Notes on Algæ New to Japan. V.

By

Kichisaburo Yendo.

Ulva rigida Ag.

Spec., p. 410.—Id.: System. Alg., p. 189.—J. Ag.: Till Alg. System., VI, p. 164, *p.p.*

= *Ulva lactuca* Wulf.: Crypt. Aquat., p. 3.

= *Ulva Lactuca α rigida* Le Jolis: Alg. Mar. Cherb., p. 38.

= *Ulva Lactuca* var. *rigida* Ardiss.: Phyc. Med. I, p. 193.

= *Ulva Lactuca* f. *rigida* De Teni: Syll. Alg. I, p. 111.

= *Ulva Lactuca* Heydr.: Beitr. z. Kennt. Algenfl. v. Ostas. p. 272. (Hedwigia, Bd. 33).—Id.: Einige Algen v. den Loochoo Ins., p. 100.

= *Ulva conglobata* Kjellm.: Mar. Chlorophyc. från Japan, p. 10, Tab. 2, fig. 1–7, Tab. 3, fig. 9–14.—Okam.: Alg. Exsc. Jap., No. 92.

= *Ulva fasciata* f. *cæspitosa* Setch.: Phyc. Bor.-Amer. No. 809.—Collins: Ulvaceae N. Amer., p. 10.—Id.: Green Alg. N. Amer., p. 217.—Weber van Bosse: Liste des Alg. du Siboga. I, p. 51.

The specific limitation of *Ulva rigida* Ag. taken by various authors, as far as I can understand, seems to be quite uncertain. Le Jolis regarded it a forma of *U. Lactuca* L. His specific conceptions of *Ulva* and *Enteromopha* are so broad that no recent botanists dare to follow him. Still the name *U. Lactuca* var. *rigida* Le Jolis is often mentioned in current literature. Hauck also included C. Agardh's species under *U. Lactuca* L. as f. *genuina*.

A carefull study of the specimens kept in the Agardhian Herbarium under *U. rigida* Ag., consulting the statement by J.

AGARDH in Till Alg. System., l. c., has led me to conclude that the limitation of the species taken by J. AGARDH is much broader than that by C. AGARDH. I am strongly inclined to think it better to mention *U. rigida* C. AG. in an independent specific rank in the sense taken by its describer. It is not my present enterprise to distiguish all the specimens of *U. rigida* J. AG. (not C. AG.) in the Herbarium into different and proper species. I have but to refer to the specimens and referrences which have directly to do with the typical form of the species in question.

To the present species I refer *U. conglobata* KJELLM. together with f. *densa*. The latter is nothing but a high tide form of f. *typica* as KJELLMAN has already suspected so. (l. c., p. 11). He discussed the relationship between, and pointed out the distinctions of, his species and *U. rigida* AG. What he has related on *U. rigida*, however, is not in the sense of C. AGARDH but of J. AGARDH. If he had tried a comparison of his specimens with C. AGARDH's original at Lund, he should have never described the Japanese plant as new. All his statement on *U. conglobata* appplies satisfactorily to *U. rigida* C. AG.

I combine also *U. fasciata* f. *cæspitosa* SETCH. with the present species. The specimens in Phyc. Bor.-Amar., in the copies I have seen, exactly coincide with *U. conglobata* f. *densa* KJELLM. The plant which passes as *U. Lactuca* var. *rigida* among the American botanists appears to me certainly different from *U. rigida* AG.

Locality. Sagami Prov. (!); Yokohama (KJELLMAN); Shimoda, Idzu Prov. (!); Shima Prov. (!); Kii Prov. (!); Amakusa (KJELLMAN, under *U. coglobata*); Kagoshima, (Prof. S. IKEDA); Loochoo (WRIGHT, HARVEY; Herb. Trinity Coll., Dublin, under *U. australis*), (KUROIWA, HEYDRICH; Herb. Mus. Bot. Berlin, under *U. Lactuca*), (WARBURG, HEYDRICH; Herb. Mus. Bot. Berlin, under *Phyc. australis* var. *umbilicata*); Formosa (WARBURG, HEYDRICH; Herb. Mus. Bot. Berlin, under *U. Lactuca*); Botel Tobago (G. NAKAHARA).

Distribution. Mediterranean Sea; Atlantic coast of southern Europe; Red Sea; Dutch Indies; California.

Spongomorpha saxatilis Collins.

Green Algae of N. Amer., p. 360.—Id.: Phyc. Bor.-Amer., No. 921.
=*Conferva saxatilis* Rupr.: Tange des Och. Meer., p. 403.
=*Conferva Chamissonis* Rupr., l. c., p. 403.
=*Cladophora Chamissonis* Harv.: Ner. Bor. Amer., III, p. 75.
=*Spongomorpha saxatilis* var. *Chamissonis* Collins: l. c., p. 360.

In general appearance of frond this species resembles very much with *Spong. arcta*. It is, however, easily separated from the latter by having the basal part of frond much slenderer than the upper.

Collins[1] notes that *C. Mertensii* and *C. viminina* may represent intermediate forms between *C. saxatilis* and *C. Chamissonis*. The type specimens in St. Petersburg show that the former two are without doubt mere forms of one and the same species, but they prove at the same time that they are quite distinct from the latter two.

The generic position of the present species is rather doubtful to me. According to Wille's view, recently published in Pflanzenfamilien, Nachtrag, p. 116, it seems better to be placed under *Cladophora*.

Locality. Oshoro (!).

Distribution. Kamtchatca; Alaska to Washington.

Spongomorpha arcta Kütz.

Phyc. Germ., p. 263.—Id.: Spec. Alg., p. 47.—Id.: Tab. Phyc. IV, Taf. 74, fig. II.—Foslie: Mar. Alg. Norway, p. 130.—De Toni: Syll. Alg. I, p. 335.—Collins: Green Alg. N. Amer., p. 359.

Forma *Hysterix* Fosl. is also represented within our boundary.

Locality. Kurile Islands (!); Kushiro (Dr. T. Kawakami).

Distribution. North-west coast of Europe; Greenland to New Jersey; Alaska to Washington.

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1) Green Alg. of N. Amer., p. 360.

Acrosiphonia Mertensii (Ruprecht).

=*Conferva Mertensii* Rupr.: Tange des och. Meeres, p. 403.
=*Cladophora Mertensii* De Toni: Syll. Alg. I, p. 317.
?=*Conferva viminea* Rupr.: Tange des och. Meeres, p. 403.
?=*Cladophora viminea* De Toni: Syll. Alg. I, p. 318.

My specimens are about 2.5 cm in height, with caespitose fronds starting from densely interwoven root. The type specimen of *Conf. Mertensii* Rupr. in St. Petersburg is larger than mine, measuring about 11 cm in height and growing on frond of *Fucus evanescens*. In mode of ramification and in other characters, the plant resembles very much to the next species. But the filaments are much finer in the present species, measuring but 110 μ or little more in diameter in the upper cells; and the cells in the upper parts of frond are once to twice as long as the diameter, only occasionally being as half short.

The type specimens of *Conf. Mertensii* and *Conf. viminea* appear to me hardly separable one from the other. The only distinction between them, in the description given by Ruprecht, lies in the length of terminal cells, in the former measuring 225 μ and in the latter, 375–750 μ.

Locality. Etorofu Island (!); Kitami Prov. (K. Kayama).
Distribution. Sitka; Kamtschatca.

Acrosiphonia duriuscula (Ruprecht).

=*Conferva duriuscula* Rupr.: Tange des och. Meeres, p. 404.
=*Spongomorpha duriuscula* Collins: Green Alg. N. Amer., p. 357.
=*Chaetomorpha? duriuscula* De Toni: Syll. Alg. I, p. 277.
=*Cladophora alaskana* Collins: in Setch. and Gardn.: Alg. N. W. Amer., p. 228.—Id.: in Phyc. Bor.-Amer., No. 917.
=*Cladophora diffusa* Kjellm. *p.p.* Beringhafv., p. 55.
=*Conferva cartilaginea* Rupr.: Tange des och. Meeres, p. 404.

The present plant is at once distinguished from the others by having sparing, upright branches, short cells, and thick and rigid membrane. Owing to the last mentioned character the emptied sporangia keep their shape with silky lustre after dried for

herbarium specimen. The sterile cells, generally very short and biconcave, interposed at irregular intervals in a branch, remain with dark green chloroplasts giving an appearance of annulations to the filaments. Fine transverse striations on the membrane of the basal cells may be perceived under high magnification.

A study of the type specimens of *Conferva duriuscula* and *Conferva cartilaginea* in the Herbarium of the Academy of Science of St. Petersburg, I can not find any legitimate difference between the two, except in the size of cells. Both forms are represented in my specimens. In some of them, frond consists of partly slender and partly robust filaments, and both sorts of filaments start ramifying from one and the same root, an evidence to justify the amalgamation of the two species into one. It is, however, to be noted that the slender and the roubst filaments do not occur mixed on the same principal branch.

The description of *Spongomorpha duriuscula* COLL. in Green Algae of N. Amer., l. c., appears to cover both *Conf. duriuscula* RUPR. and *Conf. cartilaginea* RUPR. And what the same author takes as *Conf. cartilaginea* RUPR. in the same work is surely something else. *Conf. coalita* RUPR. has nothing to do with the present species. It is excellently represented by the specimens as Phyc. Bor.-Amer., No. 819 and 922 under *Cladophora scopæformis*. Miss TILDEN's Amer. Algae No. 373 under *Cladophora arcta*, in the copy I have seen, should be also referred to it. What she has distributed as No. 376 under *Cl. cartilaginea* is very likely *Cl. composita* H. et H.

The specimens from Bering Island and enlisted by KJELLMAN under *Cl. diffusa* HARV. in his Beringhafvets Algflora, p. 55, now preserved in the Botanical Museum of Upsala, comprise various different species. One of them is nothing but *Conf. duriuscula*.

That the present plant belongs to *Acrosiphonia* J. AG. has been pointed out by RUPRECHT in his Tange, p. 401. Consulting the systematic survey on *Acrosiphonia* by KJELLMAN,[1] I

1) KJELLMAN: Studier öfver Chlorophyceslägtet Acrosiphonia. 1892.

choose to mention the present plant under that genus. Among the species of *Acrosiphonia* described by KJELLMAN, *Ac. setacea* KJELLM. stands nearest to our plant.

Locality. Kurile Islands (!).

Distribution. Bering Islands; St. Paul Island; Alaska.

Cladophora glaucescens HARV.

Phyc. Brit., Pl. 196.—DE TONI: Syll. Alg. I, p. 320.—FOSLIE: Mar. Alg. Norway, p. 136.—COLLINS: in Phyc. Bor.-Amer., No. 817. —Id.: Mar. Clad. New England, p. 120, Pl. 36, fig. 6.—Id.: Green Alg. N. Amer., p. 336.

In the Herbarium of the Trinity College, Dublin, there is a specimen of *Cladophora*, collected by C. WRIGHT in Japan and named *Cl. glaucescens* var. *japonica* by HARVEY. The variety has not been ever published by HARVEY, nor the occurrence of *Cl. glaucescens* HARV. on our coast has hitherto been reported. The specimen in the Herbarium is about 5 cm in height, pale greenish straw colour with earthy lustre. The cells of principal filaments measure 40–45 μ in diameter and 200–300 μ in length; those of the ultimate ramulets, 30–40 μ in diameter and 100–200 μ in length. Ultimate ramulets in upper portion of the frond are mostly secund.

Another specimen collected at "Hakodadi Bay, on rocks above low tide" by the same collector is kept with the said specimen. It is a tiny plant hardly exceeding 12 mm in height, caespitose, in outward appearance recalling *Cl. uncinata*. The measurements of cells are exactly as in the other. Both have the rhizoidal filaments formed by prolongation of lower cells which traverse downwards through cell-rooms of the subordinate cells.

Examining the material in my hand, I found several specimens which represent the two forms. It was also ascertained that we have much larger form than what HARVEY called var. *japonica*, attaining 20 cm or more in the total height, and keeping all the characters observed in the smaller forms. After careful comparison with European specimens of *Cl. glaucescens*

and referring to the descriptions and figures of the species, it is no more to be hesitated to inform its occurrence on Japanese coast. Very likely, HARVEY took the smalleness of his Japanese specimens as a peculiarity of them and placed them in a varietal rank of the European form.

Locality. Hakodate (!), (WRIGHT, HARVEY); Hitachi Prov. (K. SAKURAI, No. 6); Oshoro near Otaru Bay (!); Yangeshiri Island (!); Rishiri Island (!); Mutsu Prov. (!); Uzen Prov. (T. HIKIDA); Awoshima (!); Echigo Prov. (M. NAKAMURA, No. 91).

Distribution. West coast of Europe; Florida to Labrador.

Sporochnus radiciformis AG.

Spec., p. 149.—Id.: System., p. 258.—J. AG.: Spec., I, p. 175.—Id.: Anal. Alg. Cont. III, p. 33.—KÜTZ.: Spec. Alg., p. 568.—Id.: Tab. Phyc. IX, Taf. 81, fig. I.—HARV.: Phyc. Austr., Pl. 225.—DE TONI: Syll. Alg. III, p. 383.

=*Fucus radiciformis* R. BROWN: in TURN: Hist. Fuc., Tab. 189.

?=*Sporochnus sphærocephalus* KÜTZ.: Tab. Phyc., IX, Taf. 83, fig. I.—DE TONI: Syll. Alg. III, p. 384.

Specimens of *Sporochnus* have been often found on our coasts. OKAMURA reported with query *Sp. Moorei* HARV. from Enoura, Suruga Prov., in his Nippon Sorui-Meii, Ed. I, p. 125, 1902. In its 2nd. edition, p. 161, published this year, he mentions only one species *Sp. herculeus* J. AG. again with query, apparently discrediting his former information, though whatever comment is not stated about it. Examining the material at my disposal, I found two distinct species among them. One of them agrees with *Sp. scoparius* HARV. and the other with *Sp. radiciformis* AG.

Our specimens of the present species have the receptacles generally obovate or elliptical, some young ones being nearly globular. Peduncles are once or twice as long as receptacle, the entire length of a ramulet measuring 2.5–3.0 mm. Ramification is less decompound than it is represented in Phyc. Austr., Pl. 225.

Sp. sphærocephalus KÜTZ. is probably to be combined with

this species. TURNER describes and illustrates the plant to have globular receptacles, and HARVEY, to have globular and elliptical ones in the same individual. Cfr. also, J. AGARDH: Anal. Alg. Cont. III, p. 33, footnote.

Locality. Higo Prov. (K. OSHIMA, No. 2); Iyo Prov. (K. KOMATSUZAKI, No. 10).

Distribution. Australia.

Sporochnus scoparius HARV.

Trans. Irish Acad., Vol. XXII, p. 535.—Id.: Mar. Bot. West Austr., No. 16.—Id.: Phyc. Austr., Pl. 226.—KÜTZ.: Phyc. Tab. IX, Taf. 84, fig. I.—DE TONI: Syll. Alg. III, p. 383.—J. AG.: Anal. Alg. Cont. III, p. 33.

?=*Sporochnus obovatus* KÜTZ.: Tab. Phyc. IX, Taf. 83, fig. II.

?=*Sporochnus herculeus* OKAM. (non J. AG.): Nippon Sorui Meii, Ed. II, p. 161.

I have not seen any type specimen of *Sp. obovatus* KÜTZ. But judging from the figures in Tab. Phyc., l. c., and observing from my specimen that the shape of receptacles varies from elliptical to clavate, I am tempted to regard KÜTZING's plant as to represent an old form of this species.

OKAMURA reckons however with hesitation *Sp. herculeus* J. AG. occurs on the Pacific coast of middle Japan. But what he observes on receptacles of his plant is not at all events applicable to *Sp. herculeus* J. AG. which is known to have longest receptacle among the genus. Very probably his plant may be referred to the present species.

Locality. Misaki, Sagami Prov. (!).

Distribution. Australia.

Leathesia umbellata MENEGH.

Alg. Ital., p. 307.—J. AG.: Spec. Alg., I, p. 51.—HAUCK: Meeresalg., p. 355, fig. 149.

=*Corynophlæa umbellata* KÜTZ.: Spec. Alg. p. 543.—Id.: Tab. Phyc. VIII, Taf. 2.

Under what genus should this interesting plant be placed is a question still undecided among algologists. J. AGARDH brought this species in a synonymous position under his *Elachista adriatica*. DE TONI enumerates the latter, though with hesitation, as a second species of *Myriactis*, but entirely following J. AGARDH in synonymizing previous described other species under it. I am but to accept HAUCK's view to place the present plant under *Leathesia*, reserving, however, a question on the generic limitation for future.

The specific arrangement as done by J. AGARDH in Till Alg. System., II, p. 21, appears to be inadequate. This is understood from a highly interesting letter sent from HAUCK to J. AGARDH just after the publication of the mentioned work, now kept in the Agardhian Herbarium with the type specimen of *Elachista adriatica*. In it HAUCK says:—".....Auch fand ich *Cor. flaccida* KG. nur auf *Chaetomorpha, Cladophora, Zostera*, nie auf *Cystoseira*. Auf *dieser* kommen hier nur *Elachista pulvinata* (selten) und *Corynophlæa umbellata* KG. (sehr häufig) vor. Die peripherischen Fäden von *Cor. umbellata* KG. sind aber immer keulförmig nie beiderends verdünnt. Ist diese Alge nun auch identisch mit Ihrer *E. adriatica*?....." HAUCK referred to Till Alg. System., II, p. 21, in describing the present species in his Meeresalgen, though without mentioning the name *E. adriatica*. It is very probable that he has done so as he had received an answer from J. AGARDH for the letter. The view held by HAUCK, who, as an eminent algologist, sat in a more favourable position than any other to study KÜTZING's originals, and to examine the plant in living state, of the present species, is to be esteemed with greater value.

Our plant is found copiously on the vesicles of *Sargassum Kjellmanianum* and is hitherto known with unilocular sporangia only. Apparently similar plant, with assimilators nearly homogeneous in diameter for the whole length, and closely resembling to *Myriactis pulvinata* but not identical to it, is always found associated with the present species.

Locality. Oshoro (!).

Distribution. Adriatic Sea.

Dilophus flabellatus Collins.

in Phyc. Bor.-Amer., No. 834.—Collins: New Species in Phycotheca, p. 108.

=*Dictyota marginata* Okam.: Icon. Jap. Alg., Vol. III, Pl. 108, fig. 9, Pl. 109.

=*Dilophus marginata* Okam. (non J. Ag.): Icon. Jap. Alg. Vol. III, Pl. 154.

?=*Dictyota prolificans* A. and E. S. Gepp: Some New Mar. Alg. N. S. Wales, p. 250, Pl. 481, fig. 2.

Okamura described a plant from Japan with full illustration as a new, calling it *Dictyota marginata*. The plant showed the very characters of *Dilophus* J. Ag. The establisher seems to have noticed it soon after the publishment as he transferred the species to *Dilophus* in the "corrigenda" in No. 7. of his Icones. He left the specific name unaltered, noting that "of the difference of this plant and *Dilophus marginatus* J. Ag. I can not state anything unless I could study our plant by comparing with that plant of the author."

Okamura's plant agrees with *D. flabellatus* Collins in all respects so that there is no doubt left on the identity of the two. He describes his plant to have more or less stupose base and also that there are given rise many filiform stolon-like segments from both sides of stem. Collins points out the difference between his plant and *D. marginatus* J. Ag. as the latter is not stupose but is attached by a growth of rhizoids, while the former has the base stupose for a short distance. Consulting the descriptions given by the two authors and with specimens of Japanese *Dilophus* laid before me, I am quite certain that Okamura's plant may be applied to the statement "fronde cæspitosa radiculus emissis radicante" as given by J. Agardh in defining *D. marginatus*. As far as I could observe in my specimens, numerous young shoots start from the base of frond, and some ones from the margins of complanated part of stem near the root. Hence, a young frond may be well described as either cæspitose or multicipital. In some specimens the basal part of frond is stupose for a short length and in others entirely

not. As has been observed by COLLINS, the epidermal layer of an old plant often consists of two strata of small cells.

The type specimen of *Diplophus marginatus* J. AG. shows regular dichotomous ramification with narrow sini and the segments running nearly parallel. The segments are linear, about 3 mm in average breadth, bullated transversely at regular intervals. These points are already noted by the establisher of the species. The bullation, however, so far as I could understand in the type specimen, seems not to be a constant character but perhaps due to unequal contractions of the marginal and axial part of frond on drying.

In the present species, as COLLINS observes, "some of the segments develop more rapidly than others, so that as the plant grows older it assumes more of the character of a flexuous rachis with alternate branches." This is excellently illustrated by OKAMURA and may be taken as a good distinction between the two species. The other character put much stress by the two writers are rather variable and often common for both species.

A. and E. S. GEPP have jointly described a plant from New South Wales and Queensland as new, calling it *Dictyota prolificans*. The structure of the plant proves it a *Dilophus* standing near by the present species. They seem to have regarded the small proliferations on the surfaces of frond as a specific character. I have no less doubt about it, if the proliferations were not embryonal shoots germinated from the matured spores and still growing attached to the mother frond. I have repeatedly met with similar examples among Dictyotae and Spathoglossae. They are, therefore, quite different from the sporiferous proliferations characteristic to *Glossophora*.

Locality. Rikuzen Prov. (HIGASHI, OKAMURA); Iwaki Prov. (OKAMURA); Bōshū Prov. (!); Sagami Prov. (HIGASHI, OKAMURA); (F. HIRAYAMA, No. 63), (!); Idzu Prov. (!); Iyo Prov. (OKUDAIRA, OKAMURA); Hizen and Higo Prov. (OKAMURA); Echigo Prov. (!); Sado Island (T. OBARA, No. 35).

Distribution. California;? New South Wales;? Queensland.

Liagora Cliftoni J. Ag.

Epicris, p. 515.—Id.: Anal. Alg. Cont. III, p. 104.—De Toni: Syll. Alg., IV, p. 93.

=*Galaxaura Cliftoni* Harv.: Phyc. Austr., Pl. 275.

The peripheral filaments of this species ramify only twice or three times as illustrated by Harvey. This character is rather a good distinction among the allied forms of the genus. The cells of filaments are subcylindrical 18–20 μ in length and 8–9 μ in diameter. The axial strands are thick and robust, about 30 μ in diameter and many times as long as diameter; the cortical strands very slender, measuring but 5 μ in diameter.

Locality. Bōshū Prov. (F. Sugiyama); Misaki (!).

Distribution. New Holland.

Galaxaura elongata J. Ag.

Epicris, p. 529.—Kjellm.: Galaxaura, p. 56, Tab. 7, fig. 6–12.

The present species is one of the elegant forms of *Galaxaura*. In general appearance it resembles to a much elongated form of *G. cucullígera*. The part of frond without filamentous assimilators, however, is not in the proliferated manner but gradually becoming villous towards the basal part. The diameter of segments is homogeneous through the whole length of frond. This character serves to separate the present from *G. squalida*. In our specimen the annulation, though very faint, counts 26–30 in 10 mm.

Locality. Botel Tobago (Dr. T. Kawakami, No. 18).

Distribution. New Holland; Friendly Islands.

Gelidium latifolium Born.

in Born. et Thuret: Not. Algol. p. 58, Pl. 20, fig. 8–10.—De Toni: Syll. Alg., IV, p. 150.—Cotton: Mar. Alg. from Corea, p. 366.—Id.: Some Chinese Mar. Alg. p. 111.

(For list of synonymes, see: De Toni, l. c.).

COTTON reported this species from Wonsen, Corea, and Wei-hai-wei, China. Examining the material in my hand, I found the species pretty common on the Japan Sea side of our country. I mention, however, that there is another species of *Gelidium* on our coast which has a very similar appearance of frond with the present but quite differing in the shape of stichidia. It is a doubt held for a long time by me that various species of *Gelidium* may assume the general aspect of frond approaching to *G. latifolium* BORN. according to the condition of place where they grow. Still I mention the occurrence of this species within our boundary as it is more or less fixed form. In Japan such a broad form as figured in Phyc. Brit., pl. 53, fig. 3 is hitherto unknown.

Locality. Yangeshiri Island (!); Oshoro (!); Hakodate (!); Uzen Prov. (A. SATO, No. 3, 12, 56); Kaifu, Echigo Prov. (!); Echigo Prov. (R. KOBAYASHI, No. 31); Hizen Prov. (K. OSHIMA, No. 3); Hiuga Prov. (!).

Distribution. Corea; Macao and Wei-hai-wei, China; Europe; North Africa; Atlantic Islands.

Gelidium asperulum KÜTZ.

Tab. Phyc. XVIII, p. 15, Taf. 43, fig. 2.—DE TONI: Syll. Alg. IV, p. 159.

We have a well-defined form of *Gelidium* on the Pacific coast of middle Japan. It agrees with the definition and illustration of *G. asperulum* KÜTZ. KÜTZING does not give any locality for his plant and nobody seems to have ever mentioned the species to have found it since. In Syll. Alg., IV, p. 159, it is enumerated among "spieces vix distinguendae aut ulterius inquiridae."

In the Herbarium of the Botanical Museum of Berlin, there are specimens similar to ours, collected by Mr. Y. TANAKA and sent to GRUNOW. On the labels attached to them there are written in GRUNOW's handwriting: "*Gelidium corneum* var. ähnlich *G. asperulum* KÜTZ. Japan. Hb. GRUNOW. leg. TANAKA."

I am inclined to think it advisable to record the present species in the floristic list of marine algae of Japan though with

question. It is sharply distinguished from other species of *Gelidium* ever known from Japan.

Locality. Rikuzen Prov. (Miss WAINWRIGHT, No. 36); Enoshima (F. HIRAYAMA, No. 105); Hiuga Prov. (!).

Distribution. ?

Ahnfeltia concinna J. Ag.

Alg. Liebm., p. 12.—Id.: Spec. Alg., II, p. 312.—Id.: Epicris, p. 207.—DE TONI: Syll. Alg. IV, p. 256 (excl. syn.).

=*Sphærococcus concinnus* var. *immersus* Ag.: Spec., p. 312.—Id.: System., p. 234.

=*Gymnogongrus implicatus* Kütz.: Spec. Alg., p. 789.—Id.: Tab. Phyc. XIX, Taf. 69.—J. Ag.: Spec. Alg., II, p. 312.

=*Sphærococcus implicatus* Kütz.: in litt. Herb. Mus. Bot. Berol.

=*Tylocarpus implicatus* Kütz.: Phyc. Gen., p. 411.

=*Ahnfeltia californica* SONDER: in litt. Herb. Mus. Bot. Berol.

=*Ahnfeltia gigartinoides* J. Ag.: Alg. Liebm., p. 12.—Id.: Spec. Alg. II, p. 311.—Id.: Epicris, p. 206.—DE TONI: Syll. Alg. IV, p. 255.

Our specimens coincide with the type of *Ahnfeltia concinna* J. Ag. in the Agardhian Herbarium at Lund. A bleached specimen from Japan sent by Mr. TANAKA to GRUNOW is found in the Herbarium of the Botanical Museum of Berlin under *A. californica* SONDER, determined by GRUNOW. I can not find out where SONDER has published the species.

SETCHELL brought *A. gigartinoides* J. Ag. to a synonymous position under the present species. The type specimens of both species are indeed hardly separable one from the other.

DE TONI synonymizes *A. Polyides* J. Ag. under *A. concinna* J. Ag., however with question. SETCHELL expressed no hesitation in doing so. In the Agardhian Herbarium, ARESCHOUG's species is treated separately from *A. concinna*. But some specimens which are in my view to be safely determined as *A. concinna* are found under *A. Polyides*. The specimen distributed by SETCHELL as No. 430, Phyc. Bor.-Amer. under *A. concinna*, in the copy in my possession, agrees better with *A. Polyides* as

found at Lund. This form is not represented on our coast so far as our material show.

Are not *Apopholoea Lyalii* H. et H. and *Carpococcus perphoratus* J. Ag. comparable with the present species? I have not examined the structures of these plants. In the external appearances they resemble so closely with *A. concinna* that I can not restrain myself in putting forth the question.

Locality. Bōshū Prov. (F. Sugiyama); Sagami Prov. (!); Ise Prov. (K. Akatsuka).

Distribution. Sandwich Islands; Peru.

Callymenia reniformis J. Ag. **var. cuneata** J. Ag.

Epicris, p. 221.—De Toni: Syll. Alg., IV, p. 297.

Callymenia reniformis has been reported by Martens,[1] under *Euhymenia reniformis* Kütz. to have been collected in Yokohama. The specimen now kept in the Herbarium of the Botanical Museum of Berlin appears to me to be *Microcoela chilensis* Okam. Holmes also mentions the same species in his list of Japanese algae. Unfortunately, I could not find any Japanese specimen of it in the Herbarium of the University of Birmingham, where, as I was told from him, all his colllection of algae was to be found. None of Japanese collectors has ever found it on our coast and so the above mentioned informations were discredited or doubted by me.

In northern parts of Japan, however, there is a form of *Callymenia* which can be no otherwise than to identify with *Callymenia reniformis* var. *cuneata* J. Ag. It varies in its shape of frond but not as to be referred to the typical form of the species.

Locality. Rebun Island (!); Otaru Bay (!); Hakodate (!); Awomori (N. Takahashi); Muroran (N. Takahashi); Hidaka Prov. (!).

Distribution. Europe.

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1) Martens: Preussische Expedition nach Ost-Asien, Tange, p. 118.

Lomentaria umbellata II. ET II.

Flora Nov. Zel., p. 254, Pl. 119C (1845).—J. AG.: Epicris, p. 300.—Id.: Anal. Alg. Cont. III, p. 87.

=*Lomentaria catenata* HARV.: in GRAY: List of Plants coll. in Japan, p. 331 (1857).—J. AG.: Epicris, p. 635.—OKAM.: Illustr. Jap. Alg., Pl. 26.

=*Chylocladia gelidioides* HARV.: Phyc. Austr. Syn., p. 18. (1863). —J. AG.: Anal. Alg. Cont. III, p. 87.—A. et E. S. GEPP: Mar. Alg. N. S. Wales, p. 257.—OKAM.: Mar. Alg. Caroline Isl., p. 88.

=*Chylocladia Ramsayana* J. AG.: Till Alg. System. IV, p. 87 (1884).—Id.: Anal. Alg. Cont. III, p. 87.

After studying the type specimens of the four species above mentioned I have a slightest doubt that they belong to one and the same species. The illustrations of *L. catenata* HARV. given by OKAMURA in the work referred to above are the most exhaustive and excellent ever appeared for the plant. When it is found growing in a sheltered place or among other larger algae, the articulations are generally elongated, with lateral branches sparing and irregularly disposed. Such form exactly coincides with the type specimen of *Ch. Ramsayana* J. AG.

Ch. umbellata II. ET II. has been distinguished from other allied species by having recurved and hamate branches in an upper part of frond. Examination of a large number of specimens of *L. catenata* of various stages of development, show that such form of branches is very often present in that species. The primary part of frond of *L. catenata* HARV., as in *Ch. Ramseyana* J. AG., consists of several decumbent articuli radiately directed from a small scutellate root. Each decumbent articulus catches hold of substratum by a small hapter at its apex. From the upper side of the articulus an erect shoot is given rise to form a future principal segment, or another decumbent articulus, similar as the first one, may be issued. The latter mode of ramification is often repeated several times so as to form a creeping rhizome. An erect shoot may also be found standing upon one or more of the decumbent articuli (Fig. 1). When there is no suitable substratum for some creeping articuli, the

hapters do not appear in them. As a rule, the rhizome is limited to the basal part of frond but a lower branch on an erect shoot may frequently modify to assume a similar appearance (Fig. 2). *Ch. umbellata* H. ET H. is described from such form.

A. and E. S. GEPP combined *Ch. gelidioides* HARV. and *L. catenata* HARV. into one species though with some doubt. After comparing the type specimens in the Herbarium of the Trinity College, Dublin, I have but to agree with their view. They remark about the modes of ramification in both species. But in the well-grown typical forms, the lateral branches are always opposite. It may vary as alluded to above and never be mentioned as a specific difference. OKAMURA pointed out that the specimen from Sydney which he hesitatingly identified with *Ch. gelidioides* HARV. has loosely "intricated branches by coaliscing to each other." In Japanese forms of what has been passing as *L. catenata*, similar fusion of branches is frequently met with. The point of attachment, as far as I have observed, is mere thickening of cell-wall, the lamellar structure of which being more or less distorted at the point. No special hapters or tenancula has been found there.

Fig. 1.

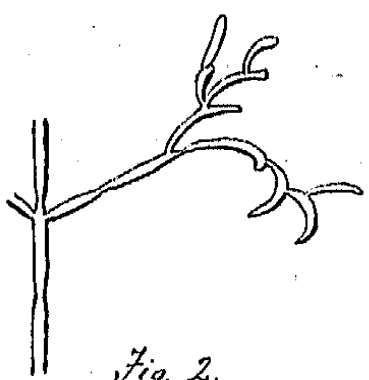

Fig. 2.

In the Agardhian Herbarium *Ch. gelidioides* HARV. is represented by a slender specimen with sparing patent branches. It resembles in general aspect to *Gelidium crinale*, hence, very likely, the specific name. Similar form is also to be found on our coast, especially among the northern inhabitants. There are many intermediate forms to link it with the large typical form.

In short, the plant has a very wide distribution in the Pacific Ocean and is highly variable in its external appearance.

Locality. On the coasts of middle and southern Japan.

Distribution. Australia.

Rhodophyllis capensis Kütz.

Spec. Alg., p. 786.—Id.: Tab. Phyc. XIX, Taf. 50.
=*Rhodymenia nigricans* Harv.: Ner. Austr., Pl. 46.

A well-distinguished species of *Rhodophyllis* by the frond beautiful purple while living, and turning into dark chocolate-purple or almost black on drying. The plant is pretty common along the Pacific coast of middle Japan.

Locality. Bōshū Prov. (F. Sugiyama); Shima Prov. (!); Kii Prov. (!).

Distribution. South Africa.

Laurencia distichophylla J. Ag.

Spec. Alg. II, p. 672.—Id.: Epicris, p. 656.—De Toni: Syll. Alg., IV, p. 800.
=*L. botrychioides* Harv.: Flor. Nov. Zel., p. 234.—J. Ag.: Epicris, p. 657.

There are about dozen species of *Laurencia* ever reported to occur in Japanese waters. It appears to me much more number to be added to the list and some of the reported species require amendment if carefully revised. It is not easy task to work over the material of *Laurencia* even those at my disposal, as the specific limitations of this genus are as uncertain as it might be. I have, however, to inform the present species to occur on our coast with utmost certainty.

J. Agardh observed that *L. botrychioides* Harv. might have been a young form of *L. distichophylla* J. Ag. In pointing out the difference between them he says:—"Præcipicua differentia in pinnulis superne dilatatis, crenulato-multifidis potius quam iterum pinnelatis." An authentic specimen of *L. botrychiodes* Harv. in the Agardhian Herbarium appears indeed to be regarded as a stunted or young form of J. Agardh's species. Still the difference pointed out by him should not be neglected so far as the specimens are concerned. In Harveys's specimen the pinnules on a pinna are of equal length, giving linear out-line to a pinna. Hence, the plant resembles to a slender form of *L. concinna*

MONT. The type specimen of *L. botrychioides* HARV. at Dublin, however, have the pinnules very often once more pinnulated, thus losing the distinction pointed out by J. AGARDH. I am rather inclined to suppose that HARVEY did not fully recognize the specific characters of *L. distichophylla* J. AG. This is strengthened by the remark in Epicris, p. 657, that the specimen under *L. distichophylla* in Flora No. Zel., p. 234 differs from the type. In the Herbarium of the Trinity College, Dublin, the specimens under the present species are not uniform.

Locality. Bōshū Prov. (F. SUGIYAMA); Sagami Prov. (F. HIRAYAMA, No. 83).

Distribution. Cape of Good Hope; New Holland.

Polysiphonia flexella J. AG.

Alg. Med., p. 140.—Id.: Spec. Alg., II, p. 1014.—DE TONI: Syll. Alg. IV, p. 916.

(For other referrences and list of synonymes, see: DE TONI, l. c.).

It is interesting to find this peculiar species of *Polysiphonia* within our boundary. The specimens in my hand agree well with KÜTZING's Tab. Phyc., XIV, Taf. 89, fig. I, but the ultimate pinnules are rudientally corticated on the lower half portions.

Locality. Rikuzen Prov. (Miss WAINWRIGHT, No. 42); Echigo Prov. (M. NAKAMURA, No. 106); Shima Prov. (K. ISHIKAWA).

Distribution. Mediterranean Sea; Atlantic coast of southern Europe.

Polysiphonia mollis H. ET H.?

in HARV.: Ner. Austr., p. 43.—DE TONI: Syll. Alg., IV, p. 877.

(For other referrences, see: DE TONI, l. c.).

This plant is readily distinguished by having an appearance of *P. violacea* but not corticated throughout the whole part of frond. It is defined to have the articuli of minor filaments 4–5 times as long as diameter. In our specimen, they are hardly 3 times as long, and no fructification was found. Still, as the

species is so well marked from others, I have but refer our specimens to it provisionally.

Locality. Owari Prov. (S. NARITA, No. Y. 16); Mikawa Prov. (!).

Distribution. Australia.

Dasya villosa HARV.

in London Journ. Bot. III, p. 433.—Id.: Ner. Austr., p. 61, Pl. XX.—DE TONI: Syll. Alg., IV, p. 1203.

=*Dasya extensa* SOND.: in KÜTZ.: Tab. Phyc. XIV, p. 21, Taf. 58.

(For other referrences, see: DE TONI, l. c.).

The distinctions between *Dasya elegans* AG. and *D. villosa* HARV. in the cystocarpic or sterile specimens are not very clear even in the type specimens at Dublin and Lund. The simpleness of ramification is never characteristic of *D. villosa*, as many of the authentic specimens of *D. villosa* are very much ramulose and some of *D. elegans* quite simple. J. AGARDH also observes this and treated on it in Till Alg. System. IV, p. 103.

The point of distinction hitherto mentioned by the previous authors is on the stichidia. In *D. villosa* they are ovato-conical and mucronate while in *D. elegans* they are conical lanceolate; in *D. villosa* they assume the position of a branch on the monosiphonous ramulets, while in *D. elegans* they are terminal and have no co-ordinate ramulets by them. In these respects our specimens agree satisfactorily with *D. villosa* HARV.

Locality. Rikuzen Prov. (Miss WAINWRIGHT, No. 4); Echigo Prov. (R. KOBAYASHI, No. 11).

Distribution. Australia.

Acrothamnion pulchellum J. AG.

Anal. Alg. Cont. I, p. 23, Tab. I, fig. 6–9.

=*Callithamnion pulchellum* HARV.: Phyc. Austr. Synop., No. 692. —DE TONI: Syll. Alg., IV, p. 1338.

I have a strong doubt about the accessory pinnulet described and illustrated by J. AGARDH, an important peculiarity by which

he claimed a new generic position for the single species. Repeated observations for several years on our plant *in vivo*, I found the terasporangia in the ordinary manner of *Callithamnion*, i. e., sigle, sessile on the upper side of a lower cell of pinnulet (often two on the lowermost cell, but one ripening earlier than the other). Excepting this point, our plant exactly coincides with the species.

Locality. Hakodate, epiphytic on larger algae (!); Oshoro, on algae and mussels (!); Shiokubi near Hakodate (S. NARITA, *d*).

Distribution. New Holland.

Prionitis australis J. AG?

Spec. Alg., II, p. 188.—Id.: Epicris, p. 158.—DE TONI: Syll. Alg., IV, p. 1588.

=*Chondrus* sp. YENDO: Text Book of Mar. Bot., p. 599, fig. 168 (in Japanese).

I identify our specimens with above mentioned species, after consulting its type specimen at Lund. None of ours, however, has fructification or the marginal ligules. Hence, with doubt.

Locality. Idzu Prov. (!); Sagami Prov. (!); Shima Prov. (Herb. Imper. Mus., No. 144).

Distribution. New Zealand.

Sapporo, 1, May, 1916.