

Flora of Koh Chang.

Contributions to the knowledge of the vegetation in the
Gulf of Siam.

By

Johs. Schmidt.

Part IV.

(W. West and G. S. West: Fresh Water Chlorophyceae. — Th. Reinbold: Marine Algae (Chlorophyceae, Phaeophyceae, Dictyotales, Rhodophyceae)¹). — M. Gomont: Myxophyceae hormogoneae. — Johs. Schmidt: Peridinales.)

Fresh Water Chlorophyceæ

by W. West F. L. S. and Prof. G. S. West B. A. — Bradford.

(With plate 2-4).

The following contribution to the flora of the island of Koh Chang has resulted from the examination of a number of collections of freshwater *Chlorophyceæ* made during the stay of the Danish Expedition in Siam in 1899—1900. The collections were preserved in weak alcohol or formaline and were twenty four in number.

Very few filamentous *Chlorophyceæ* were obtained, the chief of which were four species of *Ectogonium* and four of *Spirogyra*, one species of each of these genera being quite new. Two of the collections from stagnant water in the jungle were rich in various free-swimming *Palmellaceæ*. Some four or five of the collections contained a number of Desmids, many of which have proved to be very interesting.

The only papers dealing with freshwater Algae from this region of the world are: — Joshua on „Burmese Desmids“ (1886);

¹) Excl. *Corallinaceæ* by M. Foslie, published in part II. of the Flora of Koh Chang.

Schmidle on „Einige Algen aus Sumatra“ (1895); W. West & G. S. West on „Desmids from Singapore“ (1897); and a note by Archer in Quart. Journ. Micr. Sci. (1865) on two Desmids from Hong Kong. To these may be added a paper by Lütkemüller on „Desmidiaceen aus den Ningpo-Mountains in Centralchina“ (1900).

The following is a summary of the Chlorophyceæ observed:

	Genera	Species
Coleochaetaceæ.....	1	1
Edogoniaceæ.....	1	4
Confervaceæ.....	1	1
Ophiocytieæ.....	1	2
Zygnemaceæ.....	1	4
Desmidiaceæ.....	11	84
Palmellaceæ.....	14	25
Total....	30	121

Of the above, 9 species and a number of varieties are here described for the first time.

In addition to the above several sterile species of *Spirogyra*, *Zygnema*, *Mougeotia*, *Bulbochæte*, and *Edogonium* were observed, and also a few fragments of a species of *Chaetophora*.

Class. Chlorophyceæ.

Ord. *Confervoideæ Heterogamæ.*

Fam. *Coleochætaeæ.*

Aphanochæte Berth.

1. *A. repens* Berth. 1878; De Toni Syll, Algarum, I, p. 179.

Diam. cell. 7,7—17 μ ; altit. cell. 8,5—10 μ .

Attached to aquatic plants in stagnant water.

Area: Europe, North America, Sandwich Is., New Zealand.

Fam. *Edogoniaceæ.*

Edogonium Link.

2. *E. cryptoporum* Wittr. in Öfvers. af K. Vet.-Akad. Förh. 1870, no. 3, p. 119; in Nova Acta Reg. Soc. Scient. Upsala, ser. 3, IX, 1874, p. 7.

Var. *vulgare* Witt. in Nov. Acta Reg. Soc. Scient. Upsala, l. c.

Crass. cell. veget. 5—7,5 μ ; altit. 3—5-plo major;
 „ oogon. 19—20 μ ; „ 18—23 μ ;
 „ oospor. 17,5—18,5 μ ; „ 13—14 μ .

In stagnant water in riverbed.

Area: Europe, N. America and New Zealand.

3. *Æ. maximum* West & G. S. West, n. sp. (Tab. nostr. IV, fig. 39—41.)

Æ. dioicum, macrandrium; oogoniis singulis, subquadratis vel oblongo-rectangularibus, levissime tumidis; oosporis oogonia exacte complementibus, subquadratis vel oblongo-rectangularibus, in sectione optica verticali circularibus; membrana oosporæ crassa, glabra, quasi crassescione membranæ oogonii formata; plantis masculis eadem crassitudine ac femineis; antheridiis pluricellularibus(?).

Crass. cell. veget. 89—93 μ ; altit. 1½—2 (usque ad 3)-plo major;
 „ oogon. (et oospor.) 105—107 μ ; altit. 115—136 μ ;
 „ cell. antherid. 77—86 μ ; altit. 7—15 μ .

A large quantity of this *Edogonium* was seen from stagnant water and the plants were in abundant fruit. The oospores are rather remarkable being somewhat rectangular in outline, and having a wall which is apparently formed by an increase in thickness of the wall of the oogonium. Thus, when the spore is ripe there is no differentiation between the oospore and the oogonium, and the ripe oospores are set free by the breaking up of the filaments. Only one example of the antheridia was observed and this was only a fragment. From its general appearance it is high, probable that the antheridia are many-celled, but this point could not be definitely determined.

It may be compared with *Æ. fabulosum* Hirr from which it is easily distinguished by its larger size and its differently shaped oospores, which completely fill the oogonia.

4. *Æ. dioicum* Carter in Ann. Mag. Nat. Hist. 1, no. 4, 1858, p. 30, t. III, f. 1, 2, 5—8, 13—16; Hirr in Acta Soc. Scient. Fennicæ, Tom. XXVII, no. 1, 190, p. 175, t. XXVIII, f. 163. (Tab. nostr. IV, fig. 42.)

Crass. cell. veget. 31—35 μ ; altit. 3—5-plo major;
 „ oogon. 97 μ ; „ 100 μ ;
 „ oospor. 70 μ ; „ 70 μ .

We place this plant under *Æ. dioicum* Carter owing to the relative size of the filaments and the peculiar oogonia, which the oospores do not fill. It agrees with Carter's species in everything except the length of the cells, which are proportionately a little longer.

In stagnant water in the jungle, among the preceding species.

Area: India.

5. *C. pluviale* Nordst. in Rabenh. Alg. Europ. no. 2257; Wittr. in Acta Reg. Soc. Scient. Upsala, ser. 3, IX, p. 19; Hirn in Acta Soc. Scient. Fennicæ, tom. XXVII, no. 1, p. 280, t. XLVIII, f. 311.

Forma.

Grass. cell. veget. 19—25 μ ; alit. $\frac{3}{4}$ —2-plo major;
 " oogon. 40—46 μ ; " 44—48 μ ;
 " oospor. 38—44 μ ; " 42—44 μ .

The form observed was from rocks in a riverbed and agrees with a form mentioned by Hirn (l.c. p. 281) as occurring in Italia: in saxis humidis in Monte Fiesole prope oppidum Florenz*. This form was previously described as '*C. Montagnei* F. Magz. var. *saxicolum* Wittr'.

Area: Europe and N. America.

Ord. *Confervoideæ* *Isogamæ*.

Fam. *Confervaceæ*.

Microspora Thur., em. Lagerh.

6. *M. abbreviata* Lagerh. in Bericht. Deutsch. Bot. Gesellsch. 1887, V, p. 417. *Conferva abbreviata* Rabenh. Krypt. Flor. v. Sachs. 1863, p. 246; Flor. Europ. Algar. III, p. 323.

Grass. fil. 10—11 μ .

In stagnant water amongst *Spirogyra decimina* var.

Area: Europe, N. America, Australia, and W. Africa.

Fam. *Chaetophoraceæ*.

Trentepohlia Mart.¹⁾

7. *T. aurea* Mart.

On rocks in the jungle near Klang Munsé, very common.

Area: Europe, America, Asia.

Fam. *Ophiocyticæ*.

Ophiocytium Näg.

8. *O. bicuspidatum* Lemmermann in Hedwigia 1899, Bd. XXXVIII, p. 31, t. III, f. 13—15. *O. majus* Näg. var. *bicuspidatum* Borge.

In muddy ricefield.

Area: Europe, and E. Africa (var.).

¹⁾ Auctore E. de Wildeman.

9. *O. parvulum* A. Braun Alg. Unicell. 1855, p. 55. *Brochidium parvulum* Perty 1852.

With the preceding species in muddy ricefield.

Area: Europe, N. America, Ceylon, Sumatra, Australia, and W. Africa.

Ord. *Conjugatæ*.

Fam. *Zygnemaceæ*.

Spirogyra Link.

10. *S. neglecta* Kütz. Spec. Algar. 1849, p. 441; Rabenh. Flor. Europ. Algar. III, p. 248; Petit Spirog. de Paris, p. 26, t. IX, f. 1—5. *Zygnema neglecta* Hass. 1845.

Crass. cell. veget. $65\ \mu$; long. zygosp. $84-92\ \mu$; lat. zygosp. $61-66\ \mu$.

In stagnant water in riverbed.

Area: Europe and N. America, West Indies, Central and W. Africa (var. *ternata*). Ceylon.

11. *S. declinata* (Müll.) Kütz. Phyc. Germ. p. 223; Rabenh. Flor. Europ. Algar. III, p. 242; Petit Spirog. de Paris, 1880, p. 25, t. VIII, f. 1—3.

Forma major, cellulis vegetativis diametro $2\frac{1}{2}-5$ (usque 6)-plo longioribus; cellulis fructiferis non inflatis; chromatophoris 3 cum marginibus asperis, anfractibus $2\frac{1}{2}-4\frac{1}{2}$.

Crass. cell. veget. $46-50\ \mu$; long. zygosp. $81-92\ \mu$; lat. zygosp. $46-49\ \mu$.

In stagnant water.

Area: Europe, N. America, Madagascar and Ceylon.

12. *S. Schmidtii* West & G. S. West, n. sp. (Tab. nostr. IV, fig. 43—45).

S. cellulis vegetativis diametro 7—10-plo longioribus, extremitatibus non replicatis; chromatophoris 2—3, angustis, laxis, cum marginibus leviter crenulatis et pyrenoidibus magnis, anfractibus $2\frac{1}{2}-4$; conjugatione scalariformi, cellulis fructiferis inflatis; zygosporis elongato-ellipsoideis, diametro 2— $2\frac{1}{2}$ -plo longioribus, polis rotundatis vel conico-rotundatis; membrana zygospore mature crassa, lutea — brunnea, mesosporio scrobiculato.

Crass. cell. veget. $31-35\ \mu$; crass. cell. fruct. $53-59\ \mu$; long. zygosp. $88-118\ \mu$; lat. zygosp. $44-46\ \mu$.

It is perhaps nearest to *S. fluvialilis* Hilse but is distinguished by its less diameter, its longer cells, its fewer and different chromatophores, and by the form of its zygospores.

In stagnant water in riverbed among *S. neglecta* and *S. gracilis*.

13. *S. gracilis* Kütz. Spec. Algar. 1849, p. 438; Rabenh. Flór. Europ. Algar. III, p. 237; Petit Spirog. de Paris, 1880, p. 15, t. III, f. 7—8.

Forma cellulis paullo longioribus.

Crass. cell. veget. $17,5-19\mu$; crass. cell. fruct. 27μ ; long. zygosp. $54-63\mu$; lat. zygosp. $24-25\mu$.

In stagnant water in riverbed.

Area: Europe and N. America. Abyssinia (var. *abyssinica* Lagerh.).

Fam. Desmidiaceæ.

Gonatozygon De Bary.

14. *G. Ralfsii* De Bary Conj. 1858, p. 76, t. IV, f. 23.

Long. $163-220\mu$; lat. $11,5-13,5\mu$.

In stagnant water amongst *Spirogyra decimina* var.

Area: N. and S. America, W. Indies, Europe, Siberia, China, India, Ceylon, Sumatra, E. and W. Africa, Australia.

15. *G. Kinabani* Rabenh. Flor. Europ. Algar. III, 1868, p. 156.
Leptocystinema Kinabani Arch. 1858.

Var. *tropicum* West & G. S. West, n. var. (Tab. nostr. II, fig. 2).

Var. cellulis multo crassioribus.

Long. 336μ ; lat. $20-23\mu$.

In stagnant water, amongst the preceding species.

Area of type: Europe.

Cylindrocystis Menegh.

16. *C. Brébissonii* Menegh. 1838; De Bary Conj. 1858, p. 35, 46, 74, t. VII, f. E 1—22. *Penium Brébissonii* Ralfs 1848.

Long. $53-78\mu$; lat. $15-16,5\mu$.

In stagnant water in riverbed.

Area: Ubiquitous.

17. *C. subpyramidata* West & G. S. West, n. sp. (Tab. nostr. II, fig. 8—11).

C. parva, pæne duplo longior quam lata; cellulis ellipticis, leviter et subgradatim constrictis ad medium; semicellulis ovato-pyramidatis, pólis rotundo-subtruncatis; membrana glabra achroa; a vertice visis circularibus; pyrenoidibus singulis, magnis. Zygospore nigrescentes, oblongo-rectangulares angulis rotundatis, a latere visæ ellipticæ; in medio laterum membrana valde et subirregulariter incrassata.

Long. $27-28\mu$; lat. $15-16\mu$; lat. constrict. $14,5\mu$; long. zygosp. $32,5-34\mu$; lat. zygosp. $25-25\mu$; crass. zygosp. 20μ .

This species occurred in small gelatinous masses amongst *Spirogyra gracilis* and *S. neglecta* in stagnant water in a riverbed.

It is nearest to *Cylindrocystis pyramidata* West & G. S. West recently found in Ceylon, but it is distinguished by its smaller size, its less tapering semicells, and its more open constriction.

Penium Bréb.

18. **P. Digitus** Bréb. in Ralfs Brit. Desm. p. 150, t. XXV, f. 3. *Closterium Digitus* Ehrenb. *Penium lamellosum* Kütz. *P. navigium* W. B. Turner.

Long. 188 μ ; lat. 54 μ .

Among Utricularia in riverbed.

Area: Ubiquitous.

19. **P. australe** Racib. in Rospraw. Akad. Umiej. Krakow. Wydz. matem.-przy. ser. 2, vol. XXII, p. 367, t. VI, f. 27; West & G. S. West in Journ. Linn. Soc. bot. XXXIII, 1897, p. 157, t. VIII, f. 16.

Long. 80—75 μ ; lat. 43—44 μ ; lat. constrict. 41—42 μ .

In stagnant water in the jungle and in muddy ricefields.

Area: Singapore and Australia.

20. **P. cucurbitinum** Biss. in Journ. Roy. Micr. Soc. 1884, p. 197, t. V, f. 7.

Forma **minor** West in Journ. Roy. Micr. Soc. 1894, p. 4.

Long. 55,5 μ ; lat. 52 μ .

In stagnant water with other Desmids.

Area: Europe. New Zealand (var.).

21. **P. curtum** Bréb. in Kütz. Spec. Algar. 1849, p. 137. *Closterium curtum* Bréb. 1840. *Cosmarium curtum* Ralfs 1848.

Forma **major** Wille in Öfvers. af K. Vet.-Akad. Förh. 1879, no. 5, p. 56, t. XIV, f. 73.

Long. 58 μ ; lat. 28 μ .

On rocks in riverbed, abundant amongst *Cosmarium lere*.

Area: Europe, N. America, W. Indies, India, Madagascar, and W. Africa.

22. **P. Navicula** Bréb. in Mém. Soc. Scient. Nat. Cherbourg, 1856, IV, p. 146, t. 11, f. 37.

Long. 32,5 μ ; lat. 9,6 μ .

In stagnant water in the jungle.

Area: Europe, N. America, W. Indies, India, Burmah, Ceylon, Singapore E. Indies, Sandwich Is., New Zealand and Australia.

23. **P. minutissimum** Nordst. in Acta Univ. Lund. 1873, tom. IX, p. 46, t. 1, f. 21.

Long. $17\ \mu$; lat. $10,6\ \mu$.

In stagnant water in riverbed.

Area: Europe, Madag. scar, Burmah.

24. **P. inconspicuum** West in Journ. Roy. Micr. Soc. 1894, p. 4, t. 1, f. 6, 7.

Long. $17\ \mu$; lat. $6\ \mu$.

Amongst other Desmids in stagnant water.

Area: Europe and N. America. Ceylon.

Closterium Nitzsch.

25. **C. praelongum** Bréb. in Mém. Soc. Scient. Nat. Cherbourg, 1856, IV, p. 152, t. 11, f. 41.

Long. $459-625\ \mu$; lat. $16,5-18\ \mu$.

In stagnant water in the jungle.

Area: Europe and N. America. New Zealand (forma).

26. **C. acerosum** Ehrenb. in Abhandl. Akad. Wissenschaft. Berlin 1831, p. 68; Ralfs Brit. Desm. 1848, p. 154, t. XXVII, fig. 2.

Forma apicibus truncatis; membrana luteo-brunnea, subtilissime striolata. Long. $436-583\ \mu$; lat. $45\ \mu$; lat. apic. $8-9\ \mu$. (Tab. nostr. II, fig. 5.) Diam. zygosp. $87\ \mu$.

The apices were much more truncate than in var. *truncatum* Gutw. (in Sprav. Kom. fizyogr. Akad. Umiej. Krakow. 1891, p. 33, t. 1, f. 7); in fact, Gutwinski's variety appears to be very little different from the typical form.

Area: Ubiquitous.

27. **C. Lunula** Nitzsch 1817; Ralfs Brit. Desm. 1848, p. 163, t. XXVII, f. 1. *Vibrio Lunula* Müller 1784

Var. **sublanceolatum** Klebs in Schrift. phys.-oekon. Gesellsch. Königsberg V, 22, 1879, p. 6, t. 1, f. 1 e et f.

Forma minor, cellulis paullo angustioribus; membrana lutea, glabra. Long. $282\ \mu$; lat. $32,5\ \mu$; lat. apic. $8,5\ \mu$.

This form approaches very closely to the plant mentioned and figured by Gutwinski as *Cl. acerosum* Ehrenb. forma (Roypraw. Wydz. matem.-przyr. Akad. Umiej. Krakow. 1896, tom. XXXIII, p. 36, t. V, f. 6).

Area of type: Europe, N. and S. America, E. Africa, India, Central Asia, Japan, New Zealand and Australia.

28. **C. Ehrenbergii** Menegh. Synops. Desm. in Linnæa 1840, p. 232; Ralfs Brit. Desm. 1848, p. 166, t. XXVIII, f. 2.

Lat. 90μ ; apicibus 442μ inter se distantibus.

In stagnant water amongst *Spirogyra decimina* var.

Area: Europe, N. and S. America, W. Indies, India, Central China, Japan, New Zealand, Australia, and Samoa (var.).

29. *C. Dianæ* Ehrenb.; Ralfs l. c. p. 168, t. XXVIII, f. 5.

Lat. 21μ ; apicibus 263μ inter se distantibus.

With the preceding species.

Area: Ubiquitous.

30. *C. parvulum* Näg. Gatt. einzell. Alg. 1849, p. 106, t. VI C, f. 2.

Lat. $10,5 \mu$; apicibus $130-144 \mu$ inter se distantibus; diam. zygosp. 33μ .

In stagnant water among other Desmids (with zygospores).

Area: Ubiquitous.

31. *C. calosporum* Wittr. in Nova Acta Soc. Scient. Upsala, ser. 3, VII, 1569, p. 23, t. I, f. 11.

Forma: lat. $7-7,5 \mu$ apicibus $87-89 \mu$ inter se distantibus.

This plant, which occurred in great abundance in stagnant water in the jungle, differs from typical *Cl. calosporum* in being a little narrower, the ventral margin having precisely the correct curvature.

Area: Europe, Ceylon.

32. *C. Venus* Kütz. Phyc. German. 1845, p. 130; Ralfs Brit. Desm. 1848, p. 220, t. XXXV, f. 12.

Lat. 7μ ; apicibus 51μ inter se distantibus.

In stagnant water.

Area: Europe, N. America, Burmah, Ceylon, Central China, Japan.

33. *C. Jenneri* Ralfs Brit. Desm. 1848, p. 167, t. XXVIII, f. 6.

Forma minor, membrana plerumque luteo-brunnea.

Lat. $8,5-9 \mu$; apicibus $55-60 \mu$ inter se distantibus.

Numerous examples of this small form were observed and almost all of them possessed a yellowish-brown cell-wall. The proportion and relative curvature were exactly those of *Cl. Jenneri* Ralfs.

Area: Europe, N. America, E. Africa.

34. *C. Cynthia* De Not. Desm. Ital. p. 65, t. VII, f. 71; Cooke Brit. Desm. p. 26-27.

Lat. $10,5 \mu$; apicibus 82μ inter se distantibus.

In muddy ricelands.

Area: Europe, N. America, E. Africa, Ceylon, Sumatra, New Zealand and Australia.

35. *C. regulare* Bréb. in Mém. Soc. Sciences, Cherbourg, 1856, IV, p. 304, t. II, f. 35.

Forma apicibus crassioribus; striis validis, visis 11.

Long. 240 μ ; lat. 26,5 μ ; lat. apic. 8,5 μ .

With the preceding species.

Area: Europe, W. Africa, India, Australia.

36. *C. Ralfsii* Bréb. in Ralfs Brit. Desm. 1848, p. 174, t. XXX, f. 2.

Var. *hybridum* Rabenh. Krypt. Fl. Sachs. p. 174; Flor. Europ. Algar. III, p. 135.

Long. 464 μ ; lat. 29,5 μ ; lat. apic. 6 μ .

Area: Europe, Ceylon and Singapore.

37. *C. Kützingerii* Bréb. in Mém. Soc. Sciences, Cherbourg, 1856, IV, p. 156, t. II, f. 40.

Long. 467—540 μ ; lat. 17 μ .

In stagnant water among *Spirogyra decimina* var.

Area: Europe, N. America, Madagascar, India, Ceylon, Japan, New Zealand and Australia.

38. *C. Cornu* Ehrenb. 1830; Ralfs Brit. Desm. 1848, p. 176, t. XXX, f. 6 *f* et *g*.

Var. *slamense* West & G. S. West, n. var. (Tab. nostr. II, fig. 6—7).

Var. *cellulis minus curvatis*; zygospora subquadrata, angulis subramillatis.

Long. 140—165 μ ; lat. 5,6—7,5 μ ; diam. zygosp. 23—25 μ .

This variety differs from typical *Cl. Cornu* Ehrenb. in being somewhat less curved, and in the form of the zygospore, the angles of which are not so produced and do not project within the empty semicells. The zygospore is surrounded by a mucous investment and the semicells are attached to the outer edge of this mucus.

In muddy ricefields.

Area: Europe, N. and S. America, Australia.

39. *C. tumidum* Johnson in Bull. Torr. Botan. Club, vol. 22, no. 7, July 1895, p. 291, t. 293, f. 4. *C. Cornu* var. β Ralfs Brit. Desm. 1848, p. 176, t. XXX, f. 6 *a—e*. *C. Cornu* et forma *major* Wille in Öfvers. af K. Vet.-Akad. Förh. 1879, no. 5, p. 59, t. XIV, f. 80, 81.

a. Forma cellulis crassioribus. (Tab. nostr. II, fig. 4).

Long. 125 μ ; lat. 18,5 μ ; lat. apic. 4 μ .

The form observed was proportionately a little thicker than *Cl. tumidum* Johnson, and the ventral margin was slightly less tumid. The relative increase in thickness was due to the somewhat greater curvature of the dorsal margin. The cell-wall was quite smooth and colourless and the apices were truncate exactly as in Johnson's figures.

In general appearance and curvature this form resembles *Cl. littorale* Gay var. *crassum* West & G. S. West, but it is readily distinguished by its much smaller size and its truncate apices.

b. Forma polis paullo crassioribus. (Tab. nostr. II, fig. 3).

Long. 100 μ ; lat. 14,5 μ ; lat. apic. 5,5 μ .

On rocks in riverbed.

Area: Europe, N. America, Samoa.

40. **C. gracile** Bréb. 1839, in Mém. Soc. Sciences, Cherbourg, 1856, IV, p. 155, t. II, f. 45. *C. limneticum* Lemmermann in Plöner Forschungsberichten, Teil 7, 1899, p. 28, t. II, f. 39—41.

Long. 269 μ ; lat. 6,5 μ .

In muddy ricefields.

Area: Europe, N. and S. America, E. Africa, Sumatra, New Zealand and Australia.

41. **C. acutum** Bréb. in Ralfs Brit. Desm. p. 177, t. XXX, f. 5a et b.

Long. 138—144 μ ; lat. 5,3—7 μ .

In muddy ricefields.

Area: Europe, N. America, E. Africa, India, Burmah, Sumatra, Central China, New Zealand and Australia.

Pleurotænium Näg.

42. **P. Trabecula** Näg. Gatt. einzell. Alg. 1849, p. 104, t. VI, f. A. *Closterium Trabecula* Ehrenb. 1830.

Long. 462—564 μ ; lat. ad bas. semicell. 28—30,5 μ ; lat. ad apic. semicell. 20—20,5 μ .

In stagnant water in riverbed.

Area: Europe, N. and S. America, Siberia, India, E. Indies, Sandwich Is., China, Japan, Abyssinia.

43. **P. maximum** Lund. in Acta R. Soc. Scient. Upsala, ser. 3, VIII, 1871, p. 89. *Docidium maximum* Reinsch in Abhandl. Naturhist. Gesellsch. zu Nürnberg, III, 1866, p. 1884, t. XII, f. 4. *Pleurotænium Archerii* Delp. in Memor. Accad. Sci. Torino, ser. 2, XXX, 1877, p. 118, t. XIX, fig. 12—16.

Long. 522—560 μ ; lat. ad bas. semicell. 38—41,5 μ ; lat. ad med. semicell. 31—33 μ ; lat. ad apic. semicell. 22—24 μ .

In stagnant water among other Desmids.

Area: Europe, N. America, Abyssinia, W. Africa, Ceylon, Central China.

44. **P. gloriosum** West & G. S. West. *Docidium gloriosum* Turn. in Kungl. Sv. Vet. Akad. Handl. Bd. 25, no. 5, 1893, p. 30, t. III, f. 5.

Forma paullo minor, inflatione parva singula ad basin semicellularum.

Long. 674—858 μ ; lat. ad bas. semicell. 33 μ ; lat. ad mod. semicell. 28 μ ; lat. ad apic. semicell. 35 μ . (Tab. nostr. II, fig. 1).

The tubercles, which are situated just below the apex, were about 24 in number. They are much less conspicuous than the tubercles of many other *Pleurotania* of this nature, and consist of somewhat slight plications of the cell-wall at the apex. In fact, the tubercles of all *Pleurotania* of this nature are primarily due to a series of short (but prominent) foldings or plications round the apex. In a few species these plications are surmounted by actual bead-like outgrowths, but this is not often the case.

In stagnant water among *Spirogyra decimina* var.

Area: India.

45. *P. trochiseum* West & G. S. West in Trans. Linn. Soc. bot. ser. 2, V, 1896, p. 235, t. XIII, f. 4, 5; cfr. Journ. Linn. Soc. bot. XXXIII, 1898, p. 285—286.

Long. 335—468 μ ; lat. ad bas. semicell. 38—42 μ ; lat. ad apic. semicell. 26—29 μ .

The Siamese specimens differed from the American ones in being a little thicker towards the base of the semicells. In the character, arrangement and number of the markings they were absolutely identical.

In stagnant water in the jungle, and in muddy ricefields, abundant.

Area: N. America, Ceylon.

46. *P. hypocymatum* West & G. S. West l. c. 1896, p. 234, t. XIII, f. 1.

Forma paullo major, undulis paucioribus eis ad basin majoribus.

Long. 45 μ ; lat. ad bas. semicell. 19 μ ; lat. ad apic. semicell. 12.5 μ .

The Siamese specimens were a little longer than the American ones and the undulations did not extend so near the ends of the semicells. As the basal undulation was also a little larger than the others the *Pleurotanium* bore a certain amount of resemblance to *P. basiundatum* West & G. S. West.

In stagnant water.

Area: N. America, Ceylon (va. *angustum*).

Euastrum Ehrenb.

47. *E. ansatum* Ehrenb.; Ralfs Brit. Desm. 1848, p. 85, t. XIV, f. 2.

In muddy ricefield.

Area: Ubiquitous.

48. *E. sinuosum* Lenorm. in Ralfs l. c. p. 85, t. XIII, f. 5 a, b, d.
E. circulare Hass.

Long. 61 μ ; lat. 39 μ ; lat. isthm. 10 μ .

In stagnant water.

A small form was observed somewhat approaching var. **reductum**

West & G. S. West (in Journ. Bot. March 1897, p. 83; in Journ. Linn. Soc. bot. XXXIII, 1897, p. 160, t. VIII, f. 17).

Long. 54 μ ; lat. 34,5 μ ; lat. isthm. 11,5 μ .

Among *Utricularia* in riverbed.

Area: Europe, N. America, E. and W. Africa, India, Ceylon, Burmah, Singapore, Sandwich Is., New Zealand and Australia.

49. *E. insulare* Roy in Scott. Natur. April 1877. *E. binale* var. *insulare* Witttr. in Bih. til K. Sv. Vet.-Akad. Haudl. Bd. 1, no. 1, 1872, p. 49, t. IV, f. 7.

In stagnant water in the jungle and in muddy ricefields, abundant.

Area: Europe, N. America, E. Africa, India and Ceylon.

50. *E. binale* Ehrenb. 1840; Ralfs Brit. Desm. 1848, p. 90, t. XIV, f. 8. *Heterocarpella binalis* Turp. 1820.

Long. 14 μ ; lat. 11 μ ; lat. isthm. 5 μ .

In muddy ricefields.

Area: Ubiquitous.

51. *E. denticulatum* Gay in Bull. Soc. Bot. France, XXXI, 1884, p. 335. *E. binale* var. *denticulatum* Kirchn. in Cohn Krypt. Flor. Schlesien, 1878, p. 159.

Long. 22 μ ; lat. 15,5 μ ; lat. isthm. 5 μ .

In stagnant water in the jungle.

Forma minor.

Long. 13 μ ; lat. 11,5 μ ; lat. isthm. 3,5 μ ; crass. 7,6 μ .

In muddy ricefields.

Area: Europe, N. and S. America. E., W., and Central Africa, Madagascar, India, Ceylon, Singapore, China, New Zealand and Australia.

Micrasterias Ag.

52. *M. foliacea* Bail. in Ralfs Brit. Desm. 1838, p. 210, t. XXXV, f. 3; Johnson in Bot. Gaz. XIX, p. 56, t. VI, f. 1—4.

Long. 58—60 μ ; lat. 79—81 μ .

In stagnant water in the jungle, abundant.

Area: N and S. America, India, Ceylon, Burmah, Java, Queensland.

53. *M. Mahabuleshwariensis* Hobson in Quart. Journ. Micr. Sci. V, 1863, p. 168 c. icone; Lund. in Nova Acta R. Soc. Scient. Upsala, ser. 3, VIII, 1871, p. 15, t. 1, f. 6.

In stagnant water in the jungle, abundant.

Area: Europe, N. America, British Guiana, E. Africa and Madagascar (var. *tetracera* West & G. S. West). India, Burmah, Java, New Zealand (var.) and Australia.

Var. **surcullifera** Lagerh. in Bih. till K. Sv. Vet.-Akad. Handl. Bd. 13, no. 9, 1888, p. 5, t. 1, f. 1.

Long. 98 μ ; lat. 100 μ ; lat. isthm. 18 μ ; crass. 49.

In muddy ricefield.

Area: India and Ceylon.

54. **M. Möbii** West & G. S. West in Journ. Linn. Soc. bot. XXXIII, 1897, p. 162. *Euastrum verrucosum* Ehrenb. var. *Möbii* Borge in Bih. till K. Sv. Vet.-Akad. Handl. XXII, no. 9, 1896, p. 13, t. II, f. 18, 19. *E. verrucosum* forma Möbii in Abhandl. d. Senckeb. naturf. Ges. Frankfurt a. M. 1894, Bd. 18, p. 340, t. II, f. 21.

M. mediocris, circiter $1\frac{1}{2}$ -plo longior quam lata, profunde constricta, sinu leviter aperto ad extremum lineari et subampliato (nonnunquam sinu angusto-lineari extremo ampliato et aperto extrorsum); semicellulæ trilobæ, incisuris latis et rotundatis; lobo polari multo majori, incudiformi, late expanso cum collo latissimo, apice convexo sed in medio late et leviter retuso, extremitatibus lateralibus emarginato-truncatis; lobis lateralibus breviter subtrapeziformibus, leviter bilobulatis, lobulo superiori minori cum apice undulato-truncatis, lobulo inferiori majori cum margine levissime et subirregulariter undulato; in centro semicellularum tumore magno dense scrobiculato, tumore minimo intra lobum lateralem unumquemque; membrana cellularum irregulariter et minute granulata; a vertice visæ oblongo-ellipticæ tumore magno utrobique, polis rotundatis, lobo polari oblongo-subrectangulari, lateribus convexis, polo unoquoque in processus crassos breves divaricatos duos producto, lobulo superiori lobi lateralis uniuscujusque in processus breves divaricatos duos furcato; a latere visæ truncato-ovate, lateribus in parte superiori concavis.

Long. 111—117 μ ; lat. 90—36 μ ; lat. lob. polar. 76—80 μ ; lat. isthm. 28—31 μ ; crass. 59—60 μ . (Tab. nostr. III, fig. 21.)

We have previously shown this plant to be a *Micrasterias* and not a species of *Euastrum* (cfr. Journ. Linn. Soc. 1897, p. 162), but we give here for the first time a complete description of the typical plant. It stands nearest to *Micrasterias Americana* Ralts.

In stagnant water in the jungle, abundant amongst *Micrasterias Mahabuleshwarensis* and various *Palmellacæ*.

Area: Australia (Northern Queensland) Also var. *Ridleyi* from Singapore.

Var. **tetrachastriformis** West & G. S. West, n. var. (Tab. nostr. III, fig. 22).

Var. lobis lateralibus reductis, lobulo inferiori attenuato et subemarginato, lobulo superiori parvo et acute conico; extremitatibus lobi polaris plus attenuatis.

Long. 108—120 μ ? lat. 88—111 μ ; lat. lob. polar. 82—96 μ ; lat. isthm. 24—31 μ .

This variety, which occurred in a muddy ricefield, is easily distin-

guished from the typical form by the reduced lobules of the lateral lobes and the greater attenuation of each extremity of the polar lobe. It receives its name from its resemblance to those species of *Micrasterias* which were at one time placed under *Tetrachastrum*.

55. *M. rotata* Ralfs in Ann. Mag. Nat. Hist. V. 1844, p. 299, t. VI. f. 1; Brit. Desm. 1848, p. 71, t. VIII, f. 1.

In stagnant water in the jungle.

Area: Europe, N. and S. America. India, Singapore. Japan.

Cosmarium Corda.

56. *C. pseudopyramidatum* Lund. in Nova Acta R. Soc. Scient. Upsala, ser. 3, VIII, 1871, p. 41, t. II, f. 18.

Long. 54μ ; lat. 36μ ; lat. isthm. 11μ .

Area: General in temperate and tropical climates.

57. *C. læve* Rabenh. Flor. Europ. Algar. III, 1868, p. 161; Nordstedt in Öfvers. af K. Vet.-Akad. Förh. 1876, no. 6, p. 29, t. XII, f. 4; G. S. West in Journ. Linn. Soc. bot. 1899. (Tab. nostr. II, fig. 14.)

Long. $22-25 \mu$; lat. $16-19.5 \mu$; lat. isthm. $5.8-6.7 \mu$; crass. $9-10 \mu$. Zygosporæ angulari-globosæ, glabræ, angulis leviter incrassatis. Diam. zygosp. $22-25 \mu$. (Tab. nostr. II, fig. 15-16).

This occurred in enormous quantity on rocks in a riverbed and the zygosporæ were abundant. We have previously described what we then thought to be this plant in zygosporæ (cfr. West & G. S. West in Journ. Roy. Micr. Soc. 1896, p. 154-5, t. IV, f. 35; West in Notarisia 1892, p. 1502), but we can now definitely say that it was not. The *Cosmarium* we described from Portugal as *C. læve* with zygosporæ („zygosporæ globosæ spinis brevibus numerosis truncatis bifidisve ornatae“) is certainly not *C. læve* Rabenh., but some other closely allied species with smooth cells and a spiny zygosporæ. We are sure of this because we have now obtained *C. læve* Rabenh. in zygosporæ in such great quantity.

Area: Europe, N. and S. America, E. and W. Africa, Madagascar, India, Ceylon, E. Indies, New Zealand and Australia.

58. *C. pseudonitidulum* Nordst. in Acta Univ. Lund. IX, 1873, p. 16, t. I, f. 4.

Long. 37μ ; lat. 25μ ; lat. isthm. 7.5μ ; crass. 16μ .

All the forms seen were very delicately punctate.

In stagnant water in riverbed amongst *Spirogyra gracilis*. Also among *Utricularia* in riverbed.

Area: Europe, Central China.

59. *C. obsoletum* Reinsch in Abhandl. Senckenb. naturf. Gesellsch. VI, 1867, p. 142, t. XXII D 1, f. 1-4; in Abhandl. Naturhist. Gesellsch. zu Nürnberg III, 167, p. 184, t. XII, f. 4. *C. palustre* Turner in Kongl.

Sv. Vet.-Akad. Handl. Bd. 24, no. 5, 1893, p. 60, t. VIII, f. 65, t. IX, f. 2.
C. palustre var. *ovale* Turn. l. c.

a. Typical forms of the usual size of this species in the tropics.

Long 60—64 μ ; lat. 69—75 μ ; lat. isthm. 30—31 μ .

These specimens were exactly like those from Ceylon and Singapore, and all possessed the large conical pore which passes through the thickening at the basal angles of the semicells. Turner, who misinterpreted the nature of this pore, figured it as a spine at the angle, and thus created a new name "*C. palustre*" for typical specimens of the large form of *C. obsoletum* so abundant in tropical Asia.

b. Smaller forms without the conical pore at the basal angles.

Long. 34 μ ; lat. 44 μ ; lat. isthm. 15,5—18 μ ; crass. 23 μ .

The above two forms show a marked difference in size and correspond to the two forms mentioned by Lütkeimüller from Central China (Cfr. Ann. des k. k. Naturhist. Hofmus. Wien, 1900, Bd. XV, Heft 2, p. 119).

Abundant in stagnant water in the jungle.

Area: Europe, N. and S. America, India, Ceylon, Burmah, Central China, E. Indies, New Zealand and Australia.

60. *C. subauriculatum* West & G. S. West in Trans. Linn. Soc. bot. ser. 2, 7, 1895, p. 55, t. VI, f. 31.

Long. 46 μ ; lat. sine spinul. 48 μ , cum spinul. 52 μ ; lat. isthm. 21 μ ; crass. 29 μ . (Tab. nostr. II, fig. 19.)

In stagnant water among other Desmids.

Area: Madagascar, Central China.

Var. *truncatum* West & G. S. West, n. var. (Tab. nostr. II, fig. 20.)

Var. *angulis truncatis*, spinis binis reductis ornatis; a vertice visæ ut in forma typica.

Long. 41 μ ; lat. 46 μ ; lat. isthm. 18 μ ; crass. 24 μ .

Compare with the front view of *C. erosum* Delp.

In stagnant water in the jungle.

61. *C. Schmidtii* West & G. S. West, n. sp. (Tab. nostr. III, fig. 27—28.)

C. parvum, paullo longius quam latum, modice constrictum, sinu breviter lineari extrorsum aperto; semicellulæ elliptico-semicirculares (cellulæ subcirculares), isthmo lato; a vertice visæ ellipticæ; a latere visæ subcirculares; membrana delicatissime et dense punctulata, pyrenoidibus singulis.

Long. 22—23 μ ; lat. 18—20 μ ; lat. isthm. 8,5—9,5 μ ; crass. 11,5—12,5 μ .

After much consideration we have come to the conclusion that this must be described as a distinct species. The shape of the semicells and the wide isthmus are characteristic. Perhaps the nearest species are *C. melanosporum* Arch. and *C. nitidulum* De Not., but from both these species it is easily distinguished.

In large numbers amongst *C. laeve* Rabenh. on rocks in a riverbed, and also in stagnant water amongst various species of *Spirogyra*.

62. *C. subtrifloratum* West & G. S. West in Journ. Bot. April 1897, p. 122, t. 368, f. 11.

Forma. (Tab. nostr. II, fig. 18.)

Long. 22--24 μ ; lat. 21 μ ; lat. isthm. 6--6,5 μ ; crass. 12,5--13,5 μ .

These forms only differ from the African examples in the somewhat simplified central granules. They are distinguished from *C. subpunctulatum* Nordst. by their smaller size, much fewer and more acute granules, and by the different arrangement of the central granules.

In stagnant water in the jungle.

Area: W. Africa.

63. *C. pseudotaxichondrum* Nordst. in Öfvers. af K. Vet.-Akad. Förh. 1877, no. 3, p. 20, t. II, f. 5.

Var. *slamense* West & G. S. West, n. var. (Tab. nostr. III, fig. 26).

Var. *sinu apertiori*, *semicellulis minus angularibus*, *marginibus lateralibus leviter undulatis*, *cum serie granulorum magnorum 3 trans medium semicellulæ uniuscujusque*.

Long. 26 μ ; lat. 29 μ ; lat. isthm. 6,5 μ ; crass. 17 μ .

This variety is nearest to *C. pseudotaxichondrum* var. *africanum* West & G. S. West (in Journ. Bot. May 1897, p. 173, t. 367, f. 14).

In stagnant water in the jungle.

Area: This species (with its varieties) is widely distributed in tropical and subtropical regions.

64. *C. quadrifarium* Lund in Nova Acta Soc. Scient. Upsala, ser 3, VIII, p. 32, t. III, fig. 12.

Forma *hexasticha* Nordst. in Kongl. Sv. Vet.-Akad. Handl. Bd. 22, no. 8, p. 49; *C. hexastichum* Lund. l. c. p. 33, t. III, f. 13.

Long. 53 μ ; lat. 41 μ ; lat. isthm. 17 μ ; crass. 29 μ .

In stagnant water in riverbed.

Area of type: Europe, N. America, Ceylon.

65. *C. subdecoratum* West & G. S. West in Journ. Linn. Soc. bot. XXXIII, 1897, p. 164, t. VIII, f. 13.

Long. 76 μ ; lat. 54--59 μ ; lat. isthm. 19--22 μ .

In stagnant water in the jungle.

Area: Ceylon and Singapore.

66. *C. pseudorthopunctatum* West & G. S. West, n. sp. (Tab. nostr. II, fig. 12--13.)

C. parvum, *circiter tam longum quam latum*, *profunde constrictum sinu aperto et acutangulo*; *semicellulæ subellipticæ*, *ventre valde convexæ*, *dorso valde convexæ in medio subrectæ*, *angulis*

leviter subangularibus; membrana granulata, granulis in seriebus verticalibus 9—10 (in serie unaquaque circiter 5); a vertice visæ ellipticæ; a latere visæ circulares; pyrenoidibus singulis.

Long. 24μ ; lat. $20-23,5\mu$; lat. isthm. $5,7-6,8\mu$; crass. 12μ .

It is nearest to *C. orthopunctatum* Schmidle (in Oesterr. botan. Zeitschrift 1895, p. 389, t. XV, f. 15) but is much smaller, has more flattened apices, and both the rows of granules and the number of granules in each row are much fewer in number. The vertical view is also more narrowly elliptical and is never rhomboidal.

On rocks in riverbed among *C. lare* Rabenh.

67. *C. Blythii* Wille in Vid.-Selsk. Forhandl. Christiania, 1880, no. 11, p. 25, t. 1, f. 7.

Long. 17μ ; lat. 16μ ; lat. isthm. $4,7\mu$.

In stagnant water in the jungle.

Area: Europe, N. America. West, Central and East Africa. Madagascar. Ceylon. Central China. New Zealand and Australia.

Forma minor: Long. $13,5\mu$; lat. 13μ ; lat. isthm. $2,8\mu$; crass. $8,5\mu$.

In muddy ricefields.

68. *C. Reinschii* Archer in Quart. Journ. Micr. Sci., n. s. VI, p. 109. *C. sp.* Reinsch Contrib. Alg. et Fung. Lipsiæ 1875, t. XVIII, f. 4.

Membrana cellulæ subtilissime punctata.

Long. 37μ ; lat. 30μ ; lat. isthm. 8μ ; crass. 16μ .

In stagnant water amongst *Spirogyra decimina* var.

Area: Europe, N. America, Australia.

69. *C. æquantum* West & G. S. West, n. sp. (Tab. nostr. II, fig. 17.)

C. parvum, paullo latius quam longum, profunde constrictum, sinu sublineari et paullo aperto; semicellulæ transverse oblongæ, marginibus lateralibus rotundatis, apicibus latissimis leviter concavis; a vertice visæ oblongæ, polis rotundatis; a latere visæ circulares; membrana glabra.

Long. 31μ ; lat. 36μ ; lat. isthm. $13,2\mu$; crass. $15,3\mu$.

Among *Utricularia* in riverbed.

70. *C. exiguum* Archer in Proc. Dubl. Nat. Hist. Soc. IV, 1864, p. 49, t. 1, f. 32, 33; Nordst. in Kongl. Sv. Vet.-Akad. Handl. Bd. 22, no. 8, p. 58, t. VI, f. 12.

Long. $15,3\mu$; lat. 8μ ; lat. isthm. $1,6\mu$.

In stagnant water amongst *Spirogyra*.

Area: Europe, N. America, W. Africa, Madagascar, Ceylon, New Zealand.

71. *C. Norimbergense* Reinsch in Abhandl. Naturhist. Gesellsch. zu Nürnberg, Bd. 3, 1866, p. 113, t. IX, f. 2. *C. Hammeri* Reinsch var.

octogibbosum Reinsch l. c. p. 112, t. X, f. 1. *C. octogibbosum* (Reinsch) Turner 1893. *C. octogibbosum* var. *indica* Turn.

Forma **depressa** West & G. S. West in Journ. Bot. April 1897, p. 119.

Long. 14,5—15,5 μ ; lat. 13,5—14 μ ; lat. isthm. 5 μ .

Area: Europe, W. and E. Africa (vars.), India and Ceylon (forms), Burmah, E. Indies (var.), Central China, New Zealand.

72. *C. Meneghinii* Bréb. in Ralfs Brit. Desm. 1848, p. 96, t. XV, f. 6.

Long. 22 μ ; lat. 16 μ ; lat. isthm. 4,5 μ .

Forma: cells narrower and semicells more rounded.

Long. 18—19 μ ; lat. 12,5—13,5 μ ; lat. isthm. 3,5—3,8 μ ; crass. 8 μ .

In stagnant water in the jungle with the preceding species.

Area: Ubiquitous.

73. *C. angulosum* Bréb. in Mém. Soc. Sci. Nat. Cherbourg. IV, 1856, p. 127, t. I, f. 17. *C. Meneghinii* Bréb. var. *angulosum* Rabenh. 1868.

Var. **concinnum** West & G. S. West. *C. concinnum* Reinsch.

Long. 12 μ ; lat. 10 μ ; lat. isthm. 2,6 μ .

In stagnant water amongst *Spirogyra*.

Area: Europe, N. America, Madagascar. W. Africa.

74. *C. pusillum* Arch. in Pritch. Infus. 1861, p. 731. *Euastrum pusillum* Bréb. 1856.

Long. 12 μ ; lat. 11 μ ; lat. isthm. 4,5 μ .

Area: Europe, S. America, India, Ceylon, N. Zealand.

75. *C. contractum* Kirchn. Alg. Schlesien, Breslau 1878, p. 147; Wolle Desm. U. S. 1884, p. 63, t. 50, f. 24.

Forma minor: long. 26 μ ; lat. 20 μ ; lat. isthm. 3,8 μ ; crass. 13 μ .

Except for its rather more open sinus this form is identical with that known as *C. ellipsoideum* Efv. forma *minor* Racib. in Pamietnik Akad. Umiej. w Krakowie, Wydż. matem.-prz. X, 1885, p. 84, t. X, f. 9. (= *C. proteiforme* Turner in Kongl. Sv. Vet.-Akad. Handl. Bd. XXV, no. 5, 1893, p. 64, t. IX, f. 26).

C. ellipsoideum Efv. does not differ sufficiently from *C. contractum* Kirchn. to warrant its separation as a distinct species.

In stagnant water in the jungle.

Area: Generally distributed.

76. *C. emarginatum* West & G. S. West in Trans. Linn. Soc. bot. ser. 2, V, 1895, p. 58, t. VIII, f. 14.

Long. 9—10 μ ; lat. 8,3—9,5 μ ; lat. isthm. 4,4 μ ; crass. 4,6 μ .

With the preceding species.

Area: Madagascar. E. Africa (var.).

77. **C. exile** West & G. S. West. *Dysphinctium exile* Turner in Kongl. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 1893, p. 40, t. I, f. 21*.

Forma curta; cellulis diametro subduplo longioribus.

Long. 13—15 μ ; lat. 7,5—8,5; lat. isthm. 5,9—6,3 μ .

In stagnant water amongst various Algae.

Area: India.

78. **C. pseudarctoum** Nordst. in Wittr. & Nordst. Alg. Exsicc. no. 257 cum fig. xylogr. 1879.

Forma **australis** West & G. S. West. *C. subarctoum* (Lagerh.) Racib. forma *australis* Racib. in Rospraw. Wydz. matem.-przy. Akad. Umiej. Krakow. tom. XXII, 1892, p. 363, t. VI, f. 22.

Long. 13,5—17 μ ; lat. 8,5—10 μ ; lat. isthm. 7—8,5 μ .

On rocks in riverbed amongst *C. lave* Rabenh. and *C. Schmidtii* n. sp. Raciborski's Australian plant is decidedly a form of *C. pseudarctoum* Nordst.

Area: Europe, Australia.

79. **C. pseudoconnatum** Nordst. in Vidensk. Medd. f. d. naturh. Foren. Kjobenhavn, 1869, no. 14, p. 214, t. III, f. 17.

Long. 59 μ ; lat. 42,5 μ ; lat. isthm. 38 μ .

In muddy ricefields.

Area: Europe, N. and S. America, India, Geylon, Madagascar.

80. **C. subturgidum** (Turner) Schmidle in Hedwigia, Bd. XXXIV, 1895, p. 300. *Dysphinctium subturgidum* Turñ. in Kongl. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 1893, p. 40, t. VII, f. 4.

Forma minor Schmidle l. c. t. IV, f. 2.

Long. 96 μ ; lat. 52 μ ; lat. isthm. 49 μ .

In stagnant water amongst *Spirogyra decimina* var.

Area: E. Africa, India, Sumatra, Java, Samoa, Australia

Staurostrum Meyen.

81. **S. apiculatum** Bréb. in Mém. Soc. Sci. Nat. Cherbourg, IV, 1856, p. 142, t. I, f. 23; West & G. S. West in Trans. Linn. Soc. bot. ser. 2, V, 1896, p. 254, t. XVI, f. 6.

Long. sine spin. 21 μ ; lat. sine spin. 21 μ ; long. spin. 1,5 μ ; lat. isthm. 6,5 μ .

Area: Europe, N. America, India, Japan.

82. **S. bifidum** Ralfs in Ann. Mag. Nat. Hist. V, 1845, p. 151, t. X, f. 3; Lund. in Nova Acta Soc. Scient. Upsala, ser. 3, VIII, 1871, p. 62, t. IV, f. 2.

Forma spinis valde convergentibus.

Long. 33 μ ; lat. sine spin. 29 μ ; long. spin. 7—8 μ ; lat. isthm. 12 μ .

On rocks in riverbed.

Area: Europe, Siberia, India, Ceylon, Java, Japan.

83. *S. echinatum* Bréb. in Ralfs Brit. Desm. 1848, p. 245, t. XXXV, f. 24.

Long. sine spin. 33 μ , cum spin. 42 μ ; lat. sine spin. 29 μ , cum spin. 40 μ ; lat. isthm. 9 μ . (Tab. nostr. III, fig. 31).

This *Staurastrum* of which we observed several examples, has been referred to *S. echinatum* Bréb. after much consideration. It is certainly not a form of *S. teliferum* Ralfs., neither is it a form of *S. gladiusum* Turn., the only other species with which it could be confounded. Brébisson's figure in Ralf's 'British Desmids' (l. c.) is a very poor one, and yet our plant agrees with it in size, in outward form, in the depth of its constriction, and in relative length and number of the spines.

From *S. teliferum* Ralfs it differs in its somewhat rhomboideo-elliptical semicells which cause a much more open sinus; the spines are more numerous, a little longer and more delicate; the angles of the vertical view are not so rounded, the sides are hardly so concave, and the spines are more scattered.

From *S. gladiusum* Turn. it is distinguished by its somewhat smaller size, by its relatively longer cells, its more angular semicells and slightly more open sinus; the spines are about the same in number, but they are slightly longer and more delicate, and are more or less evenly distributed over the whole of the semicells; the angles of the vertical view are not so rounded and the spines extend all over the central part (i. e. all over the actual dorsal region of the semicells of the *Staurastrum*).

The *S. echinatum* figured by Wölle (Desm. U. S. 1884, t. 45, f. 31—32) does not represent the species, the spines being too short. That figured by Turner (in Kongl. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 1893, t. VI, f. 48) may be a form of *S. echinatum* Bréb. but it does not agree sufficiently well with Brébisson's figure in Ralfs 'British Desmids' to represent a typical specimen. The plant recorded by Schmidle (in Engler's Botan. Jahrbuch. Bd. XXVI, 1898, p. 55) as „*St. echinatum* forma?“ and figured by him (t. IV, f. 11) as „*S. echinatum* Bréb.“ is much too short-spined for Brébisson's species and is much nearer a small form of *S. pilosum* (Näg.) Arch.

In stagnant water in the jungle.

Area: Europe, India.

84. *S. submonticulosum* Roy et Biss., in Journ. Bot. 1886, p. 238, t. 268, f. 7.

Forma angulis propius ad basin semicellularum; isthmo paullo angustiori.

Long. 28 μ ; lat. 31 μ ; lat. isthm. 8 μ .

In stagnant water among other Desmids.

Area: Japan.

85. *S. orbiculare* Menegh. Synops. Desm. in *Linnaea* 1840, p. 225; Ralfs Brit. Desm. 1848, p. 125, t. XXI, f. 5.

Var. *depressum* Roy et Biss. l. c. p. 237, t. 268, f. 14.

Long. 21–25 μ ; lat. 21–25 μ ; lat. isthm. 7,5 μ –8,6 μ .

With the preceding species.

Area (of type and varieties): Ubiquitous.

86. *S. Biceanum* Rabenh. Alg. No. 1410; West & G. S. West in Journ. Roy. Micr. Soc. 1896, p. 158, t. III, f. 27. *S. orbiculare* var. *Biceanum* Rabenh. Flor. Europ. Algar. III, p. 200.

Var. *orientale* West. & G. S. West, n. var. (Tab. nostr. III, fig. 29.)

Var. *minor*, dorso semicellularum convexo (non retuso in medio); membrana glabra.

Long. 25 μ ; lat. 22,5 μ ; lat. isthm. 6 μ .

Only one specimen of the Siamese plant was seen and provisionally we place it as a variety of *S. Biceanum* Rabenh. It is very probable that *S. Biceanum* var. *orientale* will ultimately prove to be a distinct species.

Area (of type): Europe, N. America, E. Africa, Madagascar, Siberia, Japan, Samoa, New Zealand and Australia.

87. *S. Zahlbruckneri* Lütkem. in Ann. des k. k. Naturhist. Hofmus. Wien 1900, Bd. XV, Heft 2, p. 125, t. VI, f. 41–43.

Var. *mamillatum* West & G. S. West, n. var. (Tab. nostr. III, fig. 35–37.)

Var. *cellulis* in ambitu subcircularibus; semicellulis subdepressis semicircularibus, apicibus latissime rotundatis; angulis bilobulatis, lobulis valde mamillatis, iis semicellulae alterius interdigitatis cum iis alterius; a vertice visis lateribus subrectis.

Long. 92–95 μ ; lat. 80–82 μ ; lat. isthm. 27–28,5 μ .

Numerous examples of this fine *Staurostrum* were seen. The typical form was recently described by Lütkenmüller from the Ningpo Mountains in Central China. The Siamese variety is relatively shorter and possesses more rounded semicells; the angles are more deeply lobed and distinctly mamillate, the mamillate lobes of one angle fitting into those of the other, thus causing a striking peculiarity of the sinus, the aperture of which is rarely visible.

The cell-wall is very much thickened at the mamillate angles and shows a marked lamination. Sometimes a few lateral wart-like excrescences are present on the opposed faces of two interdigitating lobes of the angles. The cell-wall is strongly punctate as in the typical form.

In stagnant water in the jungle.

Area (of type): Central China.

88. *S. alternans* Bréb. in Ralfs Brit. Desm. p. 132, t. XXI, f. 7.

Long. 26 μ ; lat. 25 μ ; lat. isthm. 8,5 μ .

In muddy ricefields.

Area: Europe, N. America, E. Africa, India, Java, New Zealand and Australia.

89. *S. hexacerum* Wittr. in Bih. till K. Sv. Vet.-Akad. Handl. 1872, Bd. 1. no. 1, p. 51. *Desmidiium? hexaceros* Fhrenb. 1833. *S. tricorne* Menegh. 1840; Ralfs Brit. Desm. 1848, p. 134, t. XXII, f. 11 *a* et *c*, t. XXXIV, f. 8 *a*.

Var. *tropicum* West & G. S. West, n. var. (Tab. nostr. III, fig. 30).

Var. *semicellulis elliptico-fusiformibus*, ventre convexiori quam dorso; granulis minutissimis in seriebus trans angulos.

Long. 16 μ ; lat. 20 μ ; lat. isthm. 5,4 μ ,

This is probably identical with the form figured from Sumatra by Schmidle as *S. pygmaeum* Bréb. var. *obtusum* Wille.

In muddy ricefields.

Area (of type): Europe, N. and S. America, W. and E. Africa, Madagascar, Japan, New Zealand.

90. *S. micron* West & G. S. West in Journ. Roy. Micr. Soc. 1896, p. 159, t. IV, f. 50, 51.

Forma spinis reductis et numerosioribus. (Tab. nostr. III, fig. 38.)

Long. cum proc. 16—17,5 μ ; lat. cum proc. 19—21 μ ; lat. isthm. 5—5,5 μ .

In stagnant water in the jungle.

Area: Europe, W. Africa (var.).

91. *S. pseudotetracerum* West. et G. S. West in Trans. Linn. Soc. bot. ser. 2, V, 1895, p. 79, t. VIII, f. 39. *S. contortum* Delp. var. *pseudotetracerum* Nordst. in Kongl. Sv. Vet.-Akad. Handl. Bd. 22, no. 8, p. 50, t. V, f. 14.

Var. *robustum* West & G. S. West, n. var. (Tab. nostr. III, fig. 32—34.)

Var. *cellulis (sine processibus) paullo longioribus, processibus brevioribus: a vertice visis 4-radiatis.*

Long. sine proc. 16—20 μ , cum proc. 19—25 μ ; lat. sine proc. circ. 9,5—13 μ , cum proc. 17—26 μ ; lat. isthm. 5,5—6 μ .

With the preceding species.

Area (of type): N. America, Madagascar, Ceylon, New Zealand.

92. *S. margaritaceum* Menegh. Synops. Desm. in Linnaea 1840, p. 227; Ralfs Brit. Desm. 1848, p. 134, t. XXI, f. 9.

Forma 5-gona.

In stagnant water amongst *Spirogyra decimina* var.

Var. *robustum* West & G. S. West in Journ. Roy. Micr. Soc. 1897, p. 496, t. VII, f. 14.

Long. 25,5 μ ; lat. cum proc. 27,5 μ ; lat. isthm. 7,5 μ .

In stagnant water in the jungle.

Area (of type): Ubiquitous.

93. *S. inconspicuum* Nordst. in Acta Univ. Lund. IX, 1873, p. 26, t. 1, f. 11.

Long. 14 μ ; lat. 13 μ ; lat. isthm. 5,2 μ .

With the preceding species.

Area: Europe, N. America, Siberia, Burmah.

94. *S. leptacanthum* Nordst. in Vidensk. Medd. Naturh. Foren. Kjøbenhavn, 1869, p. 229, t. IV, f. 46.

Long. s. proc. 38 μ , c. proc. 76 μ ; lat. s. proc. 19 μ , c. proc. 50 μ .

In muddy ricefields.

Area: N. and S. America. Senegal. Ceylon. Siberia.

Arthrodesmus Ehrenb.

95. *A. alatus* West & G. S. West, n. sp. (Tab. nostr. III, fig. 23—25).

A. parvus, circiter tam longus quam latus, profundissime contractus, sinu angusto-lineari extremo subampliato; semicellulae late rectangularo-trapeziformes, angulis inferioribus subrotundatis, lateribus leviter concavis et sursum divergentibus, angulis superioribus leviter productis, subrotundatis cum spina brevissima minutissima, apicibus late retusis, nonnunquam spinis brevissimis minutissimis paucis 2—4 circa angulos superiores; a vertice vise ellipticae, polis apiculatis; membrana delicatissime punctata.

Long. 25—31 μ ; lat. bas. semicell. 20—25 μ ; lat. apic. semicell. 23—27 μ ; lat. isthm. 4,4—7,5 μ ; crass. 12,5 μ .

Numerous examples of this species were obtained from amongst *Utricularia* in a riverbed. They varied a little in their general form and proportions, but the chief variation was in the small spines round the upper angles of the semicells. The majority of specimens possessed only the apiculations at the upper angles, but others possessed a variable number (from one to four) of small spines arranged approximately in a ring round the angles.

In outward form it cannot be mistaken for any other species of the genus.

Hyalotheca Ehrenb.

96. *H. undulata* Nordst. in Wiltr. et Nordst. Alg. Exsicc. 1879, no. 248.

Long. 13—17 μ ; lat. 5,7—6,7 μ .

In stagnant water in riverbed.

Area: Europe, N. America, India.

97. **H. dissiliens** Bréb. in Ralfs Brit. Desm. 1848, p. 51, t. 1, f. 1.
 Lat. 16—18 μ ; diam. zygo. 19—22 μ .
 In stagnant water in riverbed among various species of *Spirogyra*,
 with zygo. spores.
 Area: Ubiquitous.

Ord. *Protococcaceæ*.

Fam. *Palmellaceæ*.

Cœlastrum Näg.

98. **C. sphericum** Näg. Gatt. einzell. Alg. 1849, p. 98, t. V, f. C 1.
 In stagnant water in the jungle.
 Area: Europe, N. and S. America, W. Indies, Madagascar, India, Sumatra,
 Siberia, New Zealand.
99. **C. pulchrum** Schmidle in Bericht. d. d. Botan. Gesellsch. Bd. X,
 1892, p. 206, t. XI, f. 1.
 Var. **intermedium** Böhlin in Bib. till K. Sv. Vet.-Akad. Handl. Bd. 23,
 no. 7, 1897, p. 35, t. II, f. 16, 17.
 In stagnant water in the riverbed.
 Area (of type): Europe, S. America, Ceylon, Queensland.

Pediastrum Meyen.

100. **P. duplex** Meyen. *P. pertusum* Kütz. *P. Napoleonis* Ralfs
 Brit. Desm. p. 184, t. XXXI, f. 7.
 With the preceding species abundant.
 Area: General in temperate and tropical regions.
 Var. **clathratum** A. Br. Alg. Unicell. p. 93.
 With the typical form.
101. **P. Tetras** (Ehrenb.) Ralfs in Ann. Mag. Nat. Hist. XIV, 1844,
 p. 469, t. XII, f. 4. *Micrasterias Tetras* Ehrenb. 1838.
 With the preceding species and very abundant. Coenobia of 4, 1+7 and
 5+11 cells.
 Area: Ubiquitous.

Scenedesmus Meyen.

102. **S. bijugatus** (Turp.) Kütz. Syn. Diat. 1333, p. 607. *Achnan-*
thes bijuga Turp.
 Abundant in stagnant water in the jungle and in muddy ricefields.
 Area: Ubiquitous.
103. **S. denticulatus** Lagerh. in Öfvers. af K. Vet.-Akad. Förh. 1882,
 no. 2, p. 61, t. II, f. 13—16.

Var. **linearis** Hansg. in Archiv Naturwiss. Landesdurchf. Böhm. Bd. 6, 1888, p. 268.

In muddy ricefields.

Area: Europe, N. America, W. Africa, Madagascar, Ceylon.

104. **S. acutiformis**. Schröder in Forschungsberichten der Plöner Biol. Stat. Heft 5, 1897, p. 17, t. II, f. 4.

Var. **spinuliferum** West & G. S. West n. var. (Tab. nostr. IV, fig. 46—49.)

Var. **cænobiis** e cellulis 2—8 (plerumque 4) constitutis; polis cellularum spinis curvatis minutis 2—3 instructis.

Long. cell. sine spin. 14—24 μ ; lat. cell. 3,2—8,5 μ ; long. spin. 1—5,7 μ .

This variety occurred in large quantity amongst other *Palmellaceæ* in stagnant water. The cænobia were of all sizes and contained from two to eight cells. All the cells possessed the lateral ridges characteristic of this species. The small spines were very variable in number and position, but were always of appreciable length and generally considerably curved.

It bears a considerable resemblance to *S. denticulatus* var. *linearis* Hansg., but is readily distinguished by the two prominent ridges on each cell of the cænobium. The spines at the poles of each cell are also longer and more curved than in *S. denticulatus* Lagerh.

105. **S. quadricauda** (Turp.) Bréb. in Mém. Soc. sc. nat. Falaise, vol. 1835, p. 66; Ralfs Brit. Desm. 1848, p. 180, t. XXXI, f. 12.

In stagnant water in riverbed.

Area: Ubiquitous.

Rhaphidium Kütz.

106. **R. polymorphum** Fresen. in Abhandl. der Senckenb. naturf. Gesellsch. II, p. 199, t. VIII.

Var. **aciculare** (A. Br.) Rabenh. Flor. Europ. Algar. III, p. 45.

In stagnant water in the jungle.

Var. **falcatum** (Corda) Rabenh. l. c.

With the preceding variety.

Area: This species and its varieties are ubiquitous.

107. **R. convolutum** (Corda) Rabenh. l. c. p. 46.

Lat. cell. 3,8 μ .

With the preceding species.

Area: Europe.

Selenastrum Reinsch.

108. **S. gracile** Reinsch. in Abhandl. Naturhist. Gesellsch. zu Nürnberg, III, 1866, p. 65, t. IV, f. 3 a—b.

In stagnant water, scarce.

Area: Europe, S. America, Abyssinia, India.

Tetraëdron Kütz.

109. **T. regulare** Kütz. Phyc. Germ. p. 129. *Polyedrium tetraëdricum* Näg. Gatt. einzell. Alg. 1849, p. 84, t. IV B, f. 3.

Diam. 22—23 μ .

Area: Europe, N. and S. America, W. Indies, E. Africa, Abyssinia, Kordofan.

110. **T. bifurcatum** Lagerh. in Nuova Notarisia 1893, p. 160. *Polyedrium tetraëdricum* Näg. var. *bifurcatum* Wille.

Diam. sine spin. 38—46 μ , cum spin. 50—59 μ . (Tab. nostr. IV, fig. 50.)

Area: N. and S. America, W. Indies, Abyssinia, Kordofan.

111. **T. octaëdricum** (Reinsch) Hansg. in Hedwigia 1888, p. 131. *Polyedrium octaëdricum* Reinsch.

Diam. 25—27 μ .

Var. **spinosum**. *P. octaëdricum* var. *spinosum* Reinsch.

Diam. sine spin. 21—26 μ , cum spin. 32—38 μ .

Area: Europe.

112. **T. cruciatum** West & G. S. West. *Micrasterias cruciata* Wallich in Ann. Mag. Nat. Hist. ser. 3, vol. V, 1860, p. 281, .. XIII, f. 12; *Staurophanum cruciatum* Turn. in Kongl. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 1893, p. 159, t. XX, f. 20, 21.

Diam. 52—54 μ . (Tab. nostr. IV, fig. 51.)

The eight angles were bifurcate (not trifurcate) and a few of the spines were again furcate.

Amongst various Desmids, *Scenedesmus*, etc., in stagnant water in the jungle.
Area: India, Ceylon.

Reinschiella De Toni.

113. **R. siamensis** West & G. S. West, n. sp. (Tab. nostr. IV, fig. 52.)

Cellulae magnae, solitariae et libere natantes, late lunato-lanceolatae, margine exteriori multum convexo, margine interiori subrecto et levissime retuso, apicibus productis in spinas longas gracillimas et recurvatas.

Long. sine spin. 77 μ ; lat. 28 μ ; long. spin. circ. 17—52 μ .

Apparently a distinct species nearest to *R. crassispina* De Toni.

With various Desmids amongst *Spirogyra decimina* var. in stagnant water.

114. **R. obesa** West & G. S. West, n. sp. (Tab. nostr. IV, fig. 53—54.)

Cellulae medioeres, solitariae vel binæ (interdum 3), libere nantes, oblique ellipsoideæ, paullo curvatæ, margine exteriori convexo vel recto et levissime retuso, margine interiori valde convexo, apicibus spina robusta curvata brevi acutissima præditis.

Long. sine spin. 29—30,5 μ , cum spin. 42—46 μ ; lat. 14 μ ; long. sp. n. 6,5—7,5 μ .

One cell possessed a short, thick, extra spine near to one pole.

This plant differs from the other species of *Reinschiella* in the fact that the ventral (or internal) margin is much more convex than the dorsal (or external) margin. The spines thus appear to be curved in the opposite direction to the apparent curvature of the cells.

Among various *Palmellaceæ* in stagnant water in the jungle.

Dictyosphærium Näg.

115. **D. pulchellum** Wood in Smithson. Contrib. to Knowl. 1873, p. 84, t. X, f. 4. *D. globosum* Richt. in Hedwigia 1884, p. 65.

Diam. cell. 3,8—4,5 μ .

In stagnant water.

Area: Europe, N. and S. America, Abyssinia, Australia.

Botryococcus Kütz.

116. **B. Braunii** Kütz. Spec. Algar. p. 892; Rabenh. Flor. Europ. Algar. III, p. 43.

In stagnant water.

Area: Europe, N. and S. America, Abyssinia, India, Sumatra.

Ineffigiata West & G. S. West.

117. **I. neglecta** West & G. S. West in Journ. Roy. Micr. Soc. 1897, p. 503.

In stagnant water in the jungle.

Area: Europe, N. America, Ceylon.

Dimorphococcus A. Br.

118. **D. lunatus** A. Braun Alg. Unicell. p. 44; Rabenh. Flor. Europ. Algar. III, p. 36, cum fig. xylogr.; West in Journ. Roy. Micr. Soc. 1892, p. 735, t. IX, f. 39. *Scenedesmus radiatus* Reinsch.

With the preceding plant.

Area: Europe, S. America.

Oocystis Näg.

119. **O. elliptica** West in Journ. Roy. Micr. Soc. 1892, p. 736, t. X, f. 56.

Frequent in stagnant water in the jungle and in muddy ricefields.

Area: Europe, N. America, Madagascar, Ceylon.

Glœocystis Næg.

120. **G. vesiculosa** Næg. Gatt. einzell. Alg. 1849, p. 66, t. IV F.

In stagnant water amongst other *Palmellacea*.

Area: Europe, N. and S. America, Ceylon, Australia.

121. **G. gigas** (Kütz.) Lagerh. in Öfvers. af K. Vet.-Akad. Förh. 1883, no. 2, p. 63. *Protococcus gigas* Kütz. *Chlorococcum gigas* Grun. *Glœocystis ampla* Rabenh.

In stagnant water in the jungle and in muddy ricefields.

Area: Ubiquitous.

Kirohneriella Schmidle.

122. **K. obesa** Schmidle in Flora oder Allg. Bot. Zeitung 1894, Heft 1, p. 44. *Selenastrum obesum* West in Journ. Roy. Micr. Soc. 1892, p. 734, t. X, f. 50—52.

Crass. cell. 4,8—5,2 μ .

In stagnant water in the jungle.

Area: Europe.

Appendix.

Fam. Characeae.¹⁾

Chara.

123. **C. gymnopithys** Al. Br.
vel **C. flaccida** Al. Br.

The specimens were too young for a certain determination.

Muddy ricefield near Lem Dan.

Class. Florideae.

Fam. Heiminthocladaceae.

Batrachospermum Roth.

124. **B. monilliforme** Roth.
var. **confusum** (Hass.).

On rocks in small waterfalls in the jungle near Klong Son.

Area: Europe.

¹⁾ Auctore O. Nordstedt.

Description of Plates.

a, a' = cellula vel semicellula a fronte visa.
b = " " " " a vertice visa.
c = " " " " a latere visa.
d = semicellula a basi visa.

Plate II.

Figure

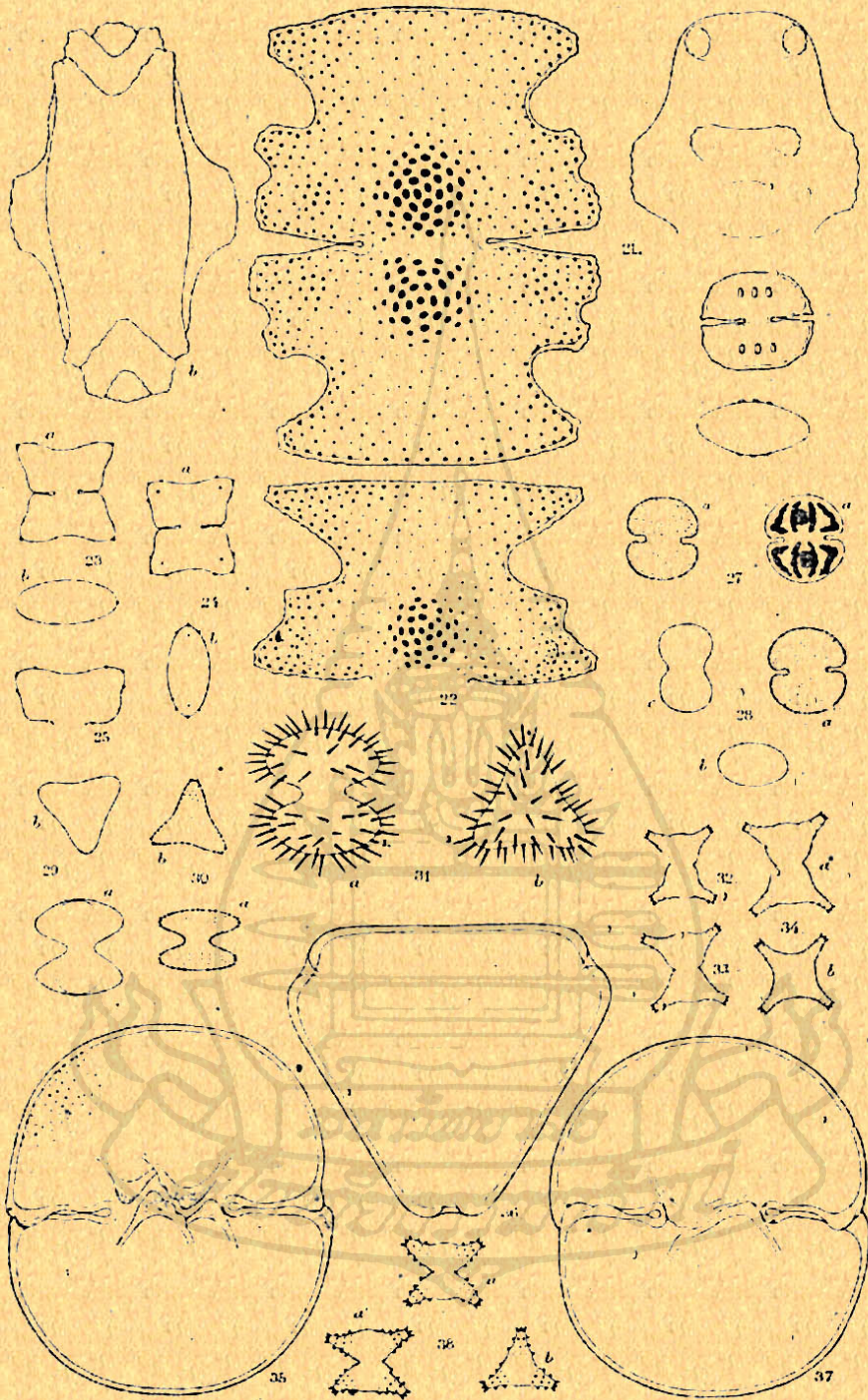
1. *Pleurotanium gloriosum* West & G. S. West forma. $\times 520$.
2. *Gonatozygon Kinahani* Rabenh. var. *tropicum* West & G. S. West, n. var.
- 3-4. *Closterium tumidum* Johnson. Two forms. $\times 520$.
5. *Closterium acerosum* Ehrenb. forma. With zygospore. $\times 120$.
- 6-7. *Closterium Cornu* Ehrenb. var. *siamense* West & G. S. West, n. var. $\times 520$.
- 8-11. *Cylindrocystis subpyramidata* West & G. S. West, n. sp. $\times 520$.
- 12-13. *Cosmarium pseudorthopunctatum* West & G. S. West, n. sp. $\times 520$.
- 14-16. *Cosmarium lere* Rabenh. 15 and 16, zygospores. $\times 520$.
17. *Cosmarium aequatum* West & G. S. West, n. sp. $\times 520$.
18. *Cosmarium subtriordinatum* West & G. S. West forma. $\times 520$.
19. *Cosmarium subauriculatum* West & G. S. West. $\times 520$.
20. var. *truncatum* West & G. S. West, n. var. $\times 520$.

Plate III.

21. *Micrasterias Möbii* West & G. S. West. $\times 520$.
22. var. *tetrachastriiformis* West & G. S. West, n. var. $\times 520$.
- 23-25. *Arthrodesmus alatus* West & G. S. West, n. sp. $\times 520$.
26. *Cosmarium pseudotaxichondrum* Nordst. var. *siamense* West & G. S. West, n. var. $\times 520$.
- 27-28. *Cosmarium Schmidtii* West & G. S. West, n. sp. $\times 520$.
29. *Staurastrum Biencanum* Rabenh. var. *orientale* West & G. S. West, n. var. $\times 520$.
30. *Staurastrum hexacerum* Wittr. var. *tropicum* West & G. S. West, n. var. $\times 520$.
31. *Staurastrum echinatum* Bréb. $\times 520$.
- 32-34. *Staurastrum pseudotetracerum* West & G. S. West var. *robustum* West & G. S. West, n. var. $\times 520$.
- 35-37. *Staurastrum Zahlbruckneri* Lütkem. var. *mamillatum* West & G. S. West, n. var. $\times 520$.
38. *Staurastrum micron* West & G. S. West, forma. $\times 520$.

Plate IV.

- 39-41. *Edogonium maximum* West & G. S. West, n. sp. $\times 220$.
42. *Edogonium dioicum* Carter. $\times 220$.
- 43-45. *Spirogyra Schmidtii* West & G. S. West, n. sp. 43 and 44, $\times 220$; 45, $\times 520$.
- 46-49. *Scenedesmus acutiformis* Schröder var. *spinuliferum* West & G. S. West, n. var. $\times 520$.
50. *Tetraëdron bifurcum* Lagerh.
51. *Tetraëdron cruciatum* West & G. S. West. $\times 520$.
52. *Reinschiella siamensis* West & G. S. West, n. sp. $\times 520$.
- 3-54. *Reinschiella obesa* West & G. S. West, n. sp. $\times 520$.



5 5746-10 107 104

111 2 10107 10800000

SIAMESE DESMIDS.

Marine Algae¹⁾

(*Chlorophyceae*, *Phaeophyceae*, *Dictyotales*, *Rhodophyceae*²⁾)

by **Th. Reinbold** — Itzehoe.

Chlorophyceae.

Ulvaceae.

Enteromorpha Link.

1. *E. plumosa* Kg. Phyc. gen. p. 300, non Ahln; De Toni Syll. I. p. 132. — *E. Hopkirkii* (M^o Calla) Harv. — *E. paradoxa* Kg. Spec. p. 479.

Our specimen represents a very delicate form which agrees with *E. paradoxa* β . *angustissima* Kg. Tab. phyc. VI. t. 35. Epiphytic on *Laurencia obtusa*.

Koh Chang-Strait in shallow water, in some places between tide-marks.

Area: Baltic; Atlantic; Mediterranean; Australia (probably more widely distributed).

Protoderma Kg.

2. *P. sp.*

Very thin indefinite membranaceous layers on shells. The plant tolerably agrees with *P. marinum* Rke. Algenfl. W. Ostsee p. 81. which is abundant in the Baltic and the German Sea, covering stones and shells. (cfr. *P. viride* Kg. Tab. phyc. VI. t. 11). In Engl. u. Prantl Pflanzf. p. 78 *Protoderma* is denoted as genus dubium.

Lem Ngob, on dead shells in the mangrove.

Caulerpaceae.

Caulerpa Lamx.

3. *C. filiformis* (Harv.) J. Ag. Alg. Syst. I. p. 5; Web. v. Bosse Caulerpa p. 262; De Toni Syll. I. p. 442. — *Herpochaete filiformis* Harv. List Friendl. Isl. Alg. Nr. 95.

Fragments only.

Koh Kahdat in 1—2 fathoms water (coral-sand).

Area: Friendly Isllds.

¹⁾ With an asterisk I have marked the species already known from Siam.

²⁾ As to the marine *Myxophyceae* see the following paper by Gomont. As to the *Corallinaceae* see part II. of these contributions.

4. *C. fastigiata* Mont. Cent. I. Nr. 16; Web. v. Bosse l. c. p. 262; De Toni Syll. I. p. 442.

f. *minor* Web. v. Bosse l. c. p. 263.

The little plants exactly agree with the original specimen (in the Botan. Museum of Hamburg) on which Mad. Weber v. Bosse has founded the forma *minor*.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Brazil.

5. *C. verticillata* J. Ag. Alg. Liebm. p. 6; Alg. Syst. I. p. 6; Web. v. Bosse l. c. p. 267; De Toni Syll. I. p. 443.

N. of Koh Kahdat on coral-reefs in shallow water.

Area: W. Indies; Ceylon; Friendly and Tonga Islds.

6. *C. scalpelliformis* (R. Br.) Ag. Spec. p. 437; sens. ampl. Web. v. Bosse l. c. 268. — *C. denticulata* Decn. — *Fucus scalpelliformis* R. Br. in Turn. Hist. t. 174.

Fragment only which perhaps is to be referred to var. *intermedia* Web. v. Bosse l. c. p. 287.

Between Koh Mesan and Cape Liant, in 9 fathoms water.

Area: Red Sea; Australia; Tasmania; Ceylon; Mauritius.

7. *C. plumaris* (Forsk.) Ag. Spec. p. 436; Web. v. Bosse l. c. p. 294; De Toni Syll. I. p. 453. — *Fucus plumaris* Forsk. Flor. aegypt. p. 190.

f. *longipes* Web. v. Bosse l. c. p. 295. — *C. plumaris* v. *longipes* J. Ag. Alg. Syst. I. p. 15. — *Fucus taxifolius* Turn. Hist. t. 54. non Vahl.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: In all tropical Seas.

8. *C. Freycineti* Ag. Spec. p. 446; sens. ampl. Web. v. Bosse l. c. p. 310.

var. *typica* Web. v. Bosse l. c. p. 312.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Guadeloupe; Red Sea; warm Pacific.

var. *pectinata* Web. v. Bosse l. c. p. 316¹⁾.

A fragment only.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Guadeloupe.

¹⁾ The determination of this fragment I owe to the kindness of Mad. Weber v. Bosse.

9. *C. Urvilliana* Mont. Voy. Pôle Sud. p. 21, sens. ampl. Web. v. Bosse l. c. p. 318.

var. *typica* f. *tristicha* Web. v. Bosse l. c. p. 319.

C. Urvilliana is by forms narrowly connected with *C. Freycineti*; I think our only fragmentary specimen is to be referred to *C. Urvilliana*, because there are three rows of teeth on one part of the frond.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area (f. *tristicha*): Lucipara Islds; Trop. Australia; Carolines Islds.

10. *C. racemosa* (Forsk.) J. Ag. Alg. Syst. I. p. 35; sens. ampl. Web. v. Bosse l. c. p. 357. — *Fucus racemosus* Forsk. Flor. aegypt. p. 191.

var. *uvifera* Web. v. Bosse l. c. p. 362.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: W. Indies; Red Sea; Warm Pacific.

11. *C. peltata* Lamx. Journ. de Bot. t. 3. fig. 2; sens. ampl. Web. v. Bosse l. c. p. 373.

The diameter of the disk varies in our plant from 3 to 8 mm.

Koh Chick, on rocks in shallow water.

Area: W. Indies; Red Sea; Warm Pacific.

12. *C. sedoides* (R. Br.) Ag. Spec. p. 438; Web. v. Bosse l. c. p. 387; De Toni Syll. I. p. 480. — *Fucus sedoides* R. Br. in Turn. Hist. t. 172.

The specimen is perhaps allied to *f. crassicaulis*.

Koh Kahdat, in shallow water (coral-sand).

Area: Australia; N. Zealand; Samoa, Tonga, Friendl. Islds.

13. *C. lentillifera* J. Ag. Alg. Rueppel. p. 173; sens. ampl. Web. v. Bosse l. c. p. 380.

var. *longistipitata* Web. v. Bosse in herb.¹⁾

Cette variété se distingue du *C. lentillifera typica* par, quelquefois, le petit nombre de ses rangées de vésicules, par le grand diamètre de celles-ci et le pédicelle dont la hauteur égale, ou surpasse la moitié du diamètre de la vésicule.

Quelques échantillons de cette variété ressemblent beaucoup, à première vue, au *C. racemosa* var. *clavifera*, mais ils se distinguent par le rétrécissement du pédicelle à son sommet de tous les échantillons de cette variété*. Web. v. Bosse in litt.

Koh Chick, on rocks in shallow water.

Area (var. *longistipitata*): New Guinea; Sarasa (îles Postillon); Tuab (île de Key).

¹⁾ Mad. Weber v. Bosse was so kind to determine this Alga and to give me the following notices.

Codiaceae.

Halimeda Lamx.

14. **H. macroloba** Decne. Corall. p. 91; De Toni Syll. I. p. 520.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Red Sea; Indian and Pacific Oceans.

Udotea Lamx.

15. **U. flabellata** Lamx. Polyp. flex. p. 311 t. 12; De Toni Syll. I. p. 510.

The Pacific specimens seem to be a little more elongated and more deeply split than the plants from the W. Indies; any other difference is not to be seen.

Off Koh Kam, in 10 fathoms water.

Area: W. Indies; Ceylon; Tropic. Australia.

16. **U. glaucestens** Harv. List Friendl. Isl. Alg. Nr. 82; De Toni Syll. I. p. 505.

A fragment only.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Friendl. Islds.

Avrainvillea Dene.

17. **A. papuana** (Zan.) Murr. et Bood. Avrainv. in Journ. of Bot. 1889; De Toni Syll. I. p. 514. — *Chloroplegma papuanum* Zan. Phyc. papuan. Nr. 10 in N. Giorn. Bot. Ital. X. 1878.

Koh Kahdat, in 1 - 2 fathoms water (coral-sand).

Area: N. Caledonia; N. Guinea; Ceylon; Philippines.

18. **A. comosa** (Bail. et Harv.) Murr. et Bood. l. c.; De Toni Syll. I. p. 515. — *Chlorodesmis comosa* Bail. et Harv. in Harv. Ner. boreal. Americ. III. p. 29. (?)

Undeveloped fragment only, therefore 'doubtful as to species.

Off Koh Kam, in 10 fathoms water.

Area: Warm Pacific (not uncommon).

Valoniaceae.

Dietyosphaeria Decne.

19. **D. favulosa** (Mert.?) Decne Classif. alg. p. 32; De Toni Syll. I. p. 371. — *Ulva favulosa* Mert. msc.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: Warm Atlantic, Indian and Pacific Oceans.

Valonia Ginn.

20. *V. utricularis* Ag. Spec. p. 431; De Toni Syll. I. p. 376. — *V. utricularis* f. *aegagropila* Hauck Meeresalg. p. 469. — *V. aegagropila* Ag. With Hauck l. c. I consider *V. aegagropila* only a form of *V. utricularis*. Koh Kahdat, on coral-reefs in shallow water.
Area: Mediterranean; Atlantic; Indian and Pacific Oceans.
21. *V. Forbesii* Harv. Alg. Ceyl. exsicc. N. 75; De Toni Syll. I. p. 374. Koh Kahdat, in 1–2 fathoms water (coral-sand).
Area: Indian Ocean; warm Pacific.

Struvea Sond.

22. *St. delicatula* Kg. Tab. phyc. XVI. p. 1 t. 2; Murr. et Bood. Struvea. p. 281, Nr. 6; De Toni Syll. I. p. 366. — *Cladophora anastomosans* Harv. Mar. Bot. W. Austr. Nr. 39. Alg. aust. exsicc. Nr. 582. Little plant and fragments only, which are however characteristic enough. Koh Lom, on coral-reefs in shallow water.
Area: Guadeloupe; Ceylon; Australia. N. Caledonia.

Siphonocladus Schmitz.

23. *S. Zollingeri* (Kg) Born. in Hariot in Jour. Bot. 1887, p. 56; De Toni Syll. I. p. 358. — *Cladophora (Aegagropila) Zollingeri* Kg. Spec. p. 415, Tab. phyc. IV. t. 64. Off Koh Kahdat, in 5 fathoms water (coral-sand).
Area: Java.

Boodlea Murr. et De Toni in Journ. Linn. Soc. Bot. XXV.

24. *B. (coacta var!) Slamensis* Reinb. u. sp. *B. intricata*, subspongiosa; filamentis primariis paullulum laxè ramosis, ramis dense divaricatisque quoquo-versum ramulosis; ramulis hinc illinc ope tentaculorum inter se cohaerentibus; articulis longitudine valde inaequalibus, primariis ad 200 μ , ramulorum c. 30–40 μ crassis, articulis terminalibus apice obtusis; articulis primariis saepe elongatis usque 20plo diametro longioribus.

This is a true *Boodlea* and, as I think, a good species nearly related to *B. coacta*, but which by other algologists may perhaps be considered only a variety of the latter.

Our plant differs from *B. coacta* — of which I have a specimen from Japan (leg. Okamura) beside me for comparison — by somewhat less compact and less sponge-like habit, as the primary filaments, provided in part with much elongated joints, are not so densely beset with main branches. The density however of the branches of the second order and

of branchlets is almost the same in both plants, but the latter are in our plant much more spreading. As to the tentacula they are quite evident in *B. Siamensis*, but they seem to occur less numerously than in *B. coacta*. The joints in the different parts of the frond of *B. coacta* are tolerably equal in length, while in our plant they generally vary not inconsiderably in length in one and the same part of the frond. Besides the joints of the primary filaments of *B. Siamensis* are thicker than in *B. coacta*.

By examination of material preserved in alcohol I can confirm the opinion uttered with some caution by Murray, who examined only dried specimens, (of *B. coacta*), that the chromatophores agree wholly with those which Schmitz has described for the genus *Siphonocladus*. (see Engl. u. Prantl. Pflanzf. I. p. 147, fig. 98).

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Dasycladaceae.

Acetabularia Lamx.

25.* *A. major* v. Mart. O. Asiat. Tange p. 25. t. 4; v. Solms-Laubach Acetabul. in Transact. Linn. Soc. 1895, Nr. 6. — De Toni Syll. I. p. 419.

The splendid well developed plants agree well with this species, except in that the stalks are somewhat longer (up to 10 cm.) than those described and figured by v. Martens which difference is, I think, of no importance.

The disk measures 2 cm. in diameter and the rays vary in number from 70 to 80.

Abundant in the Koh Chang-Strait on rocks, stones, piles etc. between tide-marks.

Area: Siam (Simaharadscha); Timor; N. Guinea.

Phaeophyceae.

Fucaceae.

Sargassum Ag.

26. *S. polycystum* Ag. Syst. p. 304; De Toni Syll. III. p. 103. — *S. brevifolium* Grev.

Koh Kahdat, in 1—2 fathoms water, attached to stones.

Area: Common in the Indian and Pacific Oceans.

Cystoseira Ag.

27. *C. latifrons* Kg. Tab. phyc. X. p. 22, t. 60; De Toni Syll. III. p. 176.

Perhaps the same species as *C. prolifera* J. Ag.

Koh Kahdat, in 1—2 fathoms water, attached to stones.

Area: China; Timor; Tropic. Australia.

Turbinaria Lamx.

28. *T. conoides* Kg. Tab. phyc. X. p. 24, t. 66; Barton, Turbin, in Transact. Linn. Soc. 1891 p. 217, t. 54; De Toni Syll. III. p. 126. — *T. vulgaris* v. *conoides* J. Ag. Spec. I. p. 267.

Koh Kahdat, in 1–2 fathoms water attached to stones; Koh Chang-Strait at Lem Ngob, east ashore.

Area: Red Sea; Indian and Pacific Oceans.

Sphacelariaceae.

Sphacelaria Lgby.

28a. *Sph. furcigera* Kg. Tab. phyc. V. p. 27, t. 90.

On *Turbinaria*.

Koh Kahdat, in 1–2 fathoms water.

Area: Red Sea; Indian and Pacific Oceans.

Ectocarpaceae.

Ectocarpus Lgby.

29. *E. ludicus* Sond. in Zoll. Verz. p. 3; De Toni Syll. III. p. 546. — *E. amicorum* Harv. Alg. Friendl. Isl. Nr. 8.

Plurilocular sporang.

Off Koh Mesan, attached to a floating cocoa-nut.

Area: Warm Pacific (Java; N. Guinea; Friendly Isl.).

30. *E. simpliciusculus* Ag. in Bot. Zeit. 1827, p. 639. var. *Vitiensis* Asken. Gazelle. p. 20. t. 5; De Toni Syll. III. p. 496. (?)

Too fragmentary, therefore doubtful as to species.

Koh Chang Noi, on coral-reef in shallow water.

Area: Fidji Islds.; E. Australia, Sandwich Islds.

Encoeliaceae.

Colpomenia Derb. et Sol.

31*. *C. sinuosa* (Roth) Derb. et Sol. Mém. p. 11, t. 32; De Toni Syll. III. p. 489. — *Encoelium sinuosum* Ag. — *Asperococcus sinuosus* Bory. — *Ulva sinuosa* Roth. Catal. III. p. 327, t. 12.

Koh Chang-Strait at Lem Ngob, Koh Kahdat, east ashore.

Area: Mediterranean; Atlantic; Red Sea; Indian and Pacific Oceans. (Siam, Simaharadscha).

Hydroclathrus Bory.

32*. **H. cancellatus** Bory Dict. VIII. p. 119; De Toni Syll. III. p. 490. — *Asperococcus cancellatus* Endl. — *Encoelium clathratum* Ag. — *Asperococcus clathratus* J. Ag.

The specimens from the Koh Chang-Strait represent a very fine and delicate form.

Koh Chang-Strait; Koh Kahdat, abundant on rocks and stones between tide-marks.

Area: Atlantic; Red Sea; Indian and Pacific Oceans; Siam (Simaharadscha).

Asperococcus Lamx.

33. **A. fastigiatus** Zanard. Phyc. indic. Pug. p. 134, t. 3. De Toni Syll. III. p. 496.

f. **major** Reinb. n. f.

fronde duplo crassiore et altiore sed minus ramosa quam in forma typica.

I think the present plant cannot be separated from *A. fastigiatus*, but it represents a remarkably robust form. The fronds are (in exsiccatis) about 5 mm. broad but less branched than the type in Zanardini's figure.

For the rest our plant offers the same characteristic features as the main species; the tips of the segments, simple or forked, are rounded and the diameter of the frond is nearly the same in all parts of the plant.

The specimens are provided (at the end of December) with pluriloc. sporangia which are collected in definite sori dispersed over the frond.

Koh Chang-Strait near Lem Ngoh, in shallow water.

Area: Sarawak.

Dictyotales.

Dictyotaceae.

Dictyota Lamx.

34. **D. dichotoma** (Huds.) Lamx. in Desv. Journ. II. p. 42; De Toni Syll. III. p. 263. — *Ulva dichotoma* Huds. Flor. angl. p. 476.

Koh Chang-Strait at Lem Ngoh, east ashore.

Area: Common in all temperate and warm Oceans.

35. **D. Barteyresiana** Lamx. Dict. Nr. 17; De Toni Syll. III. p. 262. — *D. cuspidata* Kg. Tab. phyc. IX. t. 80.

The specimens represent in part a somewhat broad form of this very varying species.

Koh Kahdat, in 1—2 fathoms water (coral-sand).

Area: W. Indies; Tropic. Australia; Ceylon (probably more widely distributed in warmer Seas).

36. *D. divaricata* J. Ag. Alg. Syst. V. p. 101; De Toni Syll. III. p. 276. — *D. Bartegresiana* var. β *divaricata* J. Ag. Spec. I. p. 94. — *D. acutiloba* Kg. Tab. phyc. IX. t. 29 non J. Ag.

The specimens are sterile but correspond in all other characters with this species. (They also agree in some manner with *Dictyota indica* Sond. Kg. Tab. phyc. IX. t. 17, a species insufficiently fixed which is cited from Siam by v. Martens).

Koh Chang-Strait at Lem Ngoh, east ashore.

Area: Atlantic; Red Sea.

37. *D. sp.*

Only a single sterile and incomplete specimen; perhaps *D. robusta* J. Ag. Anal. alg. C. I. p. 76. (Australia).

Koh Kahdat, in 1–2 fathoms water (coral-sand).

Haliseris Targ-Tozz.

38. *H. polypodioides* (Desf.) Ag. Spec. I. p. 142; De Toni Syll. III. p. 254. — *Dictyopteris polypodioides* Lamx. — *Fucus polypodioides* Desf. Flor. atl. II. p. 421.

Between Koh Mesan and Cape Liant, in 9 fathoms water.

Area: Mediterranean; Warm Atlantic; Cape; Red Sea; Pacific. (Australia, Japan).

Padina Adans.

39. *P. Commersonii* Bory Voy. Coq. Nr. 41, t. 21; J. Ag. Alg. Syst. V. p. 119; De Toni Syll. III. p. 244.

Among the present great number of specimens some are provided with oospores and belong surely, I think, to this species; but it is probable, that among the sterile plants there may be specimens of the widely distributed *Padina pavonia*.

Koh Kahdat, in 1–2 fathoms water (coral-sand).

Area: W. Indies; Red Sea; Tropic. Australia; Ceylon; N. Guinea; Japan.

Zonaria (Gymnosorus) J. Ag.

40. *Z. sp.*

Decumbent little crustaceous patches attached to stones and one little unattached sterile specimen. All show the structure of *Zonaria* (*Gymnosorus*). Judging by their mode of growth the specimens probably represent young states of *Zonaria Diesingiana* J. Ag. or *Zonaria* (*Gymnosorus*) *variegata* (Lamx.), which both occur in the Pacific. (Or should our plant perhaps be identical with *Zonaria obscura* Dick., a doubtful species shortly described in Dickie, Alg. Mangaia Isl. in Journ. Linn. Soc. 1875, p. 31?).

Rhodophyceae.

Bangiales.

Bangiaceae.

Erythrotrichia Aresch.

41. *E. ceramicola* (Lgby.) Aresch. Phyc. Scand. p. 210; De Toni Syll. IV. p. 24. — *Bangia ceramicola* Chauv. — *Goniotrichum ceramicola* Kg. — *Conferva ceramicola* Lgby. Hydroph. Dan. p. 144, t. 48.

On *Padina* and *Laurencia*.

Koh Chang-Strait at Lem Ngob, on rocks between tide-marks.

Area: Mediterranean; Atlantic; Cape Horn; Timor; Tonga Isls.

Florideae.

Gelidiaceae.

Gelidium Lamx.

42. *G. crinale* (Turn.) Lamx.; De Toni Syll. IV. p. 156; *G. corneum* var. *crinalis* Auct. J. Ag. Spec. II. p. 470. — *Fucus crinalis* Turn. Hist. t. 198.

The specimen agrees in its habit with *Acrocarpus intricatus* Kg. Tab. phyc. XVIII. t. 35.

Koh Chang Noi and Koh Lom, creeping on coral-reefs in shallow water.

Area: Mediterranean; Atlantic; Red Sea; Pacific.

Rhodophyllidaceae.

Catenella Grev.

43. *C. Nipae* Zan. Phyc. indic. Pug. Nr. 35, t. 6; De Toni Syll. IV. p. 321.

Koh Chang-Strait at Lem Ngob, creeping on the roots of mangrove-trees between tide-marks.

Area: Sarawak.

Rhabdonia Harv.

44. *R. Schmidtii* Reinb. n. sp. (Fig. 1—5).

R. gelatinoso-membranacea, caespitosa, decumbens e teretiusculo compressa, $\frac{1}{2}$ —2 mm. lata, dichotome et parce inordinateque lateraliter ramosa, frondes (et segmenta cujusque frondis) et inter se et cum aliis corporibus ope processuum hinc illinc arcte crescentes; segmentis saepe \pm elongatis marginibus paullulum inaequalibus (sparsim leviter constrictis et dilatatis) apicibus obtusis vel subacutis, proliferationibus et processibus difformibus, plerumque \pm minutis, e marginibus vel rarius e disco emergentibus, praecipue versus apices et ad apices obsitis. Tetrasp. generis



Fig. 1.



Fig. 2.



Fig. 4.



Fig. 5.



Fig. 3.

Fig. 1-5. *Rhabdonia Schmidtii*.

1. Fronds; nat. size. — 2-5 show the various forms of the excrescences growing out from the margins and the tips of the frond. 7: 1. (Dr. A. Voigt del. Figg. 2-5.)

(zonatim divisis) per frondem sparsis. Cystocarpiis ?? — Chartae adhaeret.

The plant represents a true *Rhabdonia* by the structure of the frond, characteristic for this genus, together with the zonate tetraspores. Of all the known species of *Rhabdonia* the new species seems to be most nearly related to *R. decumbens* Grun. (Asken. Gazette p. 46, t. 2). Even on reading the somewhat short diagnosis I had at first the conjecture, that the two plants, although living in very distant places of the world, were identical, but after having examined the figures of *R. decumbens*, I was convinced of the impossibility of uniting the two plants under one specific name.

Our specimens are so intricated and in part so closely attached one to the other and also to small grains from the ground (pieces of shells etc.), that it is very difficult and often even impossible to separate the fronds without injury or to make a preparation of an uninjured complete specimen. In the figures I have attempted to show the habit of the plant, but it would require a great number of figures to give a complete idea of the great variety in branching and of the diverse arrangements of the proliferations and excrescences. These latter growing out from the margin or the tips of the segments (or of the proliferations) and more seldom from the flat surface, are also of a very varying form, sometimes they are like warts or little cushions, then they resemble little teeth or roundish, simple or forked cilia, or more elongated and variously divided ones, which fringe the margins or terminate the tips of the segments. (Figg. 2—5 represent some different forms of the excrescences). The frond is not strictly articulated (as in *R. clarigera*, *R. verticillata*) but it is in part and in an irregular manner slightly constricted and dilatated alternately, so as to make sometimes the margins of the frond unequal. The consistence of the frond is somewhat gelatinous so that the plant adheres firmly to the paper. I have not seen cystocarps.

Koh Chang-Strait, in shallow water near Lem Ngob.

Sphaerococcaceae.

Gracilaria Grev.

45. *G. confervoides* (L.) Grev. Alg. Brit. p. 123; De Toni Syll. IV. p. 431. — *Fucus confervoides* L. Spec. plant. II. p. 1629.

Off Koh Kam in 10 fathoms water.

Area: Widely distributed throughout all warm Seas.

46. *G. dura* (Ag.) J. Ag. Alg. medit. p. 151; De Toni Syll. IV. p. 442. — *Sphaerococcus durus* Ag. Spec. p. 310.

Area: In almost all warm Seas.

f. *prolificans* Reinb. n. f.

fronde admodum crassa, ramis et ramulis basi eximie constrictis, proliferationibus evidenter petiolatis ex apicibus truncatis ramorum (fere flabellatim) egredientibus.

The specimens show the structure and the other characteristic points of *Gracilaria dura*, a species much varying in its habit; but I think our plant represents a very distinct form, which should be fixed. In general, proliferations occur rarely in the genus *Gracilaria*.

The specimens, provided with cystocarps, are somewhat stout and robust, about 10 cm. high and about 1—1½ mm. thick (in diameter).

Koh Chang-Strait, in shallow water near Lem Ngob.

Hypnea Lamx.

47. *H. musciformis* (Wulf.) Lamx. Ess. p. 43; De Toni Syll. IV. p. 472. — *Fucus musciformis* Wulf. in Jacq. Coll. III. p. 154, t. 14. Fig. 3.

A small but fruiting (tetrasp.) specimen.

Koh Chang-Strait at Lem Ngob, in sandy ground between tide-marks.

Area: In all warm Seas.

Champia Desv.

48. *Ch. parvula* (Ag.) J. Ag. Epic. p. 303; De Toni IV. p. 558. — *Lomentaria parvula* Gaill. — *Chylocladia parvula* Hook. — *Chondria parvula* Ag. Syst. p. 207.

The (sterile) specimen agrees in its habit with *Lomentaria parvula* β . *vaga* Kg. Tab. phyc. XV. t. 87.

4 miles S. of Koh Saket, in 9 fathoms water (shells).

Area: Mediterranean; Atlantic; Australia; Japan.

Caloglossa (Harv.) J. Ag.

49. *C. mioides* Harv. Alg. exsicc. Friendl. Isl. Nr. 33; J. Ag. Epic. p. 500; De Toni Syll. IV. p. 729. — *Hypoglossum Vieillardii* Kg. Tab. phyc. XVI. t. 10.

Very young specimens only, therefore somewhat doubtful as to species.

15 miles E. of Koh Chuen, in 10 fathoms water (shells).

Area: N. Guinea; N. Caledonia; Friendl. Islds.; Ceylon. ?

Laurencia Lamx.

50. *L. divaricata* J. Ag. Spec. II. p. 754.

Koh Kalhat, in 1—2 fathoms water (coral-sand).

Area: Red Sea; Indian and Pacific Oceans.

51. *L. dendroidea* J. Ag. Spec. II. p. 753.

Koh Kalhat, cast ashore.

Area: Warm Atlantic; Pacific (Australia, Japan).

52. *L. obtusa* (Huds.) Lamx. Ess. p. 42; J. Ag. Epic. p. 653. — *Fucus obtusus* Huds. flor. angl. p. 586. *

Some of the present specimens agree tolerably with var *squarrulosa* Grun. Alg. Fidji-Samoa Islds. p. 23. (from Tongatabu).

Koh Chang-Strait at Lem Ngob, on rocks between tide-marks.

Area: Widely distributed in all warm Oceans.

Acanthophora Lamx.

53*. *A. orientalis* J. Ag. Spec. II. p. 820.

The specimen from Lem Ngob is sterile, therefore doubtful, but I have seen some little fertile fragments between Algae from Koh Kahdat which certainly belong to this species.

Lem Ngob, Koh Kahdat in shallow water.

Area: Manila; Samoa-Tonga-Marianes Isls.; (Siam? sub nomine *A. Thieryi*).

Polysiphonia Grev.

54. *P. scopulorum* Harv. Mar. Bot. W. Aust. Nr. 88; J. Ag. Spec. II. p. 940.

On stones.

Koh Chang Noi, on coral-reef in shallow water.

Area: W. Australia.

Tolypooladia Schmitz.

55. *T. glomerulata* (Ag.) Schm. in Engl. u. Prantl. Pfl. fam. p. 441. — *Polysiphonia glomerulata* (Ag.) J. Ag. Spec. II. p. 1016. — *Polysiphonia calodictyon* Harv.; *Polysiphonia calacantha* Harv. — *Hutchinsia glomerulata* Ag. Syst. p. 158.

Koh Kahdat, Koh Chang Noi, on coral-reefs in shallow water.

Area: Indian and Pacific Oceans.

Leveillea Dene.

56. *L. jungermannioides* (Mart. et. Her.) Harv. Mar. Bot. W. Aust. p. 539. — *L. gracilis* Dene. — *Polyzonia jungermannioides* (Mart. et. Her.) J. Ag. Spec. II. p. 1169. — *Amansia jungermannioides* Mart. et Her. in Flora 1836 p. 485.

Koh Chang Noi, Koh Lom, on coral-reefs in shallow water.

Area: Red Sea; Indian and Pacific Oceans.

Ceramiaceae.

Ceramium (Roth) Lgby.

57. *C. fastigiatum* Harv. in Hook. Journ. Bot. p. 303; J. Ag. Epic. p. 96; Anal. alg. Cont. II. p. 16.

The specimens are provided with tetraspores (exteriore latere ramulorum prorumpentibus).

Off Tung Kaben, in 6 fathoms water (mud).

Area: Mediterranean; Atlantic; Australia?

58. *C. Kützligianum* Grun. Alg. Samoa, Fidji Isl. p. 9. — *Gongoceras subtile* Kg. Tab. phyc. XIII. t. 2 (non *Ceramium subtile* Ag.).

Fragments of this species, one of the finest and most delicate of the genus often occur epiphytically on other Algæ in our material.

Koh Chang Noi, on coral-reef in shallow water; between Koh Mesan and Cape Liant, in 9 fathoms water.

Area: Samoa Isl.; N. Caledonia; Sandwich Isls.

Spyridia Harv.

59. *S. filamentosa* (Wulf.) Harv. in Brit. Fl. p. 336; J. Ag. Epic. p. 268. — *Fucus filamentosus* Wulf. Crypt. aq. p. 64.

Koh Kahdat, in 1—2 fathoms water (coral-sand); off Koh Kain, in 10 fathoms water (gravel).

Area: Widely distributed in all warm and temperate Seas.

Grateloupiaceae.

Cryptonemia.

60. *C. sp.*

The little specimen is too much torn and incomplete to be determined exactly as to species.

Between Koh Mesan and Koh Chuen, in 15 fathoms water (stones).

Squamariaceae.

Peyssonellia Deene.

61. *P. Gunnlaui* J. Ag. Epic. p. 387. — *P. rubra* Harv. alg. austr. exsicc. Nr. 327.

Koh Chang Noi, on coral-reef in shallow water.

Area: Australia.

62. *P. rubra* (Grev.) J. Ag. Spec. II. p. 502. — *Zonaria rubra* Grev. in Transact. Linn. Soc. XV. p. 340.

Between Koh Mesan and Koh Chuen, in 15 fathoms water (stones).

Area: Mediterranean; Atlantic; Red Sea; Ceylon; Australia; Tonga Islds.

The *Corallinaceae* by M. Foslie have already been published in part II. of the „Flora of Koh Chang“, Botanisk Tidsskrift, vol. 24, fasc. 1, p. 15—22.

Myxophyceae hormogoneae

by M. Gomont — Paris.

(With plate 5.)

Peu de travaux ont été publiés jusqu'ici sur les Algues de la partie Sud-Est de l'Asie, et les Myxophycées n'y sont représentées en général que par un nombre infime d'espèces¹⁾. Quant à la région même explorée par l'Expédition danoise et à la partie du continent qui l'avoisine, nous ne pensons pas qu'aucun Algologue l'ait jamais visitée. Les matériaux récoltés au cours de l'Expédition danoise de 1899--1900 dans le golfe de Siam méritaient donc d'être étudiés avec attention. S'ils ne nous ont fourni, que 27

¹⁾ Voici les seuls renseignements que nous a fourni à cet égard la littérature. Encore les territoires mentionnés dans les travaux ci après sont ils presque tous assez éloignés de la localité qui nous occupe.

G. von Martens — Die preussische Expedition nach Ost-Asien, Botanischer Theil, die Tange, Berlin 1866. L'expédition a visité Java, Singapore, Siam, Macao, Hongkong, les Philippines et Macassar. L'ouvrage mentionne six Nostocacées seulement, des mers de la Chine et des îles de la Sonde — List of Algae collected by Kurz in Burma; in Proceedings of Asiatic Society of Bengal, p. 462, 1871.

Zanardini, Phycarum indicarum pugillus a d. Ed. Beccari ad Bornum, Singapore et Ceylonum, annis 1865—67 collectarum, in Mem. R. Istituto veneto vol. XVII, 1872.

Quinze Anhomocystées et dix Homocystées figurent dans ce travail. Elles proviennent de Singapore, Ceylan et Sarawak dans l'île de Borneo.

Zeller, Algae collected by M. Kurz in Arracan and British Burma, in Journ. Asiatic Soc. of Bengal, vol. XLII, part II, p. 165, 1873.

La liste donnée par l'auteur comprend 24 Homocystées et 36 Anhomocystées.

Heydrich, Beiträge zur Kenntniss der Algenflora von Ost-Asien, in Hedwigia, Band XXXIII, p. 267, 1894.

Ce travail comprend les îles Formose, Liukiu, Bonin et deux des Moluques. Trois espèces de Nostocacées seulement sont indiquées dont une est indéterminée.

Des ouvrages beaucoup plus importants ont été publiés récemment par M. de Wildeman sur les Indes Néerlandaises, mais ces îles ne sont généralement pas considérées comme appartenant à l'Asie.

espèces de Nostocacées hormogonées, il est à remarquer que, sur ce nombre, il s'en est rencontré deux nouvelles parfaitement caractérisées.

Ces 27 espèces se répartissent entre 13 genres, dont 6 appartiennent aux Homocystées et 9 aux Anhomocystées. Si on examine le catalogue que nous en donnons, on s'aperçoit immédiatement que les Algues à gaines épaisses et colorées l'emportent de beaucoup par le nombre des espèces et par leur fréquence. Ainsi, tandis que les genres *Oscillatoria*, *Lyngbya*, *Phormidium*, *Hydrocoleum* ne sont représentés chacun que par une espèce, les *Scytonema* et *Stigonema* en renferment treize à eux seuls. Deux *Schizothrix* seulement se trouvent, il est vrai, mentionnés sur notre liste, mais le *S. thelephoroides*, qui est pourvu d'une enveloppe remarquablement épaisse et ferme a été récolté dans six localités différentes. On a donc des raisons de croire qu'il abonde dans la région¹⁾.

Cette pénurie d'Algues à gaines minces ou molles peut n'être qu'apparente et résulter du moment où s'est faite l'exploration qui a eu lieu pendant la saison sèche, c'est à dire à une époque où les flaques d'eau peu profondes avaient disparu, ainsi que leurs hôtes habituels. Or c'est là surtout que se rencontrent les plantes insuffisamment protégées par leurs enveloppes, comme les *Oscillatoria*, *Phormidium*, *Nostoc*, *Anabena* etc. Notons cependant que les rochers élaboussés ou baignés par les cours d'eau permanents sont aussi l'habitat des espèces dont l'absence nous a frappé.

On pourrait conclure de cette dernière remarque que cette absence n'est pas purement accidentelle mais que, ainsi qu'on l'a maintes fois observé, les plantes les mieux adaptées aux régions tropicales sont celles qui trouvent dans l'épaisseur, la consistance ou la coloration de leur gaine une protection contre les sécheresses fréquentes et l'intensité de la lumière.

Les données que nous avons pu réunir sur l'aire d'habitation des espèces ont été indiquées dans le catalogue qui suit. Il ne faudrait pas cependant s'en exagérer l'importance. Bien que les recherches aient été poussées assez activement dans cette direction

¹⁾ Ce n'est pas sans quelque étonnement que j'ai constaté l'absence du *Porphyrosiphon Notarisii* dans les spécimens soumis à mon examen. Cette Homocystée, dont les gaines sont épaisses et fortement colorées, se rencontre en effet fréquemment dans toutes les régions chaudes. Elle a été notamment récoltée dans l'Inde par Kurz et Bélanger et à Ceylan par Ferguson.

depuis que la systématique des Myxophycées est devenue plus précise, il reste encore beaucoup à faire. Les observations que je présentais il y a huit ans, dans la *Monographie des Oscillariées*, sur l'état incomplet de nos connaissances géographiques sont encore vraies en grande partie et, même en Europe, de vastes territoires sont restés jusqu'à présent inexplorés¹⁾.

Myxophyceæ Stizenberger.

Hormogoneæ Thuret.

Homocystea Bornet et Flahault.

Lyngbyeæ Hansgirg (extensæ).

Oscillatoria Vaucher.

1. *O. tenus* Agardh.

Alg. Dec. II, p. 25, 1813.

var. *α natans* Gomont, Monogr. des Oscill., in Ann. des Sc. nat., VII^e Série, Bot., t. 16, p. 221, Pl. VII, fig. 2 et 3 — *O. natans* Kütz., Alg. aq. dulc. Dec., IV, n^o 34.

Waterhole near Lem Ngob.

Aire géogr.: Groenland, Suède, Danemark, Pays-Bas, Belgique, France, Allemagne, Hongrie, Italie, Afrique boréale et équatoriale, États Unis, Antilles, Amérique équatoriale, Sumatra, Nouvelle Zélande, Nouvelle Calédonie.

Trichodesmium Ehrenberg

2. *T. Hildebrandtii* Gomont.

Loco cit. p. 197, Pl. VI, fig. 1 — *T. Ehrenbergii*, forma *indica* Hauck, Ueber einige von J. M. Hildebrandt im Rothen Meere und Indischen Ocean gesammelten Algen, in Hedwigia, vol. XXVII, Heft 4, p. 93.

Abundant in maritime plankton throughout the area explored.

Aire géogr.: Ceylan, Singapore, Cap St Andréas (Ile de Madagascar).

¹⁾ Pour l'indication des aires géographiques j'ai seulement tenu compte des données qui présentaient un certain caractère d'authenticité. On sait en effet, qu'en l'absence d'échantillons originaux les déterminations ne doivent être acceptées qu'avec beaucoup de réserve, surtout chez les anciens auteurs.

Phormidium Kützing.

3. *P. inundatum* Kützing.

Spec. Alg., p. 251, 1849 — Gomont, loco cit. p. 172, Pl. IV, fig. 31 et 32.

Waterhole near Lem Ngob.

Aire géogr.: France occidentale, Belgique, Saxe, Mont Cameron (Afrique équatoriale), États Unis, Guyane, Nouvelle Zélande.

Lyngbya Agardh.

4. *L. majuscula* Harvey.

In Hooker, Engl. Fl., V, part 1, p. 370, 1833 — Gomont, loco cit. p. 131, Pl. III, fig. 3 et 4.

Mangrove-swamp near Lem Dan on aerial roots of *Rhizophora conjugata* between tide-marks.

Aire géogr.: Norvège, Danemark, côtes de la Manche, côtes orientales et occidentales de l'Atlantique, Mer Méditerranée, Adriatique, Mer Rouge, Mer des Indes, Océan Pacifique.

Vaginaricæ Gomont.

Hydrocoleum Kützing.

5. *H. lyngbyaceum* Kützing.

Spec. Alg., p. 259, 1849 — Gomont, Monogr. des Oscill., in Ann. des Sc. nat., VII^e série, Bot., t. 15, p. 337, Pl. XII, fig. 8 à 10.

var. *β rupestre* Kützing, loco cit.

Mangrove-swamp near Lem Ngob, forming black, shining patches on the muddy ground and on aerial roots of *Avicennia officinalis*.

Aire géogr. Mer du Nord, Mer Baltique, Manche, Mer Méditerranée sur les côtes de France, d'Algérie et de Syrie, Océan Atlantique sur les côtes de France, d'Espagne, des États Unis et aux Bermudes, Ile Maurice, Borneo.

Schizothrix Kützing (emend.).

Subgen. *Chromosiphon* Gomont.

6. *S. Lamyi* Gomont.

In Bornet, Algues du département de la Haute-Vienne contenues dans l'herbier Lamy de la Chapelle, in Bull. de la Soc. bot. de France, t. XXXVIII, p. 250, 1891; Monogr. des Oscill., loco cit., p. 323, Pl. XI, fig. 1 à 3.

With *Schizothrix thelephoroides* on wet rocks in the jungle near Kloug Munsé.

Aire géogr.: France centrale, Nouvelle Zélande.

7. *S. thelephoroides* Gomont.

Monogr. des Oscill., loco cit. p. 319, Pl. X, fig. 1 à 4.

Abundant on rocks in the jungle near Klong Munsé.

Aire géogr.: Ceylan, Brésil, Porto Rico.

Anhomocystæ Gomont.

Sur quelques Oscillariées nouvelles, in Bull. de la Soc. bot. de France, t. XLVI, p. 33, 1899.

Heterocystæ Hansgirg, Bemerk. zur System. einig. Süßwasseralgen, p. 9, 1884 — Bornet et Flahault, Revision des Nostocacées hétérocystées, in Ann. des Sc. nat., VII^e série, Bot., t. 3, p. 337.

Nostocæ Kützing.

Nodularia Agardh.8. *N. spumigena* Mertens.

var. β , *litorea*, Bornet et Flahault in Ann. des Sc. nat., VII^e série, Bot., t. 7, p. 246.

Bien que l'échantillon soit stérile, on ne peut, à cause du diamètre du trichome (15 μ), l'attribuer à une autre espèce que le *N. spumigena*. Il ne nous a d'ailleurs paru différer en rien des échantillons types de la forme *litorea*; cependant l'absence de spores nous empêche d'être absolument affirmatif sur ce dernier point.

Koh Kong, on the sandy sea-shore between tide-marks.

Aire géogr.: Suède, Mer Baltique et Mer du Nord, Pays Bas, Angleterre. Marais salans et d'eau douce de la France et de l'Allemagne.

Scytonemacæ Rabenhorst.*Desmonema* Berkeley et Thwaites.

9. *D. Wrangelii* Bornet et Flahault, Rev. des Nostoc. hétér., in Ann. des Sc. nat., VII^e série, Bot., t. 5, p. 127, 1887.

Thorea Wrangelii Agardh, Disp. Alg. Suec., p. 40, 1812.

Dans la plante adulte, les gaines renferment souvent plusieurs trichomes; il n'en est pas de même lorsqu'elle est peu développée, comme c'est ici le cas. L'échantillon ne peut cependant être confondu avec un *Tolythrix*, les rameaux étant agglutinés le long du filament principal, ce qui n'a jamais lieu dans ce dernier genre. De plus, dans la plante siamoise, les hétérocystes sont à parois minces et peu différenciés, ce qui est également un caractère du genre *Desmonema* où ils manquent quelquefois (conf. Bornet et Flahault, loco cit.).

Jungle near Klong Sarlakpet (alt. 700 ft.), on rocks in a waterfall.

Aire géogr.: Europe septentrionale et occidentale, Allemagne, Italie, États Unis, Bolivie.

Scytonema Agardh.

10. *S. mirabile* Bornet.

Les Nostocacées hétérocystées du Systema Algarum d'Agardh, in Bull. de la Soc. bot. de France, t. XXXVI, p. 155, 1889.

Conserva mirabilis Dillwyn, Brit. Coni., tab. 96, 1809.

Scytonema figuratum Bornet et Flahault, Revision des Nostocacées hétérocystées, loco cit., p. 101.

On dry rocks in the jungle near Klong Munsé.

Aire géogr.: Europe, Amérique du Nord, Indes orientales, Cochinchine, Ile Bourbon, Nouvelle Calédonie, Iles Sandwich.

11. *S. Hofmanni* Agardh.

Synops. Alg. Scand. p. 117, 1817 — Bornet et Flahault, loco cit. p. 97.

Common in the jungle all over Koh Chang, epiphytic on ferns and other low plants and also on rocks.

Aire géogr.: Europe, Indes orientales, Cochinchine, Ile Maurice, Amérique du Nord, Antilles, Terre de Feu, Tahiti.

12. *S. ocellatum* Lyngbye.

Hydrophyt. dan. p. 97, tab. 28, A, 1819. — Bornet et Flahault, loco cit. p. 95.

Leir Dan on the stem of Cocoa-palms; jungle near Klong Munsé, on rocks.

Aire géogr.: Europe, Indes orientales, Ceylan, Cochinchine, Afrique, Madère, Amérique de Nord, Antilles, Bermudes, Guyane, Brésil, Iles Borneo, Sandwich et Marquises.

13. *S. Schmidtii* Gomont, n. sp. (Pl. V, fig. 1 à 4.)

Stratum extensum, fusco-nigrum, crustaceo-lomentosum, ad millimetrum crassum, superficie sulcatum. Fila eximie et subregulariter undulata, crispa, arcte intricata, 10—12 μ , inferne usque ad 16 μ crassa, primaria repentia stoloniformia, abundanter et repetite pseudoramosa, pseudoramis patentibus; vaginæ luteo-fuscae, inferne crassae et rugosae, chlorozincico iodurato haud caerulescentes. Trichomata eximie torulosa, aëruginea, 9—12 μ crassa; articuli saepius compressi, passim subquadrati, 2—6 μ longi — Heterocystæ quadratae vel compressae, achromaticae (v. s.).

Les gaines homogènes de cette plante la placent dans la section *Euscytonema* Bornet et Flahault. Elle nous paraît voisine des *S. javanicum* et *ocellatum*. Sa croissance en gazons uniformes, sans fascicules, la sépare du *S. javanicum*; ses filaments crépus, ses articles généralement plus courts que ceux du *S. ocellatum* et ses trichomes fortement toruleux la distinguent nettement de cette dernière espèce.

Open ground near Leir Dan, on lime-stones.

14. *S. javanicum* Bornet.

In Bornet et Thuret, Notes Algologiques p. 148, 1880 — Bornet et Flahault, loco cit., p. 95.

Lem Dan, on trees and rocks near the Sea; Klong Son, on trees in the jungle.
Aire géogr.: Ceylan, Jamaïque, Guyane, Brésil, Java, Iles Sandwich.

15. *S. Guyanense* Bornet et Flahault.

Loco cit. p. 97, 1887.

Lem Dan on trees near the Sea; jungle near Klong Munsé, on rocks.
Aire géogr.: Ceylan; Amérique du Nord, Antilles, Brésil, Guyane, Venezuela, Honolulu.

16. *S. crispum* Bornet.

Les Nostocacées hétérocystées du Systema Algarum de C. Agardh, in Bull. de la Soc. bot. de France, t. XXXVI, p. 156, 1889.

S. cincinnatum Thuret, Essai de class. des Nostochinées, in Ann. des Sc. nat., 6^e sér., Bot. t. I, p. 380. — Bornet et Flahault, loco cit. p. 89.

With *Stigonema minutum* on rocks in the jungle near Klong Munsé.

Aire géogr.: Suède, Danemark, France centrale et méridionale, Corse, Allemagne, Ile Maurice, Amérique du Nord, Jamaïque, Brésil, Iles de l'Océan Pacifique.

Sirosiphoniaceæ Rabenhorst.

Stigonema Agardh.17. *S. mamillosum* Agardh.

Syst. Alg. p. 42, 1824. — Bornet et Flahault, loco cit., p. 77.

Lem Dan, on stones in a stream.

Aire géogr.: Norvège, Suède, Angleterre, France, États Unis.

18. *S. luforme* Kützing.

Spec. Alg. p. 319, 1849. — Bornet et Flahault, loco cit. p. 75.

Jungle near Klong Munsé, on wet rocks with *Stigonema ocellatum* and *Schizothrix thelephoroides* etc.

Aire géogr.: Angleterre, France, Suisse, Allemagne, Autriche, États Unis, Brésil, Guyane, Java.

19. *S. turfaceum* Cooke.

Brit. Freshwat. Algæ p. 273, 1884. — Bornet et Flahault, loco cit. p. 74.

Jungle near Klong Munsé, on humid rocks in company with *S. minutum*.

Aire géogr.: France, Allemagne, États Unis.

20. *S. minutum* Hassall.

Hist. of the Brit. freshwat. Alg. I, p. 230, pl. 67, fig. III, IV, 1845. — Bornet et Flahault, loco cit. p. 72.

Klong Munsé, on rocks in the jungle; Lem Dan, on stones in a stream.

Aire géogr.: Grœnland, Péninsule Scandinave, Danemark, Angleterre, France septentrionale et centrale, Allemagne, Autriche, États-Unis, Brésil, Iles Sandwich.

21. *S. ocellatum* Thuret.

Essai de classif. des Nostochinées in Ann. des Sc. nat., VI^e série Bot., t. I, p. 380. — Bornet et Flahault, loco cit. p. 69.

Klong Son and Klong Munsé, on wet rocks in the jungle.

Aire géogr.: Grœnland, Europe septentrionale, occidentale et centrale, États Unis, Antilles, Guyane, Japon, Ceylan, Iles Sandwich, Nouvelle Calédonie, Hawai.

22. *S. hormoides* Bornet et Flahault.

Loco cit. p. 68, 1887.

Jungle near Klong Son, epiphytic on the leaves of small herbs.

Aire géogr.: Danemark, France septentrionale et centrale, Allemagne, Suisse, Autriche, Italie, États-Unis.

Hapalosiphon Nägeli.23. *H. fontinalis* Bornet.

Les Nostocacées hétérocystées du Systema Algarum d'Agardh, in Bull. de la Soc. bot. de France, t. XXXVI, p. 155, 1889.

H. pumilus Kirchner, Kryptogamenflora von Schlesien, Algen p. 231, 1878. — Bornet et Flahault, loco cit. p. 61.

Muddy rice-field near Lem Dan, epiphytic on *Monochoria vaginata*, and in a waterhole among other algae.

Aire géogr.: Grœnland, Péninsule Scandinave, Danemark, France septentrionale et centrale, Allemagne, États-Unis, Brésil, Iles Sandwich, Indes orientales.

Rivulariaceæ Kützing.**Brachytrichia** Zanardini.24. *B. Quoyi* Bornet et Flahault.

Revision des Nostocacées hétérocystées, in Ann. des Sc. nat. VII^e série, Bot., t. IV, p. 373, 1886.

Nostoc Quoyi Agardh, Syst. Alg. p. 22, 1824.

Lem Dan, on stones in the sea-shore between tide-mark; Koh Kahdat, coral-reef in shallow water.

Aire géogr.: Océan Atlantique sur la côte des États-Unis; Mer des Indes, Océan Pacifique.

25. *B. maculans* Gomont n. sp. (Planche V, fig. 5 à 7.)

Frondes planæ, crustacæ, tenues, pagina inferiori rupibus arcte adhærentes, maculas atras, initio orbiculares, deinde confluentes ideoque ambitu irregulares, ad centimetrum et ultra latas formantes, e strato unico filorum compositæ. Trichomata torulosa, recta, parallela, arcte congesta, muco tenaci agglutinata, inferne pseudo-ramosa, sæpe medio affixa et utrinque erecta, 6—8 μ , basim versus tantummodo 4 μ crassa; articuli irregulares, sæpius subquadrati, inferne longiores; heterocystæ subquadratæ; hormogoniæ ad 70 μ longæ (v. s.).

Tandis que, chez les deux espèces de *Brachytrichia* connues jusqu'ici, les frondes sont globuleuses, le thalle de celle-ci est étalé et aplati, rappelant jusqu'à un certain point celui de l'*Isactis plana*. Le mode de ramification, aussi bien que la place des hétérocystes, qui sont intercalaires et non basilaires, rend d'ailleurs impossible toute confusion avec ce dernier genre.

Les filaments de la plante siamoise sont presque droits, très serrés et parallèles; dans les *B. Balani* et *Quoyi*, ils m'ont paru plus lâches et plus irrégulièrement contournés. Enfin la fronde du *B. maculans* n'est jamais creuse, même dans les parties les mieux développées, ni conformée de manière à le devenir. Ces différences justifient l'établissement de la nouvelle espèce.

Lem Dan, on maritime rocks between tide-marks.

Mastichotricheæ Kützinger.

Calothrix Agardh.

26. *C. crustacea* Thuret.

In Bornet et Thuret, Notes algologiques fasc. I, p. 13—16, tab. IV, 1878. — Bornet et Flahault, in Ann. des Sc. nat. VII^e série, Bot., t. III, p. 359.

Lem Ngh, mangrove-swamp, on aerial roots of *Avicennia officinalis* between tide-marks.

Aire géogr.: Skagerrack, Kattegat, Grande Bretagne, France, Espagne, dans le Golfe de Gascogne, Tanger, mer Méditerranée, Adriatique, États Unis, Antilles, Japon, Iles du Pacifique.

27. *C. scopulorum* (?) Agardh.

Syst. Alg. p. 70, 1824. Bornet et Flahault, loco cit. p. 353.

La plante est trop peu développée pour être déterminée avec certitude.

Lem Dan, on stones in the sea-shore between tide-marks.

Aire géogr.: Océan arctique; Océan Atlantique jusqu'à Tanger et Madère et sur la côte d'Amérique; Méditerranée et Adriatique; Iles St Paul dans l'Océan Pacifique.

Calothrix spec.

Peut-être *C. æruginea* ou *C. scopulorum*.

La plante est trop peu développée pour être déterminée avec certitude.

Lem Ngoh and Lem Dan, mangrove-swamp, on stem and aerial roots of *Avicennia officinalis* between tide-marks.

Calothrix spec.

Plante insuffisamment développée. Peut-être le *C. æruginea*.

Lem Ngoh, mangrove-swamp, on the leaves of young specimens of *Avicennia officinalis* between tide-marks.

Explication des figures de la planche V.

Fig. 1. — *Scytonema Schmidtii* n. sp. Touffe de filaments. (Grossissement 120 diamètres.)

Fig. 2. — Filament rampant de la même plante portant des rameaux dressés. (Grossissement 288 diamètres.)

Fig. 3. — Extrémité d'un rameau. (Grossissement 550 diamètres.)

Fig. 4. — Deux hormogonies. (Grossissement 288 diamètres.)

Fig. 5. — *Brachytrichia maculans* n. sp. Taches formées sur une pierre par les frondes de la plante. (Grandeur naturelle.)

Fig. 6. — Coupe verticale à travers une fronde. (Grossissement 288 diamètres.)

Fig. 7. — Début de la formation d'un rameau en forme de V. (Grossissement 550 diamètres.)

Peridinales

by Johs. Schmidt.

The following list of marine *Peridinales* is due to the examination of a number of plankton samples collected by the Danish Expedition in the inner part of the Gulf of Siam. The samples which are 10 in number, were obtained from the surface of the Sea by means of fine silk-nets and were preserved in formaline (4 %)¹⁾.

This is a list of the samples collected:

- Nr. 1. ²⁵/₁₂ 1899. Strait between Lem Ngob and Koh Chang.
" 2. ⁹/₁ 1900. Between Koh Kahdat and Koh Kut.
" 3. ¹¹/₁ 1900. S. of Koh Chang.
" 4. ¹⁶/₁ 1900. W. of Koh Chang, N. of Koh Savan.
" 5. ¹⁷/₁ 1900. W. of Koh Chang, S. of Koh Savan.
" 6. ¹⁸/₁ 1900. S. of Koh Chang.
" 7. ²⁷/₁ 1900. North End¹ of Koh Kut.
" 8. ²⁹/₁ 1900. 7 miles S. of Koh Kut.
" 9. ³¹/₁ 1900. 18 miles W. of Koh Chang²⁾.
" 10. ²¹/₃ 1900. 1—2 miles S. of Koh Kram.

In the following list of species recorded

c means *predominant*

+ " *common*

r " *rare*

rr " *very rare* (only a few specimens seen).

¹⁾ The *Diatoms* contained in the Plankton-samples will be published later on.

²⁾ This sample seems to consist exclusively of *Trichodesmium Hildebrandtii* Gomout.

Prorocentraceae.

Exuviella Cienk.

1. *E. compressa* (Bail.) Ostenfeld, Jagttagelser over Overfladevandets Temperatur, Saltholdighed og Plankton paa islandske og grønlandske Skibsrouter, 1899, p. 59; *Dinopyxis compressa* Stein, Der Organismus der Infusionsthier. III. Abtheil., Leipzig 1878—83, Pl. I, f. 34—38.

6 (rr).

Area: Almost ubiquitous.

Prorocentrum Ehrenbg.

2. *P. micans* Ehrenbg.

1 (rr) — 2 (rr) — 3 (rr) — 6 (rr) — 8 (rr).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

Peridiniaceae.

Pyrophacus Stein.

3. *P. horologium* Stein l. c., Pl. XXIV, f. 1—13.

1 (rr) — 2 (rr) — 7 (rr) — 10 (rr).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

Ceratium Schranck.

4. *C. tripos* (O. F. Müller) Nitsch.

var. *baltica* Schütt, Pflanzenleben d. Hochsee, p. 266, f. 4 a.

I observed two slightly different forms both of which may be referred to the above variety by Schütt. The first form differs from Baltic specimens by the left posterior horn being somewhat bent forward. The second form observed is characterized by the posterior horns being longer and running more parallel. I name this form:

f. *parallela* Schum. n. f. (see fig. 1).

It closely approaches to the forms figured by Cleve in Report on the Phytoplankton collected on the expedition of H. M. S. „Research“, 1896, Fifteenth Annual Report of the Fishery Board for Scotland, Part III, Pl. 1, fig. 1, 1897.

1 (rr) — 2 (rr) — 3 (rr) — 4 (rr) — 6 (rr)
8 (rr).

Area: Atlantic.

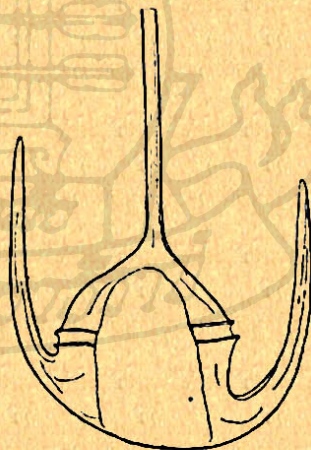


Fig. 1. *Ceratium tripos*, var. *baltica* Schütt, f. *parallela*. Ventral view.

var. **brevis** Ostenfeld & Schmidt, Plankton fra det Røde Hav og Adenbugten, Vidensk. Meddel. Naturh. Foren. Kjøbenhavn, 1901, p. 164, f. 13.

10(rr).

Area: Red Sea, Indian Ocean.

var. **dispar** Pouchet, Contributions à l'histoire des Périдиниens marins, Journ. de l'anat. et de la physiol. 1883, p. 423, fig. D; non Pouchet in Voyage de „La Manche“ à l'île Jan Mayen et au Spitzberg (Juillet—Août 1891), p. 171, fig. 13 B, Paris 1894 = *C. curvicorne* (Daday) Cleve.

A few specimens not differing from Pouchet's figure were met with in two collections.

2(rr) — 6(rr).

Area: Mediterranean.

var. **gracilis** Schröder, Phytoplankton des Golfes von Neapel, Mitth. a. d. Zool. Stat. zu Neapel, Bd. 14, 1900, Pl. 1, f. 17 b, e; Ostenfeld & Schmidt l. c. p. 164, f. 14; non Gourret, Périдиниens du golfe de Marseille, Annal. du Musée d'hist. nat. de Marseille, zool., vol. 1, n° 8, 1883, Pl. 1, f. 1.

2(rr) — 3(rr) — 4(+) — 5(rr) — 6(r) — 10(rr).

Area: Mediterranean, Red Sea, Indian Ocean.

5. *C. dens* Ostenfeld & Schmidt, l. c., p. 165, f. 16.

In the main species the left posterior horn is straight or somewhat curved (l. c. fig. 16). In one collection I found a variety of *C. dens* viz.

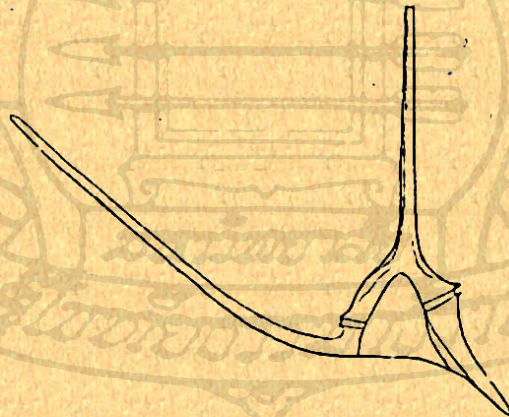


Fig. 2. *Ceratium dens* Ostenfeld & Schmidt, var. *reflexa*. Ventral view.

var. **reflexa** Schm. n. var. (Fig. 2), which is characterized by the direction of the left posterior horn.

In the Gulf of Siam this characteristic species often occurs in short chains (4 specimens together).

1 (rr) — 2 (+) — 3 (+) — 4 (+) — 5 (r) — 7 (+).
and var. *reflexa* 4 (rr).

Area: Red Sea, Indian Ocean.

6. *C. curvicone* (Daday) Cleve, Notes on some Atlantic Plankton-Organisms, Kgl. Sv. Vet.-Ak. Handl., Bd. 34, No. 1, p. 14; *C. tripos* var. *curvicone* Daday, Termesztudományi Füzetek, 1887—88, Pl. III, figg. 4, 8, 12, 14; figuræ nostræ 3 et 4.



Fig. 3.

Ceratium curvicone (Daday) Cleve.
Ventral view.



Fig. 4.

Ceratium curvicone (Daday) Cleve
Lateral view.

This species seems to be abundant in the Gulf of Siam. The specimens observed agree well with Daday's figures; but sometimes the curvature of the right posterior horns is less pronounced. As shown in fig. 4 the ventral face of the body is concave and the basilar parts of the posterior horns proceed in a nearly right angle to the transversal axis.

2 (r) — 3 (+) — 4 (+) — 5 (rr) — 6 (+) — 7 (+) — 8 (rr) — 10 (rr).
Area: Warmer Atlantic, Mediterranean, Red Sea, Indian Ocean.

7. **C. contortum** (Gourret) Cleve, Notes on some Atlantic Plankton-Organisms, Kgl. Sv. Vet.-Ak. Handl. Bd. 34, No. 1, p. 14, Pl. VII, f. 12, 1900; *C. gibberum* var. *contortum* Gourret l. c. Pl. II, f. 33; Schütt, Pflanzenleben d. Hochsee, p. 268, fig. 78 VII b.

2 (rr) — 4 (r).

Area: Warmer Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

8. **C. tenue** Ostenfeld & Schmidt l. c. p. 166, fig. 18.

2 (rr).

Area: Red Sea, Indian Ocean.

9. **C. macroceras** Ehrenberg?; *C. tripos* β *macroceras* Claparède & Lachmann, Études sur les Infusoires et les Rhizopodes, vol. I, Pl. 19, f. 1, Mém. de l'Inst. Générois, t. V—VI, 1858—59.

This species varies much in regard to length, direction and spinosity of the posterior horns. I saw forms agreeing with Bergh's figure (Organismus d. Cilioflagellaten, Morphol. Jahrb. Bd. 7, 2, Taf. XIV, fig. 27), further a form with longer and more straight posterior horns (cfr. the quoted figure by Claparède & Lachmann) and also the form figured by Ostenfeld & Schmidt l. c. fig. 19, where the posterior horns are short and ventrally bent. In the Gulf of Siam *C. macroceras* sometimes occurs in short chains (2 specimens together).

2 (r) — 3 (r) — 4 (rr) — 5 (rr) — 7 (r) — 10 (r).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

10. **C. volans** Cleve, Notes on some Atlantic Plankton-Organisms, Kongl. Sv. Vet.-Ak. Handl., Bd. 34, No. 1, p. 15, Pl. VII, Fig. 4, 1900; Ostenfeld & Schmidt, Plankton fra det Røde Hav og Adenbugten, Vidensk. Meddel. Naturh. Foren. Kjøbenhavn, 1901, p. 168, f. 21.

2 (rr).

Area: Warm Atlantic, Red Sea, Indian Ocean.

11. **C. flagelliferum** Cleve, Notes on some Atlantic Plankton-Organisms, Kongl. Sv. Vet.-Ak. Handl., Bd. 34, No. 1, p. 14, Pl. VII, Fig. 12, 1900.

The horns are often much longer than figured by Cleve.

1 (rr) 2 (+) 3 (+) 4 (r) 5 (rr) 6 (rr) 7 (r) 10 (r).

Area: Tropical Atlantic, Red Sea, Indian Ocean.

12. **C. furca** (Ehrbg.) Dujardin, Hist. nat. d. Zoophytes, Infusoires, Paris 1841.

This species occurs in large quantity in our area.

1 (rr) — 2 (+) — 3 (+) — 4 (r) — 5 (r) — 6 (c) — 7 (+) — 8 (rr) — 10 (r).

Area: Ubiquitous.

13. *C. lineatum* (Ehbg.) Cleve, Plankton collected by the Swedish Expedition to Spitzbergen in 1898, Kgl. Sv. Vet.-Ak. Handl. Bd. 32, No. 3, 1899, p. 36; *Peridinium lineatum* Ehrenbg.

Sparingly with the preceding species.

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Bering Sea.

var. *longisetata* Ostenfeld & Schmidt, Plankton fra det Røde Hav og Adenbugten, Vidensk. Meddel. Naturhist. For. Kjøbenhavn, 1901, p. 163, fig. 12.

This variety sometimes occurs in short chains (2 specimens together); then only the free specimen has a long superior horn.

2 (rr) — 3 (rr) — 4 (+) — 5 (rr) — 6 (r).

Area: Red Sea, Indian Ocean.

var. *robusta* Cleve, Plankton from the Southern Atlantic and the Southern Indian Ocean, Öfv. af Kongl. Sv. Vet.-Ak. Förh. Nr. 8, p. 925, fig. 6, 1900.

4 (rr).

Area: Southern Indian Ocean.

14. *C. candelabrum* Ehbg.; Stein, l. c. Pl. XVI, f. 15, 16.

2 (rr) — 4 (rr) — 7 (rr).

Area: Warm Atlantic, Mediterranean, Red Sea, Indian Ocean.

15. *C. fusus* (Ehbg.) Dujardin l. c.

1 (rr) — 2 (r) — 3 (r) — 6 (r) — 7 (r) — 10 (r).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

var. *extensum* Gourret, Annal. du Musée d'hist. nat. de Marseille, zool., vol. 1, n° 8, p. 52, Pl. 4, f. 56.

2 (rr) — 3 (rr).

Area: Warm Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

Gonyaulax Diesing.

16. *G. polygramma* Stein, l. c. Pl. IV, f. 15.

2 (rr) — 4 (+) — 5 (r) — 6 (+) — 7 (r).

Area: General in warm and temperate Seas.

17. *G. spinifera* (Clap. & Lachm.) Stein, l. c. Pl. IV, f. 10—12.

2 (rr) — 3 (r) — 6 (+).

Area: Atlantic, Mediterranean.

18. *G. hyalina* Ostf. & Schim., l. c. p. 172, f. 24.

4 (r) — 5 (r) — 6 (r).

Area: Indian Ocean.

Goniodoma Stein.

19. *G. acuminatum* Stein, Pl. VII, f. 1—16.

2 (rr) — 3 (rr) — 4 (rr) — 5 (rr) — 6 (r) — 7 (r) — 10 (rr).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

20. *G. armatum* (Schütt); *G. acuminatum* var. *armata* Schütt, Die Peridinien Pl. IX, fig. 32; *G. fimbriatum* Murray & Whitting, Transactions of the Linnean Society of London, 2nd Ser., Botany, Vol. V, Part 9, 1899, p. 325, Pl. XXVII, fig. 1 a, b.

2 (rr) — 4 (rr) — 10 (rr).

Area: Atlantic, Red Sea, Indian Ocean, Pacific.

Diplopsalis Bergh.

21. *D. lenticula* Bergh, l. c. Pl. XVI, fig. 60—62.

1 (+) — 2 (rr) — 3 (rr) — 10 (+).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

22. *D. saecularis* Murray & Whitting l. c. p. 325, Pl. XXVIII, fig. 5 a, b.

10 (rr).

Area: Atlantic from a little south of the Azores to the Isthmus of Panama, Red Sea, Indian Ocean.

Ostreopsis Schum. nov. gen.

Body flattened, oyster-shaped. Apex excentric, marked by a narrow, slit-shaped area. Longitudinal girdle small, not proceeding to apex, only to be seen on the inferior valve. 3 apical plates (one of which being reduced) and 1 antapical plate are present. Structure of plates porous.

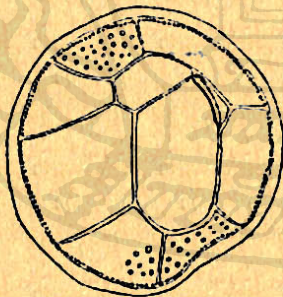


Fig. 5. *Ostreopsis siamensis* Schmidt. Arrangement of plates in the superior valve.

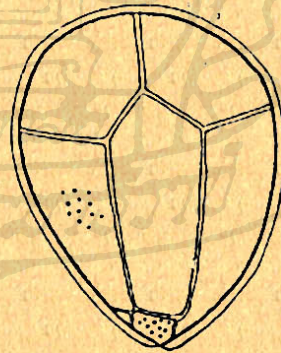


Fig. 6. *Ostreopsis siamensis* Schmidt. Another specimen. Arrangement of plates in the inferior valve.



Fig. 7. *Ostreopsis siamensis* Schmidt. Sketch of a specimen in lateral view. Arrangement of plates not indicated.

In its shape this peculiar genus is nearest to *Pyrophacus* Stein of the genera hitherto known; the number of apical- and antapical plates reminds of *Gonyaulax* Diesing, but from both those genera it is easily distinguished by the above features.

23. *O. siamensis* Schm. n. sp., figg. 5, 6, 7.

Body flat, oyster-shaped, somewhat convexo-concave, in a transversal section view triangular or roundish. Superior valve convexe, with 3 apical plates (one of which being very small) and 7 præmedian plates; inferior valve a little concave, with 1 antapical and 4 larger postmedian plates (and sometimes with small accessory plates). Longitudinal girdle short, only on the inferior valve. Structure coarsely porous, like that of *Ceratium tripos*. Length of sagittal axis about 90 μ .

2 (r) — 3 (rr) — 6 (rr).

Peridinium Ehrenberg.

24. *P. divergens* Ehrenberg.

This species, which appears in large quantity in the Gulf of Siam, varies exceedingly much in regard to size, shape and length of the posterior horns

1 (+) — 2 (r) — 3 (+) — 4 (rr) — 5 (r) — 6 (+) — 7 (+) — 10 (+).

Area; Ubiquitous.

25. *P. conicum* (Gran) Ostenfeld & Schmidt l. c., p. 174; *P. divergens* var. *conica* Gran, Hydrographic-Biologic Studies of the North-Atlantic Ocean and the Coast of Nordland, 1900, p. 47; Fig. Bergh l. c., Pl. XV, f. 43—44; Pouchet l. c., Contributions I, fig. 31—33; Schütt l. c. Pl. XIII, f. 43₁₃, 14.

1 (rr) — 6 (r) — 7 (rr) — 10 (r).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

26. *P. oceanicum* Vanhöffen, in Drygalski, Grönland-Expedition der Gesellsch. für Erdkunde zu Berlin, vol. II, 2 part, Pl. V, fig. 2.

2 (rr) — 6 (rr) — 7 (rr) — 10 (rr).

Area: Atlantic, Red Sea, Indian Ocean.

27. *P. elegans* Cleve, Notes on some Atlantic Plankton-Organisms, Kgl. Sv. Vet.-Ak. Handl., Bd. 34, No. 1, p. 16, Pl. VII, fig. 15—16.

3 (rr) — 6 (rr).

Area: Warm Atlantic, Red Sea, Indian Ocean.

28. **P. Steinii** Jørgensen, Protophyten u. Protozoën im Plankton aus der norweg. Westküste, Bergens Museums Aarbog, 1899, No. VI, p. 38; *P. Michaelis* Stein l. c., Pl. IX, f. 9—14 (non Ehrenberg).

2 (rr) — 3 (rr) — 4 (rr) — 6 (r).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

29. **P. tristylum** Stein var. *ovata* Schröder l. c., p. 18, Taf. 1, fig. 13.

2 (rr) — 3 (rr) — 6 (rr).

Area: Mediterranean, Red Sea, Indian Ocean.

30. **P. pellucidum** (Bergh) Schütt, Die Peridineen p. 157, Pl. XIV, f. 45.

1 (rr) — 2 (rr) — 6 (rr).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

31. **P. globulus** Stein, l. c. Pl. IX, f. 5—8.

5 (rr) — 10 (rr).

Area: Atlantic, Red Sea, Indian Ocean.

32. **P. pedunculatum** Schütt, Die Peridineen, Pl. XIV, f. 47.

1 (rr) — 4 (rr) — 6 (rr) — 10 (rr).

Area: Atlantic, Red Sea, Indian Ocean.

Podolampas Stein.

33. **P. bipes** Stein l. c., Pl. VIII, fig. 6—8.

2 (rr) — 3 (rr) — 4 (rr) — 5 (rr) — 6 (rr) — 7 (rr).

Area: Tropical and subtropical Seas.

Blepharocysta Ehrenberg.

34. **B. splendor maris** Ehrenberg; Stein, l. c. Pl. III, f. 17—19, Pl. VIII, f. 3—5.

2 (rr) — 3 (rr) — 4 (rr) — 5 (+) — 6 (r) — 10 (r).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean, Pacific.

Phalacroma Stein.

35. **P. doryphorum** Stein, l. c. Pl. XIX, f. 1—4.

2 (rr).

Area: General in warm Seas.

36. **P. vastum** Schütt, Die Peridineen, Pl. III, fig. 16.

6 (rr) — 7 (rr).

Area: Warm Atlantic.

37. **P. Rudgei** Murray & Whitting l. c., p. 331, Pl. XXXI, fig. 6 a, b.

In one single sample I found a small species of *Phalacroma*, which agrees with the quoted figure by Murray & Whitting.

2 (rr).

Area: Atlantic (37° 55' N., 36° 42' W.).

Dinophysis Ehrenberg.

38. *D. homunculus* Stein, l. c. Pl. XXI, f. 2, 5.

Together with the type there occurs in the Gulf of Siam a form viz. f. *pedunculata* Schm. n. f., which is characterized by the long and plainly set off posterior protuberance.

3 (r) — 4 (r) — 6 (+) — 7 (rr).

Area: General in warmer Seas.

39. *D. miles* Cleve, Plankton from the Red Sea, Öfv. af Kongl. Sv. Vet.-Ak. Förh. 1900, No. 9, p. 1030, Fig. 1; *D. aggregata* Weber van Bosse, Annal. du Jardin Bot. de Buitenzorg, 2^e sér., vol. II, p. 140, Pl. XVII, f. 3—4; *Heteroceras Schröteri* Achille Forti, Ber. d. deutsch. Botan. Ges. 1901, p. 6, f. 1—II.

var. *indica* Ostf. & Schm. l. c. p. 170.

2 (rr) — 4 (rr).

Area: Indian Ocean.

40. *D. sphaerica* Stein l. c. Pl. XX, f. 3—4.

5 (rr) — 10 (rr).

Area: Atlantic, Red Sea, Indian Ocean.

41. *D. rotundata* Clap. & Lachm., l. c. p. 409, Pl. XX, f. 16; Jørgensen, l. c. p. 31.

5 (rr).

Area: Atlantic.

Amphisolenia Stein.

42. *A. bidentata* Schröder, l. c. p. 20, Pl. I, f. 16 a—c.

2 (rr) — 3 (rr) — 4 (rr) — 5 (rr) — 7 (rr).

Area: Mediterranean, Red Sea, Indian Ocean.

Ornithocercus Stein.

43. *O. magnificus* Stein. l. c. Pl. XXIII, t. 1; Schütt, Centrifugal. Dickenwachstum der Membran, Bot. Ztg. 1900, p. 18 (Sep.), f. 8—10.

2 (rr).

Area: Warm Atlantic, Mediterranean, Red Sea, Indian Ocean.

Murrayacystae.

Pyrocystis Murray.

44. *P. lunula* Schütt.

2 (rr).

Area: Atlantic, Mediterranean, Red Sea, Indian Ocean.

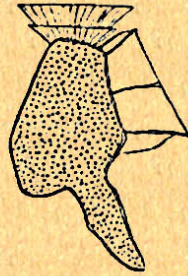


Fig. 8. *Dinophysis homunculus* Stein, f. *pedunculata*. Lateral view.