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Notes on Some Japanese Algae V.

By

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With Plates X—XIII.

Bornetella ovalis sp. nov.

Syn. *B. capitata* Okamura (non J. Agardh), Icon. of Japan. alg. vol. 1 (1908) p. 225, pl. 44, figs. 1–10.

Japanese name. Midutama.

Hab. Ryukyu.

Frond solitary, oval or obovate in shape, 0.5–1.0 cm high, provided with a very short simple stipe ending in an irregularly ramified attaching organ, very slightly encrusted with chalk. Axial segment reaches as high as the middle part of the whole length of the frond. The number of the branches of the first order in a whirl varies around 18. They ramify again making polygonal cells which form a facetted cortex. Those cells are mostly pentagonal, hexagonal or heptagonal with a diameter of about 380μ on an average. The side wall of those cells shows no special thickenings. Aplanosporangia are produced on the side of the upper parts of the branches of the first order. They are spherical or shortly pear-shaped, about 180–220μ in length, 3–8 being produced on every one branch.

Okamura gives good figures of a *Bornetella* from Ryukyu under the name of *B. capitata* J. Agardh. At that time he probably could not obtain any specimens with aplanosporangia because there is no figure of them in the plate cited above. I myself collected a good number of specimens of *Bornetella* in the islands among which there are many fertile ones. They coincide very well with Okamura's figures in vegetative characteristics and as I have never seen any other *Bornetella* from these islands, there is scarcely any doubt about the identity of our specimens with those of Okamura. Judging from the characteristics of aplanosporangia found in our specimens, however, the present *Bornetella* can not be identified with *B. capitata* J.

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Agardh because this species has ellipsoidal or oblong aplanosporangia while ours show spherical or shortly pear-shaped ones. Among other species already described, *B. sphaerica* Zanard. seems to be related most nearly to our plant. I have not been able to examine any authentic specimens of *B. sphaerica* Zanard. for comparison, but judging from the description and figure given in Solmes's work,* this species has a spherical frond which is sessile, and the aplanosporangia, though they are spherical in shape as in our species, are produced not on the upper parts of the branches of the first order. As mentioned above our plant possesses a stipe, though very short, and can not be called sessile. Aplanosporangia of our specimens occupy the upper parts of the branches of the first order being situated near the periphery of the frond.

Caulacanthus Okamurai sp. nov.

Syn. *Endocladia complanata* Okamura (non Harvey), Icon. of Japan. alg. vol. 1 (1908) p. 129, pl. 27, figs. 12–20, pl. 28, figs. 13–17.

Japanese name. Isodantû.

Hab. From Hokkaidô down to Formosa.

Okamura gives good figures of the present species in his Icones, and referred it to *Endocladia complanata* Harv. whose type specimen had been collected by C. Wright in the Ryukyu Islands, and described by Harvey with a very short diagnosis.** Very fortunately I have examined the original specimens of Harvey from Ryukyu. I have come to the conclusion that they are the same as what used to be called *Gloiopeltis cervicornis* Schm. and quite different from Okamura's *Endocladia complanata*.***

From *C. indicus* Weber van Bosse the present species is separable by the fact that the dimorphism between the sterile and tetraspore bearing parts of the frond is not so evident in our species as in *C. indicus* Weber van Bosse. On the other hand *C. spinellus* Kg. and *C. ustulatus* Kg. seem closely related to *C. Okamurai*, but both have a thicker frond than the new species.

I have referred the present plant to the genus *Caulacanthus* instead of *Endocladia*, without having been able to see any cystocarpic

* SOLMES LAUBACH, Ueber die Algengen. Cymopolia, Neomeris u. Bornetella (Ann. du Jard. Bot. Buitenzorg vol. 11, 1892) pl. 9.

** HARVEY, Char. of new alg. from Japan (1854) p. 332.

*** YAMADA, Notes on Some Japan. alg. III, p. 117.

specimens. But the strong resemblance of the anatomical characteristics of our specimens to those of *C. spinellus* Kg. lead me to think that it is more reasonable to do so than to call our specimens *Endocladia Okamurai.*

Caulacanthus spinellus (Hooker et Harvey) Kützing.

Spec. alg. (1849) p. 753, Tab. phyc. vol. 18 (1868) pl. 8; Börgesen, Easter Isl. alg. in Nat. Hist. of Juan Fernandez and Easter Isl. edited by C. Skottsberg, vol. 2, No. 9 (1924) p. 266.

Hab. Sansyôkaku, Formosa (T. Aoki).

Frond cylindrical, about 2 cm high, ramifying repeatedly and irregularly, forming a loose mass. Branches adhering to each other by means of short hapters occurring even near the end of branches; branchlets spine-like, often secundly disposed.

C. indicus Weber van Bosse which was found in the Malay Archipelage seems to me to be related very closely to the present species, both species showing dimorphism in the sterile and fertile parts of the frond. But the fertile parts of the Malayan specimens are much thicker than that of the present species. Furthermore in Weber van Bosse's species branches attach to other algae so tightly that it is difficult to separate it from other algae without damage, while that is not the case in the present species.

Chrysymenia pacifica sp. nov.

Pl. X.

Frons 11.5 cm alta, teretiuscula?, ad basin ca 2 mm crassa, sursum incrassata, ca 9 mm attingens, repetite pinnatim ramosa, hic illic adnata, lineamentum flabellatum formans; pinnis pinnulisque alternatis sursum gradatim tenuioribus, basi constrictis; ramulis ultimis saepe lanceolatis vel longe ovatis, apice acutis. Frons ex duobus stratis composita; strati exterii 2–3 seriebus cellularum minorum corticarum, et interiori 2–4 seriebus cellularum magnarum constati; cavi centrali filis tenuibus dichtomis longitudinaliter percursi. Tetrasporangia per superficiem frondis sparsa. Cystocarpia ignota.

Japanese name. Futo-taoyagisô.

Hab. Ôsima, Kii Prov. (in the Herb. of Y. Okada).

Frond 11.5 cm high, nearly cylindrical?, about 2 mm thick near the base, becoming thicker upwards attaining the width of about 9 mm in the thickest part, repeatedly pinnately branched, making a flabellate outline in general; pinnae and pinnules alternate, decreasing very gradually in thickness, constricting at the base; ultimate branchlets often lanceolate or longly ovate ending in an acute apex. Pinnae and pinnules adhere here and there to other things or to each other. Anatomically the frond composed of two kinds of cell layers and of the central cavity; the outermost layer made up of two to three rows of small coloured cells and the inner of two to four rows of larger colourless cells. The central cavity loosely filled with ramified thin rhizoidal filaments mainly running longitudinally. Tetraspores scattered all over the surface of the frond. Cystocarps unknown.

Very unfortunately there is only one dried specimen before us.

Corallopsis Opuntia J. Agardh

Epicr. syst. Flor. (1876) p. 409; De Toni, Syll. alg. vol. 4 (1900) p. 459.

Syn. *C. Cacalia* Harvey (non J. Agardh), Alg. Ceyl. No. 30.

Japanese name. Fusikure-nori.

Hab. Formosa (Miyagami).

In the herbarium of J. Agardh at Lund I have compared our only specimen from the locality mentioned above with the authentic specimens of the present species. Among J. Agardh's specimens there is also kept Harvey's Ceylon algae No. 30, which was quoted by J. Agardh as a synonym of *C. Opuntia* J. Ag. This Ceylon specimen coincides fairly well with ours in habit.

Farlowia irregularis sp. nov.

Pl. XI.

Frons caespitosa, ex basi verrucosis exsurgens, magna, usque ad 25 cm alta, ad basin frondis compressa et aliquantum tenuis, sed sursum complanata atque dilatata, irregulariter di- tri- polychotome ramosa, vel pinnatim divisa; ramulis saepe irregulariter fasciculatis in parte superiorem frondis, ramulis ultimis acutis; segmentis saepe hic illic irregulariter dilatatis. Cystocarpi et tetrasporangii ignoti.

Japanese name. Nise-karekigusa.

Hab. Kunasiri Isl., Kuriles (Y. Okada); Akkesi, Kusiro Prov.

Frond caespitose, numerous shoots arising from the same verrucous base, large, attaining 25 cm in hight, near the base the frond compressed and rather slender, becoming complanated and wider upwards, soon dividing dichotomously or irregularly or tri- to polychotomously, or sending branches in pinnate manner with wide angle, but branches in the upper part of the frond often fasciculate, and ramified repeatedly and irregularly, and ending in ultimate branchlets mostly with acute apex, sometimes in short spine-like ones; segments except near the base of the frond often becoming irregularly wider (sometimes 0.5–1.0 cm) here and there. Cystocarps and tetraspores unknown. Plant deep red in colour but turning darker after drying; substance carnose but rather week in fresh state and the frond adhering to paper when dried except near the base.

The present species grows abundantly on rocks in the littoral zone near the Biological Station of Akkesi, and Mr. Y. Okada collected it in Kunasiri Island, Kuriles. Although I have not been able to see any fertile specimens, the anatomical structure of the present plant agrees very well with that of *Farlowia* species from the American coast, and so it seems that this is most probably a member of this genus.

So far as the writer is aware three species have been referred to *Farlowia*: *F. compressa* J. Ag., *F. mollis* Farlow et Setch. and *F. crassa* J. Ag. of which *F. compressa* J. Ag. I have myself collected on the California coast and *F. mollis* was examined in the numbers 898 and 1150 of Phyc. Bor. Amer. Both seem different from *F. irregularis* by the ramification usually lacking the fasciculate branches on the upper part of the frond. Of the last species I have no authentic specimen for comparison, but judging from the description of J. Agardh it seems to be different from the present species.

Gracilaria crassa Harvey

Pl. XIII., Fig. 1.

Alg. Ceyl. No. 29; J. Agardh, Epicr. syst. Flor. (1876) p. 417; De Toni, Syll. alg. vol. 4 (1900) p. 439; Weber van Bosse, Liste des alg. du Siboga, vol. 4 (1928), p. 431.

Japanese name. Taiwan-ogonori.

Hab. Nekobana (T. Aoki) and Garanbi, Formosa.

In several herbaria in Europe the present writer has compared his specimens with number 29 of Harvey's Ceylon algae and believes that they belong to the present species.

Liagora orientalis J. Agardh

Pl. XII.

Anal. alg. vol. 3 (1896) p. 99; De Toni, Syll. alg. vol. 4 (1897) p. 86.

Japanese name. Fusa-konahada.

Hab. Daibanratu, Formosa.

Frond about 18 cm high, cylindrical, about 1.5–2.0 mm thick near the base, very gradually tapering upwards, paniculately branched; branches of the first order attaining about 13 cm; branches and branchlets again ramifying in racemose manner; ultimate branchlets often curved, provided with obtuse apex. Frond extremly lubricous, very strongly incrusted with lime, adhering very closely to paper in drying.

The central axis composed of thick cylindrical cells and thin rhizoidal cells running between them. The former cells about 30–45μ in diam., and the latter about 7μ thick, undulate and ramifying here and there. Assimilating filaments very long, ramifying in dichotomous manner and issuing from the end of thick cells making up the central axis. Ramification of assimilating filaments scarce near the base, but becoming more frequent upwards. Cells of assimilating filaments constricted at dissepiments, thin and elongate-cylindrical in their lower parts, about 7μ thick, 10–12 times as long as diameter, but becoming thicker and shorter upwards, nearly oval near the end of assimilating filaments.

Antheridia situated on the top of assimilating filaments as small spherical bodies, about 2–3μ in diameter. Hyaline hairs occur often at the extremity of assimilating filaments.

In the herbarium of J. Agardh at Lund I have seen the original specimens of the present species which were collected by Ferguson in Ceylon. There are about twenty specimens from the same locality in that herbarium, Nos. 32251–32270. Our specimen from Formosa coincides very well with Nos. 32252 and 32262 in outer appearance. In the same cover, however, there are beside them three specimens from other localities. Nos. 32272 and 32273 were collected by Wilson at "Western point" and "Port Phillip Head" and bear J. Agardh's

handwriting "*L. australasica* Sond." (32272) and "Cum *L. australasica* comparanda" (32273) respectively. No. 32275 is a specimen which was brought by C. Wright from Ryukyu, Japan. It shows some likeness to *L. ceranoides* Lamx. in habit, but its frond is much thicker and stronger than Lamouroux's species.

Liagora pinnata Harvey

Ner. Bor. Amer. vol. 2 (1853) p. 138; J. Agardh, Epicr. syst. Flor. (1876) p. 511, Anal. alg. cont. 3 (1896) p. 108; Börgesen, Mar. alg. of West Ind. vol. 3 (1915) p. 74.

Japanese name. Hane-konahada.

Hab. Platas Island.

Of this species there is preserved only one specimen in Yendo's herbarium in Tokyo. It is rather badly prepared but judging from the ramification and the characteristics of assimilating filaments I refer it to *L. pinnata* Harv. In 1925 I also found this species in Saipan, the Marianna Islands and came to believe that it is distributed also in the tropical Pacific, though, so far as I am aware, it has not been reported hitherto from this region.

Phycodrys radicosa (Okamura) Yamada et Inagaki comb. nov.

Syn. *Delesseria radicosa* Okamura, Contr. knowl. mar. alg. Japan. II. (Bot. Mag. Tokyo, vol. 10, 1896) p. 25, pl. 3. figs. 5–7.

Japanese name. Hime-konohanori.

Hab. Osyoro, Siribesi Prov.; Hakodate, Osima Prov.

Polysiphonia Harlandii Harvey

Pl. XIII., Fig. 3.

Charac. of new alg. (Proceed. Amer. Acad. vol. 4, 1859) p. 330; J. Agardh, Spec. alg. vol. 2, part 3, (1863) p. 1063; De Toni, Syll. alg. vol. 4 (1903) p. 913.

Japanese name. Taiwan-itogusa.

Hab. Kelung, Formosa.

There are two sets of specimens before us which I have referred to the present species. One was collected myself at Kelung, and the other is represented by only one small specimen collected by Mr. T. Aoki at an unrecorded place in Formosa. The specimens

from Kelung are much higher than the other, the former being about 6 cm high while the latter scarcely attains a hight of 2.5 cm.

I was fortunate enough to have been able to compare these specimens with the type specimen of Harvey at Dublin and came to the conclusion that the Formosan specimens were to be referred to the present species.

Ptilonia Okadai sp. nov.

Pl. XIII., Fig. 2.

Frons ca 5 cm alta, ca 3 mm lata, tenue membrancacea, non costata vel ad basin frondis obscure costata, pinnatim decomposita; pinnis alternis sursum gradatim angustioribus, margine pinnulis brevibus ornatis; pinnulis alternatis, spinescentibus, apice acutis vel 2-3-partitis. Cystocarpi parvi, sphaerici vel breve ellipsoidei, ad apicem pinnularum ornati.

Japanese name. Hiroha-tamaitadaki.

Hab. Ommaegasaki, Tôtômi Prov. (Y. Okada).

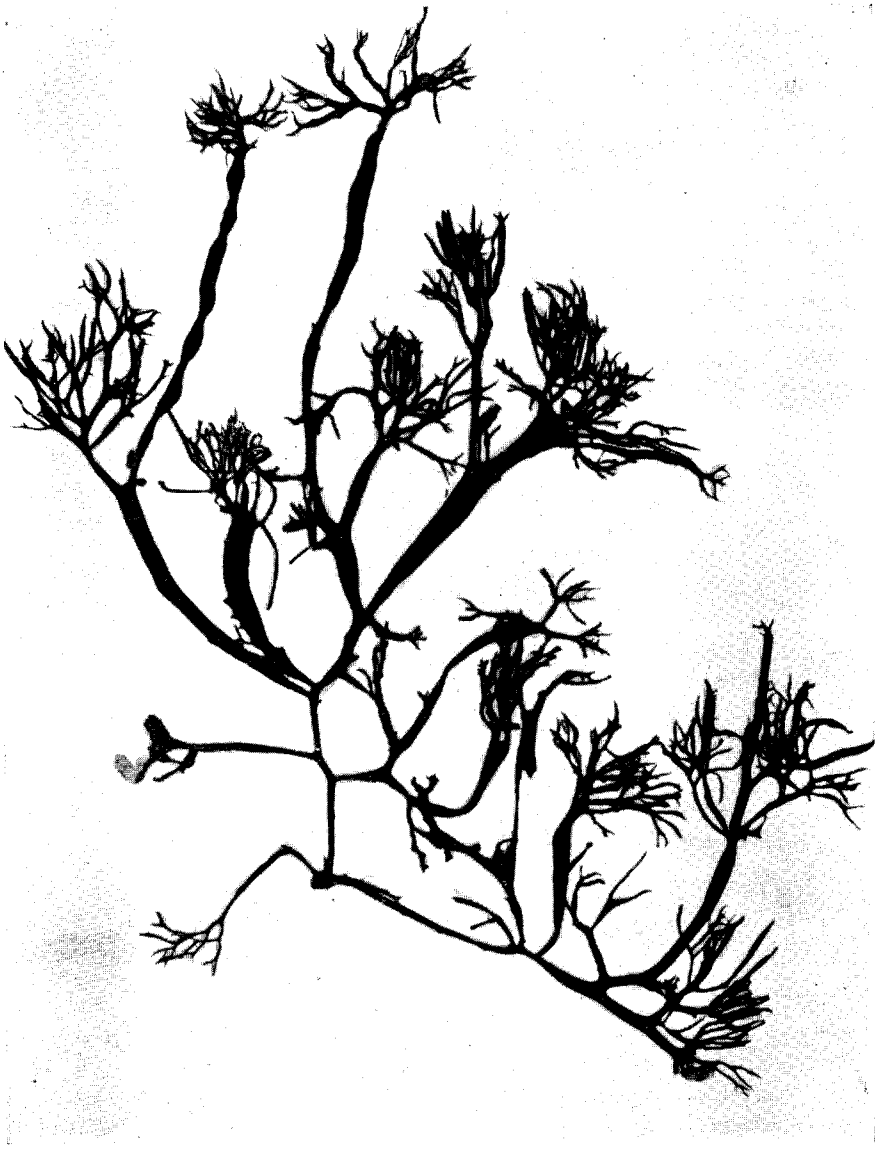
Frond about 5 cm high, about 3 mm wide in the widest part, thinly membranous in dried specimens, not costata or very dimly costata in the lower parts of the frond, decomposite-pinnate; pinnae alternate, becoming very gradually narrower upwards, set with short pinnules on the margins; pinnules alternate, spine-like and ending in an acute apex, or divided into 2–3 parts. Cystocarps spherical or shortly elliptical, rather small, scarcely 1 mm long, produced on the top of pinnules. Substance soft, adhering very closely to paper in drying, very easily decaying when soaked in water again. Colour pinkish or darker.

There are only two specimens mounted on paper before us. One is a nearly complete specimen having been picked from the base or at least near the very base of the frond. But very regrettably the attaching organ is very obscure being dried and firmly adhering to paper, and completely destitute of the midrib. The other is a fragment and slightly thicker than the former showing a very faint midrib. Both specimens were obtained from the deep see, about 40 fathoms. The structure of the frond and cystocarps show that the present plant belongs to *Ptilonia* though it is very difficult to obtain an exact idea of the anatomical characteristics of the frond, the specimens being exceedingly soft and kept dried.

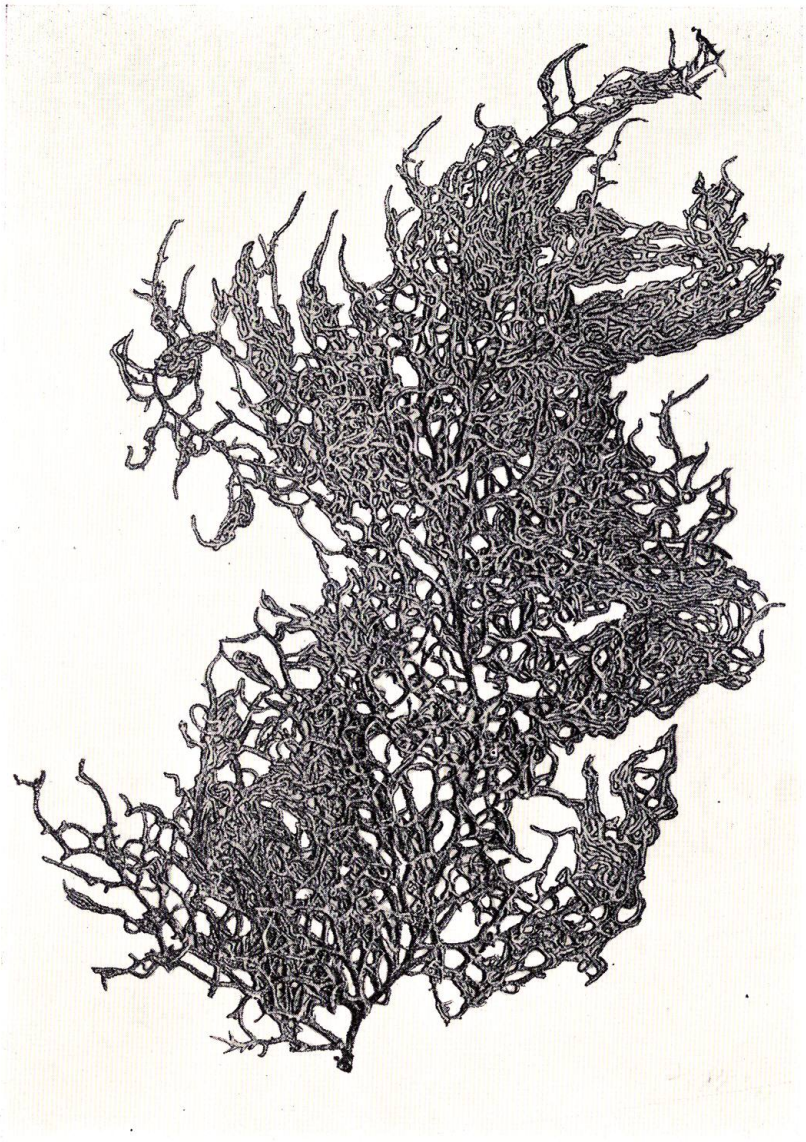
Among species of *Ptilonia* previously described *P. magellanica* (Mont.) J. Agardh seems to be related very closely to *P. Okadai*, judging from the description and especially the figures of Kützing (Tab. phyc. vol. 16, pl. 56, figs. a-e). On the other hand, our specimens seem to be much more delicate in their frond than J. Agardh's species and moreover this species has hitherto been collected only around the South pole namely at Cape Horn, in the Falkland Islands and Kergueln Islands. From those reasons I have provisionally named our specimens *P. Okadai* after the collecter of them, Mr. Y. Okada.

Plate X.

Chrysymenia pacifica Yamada. ×1.



Farlowia irregularis Yamada. Slightly reduced.



Liagora orientalis J. Agardh. Slightly reduced.

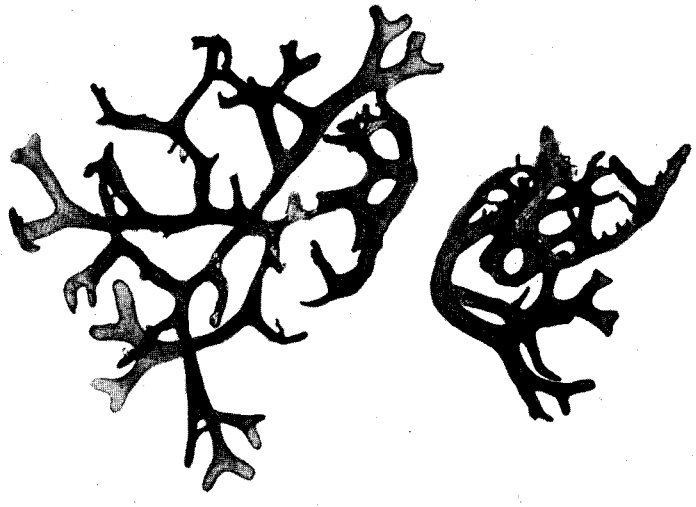


Fig. 1. Gracilaria crassa Harvey. ×1.

Fig. 2. Ptilonia Okadai Yamada. ×1.

Fig. 3. Polysiphonia Harlandii Harvey. ×1.