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# Marine Algae from Urup, the Middle Kuriles, Especially from the Vicinity of Iema Bay

By

YUKIO YAMADA

With Plates I-X.

Of the marine algae of the Kurile Islands there is no account of any completeness. So far as I am aware, there are only odd references made by former authors, some fragmentary information by Dr. K. Okamura and Dr. K. Yendo, and some papers dealing with the Laminariaceae by Prof. K. Miyabe and Mr. T. Nagai. This scantiness of information is probably owing to the inconvenient location of these islands.

In the summer of 1933 I had a favourable opportunity of visiting Urup Island, one of the Middle Kurile Islands, for observing marine flora and collecting algal materials. For this purpose we made a stay near the shore of Iema Bay of about three weeks (from 27th July to 18th Aug.).

In this trip about 60 species were collected, of which 48 are determined and listed in the following pages. Of these, 6 species belong to the Chlorophyceae, 22 to the Phaeophyceae, and 22 to the Rhodophyceae. These include *Spongomorpha duriuscula* COLLINS var. *cartilaginea* YAMADA, *Sp. duriuscula* COLLINS var. *tenuis* YAMADA, *Scytosiphon Lomentaria* J. AG. f. *tortilis* YAMADA, *Desmarestia kurilensis* YAMADA, *Pleuropterum fasciculatum* YAMADA, *Laminaria longipes* BORY var. *latifolia* YAMADA, *Schizymenia Dubyi* J. AG. var. *palmata* YAMADA, which are described as new, and also several species newly found in Japanese waters.

It is a great pleasure to offer my sincerest thanks to ex-President Dr. T. Minami who patronised our trip, and to Dean T. Tadokoro and Prof. J. Suzuki of our faculty, for affording me every facility. Thanks are also due to Messrs. T. Nemoto and T. Watanabe of our Faculty, Mr. K. Isino, and Captains E. Taketomi, E. Uzawa and S. Takasima of the Government Department of Agriculture and Forestry.

### Topography and a short sketch of the general aspect of marine flora in the vicinity of Iema Bay

Iema Bay is located nearly at the western end of Urup Island, facing southwestward towards the northeastern end of Etorofu Island, being in latitude about 45.4 North and longitude 149.3 East. The bay is surrounded by two wave-cut benches, Hiraiso-zaki, in the north, and Iema-zaki, in the south, being about 700 m. wide at the greatest width. Near the mouth of the bay lies a rocky islet, Hutago-jima, and the head of the bay forms a sand beach where a small river, Iema-gawa, empties itself.



Fig. 1. Hiraiso-zaki at low tide, seen from the head of the Bay.  
(Photo. T. WATANABE.)

The eastern wave-cut bench, Hiraiso-zaki, forms a flat, extensive bed, being built up mainly of green tuff, and making its appearance above the sea-level only at low tide. It affords excellent collecting-grounds, being about 800 m. long and about 700 m. wide, together with another bench, Iema-zaki. This is much smaller than Hiraiso-zaki, being about 300 m. long from the beach, and composed of green tuff like the latter, but near the beach, on the south side, we find numerous propylite pebbles. The edges of these benches form precipices dropping sheer into the sea at many places. Among rocks there are a number of shallow pools.



Fig. 2. Iema-zaki seen from the top of a hill when the tide is rather high.  
(Photo. Y. YAMADA.)



Fig. 3. *Fucus evanescens* AG. and *Alaria* sp. on prophyllite pebbles in Iema-zaki.  
(Photo. Y. YAMADA.)

We have almost nothing about the records of the temperature, salinity etc. of sea-water around this place because the island is uninhabited except

for a few families occupied in fox-farming; during our sojourn we ascertained, however, that the temperature of the sea water is 3.5–4°C.

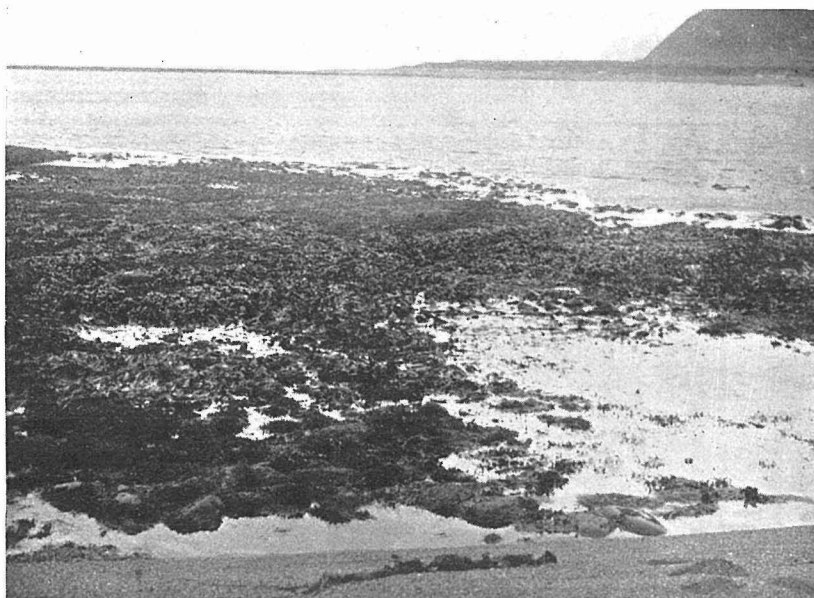


Fig. 4. The north side of Iema-zaki in the low tide. The predominant species are *Fucus evanescens* AG., *Alaria angusta* KJELLM. and *Halosaccion saccatum* KG. (Photo. Y. YAMADA.)

The algae most commonly found in the upper littoral belt is *Fucus evanescens* AG., which covers very densely almost all shallow places (Fig. 3, 4), and on the frond of them *Pylayella littoralis* KJELLM. is sometimes epiphytic. A little below the *Fucus*-formation or sometimes mixed with this alga we find *Halosaccion saccatum* KG. The frond of this species usually grows so densely side by side, that we can recognise only the round tops of the fronds (Fig. 5). The other species of *Halosaccion*, *H. firmum* RUPR. is also found at about the same level. Then we observe *Odonthalia aleutica* J. AG. and *Solanthera ulvoidea* POST. et RUPR. growing on the frond of the former, and mixed with them there are *Iridaea laminarioides* f. *cornucopiae* J. AG., *Porphyra Tasa* YENDO, *P. perforata* J. AG., *Colpomenia sinuosa* f. *deformans* SETCH. et GARD. etc. In the shallow pools among rocks I collected *Scytosiphon Lomentaria* J. AG. f. *tortilis* YAMADA, *Dictyosiphon foeniculaceus* GREV., *Chordaria flagelliformis* AG., *Chordaria flagelliformis* AG. f. *chordaeformis* KJELLM., *Chordaria gracilis* SETCH. et GARD., *Litho-*

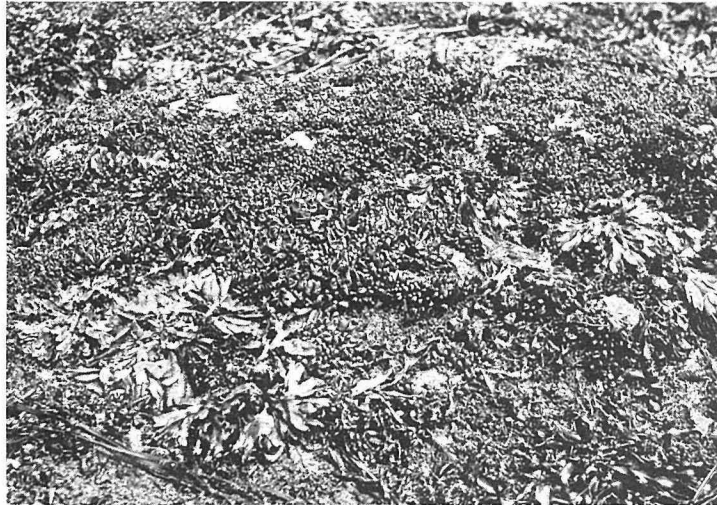


Fig. 5. *Halosaccion saccatum* Kg. in the upper littoral belt, growing densely side by side. The broad-leaved algae among them are *Fucus evanescens* Ag.  
(Photo. Y. YAMADA.)



Fig. 6. *Alaria angusta* KJELLMAN in the upper littoral belt.  
(Photo. Y. YAMADA.)

*phyllum* spp., *Corallina* spp., *Spongomorpha* spp. etc. In protected places near the shore there are *Phyllospadix*-formations here and there, and on

leaves of this plant *Monostroma zostericola* TILDEN is attached. *Alaria angusta* KJELLM. which bears a large number of long, narrow sporophylls in a fasciculate manner, is commonly observed among them (Fig. 6).

Those algae mentioned above are all to be observed even during the neap tides, while some others grow downwards, making their appearance only during the spring-tides. *Dumontia filiformis* GREV., *Pterosiphonia bipinnata* FALKB., *Porphyra umbilicalis* J. AG., *P. pseudolinearis* UEDA etc. belong to the latter group, the last mentioned species preferring rather higher and exposed places. A little further downwards grow *Rhodymenia palmata* GREV., *Laminaria longipes* BORY var. *latifolia* YAM. (Fig. 7), and then *Arthrothamnus kurilensis* RUPR. (Fig. 8). Both these two representatives of the Laminariaceae are the most common algae near Iema, and are,



Fig. 7. *Laminaria longipes* BORY var. *latifolia* YAMADA in the lower littoral belt.  
(Photo. Y. YAMADA.)

moreover, very interesting, the former because of its stolen-like "roots", and the latter because of the special branching of the stipe. Either a little lower or among them *Pleuropterum fasciculatum* YAM. is met with. This alga is very much like some species of *Alaria*, so much so that it may be nearly impossible to distinguish it from *Alaria* unless the sporophyll is seen. In the same places as those in which that species occur we find *Alaria macroptera* YENDO, *Cymathaere triplicata* J. AG., etc. The latter species, which is easily distinguished by the lighter colour of its blades from other



Fig. 8. *Arthrothamnus kurilensis* RUPR. in the lower littoral belt. The small-leaved algae found in the foreground of this photograph are all *Laminaria longipes* BORY var. *latifolia* YAMADA. The former invariably prefers places deeper than the latter does.

(Photo. Y. YAMADA.)

species of the Laminariaceae is also found on pebbles lying in rather deep tide pools (Fig. 9). Moreover, *Odonthalia corymbifera* J. AG., *Ptilota pectinata* KJELLM. etc. are found in the crevices of rocks. Among the algae growing in the sublittoral zone, the most conspicuous is *Alaria fistulosa* POST. et RUPR. whose extremely long leaves sway to and fro after the waves. These waving leaves usually occupy the sea-surface between about 4 m and 10 m off the edges of the benches near Iema (Fig. 10). Beside this, we observe one more conspicuous species of the Laminariaceae in the sublittoral zone, *Thalassiophyllum Clathrus* POST. et RUPR. This species is found only in a few places of Iema-zaki where the sea is a little protected, and its leaves make their appearance above the sea-surface only when the tide is very low. In this point it reminds one of *Eisenia arborea* SETCH. in the upper sublittoral belt in Japan proper. But the leaves are erect in *Thalassiophyllum Clathrus* POST. et RUPR., even when they are exposed to the air, while in *Eisenia* that is not the case. So far as I am aware, the present locality seems to show the southern limit of distribution of this species. In the sublittoral belt of protected places I collected *Schizymenia Dubyi* J. AG. var. *palmata* YAM., *Porphyra umbilicalis* J. AG. etc.



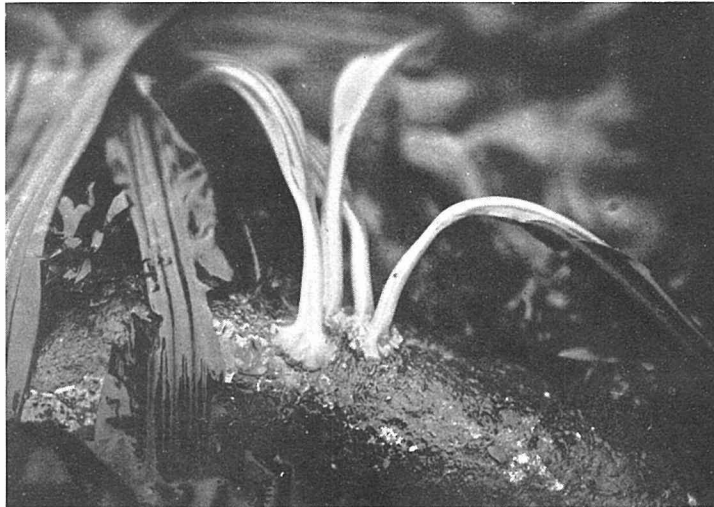


Fig. 9. *Cymathæra triplicata* J. Ag. growing on a propylite pebble. The pebble was lying on the bottom of a rock pool about 1 fath. deep. This photograph shows clearly the basal portion of this species.

(Photo. Y. YAMADA.)



Fig. 10. Leaves of *Alaria fistulosa* POST. et RUPR. waving on the sea-surface.

(Photo. T. WATANABE.)

Only as specimens cast ashore was I able to collect *Monostroma fuscum* WITTR. f. *splendens* COLLINS, *Desmarestia aculeata* LAMX., *D. kurilensis* YAM., *Cystophyllum geminatum* J. AG., *Costaria costata* SAUND., *Cymathaere fibrosa* NAGAI, *Laminaria yezoensis* MIYABE, *Callymenia ornata* J. AG. and *Odonthalia floccosa* FALKBG.

### Enumeration of species

## CHLOROPHYCEAE

### ULVACEAE

#### *Monostroma*

##### **M. (?) groenlandicum** J. AGARDH

Till Alg. Syst., III, p. 107, pl. 3, figs. 80-83; ROSENVINGE, Grönlands Havalger (1893), p. 954; COLLINS, Ulvac. N. Amer. (1903), p. 12; YENDO, Notes alg. new Japan (1909), p. 117—*Enteromorpha groenlandica* SETCHELL et GARDNER, Phyc. Cont., I (1920), p. 280, Mar. alg. Pacif. Coast N. Amer., Chlorophyc. (1920), p. 248.

Japanese name. *Himo-hitoegusa*.

Hab. Iema.

The occurrence of the present species in the Kuriles has been reported by YENDO (l. c.). Of this species I found only a few specimens entangling among other algae.

##### **M. Grevillei** (THURET) WITTRICK

Monogr. Monostr. (1866), p. 57, pl. 4, fig. 14; COLLINS, Green alg. N. Amer. (1900), p. 209; SETCHELL and GARDNER, Alg. N. W. Amer. (1903), p. 208, Mar. alg. Pacif. Coast N. Amer., Chlorophyc. (1920), p. 236.

Japanese name. *Usu-hitoegusa*.

Hab. Iema.

##### **M. zostericola** TILDEN

“Amer. alg. (1900), no. 388”; YENDO, Notes alg. new Japan, VII (1917), p. 184; SETCHELL and GARDNER, Mar. alg. Pacif. Coast N. Amer., Chlorophyc. (1920), p. 238, pl. 14, figs. 12-13.

Japanese name. *Motuki-hitoe*.

Hab. Iema. Growing always on the leaves of *Phyllospadix*.

So far as I am aware, the present species has been reported only from Japan (around Hokkaidô and the Kuriles) and Vancouver Isl.

**M. fuscum** WITTRÖCK f. **splendens** COLLINS

Ulvac. N. Amer. (1903), p. 12, Green alg. N. Amer. (1900), p. 213—*M. splendens* WITTRÖCK, Monogr. Monostr. (1866) p. 50, pl. 3, fig. 12—*M. fuscum* var. *splendens* ROSENVINGE, in SETCHELL and GARDNER's Mar. alg. Pacif. Coast N. Amer., Colorophyc. (1920), p. 242.

Japanese name. *Ô-hitoegusa*.

Hab. Iema.

Our specimens had all been cast ashore. Some of them are very large, often exceeding 50 cm. They are deep green when living, but turn dark brown in drying.

CLADOPHORACEAE

*Spongomorpha*

**S. Mertensii** (RUPRECHT) SETCHELL et GARDNER

Phyc. Cont., I (1920), p. 280, Mar. alg. Pacif. Coast N. Amer., Chlorophyc. (1920), p. 227—*Conferva Mertensii* RUPRECHT, Tange Ocht. Meeres (1851), p. 403—*Acrosiphonia Mertensii* YENDO, Notes alg. new Japan, V (1916), p. 246.

Japanese name. *Kagi-moturegusa*.

Hab. Iema.

**S. duriuscula** COLLINS var. **cartilaginea** comb. nov.

Syn. *Conferva cartilaginea* RUPRECHT, Tange Ocht. Meeres (1851), p. 357.

Syn. *Cladophora alaskana* COLLINS, in COLLINS, HOLDEN and SETCHELL, Phyc. Bor.-Amer. (Exsicc.), no. 917 (nomen nudum).

Japanese name. *Kata-moturegusa*.

Hab. Iema.

All our specimens answer well to the original description of *Sp. cartilaginea* RUPR. In those specimens the cell membrane is very thick and cartilaginous, becoming very hard to the touch in drying. The diameter of the cells is about 120  $\mu$  near the base of the frond, and about 325  $\mu$  in

the upper parts of the branches. Having examined the type specimens, YENDO\* amalgamated *Conferva duriuscula* RUPR. and *C. cartilaginea* RUPR. into one species, calling it *Acrosiphonia duriuscula* (RUPR.) YENDO. Our specimens are about the same as YENDO's, which were collected in Onnekotan, the Kuriles, and identified as *Conferva cartilaginea* RUPR. TOKIDA,\*\* on the other hand, reported *Spongomorpha duriuscula* COLLINS from Robben Island. Thanks to his kindness, I have examined his dried specimens as well as those preserved in formalin and found that they answered fairly well to the description of *Conferva duriuscula* RUPR. In those specimens the cell membrane is not so cartilaginous as in our Urup specimens, it being rather easy, therefore, to distinguish one from the other, especially in the dried state. Consequently it seems to me that we must separate our cartilaginous plant from the typical *S. duriuscula*, at least, as a variety.

***S. duriuscula* COLLINS var. *tenuis* var. nov.**

Frons tenuior quam in typo.

Japanese name. *Hoso-moturegusa*.

Hab. Iema.

In our specimens the diameter of the cells is 90–110 $\mu$  near the base of the frond, and 170–200 $\mu$  near the tips of the branches. The cell membrane near the base of the frond as well as in the rhizoid shows very fine horizontal striations.

This variety grows sometimes on rocks in the littoral belt, sometimes on the frond of *Thalassiophyllum Clathrus* RUPR.

## PHAEOPHYCEAE

### ECTOCARPACEAE

#### *Pylayella*

***P. littoralis* KJELLMAN**

Scand. Ect. och Tilopt. (1872), p. 99, Alg. Arctic Sea (1883), p. 281; SETCHELL and GARDNER, Mar. alg. Pacif. Coast N. Amer., Melanophyc.

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\* YENDO, K.: Notes on algae new to Japan, V. (Bot. Mag., Tokyo, vol. 30, 1916), p. 246.

\*\* TOKIDA, J.: The marine algae from Robben Island (1932), p. 4.

(1925) p. 402; YENDO, Notes alg. new Japan (1909), p. 120.

Japanese name. *Piraera*.

Hab. Iema. Always found growing on *Fucus evanescens* Ag.

#### ENCOELIACEAE

##### *Scytosiphon*

**S. Lomentaria** J. AGARDH f. **tortilis** f. nov.

Plate I.

Japanese name. *Yore-kayamo*.

Hab. Iema.

The present form differs from typical specimens by the two facts that the frond shows no trace of constriction and always twists.

##### *Colpomenia*

**C. sinuosa** DERBES et SOLIER f. **deformans** SETCHELL et GARDNER

Alg. N. W. Amer. (1903), p. 242, pl. 18, figs. 13-15, Mar. alg. Pacif. Coast N. Amer., Melanophyc. (1925), p. 245—*Scytosiphon bullosus* SAUNDERS, Phyc. mom. (1898), p. 163, pl. 31, figs. 1-7, Alg. Harriman Exp. (1901), p. 421.

Japanese name. *Watamo*.

Hab. Iema.

##### *Coilodesme*

**C. bulligera** STROEMFELT f. **fucicola** YENDO

Plate II, Fig. 2.

Some new alg. Japan (1913), p. 279, pl. 13, figs. 10-11; TOKIDA, Mar. alg. Robben Isl. (1932), p. 8, fig. 2.

Japanese name. *Hosoebukuro*.

Hab. Iema.

This species was found on the frond of *Desmarestia aculeata* LAMX., which had been cast ashore.

##### *Soranthera*

**S. ulvoidea** POSTELS et RUPRECHT

Plate II, Fig. 1.

Illustr. alg. (1840), p. 19; KJELLMAN, Om Beringh. Algfl. (1889), p. 47, pl. 7, figs. 4-5; SAUNDERS, Phyc. mem. (1898), p. 165, pl. 29, figs. 4-5; SETCHELL

and GARDNER, Alg. N. W. Amer. (1903), p. 244, Mar. alg. Pacif. Coast N. Amer., Melanophyc. (1925) p. 525.

Japanese name. *Tisima-hukuronori*.

Hab. Iema; Kobune.\*

The present species grows always on the frond of *Odonthalia aleutica*  
J. AG.

## CHORDARIACEAE

### *Chordaria*

#### **C. flagelliformis** (MÜLLER) AGARDH

Syn. alg. Scand. (1817) p. 12, p. XII; OKAMURA, Icon. Japan. alg., vol. 2 (1912), p. 140, pl. 90.

Japanese name. *Naga-matumo*.

Hab. Iema.

#### **C. flagelliformis** AGARDH f. **chordaeformis** KJELLMAN

Om Spets. Thalloghyt., II (1877), p. 28, pl. 1, figs. 13-15; SETCHELL and GARDNER, Alg. N. W. Amer. (1903), p. 251, Mar. alg. Pacif. Coast N. Amer., Melanophyc. (1925) p. 573; YAMADA, Notes Japan. alg., IV (1932), p. 269, pl. 4.

Japanese name. *Himo-nagamatumo*.

Hab. Iema; Kobune.

#### **C. gracilis** SETCHELL et GARDNER

Plate III.

Phyc. Cont., VII (1924), p. 8, Mar. alg. Pacif. Coast N. Amer., Melanophyc. (1925), p. 573, pl. 84.

Japanese name. *Hoso-matumo*.

Hab. Iema.

Our specimens answer very well to both the description and the photo of the present species in the above mentioned books. Like the Alaskan plants, ours are all sterile. According to SETCHELL and GARDNER, the branches of the first order in Alaskan specimens are up to 4 cm. long, but among ours there is a specimen with longer branches which attain 9 cm.,

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\* The writer is very much indebted to Mr. T. NEMOTO, lecturer in the Department of Geology and Mineralogy of our Faculty, who has visited several places in Urup Island other than Iema, and brought back many algal specimens for study. All specimens from Tokotan and Kobune mentioned in the present paper belong to his collection.

though others bear shorter branches. The assimilating filaments are very short, being about  $30\mu$  long, and composed of two or three cells with a subspherical terminal cell whose diameter measures about  $12\mu$ .

#### DICTYOSIPHONACEAE

##### *Dictyosiphon*

##### **D. foeniculaceus** GREVILLE

Alg. Brit. (1830), p. 56, pl. 8, figs. 1-4; HARVEY, Phyc. Brit., pl. 326; SETCHELL and GARDNER, Mar. alg. Pacif. Coast N. Amer., Melanophyc. (1925), p. 289, pl. 40, figs. 47-49; YAMADA, Mar. alg. Mutsu Bay (1928), p. 507.

Japanese name.

Hab. Iema.

This alga is epiphytic on *Chordaria flagelliformis* AG., *Chordaria gracilis* SETCH. et GARD. etc.

#### DESMARESTIACEAE

##### *Desmarestia*

##### **D. kurilensis** sp. nov.

Plate IV.

Frons 40 cm alta, radice discoidea adfixa, caulis principali perculente, repetite pinnatim ramosa; caule principali compresso, ca. 2 mm crasso ad basin frondis, sursum complanato, non costato; ramis ramulisque oppositis, ad apicem pilis oppositis acutis curvatis armatis.

Japanese name. *Tisima-urusigusa*.

Hab. Iema.

Fronde 40 cm high arising from a small disc-shaped root, with a percurrent principal axis, repeatedly pinnately branched; principal axis as well as branches compressed, about 2 mm wide near the base of the frond, without midrib or anything resembling one; branches opposite, provided with opposite hairs; hairs acute, with hooked terminal cells.

Of this new species I have collected only one specimen east ashore. This is composed of two fronds arising from a small disc-shaped root. It appears to be in an early stage of development, because there are numerous hairs on the ramuli. Those hairs are acute at the apices, and the terminal cells are almost always hooked, as stated in the above diagnosis.

The new species reminds one of *D. viridis* LAMX. at first sight, but in the former the principal axis, as well as the axis of branches, is always compressed, which is not the case in the latter; we can thus easily distinguish the one from the other.

**D. aculeata** LAMOUROUX

Essai (1813), p. 25; HARVEY, Phyc. Brit., pl. 49; OKAMURA, Icon. Japan. alg., vol. 4 (1923), p. 193, pl. 199, figs. 5-9.

Japanese name. *Toge-urusigusa*.

Hab. Iema.

Our specimens agree fairly well with the description as well as the figure of *D. intermedia* POST. et RUPR. given by POSTELS and RUPRECHT, but not exactly with the American specimen distributed by SETCHELL and GARDNER under this name. In the American plant the branches are often somewhat fasciculate, as has already been noticed by the distributors. This characteristic, however, cannot be seen from either the description or the figure of POSTELS and RUPRECHT cited above. In this point our specimens seem to come nearer to the alga of POSTELS and RUPRECHT than to the American specimens.

On the other hand, *D. intermedia* POST. et RUPR. seems to be related very closely to *D. aculeata* LAMX. The chief characteristic distinguishing one species from the other appears to be the presence or absence of "aculei". But it does not seem to me so important, because these "aculei" appear sometimes in abundance, sometimes very rarely. Though I cannot amalgamate these species into one without seeing their types, still I doubt the validity of *D. intermedia* POST. et RUPR.

LAMINARIACEAE

*Alaria*

**A. fistulosa** POSTELS et RUPRECHT

Illustr. Alg. (1840), p. 11, pl. 16; KJELLMAN, Om Beringh. Algfl. (1889), p. 49; MIYABE, Laminariac. Hokkaido (1902), p. 52, pl. 21; YENDO, Mongr. Alaria (1919), p. 76, pl. 1; SETCHELL and GARDNER, Mar. alg. Pacif. Coast N. Amer. (1925), p. 644; MIYABE and NAGAI, Laminariac. Kurile Isl. (1933), p. 96.

Japanese name. *Oni-wakame*.

Hab. Iema.



**A. macroptera** (RUPRECHT) YENDO (?)

Monogr. Alaria (1919), p. 79, pl. 2, figs. 1-5; MIYABE and NAGAI, l. c. p. 99.

Japanese name. *Tisima-wakame*.

Hab. Iema.

Our specimens do not coincide exactly with the description and figures of *A. macroptera* YENDO given by YENDO. In Iema specimens the sporophylls are arranged nearly fasciculately, and not pinnately as mentioned by YENDO. Nor are the blades very corrugate in our specimens. But in other characteristics they closely approach the present species. It is on this account that I put a query after the specific name.

**A. angusta** KJELLMAN

Om Beringh. Algfl. (1889), p. 38, pl. 3, figs. 1-4; YENDO, l. c., p. 123, pl. 15; MIYABE and NAGAI, l. c., p. 97.

Japanese name. *Hosoba-wakame*.

Hab. Iema.

***Pleuropterum*****P. fasciculatum** sp. nov.

Plate V.

Frons radice fibroso adfixa, rhizinis radice ad basin stipitis fere verticillatis, repetite dichotome ramosis, teretibus, apicem versus gradatim complanatis; stipite breve, 2.5-4 cm longo, basi tereti, sursum mox complanato, dilatato, margine verrucoso; lamina simplici, lineari vel linearilanceolata, basi anguste cuneata, 3 m longa et ultra, 6.5-19 cm lata, tenuiter membranacea, cryptostomatibus non ornata; costa eminenti, complanata, 10-12 mm lata; sporophyllis numero 20-30 et ultra, petiolatis, ad margines partum superiorum stipitis densissime fasciculatis, aliis lineari-oblongis vel linearibus, 7-12 cm longis, 12-22 mm latis, omnino soriferis, aliis anguste linearibus costatis, 15-50 cm longis, 13-28 mm latis, praeter ad partem superiorem soriferis, aliis tote sterilibus, conspicue costatis.

Japanese name. *Uruppu-wakame*.

Hab. Iema.

Holdfast of branched hapters; hapters somewhat verticillate at the base of the stipe, terete, dividing dichotomously, slightly compressed upwards, with complanated and somewhat broadened end; stipe short, 2.5-4 cm long, cylindrical near the base, soon becoming complanated and broadened, about 8-10 mm wide, verrucous at the margin; blade linear or linear-lanceolate, narrowly cuneate at the base, 3 m. long or more, 6.5-

19 cm wide, thinly membranaceous, with prominent midrib; midrib broad, 10–12 mm wide (almost always above 6–7 mm even in the narrow ones), elevated above the blade equally on both surfaces with rounded edges, without cryptostomata; sporophylls 20–30 in number or more, petiolate, some linear-oblong or linear in shape, 7–12 cm long, 12–22 mm wide, with sori on the whole surfaces, others narrowly linear, provided with a percurrent midrib, 15–50 cm long, 13–28 mm wide, with some upper portion remaining sterile, some completely sterile, provided with a percurrent midrib, very densely fasciculate at both edges of the flattened portion near the upper end of the stipe.

Growing in the upper sublittoral belt together with *Alaria macroptera* YENDO, etc.

The new species shows many characteristics in common with *Pleuropterum paradiseum* MIYABE et NAGAI, especially in having leaflets with a percurrent midrib among the sporophylls. Yet by the following three features it is possible to distinguish the present species from *P. paradiseum* MIYABE et NAGAI. First, the sporophylls are arranged fasciculately in the present species, while in the other they are pinnate. In our specimens, 20–30 or more sporophylls, partly representing the real sporophylls, partly leaflets with only basal portion fertile, or partly, though rarely, completely sterile leaflets, are gathered on both edges of a flattened portion of the short stipe which measures only about 5 cm in length. They are arranged not in one row, but in two or three rows, though in an irregular manner. Secondly, the shortness of the stipe in our specimens must not be overlooked. In *P. paradiseum* MIYABE et NAGAI the stipe measures 40–60 cm according to the original description, while it is less than 1/10 in our specimens. Thirdly, although this character does not seem so important as the above two, the midrib of the present species is wider than that in *P. paradiseum* MIYABE et NAGAI, the two being 10–12 mm (6–7 mm in the narrow ones) and 4–5 mm respectively.

### *Thalassiophyllum*

#### **T. Clathrus** POSTELS et RUPRECHT

Illustr. alg. (1840), p. 11, pl. 18–19; MIYABE, Laminariac. Hokkaido (1902), p. 60, pl. 28; SETCHELL, Post-emb. stag. Laminariac. (1905), p. 123, pl. 13, figs. 6–13, Mar. alg. Pacif. Coast N. Amer., Melanophyc. (1925), p. 613, pl. 72; OKAMURA, Icon. Japan. alg. vol. 5 (1925), p. 104, pl. 229; MIYABE and NAGAI, l. c., p. 96.

Japanese name. *Kikuisi-kombu*.

Hab. Iema; Kobune.

### *Laminaria*

**L. longipes** BORY var. **latifolia** var. nov.

Stipes breviores et laminae latiores quam in typo.

Japanese name. *Hiroha-himekombu*.

Hab. Iema.

According to the descriptions of *L. longipes* BORY given by SETCHELL and GARDNER, and MIYABE and NAGAI, the stipe of this species attains 8–15 cm (SETCHELL and GARDNER) or 13–37 cm. (MIYABE and NAGAI) respectively, while in our specimens it varies between 3 and 5 cm. In the next place, the blades of Urup specimens are 4–5–13 cm broad while the above-mentioned authors record them as “2–4 cm.” and “2–7, mostly 2–4 cm.” respectively. To these facts it should be added that in our specimens the leaves are usually not cuneate at the base, but rounded. The sporangial sori grow at first in a round or irregularly elliptical outline and afterwards spread more extensively, remaining sterile only on the very margins. In my specimens the sori are produced always on one side of the blade and on this side the fertile part is somewhat elevated, the other side of the blade thus forming a shallow depression. The paraphyses are not covered with a hyaline appendage but sometimes show a slightly thickened membrane at the tip.

**L. yezoensis** MIYABE

Laminariac. Hokkaido (1902), p. 41, pl. 12–13; MIYABE and NAGAI, l. c., p. 90.

Japanese name. *Gohei-kombu*.

Hab. Iema.

Our specimens show an extremely long stipe, over 1 m in length.

### *Costaria*

**C. costata** (TURNER) SAUNDERS

Prel. paper *Costaria* (Bot. Gaz., vol. 20, 1895), p. 57; SETCHELL and GARDNER, Mar. alg. Pacif. Coast N. Amer., Melanophyc. (1925), p. 610, pl. 56 b, 79 a; MIYABE and NAGAI, l. c., p. 93—*Fucus costatus* TURNER, Fuci, vol. 4 (1819), pl. 226—*Costaria Turneri* GREVILLE, Alg. Brit. (1830), p. XXXIX; POSTELS et RUPRECHT, Illustr. Alg. (1840), p. 12, pl. 24; MIYABE,

Laminariac. Hokkaido (1902), p. 50, pl. 20; OKAMURA, Icon. of Japan. alg., vol. 5 (1925), p. 99, pl. 226.

Japanese name. *Sudime*.

Hab. Iema.

### *Cymathaere*

#### **C. fibrosa** NAGAI

New sp. Cymath. Kuril. (Proc. Imp. Acad., vol. 9, 1933), p. 531; MIYABE and NAGAI, l. c., p. 91.

Japanese name. *Edane-misuji-kombu*.

Hab. Iema.

The sporangial sori are produced on the under side of the blade (by the under side is meant the side on which the blade is convex at the base) from the base upwards, the central fascia remaining sterile. Presently the sori become narrower upwards, at last ending in two narrow lines running parallel along the central fascia. The paraphyses are lengthily clavate, often exceeding  $150\mu$ , including mucilage cap. The mucilage lacunae are situated in the roots and stipe just under the surface cells, running longitudinally. In the blade they are arranged net-wise, being found in greater quantity near the central fascia than near the margins of the blade.

All the specimens of the present species were found only east ashore.

#### **C. triplicata** (POSTELS et RUPRECHT) J. AGARDH

De Lamin. (1867), p. 30; SETCHELL and GARDNER, Mar. alg. Pacif. N. Amer., Melanophyc. (1925), p. 608; MIYABE and NAGAI, l. c., p. 92—*Laminaria triplicata* POSTELS et RUPRECHT, Illustr. alg. (1840), p. 10, pl. 10.

Japanese name. *Misudi-kombu*.

Hab. Iema.

As already mentioned by NAGAI, our specimens show no mucilage lacunae in the stipe, as against the description of SETCHELL and GARDNER.

### *Arthrothamnus*

#### **A. kurilensis** RUPRECHT

Bemerk. Bau u. Wachst. gross. Meeresalg. (1848), pl. 6; MIYABE, Laminariac. Hokkaido (1902), p. 48, pl. 19; OKAMURA, Icon. Japan. alg., vol. 5 (1925), p. 103, pl. 228; MIYABE and NAGAI, l. c., p. 95.

Japanese name. *Tisima-nekoasi-kombu*.

Hab. Iema; Kobune.

The mucilage lacunae are not present in the stipe, but in the blade they are found on both sides, being distributed rather irregularly. They show an irregular, or thick short linear form, and do not assume a net-like arrangement. They are situated a little beneath the surface cells in the cross section.

The sporangial sori grow from the base upwards, covering the whole surface of one side of the blade.

## FUCACEAE

### *Cystophyllum*

#### **C. geminatum** J. AGARDH

Spec. alg., vol. 1 (1848), p. 232; YENDO, Fucac. Japan (1907), p. 28; SETCHELL and GARDNER, Mar. alg. Pacif. Coast N. Amer., Melanophyc. (1925), p. 706.

Japanese name. *Yezomoku*.

Hab. Iema.

### *Fucus*

#### **F. evanescens** AGARDH

Icon. alg. ined. (1821), t. 132; Spec. alg., vol. 1 (1820), p. 92-93; YENDO, l. c., p. 14, pl. 1, figs. 1-2; SETCHELL and GARDNER, l. c., p. 681.

Japanese name. *Hibamata*.

Hab. Iema; Tokotan; Kobune.

## RHODOPHYCEAE

### BANGIACEAE

### *Porphyra*

#### **P. pseudolinearis** UEDA

Syst. Stud. Japan. Porphyra (1932), p. 29, pl. 6, figs. 17-18, pl. 7, figs. 1-2  
—*P. linearis* YENDO (non GREVILLE), Notes alg. new Japan, III (1915), p. 106.

Japanese name. *Uppuruinori*.

Hab. Iema.

**P. umbilicalis** J. AGARDH

Plate VII.

Till alg. syst. VI (1883), p. 66, pl. 2, fig. 61; ROSENVINGE, Mar. alg. Denm., vol. 1 (1909), p. 60, pl. 1, pl. 2, figs. 1-3; UEDA, l. c., p. 31, pl. 7, figs. 6-16; pl. 8, fig. 1, pl. 20, figs. 1-3, pl. 21, figs. 1-2.

Japanese name. *Tisima-kuronori*.

Hab. Iema; Kobune.

According to UEDA, the frond of the present species varies between about 40 $\mu$  and 55 $\mu$ , while in ours it is thinner, measuring sometimes about 30 $\mu$ , probably due to its being still young.

**P. perforata** J. AGARDH

Till alg. syst., VI (1882), p. 69; HUS, Acc. Porphyra (1902), p. 202, pl. 20, figs. 4-10; UEDA, l. c., p. 26, pl. 5, figs. 15-17, pl. 17, figs. 3-4.

Japanese name. *Ana-amanori*.

Hab. Iema; Tokotan; Kobune.

**P. Tasa** YENDO

UEDA, l. c., p. 35, pl. 8, figs. 11, pl. 9, figs. 1-6, pl. 22, figs. 1-2—*Wildemannia Tasa* YENDO, Nov. alg. Japon., Decas I-III (1920), p. 3.

Japanese name. *Tasa*.

Hab. Iema.

## DUMONTIACEAE

### *Dumontia*

**D. filiformis** GREVILLE

Alg. Brit. (1830), p. 165, pl. 17; OKAMURA, Icon. Japan. alg., vol. 1 (1907), p. 65, pl. 16, figs. 1-8.

Japanese name. *Ryûmonsô*.

Hab. Iema; Kobune.

## CALLYMENIACEAE

### *Callymenia*

**C. ornata** (POSTELS et RUPRECHT) J. AGARDH(?)

Plate VIII.

Spec. alg., vol. 1 (1851), p. 290, Epier. florid. (1876), p. 223—*Iridaea*

*ornata* POSTELS et RUPRECHT, Illustr. alg. (1840), p. 17, pl. 31.

Japanese name. *Kita-tukasanori*.

Hab. Iema.

The specimens which I refer to the present species are about 25 cm high, membranous and palmately divided. At the base they show a short stipe-like portion, and fasten themselves to the substratum by means of an irregular disc. Each lobe is about 4–9 cm broad, cuneate at, or attenuated toward, the base, and on the margin provided with smaller lobes, which in turn bear some of lesser order. The lobes are sometimes perforated.

The frond is about  $400\mu$  thick. In cross section, outermost there is a layer of elongated cells, and below it we see two or three layers of round cells; then, inward, the cells become greater and more elongated, showing more irregularity in shape; and at last, near the centre, there appear some short rhizoidal cells. The content of each cell is conspicuously granulous. The cystocarps are scattered over almost all the surface of the frond, about 1 mm in diam., but they sometimes reach 2 mm, being slightly elevated on both surfaces.

*Iridaea ornata* POST. et PUPR. was described basing on the specimens collected by Lütke on the shore of Kamchatka, and illustrated in a splendid figure. J. AGARDEH, however, transferred it afterwards to *Callymenia*. Compared with this figure and the description of POSTELS and RUPRECHT, our specimens are much smaller but in general outline they agree fairly well. On the other hand, ours adhere to paper firmly in drying, while such is not the case in Kamchatka specimens.

Near the surfaces of our specimens there are many endophytic bodies like gland cells. They are nearly spherical in shape, about  $80\text{--}130\mu$  in diam., and contain an amorphous substance yellowish in colour. Though they do not show any indication of forming reproductive bodies, they may belong to the genus *Chlorocytrium*.

### *Turnerella*

**T. Mertensiana** (POSTELS et RUPRECHT) SCHMITZ

Syst. Uebers. Florid. (1889), p. 7; OKAMURA, Icon. Japan. alg., vol. 3 (1914), p. 83, pl. 123, figs. 9–10.

Japanese name. *Yezonamesi*.

Hab. Tokotan.

Of this species I could not find any specimen at Iema. The Tokotan specimen was collected by Mr. T. NEMOTO in the summer of 1931.

## NEMASTOMACEAE

*Schizymenia*

**S. Dubyi** J. AGARDH var. **palmata** var. nov.

Plate IX.

Frons palmatim lobata, cellulis glandulosis rarissimis.

Japanese name. *Sake-benisunago*.

Hab. Iema; Kobune.

## GIGARTINACEAE

*Iridaea*

**I. laminarioides** BORY var. **cornucopiae** J. AGARDH

Spec. alg., II (1851), p. 253, Epicr. florid. (1876), p. 180; YENDO, Notes alg. new Japan, VI (1917), p. 78.

Japanese name. *Atuba-ginnansô*.

Hab. Iema; Kobune.

## RHODYMENIACEAE

*Rhodymenia*

**R. palmata** GREVILLE

Alg. Brit. (1830), p. 93; HARVEY, Phyc. Brit., vol. 2, pl. 217; SETCHELL and GARDNER, Alg. N. W. Amer. (1902), p. 31; TOKIDA, Mar. alg. Robben Isl. (1932), p. 16; OKAMURA, On alg. Alaska (1933), p. 90.

Japanese name. *Darusu*.

Hab. Iema; Kobune.

Among our specimens we can distinguish two forms: f. *typica* KJELLM. and f. *glandifolia* OKAM. The latter form seems to agree well with f. *mollis* SETCH. et GARD., but not being informed about the characteristics of the surface cells of f. *mollis*, I cannot here enter into this question.

*Halosaccion*

**H. firmum** RUPRECHT

Tange Ochot. Meer. (1856), p. 292; YENDO, Notes alg. new Japan (1909), p. 131.



Japanese name. *Kata-benihukuronori*.

Hab. Iema.

**H. saccatum** KUETZING

Tab. Phyc., vol. 16 (1866), pl. 78, figs. a-b; YENDO, l. c., p. 129.

Japanese name. *Benihukuronori*.

Hab. Iema; Tokotan; Kobune.

CERAMIACEAE

*Ptilota*

**P. pectinata** KJELLMAN

Alg. Arctic Sea (1883), p. 174; OKAMURA, Icon. Japan. alg., vol. 1 (1909), p. 235, pl. 47, figs. 1-15.

Japanese name. *Kusi-benihiba*.

Hab. Iema; Kobune.

**P. asplenioides** (TURNER) AGARDH

Spec. alg., vol. 1 (1822), p. 387; J. AGARDH, Spec. alg., vol. 2 (1851), p. 98, Epier. florid. (1876), p. 77; OKAMURA, Icon. Japan. alg., vol. 1 (1909), p. 239, pl. 48—*Fucus asplenioides* TURNER, Fuci, vol. 1 (1808), pl. 62.

Japanese name. *Katawa-benihiba*.

Hab. Iema; Tokotan; Kobune.

DELESSERIACEAE

*Phycodrys*

**P. fimbriata** (DE LA PYLAEI) KYLIN

Stud. Delesseriaceae (1924), p. 44—*Delesseria fimbriata* DE LA PYLAEI in J. AGARDH's Spec. alg., vol. 2 (1852), p. 690; OKAMURA, Icon. Japan. alg., vol. 2 (1910), p. 114, pl. 83.

Japanese name. *Kasiwaba-konohanori*.

Hab. Iema; Kobune.

RHODOMELACEAE

*Pterosiphonia*

**P. bipinnata** (POSTELS et RUPRECHT) FALKENBERG

Rhodomelac. (1901), p. 273; SETCHELL and GARDNER, Alg. N. W. Amer. (1903), p. 328; OKAMURA, Icon. Japan. alg., vol. 4 (1921), p. 134, pl. 185, figs. 1-7—*Polystea gemmifera* RUPRECHT, Tange Ochot. Meer. (1856), p. 226, pl. 11—*Polysiphonia bipinnata* POSTELS et RUPRECHT, Illustr. alg. (1840), p. 22.

Japanese name. *Itoyanagi*.

Hab. Iema; Tokotan.

The present species varies very much in external habit, some specimens having rather robust branches, while in others they are exceedingly slender. In some specimens I observed some rhizoidal outgrowths emitted from the pericentral cells near the end of branchlets.

### *Odonthalia*

#### *O. corymbifera* (GMELIN) J. AGARDH

Spec. alg., vol. 2 (1863), p. 897; OKAMURA, Icon. Japan. alg., vol. 2 (1912), p. 143, pl. 91—*Fucus corymbiferus* GMELIN, Hist. Fuc. (1768), p. 124—*Odonthalia Gmelini* POSTELS et RUPRECHT, Illustr. alg. (1840), p. 14, pl. 28—*Atmaria corymbifera* RUPRECHT, Tange Ochot. Meer. (1856), p. 213 etc.—*Odonthalia obtusangula* HARVEY, Char. new alg. (1859), p. 329.

Japanese name. *Hakesaki-nokogirihiba*.

Hab. Iema; Kobune.

*Odonthalia obtusangula* HARVEY was described with the specimens collected by C. WRIGHT in the northern part of Japan, and these specimens are now preserved in the Herbaria of FARLOW, HARVEY and AGARDH. They are no other than the present species.

#### *O. aleutica* J. AGARDH

Spec. alg., vol. 2 (1863), p. 895; SETCHELL and GARDNER, Mar. alg. N. W. Amer. (1903), p. 333; OKAMURA, Icon. Japan. alg. vol. 6 (1932), p. 75, pl. 286.

Japanese name. *Aryúsyán-nokogirihiba*.

Hab. Iema; Kobune.

#### *O. floccosa* (ESPER) FALKENBERG

Plate X.

Rhodomelac. (1901), p. 607; SETCHELL and GARDNER, Alg. N. W. Amer. (1903), p. 333.—*Fucus floccosus* ESPER, Icon. Fuc., vol. 2 (1802), p. 42, pl. 130; TURNER, Fuci, vol. 1 (1808), pl. 8.—*Rhodomela floccosa* AGARDH, Spec. alg. (1822), p. 376; POSTELS et RUPRECHT, Illustr. alg. (1840), p. 14, pl. 38, fig. c; J. AGARDH, Spec. alg., vol. 2 (1863), p. 887.

Japanese name. *Husa-nokogirihiba*.

Hab. Iema.

The present species, which is commonly distributed in the North Pacific, has been included in the Japanese marine flora with a query (OKAMURA, Nippon Sorui Meii, 2nd ed., 1916, p. 82). All our specimens had been cast ashore by a storm.

**O. semicostata** J. AGARDH

Spec. alg., vol. 2 (1863), p. 898; OKAMURA, Icon. Japan. alg., vol. 4 (1916), p. 25, pl. 157, figs. 1-6.

Japanese name. *Hiroha-nokogirihiba*.

Hab. Kobune.

I myself have not been able to find the present species, but a few specimens growing on *Ptilota asplenioides* Ag. were brought back from Kobune by Mr. T. NEMOTO.

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PLATE I

PLATE 1

*Scytosiphon Lomentaria* J. Ag. f. *tortilis* f. n.  
The type specimen. × ca. 1

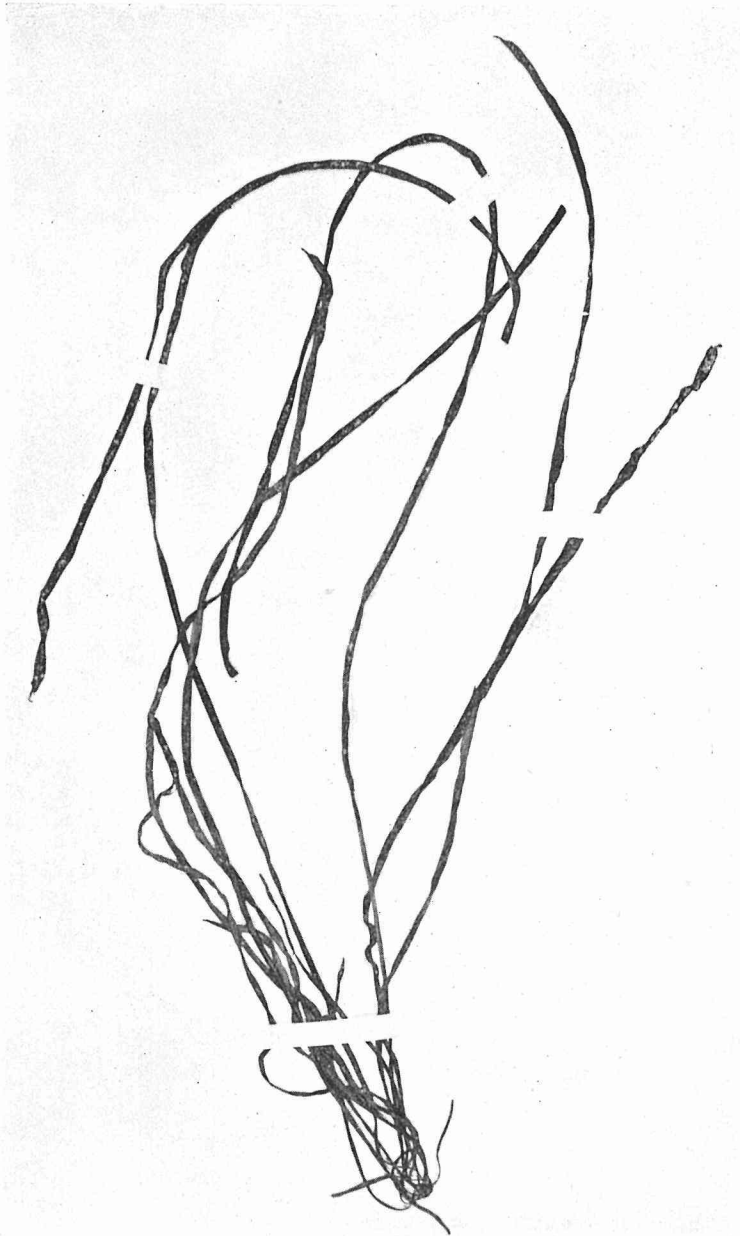
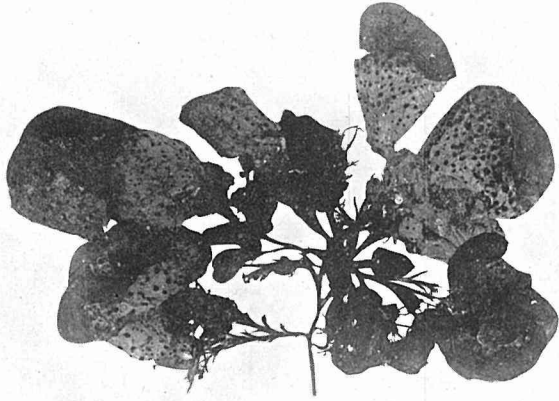


PLATE II

PLATE 2

1. *Soranothera ulvoidea* POST. et RUPR.  
In position on the host, *Odonthalia aleutica* J. AG. ×1
2. *Coilodesme bulligera* STROEMF. f. *fucicola* YENDO  
In position on the host, *Desmarestia aculeata* LAMX. Slightly reduced.





1



2

PLATE III

PLATE 3

*Chordaria gracilis* SETCH. et GARD. × ca.  $\frac{3}{4}$

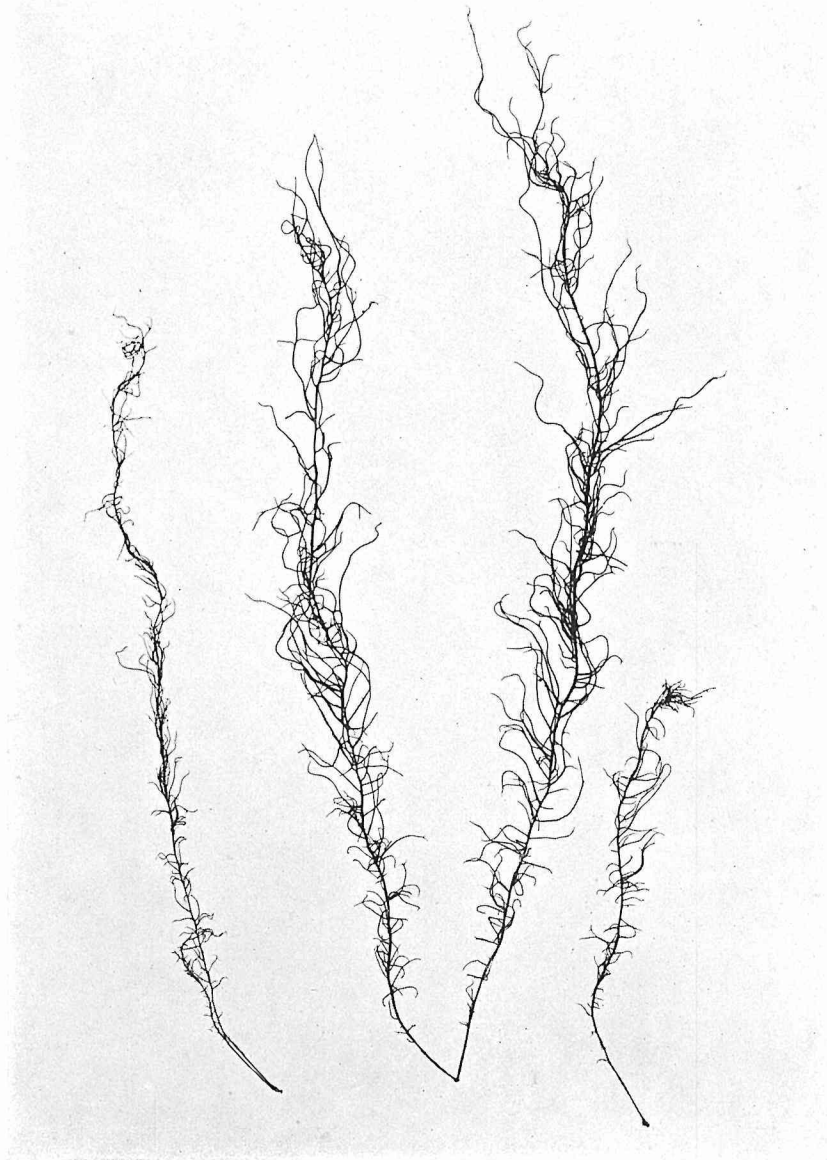


PLATE IV

PLATE 4

*Desmarestia kurilensis* sp. nov. The type specimen.  $\times$  ca.  $\frac{1}{2}$

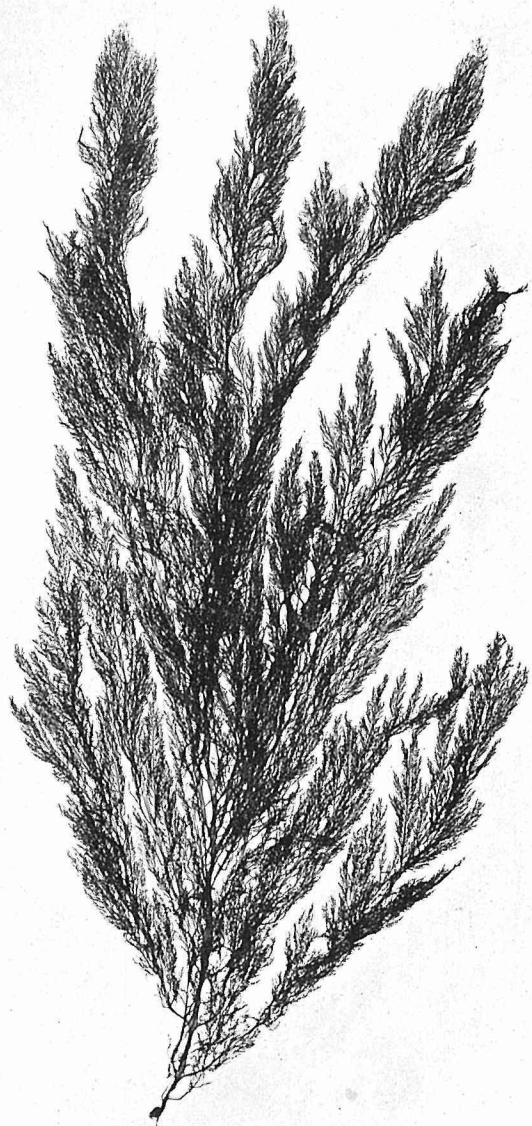


PLATE V



PLATE 5

*Pleuropterum fasciculatum* sp. nov.

The basal portion of the type specimen.  $\times$  ca.  $\frac{1}{3}$

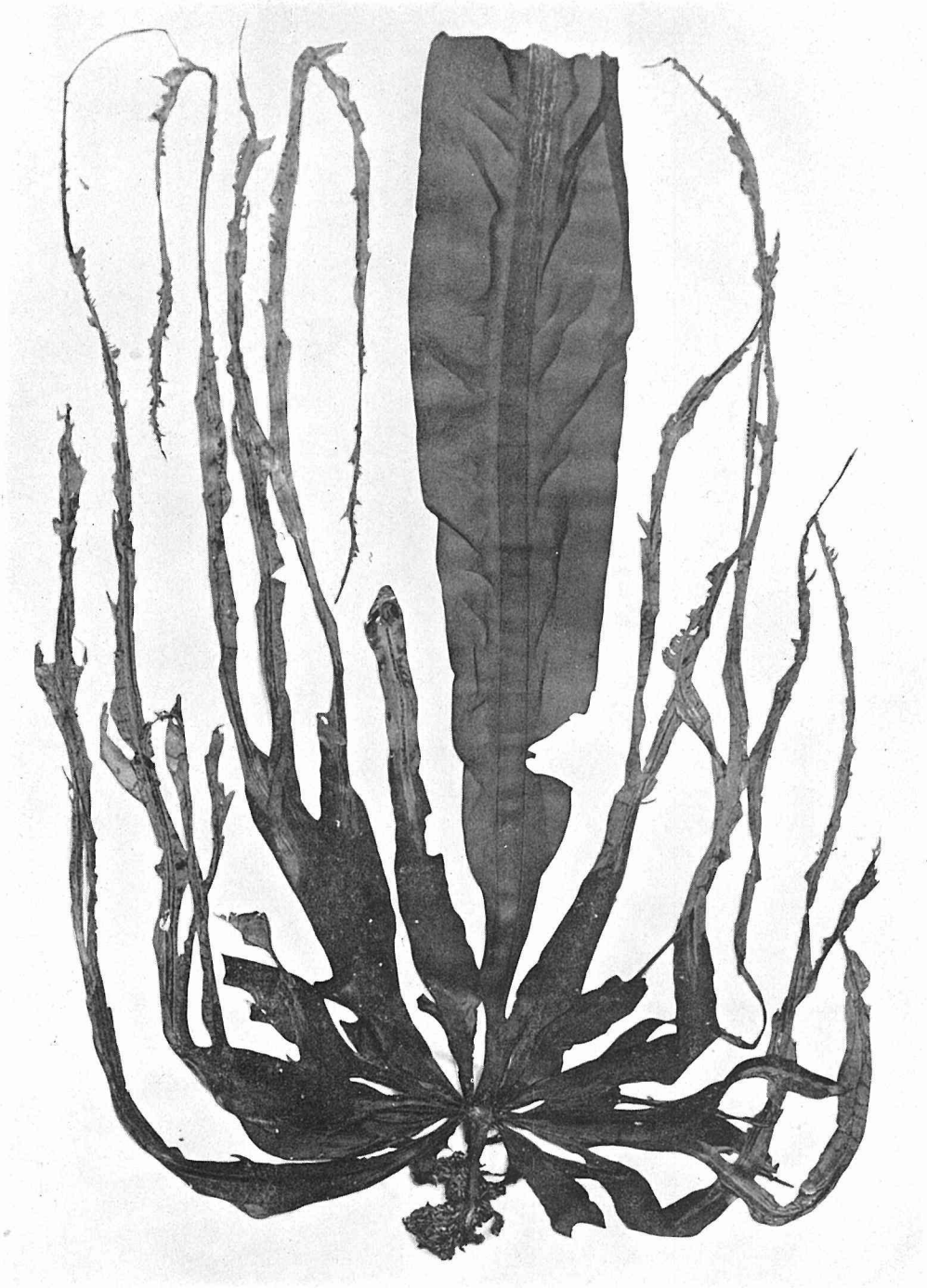


PLATE VI

PLATE 6

*Laminaria longipes* BORY var. *latifolia* var. nov.  
The type specimen.  $\times$  ca.  $\frac{1}{3}$

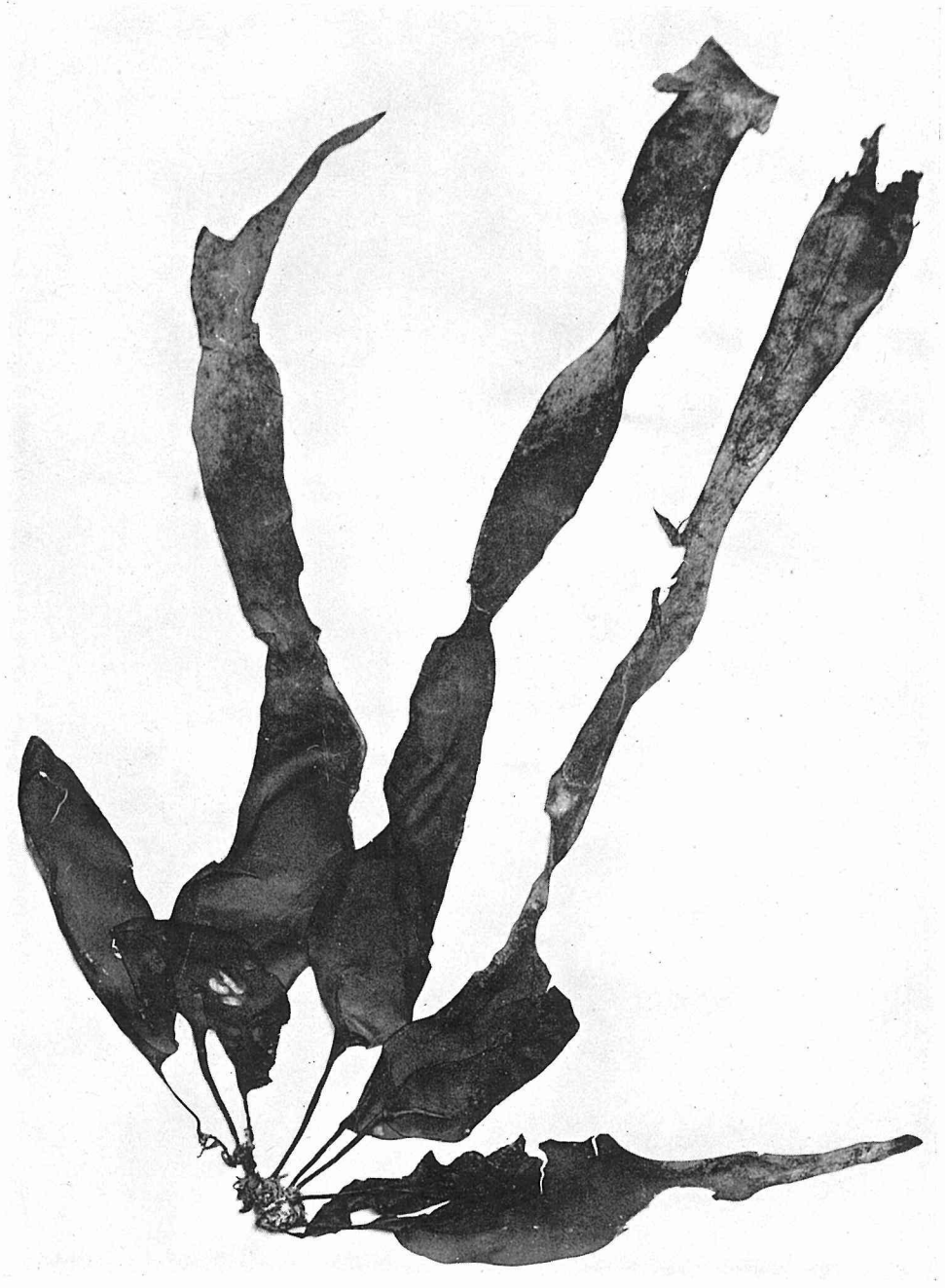


PLATE VII

PLATE 7

*Porphyra umbilicalis* J. Ag.

A monoecious specimen from Kobune.  $\times$  ca.  $\frac{3}{8}$

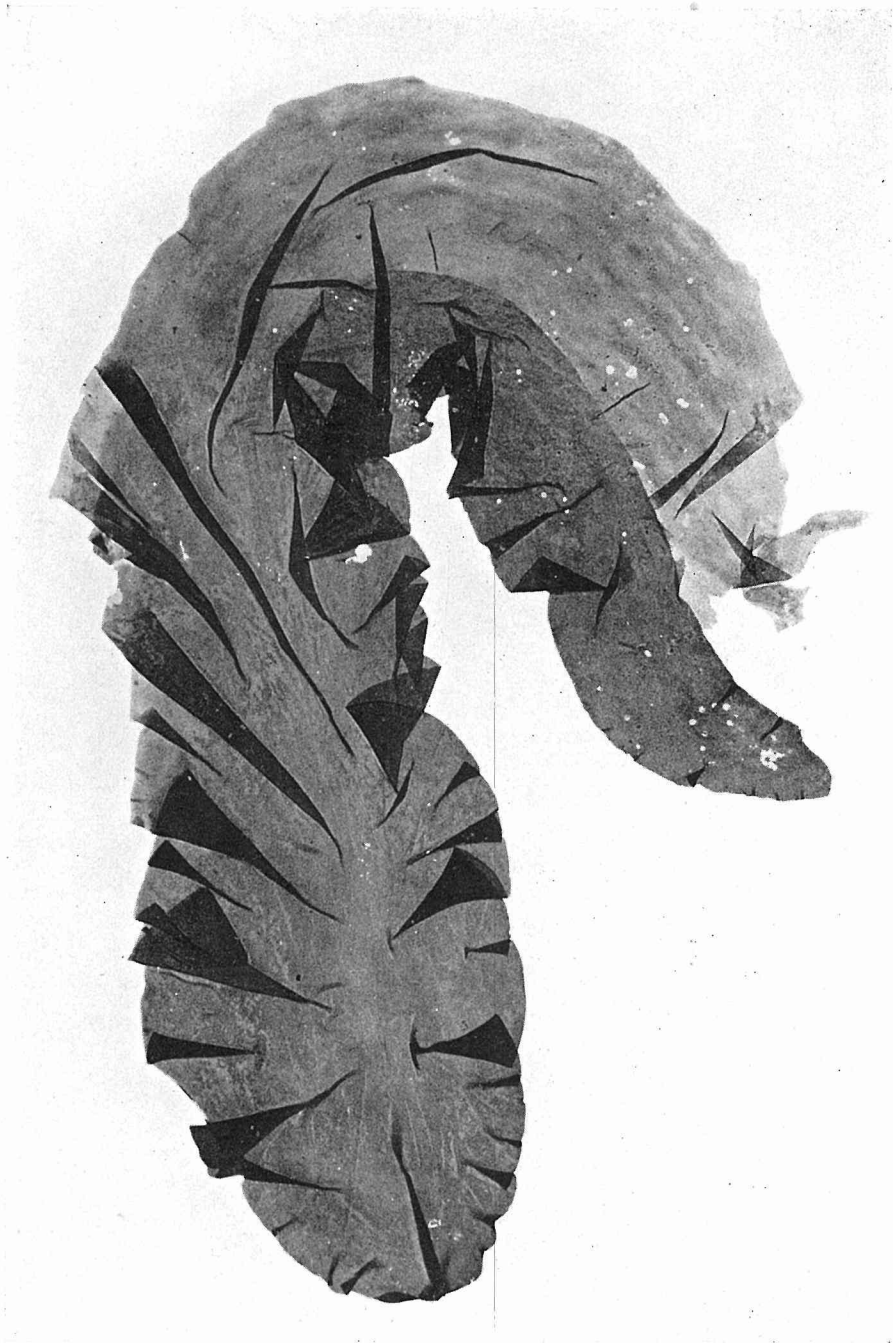




PLATE VIII

PLATE 8

*Callymenia ornata* (POST. et RUPR.) J. AG.(?) × ca.  $\frac{3}{8}$



PLATE IX

PLATE 9

*Schizymenia Dubyi* J. Ag. var. *palmata* var. nov.  
The cotype specimen.  $\times \frac{3}{5}$



PLATE X

PLATE 10

*Odonthalia floccosa* (ESPER) FALKENBERG.  $\times \frac{2}{3}$



