

SOME NEW OR LESS KNOWN DESMIDS FOUND IN NEW SOUTH WALES.

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(*Communicated by the Secretary.*)

(Plates ii.-v.)

Only two contributions to a knowledge of the *Desmidiæ* of New South Wales are known to me. Dr. Otto Nordstedt in his "Freshwater Algæ of New Zealand and Australia" gives a list of nine species collected on the Blue Mountains by Dr. S. Berggren. And Dr. M. Raciborski in "*Desmidya zebrane przez Dr. E. Ciastonia*" accounts for seventy-seven species gathered by Dr. Ciastonia in the Centennial Park, Sydney, in 1891.

During the past fourteen years in which I have studied the Desmids of New South Wales, I have been able to search only three districts, viz., Collector at the northern end of Lake George; Moura, a private estate near Parkes; and some of the suburbs of Sydney. My experience harmonises with a remark of Mr. W. B. Turner in his "Freshwater Algæ of E. India" that "From results obtained by many observers it appears that the value of gatherings is often in inverse ratio to the extent of country examined."

The number of species from New South Wales figured to date stands at about 350, a very fair total when it is remembered that only 412 forms are mentioned by Dr. Cooke in his 'British Desmids.' Of these 350, 50 are doubtful or require further investigation, 230 have been definitely identified, and the remaining 70 form the subject of this paper. After most careful consideration, fifty of these are described as new, and also twenty varieties and forms of species previously described by other observers. About one-third of these stand to the credit of

Botany, a third were obtained from Collector, and all other localities together account for the remainder.

It should be mentioned that numerous books and papers have been consulted before committing these notes to paper, but as the publications amount to nearly ninety, it would take up too much space to record my indebtedness to individual authors.

Genus *DOCIDIUM* Bréb.

DOC. EXPANSUM, n.sp. (T.iii. f.3).

Doc. minimum, curtum, crassum, $2\frac{1}{2}$ plo. longius quam latum, tumore basali lato, depresso, semicellulis ad apices expansis, apicibus rotundato-truncatis, angulis superioribus lato-rotundatis dentibus nullis, membrana levissime punctata.

Long. 72; lat. 29μ .

Botany.

For a *Docidium* this form is quite unique.

Genus *PLEUROTAENIUM* Näg.

PL. MEDIOLAEVE, n.sp. (T.ii. f.10).

Pl. magnum, valde elongatum, rectum, 12-20 plo. longius quam latum; basi semicellulae leviter inflatae et supra, inflatione minore nonnunquam instructae; apices versus sensim sed distincte attenuatae; apicibus truncatis, rugis l. denticulis 10-12 (rarius 4-6) intra marginem semper ornatis; sutura non prosiliente; membrana crassa; usque ad medium inflationum basalium dense scrobiculata (non granulata); scrobiculae trans quemque inflationem in serie densiore ordinatae; membrana in medio frondis laevi (unde nomen).

Long. 410, 504, 516, 528, 660, 684; lat. 36, 30, 38, 33, 37, 31μ .

Auburn.

Pl. mediolaeve belongs to the group having straight sides, and apices furnished only with rugæ, not with pronounced tubercles, such as the forms of *Pl. Ehrenbergii* De Bary, *Pl. crenulatum* (Ehr.), see Roy and Bisset, Jap. Desm. f.19, which come nearest in size and appearance. Others are *Pl. Stuhlmanni* (Hieron.)

Schm.;* *Pl. (Doc.) Wallichianum* Turn.;† *Pl. (Doc.) gloriosum* Turn.‡

Forma GRACILIOR, n.f.

Exacte ut in forma typica sed gracilior, cellulae 20-30 plo. longiores quam latae.

Long. 408, 444, 532; lat. 18, 21, 18 μ .

Auburn, Botany.

PL. NODOSUM Bail., γ DENTATUM Arch., Q.J. Micr. Sci. 1872, p.194, forma AUSTRALICA, n.f.

Forma apice modice elongato, vix dilatato, dentibus 10 magnis (fere aculeis) projicientibus. Semicellulae verticillis 4, in quoque verticillo nodulis 6 prominentibus obtusis, fere truncatis, membrana inter verticillos grosse punctata.

Long. 324; lat. 56 μ .

Botany.

PL. BACULOIDES (Roy & Bisset), Jap. Desm. p.9, f.18.

Apices denticulis l. rugis minutissimis 8-10 vix visibilibus semper praeditae. Endochroma in taenias longitudinales 4 disposita. Membrana subtilissime punctata. Cetera ut in Jap. Desm.

Long. 390, 400, 426, 428, 438; lat. 14, 15, 14, 15, 15 μ .

Auburn, Botany; Rose's Lagoon, Collector.

Roy & Bisset (l.c.) give long. semicell 265 μ , lat. 15 μ , but the figures tally exactly. The minute teeth were observed in every case, but they are easily overlooked.

Genus TRIPLOCERAS Bailey.

TRIP. SERRATUM, n.sp. (T.ii. f.2).

Trip. magnum, rectum, elongatum, 9-12 plo. longius quam latum, (cum dentibus), basi ad apices sensim attenuatum, apicibus aut 2 lobatis spinis geminatis intervenientibus, aut 4 lobatis lobis

* Ost. Afrik. T.1, f.21-22.

† Alg. E. Ind. T.3, f.2.

‡ l.c. T.3, f.5.

interdum productis bi-(rarius tri-)dentatis. In quaque semicellula verticilli 13-16, dentibus magnis, validis, patentibus 10 instructi; dentibus verticilli basalis in margine inferiore denticulis singulis ornatis.

Long. c. proc. 450, 480, 588; lat. c. dent. 50, 57, 50 μ .

Botany.

This form lies between *Trip. verticillatum* Bail.,* *superbum* (Mask.) Nord., and *Trip. gracile*† *bidentatum* f. *intermedia* Nord. Looked upon as an immature form, it could develop into the former by the teeth becoming bifid verrucae, or into the latter by their lengthening out into aculei. No tendency of the sort has been noticed, however, in any of the specimens that I have observed.

TRIP. GRACILE Bail., *BILOBATUM Turn., Alg. E. India, p.26, T.2, f.4. Cf. West (Desm. N. Amer. T.13, f.10-13) especially the end views.

The specimens noted had 10 teeth to the verticil and 17 verticils to the semicell. Also the apices were 4-lobed, each lobe bidentate. I have noticed in other varieties of *Triploceras* the "two intervening spines" mentioned by Turner, l.c., in bilobed apices. It seems probable that such a form is immature, and that the two spines on each side develop into bidentate lobes, thus forming a 4-lobed apex. (Cf. T.ii., f.15.)

Long. 444, 530; lat.c.ac. 34, 33 μ .

Botany.

TRIP. GRACILE Bail., *ACULEATUM Nord., Fr.Alg.N.Z., T.7, f.13-14, forma AUSTRALICA, n.f. (T.ii. f.14-15).

A forma novizelandica differt cellulis minoribus, semicellulis magis attenuatis, verticillis 8-11 in quaque semicellula.

Long. cell. 276, 300, 430; lat.c.ac. ad bas. 24, 36, 50; lat.s.ac. 20, 18; lat. sub. lob. ap. 11, 11 μ .

Botany, Centennial Park.

* Fr. Alg. N. Z. T.7, f.3.

+ l.c. T.7, f.17.

TRIP. DENTICULATUM, n.sp. (T.ii. f.11).

Trip. mediocre, gracillimum, elongatum, 16 plo. longius quam latum. Semicellulae e basi ad apices leniter attenuatae; inflationibus rotundatis 11 ornatae; inflationibus seriebus dentium minorum patentum binis praeditis; apicibus 3 (2-4?) lobatis; lobis dentibus minutis singulis (vel binis?) instructis.

Long. 371; lat. 23 μ .

Murray's Lagoon, Collector.

Most like *Trip. (Doc.) occidentale* Turn.,* which, however, has verticils with aculei pointing up and down the cell. Compare also Wolle (Desm. U. S., *Doc. gracile*, T.10, f.3).

Genus ICTHYOCERCUS West.

IC. AUSTRALIENSIS, n.sp. (T.ii. f.8).

Icth. magnus, gracilis, circ. 15 plo. longior quam latus, medio levissime constrictus. Semicellulae paullulo attenuatae, lateribus rectis, basi leviter inflatae, apice aegre dilatatae angulis in cornua minuta, acuta, productis. Membrana achroa, glabra.

Long. 144; lat. 10 μ .

Botany.

This comes very near to *IC. longispinus* (Borge),* which I cannot consider a variety of *IC. angolensis*. *IC. australiensis* is half as long again, inflated at the base, and with tiny horns instead of spines. This is, as far as I know, only the third record of the genus. It is known also from Angola and Guiana. Cf. *IC. angolensis* West (in Journ. Bot. xxxv. T. 368, f.26-31).

Genus CLOSTERIUM Nitzsch.

CL. MOURENSE, n.sp. (T.ii. f.1).

Cl. permagnum, rectum, fusiforme, diametro circ. 9 plo. longius, utroque polo leniter attenuatum, ventre in medio planum apices versus recurvatum, dorso leniter arcuatum, apicibus subobtusis,

* 'On some New Desm.', Journ R. Mier. Soc. (2) v. 1885, T.15, f.25.

† Trop. u. subtrop. T.2, f.51.

truncatis, paullulo recurvatis. Membrana achroa, glabra, striis nullis. Sutura non evidente.

Long. 844-1140; lat. 106-125 μ .

Murray's Lagoon, Collector; Moura.

Cl. libellula Focke, figured by Raciborski,* is the nearest in shape to this species, but it is far too small, and punctate. Cf. also *Cl. lunula* var. *maximum* Borge.† I have no note as to the disposal of the endochrome. *Cl. lunula*, *lanceolatum* and the stout form of *acerosum* are members of this group.

CL. MAGNIFICUM, n.sp. (T.ii. f.3).

Cl. permagnum, elongatum vix arcuatum, diametro circ. 9-12 plo. longius, ventre paullulo concavum, dorso leniter curvatum, apicibus subobtusis, truncatis, paullulo recurvatis. Membrana achroa, glabra, striis nullis. Sutura evidente. Long. 800-809; lat. 68-92; alt. (ad dorsum) 110 μ .

Lara Dam, Moura.

Most like *Cl. Wittrockianum* Turn.,‡ from which it differs in its greater size, absence of colour and striae, the slightly recurved ends and visible suture. From *Cl. lanceolatum* Kutz., it differs in its larger size, concave ventral margin, and narrower shape.

CL. MOLLE, n.sp. (T.ii. f.12).

Cl. permagnum, arcuatum, cylindricum, elongatum, diametro circ. 13-14 plo. longius, ventre regulariter concavum non tumidum, dorso regulariter convexum, ad apices sensim sensimque attenuatum, apicibus subobtusis, rotundatis, incrassatis. Membrana levissime rufescente, subtilissime striata. Sutura evidente. Endochroma obscuro-viride, in laminis longitudinalibus disposita. Vesciculi terminales minimi.

Long. 935-965; lat. 70; alt. 100 μ .

Auburn; Moura.

* Desm. Ciast. T.1, f.44.

† Alg. Regnell. T.1, f.9.

‡ Alg. E. Ind. T.1, f.25.

Cl. molle may be classed with *Cl. decorum* Bréb. (see Wolle, Desm. U. S., T. 7, f.1), *Cl. Wallichii* Turn.,* and *Cl. dilatatum* West.† It is a perfectly tubular form, with beautifully rounded ends, which are not flattened or turned back.

CL. CALAMUS, n.sp. (T.ii. f.4).

Cl. permagnum, valde elongatum, gracillimum, fere rectum, 30-35 plo. longius quam latum, paullulo curvatum, utroque polo rapidissime attenuatum, lateribus parallelis, apicibus conicis, subacutis. Membrana subtilissime striata. Endochroma in taenias 4 (3 ?) longitudinales parietales disposita; vesiculo centrali magno, terminalibus minimis. Nuclei amylacei 18 in quaque semicellula.

Long. 1000; lat. 30; alt. 60 μ .

Moura.

This species differs from *Cl. acerosum* in its almost parallel sides, from *Cl. praelongum* in its straight ends not recurved at all, and from *Cl. lineatum* in its equal curvature. From all these also it differs in the arrangement of its endochrome in the parietal taeniæ. Along with *Cl. Mourense* I fancy it holds the record for length.

CL. CORNUTUM, n.sp. (T.ii. f.13).

Cl. parvum, validum, lunatum, 5-6 plo. longius quam latum, uno polo ad alterum et ventre et dorso regulariter arcuatum, e sutura ad apices rapide attenuatum, apicibus subacutis. Membrana glabra, lutea. Sutura evidente.

Long. 160; lat. 30; alt. 54 μ .

Botany.

Its nearest ally is *Cl. Leibleinii* Kutz., which, however, is larger, swollen in the centre and more curved, but cf. Ralfs (Br. Desm., T.28, f.4) and Börgesen (Cent. Braz., T.2, f.7). I have not yet come across *Cl. Leibleinii*, nor did Nordstedt meet with it in New Zealand.

The semicell is almost exactly the shape of a rhinoceros horn.

* Alg. E. Ind. T.1, f.13.

† N. Amer. Desm. 1896, T.13, f.21.

CL. CINGULUM, n.sp. (T.ii. f.7).

Cl. parvum, magis curvatum, filiforme, diametro circa 18 plo. longius, lateribus parallelis, apicibus subacutis.

Long. 90; lat. 5; alt. 30μ .

Moura, in running water.

In outline the nearest to this form is *Cl. Cynthia* var. *curvatissimum* West, (Scott. plankt., T.14, f.3) with which it agrees in length; but that species is striolate and $2\frac{1}{2}$ times as broad. *Cl. cingulum* might be arranged with *Cl. Jenneri* Ralfs, and *Cl. calosporum* Wittr., especially var. β *Brasiliense* Börges., (Desm. C. Braz., T.2, f.5).

CL. CANCER, n.sp. (T.ii. f.16).

Cl. minimum, canceriforme, subcirculare diametro tantum duplo longius; dorso maxime convexum fere conicum; ventre concavum. Semicellulae e sutura ad apices rapidissime attenuatae, apicibus acutis paullo incurvis et in rostra brevia setacea porrectis. Membrana laevis.

Long. 46; lat. 22; alt. 48μ .

Murray's Lagoon, Collector.

I know of no other species with which this form can be classed, but cf. *Cl. cuspidatum* Bail., in Ralfs, T.35, f.11.

? CL. NAVICULOIDEUM, n.sp. (T.ii. f.9).

Cl. minutissimum, rectum, fusiforme, diametro circa 15 plo. longius, apicibus acutissimis in rostra brevia setacea porrectis. Membrana glabra.

Long. 75-84; lat. 5-6 μ .

Murray's Lagoon, Collector.

There is some doubt in my mind as to whether this is not the diatom *Nitzschia acicularis* Smith, in Br. Diats. q.v.; no size given. The disposition of the endochrome with a central clear space makes it look like a *Closterium*.

Genus *PENIUM* Bréb.

P. GRACILLIMUM, n.sp. (T.iii. f.1).

Pen. angustum, elongatum, 8-10 plo. longius quam latum, medio sinu acuto minuto vix constrictum, apicem versus levissime attenuatum; apicibus truncatis; lateribus rectis, parallelis. Semicellulae utroque margine denticulationibus 2 minutissimis in partes 3 divisae, denticulationibus non semper perfecte regulariter dispositis. Membrana achroa, longitudinaliter punctato-striata; striis 8-10.

Long 116-156; lat. 15 μ .

Coogee.

A near neighbour of *P. margaritaceum* Ehr., see Ralfs, T.25, f.1e, and Wolle, Desm. U. S. T.5, f.11, from which its perfectly straight and parallel sides, colourless membrane, and marginal denticulations serve to distinguish it.

P. PACHYDERMUM, n.sp. (T.ii. f.6).

Pen. curtum, crassum, cylindraceum, diametro subduplo longius, medio sinu acuto minuto vix constrictum. Semicellulae subconicae, angulis inferioribus rectis, lateribus e basi verticalibus, adscendentibus, tum repente ad apicem convergentibus, apicibus late rotundatis. Membrana achroa, glabra, crassa.

Long. 84; lat. 37 μ .

Centennial Park.

The congeners of this species belong to the globose group of large *Penium* forms such as *P. australe* Rac., *P. lagenaroides* Roy,* *P. cucurbitinum* Biss. β *subpolymorphum* Nord.† The last-named is nearest to it in outline.

P. AUSTRALE Rac., Desm. Ciast. p.7-8, T.1, f.11. (T.ii. f.5).

Long. 66, 66, 74, 75; lat. 37, 43, 42, 48 μ .

Collector, Auburn, Centennial Park.

* Desm. Windermere, T.5, f.6.

† Fr. Alg. N. Z. T.7, f.20.

Omnia specimina apices versus magis attenuata quam forma a cl. Raciborski delineata. Endochroma totae cellulae (ut primo videtur) in lamina quattuor lateralia disposita area vacua centrali in forma crucis reliquente, vero tamen endochroma in taenias 6-8 angustissimas longitudinales ex axi centrali radiantes, ordinata est. Nuclei amylacei singuli magni.

Genus TETMEMORUS Ralfs.

TET. IMMANIS, n.sp. (T.iii. f.5).

Tet. permagnus, 6-8 plo. longior quam latus, a fronte visus oblongus, in medio constrictus, lateribus fere parallelis, apices versus paullo attenuatus, apicibus rotundato-truncatis, incisura profunda lineari extremo ampliata; a latere visus lateribus parallelis sed paullo retusis, apices versus rapide attenuatus, apicibus obtuso-rotundatis. Membrana achroa punctata, punctis in lineis longitudinalibus dispositis.

Long. 364-425; lat. 50-58 μ .

Botany.

It outline somewhat like *T. Brébissonii*, but far exceeding it in size. Cf. also *Tet. penioides* Benn., in Cooke, Br. Desm. T.26, f.2.

TET. GRACILIS, n.sp. (T.iii. f.4).

Tet. parvus, 6-plo. longior quam latus, medio sinu acuto levi vix constrictus, a fronte visus lateribus fere parallelis, ad apices versus aegre attenuatus, apicibus rotundatis, incisura lineari extremo ampliata; a latere visus lateribus parallelis, apicibus rotundatis. Membrana achroa punctata, punctis obscuris in lineis longitudinalibus dispositis.

Long. 102; lat. 18 μ .

Coogee.

This form may perhaps be placed near *Tet. laevis*, from which it differs in its evenly cylindrical shape. Front and side views are both like the fig. of *Tet. Brébissonii* in Wolle, T.20, f.1.

Genus SPIROTAENIA Bréb.

SP. OBSCURA Ralfs, Brit. Desm., p.179, T.34, f.2. (T.iii. f.2).

Long. 134; lat. 24 μ .

Coogee.

The endochrome is bright green and apparently diffused, but on carefully focussing the surface seven darker very narrow spiral bands may be seen. The spirals are even more longitudinal than those figured by Ralfs, and are decidedly obscure. Terminal vesicles present, but very small.

Genus EUASTRUM Ehr.

EU. ROTUNDUM, n.sp. (T.v. f.20).

Eu. mediocre, subduplo longius quam latum, profunde constrictum sinu lineari. Semicellulae obscure trilobatae, campanulatae; angulis inferioribus leviter rotundatis; lateribus in parte inferiore convexis, in parte superiore concavis; lobo polare angusto, levissime inflato, apice truncato; angulis superioribus rotundatis, incisura lineari. Semicellulae supra isthmum tumore unico, paullo supra tumoribus binis et inter eos scrobiculis singulis instructae; a latere visae, ovatae, crassae, basi lato rotundato, apice conico. Membrana achroa, laevis l. subtilissime punctata.

Long. 59-68; lat. 29-30; crass. 21-24 μ .

Botany.

The nearest forms seem to be *Eu. subhexalobum* West,* *Eu. porrectum* Borge,† *Eu. intermedium* Cleve var. *compactum* West,‡ and *Eu. ansatum* (Ehr.) Schm,§ evidently misnamed, as he cites Ralfs, T.14, f.2.

The basal tumour can only be seen in $\frac{3}{4}$ face on rolling over. This species in front view is very like an immature form of *Eu. campanulatum* mihi, but the side view is characteristic, as the semicell is remarkably thick for its size, and the upper tumours

* Some Desm. U. S. T.16, f.7.

† Desm. Regnell. T.5, f.8.

‡ Fr. Alg. Ceylon, T.19, f.14-15.

§ Schmidle, Alp. Alg. T.17, f.10.

project at the widest part. Besides, *Eu. campanulatum* always shows five tumours, with careful observation. Cf. also *Eu. obesum* Josh.,* which has no central inflations or scrobicula.

EU. TRIANGULUM, n.sp. (T.iii. f.7).

Eu. magnum, diametro subduplo longius, profunde constrictum, sinu lineari. Semicellulae obscure trilobatae, triangulares; angulis inferioribus obtusis; lateribus rectis in lobum polarem rapidissime convergentibus; lobo polari producto, angusto, apice vix dilatato; angulis superioribus obtuse-rotundatis, apice truncato, incisura lineari extremo ampliata et binis verrucis instructa. Semicellulae tumoribus 3 basalibus, 2 medianis, inter hos scrobiculis singulis majoribus et (paullo infra) minoribus binis; a latere visae anguste-ovatae, basi late rotundato, apice conico. Membrana achroa subtiliter punctata.

Long. 120, 126, 128, 132; lat. 68, 72, 66, 77 μ .

Rose's Lagoon, Collector.

The two outer basal tumours have a mammillate appearance, and generally they alone are visible in front view. The form nearest to this is *Eu. latipes* Nord.,† the details of which, however, are quite different.

EU. DIDELTOIDES (Rac.)

Eu. quadriceps Nord., var *dideltoides* Rac., Desm. Ciastoni, p.19, T.2, f.31.

Nuclei amylacei 6 in quaque semicellula.

Long. 153, 160, 160, 170, 172, 176, 176; lat. 75, 75, 78, 80, 82, 80, 86; crass. 48, —, 52, —, —, —, 54; lat. lob. pol. —, 32, 27, —, 30, —, 30 μ .

Botany, Centennial Park.

Raciborski (l.c.) gives long. 170, lat. 82, lat. isth. 25, lat. lob. pol. 28 μ . Cf. *Eu. quadriceps* Nord.‡ It seems to me that this

* Burmese Desm. T.33, f.19.

† Desm. Cent. Braz. T.2, f.9.

‡ Desm. Cent. Braz. T.2, f.5.

form should not have been placed under *Eu. quadriceps* Nord. The only similarity between them is the general outline in front view. In side and end views they are entirely different, as well as in the tumours and scrobiculae. Especially is this noticeable in the polar lobe, from the cruciate form of which *Eu. quadriceps* takes its name. The specimens here figured are certainly *Eu. dideltoides* and were gathered from the same locality as Raciborski's.

EU. LONGICOLLE Nord. β AUSTRALICUM, n.var. (T.iii. f.6).

Semicellulae basi latiore, diametro tantum subduplo longiores, e basi magis inflatae; collo minus producto; lobo polari paullo magis inflato; semicellulae supra isthmum tumoribus singulis, paullo supra tumoribus 4 instructae, tumoribus exterioribus e margine orientibus, inter interiores scrobicula unica magna. Cetera ut in forma typica.

Long. cell. 140-147; lat. cell. 64-69; lat. lob. pol. 32; lat. coll. 23-24; crass. 36μ .

Botany, Centennial Park.

Cf. Nordstedt, Alg. N. Z., p.33, T.3, f.5.

This form is a member of a well defined group including *Eu. longicolle* Nord. l.c. var. *Himalyense* Turn., Alg. E. Ind., T.23, f.9, var. *capitatum* West, Fr. Alg. Ceylon, T.19, f.24; and three described herein, viz., *Eu. deminutum*, *Eu. bullatum*, and *Eu. campanulatum*, the last of which connects them with the *sinuosum* group. They are almost altogether Australasian at present, their characteristics being a well defined neck, campanulate base, and strongly dilated head.

EU. SINUOSUM Lenor. F. GERMANICA Rac., Desm. Nowe, p.31, T.2, f.10. (T.iii. f.9-10).

Long. 64, 74, 77, 78; lat. 36, 42, 43, 43; lat. lob. pol. 18, 21, 21, 20; crass. 25, —, 21, — μ .

Botany.

I do not feel quite sure that all the specimens included above should be referred to this species, yet they all come from the

same water and agree remarkably in size and markings. The four scrobiculae are arranged three in an equilateral triangle round the fourth. By careful focussing, the tops of the central basal and two upper tumours appear as scrobiculae also; and it will then be seen that the seven are arranged quincuncially—six at equal distances in a circle round the seventh. It is a characteristic feature of this form.

EU. SUBINCISUM Reinsch, Desm. Cape of Good Hope, f.12.
(T.iv. f.1)

Long. 29; lat. 23μ .

Murray's Lagoon, Collector.

Reinsch gives long. $22\frac{1}{2}$, lat. 18μ .

EU. DEMINUTUM, n.sp. (T.iii. f.8).

Eu. magnum, elongatum, medio sinu lineari constrictum, 4 plo. longius quam latum. Semicellulae suboblongae, utroque latere excavatae; angulis inferioribus rectis; lateribus e basi verticalibus tum repente convergentibus et in collum longum, angustum adscendentibus; lobo polari valde inflato, latitudine latitudinem basis fere aequante, lateribus rotundatis, apice latissime rotundato, incisura lineari extremo verrucis binis instructa. Semicellulae supra basin tumoribus binis et inter eos scrobiculis singulis praeditae; a latere visae oblongae, basi inflatae, lateribus fere rectis et parallelis, apicibus rotundato-truncatis; a vertice visae subcirculares, regulariter 6 undulatae. Membrana crassa precipue supra basin, grosse scrobiculato-punctata praecipue in lobo polari.

Long. 135-140; lat. 40; lat. lob. pol. 34-36; lat. coll. 22; crass. $33-34\mu$.

Botany.

A *Eu. longicollis* proximo differt basi angustiore, lobo polari magis inflato, tumoribus paucioribus, et conspectu a vertice visum.

See note on *Eu. longicollis*, supra.

EU. CUNEATUM Jenn. β SOLUM Nord., Alg. N. Z., p.34, T.3, f.6.

Long. 102-110; lat. 36-38; lat. ap. 18-21; crass. 23-27 μ .

Botany.

Some specimens observed differ slightly from Nordstedt's in side view, the lower part being semicircular, protruding a little and *apparently* incrassate. The appearance of incrassation, however, is caused by the folding of the membrane above the isthmus. The basal inflation is hardly visible on rolling over, and not at all otherwise.

EU. CUNEATUM Jenn. γ BASIVENTRICOSUM, n.var. (T iii. f.11).

Supra isthmum ventricosum, tumoribus nullis; a latere visae semicellulae conicae, apicibus rotundatis, basi plano, angulis basalibus rectis. Membrana punctata, punctis in lineas longitudinales interdum ordinatis. Cetera ut in forma typica.

Long. 106; lat. 42; lat. ap. 21; crass. 27 μ .

Murray's Lagoon, Collector.

A vertice semicellulam non vidi, fortasse undulationibus 4 cruciatim dispositis ut in *Eu. ansatum* Ehr.

It is difficult to find out what the forma typica is in this species. Ralfs, in Brit. Desm. p.90, says, "I have not detected any inflated protuberances;" yet in T.33, f.3, he gives an end view showing at least three tumours. Cooke, in Brit. Desm. p.70, observes "empty frond without inflations," and in T.34, f.6, figures an end view differing from Ralfs' but still with three inflations. Lundell, in Desm. Suec., refers to Ralfs without comment. Raciborski, however, in Desm. Nowe, p.30, notes the "semicellulae e basi visae late ellipticae, lateribus (4 undulatis) tumoribus 3 humillimis, vix visibilibus praeditae." Of all the forms I have observed, the one described below is the only one that had any tumours at all, and that had five, three basal and two above; and all, as Raciborski says, "very low, scarcely visible."

EU. CUNEATUM Jenn. δ CONICUM, n.var. (T.iii. f.12).

Gracilius quam forma typica, 3plo. plusve longius quam latum. Semicellulae magis attenuatae, angulis inferioribus superiori-

busque magis rotundatis, lateribus paullulo retusis; tumoribus humillimis vix visibilibus, 3 basalibus, 2 medianis instructae, inter tumores scrobiculis parvis 4; a latere visae anguste elliptico-ovatae, basi late rotundato vel rotundato truncato. Membrana punctata, punctis in lineas longitudinales nonnunquam dispositis.

Long. 120-132; lat. 40-42; lat. ap. 18-21; crass. 27-28 μ .

Botany.

The scrobiculae are arranged, three in an equilateral triangle round the fourth; in side view they appear as a very shallow depression. Sometimes only two (one above the other) are visible. The tumours are very low and obscure, especially the two top ones.

EU. BULLATUM, n.sp. (T iii. f.13).

Eu. mediocre, medio sinu lineari constrictum, diametro subduplo longius. Semicellulae trilobatae, supra basin ventricosae, angulis inferioribus obtusis, lateribus e basi lato fere verticaliter adscendentibus paullulo retusis, ad medium versus semicellulae repentissime lateribus in collum curtissimum crassum confluentibus; lobo polari valde inflato, lateribus obtuso-rotundatis apicibus leniter arcuatis, incisura lineari tuberculis nullis; semicellulae tumoribus 3 basalibus et supra juxta marginem 2 instructae; scrobiculis nullis; a latere visae ovatae, basi rotundato-truncato. Membrana grosse punctata, punctis nonnumquam (praecipue lobo polari) in lineas horizontales vel obscure in quincuncem ordinatis.

Long. 77-87; lat. 39-42; lat. ap. 25-28; lat. coll. 18-19; crass. 28 μ .

Botany, Centennial Park.

The nearest to this is *Eu. Everettense* Wolle, in Desm. U. S. T.28, f.5, which differs from it in side and end views. They both seem to me to be connected with the *longicolle* group generally, but not with any member in particular. See note on *longicolle*, supra.

EU. SINUOSUM Lenor. var. CEYLANICUM West, Fr. Alg. Ceylon, T.19, f.16.

Long. 70; lat. 39 μ .

Coogee (rarissime).

Exact shape of *Eu. circulare* in Ralfs, T.13, f.5a, but a little broader across the middle sinuation, making the basal portion more quadrate. Not much like West's fig., (l.c.) but the scrobiculae are there. West gives the size $70 \times 32\mu$.

EU. CAMPANULATUM, n.sp. (T.iii. f.16).

Eu. mediocre, medio sinu lineari constrictum, diametro circ. subduplo longius. Semicellulae trilobatae, campanulatae, supra basin ventricosae, sursum in collum curtum repente constrictae; angulis inferioribus obtusis; lateribus in parte inferiore convexis inflationibus levibus singulis, in parte superiore (collo) concavis; lobo polari paullulo inflato; angulis superioribus rotundatis; apicibus truncatis; incisura lineari. Semicellulae tumoribus 3 basalibus et supra 2 in serie horizontali cum inflationibus lateralibus ordinatis, praeditae; inter tumores scrobiculis 3. A latere visae elliptico-ovatae, ad apices attenuatae, basi rotundato-truncatae. Membrana subtilissime punctata.

Long. cell. 92, 93, 93, 96, 97; lat. cell. 52, 42, 48, 44, 41; lat. ap. 24, 18, 20, 19, 19; lat. coll. 22, 17, 18, 17, 18; crass. 33, 24, 30, 22, 24μ .

Collector, Botany, Centennial Park.

This species comes to maturity in three stages, all of which are commonly found accompanying one another. The immature forms very much resemble *Eu. ansatum* in outline, and indeed that is the case with several other species of *Euastrum*. In T.iii., figs.14, 15, 16 show the mature and the two young forms, all found in the same water. Other transition forms were noticed, and sometimes fronds formed of two different semicells. It is the connecting link between the *sinuosum* and *longicolle* groups of *Euastrum*.

Forma immatura No.1. (T.iii. f.14).

Forma ad *Eu. ansatum* accedens basi autem latiore, curtior quam forma typica, aegre ventricosa; lateribus sine tumoribus lateralibus; collo non producto; lobo polari non inflato; scrobicula una tantum.

Long. cell. 70-72; lat. cell. 36-38; lat. ap. 16-17; lat. coll. 16-17; crass. 19μ .

Centennial Park.

Forma immatura No.2. (T.iii. f.14, right hand fig.).

Forma longior quam No.1, fere tam lata quam forma typica, magis ventricosa, tumoribus lateralibus incipientibus, lobo polari aegre inflato, collo nondum producto, scrobiculis minoribus carentibus.

Long. 75-78; lat. 36-42; lat. ap. 17-19; lat. coll. 17-19; crass. 22μ .

Centennial Park, Botany.

EU. COMPACTUM Wolle, Desm. U.S.p.107, T.27, f.28-29. (T.iv. f.3).

Long. 31-36; lat. 24-25; crass. $15-16\mu$.

Collector.

EU. UNDULATUM, n.sp. (T.iv. f.2).

Eu. parvum, oblongum, paullo longius quam latum, medio sinu lineari constrictum. Semicellulae cuneatae, truncatae; lateribus levissime convexis, 4-5 crenatis; angulis superioribus in cornua breviter porrectis; apicibus truncatis incrassatis; incisura acuta brevi cuneata. Crenae sunt series granulorum 6-8 transversales, granulis obscuris infra marginem 2-3. Semicellulae tumore unico parvo obscuro vix visibile supra basin instructae. Membrana laevis.

Long. 36-44; lat. 25-30; lat. ap. $14-18\mu$.

Collector.

The granules in the marginal series are difficult to make out, so also the basal tumour, which cannot be seen at all in front view. The nearest form to this is *Eu. denticulatum* Kirch. *β elongatum* Nord., in Alg. N. Z. p.79, from which it differs in its larger size, crenate sides, series of granules and basal tumour. The most mature form observed was $44 \times 30\mu$. Cf. also *Eu. dentic. β stictum* Börges., in C. Braz. T.3, f.18, the sides of which are biundulate only and the granulations scattered, and *Eu. spec.?* Borge, in Sussw. Chlor. N. Russ. T.3, f.39, which is of similar shape and same size.

Genus ARTHRODESMUS Ehr.

AR. ELLIPTICUS, n.sp. (T.iv. f.4-5).

Ar. magnus, subcircularis, medio sinu cuneato, aperto, introrsum rotundato, constrictus. Semicellulae circ. $2\frac{1}{2}$ plo. latiores quam longae, ellipticae vel subhexagonae; angulis lateralibus obtusis in aculeos singulos productis; aculeis brevibus validis plus minus assurgentibus; a vertice visae late ellipticae, apicibus acuminatis et in aculeos singulos protractis, medio utrinque area incrassata. Membrana punctata, crassa, semper in medio semicellularum (sed non evidente) interdum ubique (aculeis etiam) valde, incrassata.

Long. 42, 44, 48, 48, 52; lat. 66, 65, 57, 60, 60, 70; crass. 24, 28, 26μ .

Rose's Lagoon, Collector; Botany.

The spines are relatively short, almost dentate in young forms, and generally form a continuation of the dorsal margin. The large incrassate spot in the centre of the semicells distinguishes this species from *Ar. convergens*, to some forms of which it is similar in shape and size. The incrassation of the membrane, including the spines, in old specimens is quite a feature of this form. Cf. *Xan. tetracentrotum* Wolle, in W. & G. S., West N. Am. Desm. T.15, f.24; *Ar. incrassatus* Lager., Am. Desm. f.18; *Ar. gibberulus* Josh., in Journ. Bot. 1885, T.254, f.6; and *Ar. curvatus* Turn., Alg. E. Ind. T.12, f.2.

Genus XANTHIDIUM Ehr.

X. OCTONARIUM Nord., Alg. N. Z. p.42, T.4, f.22.

Long. c.ac. 100, 112, 108, 104, 102; lat. c.ac. 85, 78, 90, 88, 82; long. s.ac. 76, 82, 78, 78, 72; lat. s.ac. 60, 58, 56, 54, 56; long. acul. 15, 15, 16, 17, —; crass. 40, 37, —, —, $—\mu$.

Spines $\frac{6+6}{6+6}$ $\frac{6+7}{6+7}$ $\frac{7+7}{7+7}$ $\frac{6+6}{6+5}$ $\frac{6+7}{6+7}$

Botany.

It is truly remarkable that I have never yet come across a specimen with the full eight pairs of spines to the semicell. All

the above, however, were clearly *Xan. octonarium*, as was shown in every case by the size and the central incrassation. Nordstedt (l.c.) gives $118 \times 78\mu$ over all as the size of New Zealand specimens, spines up to 20μ long. It is evident that the number of spines is not to be relied on for identification. Where I noted the end view it has been perfectly and broadly elliptic, not at all hexagonal or with truncate apices—this perhaps on account of the specimens being immature. The incrassation is on the inner side of the membrane, and visible in front view.

XAN. COOGEEANUM, n.sp. (T.iv. f.6-7).

Xan. magnum, latum, oblongum, medio sinu lineari extrorsum ampliato constrictum. Semicellulae subhexagonae, supra basin rectangulares; lateribus levissime retusis; angulis inferioribus fere rectis; lateribus e basi lato verticalibus, a medio semicellulae ad apicem convergentibus; apicibus latis, truncatis, processibus 8 concentrice ordinatis, instructis; angulis basalibus et medianis processibus singulis praeditis; infra marginem semicellulae insuper, processibus binis et dentibus acutis singulis, supra isthmum etiam dente unico, ornatae; processus omnes breves, validi et bifidi. A latere visae suboblongae, basi rotundato-truncatae; a vertice late-ellipticae. Membrana dense punctata interdum crassa.

Long. 69-84; lat. 51-60; lat ap. 36-42; long. proc. ad. 12; crass. 36-40 μ .

Coogee.

This species belongs to a small Australian group in which the semicell shows a tendency to be three-lobed, the end lobe more or less drawn out. The apex is furnished with processes arranged in a circle, and the lateral lobes with processes in pairs extending in towards the centre of the semicell. Cf. *Xan. bifurcatum* Borge, in Bailey, Bot. Bull. xv., T.14, f.6; *Xan. (Eu.) multigibberum* Nord., Fr. Alg. N. Z. T.3, f.2; and *Xan. pulcherrium*, below.

XAN. BIFURCATUM Borge, in Bailey, Bot. Bull. xv., T.14, f.6.
(T.iv. f.8, 9).

Long. c. proc. 132-250; lat. c. proc. 84-165; lat. coll. 33-60; long. s. proc. 93-220; lat. s. proc. 50-125; long. proc. 15-22 μ .

Centennial Park.

The specimen figured shows one semicell undeveloped (fig.9) and the other mature. In the young form the processes are solitary, not in pairs. The endochrome is arranged in 6 parietal fillets.

XAN. PULCHERRIMUM, n.sp. (T.iv. f.10).

Xan. magnum, subduplo longius quam latum, medio sinu cuneato introrsum acuto non lineari, profunde constrictum. Semicellulae cuneatae; basi lato; lateribus levissime retusis; apicibus truncatis leviter retusis; angulis inferioribus in processus geminatos productis et infra marginem insuper processibus singulis; apice processibus 6 concentrice ordinatis, ornato, processibus 4-fidis omnibus. Semicellulae in centro nudaе; a latere visae ovatae, apicibus processibus munitis; a vertice late ellipticae, paullo in medio utrinque inflatae; apicibus processibus 3 instructis. Membrana subtilissime punctata. Endochroma in taenias 6 longitudinaliter disposita.

Long. c. proc. 257; sine proc. 224; long. proc. ad 22; lat. c. proc. 156; sine proc. 116 : crass. 82 μ .

Lara Dam, Moura.

I had at first thought that this species might be the immature form of *X. bifurcatum*, to which class of Xan. it belongs. The young semicell of that species, however, as shown in T.iv. f.9, has the same 3-lobed outline as the mature form, whereas in *X. pulcherrimum* the semicell is decidedly cuneate, and also there are no processes at all in the centre.

XAN. HEXAGONUM, n.sp. (T.iv. f.11).

Xan. mediocre, subrectangulare, circ. tam longum quam latum, medio sinu lineari extremo ampliato profunde constrictum. Semicellulae oblongae, subhexagonae; angulis inferioribus fere rectis; lateribus levissime retusis, e basi lato verticalibus tum

repente ad apices convergentibus; apicibus latis truncatis; angulis basalibus medianis apicalibusque dentibus singulis munitis. In centro semicellulae tumore glabro, rotundato. A vertice semicellulae oblongae, crassae, regulariter hexagonae; apicibus latis truncatis, angulis in dentes minulos singulos productis; utrinque in medio tumore rotundato instructae. Membrana punctata paullo incrassata.

Long. 54; lat. 45; crass. 33 μ .

Rose's Lagoon, Collector.

Most like *X. Chalubinskii* Eich. & Rac., Nowe Gatt. Ziel. T.3, f.28.

Compare *X. fasciculatum* var. *perornatum* Nord., Alg. N. Z. T.4, f.23, with which the above coincides in size and somewhat resembles in outline. It differs, however, in the end view most of all, which in *X. hexagonum* is very broad and regularly hexagonal with dentate angles. The tumour is different also, and the spines wanting. The one cell seen was probably mature, since the membrane was incrassate. Cf. also *X. trilobum* Nord., in C. Braz. T.3, f.35, and *X. subtrilobum* West, in Journ. Bot. xxxv., T.368, f.14.

XAN. DECEMDENTICULATUM, n.sp. (T.iii. f.12).

Xan. mediocre, subcirculare, paullo longius quam latum, medio sinu cuneato profunde constrictum. Semicellulae subreniformes, angulis inferioribus rotundatis, lateribus convexis apices versus levissime retusis, apicibus angustis truncatis; semicellulae utroque latere denticulis geminatis 5 munitae, denticulis adscendentibus paullo curvatis in centro tumore verrucoso ornatae; a latere visae circulares; a vertice ellipticae, apicibus rotundatis, utrinque tumore praeditae. Membrana punctata.

Long. 84; lat. 76; crass. 40, long. dent. circ. 3 μ .

Ewenmar, Trangie.

Very similar to *X. fasciculatum* β *ornatum* Nord., in Desm. Greenland, f.10, but larger, and the six pairs of subulate spines or straight aculei in the semicell are replaced in this form by ten pairs of small very sharp-pointed teeth, which, with the exception

of the apical ones, are curved in towards the apex of the cell. This large number of teeth, greater even than in *X. octonarium*, and their entirely different shape, seem to me to distinguish this species from all forms of *X. fasciculatum*. The specimen was surrounded by a gelatinous sheath 200μ in diameter. Cf. also *X. superbum* Elfv. forma Borge, in Bail., Bot. Bull. xv., T.14, f.1.

XAN. BOTANICUM, n.sp. (T.iv. f.13).

Xan. minimum, oblongum, tam latum quam longum, medio sinu cuneato profundissime constrictum, isthmo angustissimo. Semicellulae subhexagonae, lateribus brevibus levissime retusis, apicibus latis truncatis, angulis in aculeos singulos longos, inferioribus horizontaliter, superioribus radiatim, productis; in centro tumore rotundato conico ornatae. A vertice ellipticae utroque latere tumore parvo conico instructae apicibus acuminatis in aculeos singulos protractis. Membrana subtiliter punctata.

Long. c.ac. 40; long. s.ac. 27; long. ac. ad. 12 : lat. c.ac. 43; lat. s.ac. 24; lat. isth. 6 : crass. 12μ .

Botany.

The nearest forms to this seem to be *X. simplicius* Nord., Alg. N. Z. T.4, f.26, and *Ar. octocornis* Ehr., cf. Cooke, Brit. Desm. T.47, f.2; also *Ar. longispinus* Borge, Desm. Braz. T.3, f.35, which has no tumour, and *X. controversum* var. *planctonicum* West, Scott. Plankt. T.16, f.2-3, which is twice the size, with the tumour scrobiculate.

Genus STAUSTRUM Meyen.

ST. FORCIPATUM, n.sp. (T.v. f.1).

St. parvum, subcirculare, ad latera profunde excavatum, sinu nullo, isthmo angustissimo, paullo latius quam longum. Semicellulae subellipticae, dorso convexo, depresso; angulis lateralibus subacutis in aculeos breves singulos productis, aculeis assurgentibus; a vertice triangulares, lateribus concavis, angulis acutis leviter inflatis, aculeis singulis munitis. Membrana glabra.

Long. 32; lat. 39; lat. isth. 8μ .

Botany.

Very like certain forms of *St. Dickiei* and *St. dejectum*. See *St. Dickiei* in Wolle, T.40, f.5, var. *circulare* Turn., Alg. E. Ind. T.16, f.5, forma Börgesen C. Braz. T.4, f.42, *St. dejectum* var. *convergens* Wolle, T.40, f.21, and *Ar. hiatus* Turn., l.c. T.11, f.34.

ST. ORBICULARE Ehr. β DENTICULATUM Nord., Desm. Cent. Braz. T.4, f.42. (T.iv. f.14).

Forma lateribus ad basin retractis, angulis basalibus interdum denticulis singulis instructis. Membrana valde incrassata praecipue ad angulos et ad apicem, dense punctata. A vertice angulis rotundatis, papillis latis singulis praeditis.

Long. 50-54; lat. 42-50 μ .

Botany.

Cf. *St. orb. β verrucosum* Wille, Norges Fersk. p.40, T.2, f.26, which is about half the size. The above form is not exactly like either of the two cited, but is like a cross between them. *St. denticulatum* has no papillae at the angles in end view, and *St. verrucosum* does not show the strongly incrassate angles viewed from the front. The tooth from which the Brazilian form takes its name is not always present in Australian specimens either. Nordstedt's fig. (l.c.) works out at 50 $\times$ 42 μ .

ST. PSEUDOBIRETUM, n.sp. (T.iv. f.15).

St. mediocre, fere tam longum quam latum, medio sinu brevi lineari constrictum, isthmo lato. Semicellulae trapezoideae, dorso dimidio quam basi latiores; angulis inferioribus obtusis; lateribus rectis e basi divergentibus; angulis superioribus acuto-rotundatis; dorso levissime arcuato. Anguli superiores granulis obscuris in seriebus obliquis transversalibus 5 ornati; apicibus denticulis binis interdum munitis. Semicellulae a vertice triangulares, angulis acutis leviter inflatis, seriebus 5 transversalibus granulorum ornatis.

Long. 50-54; lat. dors. 52-60; lat. bas. 30-40 μ .

Murray's Lagoon, Collector.

The first view reminds one of *Cos. biretum*, of which a var. *triquetrum* with three rounded angles in end view is recorded

from Europe. That species, however, is larger, the granules are not confined to the upper angles, nor are the angles ever bidentulate at the ends. Moreover the var. *triquetrum* has "sides deeply sinuous" in end view (Cooke, Br. Desm. p.109).

St. varians Rac., Desm. Polon. T.12, f.1; *St. Kjellmanni* Wille, Cooke, l.c., T.54, f.9; and *St. pygmaeum* Bréb., in Boldt. Desm. fr. Grönl. T.2, f.42, are nearest in form to this species, but its end view alone sufficiently marks it off from them all except the last, which is much smaller.

ST. TIARA, n.sp. (T.iv. f.16).

St. mediocre, ellipticum, paullo longius quam latum, medio sinu aperto cuneato constrictum, isthmo lato. Semicellulae subcuneatae, tiaraformes, dorso altissime convexae et verrucosae, apices versus fere acuminatae; angulis lateralibus acuto-rotundatis granulis in seriebus 3-4 transversalibus ornatis. Semicellulae a vertice quadratae; lateribus aequalibus, levissime concavis, angulis acutis.

Long. 60; lat. 54 μ .

Ewenmar Station, near Trangie.

Compare *St. Pringlei* Wolle, T.50, f.25, and *St. validum* West, Desm. N. Amer. 1896, T.16, f.36.

ST. CRUCIFORME, n.sp. (T.iv. f.17).

St. magnum, oblongum, tam longum quam latum, medio sinu brevi acutangulo constrictum, isthmo angustissimo. Semicellulae subcuneatae, lateribus supra basin paullo inflatis, dorso truncatae verrucis truncatis emarginatis 4 instructae; angulis superioribus in processus binos, unum horizontaliter, alterum radiatim, productis; processibus 5-denticulatis 3-4-fidis. Semicellulae apud angulum sub processu inferiore granulis singulis et verrucis emarginatis singulis instructae; a vertice triangulares, lateribus rectis intra quemque marginem serie verrucis lunatis 4 et granulis binis apud angulos ornatae; angulis in processus binos protractis.

Long.c.proc. 90; long.s.proc. 60; lat.c.proc. 90-102; lat.s.proc. 54 μ .

Collector.

The only species really resembling this is *St. Rosei* mihi; but compare also *St. gracile* Ralfs, β *curtum* Nord., C. Braz. T.14, f.53, which has no superior processes; and *St. bibrachiatum* Rein. var. *cymatium* West, Alg. Madag. T.8, f.28, which is only biradiate.

ST. CUNICULOSUM, n.sp. (T.iv. f.18).

St. mediocre, ellipticum, latius (cum processibus) quam longum, medio sinu acutangulo levissime constrictum. Semicellulae campanulatae, basi angustissimo, lateribus usque ad medium semicellulae verticalibus, parte superiore semicellulae utrinque in processum producto, dorso late-rotundato leviter verrucoso (vel denticulato), processibus assurgentibus. Semicellulae lateribus glabris, margine processuum inferiore glabro, superiore autem denticulato; a vertice triangulares, lateribus glabris valde concavis, intra quemque marginem serie unica denticulationum, apicibus 3-4-fidis.

Long. 48; lat. c. proc. 65 μ .

Botany.

Somewhat like *St. cytocerum* Bréb., in Ralfs, T.22, f.10, in which, however, the rays are twisted; and also like *St. cerastes* Lund, Desm. Suec. p.69, T.4, f.6, but not nearly so verrucose. In end view the sides are quite smooth, and there are only denticulations down the processes. The apices of the processes also have the usual 3-4 teeth. I have seen no four-rayed form. This is not the same as *St. approximatum* West, Fr. Alg. Ceylon, T.22, f.5, a more slender form which also occurs here.

ST. SEXANGULARE (Bulnh.) Lund, Desm. Suec. p.71, T.4, f.9.

Forma 5-radiata. Marginibus radiorum inferiorum 3-4 denticulatis. Omnia specimina a me visa immatura fuerunt radiis superioribus nondum formatis.

Long. s. rad. 34, 36, 40, 51, 60; lat. c. rad. 72, 80, 81, 96, 100 μ .

Collector; Botany.

Forma 5-radiata immatura, n.f. (Tab.v. f.11).

(*St. stellinum* Turn., Alg. E. Ind. p.119, T.15, f.6).

Forma a vertice visa 5-angulata, angulis in radios longos rectos attenuatos singulos productis; apicibus radiorum 2-3 aculeis, magnis conspicuis munitis; radiorum parte interiore glabra exteriore obscure 3-denticulata. Membrana tenue apicibus radiorum vulgo exceptis.

Lat. c. rad. 75-120 μ .

Collector.

Forma 6-radiata Lund., l.c.

Marginibus omnium radiorum 3-4 denticulatis.

Long. c. rad. 63, 67, —, 72, —, —, —; long. s. rad. 48, 50, 52, 60, —, —, —; lat. c. rad. 93, 94, 93, 105, 102, 108, 123 μ .

Collector, Botany, Centennial Park.

Forma 7-radiata Lund., l.c.

Unam tantum cellulam vidi; rara.

Lat. c. rad. 102 μ .

Collector.

Forma 6-radiata, parte interiore glabra processuum puncta-granulis in series transversalibus binis dispositis ornata.

Long. s. rad. 52; lat. c. rad. 93 μ .

Forma marginibus processuum superiorum perfecte glabris.

Curiously enough, none of the specimens answered to *β productum* Nord., Alg. N. Z. p.35, T.4, f.1, q.v.; for although a few of the 5-rayed forms did show a truncate produced apex, and were about the size required, yet being immature (the upper rays only just started) it would not have been safe to have referred them to that variety when all the rest belonged undoubtedly to the typical form. The immature 5-rayed form here figured was found as complementary semicell to a more mature semicell showing both upper and lower rays. I have never seen the corresponding 6-rayed form.

ST. SONTHALIANUM Turn., Alg. E. Ind. p.124, T.14, f.27.

(T.v. f.2).

Long. 40; lat. 55-56 μ .

Botany; Rose's Lagoon, Collector.

Almost exactly corresponding in shape and size with Turner's figure: cf. also l.c. T.16, f.36. The ends of the processes in Aus-

tralian specimens are suddenly turned inwards a little, and the sinus (if sinus it can truly be called) is rounded within.

ST. EXCAVATUM West, Alg. Madag. p.78, T.8, f.42. (T.v. f.3).

Long. 19; lat. 45 μ .

Centennial Park.

ST. CORALLOIDEUM, n.sp. (T.v. f.4).

St. mediocre, paullo latius quam longum, ad latera profunde et late excavata, medio sinu brevissimo acuto constrictum, isthmo angustissimo. Semicellulae supra basin leviter tumidae, dorso leviter convexae, parte superiore in processus rectos, longos, validos productae; processibus utrinque, verrucis (vel spinis coralloideis) in seriebus transversalibus 5 ordinatis, asperrimis; apicibus 4-fidis spinis coralloideis. Inflatione basali seriebus transversalibus binis granulorum ornata. A vertice semicellulae triangulares, angulis protractis 4-fidis, lateribus concavis verrucis vel spinis circa 16 asperrimis, intra margines verrucis in seriebus singulis ordinatis.

Long. 42-48; lat. 50-68 μ .

Botany, Centennial Park, Mosman.

This species belongs to that group of rayed *Staurostra* which have spines or verrucae along the sides in end view. It includes *St. vestitum* Ralfs (?); *St. aculeatum* (Ehr.), see Ralfs, T.23, f.1-2; *St. Sebaldi* Rein., Mittelfr., T.1, f.11; *St. pseudosebaldi* Wille, Norges Desm. T.2, f.30; *St. concinnum* West, Desm. U. S. 1898, T.18, f.7; and *St. Manfeldtii* Delp., Subalp. T.13, f.8-10, the last being the nearest. Cf. also *St. Heimerlianum* var. *spinulosum* Lutk., Desm. Oberöster. T.2, f.17.

ST. VOLANS West β ELEGANS, n.var. (T.v. f.5).

Major quam forma typica, basi interdum globoso (sursum inflata) serie unica minorum granulorum ornato; apicibus interdum truncatis; processibus 8-11 undulatis 2-4-fidis; dentibus vulgo minoribus. A vertice visa et cetera ut in forma typica.

Long. s. proc. 24-27; lat. c. proc. 52-67 μ .

Auburn, Sydney Botanical Gardens, Mosman.

A triradiate form is believed to have been noticed. Cf. West, Alg. Madag. p.79, T 9, f.10-11.

ST. ROSEI, n.sp. (T.v. f.6).

St. mediocre, medio vix constrictum. Semicellulae oblongae, dimidio latiores (sine proc.) quam longae, dorso levissime concavae fere planae; lateribus e basi haud divergentibus, angulis superioribus fissis et in processus binos, inferiores horizontales, superiores fere verticales productis; processibus longis (diametro semicellulae aequalibus) gracilibus, glabris, denticulationibus medianis magnis singulis (utroque latere) ornatis; apicibus bi-aculeatis. A vertice visae triangulares, angulis in processus longos glabros (denticulationibus nullis) singulos protractis, apicibus bi-aculeatis, apud quemque angulum processu altero. Membrana laevi.

Long. c. proc. 50; lat. c. proc. 62; long. s. proc. 20; lat. s. proc. 15 μ .

Rose's Lagoon, Collector.

It is curious that the denticulation on the side of the processes should be visible in front view only; in end view the processes are quite smooth. The nearest species to this seems to be *St. cruciforme* mihi, T.iv. f.17. Cf. also *St. bibrachiatum* Reinsch, var. *cyathiforme* West, Alg. Madag. T.8, f.28a. That, however, is only a biradiate form.

ST. MONILIFERUM, n.sp. (T.v. f.7).

St. parvum, paullo longius quam latum, medio sinu minuto vix constrictum. Semicellulae oblongae, parte inferiore glabro; lateribus e basi verticalibus, rectis; sursum dilatatae, ellipticae, dorso late rotundatae; angulis lateralibus obtuse-rotundatis seriebus 4 transversalibus granulorum ornatis, sine aculeis vel granulis apicalibus, supra isthmum series granulorum unica. A vertice semicellulae triangulares, lateribus leviter concavis, angulis obtusis, seriebus 4 $\frac{1}{2}$ transversalibus granulorum ornatis.

Long. 34-36; lat. 27-29; lat. bas. 11 μ .

Botany.

This is not a variety of *St. dilatatum*, for in that species, if the underside of the semicell be focussed, 13 vertical rows of granules can always be counted; the form above has only nine. Nor can it be a form of *St. tricornis*, which has four granules close together in a square at the extreme end of the lateral angle and which appear plainly as minute teeth in front and end views. Including the apical four, that also has 13 vertical series. In the mature form of any species the little details of ornamentation (such as number and arrangement of granules, verrucae, etc.) are remarkably constant and afford the best clue to identification in some cases. See note to *St. campanulatum*, below.

ST. CAMPANULATUM, n sp. (T.v. f.8).

St. minutum, tam longum quam latum, medio sinu minimo constrictum. Semicellulae campanulatae, supra basin levissime inflatae; lateribus paullo sinuatis; dorso plano; angulis superioribus in processus singulos horizontaliter productis, processibus brevibus apicibus rotundatis interdum denticulis binis minutis praeditis. A vertice visae triangulares lateribus concavis, angulis subacutis, apicibus rotundatis, granulis minimis in seriebus transversalibus 6 ornatis.

Long. = lat. 27-32 μ .

Rose's Lagoon, Collector.

This form is to be classed with *St. striolatum* Näg., Einz. Alg. T.8, f. A3; and *St. dilatatum* Ehr. var. *insigne* Rac., Desm. Ciast. T.2, f. 13, both of which are also known here.

ST. PATENS Turn., Alg. E. Ind. p.108, T 14, f.21, forma AUSTRALICA, n.f. (T.v. f.9).

Forma minor, a fronte visa ut a Turner l.c. delineata, aculeis autem plerumque ternis. A vertice visa triangularis, lateribus levissime concavis fere rectis, angulo quoque repente constricto et in tubulum brevem, truncatum triaculeatum producto; area centrali granulis geminatis in seriebus 3 concentrice ordinatis et angulos versus granulis binis ornata. Semicellulae interdum alternantes.

Long. 30-54; lat. 40-60 μ .

Rose's Lagoon, Collector; Botany; Mosman.

All specimens seen had the angles constricted and drawn out into a short tube. The biaculeate form with inflated angles in end view is probably immature. The granules in end view are roughly indicated in Turner's figure; they mark the corners of the truncate end, and the inflated portion of the processes.

ST. TRIDENTULUM, n.sp. (T.iv. f.20).

St. parvum, paullo latius quam longum, medio sinu acutangulo constrictum, isthmo angustissimo. Semicellulae subcuneatae, supra basin leviter inflatae, dorso planae, angulis superioribus aculeis geminatis et supra spinis longioribus singulis radiatim, instructis. A vertice visae triangulares, lateribus levissime concavis, angulis acutis in aculeos singulos productos. Membrana glabra. Endochroma laminis geminatis 3 radiantibus disposita. Nuclei amylacei singuli.

Long. 24; lat. 30 μ .

Botany.

Cf. *St. Libeltii* Rac., Desm. Nowe, p.28-29, T.3, f.12; *St. avicula* Bréb., in Ralfs, T.23, f.11; and *St. subcruciatum* C. & W., in Cooke, T.51, f.3.

ST. AGGERATUM, n.sp. (T.iv. f.21).

St. parvum, suboctagonum, paullo latius quam longum, medio sinu angustissimo (vel lineari?) profunde constrictum, isthmo angustissimo. Semicellulae subhexagonae, supra basin leviter tumidae; dorso altissime convexae; apicibus truncatis; lateribus sursum fere rectis denticulationibus ternis ornatis; angulis lateralibus denticulis brevibus singulis munitis, denticulis parallelis (interdum convergentibus). A vertice visae triangulares, lateribus leviter concavis, angulis inflatis acutis in denticulos singulos productis et granulis obscuris in seriebus transversalibus 2-3 ornatis. In area centrali granulis 6 concentrice dispositis. Membrana glabra.

Long. 28; lat. 30 μ .

Botany.

Compare *St. furcatum* Bréb. var. *aculeatum* Schm., Hedw. 34, 1895, f.19; *St. Reinschii* Roy, in Cooke, T.51, f.4; *St. forficulatum* Lund., Desm. Suec. T.4, f.5; and *St. podlachicum* Eich. & Gutw., Alg. Nov. T.2, f.49.

ST. BOTANENSE, n.sp. (T.iv. f.19).

St. parvum, tam longum quam latum, medio sinu acutangolo profunde constrictum. Semicellulae subcuneatae vel crateriformes, dorso planae, ventre inflato fere semicirculare, angulis superioribus fissis et in aculeos binos, inferiores horizontales, superiores divergentes, protractis. A vertice visae triangulares, lateribus perfecte rectis, angulis acutissimis aculeis brevibus singulis praeditis. Membrana glabra.

Long. = lat. 30μ .

Botany.

The most closely related form is *St. tridentulum* mihi; see note above.

ST. AUBURNENSE, n.sp. (T.v. f.10).

St. minutum, paullo latius quam longum, medio sinu amplo profunde constrictum. Semicellulae subcuneatae vel crateriformes, dorso levissime convexae fere planae, ventre alte convexae; lateribus aegre curvatis fere rectis; angulis superioribus in tubulos singulos radiatim productis, tubulis minimis, brevissimis. A vertice visae triangulares, lateribus medio retusis interdum distincte denticulato-asperis, angulis levissime inflatis et in tubulos singulos productis granulis minutissimis in seriebus transversalibus 4 ornatis.

Long. 18-20; lat. 23-24 μ .

Auburn; Rose's Lagoon, Collector.

Forma MINOR, n.f.

Exacte ut in forma typica sed minor. An granuli nulli?

Long. 12; lat. 16 μ .

Botany.

Of similar shape is *St. hexacerum* Wittr. var. *aversum* West, Desm. U. S. 1898, T.18, f.13, but that is granulate irregularly. Compare also *St. tunguscanum* Boldt., Siber. Chlor. T.5, f.22, and

St. apiculatum Bréb., in Cooke, T.49, f.2, which have spines instead of processes; the latter also lacks the lines of minute puncta-granules.

ST. ASSURGENS Nord., Alg. N. Z. p.37, T.4, f.8.

Long. 44, 50, 50, 52; lat 84, 87, 92, 80; crass. 20, —, 16, 21 μ .

Botany, Centennial Park.

Formae immaturae. (T.v. f.31). (See note below).

Long. 36, 40, 42, 42, 42; lat. 50, 50, 50, 52, 70; crass. 18, —, —, 15, — μ .

Botany, Centennial Park.

All the Australian specimens noted differ a little from Nordstedt's figure, *l.c.*, in the spines at the apex of the rays, which, together with the central swelling in end view, are, as he says, characteristic of the species, even in its young forms. The spines are not sharp-pointed, but blunt and rounded at the tip; the lower (for there are only two prominent) always continues the lower edge of the ray, while the upper widely diverges upwards and outwards. The upper edge of the ray is just a little retuse behind the spines, giving a recurved appearance to the end. If the cell be tilted a little, eight verrucae come into view, sometimes tipped with long spines. A curved row of five granules may be seen in front view running round the base of the central tumour and some way down each ray. Neither these nor the verrucae are conspicuous in the youngest forms. In end view a minute spine can be seen at the base of the terminal spine, on each side; in front they are only visible as granules. The youngest forms are sometimes very convex on the back, more so than in the figure, the rugae smoothed down, and the basal portion of the semicells more or less globose.

I consider *St. indentatum* West, Fr. Alg. Ceylon, T.22, f.10-12, to be an immature form of *assurgens*. He gives size 34-39 $\times$ 52-76, crass. 17 μ , which tallies exactly with the size of our immature forms given above. The same applies to *St. bicornis* Haupt., in Rac., Desm. Ciast. (from the Centennial Park) T.2, f.8; size 42 $\times$ 72 μ .

Genus COSMARIUM Corda.

Cos. CYCLOPEUM, n.sp. (T.v. f.12).

Cos. parvum, subcirculare, paullo longius quam latum, medio sinu lineari profunde constrictum. Semicellulae subpentagonae, lateribus e basi lato, divergentibus, dorso alte convexae regulariter arcuatae, angulis lateralibus obtusis, apud apices intra marginem granulis singulis vix visibilibus praeditae. A vertice lato-ellipticae, in medio granulis geminatis ornatae, apicibus obtuse-rotundatis. Membrana punctata.

Long. 30-36; lat. 27-32; crass. 18 μ .

Murray's Lagoon, Collector.

The nearest form is *Cos. pseudoprotuberans* Kirchn., in Wille, Norges T.1, f.18, which has no apical granule. Cf. also *Cos. Elfingii* β Rac., Desm. Nowe, T.1, f.14, and *Cos. bigemma* Rac., l.c. T.1, f.10.

Cos. INCRASSATUM, n.sp. (T.v. f.15).

Cos. mediocre, suboblongum, paullo longius quam latum, medio sinu cuneato profunde constrictum. Semicellulae regulariter latissime-ellipticae, lateribus late-rotundatis, dorso rotundatae paullulo deplanatae, in medio area incrassata ornatae. A vertice visae ut a fronte, lateribus in medio area incrassata luteola utrinque praeditis. A latere circulares. Membrana glabra.

Long. 42-50; lat. 36-42; crass. 21-25 μ .

Botany, Centennial Park.

Like a large edition of *Cos. ellipsoideum* Elfv. (see Rac., Desm. Polon. T.10, f.9). Cf. also *Cos. (phaseolus* Bréb. γ) *achondrum* Boldt., Sibir. Chlor., T.5, f.7.

Cos. QUADRIGEMME, n.sp. (T.v. f.13).

Cos. parvum, subquadratum, tam longum quam latum, medio sinu lineari profunde constrictum. Semicellulae subreniformes; basi lato, plano; dorso deplanato-rotundato; angulis inferioribus fere rectis; lateribus interdum paullo divergentibus, angulis superioribus late-rotundatis, ad apices intra marginem granulis 4 (medianis validioribus, exterioribus minoribus et obscuris) in

serie horizontali paullulo arcuato ordinatis, ornatae. A vertice visae ellipticae granulis geminatis utrinque instructae. Membrana minute punctata.

Long. 22-24; lat. 22-25; crass. 12-15 μ .

Murray's Lagoon, Collector.

Cf. *Cos. pseudotaxichondrum* Nord. var. *Africanum* West, Journ. Bot. xxxv., T.367, f.14; and *C. heterochondrum* Nord., De Alg. Batav. T.1, f.3.

Cos. VICENISTRIATUM, n.sp. (T.v. f.16).

Cos. parvum, subquadratum, circa tam longum quam latum, medio sinu lineari profunde constrictum. Semicellulae subreniformes, basi lato, plano; dorso truncatae, angulis inferioribus obtusis; lateribus late rotundatis; angulis superioribus obtusis; granulis circa 20 in seriebus radiantibus ubique trans marginem ordinatis ornatae; granulis 2-3 intra marginem; supra isthmum leviter inflatae. A vertice visae ellipticae, in medio utrinque inflatae, apicibus late rotundatis. Nuclei amylacei singuli.

Long. 21-27; lat. 18-27; crass. 15 μ .

Rose's Lagoon, Collector; Botany.

Young forms have the sides of the semicells converging to the broad truncate apex, not broadly rounded, and fewer lines of granules across the margin. Cf. *C. striatum* and *C. jenisejense* Boldt., Sibir. Chlor. T.5, f.9 and 13; also *C. polonicum* Rac. var. *alpinum* Schm., Alp. Alg. T.15, f.21.

Cos. FLUVIATILE, n.sp. (T.v. f.18).

Cos. parvum, subovale, paullo longius quam latum, medio sinu lineari extremo ampliato profunde constrictum. Semicellulae subreniformes a basi lato ad apicem attenuatae; angulis inferioribus obtusis; lateribus leviter convexis convergentibus sub apicem paullo retusis; apicibus angustis, truncatis; granulis obscuris in seriebus 3 trans margines laterales ordinatis, granulis intra marginem 2; supra isthmum granulis validioribus geminatis ornatae. A vertice visae ellipticae utrinque in medio granulis geminatis praeditae; apicibus obtusis, granulis in seriebus 3-4 transversalibus ornatis. Membrana subtilissime punctata.

Long. 33; lat. 27μ .

Auburn.

A few somewhat similar are *Cos. bivertex* Rac., Desm. Nowe, T.1, f.20; *Cos. isthmochondrum* var. *brasiliense* Borge, Desm. Regnell. T.2, f.21; *C. limnophilum* Schm., Alp. Alg. T.15, f.20. The nearest approach is *C. Pilgeri* Schm., Aus. Braz. T.4, f.13, which curiously enough is exactly the same size. It has, however, five strongly marked granules on each side; and Schmidle expressly says "seen from above elliptical and not tumid." The above has three rows of almost invisible minute granules across the edges, just sufficient to cause three slight denticulations on the margin. The two large granules are conspicuous in end view.

COS. JENISEJENSE Boldt. β AUSTRALE, n.var. (T.v. f.14).

Forma dorso depressa fere plana; angulis inferioribus obtusis fere rectis; lateribus verticalibus leniter convexis; angulis superioribus late rotundatis; puncta-granulis in series et verticales circ. 10 (granulis circ 7) et oblique transversales ordinatis, ornata; in centro tumore humili granulis 9 majoribus in series 3 verticales ordinatis, instructa. A vertice visa elliptica utrinque in medio tumore parvo 3-granulato praedita, apicibus late rotundatis.

Long. 35; lat. 26-29; crass. 18μ .

Murray's Lagoon, Collector.

Cf. Boldt., Siber Chlor. T.5, f.13.

COS. ORTHOPUNCTULATUM Schm., Alp. Alg. T.15, f.15.

(T.v. f.27-28).

Forma semicellulis a fronte visis perfecte ellipticis.

Long. 30-34; lat. 34; crass. 15-17: zygo. s. ac. 15; c. ac. 30μ .

Coogee.

COS. MURRAYI, n.sp. (T.v. f.19).

Cos. parvum, suboblongum, clepsydraforme, paullo longius quam latum, medio sinu breve lineato constrictum. Semicellulae subpyriformes, ad apices versus inflatae; dorso lato truncato paullulo producto; lateribus e basi angusto divergentibus, sursum convexis. A vertice visae regulariter ovaes, apicibus late rotundatis. Membrana achroa glabra.

Long. 27; lat. 23; crass. 14μ .

Murray's Lagoon, Collector.

Cf. *Cos. pyriforme* Nord., Cent. Braz., frontispiece, which in general outline it very much resembles. That species is, however, very much larger, long. = 63μ .

Cos. COLLECTORENSE, n.sp. (T.v. f.17).

Cos. parvum, oblongum, dimidio longius quam latum, medio sinu lineari extremo ampliato profunde constrictum. Semicellulae perfecte quadratae; angulis acute-rotundatis; lateribus 3-crenatis; dorso truncatae. A vertice ellipticae utrinque in medio inflatione parva instructae, apicibus rotundatis. A latere ovatae, basi angusto, apice rotundato, lateribus fere rectis e basi divergentibus. Membrana glabra.

Long. 32; lat. 22; crass. 15μ .

Murray's Lagoon, Collector.

The nearest is *Cos. tetragonum* Näg., Einz. Alg. T.7, f. A5, especially f. *polonica* Eich. & Gutw., Alg. Nov. T.5, f. 28.

Cos. LATEREPROTRACTUM, n.sp. (T.v. f.23).

Cos. minimum, subquadratum, paullo latius quam longum, medio sinu lineari extremo ampliato profunde constrictum. Semicellulae late subreniformes, depressatae, supra basin inflatae, ad apices attenuatae; dorso lato truncato. A vertice visae angustae, elongato-ellipticae; lateribus fere parallelis; apicibus subacute-rotundatis. Membrana glabra.

Long. 14; lat. 20; crass 6μ .

Rose's Lagoon, Collector.

The only one at all like the above is *Cos. subdepressum* West, N. Amer. T.15, f.15, which is reniform and minutely granular.

Cos. QUADRIFARIUM Lund. forma *HEXASTICHA* (Lund.) Nord., in Alg. N. Z. p.49.

Forma *MAJOR* Nord., l.c.

Long. 57-62; lat. $41-46\mu$.

Forma *ROSACEA*, n.f.

Forma paullo major, margine verrucis emarginatis 24 instructo; tumore majore verrucis 28 ($14 + 10 + 4$) ornata.

Long. 74; lat. 57 μ .

Botany.

Forma OCTASTICHA Nord., l.c.

Long. 56; lat. 48 μ .

Coogee.

COS. PSEUDOPACHYDERMUM Nord., Alg. N. Z. p.53, T.5, f.20.
(T.v. f.21).

Long. 110-116; lat. 72 μ .

Murray's Lagoon, Collector.

Formae immaturae. (T.v. f.22).

(= *Cos. ad obsoletum* accedens, Nord., l.c. f.22?).

Long 75, 78, 80, 84, 90, 90, 90, 102; lat. 66, 66, 68, 72, 62, 66
68, 72 μ .

Nuclei amylacei bini.

Collector; Auburn.

None of the immature forms observed showed any signs of teeth at the basal angles. On the other hand most, if not all, had a strongly incrassate yellow membrane with the characteristic incrassate papilla within the apex. One at least was noticed with the angular outline on the back, familiar in *C. obsoletum* and *C. perforatum*. The end view of these forms, however, is not a sharp-pointed ellipse, but oblong with broadly rounded ends. I think it highly probable that the two doubtful forms of *Cos. pyramidatum*, in Borge, Desm. Braz. p.94, T.3, f.8-9, are really *Cos. pseudopachydermum* and one of the above immature forms.

COS. VENUSTUM Bréb. β *induratum* Nord., Alg. N. Z. p.57, T.3, f.13.
(T.v. f.24).

Long. 30, 31, 32, 33; lat. 21, 19, 22, 21; crass. 11, —, —, 11 μ .

Collector.

Forma *incognita*: forma immatura No.1. (T.v. f.25).

Long. 18; lat. 13 μ . Nuclei amylacei singuli.

Collector.

Forma *trilobata* : Forma immatura No.2. (T.v. f.26).

Nonne *Cos. trilobulatum* Reinsch (?).

Long. 27, 24, 27; lat. 16, 17, 18; crass. —, 9, — μ .

Collector.

Forma incognita is certainly a young form of f. *trilobata*, as a semicell of each was found forming one frond. Also an intermediate form was noted between f. *trilobata* and *C. induratum typicum*. Nordstedt's fig. of *C. trilobulatum* β *basichondrum* looks, it seems to me, a good deal more like this species than that of Reinsch. Cf. Nordstedt, l.c. T.6, f.11; and Reinsch, Spec. Gen. T.3, f.A2. May not f. *trilobata* be the same as *Cos. trilobulatum* Reinsch (?). Lundell says, in Desm. Suec. p. 42, "Membrana in centro semicellulae paulum incrassata"; and the size is about the same.

Cos. SUBSPECIOSUM Nord., Desm. Arctoae T.6, f.13.

Long. 48; lat. 34; crass. 22 μ .

Coogee; rarissime.

The few specimens seen were, as to shape and size, exactly like the type, save that there were incrassate ridges connecting the granules of the tumour. In one with endochrome the pyrenoid was single, I fancied, but it was somewhat doubtful.

Cos. SUBSPECIOSUM β *VALIDIUS* Nord., Fr. Alg. N. Z. T.5, f.10.

Long. 60, 62, 63, 70, 72, 72, 75, 76, 85; lat. 53, 49, 48, 48, 50, 55, 50, 59, 56; crass. —, —, —, —, 26, —, —, —, — μ .

Collector, Moura, Centennial Park, Coogee.

Nuclei amylacei certissime bini.

In no specimen have I ever seen nine vertical rows of basal granules as in Nordstedt's fig., l.c. The most that could be seen were five-six. These did not fill up the breadth of the isthmus, however, and in the largest single semicells, when tilted, I was just able to discern nine granules across the isthmus, but nothing more.

Forma *FONTENSIS*, n.f. (T.v. f.29).

Forma paullo minor quam forma typica; tumore basali granulis in series distinctas, verticales 5 et horizontales 5-6 dispositis,

ornato. Granulis tumoris plus minus quadratis, basalibus validioribus et emarginatis. Nuclei amylacei certissime bini.

Long. 56, 60, 63, 64, 64; lat. 45, 50, 50, 48, 50; crass. —, —, —, 34, 30 μ .

Fountain in the Sydney Botanical Gardens.

This form bears the same relation to β *validius* that Forma Borge, Desm. Regnell. T.3, f.32, does to *subspeciosum* typicum. The size of the Brazilian form is $46 \times 35 \times 22\mu$, loc. cit. p.101.

Genus STAUROPHANUM Turn.

Freshw. Alg. E. India, 1892, p.195, (Genus *Dichotomum* West, 1896, Trans. Linn. Soc. 2nd Ser. Bot. v. p.270).

ST. CRUCIATUM (Wall.) Turn. β ELEGANS (West) f. SYDNEYENSIS, n.f., (T.v. f.30).

Cf. Turner, l.c., T.20, f.20, 21 (*Dich. elegans* West, l.c., T.16, f.33).

Forma corpore paullo longiore et latiore, sine constrictione, lobis ter dichotomis, apicibus non furcatis.

Long.c.proc. = lat.c.proc. = 40; long.s.proc. 18; lat.s.proc. 15 μ .

Fountain in the Sydney Botanical Gardens.

There can be no doubt at all, I think, of the identity of these two genera and species. Turner says long. = lat. = 48-54 μ . West gives long. s. proc. 15; c. proc. 42; lat. s. proc. 12; c. proc. 42 μ . Turner has the right of priority.

EXPLANATION OF PLATES II.-V.

Plate ii.

- Fig. 1.—*Cl. Mourense*, n.sp. ($\times 720$).
 Fig. 2.—*Trip. serratum*, n.sp. ($\times 720$).
 Fig. 3.—*Cl. magnificum*, n.sp. „
 Fig. 4.—*Cl. calamus*, n.sp. „
 Fig. 5.—*Pen. australe* Rac. „
 Fig. 6.—*Pen. pachydermum*, n.sp. ($\times 720$)
 Fig. 7.—*Cl. cingulum*, n.sp. „
 Fig. 8.—*Icth. australiensis*, n.sp. „
 Fig. 9.—*Cl. naviculoides*, n.sp. (?) „

- Fig. 10.—*Pl. mediolaeve*, n.sp. ($\times 720$).
 Fig. 11.—*Trip. denticulatum*, n.sp. ,,
 Fig. 12.—*Cl. molle*, n.sp. ,,
 Fig. 13.—*Cl. cornutum*, n.sp. ,,
 Fig. 14.—*Trip. gracile* Bail. β *aculeatum* Nord., f. *australia* ($\times 360$)
 Fig. 15.— ,, ,, ,, ,, end of another ($\times 720$)
 Fig. 16.—*Cl. cancer*, n.sp. ($\times 720$)

Plate iii.

- Fig. 1.—*Pen. gracillimum*, n.sp. ($\times 720$)
 Fig. 2.—*Spir. obscura* Ralfs ($\times 360$)
 Fig. 3.—*Doc. expansum*, n.sp. ($\times 720$)
 Fig. 4.—*Tetm. gracilis*, n.sp. ,,
 Fig. 5.—*Tetm. immanis*, n.sp. ($\times 360$)
 Fig. 6.—*Eu. longicollis* Nord. β *australicum*, n.var. ($\times 720$; side $\times 265$)
 Fig. 7.—*Eu. triangulum*, n.sp. ,, ,,
 Fig. 8.—*Eu. deminutum*, n.sp. ,, ,,
 Fig. 9.—*Eu. sinuosum* Lenor. f. *germanica* Rac. ($\times 720$)
 Fig. 10.— ,, ,, another form ,,
 Fig. 11.—*Eu. cuneatum* Jenn. γ *basiventricosum*, n.var. ($\times 720$)
 Fig. 12.— ,, ,, δ *conicum*, n.var. ,,
 Fig. 13.—*Eu. bullatum*, n.sp. ($\times 720$)
 Fig. 14.—*Eu. campanulatum*, n.sp., f. *immatura* (No. 1) ($\times 720$)
 Fig. 14 (right hand fig.)—*Eu. campanulatum*, n.sp., f. *immatura* (No. 2)
 ($\times 720$).
 Fig. 16.—*Eu. campanulatum*, n.sp. ($\times 720$)

Plate iv.

- Fig. 1.—*Eu. subincisum* Reinsch ($\times 720$)
 Fig. 2.—*Eu. undulatum*, n.sp. ,,
 Fig. 3.—*Eu. compactum* Wolle ,,
 Fig. 4.—*Ar. ellipticus*, n.sp. ,,
 Fig. 5.— ,, older form ,,
 Fig. 6.—*Xan. Coogeanum*, n.sp. ,,
 Fig. 7.— ,, younger form ($\times 720$)
 Fig. 8.—*Xan. bifurcatum* Borge ,,
 Fig. 9.— ,, younger form ,,
 Fig. 10.—*Xan. pulcherrimum*, n.sp. ($\times 360$)
 Fig. 11.—*Xan. hexagonum*, n.sp. ($\times 720$)
 Fig. 12.—*Xan. decemdentculatum*, n.sp. ($\times 720$)
 Fig. 13.—*Xan. Botanicum*, n.sp. ,,
 Fig. 14.—*St. orbiculare* Ehr. β *denticulatum* Nord., forma ($\times 720$; end $\times 265$)
 Fig. 15.—*St. pseudobiretum*, n.sp. ($\times 720$)
 Fig. 16.—*St. tiara*, n.sp. ,, (end $\times 265$)

- Fig. 17.—*St. cruciforme*, n.sp. (× 720).
 Fig. 18.—*St. cuniculosum*, n.sp. ,, (end × 265)
 Fig. 19.—*St. Botanense*, n.sp. ,,
 Fig. 20.—*St. tridentulum*, n.sp. ,,
 Fig. 21.—*St. aggeratum*, n.sp. ,,

Plate v.

- Fig. 1.—*St. forcipatum*, n.sp. (× 720)
 Fig. 2.—*St. Sonthalianum* Turn. (× 720)
 Fig. 3.—*St. excavatum* West ,,
 Fig. 4.—*St. coralloideum*, n.sp. ,,
 Fig. 5.—*St. volans* West, β *elegans*, n.var. (× 720)
 Fig. 6.—*St. Rosei*, n.sp. (× 360)
 Fig. 7.—*St. moniliferum*, n.sp. (× 720)
 Fig. 8.—*St. campanulatum*, n.sp. (× 720)
 Fig. 9.—*St. patens* Turn. f. *australica*, n.f. (× 720)
 Fig. 10.—*St. Auburnense*, n.sp. (× 720)
 Fig. 11.—*St. sexangulare* Bulnh., f. *immatura* (× 360)
 Fig. 12.—*Cos. cyclopeum*, n.sp. (× 720)
 Fig. 13.—*Cos. quadrigemme*, n.sp. (× 720)
 Fig. 14.—*Cos. jenisejense* Boldt. β *australe*, n.var. (× 720)
 Fig. 15.—*Cos. incrassatum*, n.sp. (× 720; end and side × 265)
 Fig. 16.—*Cos. vicensistriatum*, n.sp. (× 720)
 Fig. 17.—*Cos. Collectorenses*, n.sp. ,,
 Fig. 18.—*Cos. fluviale*, n.sp. ,,
 Fig. 19.—*Cos. Murrayi*, n.sp. ,,
 Fig. 20.—*Eu. rotundum*, n.sp. ,,
 Fig. 21.—*Cos. pseudopachydermum* Nord. (× 720)
 Fig. 22.— ,, formae ,,
 Fig. 23.—*Cos. latereprotractum*, n.sp. ,,
 Fig. 24.—*Cos. venustum* Bréb. β *induratum* Nord. (× 720)
 Fig. 25.— ,, ,, ,, f. *incognita*, n.f. (× 720)
 Fig. 26.— ,, ,, ,, f. *trilobata*, n.f. ,,
 Fig. 27.—*Cos. orthopunctulatum* Schm. (× 720)
 Fig. 28.— ,, zygo-spores (a) young, (b) mature (× 360)
 Fig. 29.—*Cos. subspeciosum* β *validius* Nord., f. *fontensis*, n.f. (× 720)
 Fig. 30.—*Staurophanum cruciatum* β *elegans* (West) f. *Sydneyensis*, n.f. (× 720)
 Fig. 31.—*St. assurgens* Nord., immature forms (× 720).



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