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A Revised List of Corallinæ.

By

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SYNOPTICAL KEY TO THE GENERA.

A. Mother cells of the propagating cells generated in the cortex: genicula unizonal or multizonal: articuli cylindrical, compressed or sagittate: ramification dichotomous, pinnate or irregular. Conceptacles verrucose, hemispherical or conical, sessile.....*Gen. I.* **Amphiroa.**

I. Medullary portion of articuli constructed with several zones of articoli interposed between zones of otricoli.

a. Articuli cylindrical, irregularly branching. Genicula multizonal rarely unizonal, lineæform.....*Sect. I.* **Euamphiroa.**

b. Articuli compressed or subcompressed, mostly dichotomously branching. Genicula multizonal, mostly fenestraform in younger portion, bandform in older portion.....*Sect. II.* **Eurytion.**

II. Medullary portion of articuli constructed with zones of articoli.

a. Articuli compressed sagittate, reniform, or truncate, pinnately branched; genicula unizonal, lineæform. Conceptacles on the surface of the compressed articuli.....*Sect. III.* **Arthrocardia.**

b. Articuli cylindrical or compressed sagittate, or linear, pinnately or irregularly branched. Conceptacles conical or hemispherical, prominent on the margins of the compressed articuli, or on the surface of cylindrical articuli.....*Sect. IV.* **Marginisporum.**

B. Mother cells of the propagating cells generated in the medulla; genicula unizonal or multizonal; articuli cylindrical, compressed, sagittate or truncate; ramification pinnate, dichotomous, verticillate or irregular. Conceptacles verruculose, globular or pear-shaped.

I. Genicula multizonal; ramuli starting from the genicula.

a. Articuli cylindrical. ramuli verticillate..... *Gen. II.* **Metagoniolithon.**

b. Articuli flat, di-trichotomously branching *Gen. III.* **Litharthron.**

II. Genicula not specially differentiated; main branches dichotomously divided, with compressed articuli; ramuli pinnate, with cylindrical articuli .....*Gen. IV.* **Lithothrix.**

III. Genicula unizonal, ramuli starting from articuli.

a. Conceptacles sessile immersed in articuli or pinnulets .... *Gen. V.* **Cheilosporum.**

i. Fertile articuli sagittate with pointed wings, conceptacles immersed in the upper margins of the sagittate articuli .... *Sect. I.* **Eucheilosporum.**

ii. Fertile articuli sagittate or reniform with round or truncate wings, conceptacles immersed in the outer margins of the articuli, or in the surface of the articuli .....*Sect. II.* **Alatocladia.**

iii. Articuli compressed hexagonal, conceptacles wartlike, on the surface of the articuli or immersed in the pinnulets .... *Sect. III.* **Serraticardia.**

b. Conceptacles stalked, mostly taking the place of a segment.

i. Branches pinnated .....*Gen. VI.* **Corallina.**

α. Pinnules simple or less decompound .....*Sect. I.* **Officinales.**

β. Pinnules densely decompound.....*Sect. II.* **Halyption.**

ii. Branches dichotomous .....*Gen. VII.* **Jania.**

SPECIAL PART.

Gen. I. AMPHIROA LAMX.

Sect. I. **EUAMPHIROA** DCNE. Mémoir. p. 111.

Amphiroa anastomosans W. v. B. Coral. Sib. Exp. p. 91. Pl. 16. fig. 3–4.

A. valonioides YENDO. Coral. ver. Jap. p. 5. Pl. 1. fig. 1–3; Pl. IV. fig. 1.

A. fragilissima f. fragilissima W. v. B. Coral. Sib. Exp. p. 90.

= *Amp. fragilissima* LAMX. Exp. Method. p. 26. t. 21. fig. d.

= *Cor. fragilissima* ELLIS et SOL. Coral. p. 123. Tab. 21. fig. 9.

= *Amp. debilis* KÜTZ. Spec. p. 700. no. 3.

= *Cor. rigens* PALL. Elench. Zooph. p. 429. no. 11.

A. fragilissima f. cuspidata W. v. B. Coral. Sib. Exp. p. 90.
= *Amp. cuspidata* LAMX. Exp. Method. p. 26. t. 21. fig. f.
= *Cor. cuspidata* ELLIS et SOL. Coral. p. 124. tab. 21.
= *Amp. fragilissima* KÜTZ. (nec LAMX.) Spec. p. 700. no. 2.
A. fragilissima f. cyathifera W. v. B. Coral. Sib. Exp. p. 90.
= *Amp. cyathifera* LAMX. Freyc. Voy. Zool. p. 627.
A. cryptarthrodia ZANARD. Coral. p. 21.
A. involuta KÜTZ. Tab. Phyc. VIII. p. 23. Tab. 48. fig. 2.
A. rigida LAMX. Histoir. p. 297. t. 11. fig. 1.
= *Amp. cladoniæformis* MENEGH. in KÜTZ. Spec. p. 700.
= *Amp. spina*, KÜTZ. Spec. p. 701.
= *Amp. irregularis* KÜTZ. l. c.
= *Amp. amethystina* ZANARD. Coral. p. 211.
= *Amp. spina β. amethystina* KÜTZ. p. 700.
A. rigida var. inordinata ZANARD. Iconogr. III. p. 265. Tab. 99. B. fig. 5.
= *Amp. inordinata* ZANARD. Coral. p. 21.
A. tribulus LAMX. Histoir. p. 302.
= *Coral. tribulus* ELLIS et SOL. Coral. p. 124. Tab. 21.

Amphiroa fragilissima has its articuli much swollen at their distal ends. That this character is also found in *Metagoniolithon* (*Amphiroa*) *Charoide* and *Metag. stelligerum* has been remarked by ARESCHOUG.[1] MADAM WEBER VAN BOSSE[2] has clearly illustrated the structure in her recent work. The intumescence is evidently due to the secondary growth of the circumgenicular cortex as was formerly proven by me in the case of *Metag. stelligerum*.[3] I had an opportunity of examining only of the specimen of *Amp. fragilissima* LAMX. kept in the herbarium of the Higher Normal School of Tokyo. The specimen is in a much distorted condition with most of the articuli separated one from another.

According to MADAM WEBER VAN BOSSE the plant has in its internal structure no less a tendency to approach to *Meta-*

1) Sp. Alg. II. p. 531.
2) Coral. of Siboga Exp. Pl. XVI. fig. 2, 5.
3) Study of Genicula. p. 29.

goniolithon and *Litharthron*. But we can not find good reason to separate the species in question from the present genus and bring it into either of these two genera.

The characters which distinguish the present section from the next are rather ambiguous. Some of the members of the *Eurytion* gradually approach this section in shape of articuli and in ramification. Yet it is often convenient to reserve the name to represent the cylindrical *Amphiroa*.

Sect. II. **EURYTION** DCNE. Memoir. p. 113.

A. nodulosa KÜTZ. Tab. Phyc. VIII. p. 19. Tab. 41. fig. 1.

A. verruculosa KÜTZ. Phyc. Gen. p. 387. Tab. 79. fig. 3.
= *Amp. cryptarthrodia β verruculosa* HAUCK. Meeresalg. p. 276.

A. Beauvoisii LAMX. Histoir. p. 299.
= *Amp. exilis* HARV. Ner. Austr. p. 95.

A. Beauvoisii β crassiuscula (HARV.) †
= *Amp. exilis β crassiuscula* HARV. Ner. Austr. p. 95.

A. zonata YENDO. Cor. ver. Jap. p. 10. Pl. 1. fig. 11–14. Pl. IV. fig. 9.

A. parthenopea ZANARD. Iconogr. III. p. 268. Tab. 100. B.

A. echigoensis YENDO. Cor. ver. Jap. p. 11. Pl. 1. fig. 15–16: Pl. IV fig. 10.

A. ephedræa DCNE. Mémoir. p. 112.
α **fusoides** (ARESCH.) †
= *Amp. fusoides* LAMX. Histoir. p. 298. t. 11. fig. 2.
= *Amp. Pöppighii* ENDL. et DIES. Alg. Natal. p. 290.
= *Amp. ephedræa* HARV. Ner. Austr. p. 95. t. 39.
= *Amp. ventricosa* LAMX. (sec. DCNE. Mémoir p. 112.)
β **Gaillonii** (ARESCH.) †
= *Amp. Gaillonii* LAMX. Histoir. p. 298. t. 11. fig. 3.
= *Amp. Guenzii* HARV. Ner. Austr. p. 95.
= *Cor. ephedræa* LAMK. Mem. Mus. II p. 238.
= *Cor. Chara γ* LAMK. (sec. DCNE. Mémoir. p. 112.)

A. anceps DCNE. Mémoir. p. 113.
= *Cor. anceps* LAMK. Mem. Mus. I. p. 238.
= *Cor. dilatata* LAMX. Histoir. p. 299.
= *Amp. dilatata* ARESCH. in J. Ag. Spec. II. p. 536.
= *Amp. galaxauroides* SOND. Plant. Preiss. Vol. II. p. 188.

= *Amp. Cumingii* RUPR. (sec. WEBER VAN BOSSE. Coral. Sib. Exp. p. 93.)
= *Amp. Karstalskii* RUPR. ditto.
= *Amp. nobilis* KÜTZ. Spec. p. 703. (sec. WEBER VAN BOSSE. l. c.)
= *Amp. ephedræa* HARV. New South Wales Algæ. no. 458. (sec. WEBER VAN BOSSE. l. c.)

A. Bowerbankii HARV. Ner. Austr. p. 97. t. 37.
= *Amp. dilatata* KRAUSS. Flora des Cap. u. Natal. p. 206. (sec. ARESCH.)

A. crassa LAMX. Freyc. Voy. Zool. p. 627.
f. Godeffroyi W. v. B. Coral. Sib. Exp. p. 98.
= *Amp. Goddefroyi* GRUN. Alg. d. Fidschi.
f. minuta W. v. B. Coral. Sib. Exp. p. 98.

A. foliacea LAMX. Freyc. Voy. p. 628. t. 93. fig. 2–3.
= *Amp. squarrosa* GRUN. in Bot. Herb. Hamburg. (sec. WEBER VAN BOSSE.)
f. procumbens W. v. B. Coral. Sib. Exp. p. 92.
f. erecta W. v. B. l. c.
= *Amp. nobilis* HAUCK. (nec. KÜTZ.) Ueber einige von Hildebr. Gesam. Alg. (sec. W. v. B.)

A. pusilia YENDO. Cor. ver. Jap. p. 13. Pl. I. fig. 22–23 : Pl. V. fig. 11–13.
A. misakiensis YENDO. l. c. p. 14. Pl. I. fig. 24–25 : Pl. VI. fig. 1.
A. canliculata MART. Preus. Exp. Tange. p. 29. Pl. VI.

SPECIES DOUBTFUL.

Amphiroa linearis KÜTZ. Tab. Phyc. VIII. p. 22. Tab. 46. fig. 2.
A. algeriensis KÜTZ. Tab. Phyc. VIII. p. 21. Tab. 44. fig. 2.
A. Boviesii KÜTZ. l. c. p. 21. Tab. 43. fig. 4.
A. pustulata MART. in Reg. Flor. no. 31. (sec. ARESCH. in J. AG. Sp. II. p. 535.)
A. brasiliana DCNE. Mémoir. p. 113.
A. complanata KÜTZ. Phyc. Gen. p. 388.
A. canaliculata YENDO (nec MART.) Cor. ver. Jap. p. 14. Pl. I. fig. 26 : Pl. IV. fig. 14–15.
A. Cumingii MONT. Zellenpl. auf den Philippin. p. 660.

The essential characters of this section in distinction from those of the others lie in the regularity of the dichotomous ramification and the flatness of the articuli in the middle and upper portions. In *Amphiroa canaliculata* MART. and some others the dichotomy is more or less disturbed. The articuli of the species in this

section are mostly linear, but subterete in some species; in this respect gradually approaching the preceding section. *Amp. nodulosa* has nearly cylindrical articuli, slightly compressed in the ultimate articuli. *Amp. canaliculata* MART. has essentially broad and ancipitous articuli at the upper portions of the fronds. Both margins, however, are inflexed very much to one side forming a pair of canals along the margins. This is found to be the case in some other species, though in a slight degree, such as *Amp. foliacea* and *Amp. misakiensis.*

Some of the members, such as *Amp. Bowerbankii*, *Amp. anceps*, *Amp. canaliculata* MART., *Amp. foliacea*, etc., are habitually decumbent. This causes the differentiation of dorsiventrality in the upper articuli. The canaliculatad species have the canals at the ventral side only, or in other words, on the shaded side: and the conceptacles are to be found on the dorsal side only. In the uncanaliculated and decumbent members the conceptacles are restricted to the shaded surface with a few conceptacles occasionally found on the opposite side. In the erect forms they are found on both surfaces.

The decumbent habit may have been caused by the fact that the genicula of the basal portion in these species develope further and finally form large horny flexible joints. These joints, i. e., the bandform genicula, allow the upper portions of the fronds to bend downwards. In the preceding section the lower genicula are very short and form the constrictions of the moniliform stems at the basal portions of the fronds. The short linear genicula cause the fronds to stand upright.

Amp. anceps DCNE., according to HARVEY'S description and illustrations,[1] is identical with *Amp. dilatata* ARESCH. ARESCHOUG

1) Ner. Austr. p. 98. t. 37.

chose to mention them separately. MADAM WEBER VAN BOSSE is of the same opinion as HARVEY; and this view I think preferable. *Amp. Cumingii* RUPR. and *Amp. Karstalskii* RUPR. have been challenged by ARESCHOUG, who thought that they have close affinity with *Amp. exilis* HARV. MADAM WEBER VAN BOSSE has kindly written me after examination of authentic specimens that RUPRECHT'S plants are identical with *Amp. anceps*. This disposal of RUPRECHT'S species is entirely on her own authority.

ARESCHOUG doubtingly referred *Amp. Beauvoisii*, *Amp. pustulata* and *Amp. complanata* to *Amp. exilis* HARV. MADAM WEBER made it clear that HARVEY'S plant was similar to *Amp. Beauvoisii* LAMX. The other doubtful species described by KÜTZING are so insufficiently defined that I can not find their exact relation to other plants; nor are they sharply enough defined to be reckoned as independent species. MADAM WEBER remarks that she saw in KUTZING'S herbarium a plant called *Amp. linearis* KÜTZ. which she thinks a stunted form of *Amp. ephedræa* LAMX. She does not mention anything about the connection between the specimen and the illustration in KÜTZING'S Tab. Phyc. VIII. Tab. 46. *Amp. canaliculata* YENDO is a doubtful plant, as has been already mentioned.[1] It is probably a broad form of *Amp. anceps*. The scarcity of the specimen precludes me from further discussion.

Sect. III. **ARTHROCARDIA** DCNE. p. p. Mémoir. p. 112.

= *Arthrocardia* ARESCH. p. p. in J. AG. Spec. Alg. II. p. 547.
= *Pseudarthrocardia* YENDO. Enumer. Cor. Alg. p. 191.

Amphiroa corymbosa DCNE. Mémoir. p. 112.

1) Enumeration of Coral. Alg. p. 190.

= *Arthrocardia corymbosa* ARESCH. in J. Ag. Spec. Alg. II. p. 550.
= *Corallina magnifica* LEACH. (sec. Harv. Ner. Austr. p. 99.)
α. ARESCH. in J. AG. Spec. Alg. II. p. 551.
= *Corallina corymbosa* LAMK. Mem. Mus. II. p. 234.
β. ARESCH. in J. AG. Spec. Alg. II. p. 551.
= *Ampiroa corymbosa* HARV. Ner. Austr. p. 99. t. 38.

A. aberrans YENDO. Cor. ver. Jap. p. 16. Pl. I. fig. 1–5 : Pl. V. fig. 1–3.

A. Wardii HARV. Ner. Austr. p. 99. t. 38.
= *Arthrocardia Wardii* ARESCH. in J. AG. Spec. Alg. II. p. 551.

A. Mallardiæ HARV. Ner. Austr. p. 99.
= *Arthrocardia Mallardiæ* ARESCH. in J. AG. Spec. Ag. II. p. 552.

SPECIES DOUBTFUL.

Corallina rigida KÜTZ. Spec. p. 708.
Amphiroa constricta KÜTZ. Tab. Phyc. VIII. p. 24. Tab. 49. fig. 3.
Corallina gomphonemacea KÜTZ. l. c. p. 30. Tab. 63. fig. 1.
Corallina frondescens KÜTZ. (nec POST et RUPR.) l. c. p. 29. Tab. 59. fig. 2.
Corallina arbuscula KÜTZ. (nec POST. et RUPR.) l. c. fig. 3.

Arthrocardia was first established by DECAISNE as the second section of the genus *Amphiroa*. ARESCHOUG elevated it to a distinct genus. Both writers enumerated two differing groups under a single section or genus. It is regrettable that SCHMITZ, when he united *Arthrocardia* ARESCH. with *Chilosporum*, did not recognize this confusion. MADAM WEBER re-established *Arthrocardia* ARESCH. She seems to have overlooked the peculiarities in the position of the conceptacles of those species such as *Cheilosporum frondescens, Cheil. yessœnse*, etc., which are enumerated under the section *Alatocladia* in the present paper. In distiguishing *Arthrocardia* from *Cheilosporum* she states: "The position of the conceptacula, however, marks a difference between the genera: in *Arthrocardia* we find conceptacula on the joint as in *Amphiroa*; in *Cheilosporum* we find them immersed in the margin of the broadened, wing-like joint....." This distinction holds good

only for separating the above listed species from the section *Eucheilosporum*.

I am not inclined to discuss the question whether *Arthrocardia* is worthy of generic rank or not. Were the characters of *Arthrocardia* important enough to elevate it to a genus, the *Marginisporum*, the *Alatocladia* and the *Serraticardia* should be equally mentioned as genera. But this is a matter of personal preference.

I was no less in doubt whether the two species, *Amp. Wardii* and *Amp. Mallardiæ*, described by HARVEY, should be legitimately reckoned under the present section or not. We have no information about the conceptacles of these species; and I was not so fortunate as to study authentic specimens. Judging, however, from the original descriptions and ARESCHOUG's notes, I ventured to arrange them as above. They may have close affinity with the *Serraticardia*.

Arthrocardia palmata ARESCH. seems to be unsatisfactorily defined. ARESCHOUG considers *Cor. filicula* LAMK. to be its forma. But the latter belongs without doubt to the *Alatocladia*, while the former has several characters allied to *Amp. aberrans*. GRUNOW[1] remarks that *Cor. flabellata* KÜTZ. seems closely related to *Arth. palmata* ARESCH. As it is impossible at present to study original specimens of these species, I must satisfy myself with the references of these noted algologists.

The genicula of *Amp. aberrans* are formed of single zones of the periclinal cells. In explaining the fig. 5. pl. II. of "Cor. ver. Jap.," I remarked that probably the geniculum was built up with several zones. This was disproved after repeated closer examination.

1) Weltreise der Novara p. 79.

Sect. IV. **MARGINISPORUM** YENDO. Enumer. Cor. Jap. p. 191.

Amphiroa declinata YENDO. Cor. ver. Jap. p. 15. Pl. I. fig. 29: Pl. VI. fig. 4.

A. crassissima YENDO. l. c. p. 16. Pl. I. fig. 27–28: Pl. V. fig. 5–6.

A. cretacea ENDL. Mantissa. Suppl. III. p. 49.

= *Corallina cretacea* POST. et RUPR. Illustr. p. 20. t. 40. f. 104.

= *Arthrocardia cretacea* W. v. B. Coral. Sib. Exp. p. 105.

f. rosariformis YENDO. Cor. ver. Jap. p. 7. Pl. IV. fig. 3.

f. capensis †

= *Amphiroa capensis* ARESCH. in J. AG. Spec. Alg. II. p. 533.

= *Amp. dubia* KÜTZ. Tab. Phyc. VIII. p. 24. Tab. 49. fig. 1.

var. tasmanica KÜTZ. Tab. Phyc. VIII. p. 23. Tab. 47. fig. 2.

= *Amp. tasmanica* SOND. Plant. Müll. p. 686.

f. breviarticulata. †

= *Amp. breviarticulata* ARESCH. in J. AG. Spec. Alg. II. p. 532.

SPECIES DOUBTFUL.

Amphiroa lucida LAMX. Histoir. p. 297.

Amp. nodularia DCNE. Mémoir. p. 111.

= *Corallina nodularia* LAMX. (sec. DCNE. Mémoir. p. 111.)

= *Cymopolia rosarium* LAMX. (do.)

= *Corallina rosarium* LAMK. Mém. Mus. I. p. 234.

The first two species which are assigned to the Japan coast only, have a peculiarity in the position of the conceptacles, which are always found on the margins of the articuli, growing in a row, pointing obliquely toward the ventral side of the frond. In other respects, these species are closely related to the preceding section.

MADAM WEBER transferred *Amp. cretacea* ENDL. to *Arthrocardia* ARESCH. The principal reason for doing so seems to be grounded on the internal structure of the articuli. In the external appearance of the articuli the species suggests a position near to *Amp. rigida* LAMX. or *Cheilosporum tuberculosum*. From the former it is distinguished by the unizonal genicula and the

superficial position of the conceptacles; and from the latter by the cortical origin of the mother cells of the spores.

I am no less in doubt in classifying *Amp. cretacea* ENDL. in the same section with *Amp. declinata*. The position of the conceptacles is very irregular in the former species, while in the latter the conceptacles are arranged in a definite regularity. *Amp. cretacea* and its forms are widely distributed in the colder seas of both the northern and the southern hemispheres. It may claim an independent position. The above disposition is a provisional one until we find a more special character in *Amp. cretacea*.

Amp. breviarticulata ARESCH. and *Amp. capensis* ARESCH. seem to be nearly allied to *Amp. cretacea* ENDL. According to the descriptions given by ARESCHOUG[1] we can hardly distinguish the former from *var. tasmanica* KÜTZ. This has been already noted by SONDER.[2] *Amp. capensis* ARESCH. is also unseparable from *Amp. cretacea.*, except that the basal genicula are comparatively longer. *Amp. dubia* KÜTZ., judging from the figures of Tab. Phyc. VIII. Tab. 49. fig. 1., is referrible to *Amp. capensis* ARESCH. These species have hitherto been distinguished by the relative size and forms of the articuli; but these points can hardly be relied upon to warrant a specific character.

MADAM WEBER doubts *Amp. breviarticulata* ARESCH. She found an *Arthrocadia* called by that name in SURINGAR's herbarium, and tried in vain to see the type of ARESCHOUG's species. Judging from the original descriptions, I believe the specimen found by her is different from what ARESCHOUG meant.

Amp. cretacea has been defined as often having recurved or flexuous articuli. ARESCHOUG put too much stress on this character

1) Spec. Alg. II. p. 532.
2) Linnea. XXV. p. 687.

in distinguishing his two species. In the specimens which I have referred to *Amp. cretacea* ENDL., found commonly in north Japan, the articuli with such characters occur frequently but not invariably. Neither ARESCHOUG nor KÜTZING gives anything about the conceptacles of their plants, and I have not seen any authentic specimens of these species. But the distinguishing characters mentioned by these authors are by no means fixed ones. Their species, if worth mentioning separately, may be disposed as above.

Amp. nodularia DCNE., according to ARESCHOUG, has close affinity with *Amp. breviarticulata.* It should be united with *Amp. cretacea* or its forma.

Gen. II. METAGONIOLITHON W. v. B.

Metagoniolithon Charoides W. v. B. Coral. Sib. Exp. p. 84.
= *Amphiroa Charoides* LAMX. Histoir. p. 301.
= *Amp. Chara* DCNE. Classif. des Alg. p. 63. Pl. 17. fig. 9.
= *Corallina Galioides* LAMK. Mem. Mus. II. p. 239.
= *Amp. stellulata* KÜTZ. Spec. p. 702.

M. stelligerum W. v. B. Coral. Sib. Exp. p. 84.
= *Amp. stelligera* ARESCH. in J. AG. Spec. Alg. II. p. 540.
= *Corallina stelligera* LAMK. Mem. Mus. II. p. 239.
= *Amp. jubata* LAMX. Histoir. p. 301. t. 11. fig. 6.
= *Amp. elegans* SOND. Plant. Preiss, p. 55. no. 53.
= *Amp. verrucosa* LAMX. Histoir. p. 300. Pl. XI. fig. 4.
= *Amp. stelligera* β. *interrupta* KÜTZ. Tab. Phyc. VIII. p. 26. Taf. 52. fig. h.
= *Amp. interrupta* LAMX. Histoir. p. 301. Pl. XI. fig. 5. A.

M. gracile †
= *Amp. gracile* HARV. Phyc. Austr. Pl. CCXXXI.
= *Amp. intermedia* HARV. Syn. Catal. of Austr. and Tasm. Alg. p. 30.

SPECIES DOUBTFULL.

Amphiroa granifera HARV. Syn. Catal. of Austr. and Tasm. Alg. p. 30.
= *Metagoniolithon graniferum* W. v. B. Coral. Sib. Exp. p. 84.

= *Amp. setacea* KÜTZ. Spec. p. 700.
= *Amp. similis* SOND. (sec. WEBER l. c. p. 84.)
Corallina Chara LAMX. Mem. Mus. I. p. 240.
Cor. radiata LAMX. Mem. Mus. I. p. 240.

This genus is easily distinguished from the others by having verticillate ramuli which start from genicula and not from articuli. The articuli are exclusively cylindrical, varying in their length according to the position in a frond and to the species. In some species, both extremities of the articuli bulge out, owing to the secondary development of the circumgenicular cortex; and in some species the verticillate ramuli are slightly curved upward and inward.

The conceptacles are, as far as I could observe from the accessible material, generated from the medullary cells. The diameter of the conceptacles is very large when compared with that of the ramuli; in *Metagoniolithon stelligerum* the former is subequal to the latter. This circumstance, no dobut, forces conceptacles to start from the deep places in the medulla.

The species under this genus are characterised by much elongated genicula. In *Metag. stelligerum* the length of a matured geniculum often attains more than twenty times its breadth, and the greater portion of the rachis is formed by the genicula. These genicula, quite strange in comparison with those of plants belonging to other genera, can send out the verticillate ramuli around a certain region. No ramuli is found starting directly from an articulus. This peculiarity, together with the medullary origin of the propagating cells, is enough to detach the present group from the genus *Amphiroa* and to place it under a new one. In my former paper I made a preliminary announcement of this matter. A few months later, MADAM WEBER, evidently

not knowing what I had suggested, established a new genus for this peculiar species.

HARVEY remarks that *Amp. gracilis* HARV. has some affinity with *Metag. stelligerum*, and still closer affinity with *Amp. intermedia* HARV. Cf. Phyc. Austr. t. 231. I consider that both of HARVEY'S plants belong to the same species. MADAM WEBER refers *Amp. granifera* to the genus *Metagoniolithon* reducing *Amp. intermedia*, *Amp. setacea*, *Amp. similis* and *Amp. stellata* to the position of its spnonymes. I can not decide at present whether *Amp. granifera* HARV. is the same as *Amp. gracilis* or not. If it be the same, the name *Amp. gracilis* HARV. should be kept on account of priority. *Amp. similis* SOND. was united by MADAM WEBER to *Metag. graniferum*. But I could not find the description in Bot. Zeitung 1845, which she mentioned as the "quelle" of *Amp. similis* SOND.

Gen. III. LITHOTHRIX J. GRAY.

Lithothrix aspergillum J. GRAY. Journ. Bot. Vol. V. p. 33.
= *Amphiroa aspergillum* ANDERSON. Zoe. II. p. 225.
= *Amp. nodulosa* FARL. (nec KÜTZ.) Report U. S. Fish. Comm. 1875. p. 715.
= *Amp. nodulosa* COLL., HOLD. et SETCH. Phyc. Bor.-Amer. no. 498.
f. nana †
= *Amp. aspergillum f. nana* SETCH. et GARD. Alg. N. W. A. p. 359.

The monotypic genus has been established by J. GRAY, who does not, however, give clear reason for its establishment. But it is not difficult to understand from his remarks that the plant has some relation to *Amphiroa* by having wartlike conceptacles and at the same time to *Corallina* in its general habit. The generic diagnosis given by him is not sufficient to separate it from the other genera. The plant was referred to *Amphiroa* by AN-

DERSON[1] without any comment, but probably strengthened by PROF. FARLOW's remark on this species.[2]*

It has, however, unique characters not mentioned by its discoverer or others, as far as my research has extended. The peculiarty lies in the genicular structure and in the branching mode of the fronds. It has no geniculum, in the exact sense, similar to any of the other *Corallinæ*. The geniculum is formed by the lower half portions of the filamentous periclinal cells, the upper half of which practically corresponding to the medulla of other species. The details are given in my former paper.[3] The axial stems ramify dichotomously while the ramuli start from the margins of the articuli of the stem. An articulus which sends forth dichotomous branches from its top has a longitudinal furrow along its median. Hence the articulus apparently seems to be two compressed articuli fused together by their periclinal sides with a geniculum on the top of each. The furrow or the canalization is also visible in the succeeding lower articuli, gently disappearing as we trace downwards. The two genicula on the top of the branching articulus are not in a straight line, but form a geometrical supplimentary angle to the axile divergence of the branches. The angulation of the genicula is also distinct in the succeeding articuli, but gradually approaches a straight line as canalization vanishes.

The canalization and the mode of pinnation of ramuli are unique characters among *Corallinæ*. The solitary conceptacles on

1) Zoe. Vol. II. p. 225.

2) Proc. of Amer. Acad. Vol. XII. p. 239.

* These two papers were not accessible to me. But finding them indispensable in preparing the present chapter, I asked MR. F. S. COLLINS for references. MR. COLLINS was so kind as to send me a transcript of all the lines relating to the subject. I desire to express to him my heartiest thanks.

3) Study of Genicula. p. 16.

the articuli of branchlets are also an unusual phase. These characters are ample enough to restore the genus, with slight modification in the original diagnosis. This was also mentioned in my former paper and noticed by MADAM WEBER.

Gen. IV. **LITHARTHRON** W. v. B.

? *Rhodopeltis* SCHMITZ. p. p. in ENG. Pflanzenfamil. Alg. p. 530.
Litharthron australe W. v. B. Coral. Sib. Exp. p. 104.
= *Amphiroa australis* SOND. Plant. Preiss. p. 55.
? = *Rhodopeltis australis* SCHMITZ (nec HARV.) p. p. in ENG. Pflanzenfamil. Alg. p. 530.

Conceptacles have not yet been found in this species, which has, however some relation to *Metagoniolithon* in the structure of genicula and the mode of ramification. It was regarded by some old writers as having close affinity with *Eurytion*. But this is merely a superficial likeness in the shape of the articuli. A study of the internal structure proves that it is an independent genus.[1] KÜTZING[2] tended toward this view but did not actually appropriate it.

HARVEY[3] described a nemathecium-like plant, calling it *Rhodopeltis australis*, epiphytic on *Litharthron australe*. SCHMITZ[4] seems to have regarded the epiphyte to be the propagating organ of the host, which he classified among *Rhizophyllidaceæ*. MADAM WEBER has written me that PROF. DE TONI called her attention to this matter. It is also mentioned by DE TONI[5] in the last

1) After the publication of "Study of Genicula" MR. REINBOLD was so kind as to send me a piece of the original specimens of *Amp. australis* SOND. The specimen was of great value in preparing the present paper. I am very glad to express my gratitude to him.
2) Tab. Phyc. VIII. p. 25.
3) Phyc. Austr. Pl. 264.
4) ENGL. u. PRANTL: Pflanzenfamilien. Algæ. p. 530.
5) Serie. XV. p. 175.

October number of La Nouva Notarisia. MADAM WEBER doubts SCHMITZ's view. So do I. The problem is reserved for future until an authentic specimen of *Rhodopeltis australis* or a fertile exemplar of *Litharthron australe* has been examined.

Gen. v. CHEILOSPORUM ZANARD. emend.

The genus *Cheilosporum* was first instituted by ZANARDINI to include most of the members of DECAISNE's fourth division of *Amphiroa*. SCHMITZ[1] extended the generic sense so as to cover the genus *Arthrocardia* ARESCH. The definition of *Arthrocardia* given by ARESCHOUG is somewhat different from that of the section *Arthrocardia* DCNE. Many of the members of *Arthrocardia* ARESCH. may more legitimately be referred to *Amphiroa* than to *Cheilosporum*. On the contrary, the greater number of species comprised in the section *Arthrocardia* DCNE. evidently belong to *Cheilosporum*. Hence the genus *Cheilosporum*, as conceived in the present paper, comprises both the sections *Arthrocardia* DCNE. *p. p.* and *Cheilosporum* DCNE. The scope given by me to the genus thus practically agrees with that given by SCHMITZ, except that some species of *Arthrocardia* ARESCH. have been removed from it.

The members enumerated under the present genus show certain characters by which they may be easily distinguished from those of the other genera. The most important characteristic lies in the fact that the spores are situated deep in the medullary portion.

The genus is divided into three sections, viz., *Eucheilosporum*, *Alatocladia* and *Serraticardia*. The *Eucheilosporum* is a group

1) System. Uebersicht. p. 455.

sharply defined from all others, and its members belong exclusively to the warmer seas. The extreme forms of the *Eucheilosporum* and of the *Alatocladia* show indeed some differences with regard to their habit and the external appearance. But I consider the differences not to be of sufficient tenor to justify their separation into different genera. In the *Alatocladia* the position of the conceptacles is rather indeterminate, so that we can not delineate a sharp boundary to separate it from the *Eucheilosporum*.

The *Serraticardia* has the external form closely resembling that of the *Arthrocardia*. By the position of the conceptacles and the pinnation of the branchlets, these two sections may easily be distinguished one from another. Only two species are assigned to the former section. They have two sorts of conceptacles, which may occur in an individual or in one branch at the same time. One is imbedded at the top of the branchlet, or articulated lobe, as it were. Another is situated upon the surface of articulus. The former character suggests *Corallina* and the latter, no doubt, is the peculiarity found in the members of the *Alatocladia*.

Sect. I. **EUCHEILOSPORUM** YENDO. Enumer. Cor. p. 193.

Cheilosporum elegans ARESCH. in J. AG. Spec. Alg. II. p. 546.
= *Amphiroa elegans* HOOK. et HARV. Ner. Austr. p. 101. Pl. XXXVIII.

C. sagittatum ARESCH. in J. AG. Spec. Alg. II. p. 545.
= *Corallina sagittata* LAMX. Freycin. Voy. p. 625. t. 95. fig. 11–12.
= *Amp. sagittata* DCNE. Mémoir. p. 113.

C. jungermannioides RUPR. in J. AG. Spec. Alg. II. p. 546.

C. spectabile HARV. Friendly Isl. Alg. no. 31.

C. cultratum ARESCH. in J. AG. Spec. Alg. II. p. 545.
= *Amp. cultrata* HARV. Ner. Austr. p. 102. Pl. XXXIX.

β **debilis** †
= *Amp. cultrata β debilis* KÜTZ. Tab. Phyc. VIII. p. 27. Tab. 54. fig. k. l.
= *Amp. cultrata γ globulifera* KÜTZ. l. c. Tab. 55. fig. 1.

δ pectinata †
= *Amp. cultrata δ pectinata* KÜTZ. l. c. Tab. 55. fig. 2.
f. multifida †
= *Amp. multifida* KÜTZ. l. c. Tab. 56. fig. 1.

SPECIES DOUBTFUL.

Amphiroa acutiloba DCNE. Mémoir. p. 113.
Amp. Lamourouxiana DCNE. l. c. p. 113.
= *Corallina Lamourouxiana* LEACH. in Herb. LAMX. (sec. DCNE. l. c.)
Amp. fastigiata DCNE. Mémoir. p. 113.
Amp. heterocladia KÜTZ. Tab. Phyc. VIII. p. 27. Tab. 55. fig. 1.
Cheilosporum pulchrum HARV. (sec. SONDER. in Fragmenta. p. 20.)

The doubtful species above mentioned are too briefly defined to make it safe to count them as independent species. *Amp. heterocladia* KÜTZ. is referrible to either *Cheil. Stangeri* or *Cheil. flabellatum*. The linear or cylindrical articuli in some part of the frond are often found in an abnormal form of this section, and their presence is never a constant character. *Amp. cultrata* HARV. *γ globulifera* KÜTZ. is the name given to a plant having the conceptacles of *Choreonema*.

Except these questionable plants, most of the members are clearly defined and acknowledged by many eminent systematists.

Sect. II. ALATOCLADIA †

= *Arthrocardia* DCNE. p. p. Mémoir. p. 112.
= *Arthrocardia* YENDO. Enumer. Coral. p. 192.
= *Arthrocardia* ARESCH. p. p. in J. AG. Spec. Alg. II. p. 548.
Cheilosporum californicum YENDO. Cor. ver. Port Renfrew. p. 715. Pl. LIV. fig. 2: Pl. LVI. fig. 3.
= *Amphiroa californica* DCNE. Mémoir. p. 112.
= *Amp. tuberculosa f. californica* SETCH. et GARD. Alg. N. W. Amer. p. 361.
C. frondescens YENDO. Cor. ver. Port Renfrew. p. 715.
f. typica YENDO. l. c. p. 715. Pl. LII. fig. 1.: Pl. LVI. fig. 4, 5 and 8.

= *Corallina frondescens* POST. et RUPR. Illustr. p. 20. t. 40. fig. 103.
= *Arthrocardia? frondescens* ARESCH. in J. AG. Spec. Alg. II. p. 549.
= *Amphiroa Hookeri* HARV. (sec. HARV. Ner. Bor. Amer. p. 86).
= *Amp. tuberculosa f. frondescens* SETCH. et GARD. Alg. N. W. Amer. p. 362.

f. maxima YENDO. Cor. ver. Port Renfrew. p. 716.
f. intermedia YENDO. l. c.
f. polymorpha YENDO. l. c.

C. filiculum †
= *Cheilosporum palmatum β filiculum* YENDO. Enumer. Cor. p. 192.
= *Arthrocardia palmata,* et *β* ARESCH. in J. AG. Spec. Alg. II. p. 550.
= *Corallina filicula* LAMK. Mem. Mus. II. p. 237.

var. planiusculum †
= *Cheilosporum planiusculum* YENDO. Cor. ver. Port Renfrew. p. 717. Pl. LIII. fig. 1–3: Pl. LVI. fig. 9–10.
= *Corallina planiuscula,* et *ff.* KÜTZ. Tab. Phyc. VIII. p. 31. Tab. 63. fig. 3.
= *Amp. tuberculosa f. planiuscula* SETCH. et GARD. Alg. N. W. Amer. p. 363.

C. Stangeri ARESCH. in J. AG. Spec. Alg. II. p. 544.
= *Amphiroa Stangeri* HARV. Ner. Austr. p. 101. Pl. XXXIX.

C. flabellatum ARESCH. in J. AG. Spec. Alg. II. p. 544.
= *Amp. flabellata* HARV. Ner. Austr. p. 101. Pl. XXXIX.

C. Darwini †
= *Amp. Darwini* HARV. Ner. Austr. p. 100.
= *Arthrocardia Darwini* W. v. B. Coral. Sib. Exp. p. 106.

C. anceps YENDO. Cor. ver. Jap. p. 18. Pl. II. fig. 6–8: Pl. VI. fig. 2.
= *Corallina anceps* KÜTZ. Phyc. Gen. p. 388.

var. modesta YENDO. Cor. ver. Jap. p. 19. Pl. II. fig. 9: Pl. VI. fig. 3.

C. Orbignianum †
= *Amp. Orbigniana* DCNE. Mémoir. p. 112.

C. latissimum YENDO. Cor. ver. Jap. p. 21. Pl. II. fig. 16–17: Pl. VI. fig. 7.

C. yessoense YENDO. l. c. p. 19. Pl. II. fig. 12–13: Pl. VI. fig. 5.

f. angusta YENDO. l. c. p. 19. Pl. II. fig. 14–15: Pl. VI. fig. 6.

C. tuberculosum †
= *Corallina tuberculosa* POST. et RUPR. Illustr. p. 20 t. 40. fig. 100.
= *Amp. tuberculosa* ENDL. Mantissa. Suppl. III. p. 49.

= *Arthrocardia? tuberculosa* DCNE. Mémoir. p. 110.
= *Arthro. tuberculosa* W. v. B. Coral. Sib. Fxp. p. 110.
= *Amp. tuberculosa f. typica* SETCH. et GARD. Alg. N. W. Amer. p. 361.
= *Amp. epiphlegmoides* J. AG. in HARV. Alg. from N. W. Amer. p. 169.
= *Arthro. epiphlegmoides* W. v. B. Coral. Sib. Exp. p. 106.

SPECIES DOUBTFUL.

Amphiroa firma KÜTZ. Spec. p. 704.
Corallina Filicula KÜTZ. Tab. Phyc. VIII. p. 30. Tab. 61. fig. 1.
Cor. carinata KÜTZ. Tab. Phyc. VIII. p. 30. Tab. 61. fig. 2.
Amp. chilensis DCNE. Mémoir. p. 113.
Amp. vertebralis DCNE. l. c. p. 112.
= *Arthrocardia vertebralis* W. v. B. Coral. Sib. Exp. p. 106.
Amp. prolifera DCNE. Mémoir. p. 113.
= *Cor. prolifera* LAMX. Histoir. p. 291. Tab. 10. fig. 5.

The section *Arthrocardia*, as before stated, was first distinguished by DECAISNE[1] as the second division of *Amphiroa*; and comprised many species of the present section and a few of *Arthrocardia* in the sense in which the present writer uses that term. It was elevated to a genus by ARESCHOUG with modification however in the sense, on account of the characteristic position of conceptacles. SCHMITZ and HAUPTFLEISCH[2] combined it with the *Eucheilosporum*, including both under the genus *Cheilosporum*. SETCHELL and GARDNER[3] in their joint work remarked that they could not discover why the present writer[4] referred some of the Canadian forms, such as *Cheilosporum frondescens*, *Cheil. filiculum f. planiusculum* (=*Cheil. planiusculum*), etc., to the genus *Cheilosporum*. To remove their doubt it will be

1) Mémoir. p. 112.
2) ENGLER. u. PRANTL: Pflanzenfamilien. p. 543.
3) Notes on N. W. Amer. Alg. p. 369.
4) Cor. ver. of Port Renfrew. p. 715.

sufficient simply to remark that *Corallina frondescens* POST. et RUPR. was referred to *Arthrocardia* by ARESCHOUG,[1] though with some doubt; and that *Arthrocardia* was reduced to *Cheilosporum* by SCHMITZ.[2] But I referred the Canadian algæ to *Cheilosporum* not merely because I was strengthened by ARESCHOUG's opinion. Some further remarks will be added below.

The principal difference between this genus and *Amphiroa* lies in the fact that in the former the mother cells of the propagating cells originate in the medullary portion of the fronds, while in *Amphiroa* they are in the cortical. The scars of the dropped conceptacles prove the difference. This is easily recognized by the practiced eye. But to get the exact view, one microtome section of the fertile articuli through a conceptacle is sufficient. This is quite clear if the reader refers to the figures which I have repeatedly delineated in my former papers.[3]

The distinguishing point between the typical forms of the *Eucheilosporum* and the *Alatocladia* lies in the position of the conceptacles. In the former the normal position of the conceptacles is the upper margin of the sagittate articuli; as a rule. only one conceptacle is found in a wing of an articulus. In the latter, one or more conceptacles are on the flat surface or the outer margins of the wings of the reniform or sagittate articuli, Hence the fertile branches of the *Alatocladia* have articuli with a pair or more of conceptacles. Cf. Pl. LVI. figg. 5, 7 and 13 in "Cor. ver. Port Renfrew:" and Pl. II. figg. 12, 14 and 16 in "Cor. ver Japon."

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1) J. AG.: Spec. Alg. II. p. 549.

2) Syst. Uebersicht. p. 455.

3) Coral. ver. Japon. Pl. II. figg. 6, 8, 14 and 16: Cor. ver. Port. Renfrew. Pl. LVI. figg. 3 and 8.

There are, however, numerous species which have the normal conceptacles at the external margins of the articuli, displaying, in a manner, the link between the *Eucheilosporum* and the *Alatocladia*. *Cheilosporum yessoense* and *Cheil. latissimum* are the best examples. Cf. Pl. II. figg. 12 and 16, "Cor. ver. Japon." We should find some difficulty in reckoning the former species under the *Alatocladia*, had not some conceptacles been found on the flat surface of the articuli, before examining a microtome section of a conceptacle.

The sharp boundary between the two sections above mentioned is by no means easily delineated. In practice, however, we can distinguish them with the utmost safety by the size of the frond, the shape of the articuli and the locality of the plants. Almost all of the *Eucheilosporum* are inhabitants of warmer climates: the articuli are sagittate with sharp pointed wings; and the height of the frond hardly exceeds a few inches. These characters are of-course arbitrary and may not be clearly ascertained in some intermediate forms. Still they are often useful in determining a sterile plant.

SETCHELL and GARDNER,[1] after their long study, hold the opinion that *Cheil. frondescens*, etc., must be united to the formæ of *Amp. tuberculosa* ENDL. The present writer wishes to be allowed to add a few words concerning their view.

Cheilosporum (*Amphiroa*) *tuberculosum* is a peculiar plant. It has the characters of both the *Arthrocardia* and the *Alatocladia* in the external as well as in the internal points. DECAISNE[2] has already noticed that it belongs to the section *Arthrocardia*

1) Alg. N. W. Am. p. 360.
2) Mémoir. p. 110.

DCNE., and ARESCHOUG,[1] without hesitation, assigned the species to the genus *Amphiroa*. I[2] have enumerated it under the genus *Amphiroa* but with much uncertainty. The fronds have both sorts of articuli, the homogeneous cylindrical ones and the compressed reniform. These forms occur in different branches separately but frequently in the same branch. Cf. Pl. LI. "Cor. ver. Port Renfrew." The conceptacles are always found upon the flattened articuli, in the same manner as is characteristic of the *Alatocladia*. This character suggests *Cheilosporum* much more than it does *Amphiroa*. The microtomic section of the fertile articuli shows some conceptacles originate deep in the medulla and some apparently in the cortex. This fact greatly perplexed me in distinguishing the generic position of the plant, but I provisionally followed the opinion of ENDLICHER,[3] and reckoned it under *Amphiroa*. The reader may notice that the diagramatic figure[4] of the cross section of the articulus with four conceptacles is the only one figure in my former papers which does not give the boundaries in the fine dotted line between the medulla and the cortex. The origin of the spores in this species, as above mentioned, is uncertain in some degree. But the presence of the conceptacles exclusively on the compressed articuli is a character which suggests disposition as above. It might well be considered as a transitional form linking the *Alatocladia* to the *Arthrocardia*.

The reduction of a species to a forma or variety of a distinct species depends upon the view of the author. A character may be taken as specific or as formal. No one can judge which should

1) J. Ag.: Spec. Alg. II. p. 538.
2) Cor. ver. Port Renfrew. p. 714.
3) Mantissa. Suppl. III. p. 49.
4) Cor. ver. Port Renfrew. Pl. LVI. fig. 1.

be absolutely legitimate. But the reduction of the Canadian species to the formæ of *Cheilosporum tuberculosum*, as has been done by SETCHELL and GARDNER, is by no means acceptable. The latter species undoubtedly has variable characters, apparently fluctuating from one to the other; while the others have, not whithout reason, been described by many systematists for a long time as distinct species.

In my former paper on *Corallinæ* of Port Renfrew I had doubt regarding *Amp. epiphlegmoides* J. AG. But as I had not been fortunate enough to see the original specimen, I placed it provisionally under *Cheil.* (*Amphiroa*) *tuberculosum*. MADAM WEBER,[1] after examining the specimen in the British Museum, thinks it very likely that it is only a form of latter species, as I had supposed. Strengthened by her remark, I here reduce the species in question as synonymous with *Cheil. tuberculosum*.

Corallina palmata ELLIS et SOL. was transfered to *Arthrocardia* by ARESCHOUG. But I had no less doubt regarding his opinion in doing so when I compared the definition of *Arthrocardia palmata* ARESCH. with the description of *Corallina palmata* ELLIS et SOL. given by various authors. Lately I was fortunate enough through the kindness of MADAM WEBER VAN BOSSE to study the specimens, labelled "*Arthrocardia palmata* ARESCH." and "*Corallina palmata* ELLIS et SOL.," which were kept in the Herbarium of SURINGAR. After careful examination of the specimens, and referring to almost all of the literature concerning both species, I have come to the conclusion that the species *Arthrocardia palmata* ARESCH. is quite different from *Corallina palmata* ELLIS et SOL. SURINGAR's specimen of *Arth. palmata* is sterile. But it accords very well with the description of *Arth.*

1) Coral. Siboga Exp. p. 106.

palmata f. β of ARESCHOUG. It stands closely to *Cheil. planiusculum* YENDO, and the latter may well be taken as its variety. The difference lies in the shape of articuli; the axial articuli of the former having much more projected lobes, and those in the latter being nearly triangular. Hence the specific name *Corallina Filicula* should be reserved by priority. The illustration of *Cor. Filicula* delineated by KÜTZING in his Tab. Phyc. VIII. Taf. 60. fig. 1. seems to represent a different species.

Not a few of the present members have been unsatisfactorily defined. Some of DECAISNE'S species which he described from American plants should probably be reduced as synonymous with others, or some described by other authors afterwards may be identical with his. DECAISNE'S original definitions are often incomplete and good for more than two distinct forms. Actual examination of the authentic specimens is necessary to the solution of this problem.

Sect. III. **SERRATICARDIA** YENDO. Enumer. Cor. Alg. p. 193.

Cheilosporum maximum YENDO. Cor. ver. Jap. p. 21. Pl. II. fig. 18–19: Pl. VI. fig. 9.

C. McMillani YENDO. Cor. ver. Port Renfrew. p. 718. Pl. LII. fig. 4–5: Pl. LVI. fig. 11–14.

SPECIES DOUBTFUL.

Corallina officinalis L. *f. robusta* SETCH. et GARD. (nec Kjellm.) Alg. N. W. Amer. p. 365.

The present section is characterized by the peculiar position of the conceptacles. Those on the hexagonal articuli, mostly in pairs, show the relationship to the *Alatocladia*; those imbedded in the apices of the pinnated ramuli suggest a transition to *Corallina*. It differs from the latter genus by having the compressed con-

ceptacles as in the *Eucheilosporum*. The conceptaculiferous pinnules may be considered as the apices of the sagittate articuli enormously prolonged and finally jointed. I have formerly mentioned such a circumstance in a frond of the *Eucheilosporum*.[1]

SETCHELL and GARDNER[2] have doubted my species and think them the robust forms of *Corallina*. They hesitatingly referred *Cheil. McMillani* to a coarse form of Californian *Corallina*: and further stated that they could not find any conceptacles on the surface of the articuli of their *Corallina* except some which seemed that of *Choreonema*. A single glance at a section of the conceptacles under the microscope will determine whether it belongs to the plant proper or to the parasite. Pl. II. fig. 19. of "Cor. ver. Japon" shows the cross section of the conceptacles of *Cheil. maximum*. No one can confuse the comparatively conspicuous conceptacles of *Corallinæ* with the small sized ones of *Choreonema*. I am quite cunvinced by ARESCHOUG when he writes in J. AG's. Spec. Alg. II. p. 564 as follows: "Quæ sub hoc nomine (*Corallina officinali* L.) inde (e Capite bonæ spei) accepimus, sunt cum *Arthrocardiæ palmatæ*, tum *Arthrocardiæ corymbosæ* formæ juniores, quæ pro *Corallina officinali* ab incauto facile haberi possunt."

Gen. VI. **CORALLINA** LAMX.

= *Titanephillum* NARDO. (sec. ENDLICHER).

Although we can not find a detailed account, it is not hard to understand that it was on the following ground that SOLMS-

1) Cor. ver. Japon. p. 12. Cf. also Kütz.: Tab. Phyc. VIII. Tab. 54.
2) Alg. N. W. Amer. p. 365.

LAUBACH[1] united *Jania* LAMX. with *Corallina* LAMX. He noticed the pinnated ramuli in *Jania corniculata* and referred it to a variety of *Jania rubens*. He also, at the same time, remarked that the pinnation is a character which has hitherto played the important part in separating *Corallina* from *Jania*, which was defined as branching dichotomously.

I can not acquiese in the opinion that the pinnation of *Jania corniculata* LAMX. is identical in its nature with that of *Corallina*. The members of *Jania* seem to have the ability of issuing pinnate or subpinnate ramuli at the lower portion of a frond. *Jania micrarthrodia f. antennina* (KÜTZ.) is the actual example, besides the above mentioned species. Cf. Tab. Phyc. VIII. Taf. 84. fig. 1. Yet all the members of *Jania* are sharply defined as having the dichotomous branches at the apical portions of the fronds. The conceptacles of *Jania*, even in the pinnated fronds, are always found at the dichotomous points of the upper ramuli, or at the apical points. In *Corallina*, as a rule, they are at the ends of pinnæ or the pinnules. I cannot discover any necessity of uniting both genera simply for the reason that there is a species in a genus which shows, in a manner, a similar character to one found in the other genus; and more so, if this common character is a vegetative one. This circumstance suggests to us that both genera are related to one another and not that they must be united into one.

I held this opinion long ago and mentioned *Jania* as a subgenus in the list of Japanese Corallinaceæ.[2] But I found it better to restore the genus in LAMOUROUX's sense. The regularity of the dichotomous ramification, which is rarely disturbed, seems

1) Corallina. p. 6. foot note.
2) Enumeration of Cor. Alg. p. 193.

to have special signification in the phylogeny. The other characters limited to the group indicate generic rank rather than subgeneric.

DECAISNE and his followers ascribe the establishment of the genus *Corallina* to TOURNEFORT, while ARESCHOUG chooses LAMOUROUX as its founder. The latter author remarks that the genus *Corallina* in TOURNEFORT's sense comprised *Algæ* and *Zoophyte* together. I am inclined to think that the recent definition of *Corallina* is largely drawn from the elaborate work of LAMOUROUX.

Sect. I. OFFICINALES †

Corallina officinalis L. **f. typica** KJELLM. Alg. Arct. p. 86.
= *Corallina officinalis, a.* ARESCH. in J. AG. Spec. Alg. II. p. 562.
= *Cor. officinalis vulgaris* KÜTZ. Tab. Phyc. VIII. p. 32. Tab. 66. fig. 2.
= *Cor. officinalis* L. Fauna Suec. n. 2234. (sec. ARESCH. l. c.).
= *Cor. articulata* ELLIS. Coral. p. 60. t. 24. fig. a. A.
= *Cor. nana* ZANARD. Coral. p. 20. (sec. ZANARD. Iconogr.)
= *Cor. laxa* LAMK. Mem. Mus. II. p. 231.
= *Cor. spathulifera* KÜTZ. Spec. p. 709.
= *Cor. longicaulis* LAMK. Mem. Mus. II. p. 232.
= *Cor. officinalis* γ YENDO. Cor. ver. Jap. p. 29. Pl. III. fig. 13: Pl. VII. fig. 12.
= *Cor. officinalis f. typica* SETCH. et GARD. Alg. N. W. Amer. p. 364.

f. paltonophora KÜTZ. Tab. Phyc. VIII. p. 33. Tab. 68. fig. 2.
f. flexilis, KJELLM. Alg. Arct. p. 86.
f. robusta, KJELLM. l. c.
f. mediterranea KÜTZ. Tab. Phyc. VIII. p. 32. Tab. 66. fig. 3.
f. Farnoesis KÜTZ. l. c. p. 33. Tab. 68. fig. 1.
b. ARESCH. in J. AG. Spec. Alg. II. p. 563.
= *Cor. angelica* ELLIS et SOL. Coral. p. 63. t. 24. fig. 3.
= *Cor. elongata* ELLIS et SOL. l. c. p. 119.
c. ARESCH. in J. AG. Spec. Alg. II. p. 563.
= *Cor. nodularia* PALL. Elench. Zooph. p. 421.

= *Cor. loricata* ELLIS et SOL. Coral. p. 17.

α YENDO. Cor. ver. Jap. p. 28. Pl. III. fig. 11 : Pl. VII fig. 10.

? = *Corallina officinalis fastigiata* KÜTZ. Tab. Phyc. VIII. p. 32. Taf. 67. fig. 1.

β YENDO. Cor. ver. Jap. p. 28. Pl. III. fig. 12 : Pl. VII. fig. 11.

? = *Cor. officinalis elator* KÜTZ. Tab. Phyc. VIII. p. 32. Taf. 67. fig. 2.

θ **mediterranea** HAUCK. Meeresalgen. p. 281.

= *Cor. mediterranea* ARESCH. in J. AG. Spec. Alg. II. p. 568.

= *Cor. granifera* KÜTZ. (nec ELLIS et SOL., nec SOND.) Spec. p. 709.

= *Cor. densa* KÜTZ. Spec. p. 705.

var. chilensis KÜTZ. Tab. Phyc. VIII. p. 32. Taf. 66. fig. 1.

= *Cor. chilensis* DCNE. in Herb. Paris. (sec. HARV. Ner. Austr. p. 103).

= *Cor. officinalis δ* YENDO. Cor. v. Jap. Pl. VII. fig. 13.

var. profunda FARL. Mar. Alg. New Eng. p. 179.

Corallina squamata ELLIS et SOL. Coral. p. 117.

= *Cor. cupressina* LAMK. Mem. Mus. II. p. 233.

= *Cor. abietina* LAMK. l. c.

= *Amphiroa heterarthra* TREV. Flora. no. 27. p. 416. (sec. TREV.).

Cor. virgata ZANARD. KÜTZ : Phyc. Gen. p. 397.

= *Cor. attenuata* KÜTZ. Tab. VIII. p. 37. Tab. 77. fig. 1.

= *Cor. granifera* ELLIS et SOL. Coral. p. 120. t. 21. fig. c. C.

= *Cor. Bertiana* DE NOT. (sec. PREDA. Primo Contr. p. 80).

= *Cor. gibbosa* KÜTZ. Tab. Phyc. VIII. p. 39. Tab. 82. fig. 2.

Cor. ceratoides KÜTZ. Tab. Phyc. VIII. p. 36. Tab. 75. fig. 2.

Cor. elegans LENORM. in J. AG. Spec. Alg. II. p. 570.

Cor. pectinata LAMK. Mem Mus. II. p. 233.

Cor. pilulifera POST. et RUPR. Illustr. p. 20. t.40. fig. 101.

= *Cor. officinalis* L. *f. pilulifera* SETCH. et GARD. Alg. N. W. Amer. p. 366.

f. flabellata RUPR. Tange. p. 344.

f. filiformis RUPR. l. c.

f. Sororia RUPR. l. c.

f. intermedia YENDO. Cor. ver. Jap. p. 30. Pl. III. fig. 16 : Pl. VII. fig. 16.

f. arbuscula †

= *Cor. arbuscula* POST. et RUPR. Illustr. p. 20. Tab. 40. fig. 102.

Cor. capensis LEACH. in DECAISNE : Mémoir. p. 107.

= *Arthrocardia capensis* ARESCH. in J. AG. Spec. Alg. II. p. 552.

Cor. sessilis YENDO. Cor. ver. Jap. p. 32. Pl. III. fig. 18 : Pl. VII. fig. 18.
Cor. Berterii MONT. Flor. Chil. (sec. HARV.: Ner. Austr. p. 103),
Cor. kaifuensis YENDO. Cor. ver. Jap. p. 33. Pl. III. fig. 19 : Pl. VII. fig. 19.
Cor. confusa YENDO. l. c. p. 34. Pl. III. fig. 20 : Pl. VII. fig. 20.
Cor. armata HOOK. et HARV. Ner. Austr. p. 103. Pl. XL.
Cor. vancouveriensis YENDO. Cor. ver. Port Renfrew. p. 719. Pl. LIV. fig. 3 : Pl. LV. fig. 1–2 : Pl. LVI fig. 16–17.
= *Cor. officinalis f. multiramosa* SETCH. et GARD. Alg. N. W. Amer. p. 366.
f. typica YENDO. Cor. ver. Port Renfrew. p. 719. Pl. LIV. fig. 3 : Pl. LVI. fig. 16.
= *Cor. officinalis f. multiramosa subf. laxa* SETCH. et GARD. Alg. N. W. Amer. p. 367.
f. densa YENDO. Cor. ver. Port Renfrew. p. 719. Pl. LV. fig. 1 : Pl. LVI. fig. 17.
= *Cor. officinalis f.multiramosa subf. densa* SETCH. et GARD. Alg. N. W. Amer. p. 367.
Cor. aculeata YENDO. Cor. ver. Port Renfrew. p. 720. Pl. LV. fig. 3 : Pl. LVI. fig. 18–19.
= *Cor. officinalis f. aculeata* SETCH. et GARD. Alg. N. W. Amer. p. 367.

SPECIES DOUBTFUL.

Amphiroa variabilis HARV. Ner. Austr. p. 98.
= *Arthrocardia variabilis* W. v. B. Coral. Sib. Sxp. p. 106.
Corallina bifurca KÜTZ. Tab. Phyc. VIII. p. 41. Tab. 86. fig. 3.
Cor. lobata LAMX. Histoir. p. 285.
Cor. cubensis KÜTZ. Tab. Phyc. VIII. p. 37. Tab. 77. fig. 2.
= *Jania cubensis* MONT. (sec. KÜTZ : Spec. p. 708).
Cor. Deshaysii MONT. fide HARV. Ner. Austr. p. 103.
Cor. muscoides KÜTZ. Tab. Phyc. VIII. p. 42. Tab. 84. fig. 5
Cor. polychotoma LAMX. Histoir. p. 285.
Cor. simplex LAMX. l. c. p. 290. t. 10. fig. 4.
Cor. pinnata ELLIS et SOL. Coral. p. 117.
Cor. racemosa KÜTZ. Tab. Phyc. VIII. p. 41. Tab. 85. fig. 1.
Cor. hemisphærica FOSL. Nye Havsalg. Tromö Mus. Aarsh. X.
Cor. Calvadosii LAMX. Histoir. p. 290.
= *Cor. officinalis f. d.* ARESCH. in J. AG. Spec. Alg. II. p. 563.
Cor. palmata ELLIS et SOL. Coral. p. 118. Tab. 21. fig. a. A.
= *Cor. flabellata* KÜTZ. Tab. Phyc. VIII. Tab. 60. fig. 2.

The representative member of the present section, *Corallina officinalis* L., is universally distributed. The plant undergoes much morphological change according to the condition of the place where it grows. Numerous formæ have been described and many forms were mentioned as distinct species or varieties. The best authorities, however, agree in the opinion that many of the formæ are local variations and not worth mentioning separately. If a widely differing form be reduced to the variety or forma, because of some similarity to *Corallina officinalis* L., only a few species among those listed above may retain their specific position. There is no doubt, as I formerly mentioned, that the forms hitherto mentioned as *Corallina officinalis* may have been confounded with various distinct plants; or, on the contrary, some of the plants described as independent species may be reduced to formal or often to synonymous position. At present, however, the revision of the specimens of *Corallina officinalis*, reported from innumerable localities, is beyond my power. I must confine myself here to mentioning the formæ hitherto described with more or less exact definitions; and at the same time trying to make the nearest possible references thereof.

SETCHELL and GARDNER[1] combined *Coriallina pilulifera* POST. et RUPR., *Cor. vancouveriensis* mihi, and *Cor. aculeata* mihi, as the formæ of *Cor. officinalis* L., and mentioned a number of subformæ under them. It is a matter of personal preference whether the plants with such affinity should be taken as formæ or as distinct species. The plants, however, which have characters more or less constant and easily distinguishable from the typical forms of *Cor. officinalis* L. may be considered as distinct species.

1) Alg. N. W. Amer. p. 366.

Corallina sessilis is a peculiar plant. It was first described by the present writer in "Cor. ver. Japon." p. 32. Lately I also found it among a collection of *Corallina* from Australia, sent by DR. OKAMURA for determination.[1] The position and the form of the conceptacles show the characters of *Corallina*; and at the same time are referrible in some respects to both the *Serraticardia* and the *Alatocladia*. Cf. "Cor. ver. Japon." l. c. Judging from the description given by HARVEY in Ner. Austr. l. c., *Amphiroa variabilis* HARV., which was described from a sterile specimen, is probably related to this species.

ARESCHOUG doubted the generic position of *Cor. capensis* LEACH., but he provisionally included it under *Arthrocardia* ARESCH. He did not know the propagating organ of the species. There are two fertile specimens of "*Arthrocardia capensis* ARESCH." in SURINGAR'S Herbarium, collected at Cape Agulhas, South Africa. They differ slightly in minor points but evidently accord with the description given by ARESCHOUG in J. AG.'s Spec. Alg. II. p. 552, and one of them especially with *f.* β of ARESCHOUG. The conceptacles have a peculiar character resembling those of *Corallina sessilis* in general. As there has nothing been reported concerning the matter, it will not be superfluous to give some points in detail.

The articuli in the middle and upper portions are cuneate, more or less compressed above. Each upper corner of an articulus is mostly extended to a short spinous process. Very often we find one more process at the external side of the former situated very close and parallel. Both are never jointed, and are alike one to another. They elongate further, keeping their relative

1) Bot. Mag. Tokyo. Vol. XVIII. p. 92.

positions as before, but the inner one becoming gradually thicker and thicker, till finally it results in a pyriform, short-stiped conceptacle. The external process is now found at the lateral margin of the conceptacle, fused to the wall of the latter. The apex of the former is often found much more pronounced than the terminal end of the conceptacle, or, not infrequently, it takes place just upon the latter and thus the conceptacle seems to have apiculated.

The apparent difficulty in reckoning *Cor. sessilis* and *Cor. capensis* in the genus *Corallina* lies in the point that the conceptacles are not jointed. This character may suggest an extreme form of *Alatocladia* in some way. We must, however, remember that there are many conceptacles found in the *Officinales* without any joint to separate them from the axial articuli. Cf. "Cor. ver. Port Renfrew." Pl. LVI. fig. 16. I believe it will be safest to group these species under the present section, as I could not discover any conceptacle upon the surface of the hexagonal articuli of the axial stems.

Corallina palmata ELLIS et SOL. is a doubtful plant, as has been stated before (p. 26). GRUNOW mentions *Arthrocardia palmata* ARESCH. in the list of plants collected during the Novara Expedition (p. 79): and remark that the plant is similar to *Cor. flabellata* KÜTZ. illustrated in Tab. Phyc. VIII. Tab. 60. The specimen bearing the name of "*Corallina palmata* ELLIS et SOL.," kept in SURINGAR'S Herbarium, accords very well with the description of *Cor. palmata* ELLIS et SOL. and at the same time with the figures of *Cor. flabellata* KÜTZ. l. c. It is far from doubtful that this species should be better placed near *Amp. corymbosa* under the section *Arthrocardia*.

Most of the other doubtful speciee in the above list are

unsatisfactorily described, or referred to sterile specimens. *Cor. hemisphærica* Fosl. seems an unfixed local from of *Cor. officinalis* L.

Sect. II. **HALIPTYLON** Dcne. (Mut. strict.) Mémoir. p. 111.

Corallina Cuvieri Lamx. *a Cuvieri* Aresch. in J. Ag. Spec. Alg. II. p. 572.
= *Corallina Cuvieri* Lamx. Expos. Method. p. 24. t. 69. fig. 13–14.
= *Jania Cuvieri* Dcne. Mémoir. p. 111.
= *Jania granifera* Sond. Plant. Preiss. II. p. 187.
? = *Jania granifera* Dcne. Mémoir. p. 111.
β. **crispata** Aresch. in J. Ag. Spec. Alg. II. p. 572.
= *Cor. crispata* Lamx. Histoir. p. 289. t. 10. fig. 3.
= *Jania crispata* Dcne. Mémoir. p. 111.
= *Jania subulata β crispata* Harv. (sec. Sond. Plant. Müll. Cont. p. 522.)
δ. **subulata** Aresch. emend. in J. Ag. Spec. Alg. II. p. 572.
= *Cor. subulata* Ellis et Sol. Coral. p. 120. t. 21. fig. B.
= *Jania subulata* Sond. Plant. Preiss. II. p. 186.
= *Cor. Cuvieri β subulata* Kütz. Tab. Phyc. VIII. p. 33. Tab. 70. fig. II.
f. denudata Sond. Plant. Müll. Cont. p. 521.
= *Cor. denudata* Kütz. Tab. Phyc. VIII. p. 34. Tab. 73.
f. densa †
= *Cor. gracilis f. densa* Collins. Phyc. Bor. Amer. no. 650.
var. calliptera Grun. Novara Exp. p. 78.
= *Cor. calliptera* Kütz. Spec. p. 705.
= *Cor. gracilis* Collins, Hold. et Setch. Phyc. Bor. Amer. no. 399.
Cor. rosea Lamx. Mém. Mus. 1. p. 235.
= *Jania rosea* Dcne. Mémoir. p. 111.
Cor. pilifera Lamx. Histoir. p. 290.
Cor. trichocarpa Kütz. Tab. Phyc. VIII. p. 35. Tab. 74. fig. 1.
Cor. clavigera Kütz. Tab. Phyc. VIII. p. 36. Tab. 75. fig. 1.
Cor. pistillaris Aresch. J. Ag. Spec. II. 574.
= *Jania pistillaris* Mont. Pôle Sud. Bot. p. 147.
Cor. Hombronii Kütz. Spec. p. 708.
= *Jania Hombronii* Mont. Pôle Sud. Bot. p. 146.

SPECIES DOUBTFUL.

Corallina gracilis LAMX. Histoir. p. 288. t. 10. fig. 1. a. B.
= *Jania gracilis* MONT. Pôle Sud. Bot. p. 147.
Jania elegans DCNE. Mémoir. p. 111.
Cor. Turneri LAMX. Histoir. p. 289. t. 10. f. 2. a. B.
= *Cor. Cuvieri* γ *Turneri* KÜTZ. Tab. Phyc. VIII. p. 34. Tab. 70. fig. 2. h.
Cor. paniculata LAMX. Freyc. Voy. p. 626.
= *Jania paniculata* DCNE. Mémoir. p. 111.
Cor. plumifera KÜTZ. Spec. p. 705.
Cor. rosea LAMX. β *crispa* KÜTZ. Spec. p. 708.

This division is characterized by the dense ramuli aggregated on both sides of the main branches. Morphologically speaking, the segments corresponding to the pinnæ as well as to the pinnules of the *Officinales* are stunted in the present group, forming a sort of "kurztrieb." The simpler form suggests close affinity with the preceding section and there can be no sharp line drawn between the two. *Corallina Cuvieri var. calliptera, Cor. rosea,* etc., of this section are closely related to *Cor. Berterii* of the preceding section. Some vexatious and erroneous references, as a consequence, have been made in the genus. For example, *Jania granifera* SOND. was taken by ARESCHOUG[1] as synonymous with *Cor. Cuvieri* LAMX.; KÜTZING[2] transferred the former to the genus *Corallina* keeping the original specific name: finally *Corallina granifera* KÜTZ. was referred by HAUCK[3] to *Cor. officinalis* L. Consequently, if these referrences have all been correctly made, *Cor. Cuvieri* LAMX. must be united with *Cor. officinalis* L., or at least there must be a close similarity between both species, which can not be readily admitted.

1) J. AG. Spec. Alg. II. p. 572.
2) Spec. Alg. p. 708.
3) Meeresalg. p. 281.

DECAISNE assigned some of the members of the present section to the genus *Jania*. LAMOUROUX's original definition of *Jania*, which was followed by many distinguished systematists, can by no means include the present section. ARESCHOUG wisely reckoned them under *Corallina* instead of *Jania*.

Corallina gracilis LAMX. has been held in doubt by ARESCHOUG.[2] This species has not been fully defined and is hardly referrible to other plants without authentic specimens. In Phyc. Bor.-Amer.[3] this name is assigned to one of the plants. The specimen is more applicable to *Cor. Cuvieri var. calliptera* GRUN. than the imperfectly described species of LAMOUROUX. COLLINS mentioned, in no. 650. of the same exsiccate, a plant bearing the name of *Corallina gracilis* LAMX. *var. densa* COLLINS. But the plant labelled no. 650 b. in the copy kept in my herbarium is quite distinct from the type species with regard to the characters of the articuli of the axial stems. It is related in several respects to a form of *Cor. Cuvieri*. It probably belongs to an undescribed species and must wait further study with a large stock of specimens. The specimen labelled 650. a. contains many fragments of distinct forms, all of which it is improper to refer to no. 650.

Almost all of the members of this section are inhabitants of the Australian seas.

Gen. VII. **JANIA** LAMX.

Jania adhærens LAMX. Histoir. p. 270.
= *Corallina adhærens* KÜTZ. Spec. p. 710.
J. decussato-dichotoma †

1) Mémoir. p. 111.
2) J. AG. Spec. Alg. II. p. 572.
3) COLLINS, HOLDEN and SETCHELL. No. 399.

= *Cor. decussato-dichotoma* YENDO. Cor. v. Jap. p. 25. Pl. III. fig. 1–3 : Pl. VII. fig. 3–4.
= *Cor. adhærens* KÜTZ. p. p. Tab. Phyc. VIII. p. 40. t. 83.

J. micrarthrodia LAMX. *α* **tenuissima** ARESCH. in J. AG. Spec. Alg. II. p. 555.
= *Cor. tenuissima* KÜTZ. Tab. Phyc. VIII. p. 40. Tab. 84. fig. 3.
= *Jania tenuissima* SOND. Plant. Preiss. p. 39.

f. antennina †
= *J. micrarthrodia β* ARESCH. in J. AG. Spec. Alg. II. p. 555.
= *J. micrarthrodia* LAMX. Histoir. p. 271. t. 9. fig. 5. a. B.
= *J. antennina* KÜTZ. Phyc. Gen. p. 389.
= *Cor. antennina* KÜTZ. Tab. Phyc. VIII. p. 40. Tab. 84. fig. 1.

J. rubens LAMX. Histoir. p. 272.
= *Cor. rubens* L. Syst. Natur. ed. 12. Vol. I. p. 1304.
= *Cor. dichotoma* ELLIS et SOL. Coral. p. 65. t. 24. fig. f. F.
= *J. cristata* ENDL. Mantissa. Suppl. III. p. 49.
= *J. rubens C cristata* LAMX. Histoir. p. 272.
= *Cor. cristata* ELLIS. Coral. t. 27. n. 7.
= *Cor. rubens cristata* KÜTZ. Tab. Phyc. VIII. p. 38. Tab. 80. fig. 2.

E concatenata LAMX. Histoir. p. 273.
= *Cor. rubens β concatenata* KÜTZ. Tab. Phyc. VIII. p. 40. Tab. 84. fig. 4.
= *Cor. intermedia* KÜTZ. Tab. Phyc. VIII. p. 37. Tab. 79. fig. 1 : p. 42. Tab. 86. fig. 4.

var. corniculata †
= *Cor. corniculata* L. Syst. Natur. ed. 12. Vol. I. p. 1305.
= *J. corniculata* LAMX. Histoir. p.
= *Cor. corniculata* ELLIS et SOL. Coral. p. 121. t. 24. fig. d. D.
= *Cor. alba* ELLIS. Coral. p. 65. t. 24. fig. d. D.
= *J. pulumula* ZANARD. Coral. p. 21.
= *Cor. plumula* KÜTZ. Tab. Phyc. VIII. p. 41. Tab. 86. fig. 1.
= *Cor. rubens var. corniculata* HAUCK. Meersalg. p. 279.

J. longifurca ZANARD. Coral. p. 21.
= *Cor. longifurca* ZANARD. Iconogr. II. p. 63. Tab. 56.

J. capillacea, HARV. Ner. Bor. Amer. II. p. 84.

J. ungulata †
= *Cor. ungulata* YENDO. Cor. ver. Jap. p. 26. Pl. III. fig. 7–8 : Pl. VII. fig. 8.

f. brevior †
= *Cor. ungulata f. brevior* YENDO. l. c. p. 27. Pl. III. fig. 9 : Pl. VII. fig. 9.

J. purpurata BLAINV. in KÜTZ. Spec. Alg. p. 710.
= *Cor. purpurata* LAMK. Mem. Mus. II. p. 237.
J. crassa LAMX. Expos. Method. p. 23. t. 69. f. 9–10.
= *J. micrarthrodia* LAMX. δ. ARESCH. J. AG. Spec. Alg. II. p. 555.
= *Cor. crassa* COLL. Phyc. Bor. Amer, no. 500.
J. nipponica †
= *Cor. nipponica* YENDO. Cor. ver. Jap. p. 23. Pl. II. fig. 20: Pl. VII. fig. 1.
J. pacifica ARESCH. in J. AG. Spec. Alg. II. p. 556.
J. fastigiata HARV. Ner. Austr. p. 107.
J. natalensis HARV. l. c.
= *Cor. natalensis* KÜTZ. Tab. Phyc. VIII. p. 38. Tab. 79. fig. 2.
J. yenoshimensis †
= *Cor. yenoshimensis* YENDO. Cor. ver. Jap. p. 23. Pl. II. fig. 21–24: Pl. VII. fig. 2.
J. Novæ Zelandiæ HARV. Fl. N. Z. II. p. 237. (sec. Hooker: Handbook. p. 2.)
J. affinis HARV. (sec. SONDER: Alg. Austr. p. 21.)
J. spermaphros KÜTZ. Spec. p. 708.
= *J. rubens var. D. spermaphros* LAMX. Histoir. p. 272.
= *J. rubens var. B. pyrifera* LAMX. l. c.
= *Cor. spermaphros* ELLIS. Coral. p. 122. Tab. 24. fig. g.
J. arborescens †
= *Cor. arbrescens* YENDO. Cor. ver. Jap. p. 25. Pl. III. fig. 5: Pl. VII. fig. 5.
J. tenella GRUN. Novara Exp. p. 78.
= *Cor. tenella* KÜTZ. Tab. Phyc. VIII. p. 41. Tab. 85. fig. 2.
J. radiata †
Cor. radiata YENDO. Cor. ver. Jap. p. 26. Pl. III. fig. 6. Pl. VII. fig. 7.
J. pusilla †
= *Cor. pusilla* SOND. Alg. Austr. p. 21.
= *Cor. nana* LENORM. (sec. l. c.)
= *Cor. Lenormandiana* GRUN. (?) ?

SPECIES DOUBTFUL.

J. pygmæa LAMX. Histoir. p. 269. t. 9. fig. 1.
= *Cor. pygmæa* KÜTZ. Tab. Phyc. VIII. p. 37. Tab. 78. fig. 3.
J. pumila LAMX. Histoir. p. 269. t. 9. fig. 2.
= *Cor. pumila* KÜTZ. Tab. Phyc. VIII. p. 39. Tab. 83. fig. 1.
J. pedunculata LAMX. Histoir. p. 269. t. 9. fig. 3. *α. β.*
= *Cor. pedunculata* KÜTZ. Tab. Phyc. VIII. p. 37. Tab. 78. fig. 2.

J. verrucosa LAMX. Histoir. p. 269. t. 9. fig. 4. *a*. *β*.
= *Cor. verrucosa* KÜTZ. Tab. Phyc. VIII. p. 38. Tab. 80. fig. 3.
J. parvula ZANARD. Coral p. 21.
J. gibbosa LAMX. Histoir. p. 269.
J. compressa LAMX. Freyc. Voy. p. 624. t. 90. fig. 8–10.
Cor. constricta KÜTZ. Tab. Phyc. VIII. p. 40. Taf. 84. fig. 2.
Cor. tridens KUTZ. Tab. Phyc. VIII. p. 41. Taf. 85. fig. 3.

This genus is sharply distinguished from the others by the great delicacy of its fronds and the regular ramification. The greatest number of the species ramify dichotomously in a plane. *J. decussato-dichotoma* branches in an aberrant manner as was described in my former paper.[1] And it is highly probable that this species has been hitherto reckoned among *J. adhœrens* LAMX. There are many species closely related to *J. adhœrens* LAMX., found in the warmer parts of the Atlantic and the Pacific Ocean, such as *J. capillacea*, *J. micrarthrodia f. antennina*, *J. micrarthrodia f. tennissima*, *J. tenella*, *J. novæ-Zelandœ* and *J. ungulata*. The essential distinguishing character lies in the relative size of the articuli. It is a question whether or not it is worthy to serve as a specific character. *J. adhœrens* LAMX. seems to undergo some change in the minor character. This species stands in the present genus in the same relation as *Corallina officinalis* L. in the *Officinales*.

The articuli are, in the majority of the genus, cylindrical, a few only have compressed ancipitous, and some, slightly complanated articuli. The pinnate ramules, as has been already remarked, are frequently found at the basal and middle portions of *J. rubens var. corniculata* and *J. micrathrodia f. antennina*. At the base of certain species a sort of a delicate ramulet is found in a form of the rhizoidal processes. These ramulets are proliferated

1) Study of Genicula. p. 8.

from the lateral surface of the basal articuli and seem to be of the same nature as those found in some *Corallina*.

J. adhærens, *J. pusilla*, *J. radiata*, etc., are always found epiphytic upon other algæ. The first one and some of its allies are mostly upon *Digenia simplex* AG. and the latter two upon *Sargassum*, *Cystophyllum*, *Cystophora* or other brown algæ.

I have several specimens of *J. pusilla* SOND. kindly sent by MAJOR REINBOLD, PROF. MIYABE and others. They seem to have been distributed from the herbarium of DR. F. von MÜLLER, and are named "*Corallina Lenormandiana*=*Cor. nana* LENORM. nec ZANARD." The author of the species was not mentioned with any of the specimens. I am not certain where LENORMAND mentioned the plant. In asking MR. REINBOLD about the matter a few years ago, he answered that he thought the author of *Cor. Lenormandiana* is probably GRUNOW, but not quite sure. So far as I could ascertain, the specific name has never been published.

TOKYO, MAY, 1905.

SPECIES INDEX.

ERRATA.

P. 4. Insert next to "α fusoides (ARESCH.)"
= Amp. Gaillonii KRAUSS. Beitr. Flor. Caput. p. 206.
P. 5. for "= Amp. Goddefroyi GRUN." read "= Amp. Godeffroyi GRUN."
P. 8. for "= Ampiroa corymbosa HARV." read "= Amphiroa corymbosa HARV."
,, for "Amphiroa constricta KÜTZ." read "Amphiroa contracta KÜTZ."
,, insert next to "Corallina frondescens KÜTZ." etc.
Corallina Filicula f. ramosissima KÜTZ. Spec. p. 707.
P. 29. for "f. Farnoensis KÜTZ." etc., read "f. faroensis KÜTZ." etc.
P. 38. for "= J. pulumula ZANARD." read "= J. plumula ZANARD."