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The genus *Compsothamnionella* Itono (Ceramiaceae, Rhodophyta) on the South African coast

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SUMMARY

Evidence is presented for the occurrence of one species of *Compsothamnionella* on the coast of the eastern Cape Province, South Africa. *Compsothamnionella* is once more separated from *Pleonosporium*, the chief differences being: (i) a more complex cortication in *Compsothamnionella*, involving filaments that connect laterals of alternate segments, in contrast to absent cortication or of loose rhizoidal filaments not connecting laterals in *Pleonosporium*; (ii) development of the procarp on the second to fifth cell below the apex of the female fertile filament in *Compsothamnionella*, in contrast to *Pleonosporium* where the procarp develops on the subapical cell only. It is concluded that the tribal position of *Compsothamnionella* is intermediate between the Ptiloteae and the Compsothamnieae. The South African species is new to science, and the name *C. sciadophila* is proposed.

Key-words: Ceramiaceae, *Compsothamnionella*, *Pleonosporium*, Rhodophyta, South Africa, taxonomy.

INTRODUCTION

The genus *Compsothamnionella* was established by Itono (1977) for two Japanese species of Ceramiaceae, one hitherto assigned to *Pleonosporium* (*P. japonica* Itono), the other described as new to science (*C. mageshimensis* Itono). The type species of *Compsothamnionella* is *C. japonica* (Itono) Itono.

Rather scanty information has so far been available on the sexual reproduction of this genus: only pre-fertilization female structures of *C. japonica* were described, which according to Itono were similar to those of *Pleonosporium*.

On the evidence available, Norris (1985) concluded that *Compsothamnionella* was not different from *Pleonosporium*, and the genera were merged again.

Material of a small ceramiaceous species collected along the coast of the eastern Cape Province, South Africa, was found to agree completely with Itono's description of *Compsothamnionella*, although apparently it is a different species. Since reproductive structures of all kinds were present, it is now possible to comment on the taxonomic affinities, and to reconsider the validity of *Compsothamnionella* as a separate genus.

MATERIALS AND METHODS

Material was collected on several localities along the coast of the eastern Cape Province, South Africa, during the year 1987. Specimens were preserved in 5% formalin in seawater.

For microscopic study, plants were stained with FCF fast green and embedded in KARO corn syrup or GURR's Aquamount. Drawings were prepared with the aid of a camera lucida. Voucher specimens, including the type, are in the Rhodes University Herbarium (RUH) (Sa numbers); permanent slides (EC numbers) are for the time being in the personal collection of the author.

RESULTS

Compsothamnionella sciadophila *nov. sp.*

Diagnosis. Plantae plumosae, usque ad 20 mm alto. Plures axes principales distincti cum usque ad quatuor vel quinque ordinibus lateralium, gradatim breviorum et alternantium, totaliter complanatorum. Axes principales cum filamentis corticantibus in plano ramificationis; filamenta corticalia connectentia lateralia segmentorum alternantium.

Tetrasporangia in parvis fasciculis in lateralibus globose, 45–50 μm diametro, divisa tetraedrice.

Stichidia spermatangialia in extremis et paene extremis ramulis, cylindrice, cum axi centrali longitudinis circa 8 cellularum, metiens *c.* 80 × 25 μm.

Procarpia evolventia in rhachidibus lateralium (secundae et tertiae ordinis), cellula axialis fertilis in secunda usque ad quinta positione sub apice. Carposporophyta cum circa quinque gonomolobibus circularibus, numero filamentorium involucralium circumcincta.

Typus in RUH no. Stegenga Sa 1227, lectus in loco vocato 'Three Sisters', (33°34'S, 27°03'E) ex lacu regionis aestus superioris, die 28.4.1987.

Plants plumose, up to 20 mm tall. Several distinct main axes with up to four or five orders progressively shorter, alternating laterals, entirely complanate. Main axes with corticating filaments in the plane of branching; cortical filaments connecting laterals of alternating segments.

Tetrasporangia in small clusters on laterals, globose, 45–50 μm in diameter, tetrahedrally divided.

Spermatangial stichidia on ultimate and penultimate ramuli, cylindrical, with a central axis about eight cells long, measuring approximately 80 × 25 μm.

Procarps developing on rhachis of (second or third order) laterals, the fertile axial cell in second to fifth position below the apex. Carposporophytes with about five rounded gonimolobes, surrounded by a number of involucral filaments.

Type in RUH, Stegenga no. Sa 1227, collected at Three Sisters Eastern Cape Province, RSA (33°34'S, 27°03'E), from a pool in the upper intertidal, 28 April 1987.

Description. Plants are of a plumose appearance, with several distinct main axes, branching from every segment, with four or five orders of progressively shorter, alternating laterals, all strictly complanate (Fig. 1a). Although plants are only basally attached, the complanate thalli are often found lying almost horizontal, and development of reproductive structures is often confined to the upper side of these 'blades'. Thalli are up to 20 mm long.

The main axis without cortication is up to 200 μm in diameter, the cells toward the apex diminishing to 15–20 μm diameter; throughout the plant cells vary from once to twice as long as broad. In older thallus parts, main axes are partly corticated (Fig. 1b); this cortication consists of filaments that connect the basal cell of a lateral with the lateral

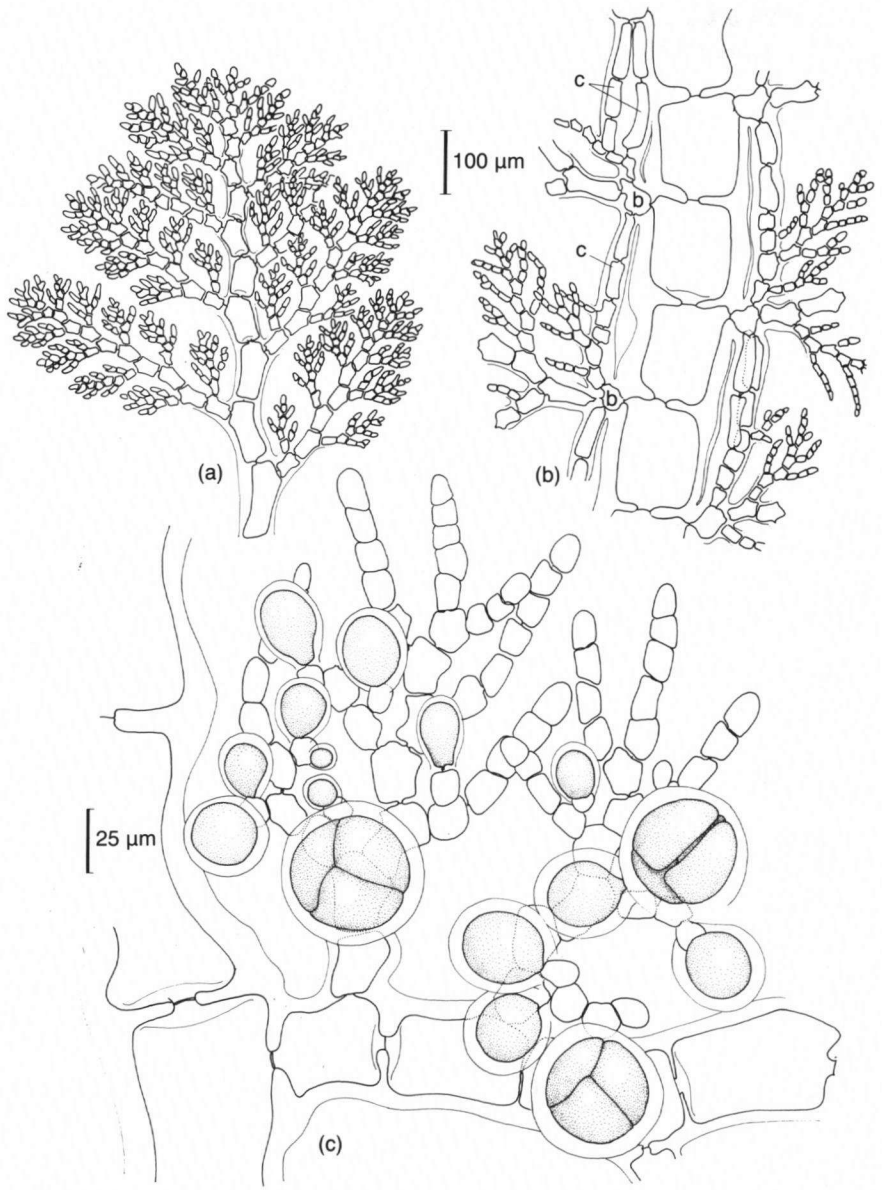

Fig. 1. *Compsothamnionella sciadophila* nov. sp. (a) Thallus apex. Port Alfred, 17 March 1987. (b), Detail of main axis with corticating filaments (b, basal cell of lateral; c, corticating filament). Three Sisters, 5 March 1987. (c) Tetrasporangia. Three Sisters, 5 March 1987.

straight below it, usually via one of the higher order laterals. Consequently the cortication is mostly restricted to the plane of branching of the complanate thallus. Corticating filaments are about 50 µm in diameter.

Tetrasporangia (Fig. 1) develop in small clusters from the cells of the ultimate and penultimate ramuli, and, as explained above, usually to one side of the complanate thallus. Tetrasporangial clusters consist of a single pedicel, with two or three sporangia of

different ages. Mature tetrasporangia are globose, tetrahedrally divided, 45–50 μm in diameter.

Spermatangia (Fig. 2b) develop in stichidia on ultimate or penultimate ramuli. Stichidia have a seven- to 10-celled axis, each cell with a whorl of spermatangium mother cells that bear two or three spermatangia each. Mature stichidia are cylindrical, approximately 80 × 25 μm.

Female reproductive structures (Fig. 2a, c–g) develop on the rhachis of second or third order laterals, in a position on the second to fifth segment below the apical cell. A supporting cell, bearing one sterile cell, emerges opposite a vegetative lateral, usually when the latter is still in a unicellular stage (Fig. 2a): the supporting cell then gives rise to a four-celled carpogonial filament (Fig. 2c, d). Immediate post-fertilization stages have not been observed. The young carposporophyte consists of a gonimoblast initial, borne directly on the supporting cell and presumably derived from an auxiliary cell; it gives rise to four or five gonimolobes (Fig. 2e, f). No cell fusions have been observed in the developing carposporophyte. As the carposporophyte develops, involucral filaments are produced by the cells in the second and third position below the fertile axial cell (Fig. 2f); the cell immediately below the fertile axial cell only bears a normal vegetative lateral. Involucral filaments, usually branched, are distinguished from vegetative laterals by their larger diameter. Mature gonimolobes (Fig. 2g) are globose, up to 150 μm in diameter; virtually all cells turn into carposporangia simultaneously; individual carpospores are about 20 μm in diameter.

If no fertilization takes place, the fertile axis may continue to grow, while the supporting cell or the sterile cell gives rise to a vegetative lateral.

Material examined

Kini Bay, 13 June 1987 (EC 259); Kenton-on-Sea, 2 December 1987 (Sa 1933, EC 468), on *Prionitis filiformis* Kylin from a deep tidal pool (tetrasporangial); Port Alfred, Sharks Bay, 17 March 1987 (EC 128), on *Pyura stolonifera* and *Halimeda cuneata* Hering in Krauss; Three Sisters, 5 March 1987 (Sa 1073, EC 9, 10, 16, 18, 39, 84), in tidal pools, mainly under overhanging rock (tetrasporangial, male); Three Sisters, 28 April 1987 [Sa 1227 (= type), 1236, EC 180, 185, 190] (tetrasporangial, female); Three Sisters, 11 August 1987 (Sa 1598, 1653, 1656, EC 317, 341) (tetrasporangial, female); East London, Bat's Cave, 9 September 1987 (Sa 1673).

One herbarium specimen of *C. sciadophila* was detected in the M. A. Pocock collection, Albany Museum, Grahamstown (GRA): East London, Cove Rock, 'in caves at entrance to gully', 22 November 1945 (MAP 8510).

The specific epithet was chosen with regard to the preferred habitat of this plant, i.e. shaded positions in tidal pools, under overhanging rock walls, etc.

DISCUSSION

Several elements in the vegetative and reproductive morphology of the present species suggest that it belongs to the genus *Compsothamnionella* and that this genus should be kept separate from *Pleonosporium*:

1. In vegetative morphology, the strictly complanate nature of the thallus and the special form of cortication are distinct. Both the Japanese species mentioned in the original description of the genus have the same form of cortication, consisting of filaments that connect laterals of alternate segments. Species of *Pleonosporium* are not as strictly

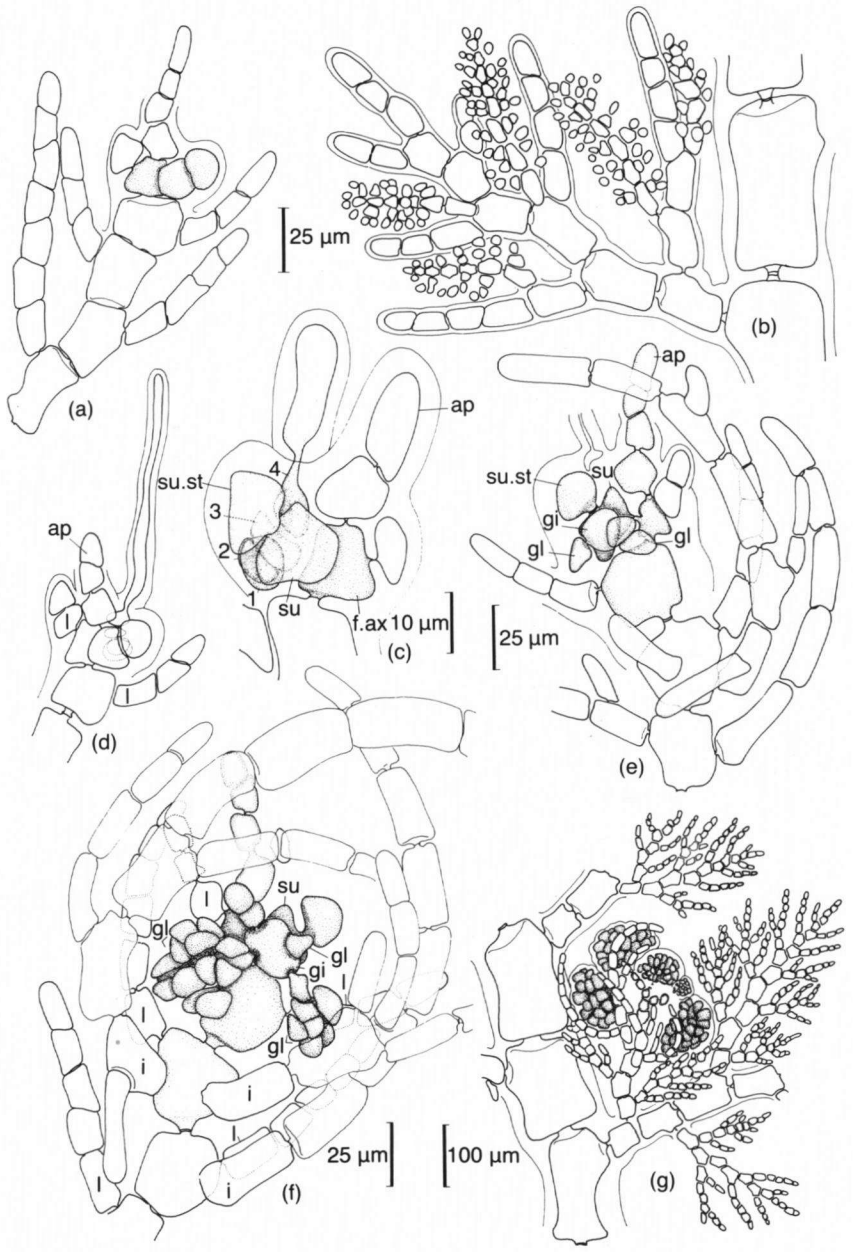

Fig. 2. *Compsothamnionella sciadophila* nov. sp. (b), Spermatangial stichidia (shown in optical section). Three Sisters, 5 March 1987. (a, c–g) Development of female reproductive structure, all illustrated from the type, Three Sisters, 28 April, 1987. (a) Supporting cell with sterile cell formed. (c, d) Carpogonial filaments. (e, f) Early post-fertilization stages, formation of gonimolobes. (g) Mature carposporophyte. Abbreviations: ap, apical cell of (fertile) filament; f.ax, fertile axial cell; gi, gonimoblast initial; gl, gonimolobe; i, involucral filament; l (basal cell of) vegetative lateral; su, supporting cell; su.st, sterile cell on supporting cell; 1, 2, 3, 4, cells of carpogonial filament (4 = carpogonium).

complanate, although often in part distichously branched, while cortication, if present, seems to be more haphazard and without anastomosing laterals.

2. With regard to tetrasporangial arrangement, both *Compsothamnionella japonica* and *C. mageshimensis* have pedicellate sporangia; in the latter species small clusters of successively ripening sporangia occur, a condition also found in *C. sciadophila*. Pedicellate sporangia (often polysporangia) are also found in some *Pleonosporium* species (e.g. Lindstrom *et al.* 1982), and I agree with Norris (1985) that this character alone would not be sufficient for distinction at the generic level.

3. In the morphology of the female reproductive system there are a few interesting elements. In *Compsothamnionella* the first-formed 'pericentral cell' on the fertile axial cell is clearly equivalent to a vegetative ramulus. I think it is essential that Itono (1977, p. 281) remarks that this cell can be divided (although rarely) and thus appear in the form of a small branchlet. In *Pleonosporium* the sterile pericentral cell may be the first-formed [in *P. caribaeum* (Boergesen) Norris; Norris 1985], or the last-formed (in *P. callicladum* Norris; Norris 1985); it is not obviously equivalent to a vegetative branchlet. Also, it appears that in *C. japonica* the development of the supporting cell, although usually from the subapical cell of the fertile filament, is sometimes from the cell below it (Itono 1977, Fig. 64G). In *C. sciadophila* the supporting cell originates in a position on the second to fifth cell below the apex of the fertile filament.

The combination of the above-mentioned characters offsets *Compsothamnionella* against *Pleonosporium* and the genera should be kept separate.

In addition, these characters raise some doubts as to the tribal position of *Compsothamnionella*. Itono (1977) assigned it to the tribe Compsothamnieae, noting the resemblance to the genus *Compsothamnion*. Both the rather sophisticated form of corticationand the formation of procarps at a slightly variable distance below the apex of the fertile filament show more affinity with the tribe Ptiloteae. A similar position of the procarp has been demonstrated clearly in a genus such as *Plumariopsis* (Moe & Silva 1983). In that genus the supporting cell is, however, replacing one of a pair of laterals and not bearing a sterile cell. In Ptiloteae, where the supporting cell is formed in addition to laterals, its position is transverse in relation to those laterals; sterile cells on the supporting cell may be present or absent in the tribe (Moe & Silva 1983, Lindstrom & Wynne 1981). A possibly more important difference is the presence of a foot cell below the gonimoblast initial in the Ptiloteae, absent in *Compsothamnionella*. The absence of a foot cell is shared by the genus *Gymnothamnion*, recently removed from the Ptiloteae and assigned to a separate tribe, the Gymnothamnieae (Kajimura 1989). However, the oblique division of the apical cell and the development of a cortex in *Compsothamnionella* exclude it from that tribe, as these features are more in line with the Ptiloteae. In the Ptiloteae only one genus (*Euptilota*) is known to have one lateral per segment; many genera have much larger complanate thalli with heavily corticated main axes and opposite laterals. In conclusion, *Compsothamnionella* appears to take an intermediate position between the tribes Ptiloteae, Compsothamnieae and possibly Gymnothamnieae.

The South African species differs from the two Japanese species of *Compsothamnionella*, mainly in cell dimensions and branching characteristics. In general, *C. japonica* is more slender (main axis up to 90 μm diameter, up to 200 μm in *C. sciadophila*), with relatively longer cells (two to three times longer than broad; one to two times in *C. sciadophila*).

In *C. mageshimensis*, apparently a somewhat more robust species (main axes up to 135 μm in diameter), main axial cells are also longer (three times longer than broad), and the laterals appear to rebranch from the second segment on, not from the first as in *C. sciadophila* (cf. Itono 1977, Fig. 24A, C, D).

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