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On carpospore germination in *Predaea tokidae* Kajimura (Gymnophloeaceae, Rhodophyta) in culture*

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Result of cultural study of carposporelings of *Predaea tokidae* Kajimura (Gymnophloeaceae, Rhodophyta) carried out in the laboratory is presented herein. Germination of carpospores was similar to the immediate filamentous type and diprotocellular type. Discharged carpospores grew into short uniseriate prostrate filament which further developed into either monostromatic crust or sparsely branched uniseriate filament. The crust densely formed short erect free filaments on the thallus surface, and the developed uniseriate filament sparsely produced short lateral branches which developed into monostromatic crust that also densely formed short erect free filaments on the surface. The sporelings of *P. tokidae* is compared with the ones of *P. weldii* Kraft et Abbott and *P. kraftiana* Millar et Guiry in vegetative structure.

Key Index Words: carposporeling—cultural study—Gymnophloeaceae—Predaea tokidae—*Rhodophyta.*

Introduction

Thirteen species of *Predaea* have been reported from tropical, subtropical and warm temperate regions of the northern and southern hemisphers (Feldmann 1942; Børgesen 1950; Dawson 1960; Kraft & Abbott 1971; Yoshida 1980; Kraft 1984; Kajimura 1987a; Millar & Guiry 1989) since the genus was established by G. De Toni (1936). All the species of *Predaea* are very rare including those three species which are endemic to Japan such as *P. japonica* Yoshida (1980), *P. bisporifera* Kajimura (1987a) and *P. tokidae* Kajimura (1987a). Carpospore germination in *P. tokidae* has not been reported in detail since it was presented as a new species (Kajimura 1987a). Collection of mature cystocarpic plants of *P. tokidae* made by the present writer in May 1979 allowed him to carry out the cultural study on carpospore germination of it in the laboratory, and the result of the present study is detailedly presented herein.

Material and Methods

Mature cystocarpic plants used to initiate culture were growing on *Lithothamnium*

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sp. and collected by the present writer with a dredge designed by himself (Kajimura 1987b) from the depth of 20 m off Tsudo in the Oki Islands, Shimane Prefecture, on May 9, 1979. The material was kept in seawater and transported in one liter plastic bottle to the laboratory immediately after the collection. Carpospores released overnight were isolated by standard techniques (Chapman 1975) and cultured at 15°C (corresponding to the mean water temperature at 50 m depth in the vicinity of the Oki Islands in May according to the Japan Oceanographic Data Center 1973) and 600 lux continuous illumination. The culture medium (Erdschreiber) was changed weekly.

Observations and Discussion

Development of carposporeling

The discharged carpospores were 5–10 μm in diameter and germination took place soon after discharge. Germination of carpospores was similar to the immediate filamentous type (Figs. 1 (a-i)) and diprotocellular type (Figs. 2 (b-g)) (Inoh 1947), and the carposporeling became an uniseriate short prostrate filament that ramified irregularly and sparsely (Figs. 1 (b-d, f, i), 2 (e-g)). This stage was observed approximately one week after inoculation of carpospores. The thallus of the short filamentous stage grew either radially or uniseriately, then developed into monostromatic irregularly shaped crust consisting of various cells in shape and size from the roundish in the inner part to the elongate along the margin of thallus (Fig. 2 (h)) or sparsely branched filament consisting of elongate cells. Short lateral branches were sparsely formed from the primary filament (Figs. 3, 4), which consisted of roundish cells and irregularly ramified to form irregularly shaped monostromatic crust of various sizes. Both of the monostromatic crustaceous thalli and the monostromatic crustaceous part developed from the lateral branches of the primary filament produced short erect free uniseriate filaments which were sparsely irregularly ramified and consisted of spherical to ovoid cells of various sizes. Old parts of the primary filament also produced the erect short free filaments sparsely.

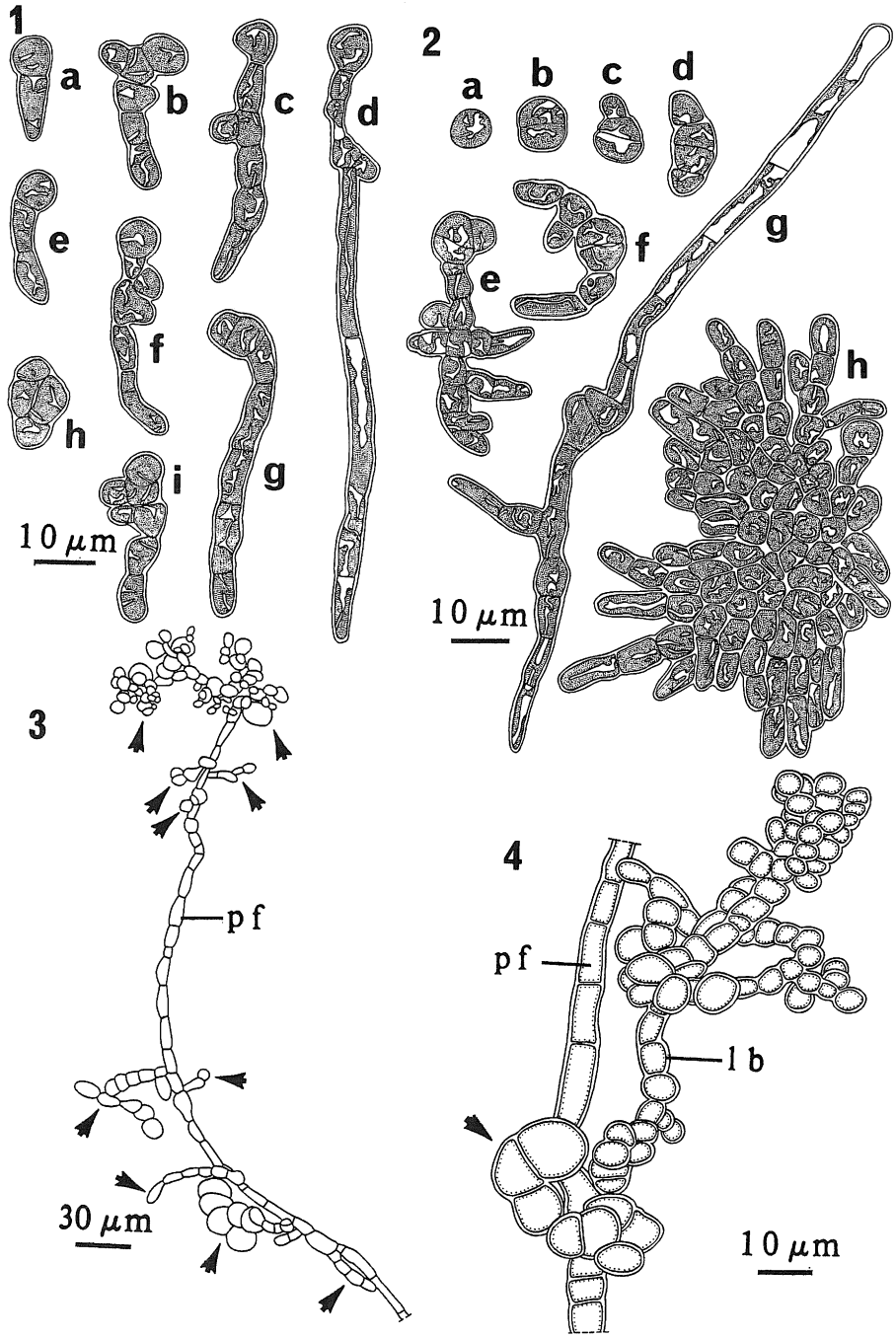
Figs. 1–4. *Predaea tokidae* Kajimura.

Fig. 1 (a-i). Carposporelings at early stage of development similar to immediate filamentous type of germination.

Fig. 2 (a). A discharged carpospore. Fig. 2 (b-g). Carposporelings at early stage of development similar to diprotocellular type of germination. Fig. 2 (h). Two weeks old monostromatic crustaceous carposporeling.

Fig. 3. Part of a filamentous micro-thallus showing some short lateral branches (arrows) arising from the primary filament (pf), consisting of spherical to ovoid cells and irregularly branched, and with some short erect free filaments.

Fig. 4. Part of a four months old filamentous micro-thallus showing a lateral branch (1b) and an erect short free filament (arrow) arising from the primary filament (pf) and consisting of spherical to ovoid cells each.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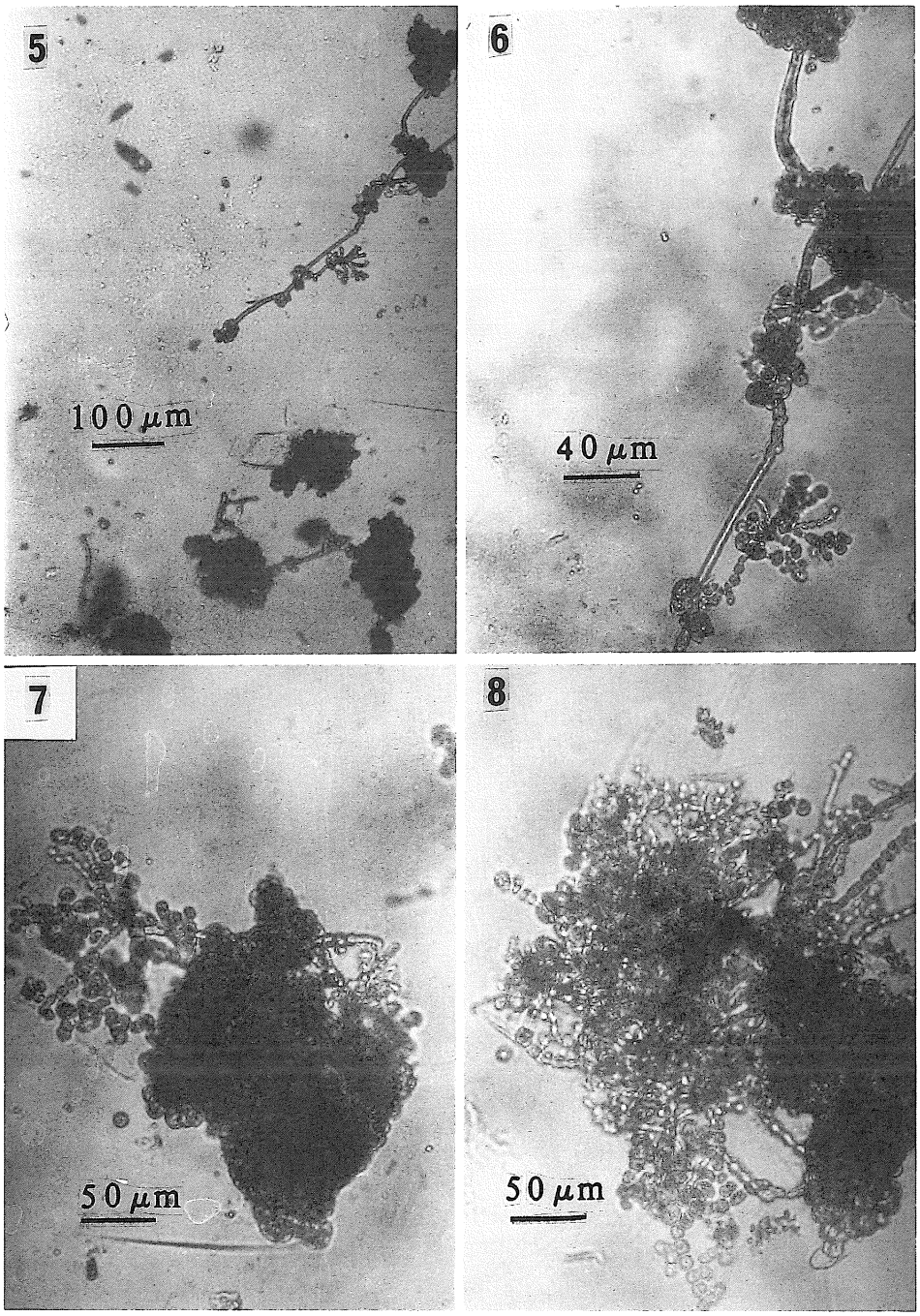
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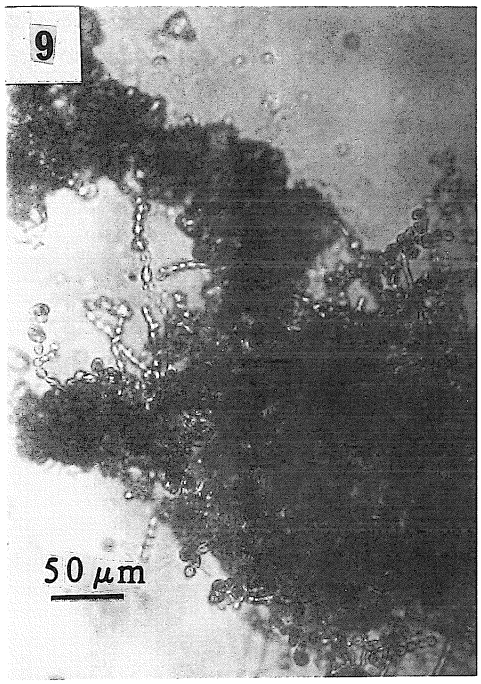

Fig. 9. *Predaea tokidae* Kajimura.
Six months old crustaceous thallus with many secondary filaments along its margin.

The crustaceous thalli or crustaceous part formed on the filamentous thalli became partly or wholly opaque (Figs. 5–9) and frequently produced secondary prostrate filaments consisting of spherical to ovoid cells (Figs. 8, 9). Terminal cells of the erect free filaments were frequently swollen and vesicular in appearance but no formation of tetrasporangia or monosporangia was observed. The cells contained usually one rarely two or three irregularly band-shaped chromatophores.

Remarks

Cultural study on the development of carposporelings in *Predaea* has been reported only on four species of the 13 known species to date, namely, *P. feldmannii* Børgesen (Lemus & Ganesan 1977), *P. weldii* (as *P. pusilla* (Berthold) J. Feldmann, Lemus & Ganesan 1977), *P. ollivieri* J. Feldmann (Athanasiadis 1988) and *P. kraftiana* (Millar & Guiry 1989).

The carposporelings of *P. tokidae* obtained through the present culture are related

Figs. 5–8. *Predaea tokidae* Kajimura.
Fig. 5. Several six months old micro-thalli.
Fig. 6. Six months old filamentous micro-thallus with several lateral branches developed into the crustaceous.
Fig. 7. Six months old filamentous micro-thallus with a large crustaceous part.
Fig. 8. Six months old crustaceous micro-thallus with many secondary filaments marginally.

to the ones of *P. weldii* and *P. kraftiana* in having crustaceous structure with erect short free filaments. However, *P. tokidae* is distinct from *P. weldii* in having no acrochaetioid stage in the development of the carposporeling and usually one rarely two or three irregularly band-shaped chromatophores in the vegetative cell of them *P. tokidae* is also distinct from *P. kraftiana* in having no 'firmly attached circular crust' (Millar & Guiry 1989) in the development of the carposporeling.

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