

***Mollisia casaresiae* (Ascomycetes) the teleomorph
of *Casaresia sphagnum*, an aquatic fungus**

by

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With 3 figures

Webster, J., C.A. Shearer & B.M. Spooner (1993): *Mollisia casaresiae* (Ascomycetes) the teleomorph of *Casaresia sphagnum*, an aquatic fungus. - Nova Hedwigia 57: 483-487.

Abstract: Apothecia of a *Mollisia* developed in close association with *Casaresia sphagnum* on wooden dowels which had been submerged in the R. Teign, Devon, England for one year. Cultures derived from ascospores developed conidia of the *Casaresia*, demonstrating that the apothecia represent the teleomorph of the latter. This teleomorph is described as a new species.

In experiments to test the effect of precolonization of woody substrata by aquatic hyphomycetes on subsequent colonization by aquatic fungi, cylindrical birch dowels were attached to masonry bricks and immersed in the rapidly flowing River Teign at Glassy Steps, North Park near Gidleigh, Devon (Site III of Shearer & Webster, 1991, where a description of the site and details of techniques are given). The dowels were placed in the river on June 19 1991 and were recovered at one to two month intervals and brought back to the laboratory for microscopical examination. Samples collected one month later all bore a coarse, septate, dark mycelium associated with a darkening of the wood. In later samples this dark mycelium developed the characteristic, branched, curved, hooked conidia of *Casaresia sphagnum* Frago. Almost all the samples collected throughout the following months were densely covered by fruiting colonies of *Casaresia*, which formed a thick black mat of dark hyphae. One dowel collected on 28 May 1992 bore, growing through the mat of *Casaresia* mycelium, six apothecia of an inoperculate discomycete. Because of the close physical association of the apothecia with the *Casaresia* it was suspected that these

apothecia might represent the teleomorph of this fungus. Cultures derived from ascospores developed *Casaresia sphagnorum* conidia, proving that this was indeed the case. A small segment of dowel bearing apothecia was placed in the lid of a Petri-dish containing filtered 0.1% Malt Extract Agar and within a few hours ascospores had been projected onto the agar. These germinated overnight and germinating ascospores were transferred to plates of 2% Malt Extract Agar. The plates were incubated at 12-13°C in diffuse light. A compact, slow-growing grey-black mycelium with paler grey aerial hyphae developed as described by Webster & Descals (1975) in cultures derived from conidia. After one month, culture pieces were floated on sterile distilled water and incubated at 12-13°C. Within 10 days *Casaresia* conidia were seen developing at the interface between water and air (Fig. 1). Conidia were slow to develop in these cultures and took several days to mature. When agar culture pieces derived from conidia were placed in distilled water aerated by compressed air Webster & Descals (1975) showed that macroconidial development occurred within 3 days. They have also described a microconidial synanamorph developing from the mycelium or from the macroconidia in aerated cultures. Microconidia have not been seen in the present culture derived from ascospores.

Conidium ontogeny can clearly be followed in cultures floated in water (Fig. 2). Conidiophores develop as terminal or lateral branches from the hyphae at the surface of the culture. At their base the conidiophores are little-differentiated from vegetative hyphae except that they are darker and wider, about 3 μm diam. The conidiophore extends as a wider, terminal, club-shaped branch with several, usually paired, sub-opposite branches of similar form to the terminal one. Growth of all the branches is apical. The branches develop many septa. The apical part of each branch is at first paler than the basal cells and the end cells include large, clear vacuoles. At maturity, all the cells develop dark brown walls and the end cell of each branch becomes recurved and pointed to form a claw-like hook. Each branch is curved in a bow-like manner. The branches are wider at the middle, tapering towards each end. The conidiophore fractures at its base so that a flattened, branched propagule with branches mostly in one plane, each ending in a recurved hook is detached.

***Mollisia casaresiae* Webster, Shearer & Spooner sp. nov.**

Apothecia rotundata vel undata, initio cupulata, postea discoidea, 1.0-1.3 mm diam.: discus albus vel fuscus, excipulum paulo fuscus. Excipulum ectale texturae prismaticae ad texturam globulosam; cellae tenuibus parietibus, pallide fuscae vel hyalinae, 5-12 μm . Regio subhymenialis gelatinosa, tenuibus anastomosantibus hyalinis hyphis. Asci cylindrici vel clavati, minimis poris, pallide I+ 75-95 \times 6-7.5 μm . Paraphyses cylindricae vel clavatae, paulo superantes ascos: crassae supra, cella terminalis plena materia refractili. Ascosporae biseriatae vel oblique uniseriatae, unicellulares vel uniseptatae, hyalinae, levi superficie, obconicales vel breviter clavatae, eguttulatae, 9-12 \times 2.5-3 μm . Ad baculis betulinis antea undecim menses immersis in flumine Teign prope Gidleigh in comitatu Devon, Anglia: HME 4407. Holotypus est nunc in Herb. K. (K (M) 21739). Hic fungus teleomorpha est *Casaresiae sphagnorum*.

Apothecia circular or irregular in outline, initially cupulate, becoming saucer-shaped or flattened, 1.0-1.3 mm diam.: disc dirty white to beige, excipulum slightly darker. Ectal excipulum 50-70 μm thick, of textura prismatica to textura globulosa; cells 5-12 μm diam. in chains vertical to the surface, becoming radially-arranged to-



Fig. 1. *Casaresia sphagnum* macroconidial state formed at the surface of cultures derived from *Mollisia* ascospores. Fig. 2. Developing macroconidium. Scale bar for Figs. 1 and 2 = 500 μ m. Fig. 3. Asci and a discharged ascospore of *Mollisia casaresiae*. Scale bar = 50 μ m.

wards the margin, very pale brown to almost completely hyaline, only outermost cell layer on the flanks to base of apothecium pale brown. Surface cells with walls slightly thickened, 1-1.5 μm thick, other cells thin-walled. Medullary excipulum of narrow interwoven hyphae 1.5-3 μm diam. with thin or slightly thickened refractive walls. The subhymenial region is composed of gelatinous material containing fine anastomosing hyaline hyphae. Asci 75-95 \times 6-7.5 μm , narrowly cylindrical to clavate, with very small pore, weakly I+, 75-95 \times 6-7.5 μm , (Fig. 3). Paraphyses cylindrical to narrowly clavate, slightly exceeding the asci: thickened above, terminal cell filled with refractile material. Ascospores biseriate to obliquely uniseriate, unicellular or 1-septate, hyaline, smooth, obconical or shortly clavate, eguttulate, (7-)-9-12 \times 2.5-3 μm . Germination is by germ-tube from one or both ends of the spore. On birch wood dowels previously immersed for 11 months in the River Teign near Gidleigh, Devon, 26.5.92, HME 4407. The holotype specimen has been deposited in Herb. K. (K (M) 21739).

Discussion

The growth of *Casaresia sphagnum* on submerged wood has been known for some time. Perrott (1960) reported the fungus (as *Ankistrocladium fuscum*) from oak twigs submerged in Ullswater, a lake in the English Lake District. Sanders & Anderson (1979) noted that it colonized oak wood blocks submerged in a Dartmoor stream whilst Shearer & Webster (1991) reported it on corticated and decorticated alder and oak twigs after submergence in the River Teign at the present site and at other places downstream. There are several records of the spores being entangled onto leaves or other debris or occurring in stream scum (Ingold 1960; Petersen 1963; Nilsson 1964; Webster & Descals 1975). The original illustrations by Gonzales Fragoso (1920) show conidia developing from mycelium ramifying over leaves of *Sphagnum squarrosum* but it is possible that conidia formed on wood might be detached and attach themselves by their hooks to the *Sphagnum*.

The demonstration that *Casaresia sphagnum* is an ascomycetous anamorph adds to the growing list of aquatic hyphomycetes which have been shown to be so related, although a few are conidial basidiomycetes (Webster 1992). The existence of the microconidial synanamorph analogous to that found in some other aquatic hyphomycetes with ascomycetous teleomorphs again raises the possibility that these "microconidia" function as spermatia.

The apothecia are atypical of *Mollisia* in being so pale; only the surface cells of the receptacle, mostly towards the base, show distinct, brownish pigment. However, pale species such as *M. olivella* (Quél.) Boud. are known. In addition, the presence of mucilage in the subhymenium has apparently not previously been reported in the genus. This is possibly an adaptation to an aquatic habitat which can scarcely be considered of generic significance. The ectal structure and characters of asci and spores are otherwise typical of *Mollisia*.

Acknowledgements

We gratefully acknowledge help from Tony Davey in helping us set in place and recover the dowels from the River Teign. We are also grateful to Mr H.W. Stubbs for the Latin translation.

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