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A DESCRIPTIVE REVIEW OF *GRACILARIA* FROM  
GHANA, WEST AFRICA

Hikoei OHMI\*

While I was studying Gracilariaceous plants from Japan and its adjacent waters, I had an opportunity to examine a number of herbarium specimens of *Gracilaria* from Ghana, West Africa, through the kindness of Dr. G.W. Lawson of The University College of Legon, Ghana. The majority of the specimens are labelled by him as *Gracilaria henriquesiana* Hariot, and the rest as *G. ferox* Agardh and *G. verrucosa* (Huds.) Papenfuss. The discovery of peculiarly constructed antheridial conceptacles in the specimens of *G. henriquesiana* was previously reported by myself in a short paper (Ohmi, 1958). Here I wish to give full data of these specimens as well as the descriptions of the species except *G. verrucosa* in the hope that this will be of some use for a taxonomic study of *Gracilaria*.

I am much obliged to Emer. Prof. J. Tokida of Hokkaido University for his kindness in reading the manuscript and also to Dr. G.W. Lawson for the loan of valuable specimens.

Description of the species

*Gracilaria henriquesiana* HARIOT

Plate I, A-C; II, Figs. 1-6

Les Algues de San Thome, 1908, p. 2; De Toni, Syll. Alg. VI (5), 1924, pp. 269-270; Lawson, The general features of seaweed zonation on the Gold Coast. Proc. 1st Inter. Seaweed Symp., 1952, p. 19.

Material examined: Foote 627, sterile, Pram Pram, Nov. 1949; Foote 660, ♀, Pram Pram, Nov. 1949; Lawson A 35, ♂, Pram Pram, Feb. 1951; Lawson A 136, ♂, Nungua, Apr. 1951; Lawson A 1061, ⊕, Tema, Jan. 1956; Foote 231, ⊕, Pram Pram, Apr. 1941; Lawson A 280 ⊕, Winneba, Dec. 1951; Lawson A 927, ⊕, Pram Pram, Jan. 1955; Lawson A 972, ⊕, Winneba, Nov. 1955; Lawson A 973, ⊕, Pram Pram, Dec. 1955; Lawson A 16, ⊕, Pram Pram, Jan. 1951; Lawson A 17, ♂, Pram Pram, Jan. 1951; Lawson A 935, ♀, Pram Pram, Nov. 1955; Lawson A 936, ♀, Pram Pram, Nov. 1955; Lawson A 1061, ⊕, Tema, Jan. 1956.

Distribution: West Africa.

Frond complanate, flabelliformis, arising in tufts from a common small attachment disc, 3-18 cm long and 0.7-5 mm broad in dried specimens, tapering gradually

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towards the base into an elongated cuneate or linear portion and a short subterete stipe, lobed in repeated dichotomous manner with rounded axil, ending into blunt bifurcate tips; the angle of the furcation is considerably sharp; up to  $875\mu$  in thickness when immersed in water; some specimens are furnished with abundant pinnate proliferations along the margins of the upper and middle portions of the frond; subcartilaginous in substance, brownish to purplish red or sometimes olive green in color in dried specimens

Medulla in the inner structure of frond consists of 3-6 layers of large isodiametric parenchymatous cells, which attain  $315\mu$  in diam. and are surrounded by a thin wall, mostly less than  $4\mu$  in thickness; infracortical cells are generally one-layered,  $30-40\mu$  in diam.; the cortex is built up of 1-2 layers of minute cuboid cells which are  $4-6\mu$  in diam. Surface jelly substance is very thin.

Tetrasporangia densely scattered on both surfaces of frond, bordered by unmodified cortical cells; they are spherical or ovoid in shape,  $25\mu \times 30\mu$  to  $30\mu \times 42\mu$  in dimension as seen in transverse section, cruciately divided.

Cystocarps hemispherical or low dome-like in shape, non-rostrate, up to 1.25 mm in diam.,  $700\mu$  in height, slightly constricted at the base, with gonimoblast placenta consisting of large vacuolous cells, with nutritive filaments issued from placenta and growing towards the pericarp; the pericarp ca.  $210\mu$  thick; carpospores roundish or ovoid in shape,  $12-18\mu$  in diam. The surface jelly of the pericarp is ca.  $9\mu$  thick.

Antheridial globular conceptacles are densely scattered on both surfaces of frond, surrounded by slightly modified or unmodified cortical cells, immersed under a slightly elevated surface layer of the frond, vaguely discernible from the frond surface as roundish pits, containing 3-6 aggregated small globular cavities which are  $20-45\mu$  in diam. and containing many spermatangia (cf. Ohmi, 1958).

These antheridial conceptacles closely resemble the so-called antheridial caves of *Gracilaria multifurcata* (Börjesen, 1953). However the latter species is different from *G. henriquesiana* not only in the external appearance but also in having more than six globular antheridial cavities aggregated in each "cave".

The present species is known to be one of the commonest red algae among the intertidal seaweeds of Ghana (Dickinson and Foote, 1951; Lawson, 1954). According to the personal communication from Dr. Lawson, Mrs. Nielson of Ibadan is of the opinion that *G. henriquesiana* is a form of *G. dentata*. But I can say nothing about the relation between these two species as I am not accessible at present to any reliable specimens of the latter.

#### *Gracilaria verrucosa* (HUDS.) PAPENFUSS

Hydrobiologia II, 1950, p. 195. *Fucus verrucosus* Huds. Fl. Angl., 1762, p. 470. *Fucus confervoides* L. Sp. Plant. II, 1763, p. 1629. *Gracilaria confervoides* (L.) Grev. Alg. Brit., 1830, p. 123.

Material examined: *Lawson* A 74, ♀, Nungua, Feb. 1951; *Lawson* A 940, ♀, Pram Pram, Nov. 1955; *Lawson* A 971, ♀, Winneba, Nov. 1955.

Habitat: According to Lawson the plant commonly grows on rocks partially covered by sand, or on sandy bottoms of tide pools.

Distribution: Cosmopolitan.

### *Gracilaria ferox* J. AGARDH

Plate I, D; II, Fig. 7

Sp. Alg. II, 1852, p. 592; Id., Epicr., 1876, p. 414; De Toni, Syll. Alg. IV (2), 1900, p. 434; VI(5), 1924, p. 255; Börgesen, Mar. Alg. Danish W. Indies III, 1920, p. 374; Taylor, Mar. Alg. Florida, 1928, p. 154, pl. 33, fig. 2.

Material examined: *Lawson* A 731 a-c, sterile, Victoria, Dec. 1953; *Lawson* A 808, sterile, Nachitgal Lighthouse, Dec. 1953.

Distribution: Florida; Bermuda; and the Caribbean Sea.

Frond erect, arising in tufts, 4–6 cm high, subterete or slightly compressed, up to 2 mm in breadth, repeatedly bi- or tripartite, branched densely at close intervals in the upper part with a patent round axil, bushy flabellate or corymbose; ultimate branchlets ending mostly in obtuse, or occasionally in considerably acute apices; pinkish or brownish red in color.

The transverse section through the frond shows that the medulla consists of several layers of roundish parenchymatous cells which are 120–160  $\mu$  in diam. and surrounded by a wall 6–10  $\mu$  thick. Cortex is composed of two layers of small ovoid cells, which are 5–6  $\mu$  in diam. Surface jelly substance ca. 3  $\mu$  thick.

Four specimens at hand are all sterile, but their structure agrees very well with the description and figure of the present species given by Taylor (1928, p. 154, pl. 33, fig. 2). According to Lawson this plant grows together with *Sargassum* on somewhat exposed rocks fringing the infralittoral zone.

### Summary

In the present paper are given the data and descriptions of three species of the genus *Gracilaria* on the basis of the herbarium specimens from Ghana borrowed from Dr. G.W. Lawson of The University College of Legon, Ghana.

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## **Explanation of Plates**

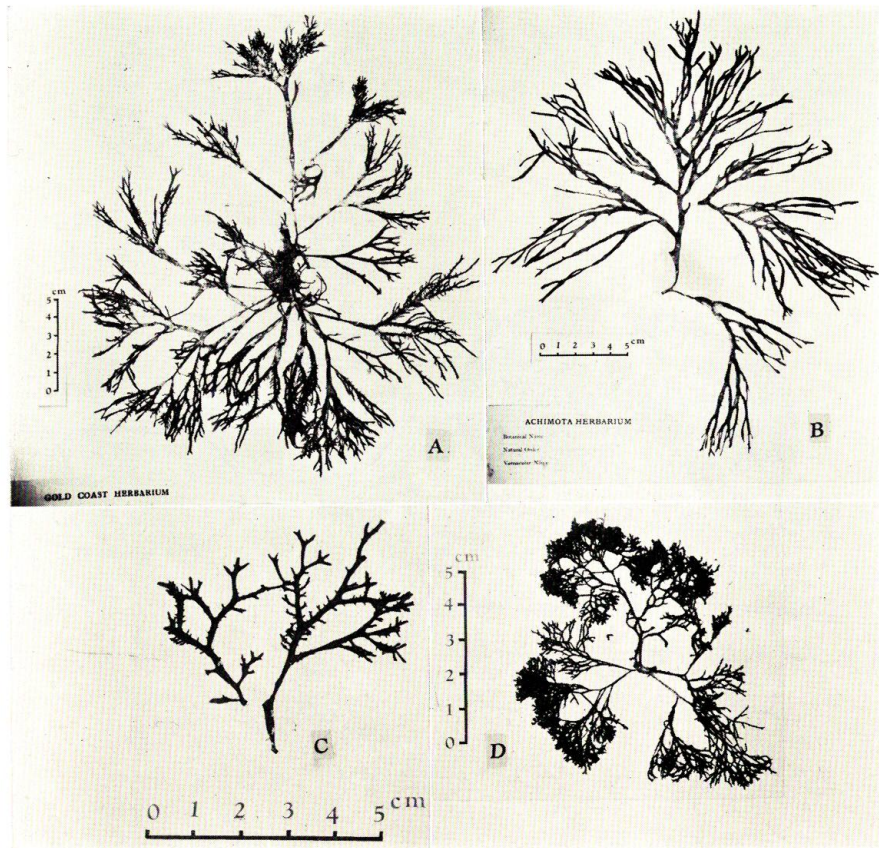
PLATE I

A-C. *Gracilaria henriquesiana* Hariot

- A. A tuft of tetrasporic plant from Pram Pram, Ghana, *Lawson* A 973
- B. A tetrasporic plant from Pram Pram, Ghana, *Lawson* A 927
- C. A tetrasporic plant from Pram Pram, *Lawson* A 16

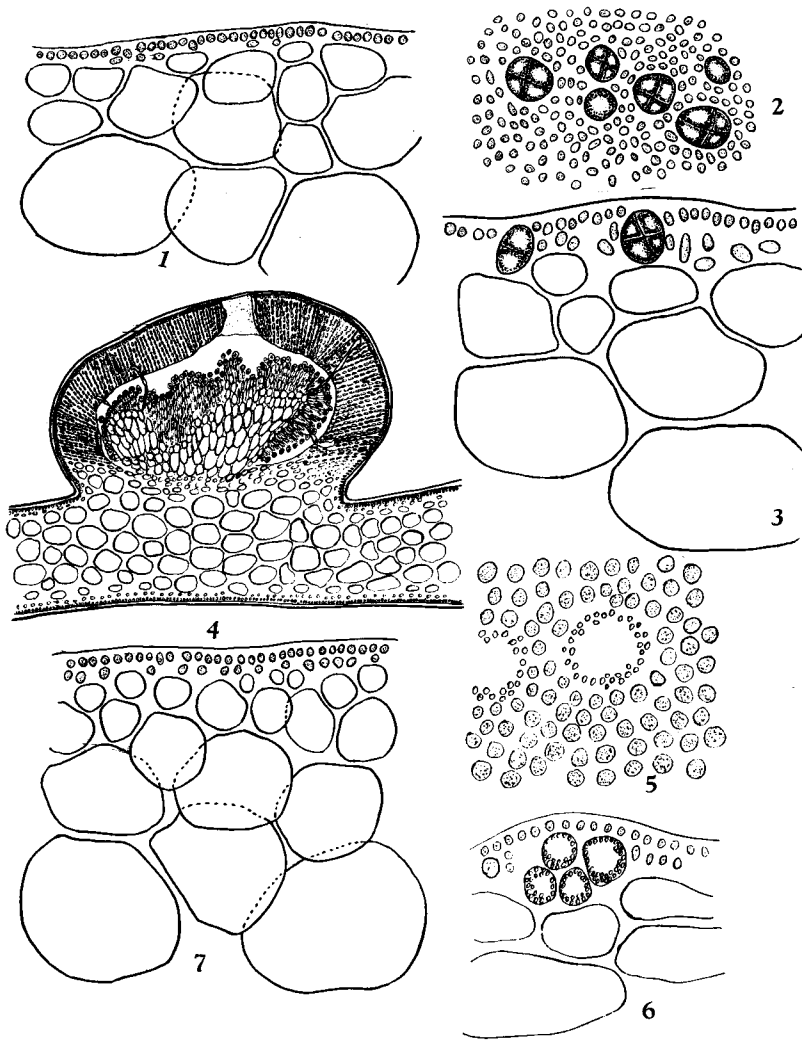
D. *Gracilaria ferox* J. Agardh

- D. Sterile plant from Nachtigal Lighthouse, Ghana, *Lawson* A 808



H. OHMI : A descriptive review of *Gracilaria* from Ghana





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## PLATE II

Figs. 1-6 *Gracilaria henriquesiana* Hariot

Fig. 1. Transverse section through a branch × 120

Fig. 2. Surface view of a tetrasporic frond × 210

Fig. 3. Transverse section through a tetrasporic frond × 210

Fig. 4. Transverse section through a mature cystocarp × 37

Fig. 5. Surface view of a frond showing two antheridial conceptacles as seen beneath the superficial cells which are not drawn in this figure × 250

Fig. 6. Section through a part of an antheridial frond showing an aggregation of small bodies (four in the figure) in an antheridial conceptacle × 140

Fig. 7. *Gracilaria ferox* J. Agardh

Fig. 7. Transverse section through a branch × 210