A NEW SPECIES OF *PORPHYRA*, EPIPHYTIC ON *CHORDA FILUM* FROM HOKKAIDO

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On March 7, 1954, the writer was botanizing along the coast of Mori, Prov. Oshima, Hokkaido, when he met with fishermen who were gathering laver by means of a long pole from a small boat about 300 meters off the shore. The plant was epiphytic on *Chorda Filum* (*L.*) *LAMOUR.* in a depth of about 3 – 8 meters and was characterized by being peculiar bright red in color. According to the fishermen, the laver grows there abundantly from late winter to early spring and only a few years have passed since its discovery. The yield of the laver in 1954 has amounted as to much as about 600 *kan* in wet weight being sold raw at the price of 350 *yen* a *kan* (3.75 kg).

After careful examinations the writer has concluded that this species of *Porphyra* is new to science. Its diagnosis and anatomical descriptions are given here as follows.

Porphyra moriensis OHMI sp. nov.

Planta monoica saepe androdioica, in fronde *Chorda Filum* (*L.*) *LAMOUR.* crescens; fronde membranacea, monostromatica, flaccida, ovata vel oblongo-ovata, ad basin distincte breve stipitata, marginibus undulato-plicata, apice obtusis, 2–30 cm raro usque 34 cm longa, 1–10cm raro usque 11.5 cm lata, plerumque 20–30μ raro 45μ crassa; colore roseo-purpureo vel coccineo, saepe ex parte olivaceo, quamdiu juvenilis, basi rotunda, quando vero matura cordata; cellulis vegetativis a facie visis subquadratis, 12–18μ × 6–12μ, plus minus sine ordine dispositis, in sectione thalli transversa orthogona, cellulis diametro ca. 2-plo longioribus; chromatophorum in cellulis stellare, pyrenoide centrali instructum; parte gelatinosa sub superficie frondis 1/5–1/7 totius crassitudinis; antheridiis et sporocarpis ex cellulis vegetativis dividis; antheridiis ad apicem et marginem frondis in luteolos pannos secus lineas longas extendentibus, ca. 53μ crassis; spermatiis a facie visis quaternis quadrigeminatis, in sectione transversa octonis quadriplicatis, 128 spermatiis in fasciculis singulis, formula $\frac{a}{4}\frac{b}{4}\frac{c}{8}$; sporocarpis in rubripurpureos pannos occupantibus, carposporis a facie visis binis bigeminatis, in sectione transversa binis duplicatis, 8 carposporis in fasciculis singulis, formula $\frac{a}{2}\frac{b}{2}\frac{c}{2}$.

Japanese name. *Kayabe-nori* (n. n.).

Hab. Mori, Prov. Oshima, Hokkaido.

Distribution. Endemic.

Frond ovate to oblong-ovate, round or cordate at the base, shortly stipitate, arising singly from a discoid holdfast composed of rhizoids, membranaceous, monostromatic, entire and undulate on the margin, 2-30 cm long, 1-10 cm broad, exceedingly flaccid, particularly so in the fertile portion, peculiarly deep pink or rose purple to crimson in color, partly often olivaceous, becoming dull purplish-red upon drying; membrane 20-30μ, rarely up to 45μ thick in vegetative part, up to 53μ thick in fertile part, and 57μ thick at the base; vegetative cells usually subquadrate with rounded corners, 12-18μ × 6-12μ, polygonal in a young thallus, somewhat irregularly disposed in surface view, elongated rectangular, usually about twice as long as broad, e. g., 23μ high and 10-15μ broad in cross section; chromatophore single, stellate, cerise in color, with a central pyrenoid, ca. 3μ in diam.; surface jelly very thin, less than 4μ; lowermost cells projecting rhizoidal filaments, oblong-capitate or angular-capitate, 18-42μ long, 10-22μ broad; rhizoidal filaments long, slender, hyaline, 1.5-2μ in thickness, with no septa, sometimes ending abruptly in a somewhat swollen tip, 4μ thick; monoecious or androdioecious; antheridia polygonal in surface view, formed at first near the tip and along the peripheral region of the frond, later gradually spreading over the whole frond, unmixed with vegetative cells; antheridium containing 128 antherozoids formed according to the formula, 128 $(\frac{a}{4}\frac{b}{4}\frac{c}{8})$; sporocarp containing 8 carpospores formed according to the formula, 8 $(\frac{a}{2}\frac{b}{2}\frac{c}{2})$, brownish red in color.

The present species has been found growing gregariously on the fronds of *Chorda Filum* (*L.*) *LAMOUR.* in a depth of about 3-8 meters about 300 meters off the shore of Mori, Prov. Oshima, Hokkaido.

Up to the present, so far as the writer is aware, two species have been authoritatively reported to grow in such a deep water. One is *Porphyra Nereocystis ANDERSON* and the other is *P. yezoensis UEDA f. Kinositai YAMADA et TANAKA*, growing respectively on stipes of *Nereocystis Luetkeana* and on the rocky bottom. The present species is closely related with the latter, but differs in several respects as mentioned below.

The shape of the frond is fairly constant in this new species, irrespective of its size, being oval when young and oblong when old. The frond margin is undulate in older fronds, but not laciniate. It shows the tendency to be much more undulate in older fronds. The frond base is decidedly stipitate. The largest specimen in the writer's hand attains 34 cm in length and 11.5 cm in breadth at its broadest portion. The following table shows the result of the measurement of 33 fronds growing on one and the same thallus of *Chorda Filum*.

Judging from the data listed in the table 1 as well as from those obtained in other observations, the ratio of breadth to length in this species is commonly from 1/2 to 1/3. Adult thalli measure on an average 18-30 cm in length and 5-10

Table 1. The dimensions of the fronds.

No. of specimen	length	breadth
1	3 mm	1.5 mm
2	5	1.7
3	7	2
4	7	3
5	9	3
6	10	4
7	10	5
8	12	3
9	14.5	4.5
10	15	4
11	16	8
12	17	10
13	18	8
14	55	17
15	56	16
16	56	21
17	63	18
18	64	18
19	70	20
20	75	24
21	78	34
22	96	30
23	105	37
24	111	45
25	115	45
26	116	45
27	116	47
28	118	48
29	119	48
30	122	48
31	127	49
32	147	58
33	152	51

cm in breadth.

The plant is as a rule monoecious, but occasionally androdioecious. In the latter case antheridia are borne exclusively. Antheridia are formed in elongated patches or streaks. These streaks are usually sharply outlined, especially at the margins of the fronds, owing to the distinct discoloration of the ripened antheridia against slightly brownish red sporocarps formed between them. Antheridia appear to ripen earlier than sporocarps do.

The antheridium mother cell divides at first by two cruciately crossing walls perpendicular to the surface of the frond. Subsequent divisions, parallel to the surface, take place three times and then two perpendicular divisions follow. The antherozoids thus formed are 128 in number, being arranged in cross section of the frond in four tiers of eight each, and in surface view, in four tiers of four each.

Each sporocarp is divided into eight carpospores by two cruciately or rarely more or less obliquely crossing walls perpendicular to the surface of the frond and next by one wall parallel to the surface of the frond. Thus produced eight carpospores are arranged in two tiers of two each in both cross section and surface view.

At first sight this species of *Porphyra* appears to be closely allied to *Porphyra yezoensis UEDA f. Kinositai YAMADA et TANAKA*, particularly in being peculiarly bright purplish in color and in having irregular streak-shaped antheridial patches. But it is not identifiable with the latter in being epiphytic instead of saxicolous, in being frequently androdioecious and in having a different dividing mode of antheridia and sporocarps. According to Tanaka, the sporocarps of *Porphyra yezoensis UEDA f. Kinositai* contain usually eight, or rarely sixteen, carpospores, and the formula of antheridial division is similar to that of *P. yezoensis UEDA* which accords to $64\ (\frac{a}{2}\frac{b}{4}\frac{c}{8})$. On the other hand, the sporocarps and antheridia of the writer's plant are divided according respectively to the formulae $8\ (\frac{a}{2}\frac{b}{2}\frac{c}{2})$ and $128\ (\frac{a}{4}\frac{b}{4}\frac{c}{8})$, as already mentioned above.

In conclusion, the writer wishes to express his hearty thanks to Prof. Y. Yamada, Prof. J. Tokida, and Prof. T. Tanaka, for their kindness in helping him in various

ways. He is also much obliged to Mr. Y. Ogawa of Mori Town Office, who gave him assistance in collecting the materials of the present study.

Summary

1. In this paper is reported the discovery of a new species of *Porphyra*, *Porphyra moriensis*.

2. The new species appears to be closely related to *Porphyra yezoensis* UEDA *f. Kinositai* YAMADA *et* TANAKA, but it differs from the latter in the dividing mode of antheridia and sporocarps, in being androdioecious instead of monoecious, in the habitat, and in the thickness of frond.

Literature cited

Dawson, E. Y. (1952). Marine red algae of Pacific Mexico. 1. *Allan Hanc. Pac. Exp.* **17** (1), 1—171.

Hus, H. T. A. (1902). An account of the species of *Porphyra* found on the Pacific coast of North America. *Proc. Calif. Acad. Sci.* ser. 3, Bot., **2** (6), 173—240.

Nagai, M. (1941). Marine algae of the Kurile Islands. 2. *Jour. Fac. Agr., Hokkaido Imp. Univ.* **46** (2), 139—310.

Smith, G. M, (1943). *Marine algae of the Monterey Peninsula.* 622 p. Stanford Univ. Press.

Tanaka, T. (1952). The systematic study of the Japanese Protoflorideae. *Mem. Fac. Fish., Kagoshima Univ.* **2** (2), 1—92.

Taylor, W. R. (1937). *Marine algae of the northeastern coast of North America.* 427 p. Ann Arbor.

Tokida, J. (1932). The Marine algae from Robben Island, Saghalien. (1932), *Bull. School of Fish., Hokkaido Imp. Univ.* **2**, 1—34.

———— (1934). Ditto. *Ibid.* **4**, 16—26.

Ueda, S. (1932). A systematic study of genus *Porphyra* found on the Japanese coasts. (in Japanese). *Jour. Imp. Fish. Inst.* **28** (1), 1—45.

Explanation of plates

Porphyra moriensis OHMI

plate I

1. Surface view of vegetative frond
2. Surface view of young vegetative frond
3. Cross section of vegetative portion of a frond
4. Lowermost cells with rhizoidal filaments seen from the surface
5. Rhizoid cells mostly with the initial of the rhizoidal filaments, showing hyaline filaments and colored content
6. Longitudinal section of the lowermost portion of a frond
7. Surface view of antheridial portion
8. Cross section of antheridial portion
9. Cross section of sporocarpic portion
10. Surface view of sporocarpic portion

1-6: ×210, 7 & 8: ×380, 9 & 10: ×210

Plate II

The type specimen of monoecious frond taken off the host-plant × 2/3

Plate III

1. Habit of juvinile specimens attaching to a frond of *Chorda Filum* (*L.*) *LAMOUR.* × 3/7
2. Habit of specimens arising from a frond of *Chorda Filum* (*L.*) *LAMOUR.* × 2/3

Plate IV

Various specimens, young or adult, arising from the host-plant × 2/3

Plate I

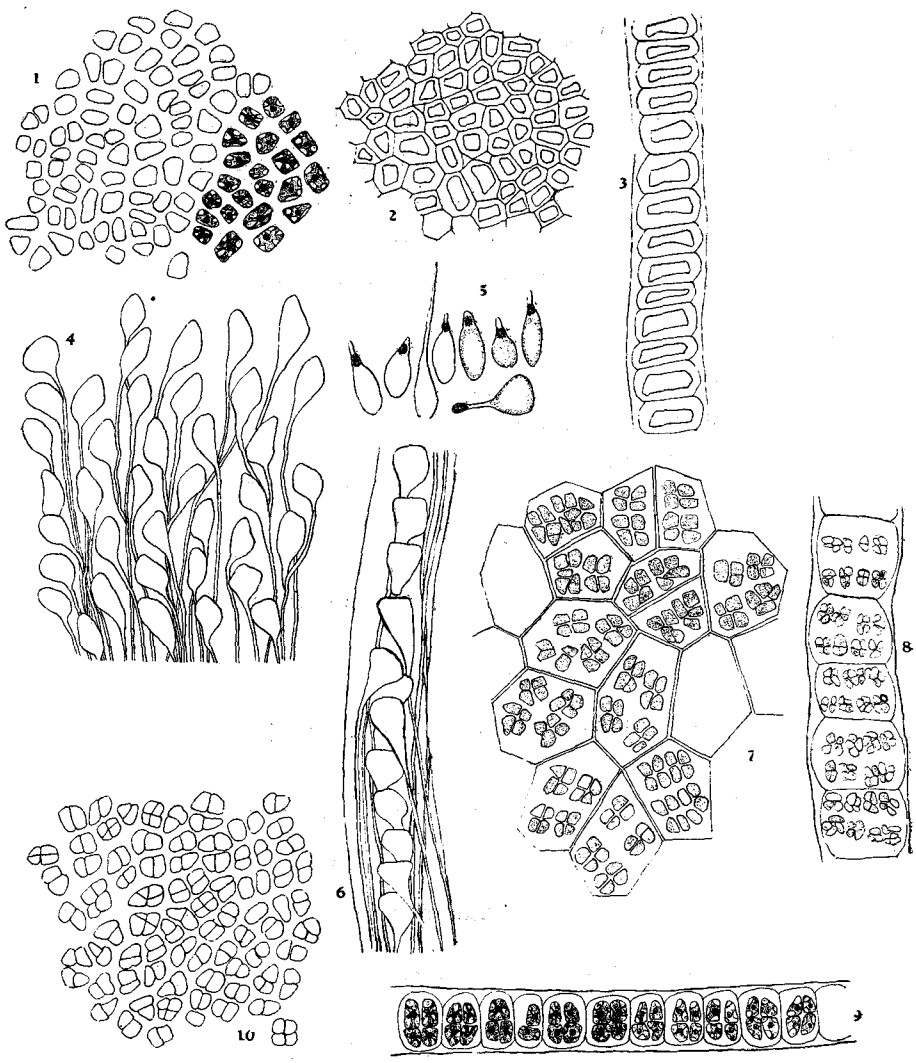

Plate II

Plate Ⅲ

1

2

Plate IV