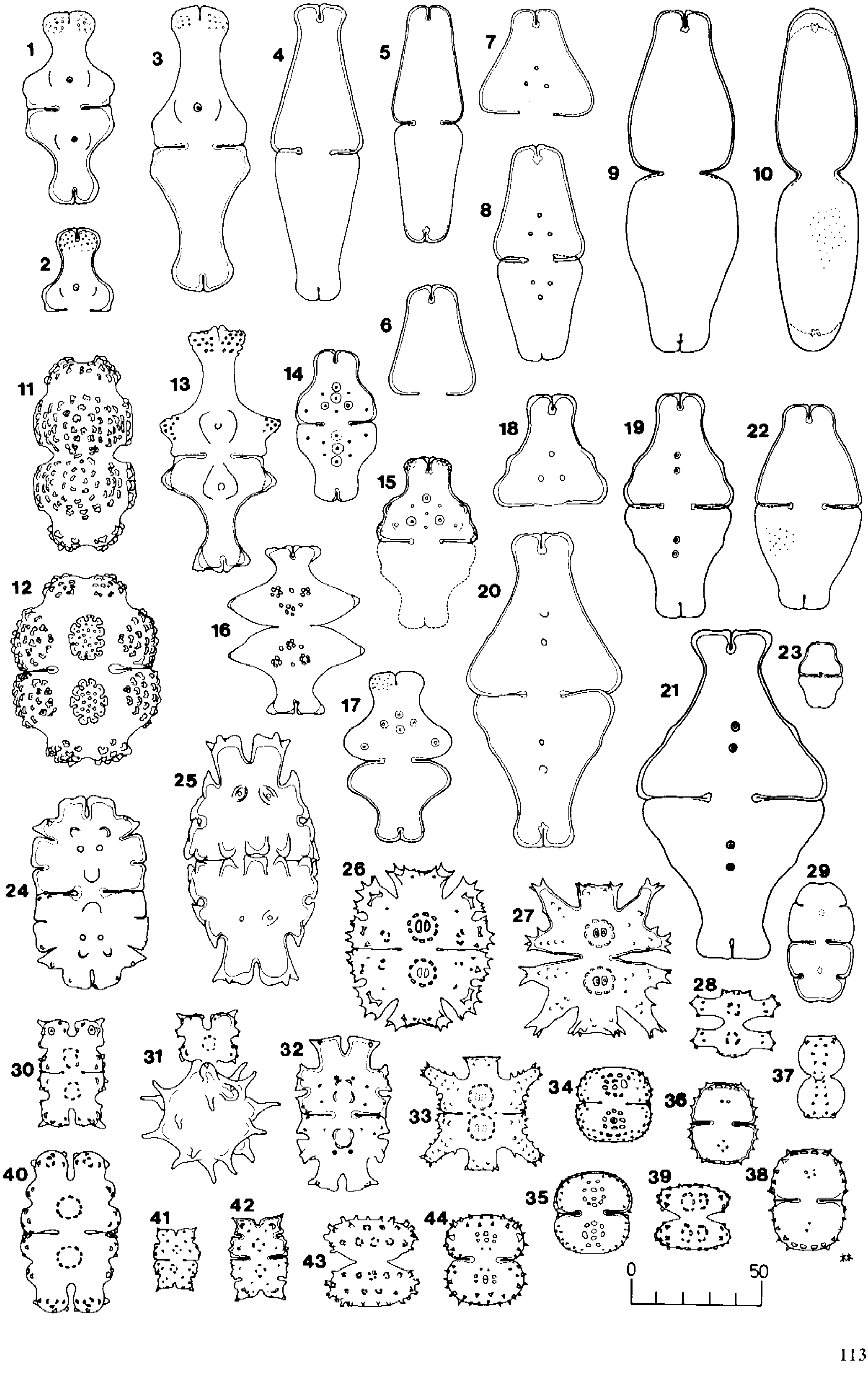
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PLATE 19

1	*Micrasterias radiosa* var. *ornata* fa. *aculeata*
2	*Euastrum moebii* var. *burmense*
3	*E. moebii* var. *diplocanthylum*
4	*E. moebii* var. *insolitum*
5	*E. moebii* var. *tetrachastriforme*
6	*E. moebii* var. *tetrachastriforme* forma
7	*E. moebii* var. *tetrachastriforme* forma, zygospore
8	*E. moebii* forma
9	*E. didelta* forma
10	*E. latepediforme*
11	*E. latepediforme* forma

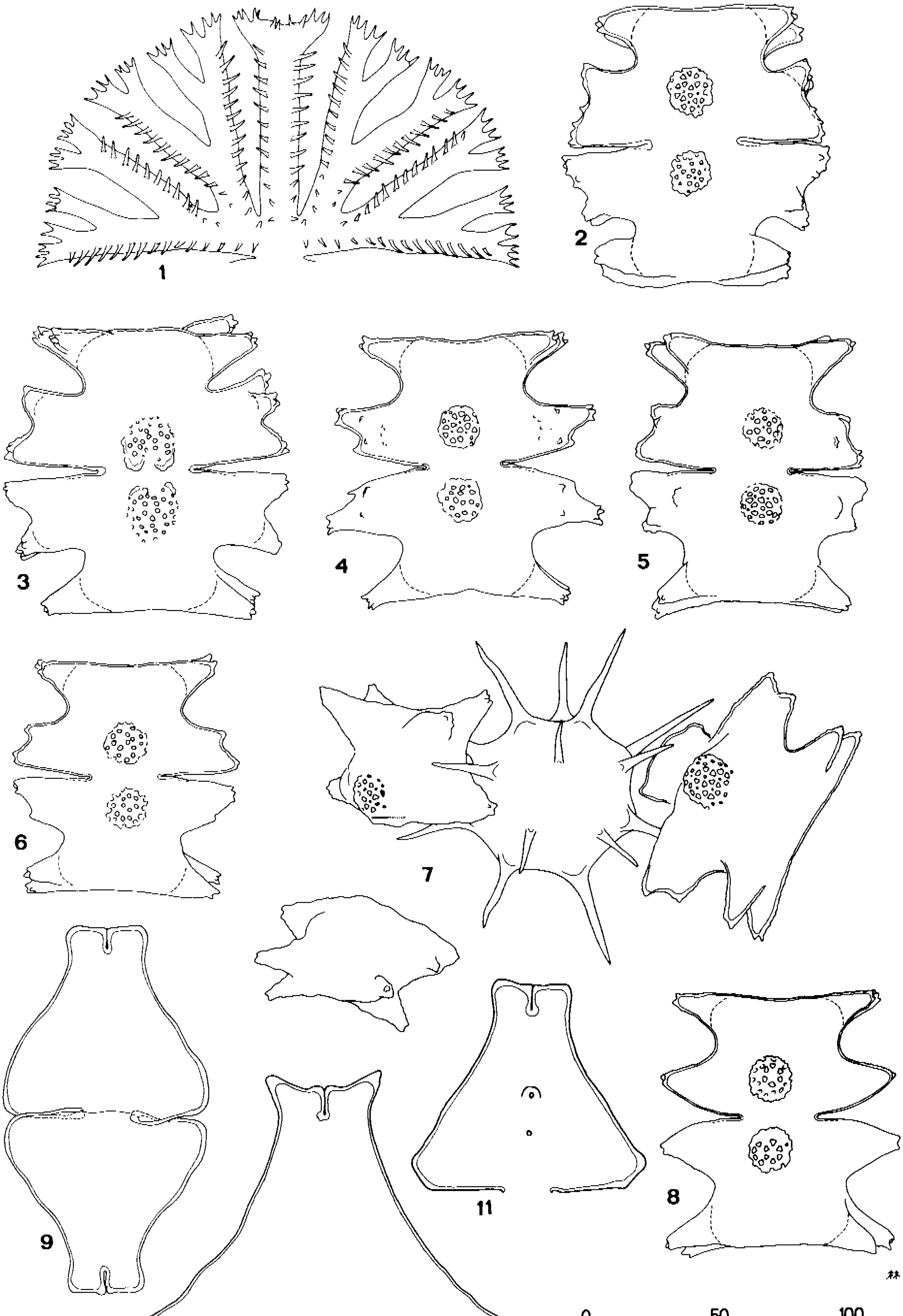
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PLATE 20

1	*Micrasterias doveri*
2,3	*M. torreyi* var. *curvata*
4	*M. thomasiana* var. *notata*
5–10	*M. torreyi* var. *crameri*, range of forms: 5: top semicell has 7 lateral lobes 6: small 8-lobed form 7: 8-lobed form 8: 8-lobed form with spines in the apical notch and a supra-isthmian swelling 9,10: forms with more incised lateral lobes
11–13	*M. lux* var. *longibracchiata* forma
14	*M. lux*
15,16	*M. thomasiana* var. *evoluta*

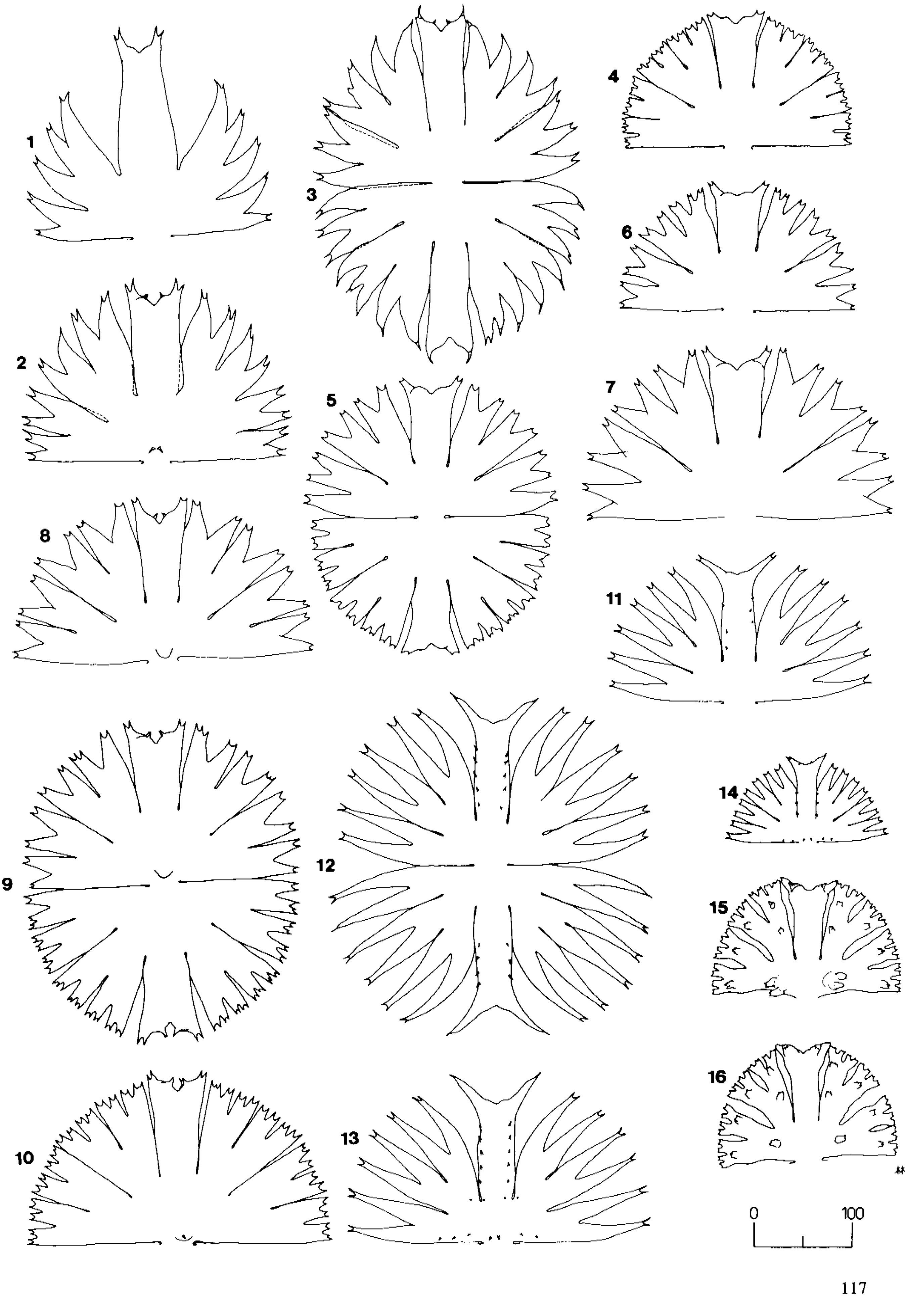
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PLATE 21

1–4	*Micrasterias tropica* var. *polonica*
5	*M. mahabuleshwarensis* var. *surculifera*
6	*M. mahabuleshwarensis* var. *reducta*
7	*M. mahabuleshwarensis* var. *tetradonta*
8	*M. zeylanica* fa. 2
9	*M. zeylanica* fa. 1
10–13	*M. zeylanica* fa. 3
14	*M. decemdentata* var. *intermedia*
15	*M. truncata*
16	*Micrasterias* sp.
17–19	*M. pinnatifida*

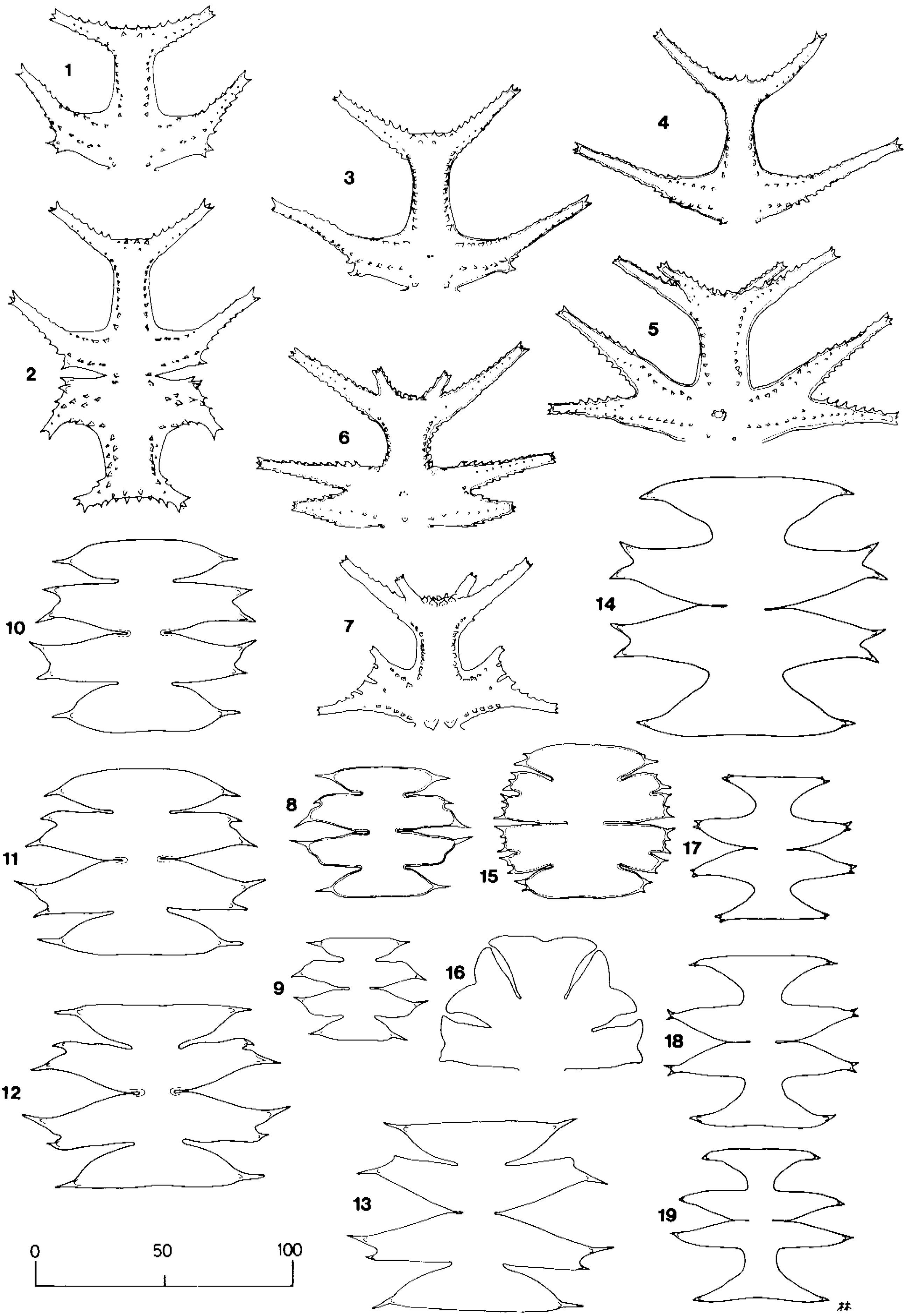
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PLATE 22

1	*Micrasterias radiosa* var. *evoluta* forma
2	*M. thomasiana* var. *torneensis*
3	*M. apiculata* var. *lacerata*
4,5	*M. foliaceae* formae
6	*M. alata*
7	*M. alata* var. *parallela*
8	*M. alata* forma
9,10	*M. anomala* var. *bifurcata*
11	*M. radians*
12	*M. ceratofera*
13	*M. foliaceae*
14	*M. foliaceae* var. *ornata*
	Scale (a): 2–5, 11, 13, 14
	Scale (b): 1, 6–10, 12

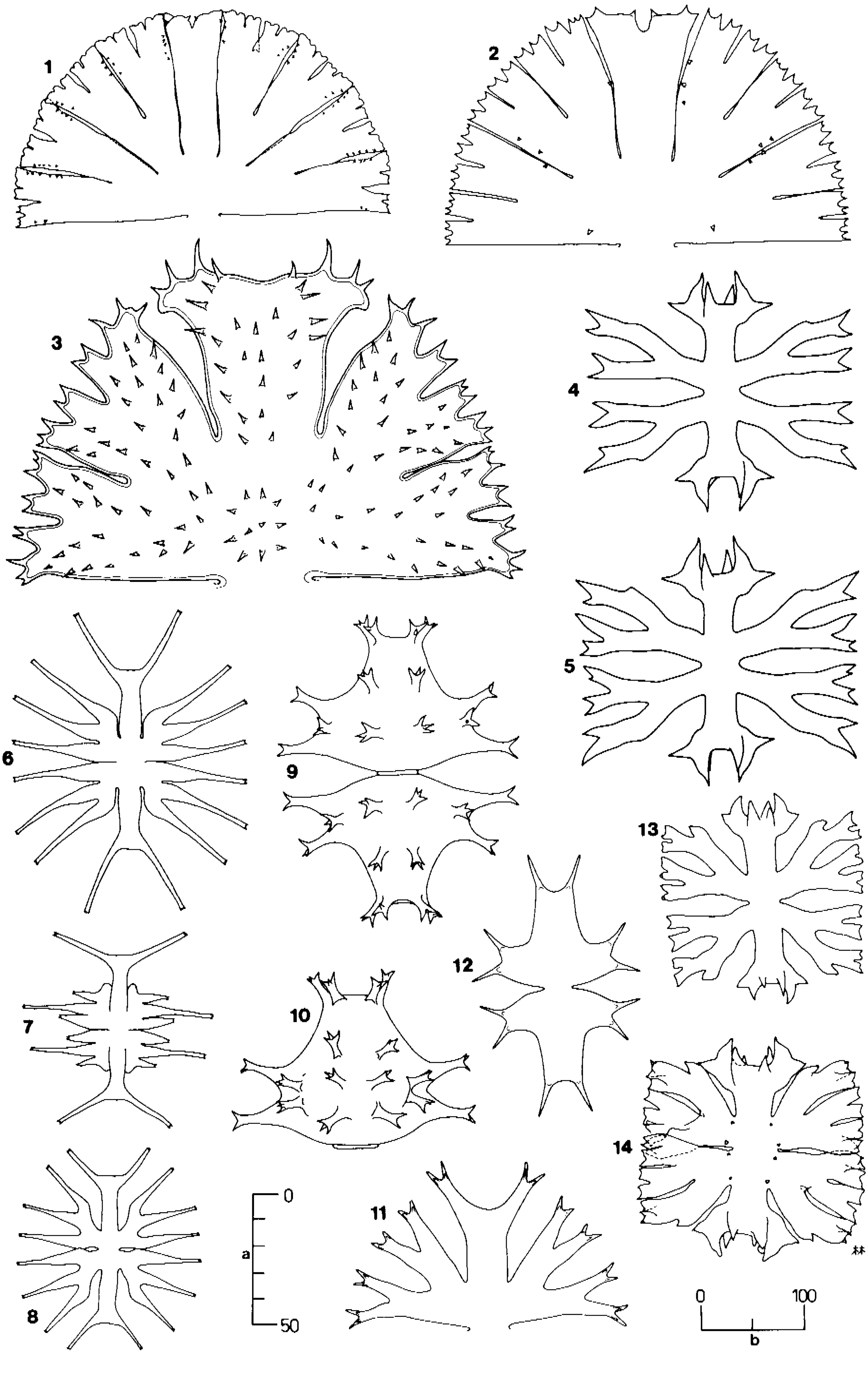
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PLATE 23

1,2	*Xanthidium superbum*
3	*X. armatum* var. *anguliferum*
4–6	*X. acanthophorum*
7–9	*X. antilopaeum* var. *laeve* fa. *longispinum*
10	*X. calcarato-aculeatum*
11	*Staurastrum hypacanthum*
12,13	*Cosmarium obsoletum* forma
14	*Cosmarium* sp. 1, zygospore
15	*Cosmarium* sp. 1
16,17	*C. lundellii* var. *corruptum*
18	*C. zonatum*
19	*Actinotaenium cucurbitinum*
20	*A. capax* var. *minus*
21	*A. elongatum* forma
22	*A. cucurbita*

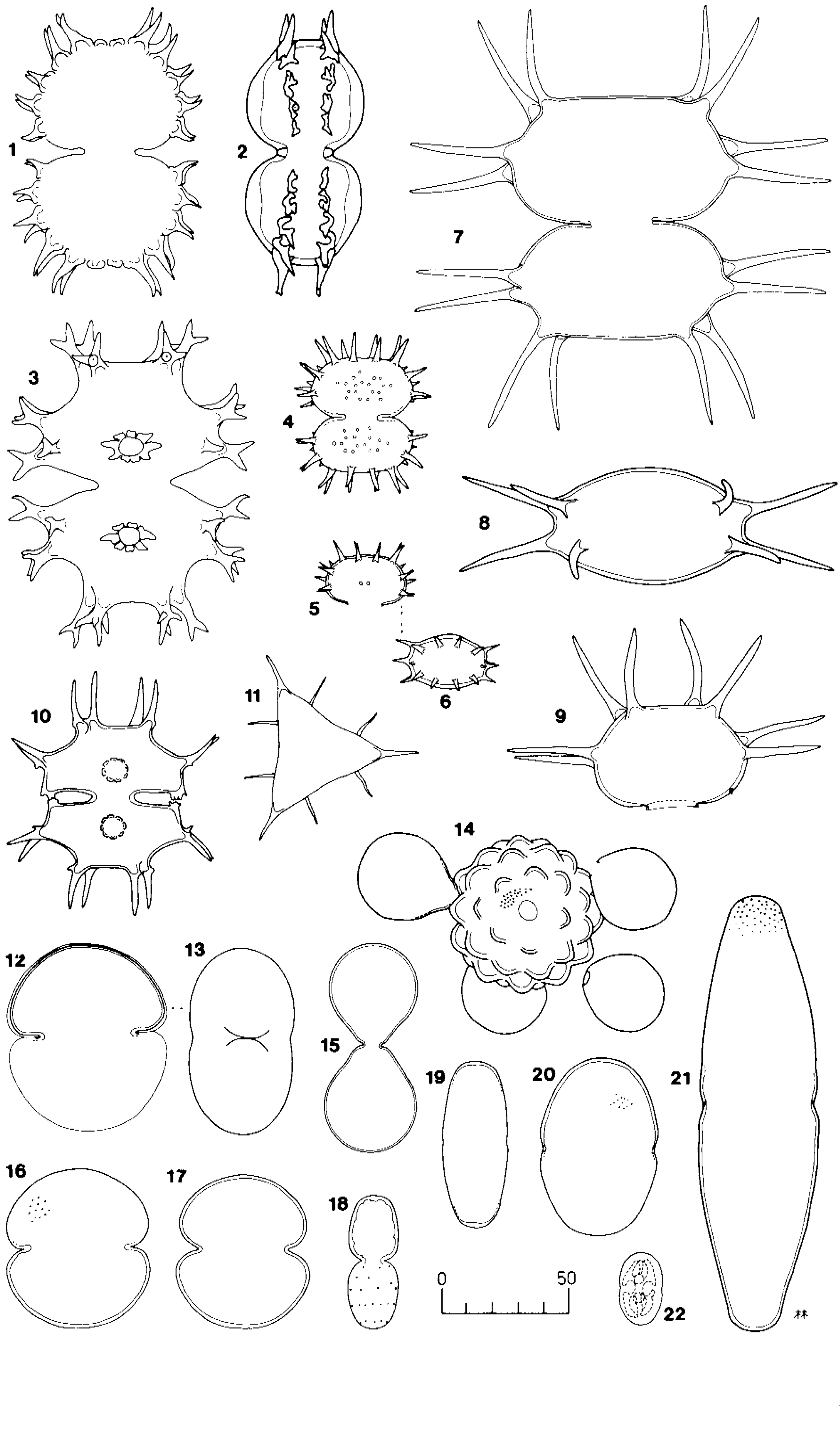
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PLATE 24

1–11 *Xanthidium multicorne* series:
1: large form
2,3: cell showing 3–4 'symmetrical asymmetry'
4: end view
5,6: cells with 6 pairs of convergent spines per semicell
7,8: cells with 4–6 pairs of divergent spines per semicell
9: cell showing 2–3 'symmetrical asymmetry'
10: intermediate cell
11: 'droopy' cell

12 *X. hastiferum*
13,14 *X. hasteriferum* var. *javanicum*
15 *X. sexmamillatum* var. *pulneyense*
16,17 *Xanthidium* sp. 1
18 *X. subtrilobum*
19 *X. subtrilobum*, lower semicell has paired lateral spines
20 *X. subtrilobum* var. *inornatum*
21 *Xanthidium* sp. 2
22,23 *X. controversum*
24 *X. burkilii*

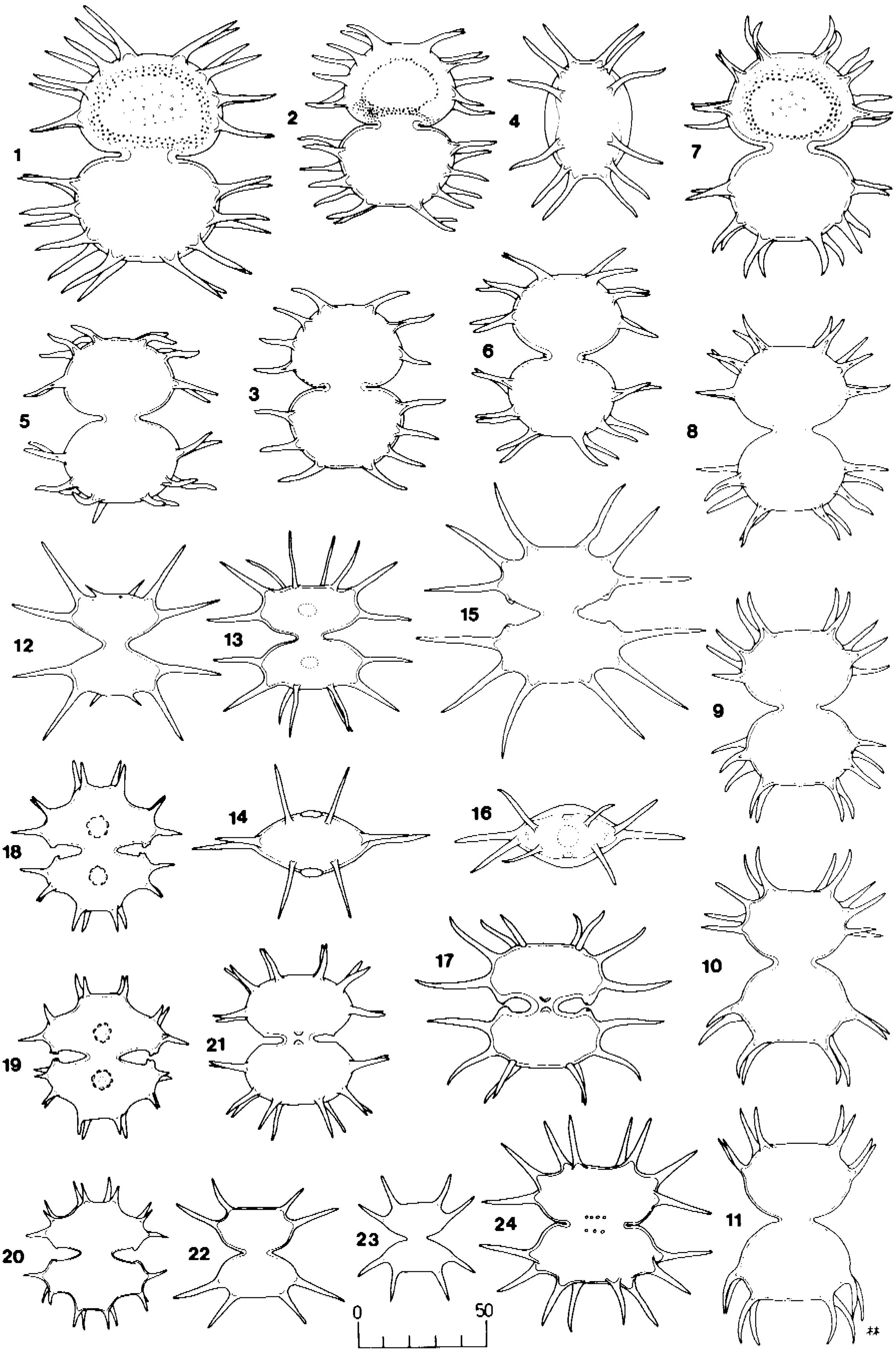
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PLATE 25

1	*Staurodesmus gibberulus*
2	*Std. gibberulus* var. *mucronatus*
3	*Std. gibberulus* var. *mucronatus* fa. *bimucronatus*
4	*Std. gibberulus* var. *mucronatus* fa. *bimucronatus*, zygospore
5,6	*Std. gibberulus* forma
7,8	*Staurastrum scottii*
9,10	*Staurodesmus* sp. 1
11–13	*Xanthidium apiculatum*
14	*X. apiculatum*, dichotypical cell
15–17	*X. apiculatum*, spinelss form
	Scale (b): 7–10 only

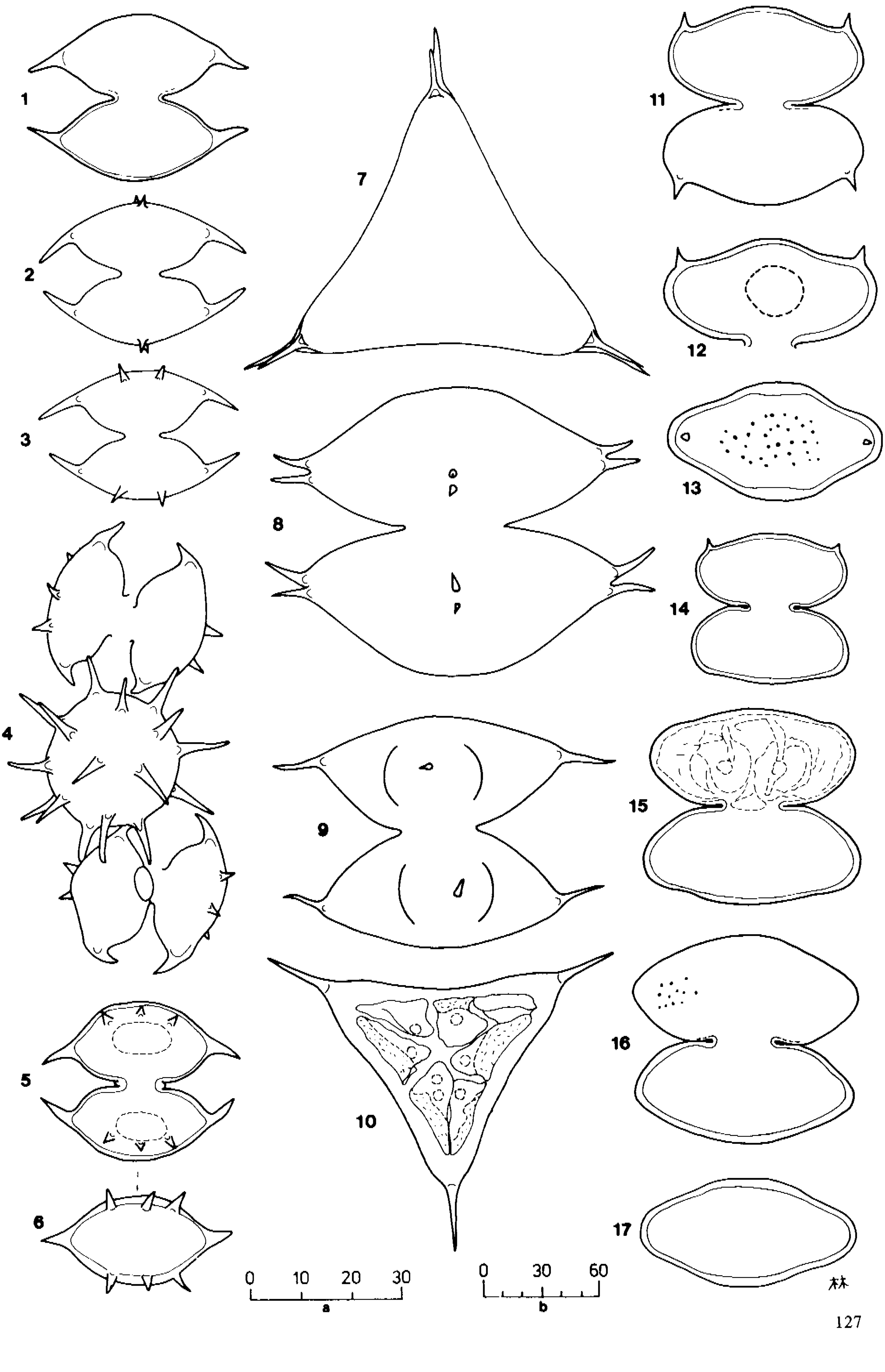
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PLATE 26

1	*Staurastrum longispinum* var. *bidentatum*
2	*Staurodesmus dickiei* var. *maximus*
3,4	*Std. dickiei* var. *maximus* fa. *grande*
5–7	*Std. megacanthus* forma
8	*Staurodesmus* sp. 2
9	*Std. arcuatus*
10	*Std. arcuatus*, dichotypical cell
11	*Std. arcuatus* var. *octospinatus*
12	*Std. arcuatus* var. *octospinatus*, zygospore
13–15	*Std. arcuatus* forma
16–18	*Std. megacanthus* var. *orientalis*
19–22	*Std. connatus*
23	*Std. connatus*, zygospore
24–26	*Std. cuspidatus* var. *curvatus*
27	*Std. cuspidatus* var. *curvatus*, dichotypical cell
28,29	*Std. cuspidatus* var. *divergens* forma
30,31	*Std. connatus* forma
32,33	*Std. cuspidatus* var. *divergens*
34	*Std. validus*
35	*Std. validus* forma
36	*Std. curvatus* var. *borgei*
37	*Std. curvatus* var. *latus*
38,39	*Std. curvatus* var. *latus* forma, zygospore
40	*Std. glaber* forma, biradiate cell
41	*Std. glaber* forma
42,43	*Std. glaber* var. *hirudinella*

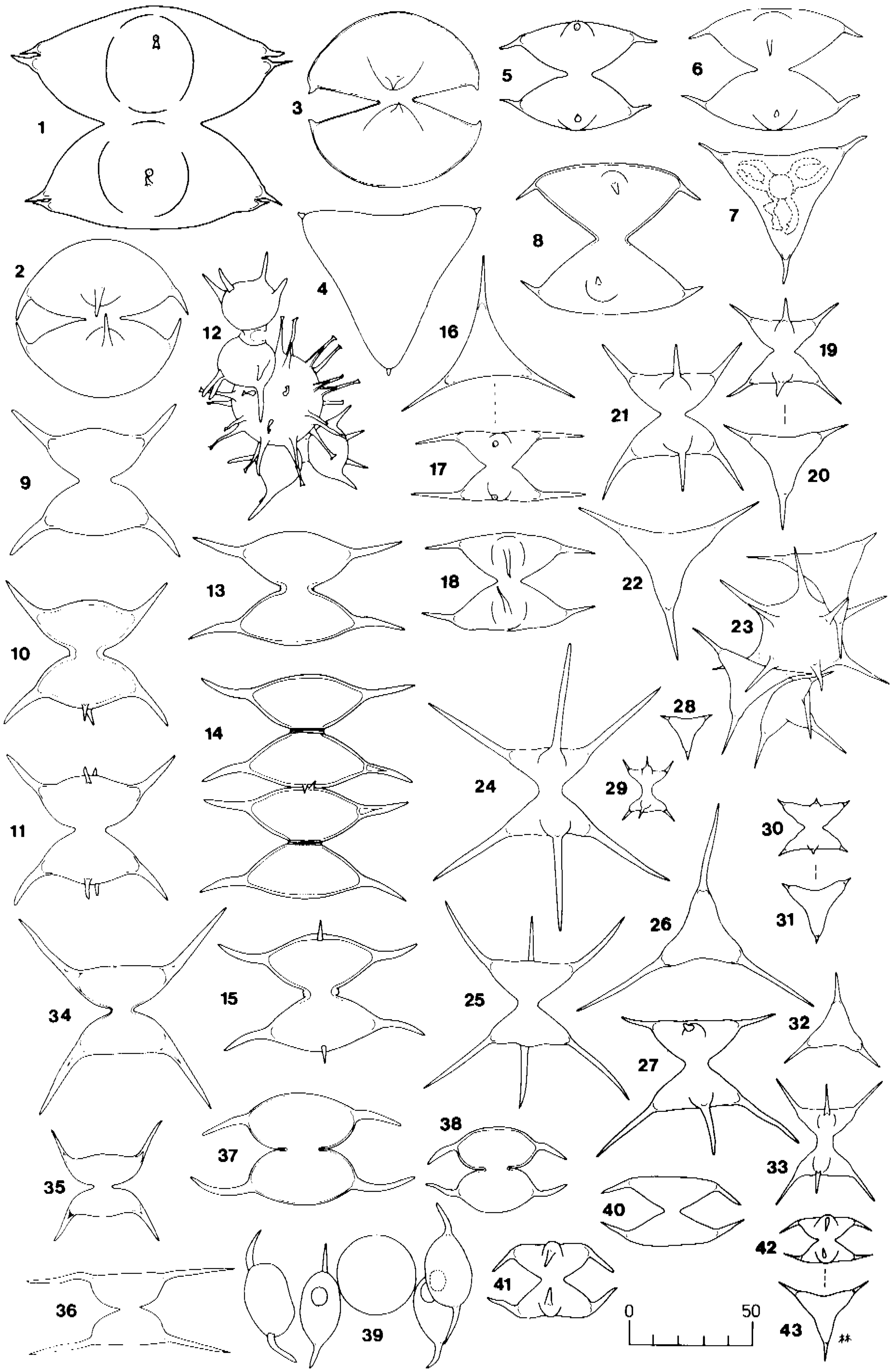
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PLATE 27

1	*Staurodesmus mucronatus* var. *delicatulus*
2–5	*Std. mucronatus* var. *delicatulus* forma
6,7	*Staurodesmus* sp. 3
8,9	*Staurodesmus* sp. 4
10,11	*Std. spencerianus* var. *triangulatus* forma
12	*Std. spencerianus* var. *triangulatus*
13,14	*Std. psilosporus* forma
15,16	*Std. dickiei* forma
17,18	*Std. dickiei* forma, biradiate cell
19	*Std. unicornis* var. *subscolopacinus*
20,21	*Std. mamillatus* var. *elegans*
22,23	*Std. unicornis* var. *gracilis*
24	*Std. lunatus* forma
25	*Arthrodesmus octocornis*
26–28	*Std. furcatospermus*
29	*Std. unicornis* var. *gracilis*
30,31	*Std. unicornis* var. *gracilis*, small form

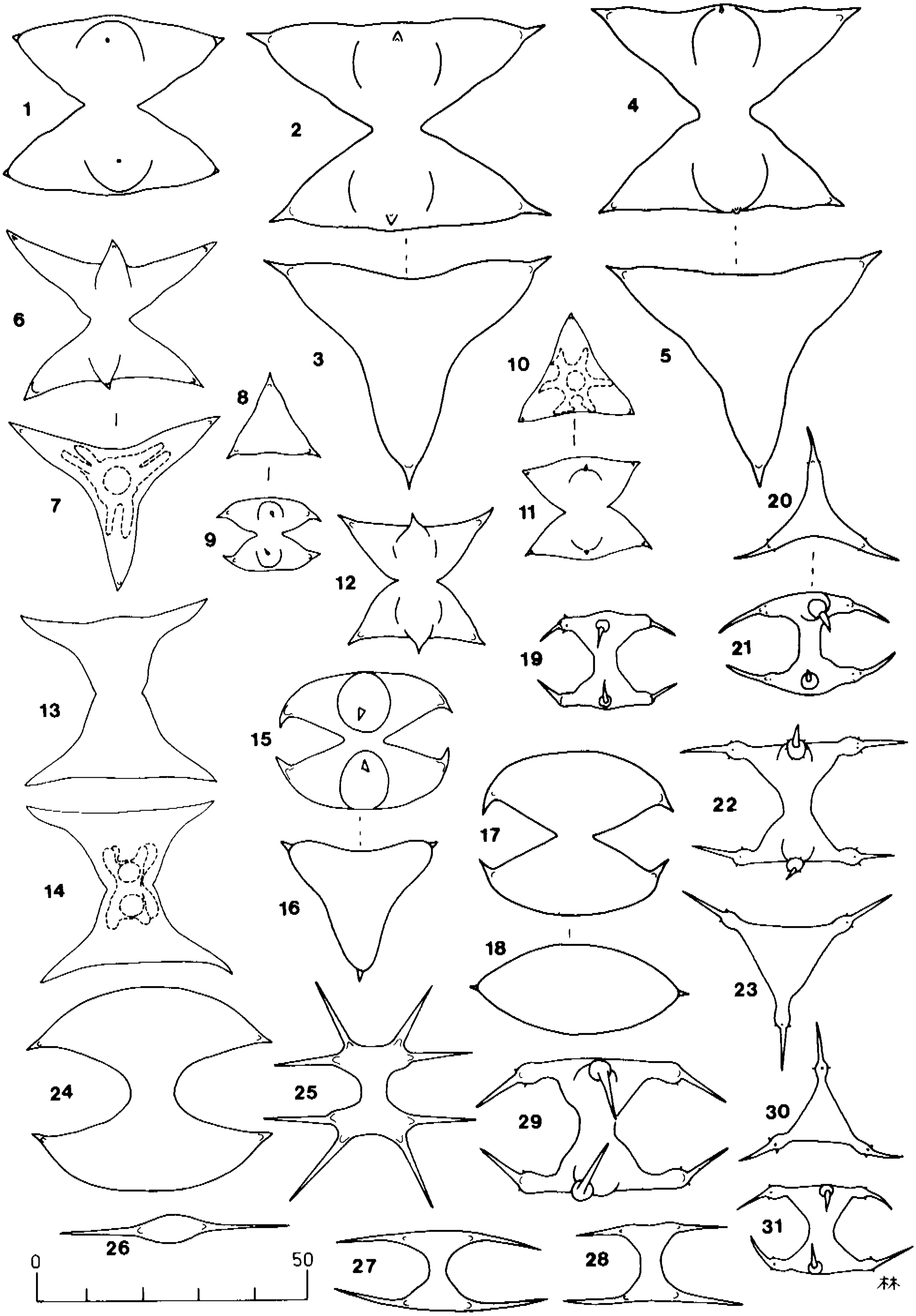
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PLATE 28

1–3	*Staurastrum wildemanii* 'var. *majus*'
4	*St. wildemanii*, dichotypical cell
5,6	*St. wildemanii*
7,8	*St. wildemanii*, 'var. *unispiniferum*'
9,10	*St. wildemanii*, dichotypical cells
11,12	*St. wildemanii* forma, 2-spined cell
13	*St. wildemanii* forma, dichotypical cell
14,15	*St. wildemanii* forma, 3-spined cell
16	*St. wildemanii* forma, end view of 4-radiate cell
17,18	*St. bifidum*

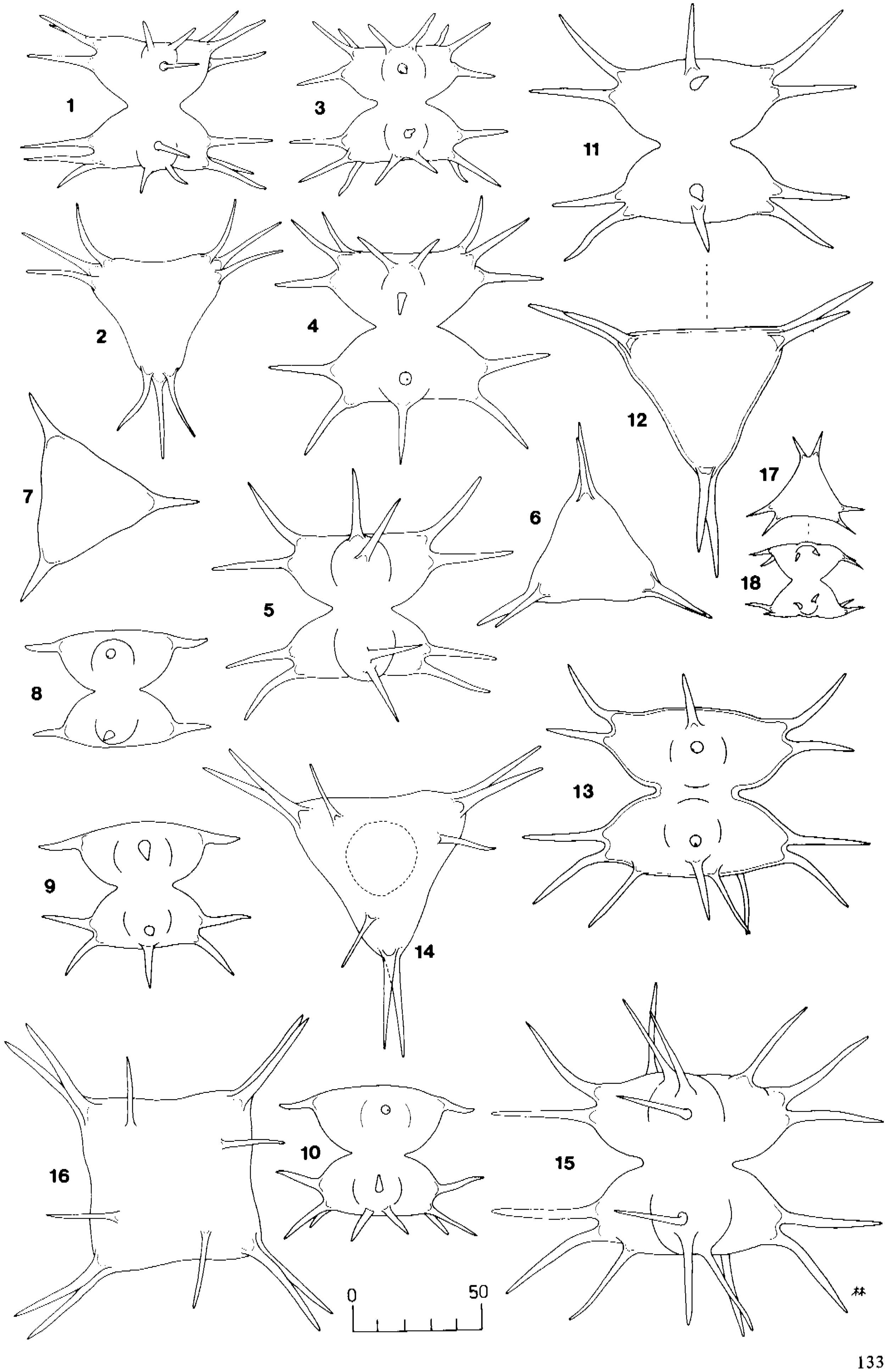
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PLATE 29

1,2	*Staurastrum* sp. 2
3,4	*St. orbiculare* var. *denticulatum*
5	*St. orbiculare* var. *denticulatum* forma
6,7	*St. orbiculare* var. *denticulatum* fa. *minor*
8,9	*St. muticum*
10–14	*St. orbiculare* var. *protractum*
15,16	*St. pachyrhynchum*
17,18	*St. clepsydra* var. *minimum*
19,20	*St coarctatum* var. *subcurtum*
21,22	*St. retusum* var. *boreale*
23	*St coarctatum* var. *horii*
24,25	*St. retusum*, small form
26	*St. retusum*, small form, zygospore
27,28	*St. retusum*, large form

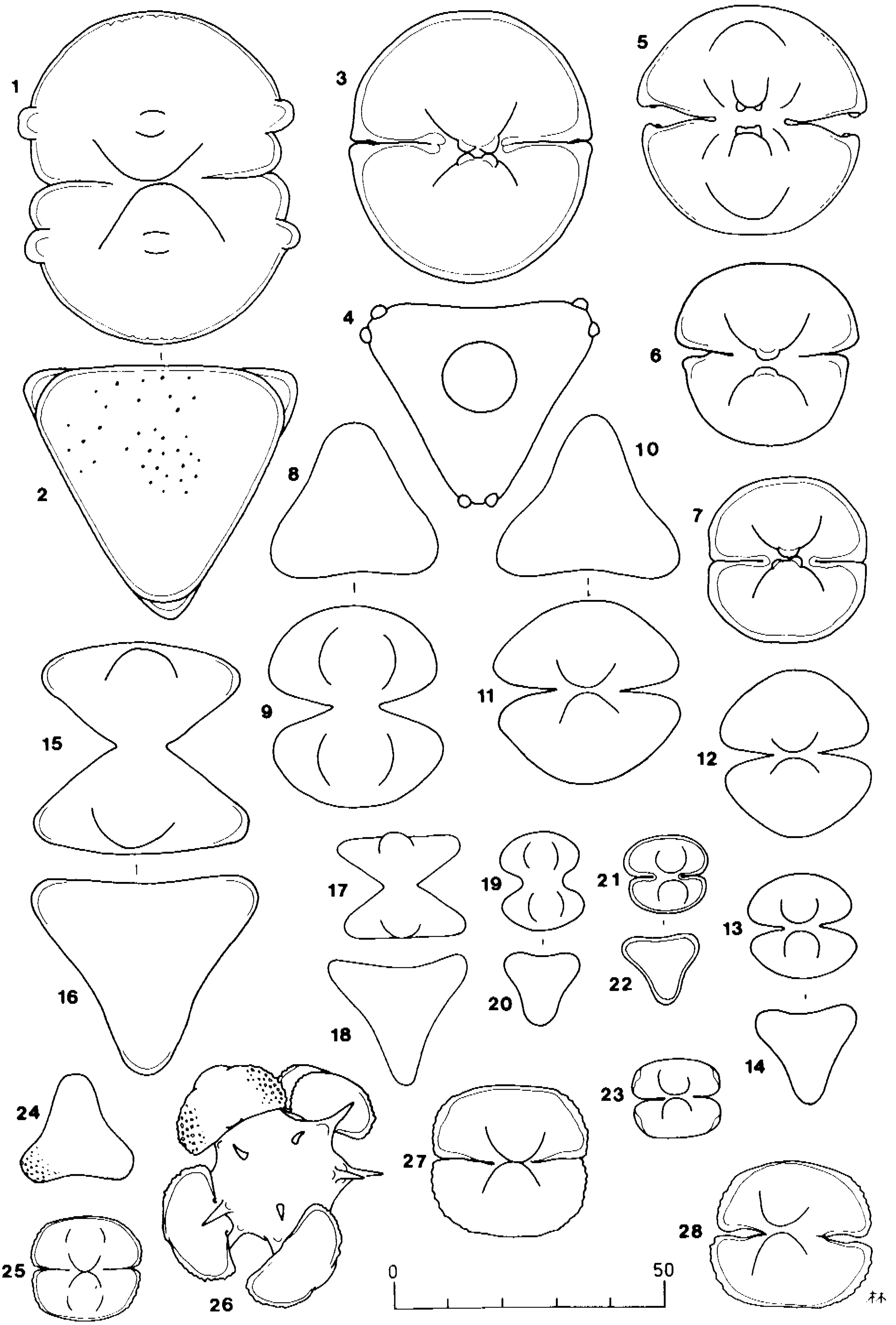
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PLATE 30

1	*Staurastrum* sp. 5
2	*St. emaciatum*
3–5	*St. acestrophorum*
6	*Staurastrum* sp. 8
7,8	*Staurastrum* sp. 6
9,10	*St. galeatum* forma
11,12	*Staurastrum* sp. 7
13,14	*St. distentum*
15–18	*St. zonatum* var. *ceylanicum* forma
19	*St. exporrectum*
20,21	*St. maskellii*
22–24	*Staurastrum* sp. 3
25,26	*Staurodesmus bulnheimii* var. *huitfeldtii*
27	*Std. extensus*

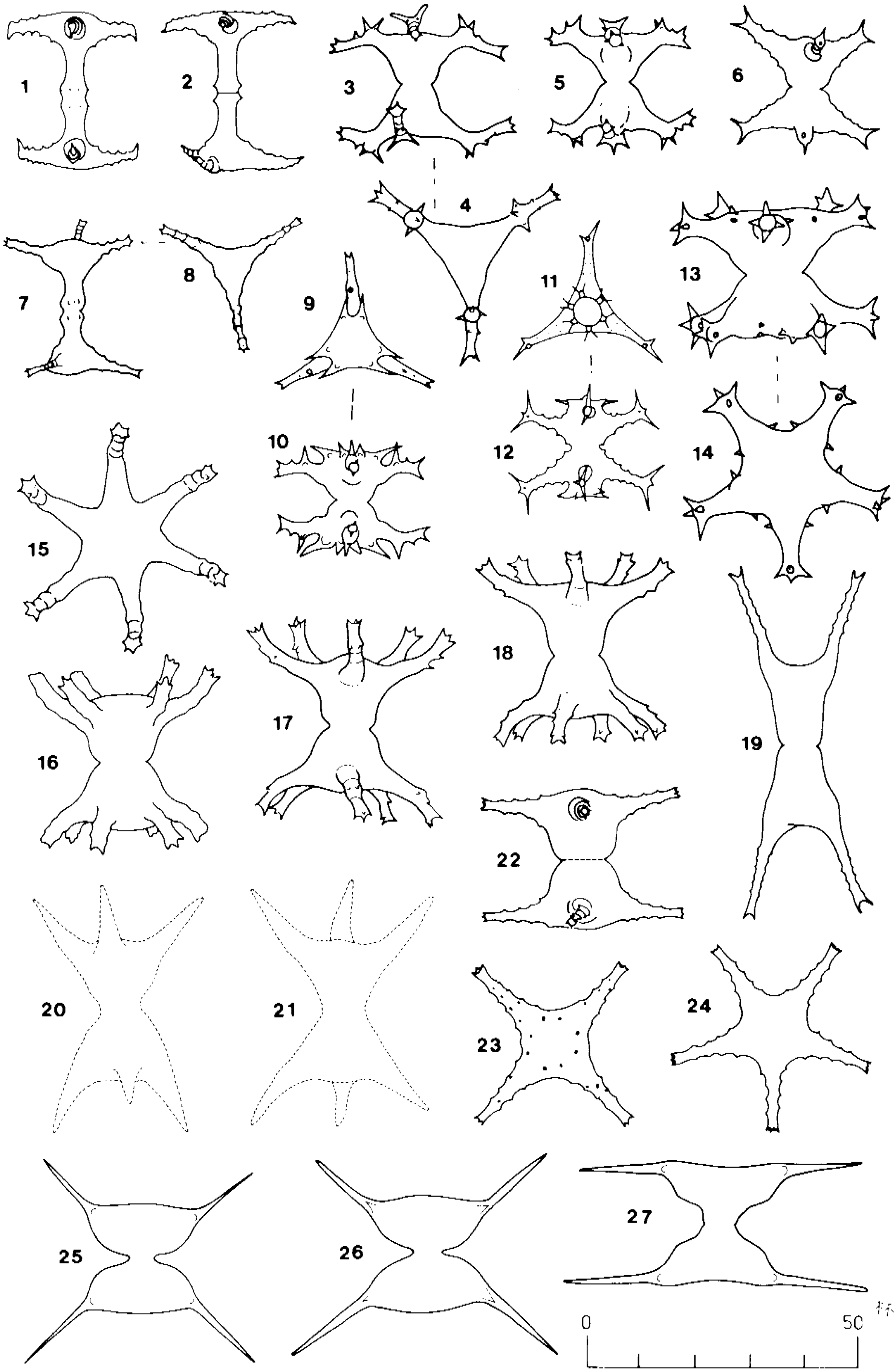
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PLATE 31

1–14	*St. saltans* var. *sumatranum*–var. *polycharax* intergrading series: 1: forma 1 — *St. saltans* var. *sumatranum* 2: forma 2 — *St. saltans* var. *sumatranum* – var. *polycharax* intermediate 3: forma 3 — *St. saltans* var. *polycharax* 4–6: Javanese forms of *St. saltans* var. *polycharax* (redrawn from Scott & Prescott 1958*b*) 7–9: forma 4 — highly developed form of *St. saltans* var. *polycharax* 10: cell with one normal and one large semicell 11–14: forma 5 — large cells
15,16	*St. longebrachiatum* forma
17	*Staurastrum* sp. 9
18	*St. columbetoides* var. *intermedium*
19,20	*Staurastrum* sp. 10
21	*St. leptocladum*
22,23	*St. indentatum* forma
24–26	*St. longebrachiatum*
27,28	*St. longebrachiatum*, form with apical spines
29	*St. longebrachiatum* var. *australe* forma

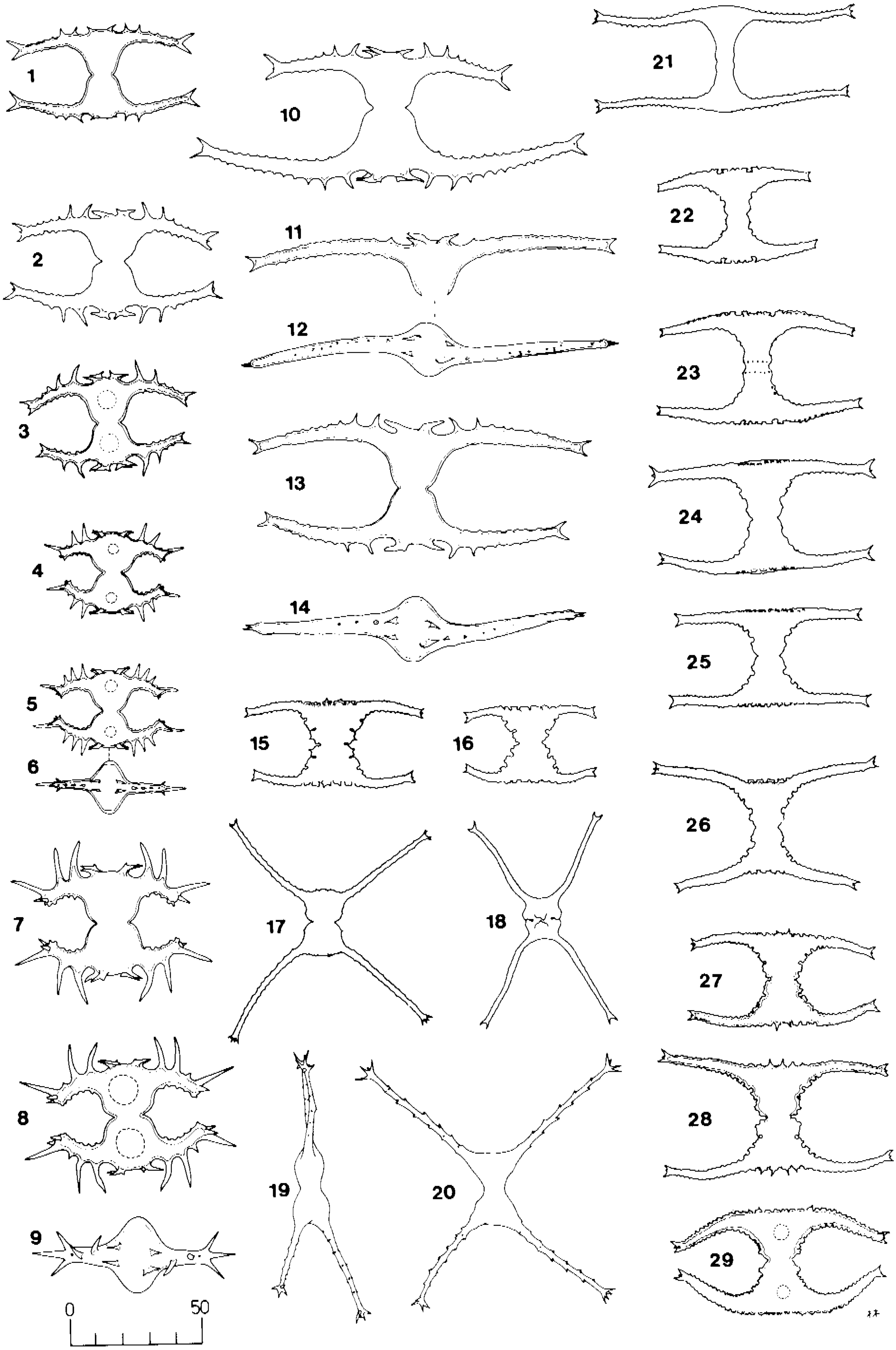
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PLATE 32

1,2	*Staurastrum excavatum*
3,4	*St. subgracillimum*
5	*St. tetracerum*
6–9	*St. tetracerum* forma
10–12	*St. subgracillimum* var. *tortum*
13,14	*St. gracile* fa. *kriegeri*
15	*St. tangaroaii*
16	*St. gracile* var. *elongatum*
17	*St. multinodulosum*
18–23	*St. ceylanicum*: 18,19: 6-radiate cell 20,21: 5-radiate cell 22: 5/4-radiate cell 23: 4-radiate semicell with quadrifid endings to the processes
24,25	*St. gladiosum*
26	*St. nodulosum*

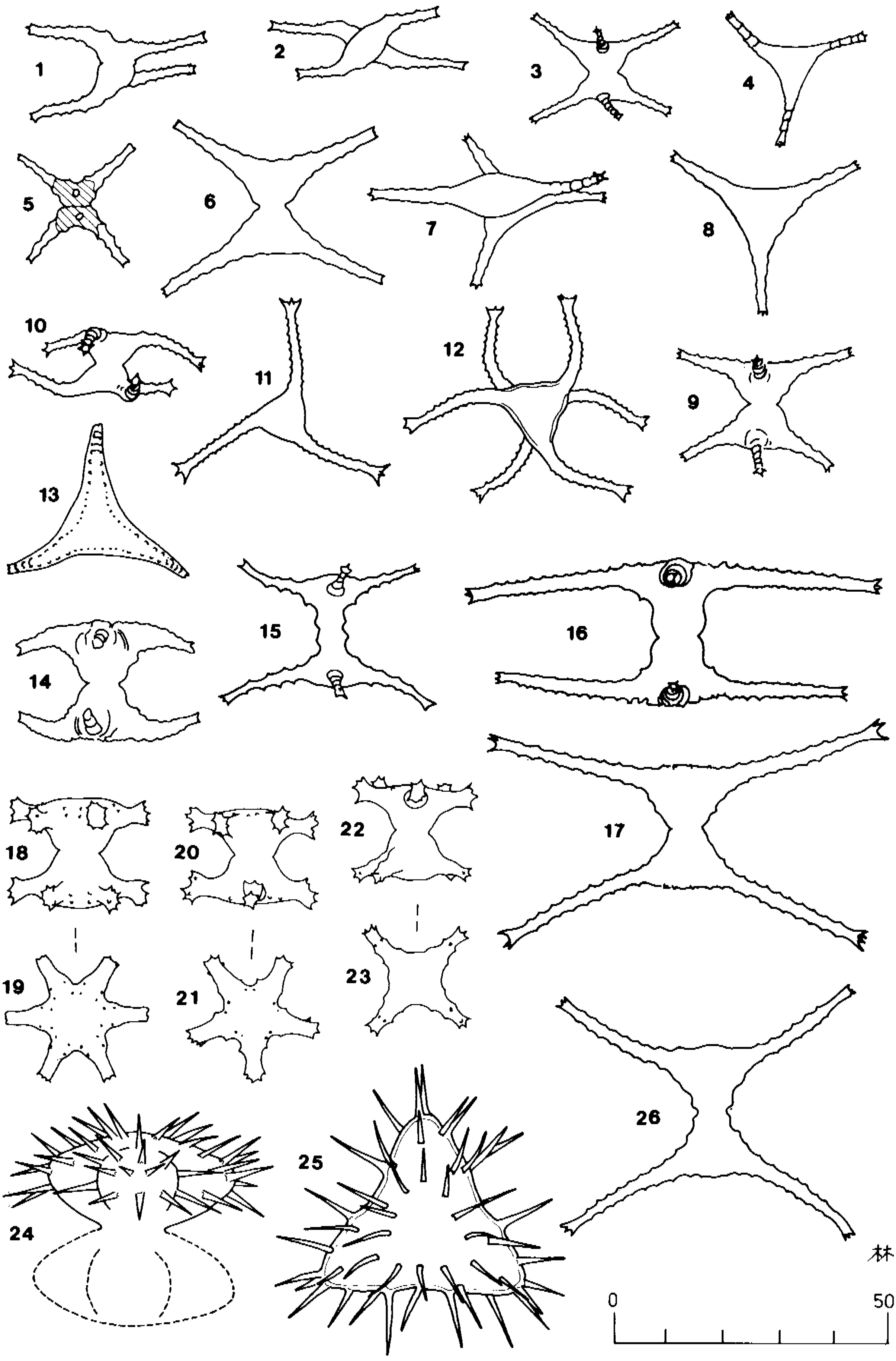
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PLATE 33

1,2	*Staurastrum tohopekaligense* fa. *minus*, robust 9-armed cell
3,4	*St. tohopekaligense* fa. *minus*, robust 15-armed cell
5,6	*St. tohopekaligense* forma, 9-armed cell
7	*St. tohopekaligense* forma, 15-armed cell
8,9	*St. clevei* forma
10,11	*St. laeve*
12,13	*Staurastrum* sp. 4
14,15	*St. tohopekaligense* fa. *minus*
16–18	*St. tohopekaligense* fa. *minus*, dichotypical cell
19,20	*St. laeve* forma
21–26	*St. botanense* formae
27	*St. inconspicuum*
28,29	*St. contectum* forma

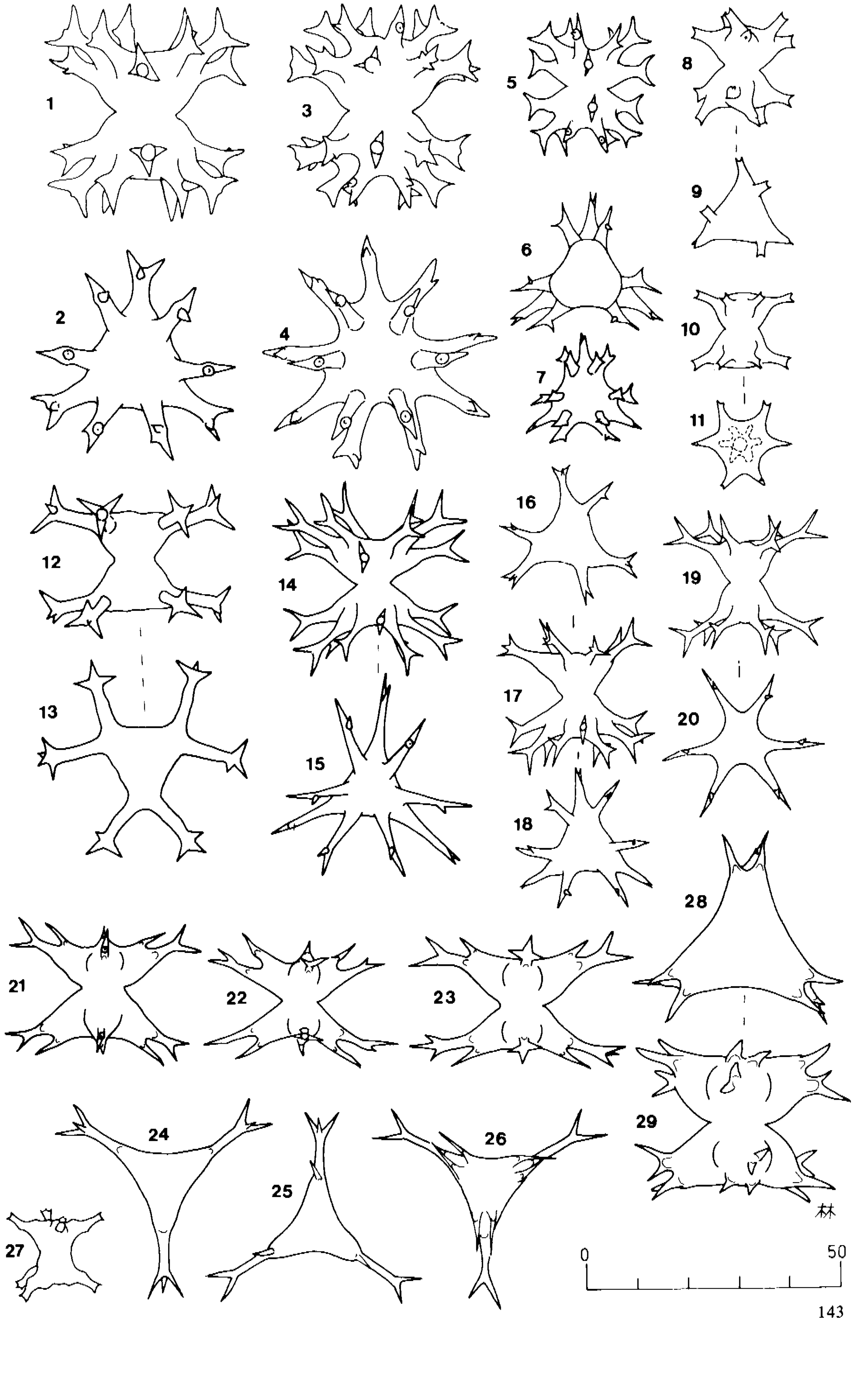
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PLATE 34

1,2	*Staurastrum tohopekaligense* var. *trifurcatum*
3,4	*St. tohopekaligense*, form with 9 arms per semicell
5,6	*St. tohopekaligense*, form with 15 arms per semicell
7,8	*St. sexangulare* forma 1
9,10	*St sexangulare* forma 2
11,12	*St. sexangulare* var. *subglabrum*, typical
13,14	*St. sexangulare* var. *subglabrum*, smooth form
15,16	*St. sexangulare* var. *subglabrum*, simple form
17–19	*St. leptopus* var. *variabile*
20,21	*St. heimii*
22–25	*St. sexangulare* var. *subglabrum*, simple form
26	*St. sexangulare* var. *subglabrum*, intermediate cell
27–29	*St. sexangulare* var. *subglabrum*, elaborate form
30	*St. pseudotetracerum*
	Scale (a): 1–29
	Scale (b): 30 only

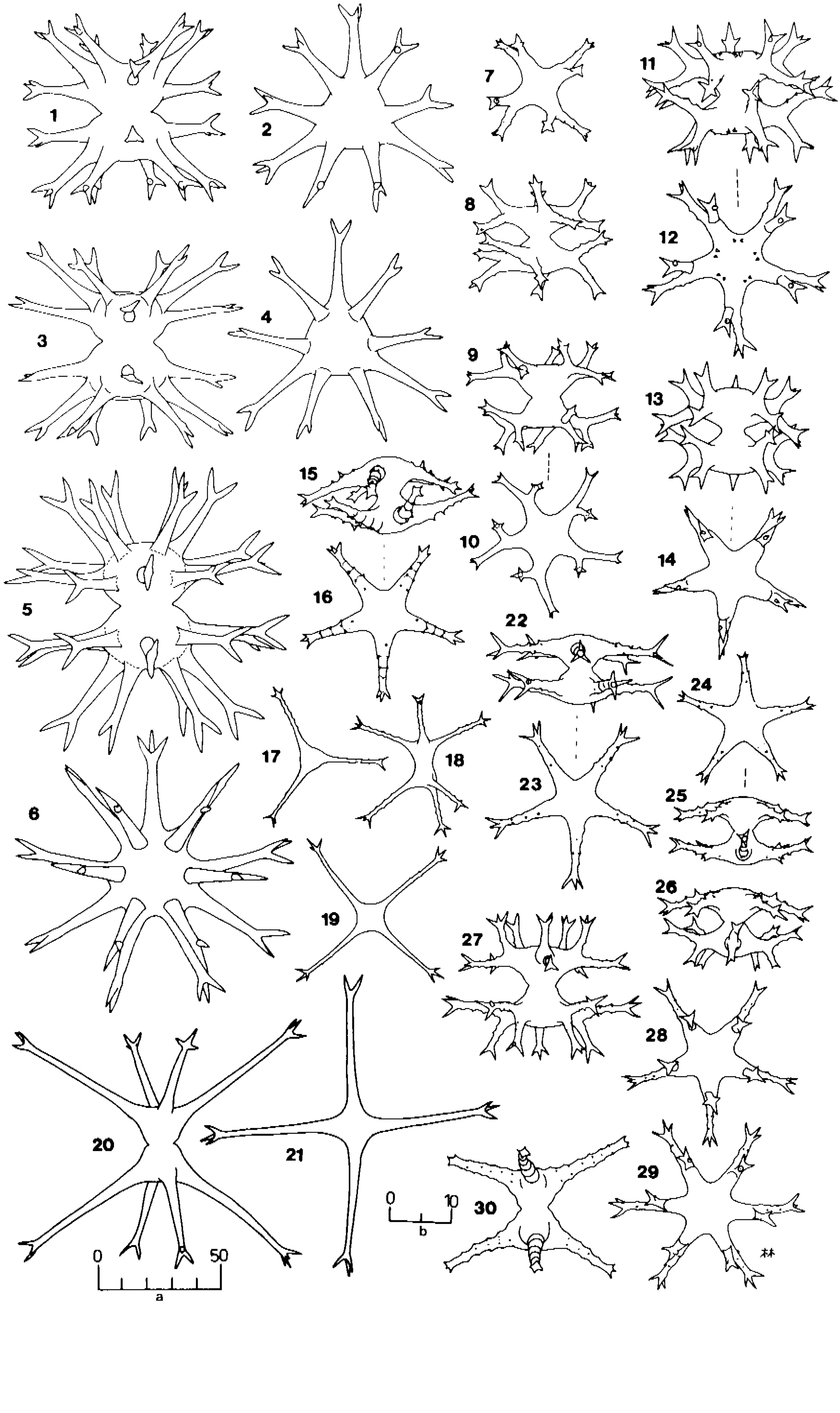
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PLATE 35

1–7 *Staurastrum elegans*:
1,2: 4-radiate cell
3,4: 5-radiate cell
5: 6-radiate cell
6,7: 7-radiate cell

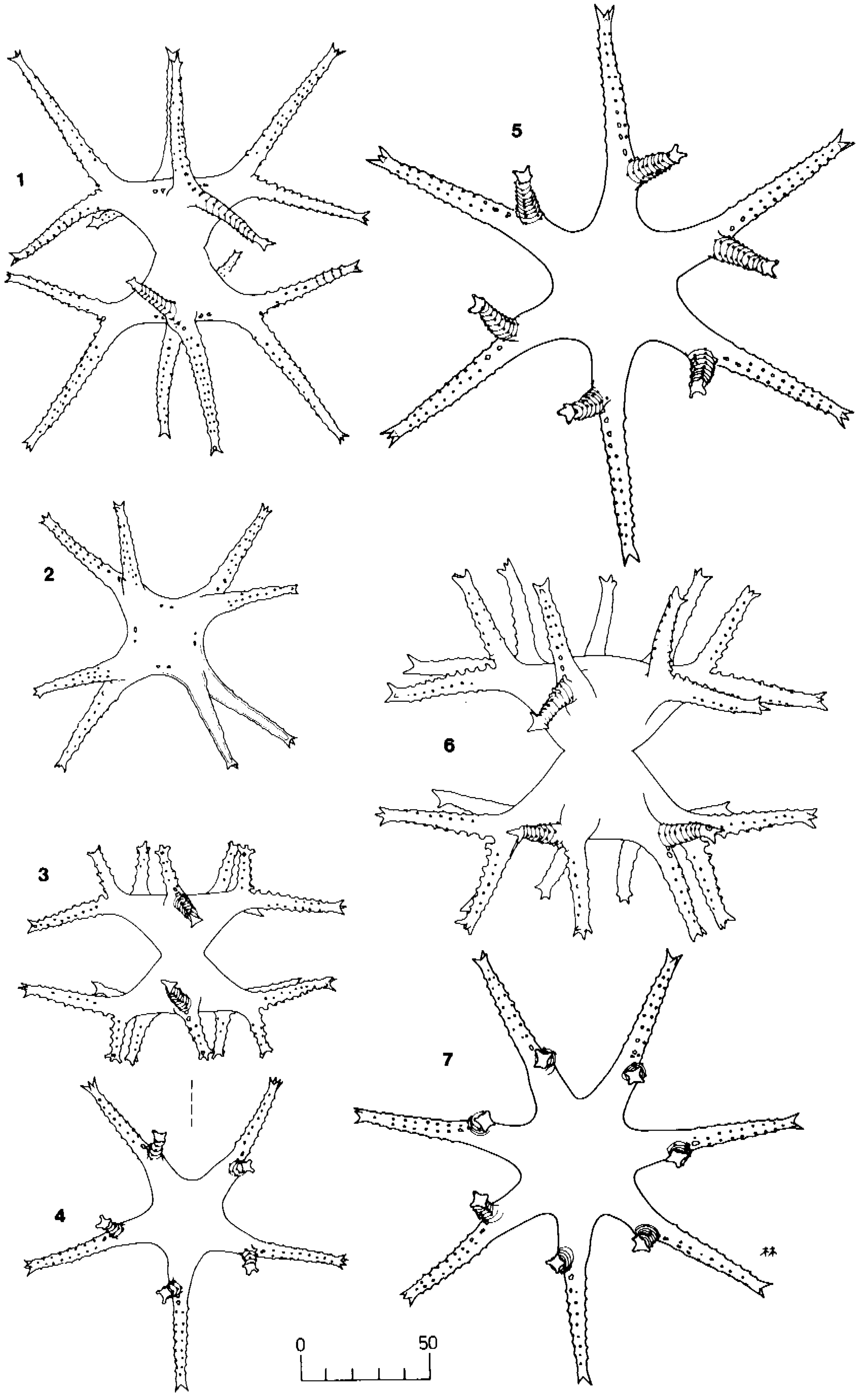
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PLATE 36

1,2	*Staurastrum elegans*, 8-radiate form
3–5	*St. victoriense*
6,7	*St. pseudosebaldi* fa. *latum*
8–10	*St. tauphorum*

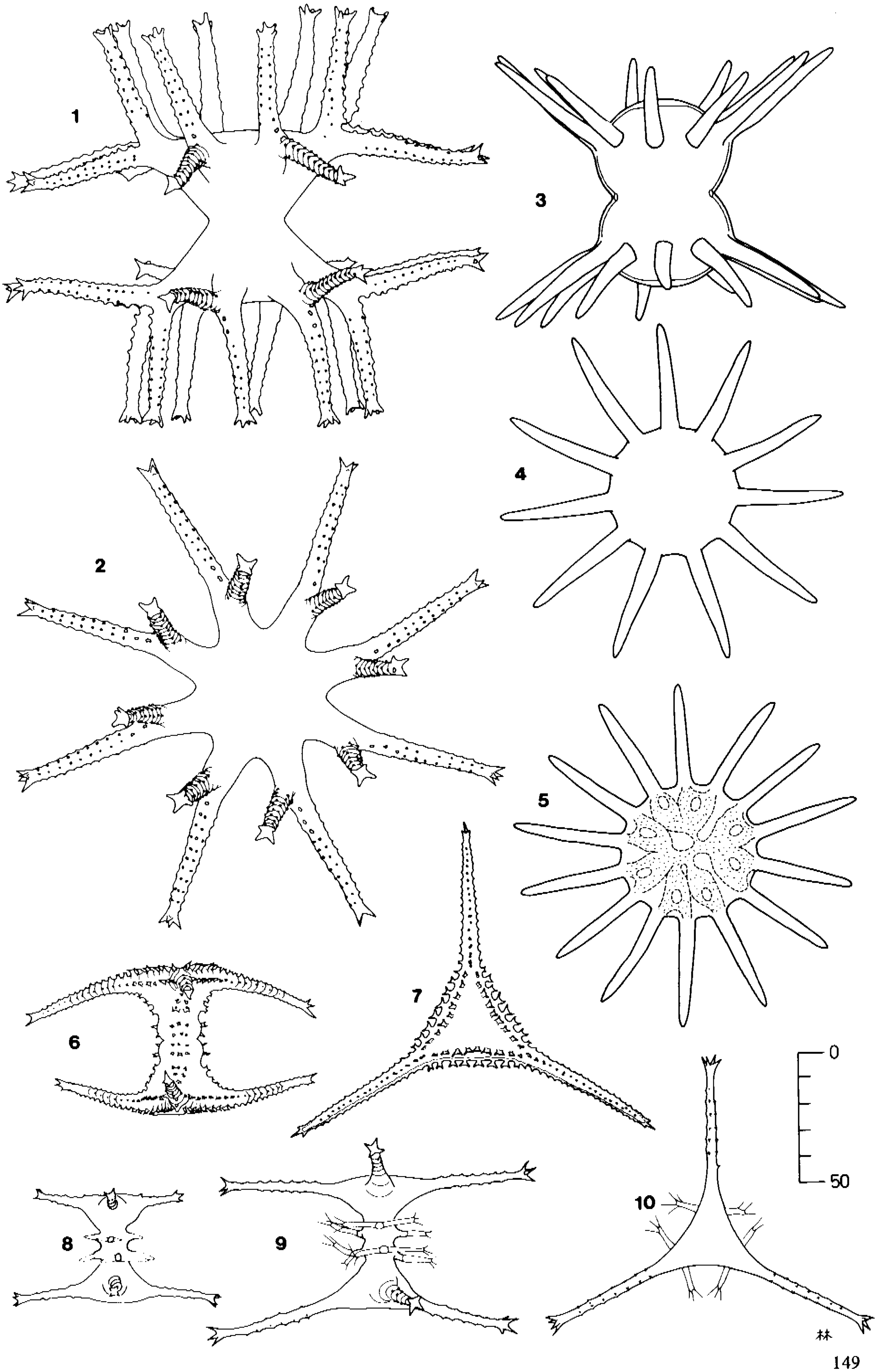
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PLATE 37

1,2	*Staurastrum sexangulare* var. *asperum* forma
3–5	*St. sexangulare* var. *asperum*
6–8	*Staurastrum* sp. 11, ornate type
9–12	*Staurastrum* sp. 11, less ornate type
13,14	*St. zonatum* var. *majus*
15–17	*St. pinnatum* var. *subpinnatum*
18–21	*St. pinnatum* var. *subpinnatum* fa. *robustum*

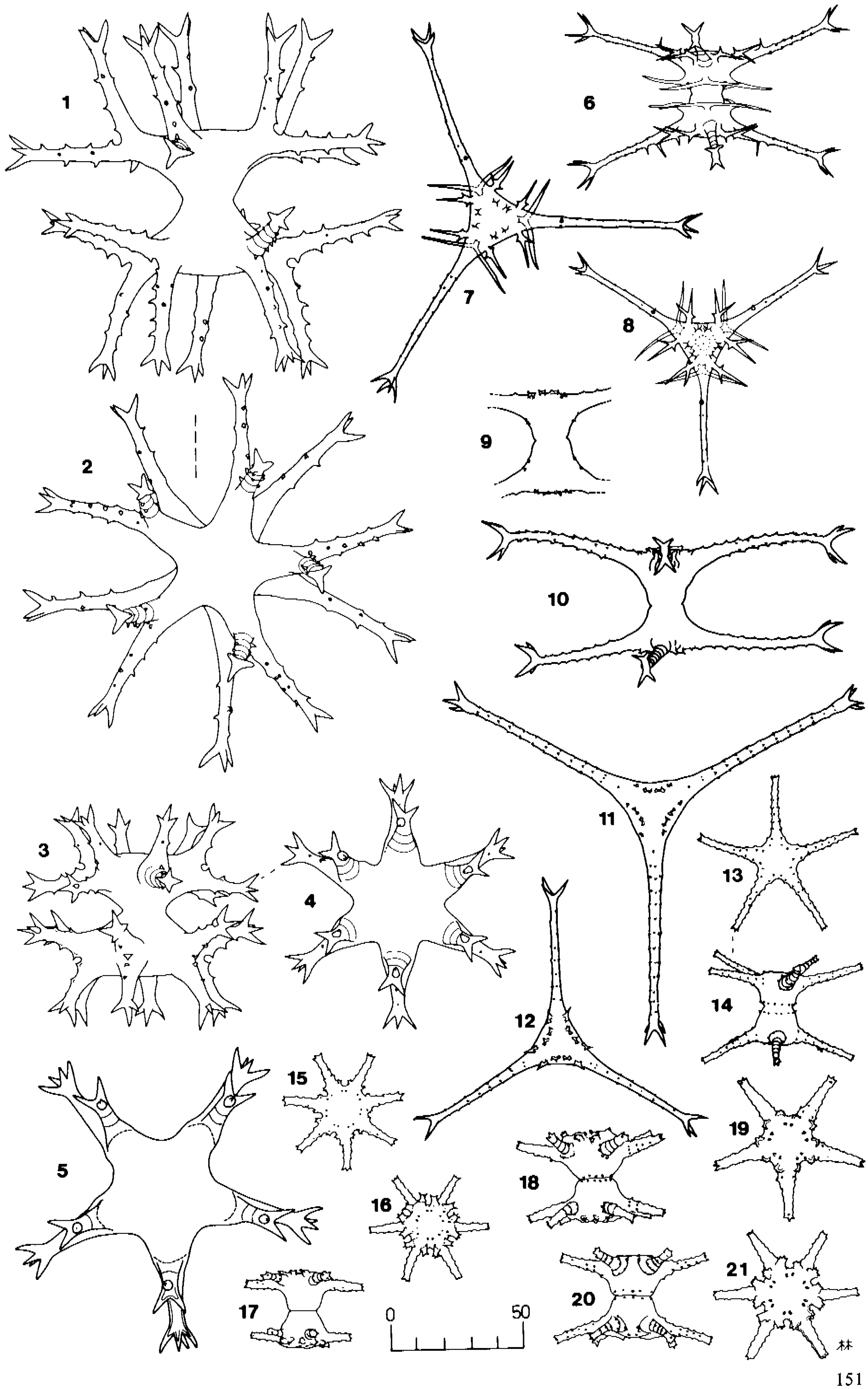
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PLATE 38

1–5 *Staurastrum sagittarium*
6–8 *St. sagittarium* var. *longispinum*
9–13 *Staurastrum* sp. 1:
9: side view, 9-radiate cell
10: top semicell of a 9-radiate cell with the processes spread out
11: top semicell of a 10-radiate cell
12: top semicell of an 8-radiate cell
13: top semicell of a 9-radiate cell
14–19 *St. pentacerum* fa. *curvatum*
20–22 *St. boergesenii* var. *gracilis*

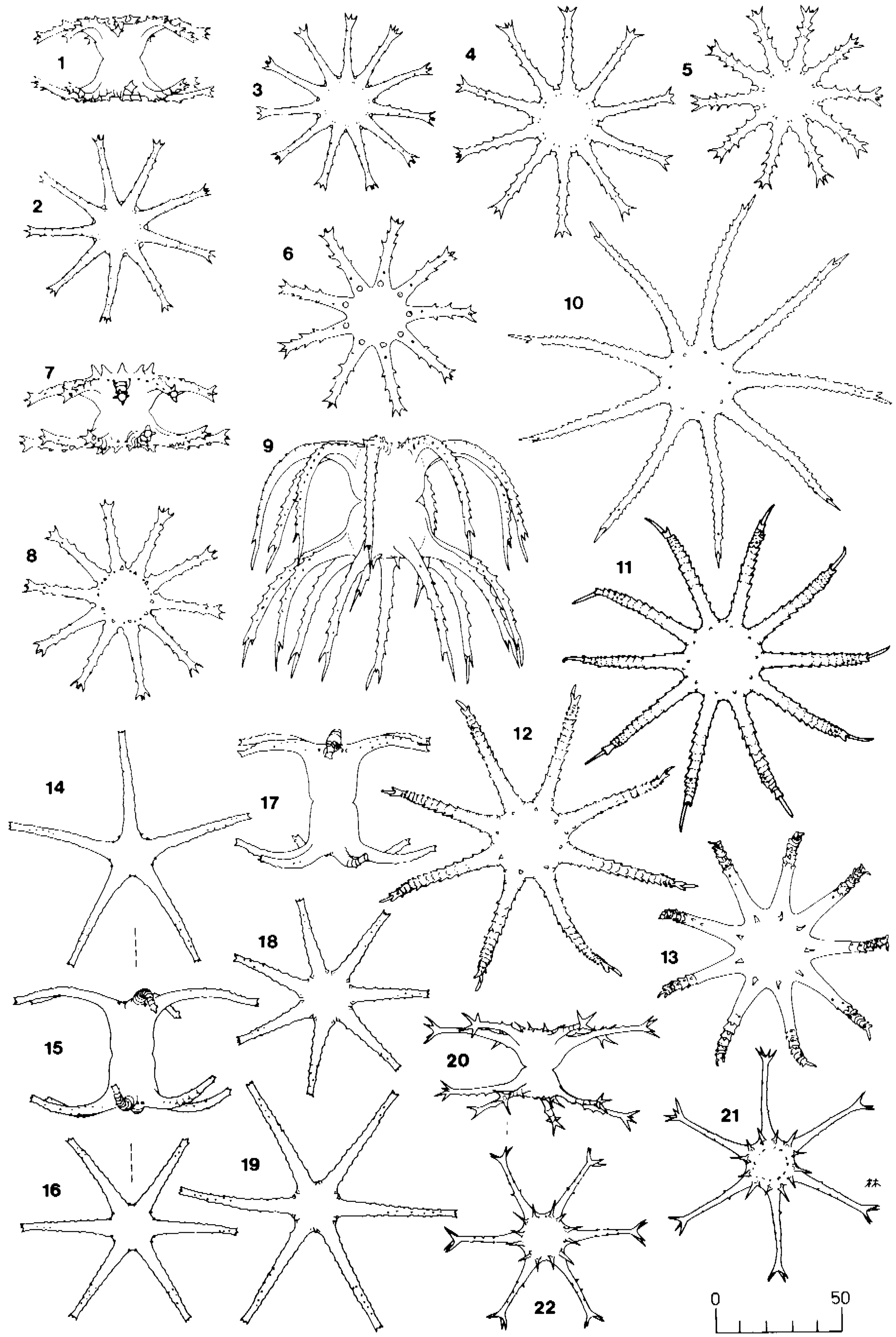
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PLATE 39

1–4	*Staurastrum sonthalianum*
5,6	*St. peristephes*
7–9	*St. submanfeldtii* fa. 1
10,11	*St. floriferum*
12,13	*St. cerastes* var. *pulchrum*
14,15	*St. javanicum* var. *apiculiferum*
16–18	*St. submanfeldtii* fa. 2
19,20	*St. floriferum*
21,22	*St. cyclacanthum* var. *subacanthum*
23–26	*St. ensiferum*
27,28	*St. protectum* var. *rangoonense*
29,30	*St. freemanii*, '*nudiceps*' form
31	*St. freemanii*, dichotypical cell
32,33	*St. freemanii*, '*triquetrum*' form
34,35	*St. freemanii*, '*evolutum*' form
36–46	*St. forficulatum*, range of forms
47	*St. rosei* var. *elongatum*
48	*St. rosei*
49,50	*St. spinipendens*
51–53	*St. anisacanthum*
54	*St. forficulatum*
55,56	*St. avicula*
57	*St. rectangulare* var. *verrucosum*

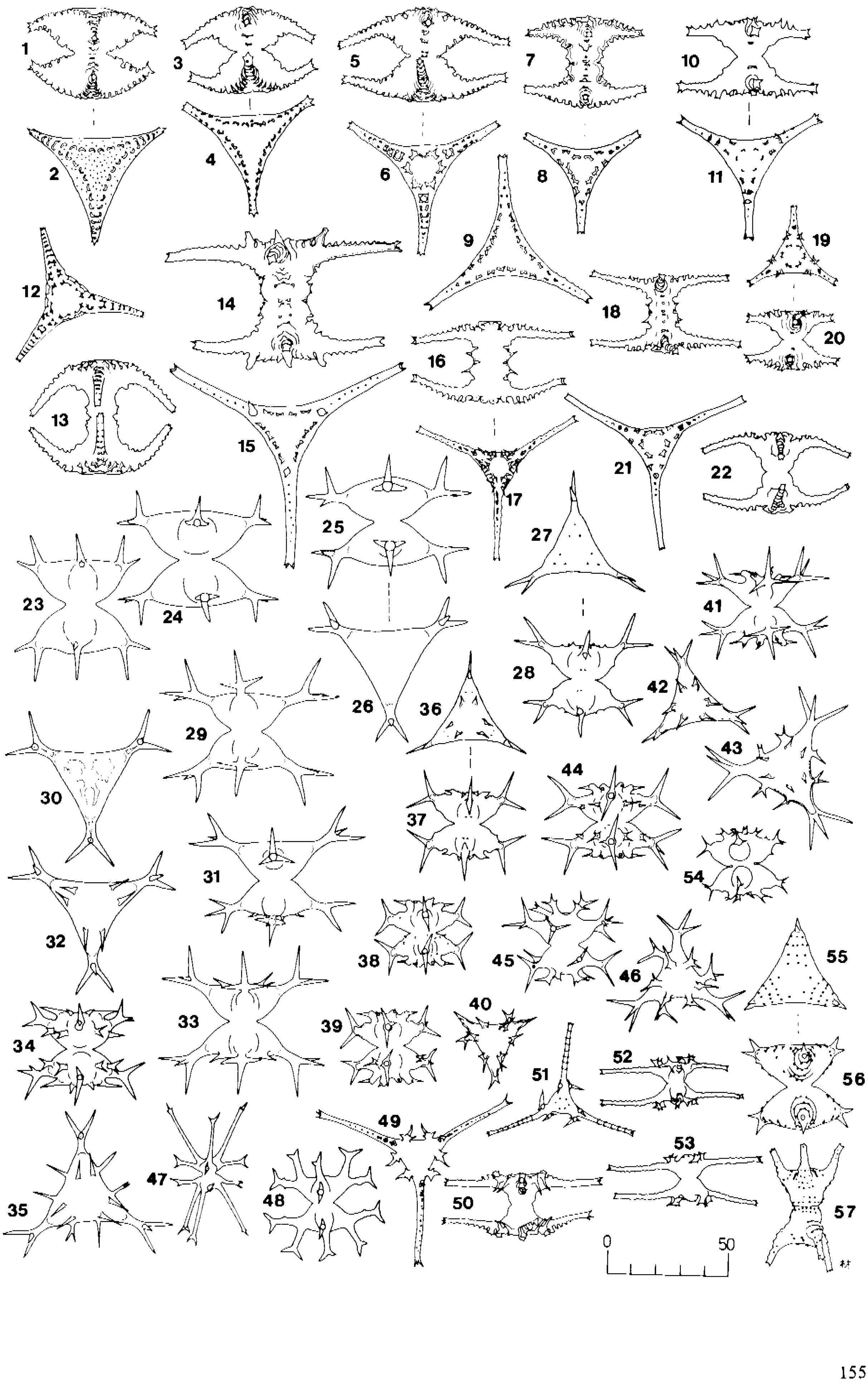
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PLATE 40

1–6	*Peridinium gutwinskii*
7–10	*P. gatunense* var. *zonatum*
11	*P. volzii* fa. *vancouverense*
12–14	*P. aciculiferum*
15,16	*Peridinium* sp. 1
17–21	*P. gatunense*
22,23	*P. palustre* var. *raciborskii*
24,25	*P. inconspicuum*
26,27	*P. intermedium* var. *conicum*
28,29	*P. umbonatum* var. *inaequale*
30–33	*Sphaerodinium cinctum* var. *limneticum*
34,35	*Glenodinium pulvisculus*

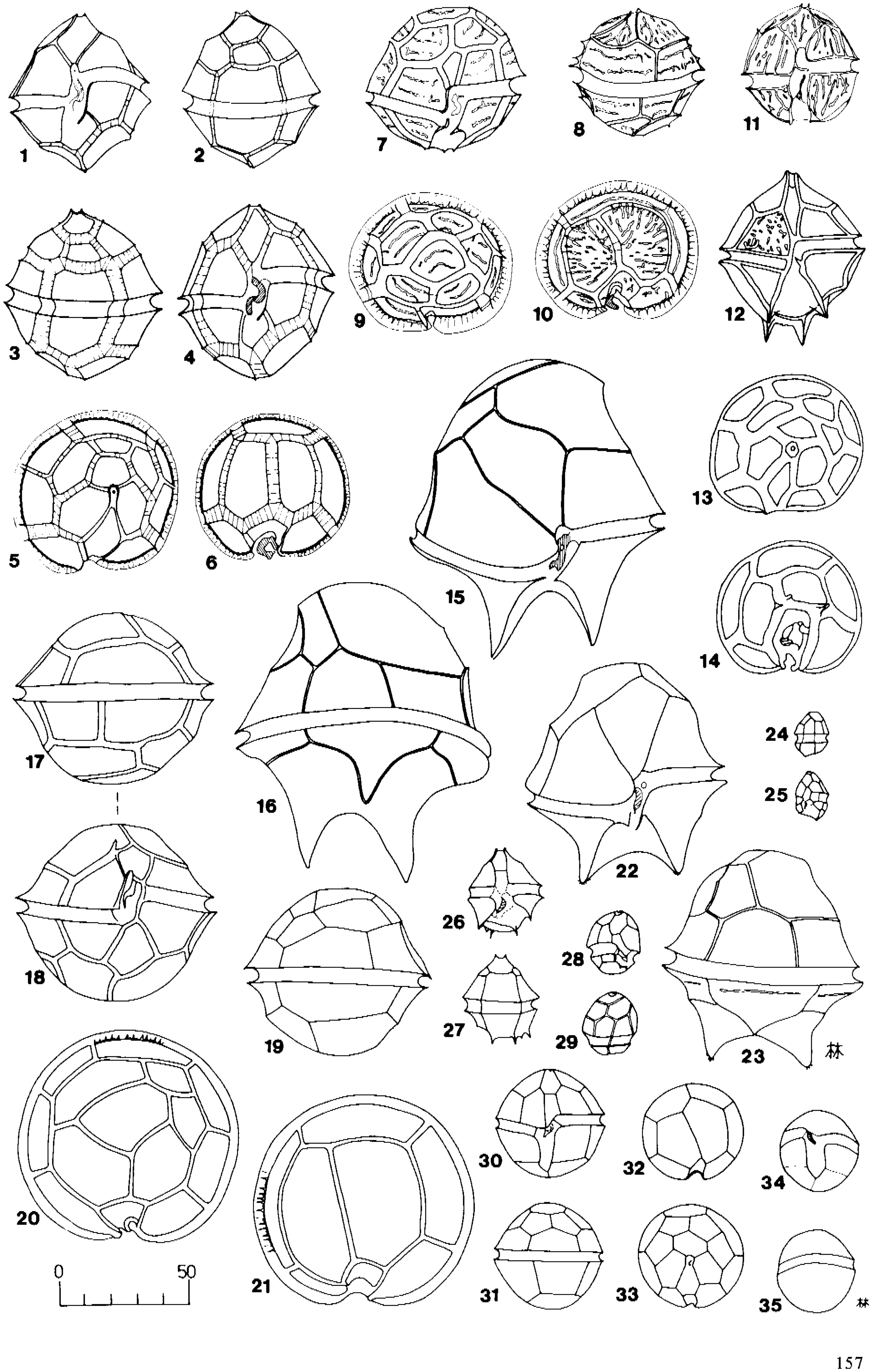
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PLATE 41

1	*Gonium formosum*
2	*Pandorina morum?*
3	*Pandorina* sp.
4,5	*Eudorina elegans*
6,7	*Volvox aureus*
8	*Euglena spirogyra*
9,10	*E. sanguinea*, cell and palmelloid stage
11	*E. acus*
12	*E. oxyuris*
13	*Phacus curvicauda*
14,15	*P. curvicauda* forma
16	*Phacus* sp. 2
17,11	*Phacus* sp. 1
19	*P. helicoides*
20	*P. longicauda*
21	*Strombomonas* sp. 1
22–24	*S. fluviatilis* var. *rugosa* fa. *major*
	Scale (a): 6 only
	Scale (b): 10 only
	Scale (c): 1–5, 7–9, 11–24

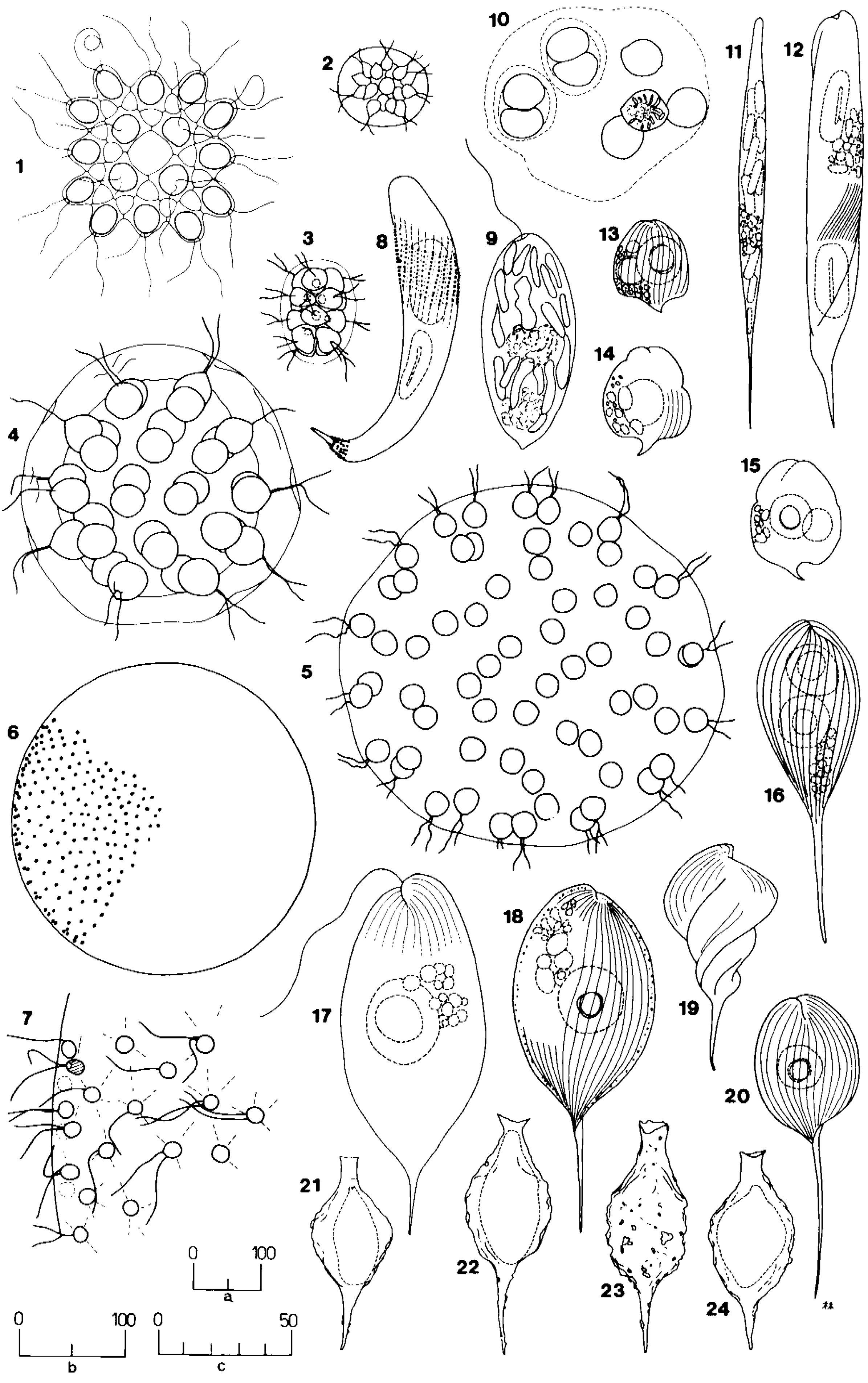
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PLATE 42

1	*Lepocinclis fusiformis*
2	*L. ovum*
3,4	*L. ovum* var. *australis*
5	*L. salina*
6	*L. ovata* var. *deflandriana*
7	*Phacus suecicus*
8	*Strombomonas* sp. 2
9	*Strombomonas* sp. 3
10	*Strombomonas* sp. 4
11	*Trachelomonas playfairii*
12–14	*T. oblonga* var. *australica*
15	*T. splendida* forma
16	*T. armata* var. *steinii*
17,18	*T. lismorensis*
19	*T. hispida*
20	*T. granulosa*
21	*T. clavata* var. *subarmata*
22	*Trachelomonas* sp. 2
23	*T. superba*
24	*Trachelomonas* sp. 1
25–27	*Chlamydomonas bicocca*
28–30	*Euglena* sp.

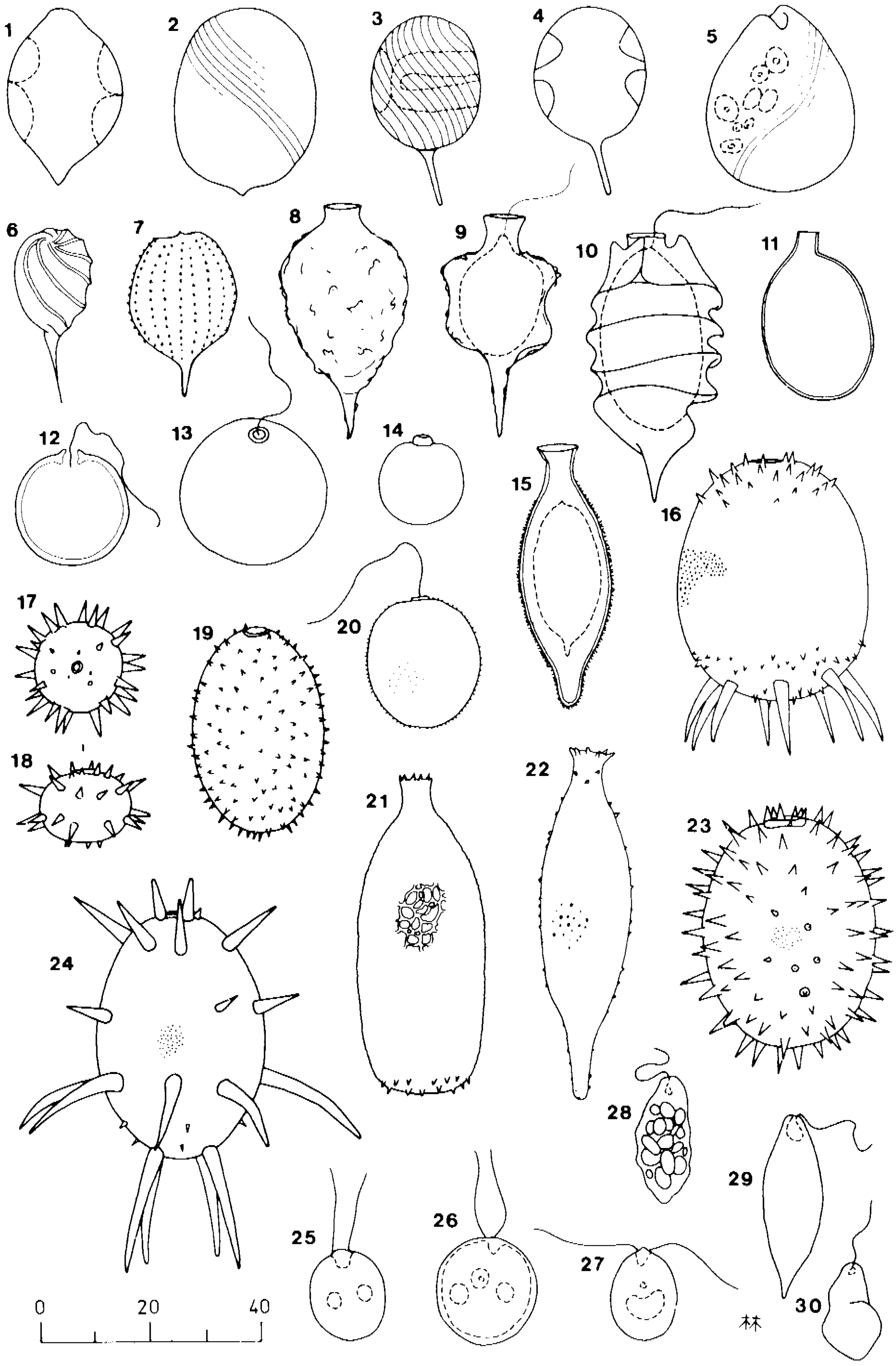
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PLATE 43

1–4	*Sphaerocystis schroeteri*
5	*Chroococcus limneticus*
6	*Anabaena catenula*
7	*Geminella* sp.
8,9	*G. ordinata*
10–12	*Merismopedia* sp.
13	*Hapalosiphon* sp.
14	*Spinoclosterium cuspidatum*
15	*Glaucocystis* sp.
16–18	*Centritractus belanophorus*
19–21	*Ophiocytium capitatum*
22	*Mallomonas splendens*
23	*Synura petersenii*
24	*Dinobryon sertularia*
25	*D. sertularia*, statocyst
26	*D. divergens* var. *schauinslandii*
27	*D. bavaricum*
28,29	*Chrysococcus radians*
30	*Pyramimonas* sp.
31	*Gonyostomum latum*
32	*Merotrichia bacillata*
33	*Batrachospermum moniliforme*
34	*Batrachospermum moniliforme*, enlarged portion showing club-shaped trichogyne with attached spermatia

Scale (a): 9, 28 and 29 only
30–33 not to scale

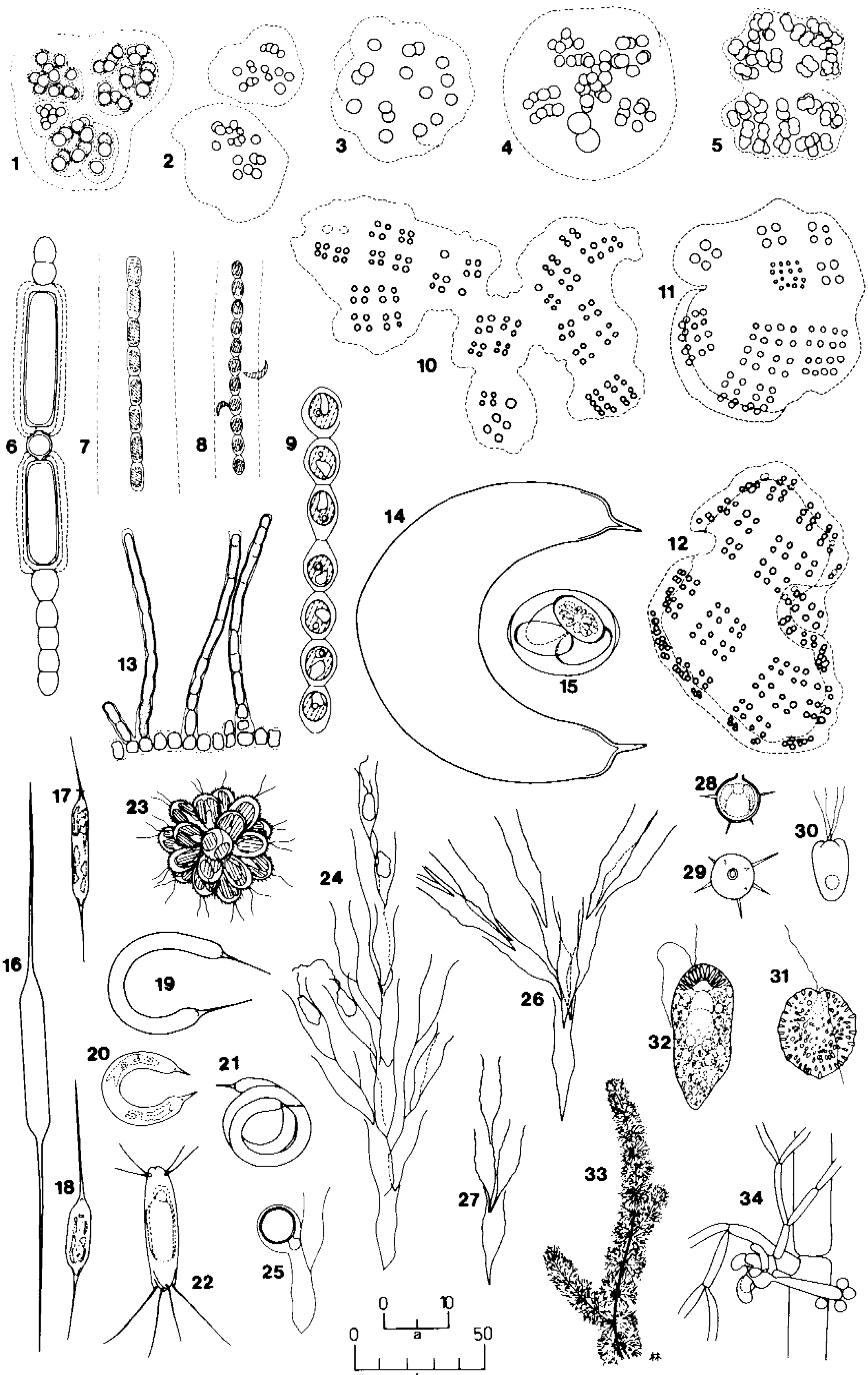
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PLATE 44

1,2	*Anabaena flos-aquae*
3,4	*Microcystis aeruginosa*
5	*Spirulina princeps*
6	*Merismopedia glauca*
7	*Oscillatoria* sp. 1
8	*Oscillatoria* sp. 2
9	*O. princeps*
10	*O. subbrevis* var. *major*
11	*Oscillatoria* sp. 3
12	*Anabaena catenula*
13	*Gloeotrichia* sp.
14	*Aphanocapsa koordersi*
15	*Coelosphaerium pallidum*
16	*Oscillatoria lemmermannii*
	Scale (a): 1 and 3 only

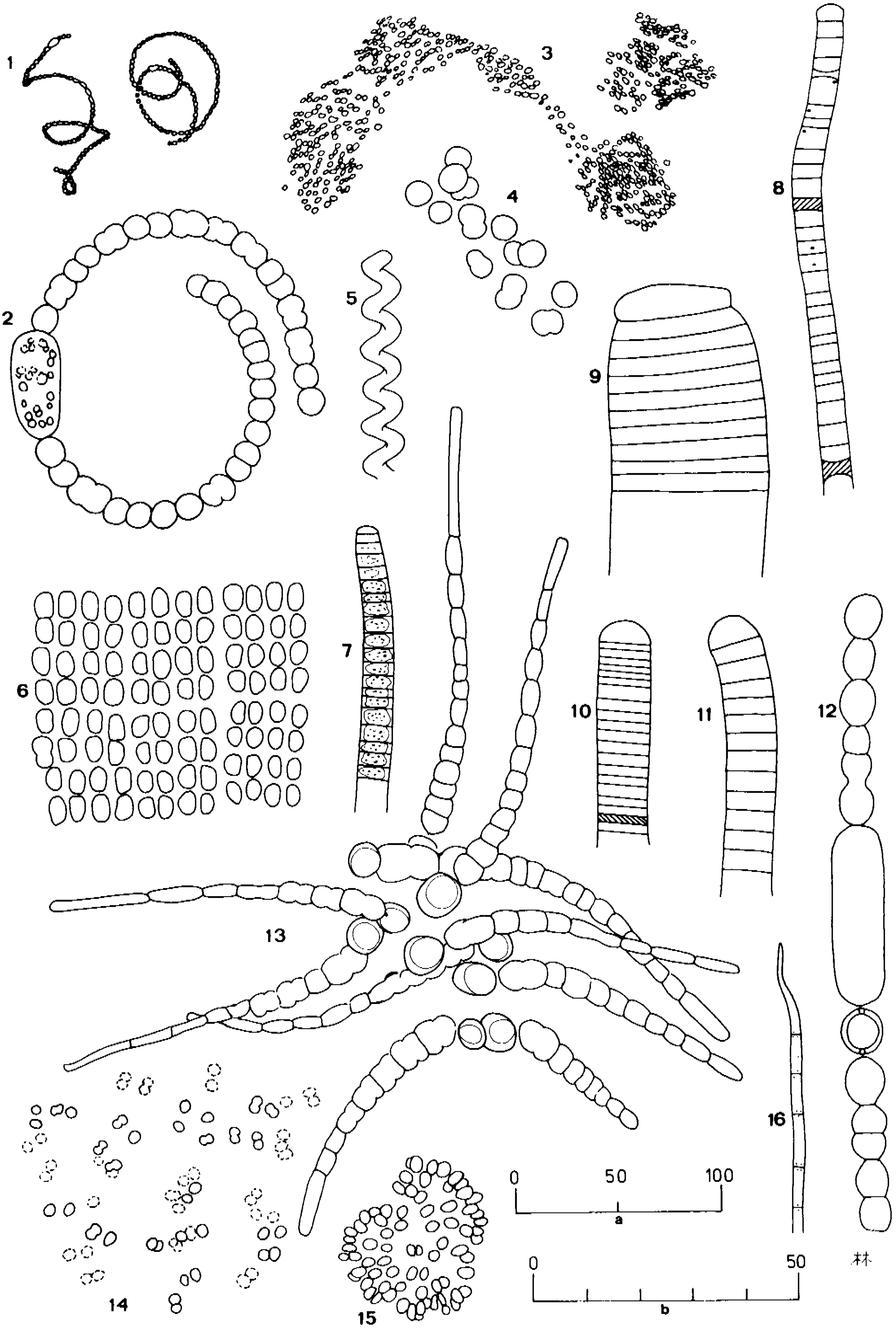
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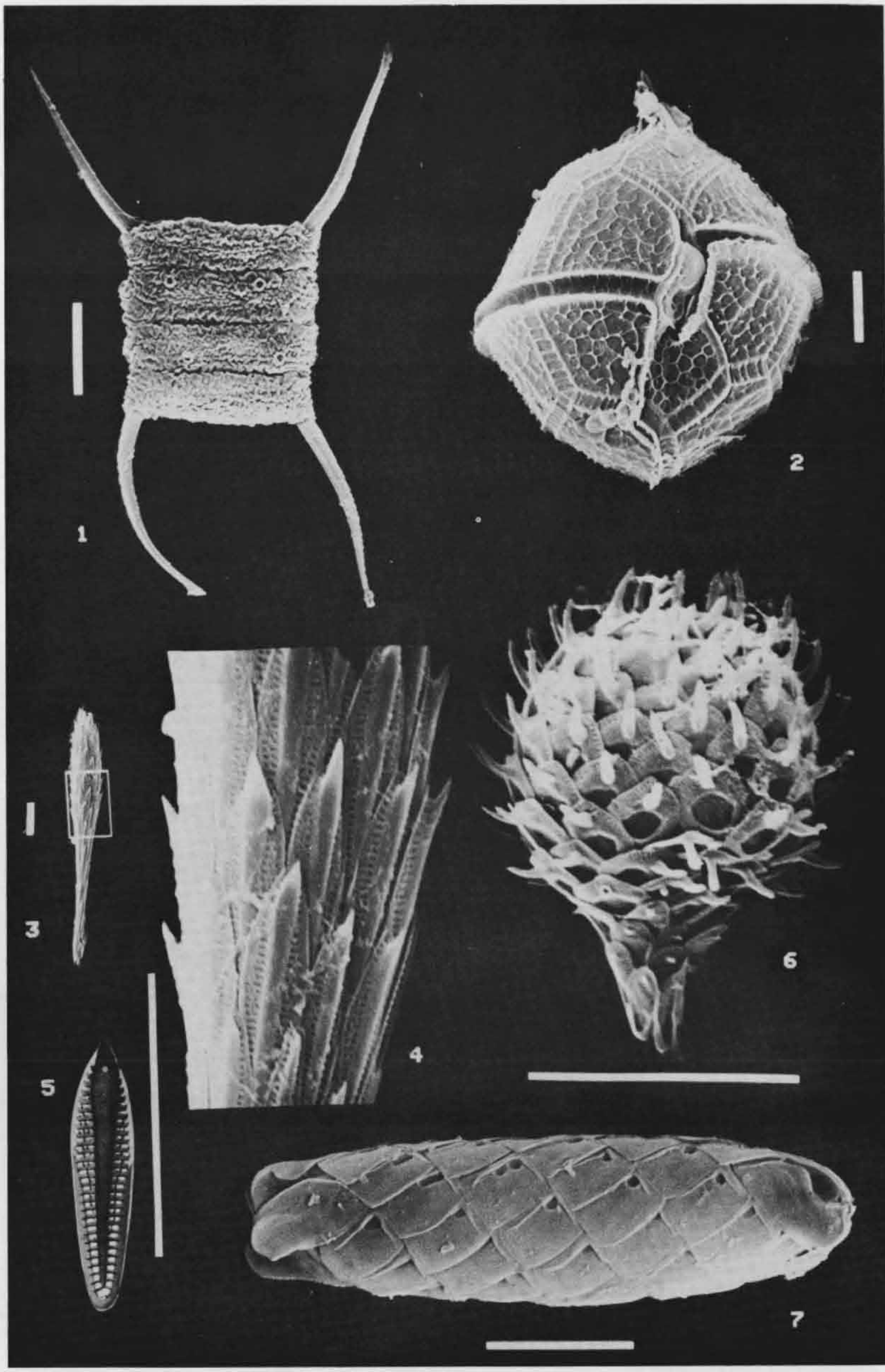
PLATE 45

1 *Scenedesmus quadricauda*
2 *Peridinium gutwinskii*
3–5 *Synura petersenii*:
 3: single cell
 4: enlarged portion of cell
 5: scale
6 *Synura echinulata*
7 *Mallomonas splendens*, anterior and posterior spines were lost during preparation

Each scale is 10 μm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Index of species

Numbers in bold are plate numbers, those in ordinary type are page numbers.

SUPERVISING SCIENTIST FOR THE ALLIGATOR RIVERS REGION

RESEARCH PUBLICATIONS

Alligator Rivers Region Research Institute Research Report 1983–84
Alligator Rivers Region Research Institute Annual Research Summary 1984–85

Research Reports (RR) and Technical Memoranda (TM)

RR1	The macroinvertebrates of Magela Creek, Northern Territory. April 1982 (pb, mf — 46pp)	Marchant, R.
RR2	Water quality characteristics of eight billabongs in the Magela Creek catchment. December 1982 (pb, mf — 60 pp)	Hart, B.T. & McGregor, R.J.
RR3	A limnological survey of the Alligator Rivers Region. I. Diatoms (Bacillariophyceae) of the Region. August 1983 (pb, mf — 160 pp)	Thomas, D.P.
TM1	Transport of trace metals in the Magela Creek system, Northern Territory. I. Concentrations and loads of iron, manganese, cadmium, copper, lead and zinc during flood periods in the 1978–1979 Wet season. December 1981 (pb — 27 pp)	Hart, B.T., Davies, S.H.R. & Thomas, P.A.
TM2	Transport of trace metals in the Magela Creek system, Northern Territory. II. Trace metals in the Magela Creek billabongs at the end of the 1978 Dry season. December 1981 (pb — 23 pp)	Davies, S.H.R. & Hart, B.T.
TM3	Transport of trace metals in the Magela Creek system, Northern Territory. III. Billabong sediments. December 1981 (pb — 24 pp)	Thomas, P.A., Davies, S.H.R. & Hart, B.T.
TM4	The foraging behaviour of herons and egrets on the Magela Creek flood plain, Northern Territory. March 1982 (pb, mf — 20 pp)	Recher, H.F. & Holmes, R.T.
TM5	Flocculation of retention pond water. May 1982 (pb, mf — 8 pp)	Hart, B.T. & McGregor, R.J.
TM6	Dietary pathways through lizards of the Alligator Rivers Region, Northern Territory. July 1984 (pb, mf — 15 pp)	James, C.D., Morton, S.R., Braithwaite, R.W. & Wombey, J.C.
TM7	Capacity of waters in the Magela Creek system, Northern Territory, to complex copper and cadmium. August 1984 (pb, mf — 42 pp)	Hart, B.T. & Davies, S.H.R.
TM8	Acute toxicity of copper and zinc to three fish species from the Alligator Rivers Region. August 1984 (pb, mf — 31 pp)	Baker, L. & Walden, D.
TM9	Textural characteristics and heavy metal concentrations in billabong sediments from the Magela Creek system, northern Australia. October 1984 (pb, mf — 39 pp)	Thomas, P.A. & Hart, B.T.
TM10	Oxidation of manganese(II) in Island Billabong water. October 1984 (pb, mf — 11 pp)	Hart, B.T. & Jones, M.J.
TM11	*In situ* experiments to determine the uptake of copper by the aquatic macrophyte *Najas tenuifolia* R.Br. December 1984 (pb, mf, — 13 pp)	Hart, B.T., Jones, M.J. & Breen, P.
TM12	Use of plastic enclosures in determining the effects of heavy metals added to Gulungul Billabong. January 1985 (pb, mf — 25 pp)	Hart, B.T., Jones, M.J. & Bek, P.
TM13	Fate of heavy metals in the Magela Creek system, northern Australia. I. Experiments with plastic enclosures placed in Island Billabong during the 1980 Dry Season: heavy metals. May 1985 (pb, mf — 46 pp)	Hart, B.T., Jones, M.J. & Bek, P.
TM14	Fate of heavy metals in the Magela Creek system, northern Australia. II. Experiments with plastic enclosures placed in Island Billabong during the 1980 Dry Season: limnology and phytoplankton. May 1985 (pb — 32 pp)	Hart, B.T., Jones, M.J., Bek, P. & Kessell, J.
TM15	Use of fluorometric dye tracing to simulate dispersion of discharge from a mine site. A study of the Magela Creek system, March 1978. January 1986 (pb, mf — 51 pp)	Smith, D.I., Young, P.C. & Goldberg, R.J.

pb = available as paperback; mf = available as microfiche

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