

THE LARGER CUP FUNGI IN BRITAIN

part 4

Sarcoscyphaceae and Sarcosomataceae

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The first article in this series (Spooner, 2000) provided an introduction to cup fungi and noted that most of the larger species belong to the order Pezizales. These are commonly known as the ‘operculate cup-fungi’ based on their ascus structure – mostly thin-walled and dehiscing by an apical ‘lid’ or operculum - and include an estimated 300 or so species in Britain. A key to the 13 families of Pezizales represented in Britain was provided, and two subsequent articles (Spooner 2001a, 2001b) provided keys for the identification of the British species of the family Pezizaceae. In the present article two further families, Sarcoscyphaceae and Sarcosomataceae, are considered. These families are closely related to each other, and indeed some authors have preferred not to separate them but to merge all their included species in a single family Sarcoscyphaceae. They differ significantly from other Pezizales most notably in ascus and spore characters. The asci, always non-amyloid, are rather thick-walled, with the operculum usually subapical, positioned slightly to one side of the apex – often termed ‘suboperculate’. In addition, the spores of these fungi are commonly asymmetrical, often curved or inequilateral, unlike those of almost all other Pezizales. They are also unusual in being multinucleate, otherwise characteristic in the Pezizales only of Morchellaceae. Under the microscope the ascus and spore characters are usually fairly easy to observe, but many of the species that belong in this group can be so recognised either by their particularly brightly coloured apothecia (Sarcoscyphaceae) or their dull, brown to blackish colours (Sarcosomataceae). The bright, usually red or orange colours are due to the presence of abundant carotenoid pigments, these usually being absent in the dark-coloured species in which melanin-like pigments occur instead. The

apothecia of these fungi vary greatly in size and shape, some being small, sessile, discoid structures others being large, cupulate, often stalked and sometimes even compound. They occur mostly in spring and are saprotrophs, occurring on the ground or on rotting wood. Although Sarcoscyphaceae exhibits its greatest diversity in the tropics, both of these families are virtually cosmopolitan in distribution. However, they include between them no more than about 60 species in all and, in Britain, just nine species ranged in six genera have been recorded. Furthermore, it should be noted that some of the British species are rare and, regrettably, two of them, the beautiful and distinctive *Microstoma protracta*, and the obscure *Pithya vulgaris*, both known here from ancient records from only single localities, are surely now extinct in Britain. A key plus brief descriptions for the British genera and species are provided in this account.

Sarcoscyphaceae Le Gal ex Eckblad

Characterised by leathery, sometimes gelatinous apothecia, bright coloured with carotenoids present; ascospores hyaline, smooth or ornamented with non-cyanophilous longitudinal ridges or reticulum. Hairs or setae frequently present on the outer surface.

Sarcosomataceae Kobayasi

Characterised by leathery, sometimes gelatinous apothecia, dull coloured due to melanin-like pigments, carotenoids usually lacking; ascospores hyaline, smooth or rarely ornamented with transverse ridges or cyanophilous markings. Hairs or setae commonly present on the outer surface and sometimes also in the hymenium.

Key to British Genera of Sarcoscyphaceae and Sarcosomataceae

- 1. Disc whitish or grey to blackish, lacking carotenoid pigments; outer surface dark- or dull-coloured, grey to blackish, with dark brown basal tomentum or subiculum, and sometimes bearing dark brown setae (Sarcosomataceae) 2
- 1. Disc bright orange to red or scarlet, carotenoid pigments present; outer surface whitish to pale orange, whitish felty, lacking both dark brown tomentum and setae (Sarcoscyphaceae) 4
- 2. Setae present on receptacle and in hymenium; spores ellipsoid, biguttulate, with short, blunt apiculae; gelatinised tissues lacking *Desmazierella*
- 2. Setae lacking throughout; spores globose or ellipsoid to fusoid, multiguttulate, not apiculate; gelatinised tissues present 3
- 3. Ascospores ellipsoid or ellipso-fusoid; apothecia stipitate, outer surface bearing brick-red granules in British species *Plectania*
- 3. Ascospores globose; apothecia sessile or short-stipitate, outer surface lacking red granules *Pseudoplectania*
- 4. Ascospores globose; apothecia on dead leaves or branches of conifers *Pithya*
- 4. Ascospores ellipsoid to fusoid; apothecia on woody debris or soil 5
- 5. Apothecia arising from a hard, black 'root' (pseudorhiza); apothecia often caespitose, with common base; margin lobed; excipulum with gel layer present; asci maturing simultaneously *Microstoma*
- 5. Apothecia lacking a pseudorhiza; apothecia not caespitose; margin even; excipulum lacking a gel layer; asci maturing successively *Sarcoscypha*



The black cups of *Plectania melastoma* in moss in conifer litter, Devon, Bovey Tracey, Great Plantation. Photograph © Peter Roberts.

***Desmazierella* Lib., 1829**

Type and only British species: *D. acicola* Lib.

Literature: Dennis (1978); Ellis & Ellis (1997); Meléndez-Howell *et al.* (1998); Petersen (1998).

Apothecia 3 - 5 mm across, sessile, superficial, with basal dark brown tomentum or subiculum, usually solitary, scattered. Disc plane or convex, whitish to grey, or with yellowish tinge when dry, bearing fine, dark brown setae. Receptacle pale brown, bearing setae. Setae tapered, dark brown, paler to apex, up to c. 1 mm long, 18 - 20 µm diam., rigid, thick-walled, granulate, multiseptate. Hyphae of subiculum pale brown, smooth or partly granulate, septate, flexuous, with slightly thickened walls. Asci cylindrical, arising from a crozier, 270 - 300 x 15 - 17 µm, 8-spored. Ascospores 16 - 19 (- 20) x 8 - 10 (- 11) µm, hyaline, ellipsoid, biguttulate, smooth, with a blunt apiculus sometimes present at each end. Paraphyses much branched and anastomosing, apical part often extended above the disc surface as seta-like structures, 4 - 8 µm diam., brown, tapered, granulate. Anamorph *Verticicladium trifidum* Preuss.

On dead needles of *Pinus sylvestris*. Widespread and common, particularly in the anamorphic state; apothecia mainly developed March - May.

Ultrastructural studies of asci and ascospores by Meléndez-Howell *et al.* (1998) suggest that *Desmazierella* may be better referred to Sarcoscyphaceae.

***Microstoma* Bernstein, 1852**

= *Anthopeziza* Wettst. 1885

Type and only British species: *M. protracta* (Fr.) Kanouse (= *Peziza protracta* Fr.; *Anthopeziza protracta* (Fr.) Nannf.; *Plectania protracta* (Fr.) Gelin; *Sarcoscypha protracta* (Fr.) Sacc.; *Peziza mirabilis* I.G. Borshch.; *Lachnea mirabilis* (I.G. Borshch.) Phill.; *Microstoma hiemale* Bernst.; *Plectania hiemalis* (Bernst.) Seaver; *Anthopeziza winteri* Wettst.)

Literature: Dennis (1978); Kanouse (1948); Nannfeldt (1949)

Apothecia cupulate to funnel-shaped, stipitate, usually caespitose, arising from a hard, blackish pseudorhiza. Disc 0.5 - 2 cm across, deeply concave, bright red, smooth. Receptacle cupulate, expanding with age, margin lacinate or lobed, orange, white-hairy. Stipe to c. 2 cm long, cylindrical, whitish above, darker below, white-strigose. Asci 8-spored, cylindrical, up to c. 560 x 27 µm. Ascospores 49 - 57 x 15 - 18 µm, fusoid, hyaline, smooth, containing 1 - 3 large guttules, uniseriate. Paraphyses filiform, obtuse, branched above, not or slightly enlarged to the apex, 3 - 5 µm diam., containing reddish pigment.

This beautiful species is widespread, if scarce, throughout much of northern Europe but is known in Britain from only a single Scottish locality (Aberdeenshire, nr. Ballater, N. bank of the Dee) where it was first collected amongst grass by J.W.H. Trail on 12 April 1890 (Trail, 1890). It was refound at the same locality exactly twenty years later by Miss J.L. Legge (Trail, 1910), but has not been seen since and is evidently long extinct in Britain.

***Pithya* Fuckel, 1870**

Type: *P. vulgaris* Fuckel

British species: *P. cupressina* (Fr.) Fuckel (= *Peziza cupressina* Fr.; *Peziza cupressi* Batsch; *P. cupressi* (Batsch) Rehm; *Lachnella cupressi* (Batsch) Phill.; *Dasyscypha cupressi* (Batsch) Phill.); *P. vulgaris* Fuckel

Literature: Nannfeldt (1949); Denison (1972); Dennis (1978); Meléndez-Howell *et al.* (1990); Paden (1984).

The genus is characterised by orange to ochre, virtually sessile apothecia, globose spores, and occurrence on dead leaves and twigs of conifers. The two British species are similar in many characters, and were considered synonymous by



Painting by E. Wheeler of *Pithya cupressina* collected by C.H. Spencer-Percival, Morpeth 1903. courtesy of the Herbarium, Kew.

Nannfeldt (1949). However, there appear to be sufficient consistent differences with regard to substrate, apothecial size and paraphysis characters, as indicated in the key, to recognise two taxa. In addition, *P. vulgaris* does not produce an anamorph (Paden, 1984), and that species also differs according to Meléndez-Howell *et al.* (1990) in possessing a perispore. *Pithya vulgaris* has not previously been reported from Britain, but an old collection from Northumberland, cited below, can be referred here.

Key to British species of *Pithya*

- 1. Apothecia 1 - 3 mm diam., on leaves or twigs of *Juniperus* spp. Paraphyses simple or occasionally branched, mostly regular, 3 - 3.5 (-4) μm wide *P. cupressina*
- 1. Apothecia 3 - 6 (-10) mm diam., on bark or rarely needles of Pinaceae. Paraphyses commonly branched or lobed, irregular towards the apex and enlarged to 4 - 6.5 μm diam. *P. vulgaris*

Pithya cupressina

Apothecia solitary, scattered to gregarious, 1 - 3 (-5) mm across, sessile or short stipitate. Disc plane or slightly concave, bright orange, paler when dry, smooth. Receptacle paler, cupulate then expanding, with white basal tomentum. Hyphae of tomentum hyaline, thin-walled, septate. Asci cylindrical, tapered below, 8-spored, (180-) 200 - 220 x 12 - 14 μm . Spores globose, (10-) 11 - 12 μm diam., hyaline, with slightly thickened walls, smooth, multiguttulate and sometimes with a de Bary bubble, uniseriate within the ascus. Paraphyses filiform, obtuse, not or somewhat enlarged towards the apex, 3 - 4 (- 5) μm wide, frequently branched. Anamorph *Mollardiomyces cupressina* Paden.

On dead leaves of *Juniperus* spp. England & Wales, scarce; throughout the year.

Pithya vulgaris

Apothecia 3 - 6 (-10) mm diam., scattered, sessile. Disc flat, orange-yellow, often brownish when dry. Margin slightly rugose. Receptacle discoid or shallow cupulate, paler than disc, basal hyphae apparently lacking. Asci cylindrical, tapered below, 15 - 17 μm diam., 8-spored. Spores globose, 10 - 11.5 μm diam., hyaline, smooth, uniseriate within the ascus. Paraphyses often branched or lobed, septate, irregularly enlarged towards the apex to 4 - 6.5 μm diam. Anamorph lacking (Paden, 1984).

On bark or rarely needles of Pinaceae. Not previously reported as British. Very rare; known in Britain from only a single old collection (England, Northumberland, Morpeth, on bark of 'fir', leg. Perceval, undated (c. 1888), K(M) 55712).

***Plectania* Fuckel, 1870**

Type and only British species: *P. melastoma* (Sow.) Fuckel (= *Peziza melastoma* Sow.; *Urnula melastoma* (Sow.) Boud.; *Rhizopodella melastoma* (Sow.) Cke; *Lachnea melastoma* (Sow.) Gill.; *Sarcoscypha melastoma* (Sow.) Quél.; *Peziza atrorufa* Grev.)

Literature: Dennis (1978); Donadini (1987); Korf (1957); Nannfeldt (1949)

Apothecia cupulate, 1- 2.5 cm across, stipitate, arising from a dense blackish tomentum. Disc concave, blackish, smooth. Receptacle blackish, bearing brick-red or orange granules in the upper part and at the margin. Asci cylindrical, tapered below, 8-spored, 350 - 500 x 13 - 16 μm . Spores 21 - 25 (- 28) x 9 - 12 μm , ellipso-fusoid, ends slightly truncate, hyaline, smooth, multiguttulate or with granular content, walls slightly thickened, uniseriate within the ascus. Paraphyses slender, obtuse, often forked or branched, sometimes anastomosing, apex sometimes lobed or irregular, septate, 2 - 4 μm wide, with brown, granular pigment. Basal hyphae 8 - 10 μm diam., dark brown, flexuous, sometimes branched, sparsely septate, smooth, walls thin or somewhat thickened.

On woody debris & leaf litter. England, spring & early summer, uncommon

***Pseudoplectania* Fuckel, 1870**

Type: *P. nigrella* (Pers.) Fuckel

British species: *P. nigrella* (Pers.) Fuckel (= *Peziza nigrella* Pers.; *Plectania nigrella* (Pers.) P. Karst.; *Sarcoscypha nigrella* (Pers.) Cke.); *P. sphagnophila* (Pers.) Kreisel (= *Peziza sphagnophila* Pers.)

Literature: Breitenbach & Kränzlin (1984); Donadini (1987); Nannfeldt (1949); Petersen (1990)

The genus is characterised by blackish, gelatinous, sessile to short-stalked apothecia and globose spores.

Key to British species of *Pseudoplectania*

1. Apothecia among moss or on the ground in coniferous litter; paraphyses irregularly much-branched and lobed, sometimes anastomosing, apex 4 - 6 μm diam. *P. nigrella*
1. Apothecia in *Sphagnum*; paraphyses simple or only occasionally branched, apex 2.5 - 4 μm diam. *P. sphagnophila*

P. nigrella

Apothecia 1 - 3 cm across, sessile, cupulate or expanding, blackish throughout, with dense basal tomentum. Disc concave, smooth. Receptacle tomentose. Hyphae of tomentum 4 - 9 μm diam., dark brown, flexuous or contorted, septate, smooth, walls slightly thickened; binding debris. Asci 320 - 390 x 14 - 17 μm , cylindrical, long tapered below, 8-spored or sometimes with 2- 4 spores aborting. Spores globose, 11.5 - 13 μm diam., hyaline, smooth, multiguttulate, uniseriate within the ascus. Paraphyses irregularly much branched, forked or lobed, sometimes anastomosing, septate, obtuse, apex usually slightly enlarged, 4 - 6 μm diam., upper part with brown, encrusting pigment.

Amongst coniferous litter and in moss in spring; widely distributed but scarce, known from Gloucestershire, N. Wales & N. Scotland.

P. sphagnophila

Apothecia scattered, sessile or short-stipitate, shallow cupulate, blackish throughout, 0.5 - 1.5 cm diam., with thick basal tomentum. Disc concave, smooth. Receptacle tomentose. Hyphae of tomentum mostly 6 - 8 μm diam., smooth, septate, walls slightly thickened. Asci 350 - 400 x 14 - 16 μm , cylindrical, long-tapered below, 8-spored. Spores globose, 12 - 13 μm diam., hyaline, smooth, multiguttulate, uniseriate within the ascus. Paraphyses filiform, obtuse, simple or occasionally branched, not or slightly enlarged at the apex, 2.5 - 4 μm diam., upper part with brown walls and some encrusting pigment.

In bogs, amongst *Sphagnum*, in spring. Rare and localised, known only from Cheshire & S. Ireland.

Sarcoscypha (Fr.) Boud., 1885

Type: *S. coccinea* (Jacq.: Fr.) Lambotte

British species: *S. austriaca* (Beck: Sacc.) Boud. (= *Lachnea austriaca* Beck: Sacc.; *Peziza imperialis* Beck 1884 non Peck 1878); *S. coccinea* (Jacq.: Fr.) Lambotte (= *Peziza coccinea* Jacq.; *Peziza insolita* Cooke; *Geopyxis insolita* (Cooke) Sacc.)

Literature: Baral (1984); Butterfill & Spooner (1995); Harrington (1990)

Apothecia sessile or stipitate, disc usually bright-coloured (scarlet to orange), rarely whitish, non-gelatinous, externally hairy but lacking setae; mostly developed on woody substrata; spores smooth, symmetrical, ellipsoid or oblong, sometimes indented at the poles, guttulate.

There are two British species, but it is only in recent years that the presence of *S. austriaca* in Britain has been recognised. Macroscopically, this is virtually indistinguishable from *S. coccinea*, though may differ slightly in habitat with a preference for *Salix* and *Acer* rather than *Corylus* and *Fagus*. Both species develop apothecia in late winter and early spring. A recent study (Butterfill & Spooner, 1995) showed that the relative abundance of these species has changed significantly in recent years. The once common *S. coccinea* appears now to be much the rarer of the two, with only a dozen or so collections in the past 25 years. The cause of this change has not been established.

Key to British species of *Sarcoscypha*

1. Excipular hairs straight to slightly sinuous; ascospores mostly 9 - 12 μm wide, usually with rounded ends, apparently never germinating to form conidia; paraphyses never moniliform *S. coccinea*
1. Excipular hairs strongly sinuous to coiled and convoluted; ascospores mostly 11 - 14 μm wide, usually truncate to indented at the ends, sometimes germinating to form conidia on short germ tubes; paraphyses often moniliform below *S. austriaca*

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Sarcoscypha austriaca, the scarlet elf cup, with its beautiful red cups with scurfy white outer surface. Photograph © Brian Spooner, Kew.

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