Takashi KANEKO*: On *Spermothamnion suyehiroi* (Okam.)

*Okam.* from the Japan Sea coast of Hokkaido

金子 孝*: 北海道産スエヒロヒビダマについて

The red alga, *Spermothamnion suyehiroi* (Okam.) Okam. (1934), was first described by Okamura as *Pleonosporium suyehiroi* in 1933 on the basis of the materials collected from Hiroshima bay and Onomichi, Hiroshima Pref. in southwestern Japan. Structures of the thallus and polysporangium of this species were well described and illustrated by Okamura (1933, '34). However, the sexual reproductive organs and cystocarp of this alga have remained unknown to this day. The writer fortunately discovered a number of sexual individuals including those with mature cystocarps among the materials of this species collected in Rishiri Isl. and Rebun Isl. in the northwestern Hokkaido, Japan Sea. Based on his observations on these specimens, the writer will propose to transfer the present species to the genus *Tiffaniella* Doty & Menez (1960).

The writer wishes to express his hearty thanks to Dr. J. Tokida, Prof. Emeritus of Hokkaido University, for his kindness in reading the manuscript, to Dr. Isabella A. Abbott of Hopkins Marine Station of Stanford University for her kindness in sending him some specimens of *Tiffaniella snyderae* (Farlow) Abbott from California and valuable advice, and also to Dr. Y. Saito of Hokkaido University for his kind advice.

**Materials and observations**

Materials examined. Materials used in this study were collected by the writer with SCUBA at the depth of 3 to 12 meters; they were growing on shells of mussels, *Mytilus coruscus* and *Crenomytilus grayanus*, and of a limpet, *Acmaea pallida*, and also on rocks covered with crustaceous coralline algae. Data of collections are as follows.

Rishiri Island: July 14, 1971 (sterile); August 15, 1971 (♀); July 18, 1971 (♀)

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Vegetative structure. The thallus, filamentous and uniseriate-celled, is composed of erect and prostrate axes. The prostrate axes are attached to the substratum by digitate haptera (Fig. 1). Each prostrate axial cell bears one erect axis, which is up to 3.5 cm high and subdichotomously branched. Cells of the erect axis measure $295.5 \pm 87.8 \mu m \times 54.0 \pm 15.5 \mu m$. The thallus cells are multinucleate.

Polysporangia. Polysporangium is produced on each cell of the polysporangial branch on its adaxial side, and divided into 16, rarely 32, spores. The sporangia, ovoid to subspherical, measure $106.9 \pm 5.2 \mu m \times 89.1 \pm 6.5 \mu m$. Polysporangial branches are born abaxially or on both sides of the middle part of the erect axis, and are spread out to take a shape of reindeer-antler (Figs. 2 & 3).

Spermatangial head. The spermatangial heads are elongate, measuring $136.8 \pm 31.9 \mu m \times 46.7 \pm 7.1 \mu m$, sessile on the adaxial sides of the upper part of the erect axis. Spermatangium is ellipsoidal in shape, ca $4.3 \mu m \times 3.0 \mu m$ in size (Figs. 4 & 5).

Development of the procarp and carposporophyte. Procarp is formed subterminally at the apical fertile axis of a short lateral fertile branch. The fertile axis is usually composed of three, rarely five, short cells (Figs. 6-9). The middle cell of the three cells, or the second cell from the base of the fertile axis, undergoes divisions to produce three pericentral cells (Figs. 7-10). One of the pericentral cell which is adaxial, becomes the supporting cell. The supporting cell gives rise to a four-celled carpogonial branch. The trichogyne is straight, up to $200 \mu m$ long (Fig. 10). The post-fertilization process of the procarp could not be followed thoroughly. However, as shown in Figs. 12-15, the fertilised carpogonium seems to cut off a connecting cell, which fuses with two auxiliary cells formed from the supporting cell and one of the pericentral cells respectively. The auxiliary cells are fused with the middle cell of the fertile axis to form a large fusion cell (Fig. 16). At the further developmental stages of gonimoblast, the fusion cell fuses with the basal cell of the fertile axis and a large T-shaped fusion cell is formed as seen in a vertical section of the cystocarp (Fig. 17).
Figs. 1-11. *Tiffaniella suyehiroi*. 1. A prostrate axis showing digitate haptera and two erect axis. 2 & 3. Polysporangial branch. 2, showing young ones; 3, showing a mature one. 4 & 5. Spermatangial heads: 4, showing young ones; 5, showing a mature one. 6-10. Various developmental stages of procarp; 6, showing 3-celled fertile axis; 7 & 8, showing the formation of pericentral cells; 9, showing abnormal five-celled fertile axis; 10, showing a mature procarp. 11. Procarp after fertilization.
Figs. 12-17. *Tifaniella suyehiroi*. 12-16. Post-fertilization stages of procarp: 15, showing two auxiliary cells with two groups of gonimoblast filaments; 16, showing fusion of the auxiliary cells and the middle cell of the 3-celled fertile axis. 17. Optical vertical section of a mature cystocarp, showing terminal carposporangia.
Each carposporangium is enveloped by a gelatinous wall. Involucre around the cystocarp is absent.

Discussion

Our Hokkaido plants under consideration are no doubt referrable to *Spermothamnion suyehiroi* (Okam.) Okam., judging from the vegetative and polysporangial features described by Okamura (1933 & 1934).

In 1960, Doty & Menez proposed a new genus *Tiffaniella* for four species previously referred to *Spermothamnion* or *Pleonosporium*, on the ground that they had modified rhizoids and no involucre around the cystocarp. Later, in 1971, Abbott gave further definitions to *Tiffaniella*, stating that it has: (1) no involucre around the cystocarp, (2) a T-shaped fusion cell made up of the basal and second cell of fertile female axis and two auxiliary cells, (3) terminal carposporangia, each surrounded by individual gelatinous envelope, and (4) a creeping portion, usually with modified rhizoids.

Twelve taxa of *Spermothamnion*, including nine species, two forms, and one variety, have been reported from Japan and its vicinity. Two of them, *Spermothamnion codicola* Yamada & Tanaka (1934) and *S. tamamiru* Segawa (1938), which lack involucre around the cystocarp, were transferred to the genus *Tiffaniella* by Doty & Menez (1960) and by Gordon (1972) respectively. In the present paper, the writer proposes to transfer *S. suyehiroi* to *Tiffaniella*, according to the definitions given by Doty & Menez (1960) and Abbott (1971).

*Tiffaniella suyehiroi* (Okam.) Kaneko, comb. nov.

Basionym = *Pleonosporium suyehiroi* Okam., 1933, p. 20, Pl. 314, figs. 1-6.

*Spermothamnion suyehiroi* (Okam.) Okamura, 1934, p. 886, fig. 1.

*Tiffaniella suyehiroi* has a close resemblance in general appearance to *T. snyderae* (Farl.) Abbott (cf. Dawson 1950). As a result of examinations of the *T. snyderae* specimens from California (Abbott A6849, polysporangial and procarpic plants; J. Norris 937, polysporangial and spermatangial plants), it has become obvious that *T. suyehiroi* is different from the former in size of cells of the erect axis, in manner of branching of the polysporangial branch, and in shape of the spermatangial head (cf. Abbott 1971). Moreover, the polysporangial branch in *T. suyehiroi* is spread out to take a shape of
reindeer-antler, while it never takes such a shape in *T. snyderae*.

**References**


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紅藻スエヒロヒビダマの有性体。果胞子体は今日まで知られていなかったが，北海道日本海沿岸の利尻・礼文・天売・幌尻島の水深 3-12 m の漸満带からこれらを採取し，観察した。胎原列は直立枝の側枝に頂生し，受精後，助細胞ならびに側枝の細胞とで T 字様の竜合細胞を形成し，果胞子は 1 個ずつゼラチン様膜で覆われる。また囊果を囲む苞巻を欠くなどの点から本種を *Spermothamnion* 属から *Tiffaniella* 属に移すのが妥当と考え，新組合せ *Tiffaniella suyehiroi* (Okam.) Kaneko を提唱する。