THE LARGER CUP FUNGI IN BRITAIN - part 3
The genera Peziza and Plicaria
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The first part of this series (Spooners, 2000a) provided a brief introduction to cup fungi or ‘discomycetes’ and considered in particular the ‘operculate’ species, those in which the ascus dehisces via an apical lid or operculum. These constitute the order Pezizales and include most of the larger discomycetes. A key to the 12 families of Pezizales represented in Britain was given. In the second part (Spooners, 2000b) a key to the British genera of the family Pezizaceae was provided, together with brief descriptions of the genera and keys to the species of all genera other than Peziza and Plicaria. These two genera are considered in the present part.

Peziza and Plicaria are closely related and share a number of fundamental characters. For example, both have asci in which the wall is stained intensely blue at the apex in iodine. This character is shared also by Plicariella, a genus recently reinstated based on British material (Spooners, 2001, in press). These three genera are distinguished according to structure of the apothecia, ascospore characters and also by chemistry and ecology. They are discussed further by Dissing & Pfitzer (1981), Eckblad (1968), Egger (1987), Hirsch (1985), Maas Geesteranus (1967) and Spooner (2001, in press). Peziza is easily recognised by its ellipsoid spores, whereas Plicaria and Plicariella both have globose spores. These last two genera are distinguished by apothecial anatomy and ecology, Plicaria having thin-fleshed, smooth or finely granular apothecia on burnt ground, Plicariella having thick-fleshed, coarsely pustular apothecia on damp soil.

Peziza is a large genus, probably including over 100 species world-wide. There is no world monograph and much revisionary work in the genus is needed. Many species are inadequately known and require critical study. In Britain well over 50 species are now known, although many of these have been rarely recorded. Others probably occur and, indeed, collections of several critical species whose identity is unclear await further study. The key presented here is, therefore, a preliminary one pending further work but will hopefully allow identification of the better-known species and perhaps stimulate further much-needed study of the genus.

It should be noted that several of the species included here have not yet been formally reported as British, viz.: P. depressa, P. granulosa, P. isabellina var. ianthina, P. labissiana, P. megalochondra, P. mercae, P. noravescit, P. cf. moseri, P. niguis, P. niguis var. fourtoulii, P. proserpina and P. udiola. In addition, one further species, P. saccardiana (Spooners & Legon, 1992), has been reported from Britain since Cannon et al. (1985).

Notable changes to names in current GB literature employed here are: P. emiliae ⇒ P. housei; P. praeruptiva ⇒ P. violacea; P. violacea ss. auct. ⇒ P. pseudoviolacea; P. pleurota ⇒ P. badiofusca. Other names which appear in Cannon et al. (1985) (under Aleuria, Galactinia or Peziza) prove to be based on misidentifications or to belong in other genera and are not included in the key.

For those unfamiliar with the genus, the following points may prove helpful as an adjunct to the key:

Most smooth-spored species lack guttules, and were once referred to the genus Aleuria (ss Boudier). In contrast, most species with ornamented spores possess 1 or 2 well-defined guttules and were once referred to the genus Galactinia. This is a useful general rule but there are exceptions in both cases. For example, P. amelina has smooth spores with 2 guttules, whereas P. arvernensis,
P. merdae and P. moravceii all have ornamented spores which lack guttules. The last two have spores with a very finely punctate ornament which can be clearly observed only under an oil immersion lens.

Colour of the disc is an important and often critical character in Peziza and is employed in the key in various places. Where it is not specifically mentioned, species should be assumed to be some shade of brown.

Probably the commonest species in Britain and the most likely to be encountered are: P. badia, P. cerea, P. micropus, P. petersii, P. repanda, P. succosa, P. varia, P. vesiculosa and P. violacea.

For a glossary of terms see part 2 (Soper 2000b).

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**Peziza** Fr., 1822
Lectotype: *P. vesiculosa* Bull.
*Aleuria* (Fr.) Gillet in Champignons de France. Les Discomycètes: 30 (1879), non *Aleuria* Fuckel (1870)
*Galactinia* (Cooke) Boud., Bull. Soc. mycol. Fr. 1: 101 (1885)

Apothecia solitary to gregarious, cupulate or discoid, sessile or with short stipe or pseudostipe. Disc usually concave, smooth, variously coloured: fawn, brown to dark brown or reddish-brown, olivaceous, violaceous, yellow or whitish; margin even or sometimes denticulate. Receptacle usually paler than disc, surface almost smooth or finely granular. Flesh often layered. Excipulum comprising globose to angular, hyaline or pale brown, thin-walled cells, often with a hyphal layer. Asci 8-spored, operculate, cylindrical, apex truncate-rounded, blue in Melzer's Reagent. Ascospores ellipsoid, hyaline or rarely brownish at maturity, guttulate or not, sometimes with a de Bary bubble, smooth or ornamented with warts, crests or a reticulum. Paraphyses cylindrical, often clavate at the apex, sometimes curved, hyaline or with brownish, granular pigment, sometimes apically agglutinated by brown amorphous matter.

Anamorph: *Chromelosporium* Corda, *Ostracoderma* Fr.
Saprobic, on various substrates.

**Literature:**

**Preliminary key to British species of Peziza**

1. Spores smooth or finely longitudinally striate under light microscope; guttules usually absent, rarely present .......................................................... 2
1. Spores ornamented with fine to coarse warts or reticulum under light microscope; guttules usually present, rarely absent ................................... 25

2. In sand dunes, apothecia hypogeous in development, long pseudostipe present (spores 15 \(-17 \times 9-10 \mu m\)) ................................................................. *P. ammophila*
2. In other habitats; not hypogeous in development; pseudostipe lacking .................................. 3

3. Ascospores fusoid, mostly over 30 \( \mu m \) long, finely longitudinally striate, with guttules; apothecia on soil, disc violaceous, c. 1 cm across .................................. *P. gerardii*
3. Ascospores ellipsoid, shorter than 30 \( \mu m \), not striate; habitat, size and colour of disc various ........................................................................... 4
4. Apothecia on dung or manured soil ........................................... 5
4. Apothecia in other habitats ................................................... 7

5. Apothecia 5 - 10 cm across, thick-fleshed, margin long incurved, gregarious, often densely so; hymenium commonly separating and becoming vesiculose with age; spores mostly 21 - 24 μm long; on manured soil ........................................... P. vesiculosa
5. Apothecia smaller, 1 - 2 cm across, on horse or cow dung .................. 6

6. Spores 18 - 21 x 10 - 11 μm ................................................. P. bovina
6. Spores 15 - 17 x 6 - 8 μm ................................................... P. fimeti (requires confirmation for GB)

7. On rotting vegetation; disc pinkish-brown (c. 1.5 cm diam); spores eguttulate, 16 - 20 x 8 - 10 μm ................................................. R. isabella var. ianthina
7. On various substrates; disc brown, yellowish or violaceous; spores eguttulate or rarely . . guttulate, larger or smaller than above ........................................... 8

8. Spore length mostly in range 13 - 17 μm ................................... 9
8. Spore length mostly in range 17.5 - 24 μm .................................. 13

9. Apothecia violaceous, on burnt ground; spores 13 - 15 x 7.5 - 8 μm . . P. pseudoviolacea
9. Apothecia not violaceous, on other substrata or occasionally on burnt ground; spores 14 - 17 x 8 - 10 μm ................................................. 10

10. Paraphyses moniliform at maturity (spores 14 - 16 x 8 - 10 μm) ............. P. varia
10. Paraphyses simple, without inflated cells at maturity .......................... 11

11. On rotten wood; short stipe often present; middle layer of interwoven hyphae usually well developed; (spores 15 - 17 x 8.5 - 9.5 μm) ................................................. P. micropus
11. On soil, rotten textiles, plaster, brickwork, mortar or on burnt ground; short stipe present or not, middle layer of interwoven hyphae thin ................................................. 12

12. On plaster, brickwork, mortar etc.; disc pale, yellowish to cream; short stipe sometimes present (spores 14 - 16 x 8 - 9 μm) ................................................. P. cerea
12. On soil, rotten textiles or burnt ground; disc fawn-brown; short stipe lacking (spores 15 - 16 x 8 - 9.5 μm) ................................................. P. repanda

13. Apothecia on wet ground in spring; paraphyses with swollen and/or lobed segments . . 14
13. Apothecia on soil, burnt ground or rotten wood, etc., various seasons; paraphyses either lacking modified segments or with slightly inflated penultimate cell ................................................. 15

14. Paraphyses moniliform, lacking lobed segments; disc reddish-brown ............ P. ninguis
14. Paraphyses with distinctly lobed segments; disc yellow-brown.. P. ninguis var. fourtoulli

15. Apothecia brown to yellowish, on wood, wood-chips, sawdust, garden mulch or soil . . 16
15. Apothecia dark brown to blackish brown or purple or red-brown or violaceous, on rotten wood or bark, soil or burnt ground ................................................. 22

16. Apothecia yellowish, on wood chips, compost or mulch; spores mostly 8 - 9.5 μm diam., ends slightly tapered (spores 18 - 21 μm long) ................................................. P. aurata
16. Apothecia fawn or darker, on wood or wood chips, or on soil; spores mostly 10-13 μm diam., ellipsoid ................................................. 17
17. Apothecia stipitate, up to 7 cm diam., margin often coarsely granular/pustular; apical cells of paraphyses with distinct yellowish guttules, penultimate cell often somewhat inflated; flesh not distinctly stratified, containing large, thin-walled cells to c. 250 μm diam.; on wood-chip much in hothouse (spores 20 – 23 x 10 – 13 μm) ........... P. megalochondra
17. Apothecia sessile, 1 – 5 cm diam., margin not or only finely granular; paraphyses lacking guttules, apical cells sometimes swollen or lobed; flesh stratified or not, lacking such large cells; on rotten wood, sawdust or soil ........................................... 18

18. On rotten wood or sawdust; yellow-brown, flesh rather thick and virtually unstratified . 19
18. On soil; fawn-brown to red-brown, flesh usually distinctly stratified. .................. 20

19. Spores 22 – 25 x 11 – 12 (13) μm; paraphyses apically irregularly swollen, curved and sometimes lobed ......................................................... P. rudicola
19. Spores (17–) 18 – 21.5 x 9.5 – 11 (-12) μm; paraphyses apically not so modified ........ P. ampliata

20. Apothecia small, scarcely over 1 cm across; spores 11 – 13 μm diam. .... P. subrepa.
20. Apothecia larger, 1 – 5 cm across; spores 9 – 11 (-12) μm diam. .................. 21

21. Apothecia cupulate, surface finely scurfy towards the margin ......................... P. granulososa
21. Apothecia saucer-shaped, surface distinctly granular, margin often with small irregular teeth ......................................................... P. granularis

22. Apothecia < 1 cm diam., purple-brown; receptacle distinctly warted–granular, margin slightly denticulate; whitish basal anchoring hyphae present; on bark in wet places (spores 19 – 22 x 11 – 12.5 μm) ......................... P. precedens
22. Apothecia 1 – 6 cm diam., dark brown to blackish-brown or violaceous; receptacle scurfy or pustular only at the margin; whitish anchoring hyphae lacking; on damp soil or burnt ground .................. 23

23. Apothecia violaceous, to c. 6 cm diam., basally thick-fleshed; spores guttulate, 19 – 23 μm long. ......................................................... P. pampelina
23. Apothecia dark brown to blackish-brown, to c. 2 cm diam., thin-fleshed; spores eguttulate, 17 – 20 μm long .................................. 24

24. Spores 11 – 13 μm wide; paraphyses sparsely septate, unbranched above .... P. sepia
24. Spores 10 – 11 μm wide; paraphyses closely septate and often forked above ........ P. sterigmatizans

25. Ascospores with distinct polar apiculae .............................................. 26
25. Ascospores lacking polar apiculae, but sometimes with warts more prominent at the poles ......................................................... 27

26. Spores 18 – 24 μm long; apiculae conical or finger-like; ornament of discrete warts 0.5 – 1.5 μm across ......................................................... P. apiculata
26. Spores 16 – 19 μm long; apiculae broad, obtuse; ornament fine, punctate ........ P. prothetica

27. Ascospore ornament a complete or broken reticulum ................................ 28
27. Ascospore ornament of warts or ridges, not forming a reticulate pattern .......... 29
28. Ascospores 16 - 20 x 8 - 10 μm; ornament a broken reticulum of forked and anastomosing ridges; disc olivaceous when fresh; on damp soil or burnt ground .................. P. badia
28. Ascospores 12 - 14.5 x 6.5 - 8.5 μm; ornament an irregular network of blunt ridges; disc brown; on steam-sterilised soil ......................... P. ostracoderma

29. Apothecia on burnt substrates or plaster, less often on sand/mortar/brick work ............ 30
29. Apothecia on other substrates, soil, rotten wood & litter or dung ......................... 37

30. Ascospores 15.5 - 18 μm long, lacking regular, distinct guttules; finely ornamented . . . . 31
30. Ascospores mostly 10.5 - 14 μm long, guttulate or not; finely or coarsely ornamented . . . 32

31. Disc dark brown; ascospores with warts often vertically elongated at the poles .......... P. echinospora
31. Disc yellow-brown; ascospores with warts not elongated at the poles ...................... P. arvernensis

32. Ascospores with very fine, regular, isolated warts; apothecia violaceous or wine red . . 33
32. Ascospores coarsely ornamented or with fine, irregular often elongated markings;
apothecia brown, whitish or greyish lilac ........................................ 34

33. Apothecia violaceous; paraphyses mostly bent or hooked and irregularly thickened at the
ax, and with dark brownish pigment (spores 11.5 - 13.5 x 6.5 - 7 μm) ....................... P. violacea
33. Apothecia on plaster, wine red; paraphyses not markedly apically hooked or pigmented
(spores 11 - 12.5 x 6 - 6.5 μm) ...................................................... P. domiciliana

34. Ascospores narrowly ellipsoid, (10-) 11 - 13 x 5.5 - 6.5 μm, with irregular ornament;
apothecia greyish-lilac, receptacle paler, to 10 cm diam ............................... P. petersii
34. Ascospores broadly ellipsoid, 10.5 - 14 x 6 - 9 μm, coarsely ornamented; apothecia
brown or whitish, 2 - 3 cm diam. or sparassoid ...................................... 35

35. Ascospores ornamented with prominent, wing-like or pyramidal ridges and spines;
apothecia dark brown, on burnt calcareous soil ........................................ P. vacinii
35. Ascospores ornamented with isolated warts; apothecia whitish or with ochraceous to
pinkish tints, on various burnt soils .......................................................... 36

36. Apothecia simple, cupulate .......................................................... P. proteana
36. Apothecia large, sparassoid .................................................. P. proteana forma sparassoides

37. Ascospores with very fine punctate ornament (oil immersion lens); apothecia on soil,
dung or rotten wood .......................................................... 38
37. Ascospore ornament distinct, of isolated or sometimes confluent warts or short ridges;
apothecia on soil, compost or rotten wood ................................................. 41

38. On soil or rotten wood; apothecia lilac or violaceous to purple-brown; spores obscurely
to distinctly guttulate; paraphyses with granular, brownish pigment .................. 39
38. On dung; apothecia pale brown; spores eguttulate; paraphyses pigmented or not ........ 40

39. On rotten wood; apothecia 2 - 5 cm diam., with dark violaceous or purplish-brown
hymenium; spores obscurely guttulate or 1-guttulate (14 - 17 x 8 - 8.5 μm) P. isabellina
39. On soil; apothecia 1.5 - 2.5 cm diam., violaceous, fading to brownish with age; spores
with 2 large guttules 4 - 5 μm diam. (14 - 15 (- 16) x 8 - 9 μm) .................. P. cf. moseri
40. Paraphyses nonlifiform; spores 15.5 - 17.5 x 7.5 - 8.5 μm .................. P. merdæae
40. Paraphyses simple; spores 13 - 15 (- 16) x 6.5 - 8.5 μm .................. P. moravecii

41. Ascospores eguttulate (spores 15 - 18 x 8 - 9 μm, ornamented with fine but distinct, isolated or sometimes partly confluent warts) .................. P. arvorensis
41. Ascospores with 1 or 2 distinct guttules or with irregular guttulation ........... 42

42. Apothecia yielding a yellow or yellow-green latex when fresh; spores with 1 or 2 distinct guttules ................................................................. 43
42. Apothecia yielding a bluish latex or none; spores with 1 or 2 distinct guttules or with irregular guttulation ....................................................... 45

43. Ascospores ornamented with fine, often elongated, irregular warts less than 0.5 μm high; (spores 15 - 17 x 8 - 9 μm; apothecia on soil) .................. P. michelii
43. Ascospores ornamented with coarse, irregular, isolated warts 1 - 2 μm high .......... 44

44. Ascospores 14 - 17.5 x 8.5 - 10 μm, with a single guttule; warts to c. 1 μm high ....
.................................................................................................................. P. succos.
44. Ascospores 17 - 19 x 9 - 10 μm, with 2 guttules; warts to 2 μm high ............... P. succosa

45. Natrophilous (on sodium-rich soils); ascospores with irregular guttulation and fine, dense, rugulose-punctate ornament (spores 15 - 18 x 7 - 8.5 μm) .................. P. natrophila
45. Not so; ascospores with 1 or 2 guttules; ornament various .......................... 46

46. Apothecia on rotten wood ........................................................................ 47
46. Apothecia on soil or litter ........................................................................ 48

47. Ascospores 17 - 22 x 8 - 9 μm, ornamented with isolated, rather regular warts 0.5 - 1 μm across ................................................................. P. epixyla
47. Ascospores 14.5 - 16.5 x 8.5 - 9.5 μm, ornamented with isolated, irregular warts commonly 1.5 - 2 μm across .................................................. P. nidulariformis

48. Ascospores mostly less than 16.5 μm long ................................................. 49
48. Ascospores mostly longer than 17 μm ....................................................... 52

49. Apothecia yielding a bluish latex which turns violaceous; ascospores narrowly ellipsoid, 7 - 8 μm diam. .......................................................... P. sanioide
49. Apothecia without coloured latex; ascospores ellipsoid to broadly ellipsoid, 8 - 10.5 μm diam. ................................................................. 50

50. Ascospores 9 - 10.5 μm diam., usually with a single guttule; paraphyses with yellow-brown encrusting pigment ............................................... P. biaffusca
50. Ascospores 8 - 9 μm diam., with 1 or 2 guttules; paraphyses lacking yellow-brown encrusting pigment .......................................................... 51

51. Ascospores biguttulate, ellipsoid, to 16.5 μm long, ornamented with isolated regular warts 0.5 - 1 (-1.5) μm across; apothecia 1 - 2 cm across, on compost .................. P. labessiana
51. Ascospores with a single guttule, broadly ellipsoid, to 15 μm long, ornamented with isolated or sometimes confluent or elongated warts mostly 1 - 2 μm across; apothecia to 5 cm across, on soil .................................. P. saccardiana
52. Disc lilac or pale violaceous; ascospores narrowly ellipsoid, 8 - 9 μm diam., with fine, regular, punctate ornament; paraphyses with brownish, granular pigment; apothecia on calcareous soil. ......................................................... *P. howsei*

52. Disc brown to dark brown, sometimes with purple tinge; ascospores narrowly ellipsoid or ellipsoid, ornament various; paraphyses with or without brown pigment; apothecia on various soils ................................................................. 53

53. Ascospores mostly 10 - 12 μm diam., with isolated, rounded, mostly regular warts which may be higher and more prominent at the poles ......................................................... 54

53. Ascospores mostly 8 - 10 μm diam., with isolated but sometimes rather irregular, angular or elongated warts, more prominent at the poles or not ................................................. 55

54. Paraphyses with brown pigment; ascospores with warts higher and more prominent at the poles (spores 17 - 19.5 x 9.5 - 11 μm). ......................................................... *P. depressa*

54. Paraphyses lacking brown pigment; ascospore warts not higher and more prominent at the poles (spores 18 - 21 x 10 - 12 μm) ......................................................... *P. brunneoatra*

55. Ascospores with rather coarse irregular, angular, curved or elongated warts to c. 2 μm across; paraphyses lacking granular pigment; apothecia on wet ground; disc with olivaceous tints. Apothecia (2-) 3 - 5 cm across ......................................................... *P. limnarea*

55. Ascospores with fine, regular or irregular to angular warts 0.5 (- 1) μm across, often more prominent at the poles; paraphyses with distinct brown pigment; apothecia on damp but not wet soil; disc vinaceous, lacking olivaceous tints. Apothecia 1 - 3 (-5) cm across ......................................................... *P. lipividula*

**Plicaria** Fuckel, 1870
Lectotype: *P. trachycarpa* (Currey) Boud.
*Curreyella* Massee, 1895
*Detoma* Sacc., 1889

Apothecia solitary to gregarious, cupulate or discoid, sessile. Disc concave, smooth, brown to dark brown or reddish-brown. Receptacle concolorous or paler than disc, surface almost smooth or finely granular. Flesh unlayered. Excipulum comprising globose to angular, pale brown, thin-walled cells. Ascii 8-spored, operculate, cylindric, apex truncate-rounded, blue in Melzer’s Reagent, wall brownish with age. Ascospores globose, hyaline at first, becoming brownish at maturity, guttulate, sometimes with a de Bary bubble, smooth or ornamented with warts, spines or a reticulum. Paraphyses cylindric, apically clavate, sometimes curved, hyaline or with brownish, granular pigment, sometimes apically agglutinated by brown amorphous matter.

Anamorph: *Chromelosporium* Corda.
Saprobic, on burnt ground or rarely on peat or sterilised soil.

Literature:

British species
*P. carbonaria* (Fuckel) Fückel (= *Peziza anthracina* Cooke; *Plicaria anthracina* (Cooke) Boud.; *Peziza trachycarpa* var. *muricata* Grelet (nom. inval.); *Galactinia muricata* (Grelet) Le Gal (nom. inval.))

*P. endocarpoides* (Berk.) Rifai (= *Peziza endocarpoides* Berk.; *Peziza leiocarpa* Currey; *Plicaria leiocarpa* (Currey) Boud., *Galactinia leiocarpa* (Currey) Le Gal)
*P. trachycarpa* (Currey) Boud. (= *Peziza trachycarpa* Currey, *Curreyella trachycarpa* (Currey) Massac, *Galactinia trachycarpa* (Currey) Le Gal)

**Key to British species of Plicaria**

1. Spores smooth, 8 - 9 (-10) μm diam.; apothecia 2 - 6.5 cm diam., exuding yellow juice ........................................... *Rendocarpoides*
   1. Spores ornamented, (10-) 11 - 16 μm (excl. ornament); apothecia 1 - 3 cm diam., not exuding yellow juice ........................................... 2

2. Spore ornament of warts and short ridges to c. 1 μm high; spores 10 - 13 μm diam. excl. ornament. ......................................................... *P. trachycarpa*
   2. Spore ornament coarser, of cylindric, truncate to conical warts and/or spines 1.5 - 2 (-2.5) μm high; spores 12 - 13 μm diam. excl. ornament. ........... *P. carbonaria*

**References**


Figs. 1-7 Spores of Peziza species showing different forms of ornamentation as seen when stained with Melzer's reagent with the exception of fig. 7 which is unstained. All spores in proportion, originally x1600, scale bars equal 20 μm:

Figs. 8-11 Paraphyses (unstained) originally x1600, scale bars equal 50 μm:

Peziza badia, a common and attractive species on damp soil and burnt areas. Often has a mixture of olivaceous, brown to brownish-purple tones. Photograph by Peter Roberts, Bellever Forest, Dartmoor, Devon 1987.