Mem. Fac. Sci. Shimane Univ.,
23, pp. 107–111 Dec. 20, 1989

Morphological note on *Griffithsia okiensis* Kajimura (Ceramiaceae, Rhodophyta)[1]

Mitsuo KAJIMURA

Marine Biological Station, Shimane University,
Kamo, Saigo, Oki-gun, 685 Japan

Production of connecting cells and the diploidization of the supporting cell prior to cutting off of the auxiliary cell are newly reported for *Griffithsia okiensis* Kajimura together with some other morphological notes. Morphological comparison of *G. okiensis* and its allied two taxa which have two carpogonial branches borne on the single supporting cell, namely, *G. monilis* Harvey var. *cincta* Baldock and *G. teges* Harvey is also made in this poper.

Key Index Words: Griffithsia okiensis—*Geramiaceae—Rhodophyta—morphological note—connecting cells.*

Introduction

It has been considered to be reasonable that the production of connecting cells and the diploidization of the supporting cell prior to cutting off of the auxiliary cell are variable characters within the genus of *Griffithsia* (Phillips 1897; Lewis 1909; Kylin 1916; Dixon 1964; Baldock 1976; Kim and Lee 1987). The present writer could detect those two morphological characters mentioned above also in *Griffithsia okiensis* (Kajimura 1982) through his continuous observations made on many materials which had been further collected since 1982 when this alga was reported as a new species, and the result of his observations has made redefinition of this species possible.

Materials and Methods

Further collections of abundant mature fertile specimens of *Griffithsia okiensis* were made by the present writer at low tide level at Takeishi in Kamo Bay, the Oki Islands as shown in Table 1.

Fresh specimens as well as specimens preserved in formalin-seawater were used also in this study. Materials were stained with a 1% aqueous solution of aniline blue to which acetic acid was added in the volumetric ratio of about 1:9. The stained materials were mounted in a 50% aqueous solution of rice syrup to which was added acetic acid in the volumetric ratio of about 1:5.

[1] Contribution No. 46 from Oki Marine Biological Station, Shimane University.

Table 1. List of the collections of material.

No.	Date	Substratum	Maturity
OS 9985	Aug. 11, 1986	On rocky bottom and *Dictyopteris prolifera*	♀, ☮
OS 9986	Sep. 21, 1986	On *Halichondria* sp., *Dictyopteris prolifera* and *Jania* sp.	♀
OS 9987	Sep. 22, 1987	On *Cladophora ohkuboana*	♀
OS 9988	Sep. 24, 1987	On *Dictyopteris prolifera*, *Corallina pilulifera* and *Jania* sp.	♂, ♀, ☮
OS 9989	Dec. 10, 1987	On rocky bottom and *Dictyota dichotoma*	♂, ♀, ☮
OS 9990	Feb. 12, 1988	On *Corallina pilulifera* and *Jania* sp.	♀, ☮
OS 9991	Mar. 3, 1988	On *Corallina pilulifera*	♀
OS 9992	Apr. 9, 1988	On *Corallina pilulifera*	♂, ♀, ☮
OS 9993	Aug. 10, 1988	On *Dictyopteris prolifera*	♂, ♀, ☮
OS 9994	Sep. 29, 1988	On rocky bottom	♂, ♀, ☮
OS 9995	Jan. 5, 1989	On *Cladophora ohkuboana*, *Dictyota dichotoma*, *Sargassum horneri* and *Corallina pilulifera*	♂, ♀, ☮
OS 9996	Jan. 6, 1989	On rocky bottom and *Jania* sp.	♂, ♀, ☮
OS 9997	Jan. 10, 1989	On *Cladophora ohkuboana*	♂, ♀, ☮
OS 9998	Mar. 25, 1989	On rocky bottom	♀, ☮
OS 9999	Apr. 13, 1989	On rocky bottom, *Cladophora ohkuboana* and *Dictyota dichotoma*	♂, ♀, ☮
OS 10000	Apr. 19, 1989	On *Corallina pilulifera*	♂
OS 10001	Jun. 21, 1989	On rocky bottom	♂, ☮

Observations

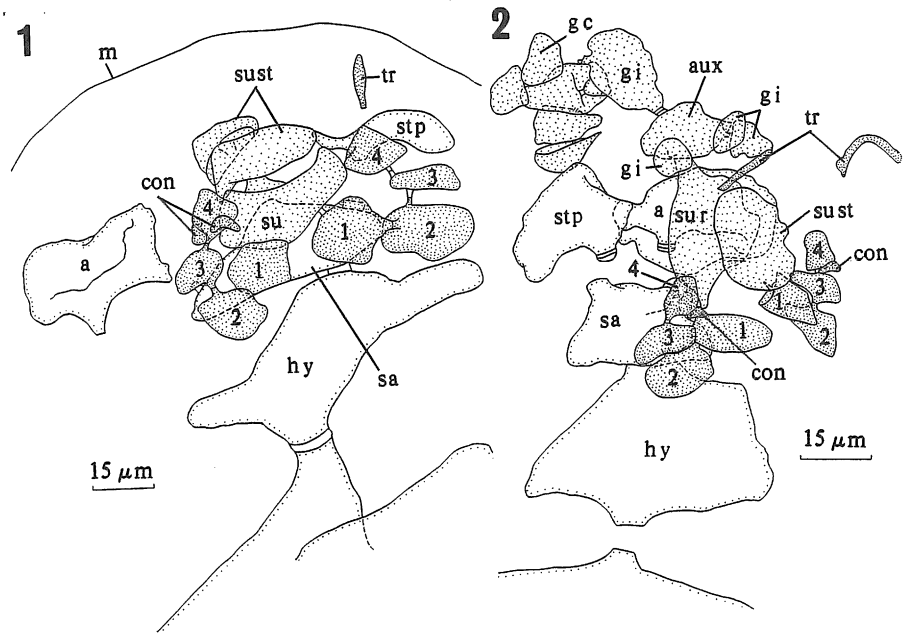
Thallus is composed of fan-shaped branches and often takes the form of a hemispherical tuft at most.

The female fertile axis consists of 3 (rarely 2) cells. One fertile axis arises from a single vegetative cell. Trichoblasts are usually none, usually 2 opposite but rarely 3–4 vegetative filaments and usually 7–10 involucral cells arise from upper margin of the subhypogynous cell. The subapical cell of the fertile axis produces 2 pericentral cells, one of which remains sterile. The other is the supporting cell, producing a sterile cell (the supporting-sterile cell) which rerely divides once and laterally a pair of 4-celled carpogonial branches. The carpogonium bears a long trichogyne. When the female fertile axis consists of 2 cells, the hypogynous cell is not formed. Following presumable

fertilization, a pair of connecting cells are usually cut off from either side of the lower part of each carpogonium (Fig. 1). Probably one of the 2 fertilized carpogonia connects with each supporting cell through the connecting cell. The one connecting cell closer to the supporting cell fuses with it. This connecting cell may transfer the diploid nucleus to the supporting cell, and the first cell produced from division of the supporting cell functions as a generative auxiliary cell and remains attached to the carpogonium for a short time. The auxiliary cell is considered to receive the diploid nucleus produced at fertilization. Several gonimoblast initials arise from the auxiliary cell in various direc-

Abbreviations used in Figures

a	apical cell of female fertile axis	sa	subapical cell of the female axis
aux	suxiliary cell	stp	sterile pericentral cell
con	connecting cell	su	supporting cell
gc	gonimoblast cell	sur	supporting residual cell
gi	gonimoblast initial	sust	sterile cell on the supporting cell
hy	hypogynous cell of female axis	tr	trichogyne
m	outer membrane	1, 2, 3, 4	cells of the carpogonial branch



Figs. 1, 2. *Griffithsia okiensis* Kajimura.
Fig. 1. Female fertile axis presumably after fertilization with a single supporting cell bearing 2 carpogonial branches and a sterile cell divided into 2.
Fig. 2. Developing carposporophyte with 4 gonimoblast initials cut off from the auxiliary cell and 5 gonimoblast cells.

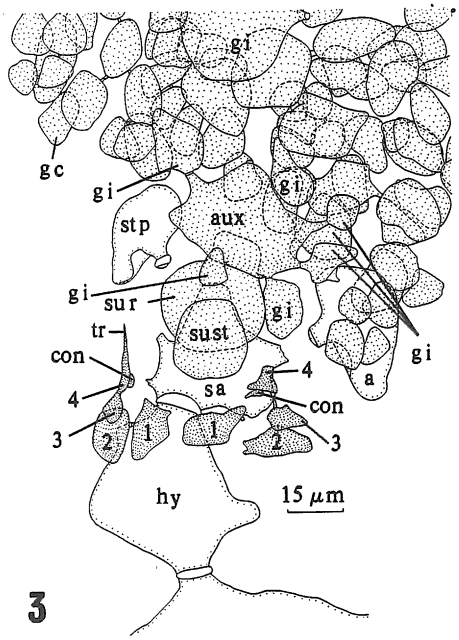


Fig. 3. *Griffithsia okiensis* Kajimura. Young carposporophyte with 8 or more gonimoblast initials cut off from the auxiliary cell and further developed gonimoblast filaments.

Table 2. Comparison of *Griffithsia okiensis* and its allied taxa.

Character	*G. okiensis* Kajimura	*G. monilis* var. *cincta* Baldock	*G. teges* Harvey
Vegetative cell	Cylindrical	Globose	Cylindrical
Thallus structure	Flabellate branches forming tuft, dichotomous	Flabellate, subdichotomous, moniliform	Irregularly subdichotomous
Height of thallus (cm)	0.3–1	4–11	2.5–20
Female fertile axis	2-3-celled, 1 rarely 2, apical	3-celled, 1 rarely 2, apical	3-celled, 1 rarely 2, apical
Trichoblast	Rarely 1–3	Commonly numerous	Commonly 2 pairs
Carpogonial branch per supporting cell	2	2 rarely 1	1 rarely 2
Origin of involucre	Subhypogynous cell, vegetative cell bearing spermatangial or tetrasporangial fascicles	Hypogynous cell, basal and terminal axial cells of spermatangial fascicles, basal cell of tetrasporangial fascicles	Hypogynous cell, spermatangial and tetrasporangial fascicles naked

tions (Figs. 2, 3), and all the gonimoblast cells except the lower ones become carposporangia. Lower gonimoblast cells, the auxiliary cells, supporting residual cell and the fertile subapical cell fuse each other to form a large fusion cell.

Discussion

Comparison of *G. okiensis* and its allied two taxa which have two carpogonial branches borne on the single supporting cell is made as shown in Table 2. *G. okiensis* is related to *G. teges* Harvey (Baldock 1976) in the shape of vegetative cell but it is distinct in other 6 characters listed in Table 2, namely, thallus structure, height of thallus, female fertile axis, trichoblast, carpogonial branch per supporting cell and origin of involucre respectively. On the other hand, *G. okiensis* is distinct from *G. monilis* Harvey var. *cincta* Baldock (Baldock 1976) in all of those 7 characters listed in Table 2.

Acknowledgements

The present writer wishes to acknowledge his indebtedness to Professor Emeritus Dr. J. Tokida of Hokkaido University for his continuous encouragement, and also to Dr. P. C. Silva of the Department of Botany, University of California, Berkeley, for his helpful suggestions and kindly opening his library for this study.

References

Baldock, R. N. 1976. The Griffithsieae group of the Ceramiaceae (Rhodophyta) and its Southern Australian representatives. *Aust. J. Bot.* **24**: 509–593.

Dixon, P. S. 1964. Auxiliary cells in the Ceramiales.*Nature* (*London*) **201**: 519–520.

Kajimura, M. 1982. On a new species of *Griffithsia* (Rhodophyta, Ceramiaceae), *G. okiensis*, from Japan. *Mem. Fac. Sci., Shimane Univ.* **16**: 77–90.

Kim, H.-S. and I. K. Lee. 1987. Morphology and reproduction of *Griffithsia venusta* Yamada (Ceramiaceae, Rhodophyta). *Kor. J. Phycol.* **2**: 51–60.

Kylin, H. 1916. Die Entwicklungsgeschichte von *Griffithsia corallina* (Lightf.) Ag. *Z. Bot.* **8**: 97–123.

Lewis, I. F. 1909. The life history of *Griffithsia Bornetiana*. *Ann. Bot.* (*London*) **23**: 639–690.

Phillips, R. W. 1897. On the development of the cystocarp in Rhodymeniales. *Ann. Bot.* (*London*) **11**: 347–368.