

A KEY TO THE LICHEN-FORMING, PARASITIC, PARASYMBIOTIC AND SAPROPHYTIC FUNGI OCCURRING ON LICHENS IN THE BRITISH ISLES

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Abstract: An artificial key for the identification of 218 lichen-forming, parasitic, parasymbiotic and saprophytic fungi reported as occurring on lichens in the British Isles is provided. *Agyrium flavescens* Rehm, *Cyphelium marcianum* B. de Lesd., *Scutula krempehuberi* Körber and *Stigmidium solorinaria* (Vainio) comb. nov. are reported from the British Isles for the first time, and three further new combinations are made: *Bacidia killiasii* (Hepp) comb. nov., *Pleospilus ascaridiella* (Nyl.) comb. nov. and *Polycoccum gelidaria* (Mudd) comb. nov. References to publications in which further information on the species can be found are included. Illustrations of the spores of 141 species and an index to the names of fungi and hosts are also presented.

Introduction

In the recent checklist of lichen-forming, lichenicolous and allied fungi occurring in the British Isles (Hawksworth *et al.* 1980), 183 lichenicolous fungi (i.e. fungi growing on lichens) were included. These were distributed through 79 genera, 40 of which include only lichen-inhabiting species, 16 of which also include lichenized taxa and 23 of which also include saprophytic or other fungi. These fungi exhibit a wide range of life-styles which have been reviewed elsewhere (Hawksworth 1982a): parasites causing death, discolorations or gall-like malformations; saprophytes occurring on decaying thalli; and parasymbionts, secondary fungi entering into stable relationships with their lichen hosts, i.e. symbionts with already existing symbioses. In addition to these categories, several lichen-forming fungi with an independent thallus are confined to a host lichen either for the whole or for the initial phases of their life cycle; some of these are parasitic, the mycobiont usurping the position of that of the host and taking over its algae to establish a new lichen thallus.

These biologically intriguing taxa have received scant attention, despite their numbers, from both mycologists and lichenologists. The lichens are one of the least explored ecological niches for fungi (and other microorganisms) remaining today, but studies in this field have been hampered by a grossly inadequate literature and a confused taxonomy based largely on nineteenth century concepts.

In order to start to come to grips with the problem, I prepared a manuscript key to the fungi recorded as growing on lichens in the British Isles in 1972. This first key was based on the extant literature, but as our knowledge of the fungi increased revised editions were prepared in 1974 and 1977. The manuscript keys were made available to several colleagues and following a period of testing have now been revised again and are published here for the first time.

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These keys are nevertheless presented with some hesitation in view of the imperfect knowledge we have of many of the taxa included, and because additional hitherto unknown species are continuously being discovered. The present key, for example, includes the first reports of four species from the British Isles. In addition, I have considerable numbers of collections for study, the taxonomy and nomenclature of which has not been sufficiently clarified for inclusion at this time. I plan, however, to publish revised editions of the key in the future and would therefore welcome comments from the wider audience to whom it is now made available.

The nomenclature in the keys follows Hawksworth *et al.* (1980). The citation of synonyms is restricted to cases where changes in names from those adopted in that list have been made or new combinations are being proposed. In endeavouring to use older literature (see below) it will therefore be necessary to use the 1980 checklist in conjunction with this key. In several cases the generic placements of species are unclear; where these are almost certainly inappropriate the generic names have been placed between inverted commas ("**Lecidea**"). Hosts named are restricted to those lichens known to support the taxon in the British Isles and are therefore not necessarily exhaustive. Some indication of distributions is provided but this information can be expected to be particularly incomplete at the present time in view of the little collecting of lichenicolous fungi that has so far taken place.

Publications in which modern descriptions, observations, and(or) illustrations can be found are indicated at the end of each entry. Descriptions of most taxa described up to about 1912 are compiled in Vouaux (1912–14). A revision of the central European taxa is provided by Keissler (1930), and Olivier (1905–07) presented a detailed account of the taxa then known from France. Keys to 457 species, based largely on the older literature, were published by Clauzade & Roux (1976); their work is reviewed in *Lichenologist* 9: 91 (1977). Useful compilations of older taxa are provided by Lindsay (1869) and Arnold (1874), and host lists are to be found in Keissler (1930) and Zopf (1896).

The checklist of Watson (1948) includes notes on the characters of some taxa, as does the monograph of British lichens by Smith (1926). New and interesting taxa discovered in the British Isles have been reported in a series of papers by Hawksworth (1975*a*, 1978, 1980*a*, 1982*b*). A key to the taxa known to occur on *Peltigera*, a genus especially rich in lichenicolous fungi (see Hawksworth 1982*c*), is given by Hawksworth (1980*b*). Papers concerned with particular systematic groups are indicated at appropriate points in the keys.

In the determination of lichenicolous fungi, it is important to utilize the general mycological literature in addition to works restricted to lichenicolous fungi. Openings into this body of information are provided by Ainsworth (1971), Ainsworth *et al.* (1973), Hawksworth (1974) and Hawksworth *et al.* (1983).

Illustrations of the spores of 141 of the included species are compiled into three pages at the end of the key. These are presented as an identification aid, but in the space available it is not possible to illustrate the full range of size and shape seen within the species; this must be borne in mind when consulting them.

No special techniques are in general required for the determination of lichenicolous fungi, although their small size dictates delicate handling. Microtome sections are often essential for critical work and preparing descriptions of species, but not

for routine examination and identification. Small samples, for example individual fruits, can be removed with the aid of a scalpel or point of a razor blade from thalli moistened with a drop of water. These can then be mounted in a small drop of potassium hydroxide (10–15%) on a microscope slide and the tissues dispersed by light pressure on a coverslip. Measurements are best made in water. Other mountants of value are lactophenol-cotton blue (phenol 20 g : lactic acid 20 g : glycerine 40 g : water 20 g : few drops cotton blue) which stains hyphae blue, erythrosin-ammonia (erythrosin 0·5 g : ammonia 100 ml 10%) for the examination of conidiogenous cells, and Lugol's iodine (use after pre-treatment with potassium hydroxide; iodine 0·5 g : potassium iodide 1·5 g : distilled water 100 ml) for studies of ascus structure and determination of colour reactions with iodine.

Users of these keys should remember that I have not been able to examine material of all the taxa incorporated. In those cases published descriptions and illustrations have been employed when constructing the key, and experience indicates that these may not always be relied upon, nor may published determinations of host lichens. I have, however, endeavoured to verify these data and have studied type material of the majority of taxa included.

Synopsis

Ascomycotina	2
Ascomata perithecioid or thyrtothecioid	3
Ascospores brown	4
Ascospores transversely septate	6
Ascospores muriform	38
Ascospores non-septate	41
Ascospores hyaline	47
Ascospores transversely septate, muriform or vermiform	53
Ascomata pink, orange, red, rose or \pm hyaline	54
Ascomata greenish, brown or black	64
Ascospores non-septate and not vermiform	48
Ascomata stalked and(or) spores forming in a mazaedium	88
Ascomata lirelliform	99
Ascomata of other types	106
Ascospores brown	107
Ascospores hyaline	126
Deuteromycotina	172
Coelomycetes	173
Conidia pale to dark brown	174
Conidia hyaline	185
Hyphomycetes	197
Conidia hyaline or pinkish	198
Conidia pale brown or dark brown	205
Basidiomycotina	217

Key to the Species

1	Spores produced in asci	2
	Spores not produced in asci	171

- 2(1) Hymenium not exposed at maturity (ascomata flask- or scale-like; perithecioid or thyrlotheecioid) 3
 Hymenium exposed at maturity (ascomata apothecia, ardellae, artho-
 nioid, calicioid, lirelliform or effuse) 87
- 3(2) Ascospores brown at maturity 4
 Ascospores hyaline at maturity 47
- 4(3) Ascospores transversely septate or muriform 5
 Ascospores non-septate 41
- 5(4) Ascospores transversely septate 6
 Ascospores muriform 38
- 6(5) Ascospores 1-septate 7
 Ascospores 3- or more septate 27
- 7(6) Asci multispored 8
 Asci 2-8 spored 9
- 8(7) Perithecia 0·05-0·11 mm diam, usually \pm completely immersed;
 ascospores brown, 5-7(-8) \times 2-3(-4) μ m; on *Bacidia sabuletorum*,
Caloplaca, *Fulgensia* and *Lecanora* species, almost always on cal-
 careous rocks; widespread, especially in the south. See Hawksworth
 (1979a). Fig. 71.
 . . . **Muellerella lichenicola** (Sommerf. ex Fr.) D. Hawksw.
 Perithecia 0·15-0·2 mm diam, usually \pm superficial and immersed
 only at the base; ascospores dark brown, 6-9(-10·5) \times 4-5 μ m; on
Haematomma, *Huilia*, *Lecidea*, and other crustose lichen thalli,
 almost always on siliceous rocks; widespread and common, es-
 pecially in upland areas. See Hawksworth (1979a). Fig. 73.
 . . . **Muellerella pygmaea** (Körber) D. Hawksw.
- 9(7) Interascal tissue (hamathecium) of branched and anastomosing para-
 physes (paraphysoids or pseudoparaphyses) 10
 Interascal tissue (hamathecium) absent or gelatinized (periphyses
 sometimes present) 21
- 10(9) Perithecia arising singly; walls consisting of angular pseudoparenchy-
 matous cells 11
 Perithecia arising in groups united by a dark clypeus; walls consisting
 of compacted interwoven hyphae 20
- 11(10) Asci 2-4 spored 12
 Asci 8-spored 14
- 12(11) Asci 4-spored (see also 14b). 13
 Asci 2-spored; ascospores dark brown, verrucose, variable in size,
 25-30 (-40) \times 8-10(-12) μ m; on *Verrucaria baldensis* and other cal-
 cicolous pyrenocarpous lichens; Gloucestershire. Fig. 96.
 . . . **Polycoccum dzieduszyckii** (Boberski) D. Hawksw.

- 13(12) Ascospores olivaceous brown, coarsely verrucose with protruding warts, cells \pm equal, $18 \times 10.5 \mu\text{m}$; on *Placopsis gelida*; Teesdale, no recent record. Fig. 98.
 . . . **Polycoccum gelidaria** (Mudd) D. Hawksw. comb. nov.
 [Basionym: *Sphaeria gelidaria* Mudd, *Man. Br. Lich.*: 130 (1861).]
 Ascospores at first hyaline but becoming brown when mature, cells unequal, $16\text{--}23(?\text{--}28) \times 6\text{--}9.5(?\text{--}12) \mu\text{m}$; on *Lecidella* species; British record dubious. . . **Polycoccum sporastatae** (Anzi) Arnold
- 14(11) Perithecia mainly exceeding 0.15 mm diam 15
 Perithecia $0.05\text{--}0.15 \text{ mm diam}$; asci sometimes 4-spored, but then with 4 abortive spores visible in younger asci; ascospores $14\text{--}18 \times 7\text{--}8.5 \mu\text{m}$; parasymbiotic on *Acarospora fuscata*; Merioneth and Shropshire. Fig. 100.
 . . . **Polycoccum microsticticum** (Leighton) Arnold
- 15(11) Ascospores exceeding $12 \mu\text{m}$ in length 16
 Ascospores $9\text{--}11.5(-13) \times 4.5\text{--}5(-7) \mu\text{m}$; on *Rhizocarpon obscuratum*; Cumberland. See Hawksworth (1979a). Fig. 95.
 . . . **Polycoccum arnoldii** (Hepp) D. Hawksw.
- 16(15) Ascospores mainly less than $25 \mu\text{m}$ in length 17
 Ascospores $25\text{--}36 \times (12\text{--})14\text{--}18 \mu\text{m}$, coarsely verrucose; perithecia to 0.3 mm diam ; on *Thelidium incavatum* and other pyrenocarpous lichens on hard limestones; North-West Yorkshire, Gloucestershire, Lismore and Banff. See Swinscow (1966). Fig. 99.
 . . . **Polycoccum marmoratum** (Krempelh.) D. Hawksw.
- 17(16) Ascospores mainly exceeding $7 \mu\text{m}$ in width 18
 Ascospores $(12\text{--})13.5\text{--}16(-18) \times 4\text{--}6(-7) \mu\text{m}$; on *Peltigera* thalli, sometimes forming galls; Derbyshire, South Lancashire, South-West Yorkshire and East Perthshire. See Hawksworth (1978). Fig. 101. **Polycoccum peltigerae** (Fuckel) Vězda
- 18(17) Ascospore cells \pm equal in size 19
 Ascospore cells unequal in size, the septum in the lower third, $14\text{--}22 \times 8\text{--}10 \mu\text{m}$; forming galls to 2.5 mm diam on *Stereocaulon* species; Banff, Mid-Perthshire and South Aberdeen. See Hawksworth (1978). Fig. 102.
 . . . **Polycoccum trypetelioides** (Th.Fr.)R. Sant.
- 19(18) Ascospores $14\text{--}18(-21) \times 7\text{--}9 \mu\text{m}$; forming wart-like galls on *Phycia caesia*; Ayrshire, Hertfordshire, Suffolk and Sussex. See Hawksworth (1975a). Fig. 97. . . **Polycoccum galligenum** Vězda
 Ascospores $(18\text{--})19\text{--}26 \times 5.5\text{--}7(-9) \mu\text{m}$; on *Placopsis gelida*; Teesdale, West Invernesshire, and the Outer Hebrides.
 . . . **Polycoccum squamarioides** (Mudd) Arnold
- 20(10) Ascospores $(13.5\text{--})14\text{--}16(-18) \times (5.5\text{--})6\text{--}7(-7.5) \mu\text{m}$; parasitic on *Cetrelia olivetorum* on which it forms neat round holes in the thallus, and also on *Parmelia pulla*; Ayrshire, West Invernesshire and

South Devon. See Hawksworth (1977a, 1982b). Fig. 25.

. . . **Clypeococcum cladonema** (Weddell) D. Hawksw.
 Ascospores (9-)10-12(-13) × (4-)5-6(-6.5) μm; parasitic on *Hypocnomyce scalaris*, infected squamules becoming brown, bleached and finally killed; Berwickshire, Cumberland, Durham, East Norfolk, Stirlingshire and West Somerset. See Hawksworth (1980a). Fig. 26.

. . . **Clypeococcum hypocenomyceae** D. Hawksw.

- 21(9) Ascospores lacking conspicuous guttules, reddish brown to dark brown prior to release from the asci 22
 Ascospores 2-4 guttulate, the upper cell larger, yellowish at first but becoming olivaceous with age, 13-18 × 5-8 μm; reported on *Catapyrenium* squamules on Ben Lawers but usually on *Umbilicaria* species outside the British Isles; British record dubious. See Janex-Favre (1965).
 . . . **"Stigidium" gyrophorarum** (Arnold) D. Hawksw.
- 22(21) Ascospores mainly exceeding 11 μm in length 23
 Ascospores mainly less than 11 μm in length 26
- 23(22) Ascospores with both ends rounded 24
 Ascospores with one or both ends strongly attenuated, 12-16(-20) × (4-)6(-8) μm; on a wide range of saxicolous crustose lichens, especially *Huilia* and *Rhizocarpon* species; widespread in upland areas. See Hawksworth (1979a). Fig. 40.
 . . . **Endococcus stigma** (Körber) Stizenb.
- 24(23) Ascospores narrowly ellipsoid, mainly less than 6 μm wide . . . 25
 Ascospores broadly ellipsoid, 12-16(-18) × (5-)7(-9) μm; on a wide range of saxicolous crustose lichens, especially *Aspicilia* and *Huilia* species; widespread from lowland to upland situations. See Hawksworth (1979a). Fig. 39. . . **Endococcus rugulosus** Nyl.
- 25(24) Ascospores 10.5-13(-14) × (3.5-)4-5 μm; perithecia mainly 0.05-0.08 μm diam; parasymbiotic on the apothecia and forming galls on the thallus of *Xanthoria parietina*; rare, Norfolk and Somerset. See Hawksworth (1982b). Fig. 37.
 . . . **Endococcus parietinus** (Lindsay) Clauz. & Roux
 Ascospores (12-)14-18(-20) × 3.5-5(-6) μm, exceptionally 0- or 2-septate; perithecia 0.15-0.2 mm; on unidentified saxicolous crustose lichen; Perthshire, no recent record. See Hawksworth (1979a). Fig. 36. **Endococcus exerrans** Nyl.
- 26(22) Ascospores 9-10.5(-11) × 3.5-4 μm; perithecia largely superficial, 0.07-0.1(-0.12) mm diam; in clusters on gall-like terminal swellings on *Usnea florida* and *U. subfloridana*; occasional, Carmarthen-shire, Cornwall and Devon. See Hawksworth (1982b). Fig. 35.
 . . . **Endococcus alpestris** D. Hawksw.
 Ascospores (7-)9-10(-12) × 4-6(-7) μm; perithecia mainly immersed; on thalli of a wide range of saxicolous crustose lichens, especially

Huilia and *Lecidea* species; frequent in upland areas. See Hawksworth (1979a). Fig. 38.

. . . . **Endococcus propinquus** (Körber) D. Hawksw.

- 27(6) Asci 2–4 spored 28
- Asci 8-spored 31

- 28(27) Interascal tissue (hamathecium) absent or gelatinized 29
- Interascal tissue (hamathecium) of branched and anastomosing pseudoparaphyses or paraphysoids 30

- 29(28) Perithecial locules arising in superficial botryose clusters, walls very uneven and corrugated, opening irregularly, wall cells with Munk pores (circular holes *c.* 1.5 µm diam); ascospores 3-septate, end cells ± hyaline, 30–39(–41) × 8–11(–12) µm; on thalli of *Peltigera rufescens*; South Lancashire. See Hawksworth (1980b). Fig. 49.

. . . . **Lasiosphaeriopsis salisburyi** D. Hawksw. & Sivanesan

Perithecia arising singly or in small groups, immersed; ascospores (2–)3(–7) septate, end cells concolorous, 16–21 × 7–12.5 µm; on *Huilia macrocarpa*; Killarney, no recent record.

. . . . **“Phaeospora” supersparsa** Arnold

- 30(28) Ascospores (17–)19–30(–34) × (7–)8–11(–12) µm, 3-septate, the end cells often paler, septa with central pores; perithecia immersed to erumpent, (0.1–)0.15–0.25 mm diam; on a wide range of lichens, seen in the British Isles on thalli of *Baeomyces rufus*, *Caloplaca teicholyta*, *Diploschistes caesioplumbeus*, *Lecanora jamesii*, *Leptogium teretiusculum*, *Massalongia carnosa* and *Peltigera* species, parasymbiotic to parasitic, forming galls on *Peltigera*; widespread. See Hawksworth (1980b, 1983). Fig. 104.

. . . . **Pyrenidium actinellum** Nyl.

[syn. *Dacampiosphaeria rivana* (de Not.) D. Hawksw.]

Ascospores 17.5–18.5 µm long, 3-septate; on *Anaptychia ciliaris* and *Heterodermia leucomelos*; no material located.

. . . . **“Leptosphaeria” leucomelaria** (Mudd) Vouaux

- 31(27) Perithecia arising singly or in small groups, not aggregated into a stroma 32
- Perithecia immersed in a superficial black convex stroma; ascospores 3-septate, often slightly curved, (18–)20–23(–26) × 7–8.5(–10) µm; on thallus of *Parmelia omphalodes*, *P. saxatilis* and *P. sulcata*; frequent, especially in the west. Fig. 45.

. . . . **Homostegia piggottii** (Berk. & Broome) P. Karsten

- 32(31) Ascospores exceeding 23 µm in length 33
- Ascospores not exceeding 23 µm in length 35

- 33(32) Ascospores 3-septate 34
- Ascospores finally 7-septate 86a

- 34(33) Ascospores 24–30(–36) × 8–12 µm, golden brown, verruculose; perithecia 0.15–0.25 mm diam; interascal tissues absent; parasitic on

- Caloplaca saxicola*; Somerset, no recent records.
 "**Phaeospora**" **epicallospisma** (Weddell) Arnold
 Ascospores $24-26 \times 6.5-9 \mu\text{m}$, dark brown, the apices of the end cells paler, smooth-walled; interascal tissue of knobby pseudoparaphyses; perithecia $0.075-0.1 \text{ mm}$ diam; on thalli of *Verrucaria hydrela*; Sussex, no recent records. Fig. 86.
 "**Phaeospora**" **hetairizans** (Leighton) Arnold
- 35(32) Interascal tissues (hamathecium) absent or gelatinized 36
 Interascal tissue (hamathecium) consisting of pseudoparaphyses $2.5-4 \mu\text{m}$ thick; ascospores 3-septate, pale brown, $19-21 (-22) \times 4.5-6 (-6.5) \mu\text{m}$; on *Peltigera* thalli; Warwickshire. See Hawksworth (1980b). Fig. 52.
 **Leptosphaeria clarkii** D. Hawksw.
- 36(35) Ascospores exceeding $12 \mu\text{m}$ in length 37
 Ascospores $9-11 \times 6 \mu\text{m}$; on *Pannaria*; Perthshire, no recent records
 **Phaeospora exoriens** (Stirton) A.L.Sm.
- 37(36) Ascospores $14-16 \times (5-)6-7 \mu\text{m}$; on a wide range of crustose lichens, including *Lecanora dispersa*, *Micarea bauschiana* and *Rhizocarpon concentricum*; widespread, especially in upland areas. See Vězda (1963). Fig. 87. **Phaeospora parasitica** (Lönnr.) Arnold
 Ascospores $17-22 \times 5.5-8 \mu\text{m}$; on *Rhizocarpon concentricum*; widespread in upland areas. Fig. 88.
 **Phaeospora rimosicola** (Leighton ex Mudd) Hepp
 [syn. *Pyrenulella endococcoidea* (Nyl.) Fink]
- 38(5) Ascospores with 3 or more transverse septa 39
 Ascospores with 1-2 transverse septa, septa irregular, $10-30 \times 6-12.5 \mu\text{m}$; on *Catapyrenium lachneum* and *Protoblastenia calva* or *P. rupestris* on limestone; Ben Lawers and Westmorland. See Vězda (1970). Fig. 63. **Merismatium lopadii** (Anzi) Zopf
 [?Syn. *Polyblastia nigriella* (Nyl.) Arnold]
- 39(38) Ascospores with 3-5 transverse septa, broadly ellipsoid, exceeding $7 \mu\text{m}$ in width. 40
 Ascospores with 7 transverse septa, cylindrical-fusiform, $21-25 \times 5-6.5 \mu\text{m}$; perithecia c. 0.25 mm diam; on *Leptogium burgessii*; Argyllshire. See Hawksworth (1975c). Fig. 93.
 **Pleospora leptogiicola** D. Hawksw.
- 40(39) Ascospores with 3 transverse septa, longitudinal septa scarce, $18-23 \times 7-11.5 \mu\text{m}$; finely verruculose, dark brown; perithecia $0.2-0.35 \text{ mm}$ diam; on *Pertusaria pseudocorallina* and an unidentified crustose lichen; no recent records. See Hawksworth (1979b, 1980b). Fig. 94.
 "**Pleospora**" **peripherica** (Taylor) D. Hawksw.
 Ascospores with 3-5 transverse septa, $20-40 \times 7-12 \mu\text{m}$, smooth-walled, red-brown, somewhat attenuated at the apices; on *Leptogium tenuissimum*, *Solorina crocea* and an unidentified white crustose lichen; rare, North Yorkshire, Inverness and Perthshire. See

- Eriksson (1981), Hawksworth (1975a) and Riedl (1969). Fig. 29.
 . . . **Dacampia hookeri** (Borrer) Massal.
 [syn. *Pleospora hookeri* (Borrer) Keissler]
- 41(4) Asci multispored 42
 Asci 8-spored 43
- 42(41) Ascospores $2.5-3.5 \times 2-2.5 \mu\text{m}$; perithecia immersed in the hymenium of *Bacidia rubella*; occasional from South Devon to Scotland. See Hawksworth (1975a), Vězda (1963). Fig. 70.
 . . . **Muellerella hospitans** Stizenb.
 Ascospores $5-6 \times 2.5-3 \mu\text{m}$; perithecia becoming \pm superficial; on thalli of *Arthonia radiata*; reported from Jersey north to Kincardine but some records refer to *M. hospitans*. Fig. 72.
 . . . **Muellerella polyspora** Hepp ex Müll. Arg.
- 43(41) Ascospores exceeding $15 \mu\text{m}$ in length 44
 Ascospores $10-13 \times 8-10 \mu\text{m}$ or $8-9 \mu\text{m}$ diam, globose to ellipsoid, sometimes becoming 1-septate or submuriform adhering in groups of 2-5; on thalli of *Ochrolechia tartarea*, *Pertusaria hemisphaerica*, *P. pupillaris* and *Placopsis gelida*; widespread, Hampshire, Merioneth, Outer Hebrides, Perthshire and West Sussex. See Hughes (1951), Hawksworth (1975a, 1978). Fig. 127.
 . . . **Synaptospora tartaricola** (Nyl.) Cain
- 44(43) Asci 4-6 spored 45
 Asci 8-spored 46
- 45(44) Ascospores $(21-28-34) \times 13-16 \mu\text{m}$; asci 4-6 spored; on *Cladonia squamules*; widespread. See Hawksworth (1978). Fig. 5.
 . . . **Adelococcus cladoniae** (Anzi) Keissler
 Ascospores $17-25 \times 8-12 \mu\text{m}$; asci 4-spored; on *Nephroma laevigatum*; West Ross-shire. See Hawksworth (1975a). Fig. 7.
 . . . **Adelococcus nephromatis** (Crouan) D. Hawksw.
- 46(44) Ascospores $(17-20-25) \times 9-13 \mu\text{m}$; on *Parmelia mougeotii*; Outer Hebrides. See Hawksworth (1978). Fig. 6.
 . . . **Adelococcus cf. groedensis** (Zopf) Keissler
 [The British record of *Polycoccum dannenbergii* (B. Stein) Vězda, on *Pertusaria cf. leioplaca* may also belong here. I recently examined the type of Stein's name and found it is no lichenicolous fungus, but a bark saprophyte.]
 Ascospores $11.5-16 \times 7.5-10 \mu\text{m}$; normally on *Acarospora glaucocarpa*; British record dubious. See Watson (1948).
 . . . **Adelococcus alpestris** (Zopf) Theiss. & H. Sydow
- 47(3) Ascospores non-septate and not vermiform. 48
 Ascospores transversely septate, muriform, or simple and vermiform 53
- 48(47) Ascospores with rounded ends 49
 Ascospores with pointed ends, $16-21 \times 5-6 \mu\text{m}$; asci 4(?-8) spored, often expelled with the spores; interascal tissue (hamathecium)

- absent; on *Leptogium* species; rare, south-west England and south-west Ireland. See Mitchell & Henssen (1966), and Eriksson (1981).
Fig. 80. **Obryzum corniculatum** Wallr.
[syn. *Sphaerulina corniculata* (Wallr.) Vouaux]
- 49(48) Ascospores not exceeding 15 μm in length 50
Ascospores 15–20(–24) \times 4–7(–8) μm ; forming bullate galls on *Xanthoria parietina*; Dorset and Westmorland. See Hawksworth (1975a). Fig. 43. **Guignardia olivieri** (Vouaux) Sacc.
- 50(49) Asci 4–8 spored 51
Asci multispored; ascomata 0.1–0.15 mm diam, bright yellow pruinose, citrine green when fresh; ascospores 4–6 \times 1.5–2 μm or (6–)8–10(–12) \times 3 μm ; a lichenicolous lichen on the thallus of *Baeomyces*, *Peltigera* and *Solorina* species; upland areas. See Salisbury (1966) and Ahti (1973). **Thelocarpon epibolum** Nyl.
[The longer-spored morph, var. **epithallinum** (Leighton ex Nyl.) G. Salisb., occurs on *Peltigera* thalli and rotting wood; it was maintained by Ahti (1973).]
- 51(50) Interascal tissues (hamathecium) absent. 52
Interascal tissue (hamathecium) of persistent unbranched filiform paraphyses; ascospores 8–10(–11) \times 3–5 μm ; perithecia 0.1–0.15 mm diam, subhyaline to pale reddish or olivaceous near the ostiole; forming bullate deformations on *Thamnolia vermicularis*; Merioneth and the Scottish Highlands, no recent records. See Hawksworth (1980a). Fig. 130.
. **Thamnogalla crombiei** (Mudd) D. Hawksw.
- 52(51) Ascospores 7–8 \times 3 μm ; on *Cladonia*; Merioneth.
. **Guignardia fimbriatae** (Vainio) Keissler
Ascospores 7–11 \times 6–8 μm ; a lichenicolous lichen on *Aspicilia calcarea*, mentioned by Watson (1948) on *Caloplaca* and *Lecanora albescens*; British records in need of confirmation. See Zehetleitner (1978). **Verrucaria insularis** (Massal.) Jatta
- 53(47) Perithecia pink, orange, red, rose, or subhyaline; interascal tissues (hamathecium) absent 54
Perithecia greenish, brown or black; interascal tissues (hamathecium) present or absent 64
- 54(53) Ascospores 1-septate 55
Ascospores 2- or more septate or muriform 61
- 55(54) Perithecia arising on a superficial basal byssoid stroma 56
Perithecia immersed or erumpent, not developed on a stroma 59
- 56(55) Ascospores less than 15 μm in length. 57
Ascospores 15–18 \times 4 μm ; asci 4-spored; perithecia orange-red; on *Caloplaca* species; British record dubious.
. **Nectria epicallopisma** (Arnold) Sacc.
- 57(56) Ascospores exceeding 12 μm in length 58

- Ascospores $9-12 \times 3-4$ (?-7) μm ; perithecia pale yellow to orange; parasitic on thalli of *Lobaria* and *Peltigera* species, often causing extensive damage; occasional, Norfolk, South Lancashire and north-west Scotland. See Booth (1959). Fig. 74.
 . . . **Nectria lecanodes** Ces.
- 58(57) Perithecia rose; asci 4-8 spored; ascospores $12-18 \times 6-8 \mu\text{m}$; on an unidentified crustose lichen in South Devon (Watson 1948), in need of confirmation. See Vězda (1970).
 . . . **Nectria indigens** (Arnold) Rehm
 Perithecia subhyaline; asci 8-spored; ascospores $12-15 \times 4-6 \mu\text{m}$; on thalli of lecideoid lichens; British record dubious.
 . . . **Nectria insidiosa** (Nyl.) Sacc. & D. Sacc.
- 59(55) Ascospores not exceeding 20 μm in length 60
 Ascospores $22-28$ (-33) $\times 3.5-4$ (-4.5) μm ; perithecia orange but red around the ostiole, 0.15-0.25 (-0.35) mm wide; on *Peltigera* thalli; Midlothian. See Hawksworth (1978). Fig. 76.
 . . . **Nectriella tenuispora** D. Hawksw.
- 60(59) Perithecia brownish red to orange; ascospores (11-)12-15 (-17) \times (4-)4.5-7 μm ; anamorph *Illosporium carneum* (see 203a) usually present; on *Peltigera* thalli; widespread and locally abundant. Fig. 76 . . **Nectriella robergei** (Mont. & Desm.) Weese
 Perithecia deep red; ascospores (10-)11-14(-15) $\times 4.5-6$ (-7) μm ; anamorph absent (? always); parasitic, forming bleached areas on the thalli of *Anaptychia fusca*; rare, South Devon and Co. Kerry. See Hawksworth (1980a, 1982a). Fig. 77.
 . . . **Nectriella tinctoria** (Fuckel) R. Sant.
- 61(54) Ascospores ellipsoid with the apices extended into cilia . . . 62
 Ascospores vermiform, multiseptate, (45-)60-100(-120) \times (4.5-)5-7(-8) μm ; perithecia pale orange, translucent, with stiff white hairs; on thalli of *Lecanora conizaeoides*, *Lecidea uliginosa*, and *Lepraria incana*, perhaps sometimes persisting as a saprophyte on wood; rare or overlooked, widely scattered in lowland England. See Hawksworth (1978). Fig. 132.
 . . . **Trichonectria hirta** (Bloxam) Petch
- 62(61) Ascospores muriform 63
 Ascospores 3(-4) septate, body 21-30(-38) $\times 5-7 \mu\text{m}$; on filaments of *Ephebe lanata*; Argyllshire, no recent record. See Hawksworth & Pirozynski (1977). Fig. 81. . **Paranectria affinis** (Grev.) Sacc.
- 63(62) Asci 8-spored; ascospores with 5-8 transverse and 1-2 longitudinal septa, body (22-)25-32(-36) \times (9-)11-14(-15) μm ; on *Parmeliella atlantica*; Argyllshire. See Hawksworth (1982b). Fig. 82.
 . . . **Paranectria oropensis** (Ces.) D. Hawksw. & Piroz.
 Asci 2- or 4-spored; ascospores finally with 20-50 irregular cells, body (23-)30-45.5 \times (10-)13-18(-20.5) μm ; on *Peltigera rufescens*;

Derbyshire. See Hawksworth (1982b). Fig. 83.

. . . **Paranectria superba** D. Hawksw.

- 64(53) Ascomata thyriothecoid, composed of two superimposed plates of radially arranged quadrangular cells 65
- Ascomata perithecioid, flask-shaped 66

- 65(64) Thyriothecia 80–160 μm diam, ostiolar setae absent; asci 4(–6) spored; ascospores 1-septate, 14–16 \times 2.5–4 μm ; parasymbiotic on *Cetraria islandica*; South Aberdeenshire, no recent record. See Hawksworth (1980a). Fig. 133.

. . . **Trichothyria cetrariicola** (Nyl.) D. Hawksw.

- Thyriothecia 50–70 μm diam, ostiole with 3–6 red-brown stiff diverging setae; asci 4-spored; ascospores 1-septate, (13.5–)15–21 \times (3–)4–5 μm ; on old *Peltigera* thalli, especially veins on the underside; Caernarvonshire and Shropshire. See Hawksworth (1982b). Fig. 4.

Actinopeltis peltigerioli D. Hawksw.

- 66(64) Ascospores not exceeding 4 μm in width 67
- Ascospores exceeding 4 μm in width 68

- 67(66) Asci 8-spored 140b
- Asci 16-spored; ascospores 50–100 \times 2–3 μm , simple but often appearing multiseptate due to included guttules; on old *Peltigera* thalli; Glamorganshire.

. . . **Neolamyia peltigerae** (Mont.) Theiss. & H. Sydow

- 68(66) Interascal tissues (hamathecium) present 69
- Interascal tissues (hamathecium) absent or gelatinized 78

- 69(68) Ascospores 1-septate 70
- Ascospores (1–)3 septate 76

- 70(69) Perithecial wall dark brown to black throughout 71
- Perithecial wall almost hyaline, olivaceous near the ostiole, this region aeruginose in K, 0.075–0.1(–0.125) mm diam; ascospores (?13–)17.5–23 \times (?3.5–)5–7(–8) μm , septum refractive where it joins the spore wall; in the hymenium of *Lecanora polytropa*, and perhaps also of *L. intricata* and *Pachyospora verrucosa*; widespread. See Vězda (1970). Fig. 22.

. . . **Cercidiospora epipolytropa** (Mudd) Arnold

- 71(70) Ascospores not exceeding 12 μm in length 72
- Ascospores exceeding 15 μm in length 73

- 72(71) Ascospores 9–12 \times 5–6 μm ; usually on *Hymenelia lacustris*; the British record of Smith (1926) from Derbyshire is dubious. See Swinscow (1967) “**Arthopyrenia**” **lomnitzensis** B. Stein
- Ascospores 4.5–8 \times 1.5(–2) μm ; paraphyses filiform, disappearing at maturity; perithecia 0.1–0.15 mm diam, superficial and with stiff dark bristles; anamorph *Monocillium*; on decaying podetia of *Cladonia rangiformis*, probably saprophytic; Glamorganshire. See

- Hawksworth (1975a). Fig. 79.
 . . . **Niesslia cladoniicola** D. Hawksw. & W. Gams
- 73(71) Ascospores exceeding 8 μm in width 74
 Ascospores not exceeding 8 μm in width 75
- 74(73) Ascospores (18–)20–26(–28) \times (7–)9–10.5 μm 77a
 Ascospores 18–25 \times 9–12 μm ; associated with freshwater *Verrucaria* species; Argyllshire and Inverness-shire. See Swinscow (1967).
 . . . **“Arthopyrenia” strontianensis** Swinscow
- 75(73) Asci 4–8 spored; ascospores (15–)17–22(–24) \times (4.5–)5–6.5(–7) μm ; on *Collema* species, *Lecidea metzleri*, *Leptogium turgidum* and other calcicolous lichens; widespread. See Vězda (1963). Fig. 33.
 . . . **“Didymella” sphinctrinoides** (Zwackh) Berl. & Vogl.
 Asci 6–8 spored, ascospores 22–28 \times 6–8 μm ; on *Collema*; Somerset.
 . . . **“Didymella” pulposi** Vouaux
- 76(69) Ascospores exceeding 18 μm in length 77
 Ascospores 12–18 \times 4–6 μm ; perithecia erumpent, 0.2–0.25 mm diam; on an *Ochrolechia* thallus; Ben Lawers. See Vězda (1970) and Hawksworth (1975a). Fig. 65.
 . . . **“Metasphaeria” tartarina** (Nyl.) Keissler
- 77(76) Ascospores broadly ellipsoid, (18–)20–26(–28) \times (7–)9–10.5 μm , secondary septa thin and developing late, sometimes with a brownish tinge; perithecia (0.15–)0.2–0.3 mm diam; on *Rhizocarpon concentricum*; Ben Lawers; no recent records. Fig. 13.
 . . . **“Arthopyrenia” allogena** (Nyl.) Arnold
 Ascospores somewhat fusiform, 22–25 \times (5–)5.5–6.5 μm ; perithecia 0.075–0.125 mm diam; forming galls on *Stereocaulon dactylophyllum*; Ben Alder. See Hawksworth (1982b). Fig. 64.
 . . . **“Metasphaeria” stereocaulorum** (Arnold) Sacc.
- 78(68) Perithecia ostiolate, wall cells without Munk pores 79
 Perithecia opening irregularly, often by a triradiate or cruciform split, walls uneven, cells with Munk pores (see 29a); asci 2- or 4-spored, long-stalked, thin-walled; ascospores (0–)1(–3) septate, 30–50 \times 7–10 μm ; on *Solorina crocea*; Mid-Perthshire, South Aberdeenshire, and Co. Kerry, no recent records. See Vězda (1970) and Hawksworth (1980a). Fig. 107.
 . . . **Rhagadostoma lichenicola** (de Not.) Keissler
- 79(78) Ascospores 1-septate 80
 Ascospores 3- or more septate 83
- 80(79) Perithecia with stiff brown setae 81
 Perithecia lacking setae 82
- 81(80) Ascospores 12–16 \times 3.5–4.5 μm ; paraphyses always absent; on decomposing thalli of *Peltigera leucophlebia*; Ben Avon. See Hawksworth (1980b). Fig. 140.

- . . . **Wentiomycetes peltigericola** D. Hawksw.
 Ascospores $4.5-8 \times 1.5(-2) \mu\text{m}$ 72b
- 82(80) The taxonomy of *Stigmidium* is currently largely host-based and requires a modern monographic treatment. The following taxa have been recognized in the British Isles but in addition I have numerous collections from hosts not mentioned here.
- (a) On *Pertusaria lactea*; ascospores $12.5-18 \times 2.5-5 \mu\text{m}$; perithecia aggregated into groups; upland areas in Scotland and Wales.
 . . . **Stigmidium aggregatum** (Mudd) D. Hawksw.
 [? syn. *S. eucline* (Nyl.) Vězda]
- (b) On *Parmelia conspersa* apothecia and thalli, and apothecia of a wide range of crustose lichens, especially *Lecanora* species; ascospores $11-18 \times 3.5-5 \mu\text{m}$; widespread. See Vězda (1963). Fig. 121.
 . . . **Stigmidium dispersum** (Lahm ex Körber). D. Hawksw.
- (c) On *Ephebe lanata*, forming galls; ascospores $16-20 \times 4-5 \mu\text{m}$; rare. See Henssen (1963).
 . . . **Stigmidium ephebes** (Henssen) D. Hawksw.
- (d) On ? *Catapyrenium* squamules; ascospores $13-18 \times 5-8 \mu\text{m}$, with a yellowish tinge. 21b
- (e) On *Verrucaria halizoa* and *V. mucosa*; ascospores $10-15 \times 4-6 \mu\text{m}$, sometimes with 2 pseudosepta; South Devon, the Isle of Wight and the Channel Islands. See Swinscow (1965). Fig. 122 **Stigmidium marinum** (Deakin) Swinscow
- (f) On *Graphis scripta*, forming neat circular grey-black patches on the thallus; ascospores $14-15(-19) \times 3-5 \mu\text{m}$; widespread in old woodlands, and common in western Scotland. Fig. 123.
 . . . **Stigmidium microspilum** (Körber) D. Hawksw.
- (g) On decolorized *Peltigera* thalli; ascospores $9-12 \times 2.5-3.5 \mu\text{m}$; Argyllshire, Island of Mull, East Perthshire, East and West Inverness. See Hawksworth (1975a, 1980b). Fig. 124.
 . . . **Stigmidium peltideae** (Vainio) R. Sant.
- (h) On *Lecania cyrtella*; ascospores $14-18 \times 3.5-5 \mu\text{m}$; Somerset.
 . . . **Stigmidium punctillum** (Arnold) D. Hawksw.
- (i) On *Lecanora* apothecia and other crustose lichens; ascospores $9.5-14 \times (2-)4-5 \mu\text{m}$, sometimes becoming 3-septate; widespread. See Vězda (1963). Fig. 125.
 . . . **Stigmidium schaeereri** (Massal.) Trevisan
- (j) On *Solorina saccata*; ascospores $9-11(-12) \times 3-3.5 \mu\text{m}$; Derbyshire (Monyash, Lathkill Dale, 13 April 1979, *D. L. Hawksworth* 4917, IMI 237624), new to the British Isles.
 . . . **Stigmidium solorinaria** (Vainio) D. Hawksw. comb. nov.
 [Basionym: *Pharcidia coniodes* var. *solorinaria* Vainio, *Acta Soc. Fauna Flora fenn.* 49(2): 135 (1921).]
- (k) On *Polyblastia theleodes*; ascospores $(15-)16-18(-20) \times 6-7.5(-8) \mu\text{m}$; Ben Lawers, no recent records. Fig. 126.
 . . . **Stigmidium superpositum** (Nyl.) D. Hawksw.
- 83(79) Ascospores mainly less than $15 \mu\text{m}$ in length 84

- Ascospores exceeding 15 μm in length 85
- 84(83) Ascospores 3–5 septate, 11–16 \times 3–4 μm ; a doubtful taxon described from Co. Kerry **“Arthopyrenia” desistens** (Nyl.) A.L.Sm.
Ascospores 1–3 septate, 9.5–14 \times (2–)4–5 μm 82i
- 85(83) Ascospores exceeding 23 μm in length 86
Ascospores *c.* 21 \times 5 μm ; on an unidentified placodioid lichen; Ben Lawers, no recent record. Fig. 118.
. **“Sphaerulina” dubiella** (Nyl.) Keissler ex W. Watson
- 86(85) Ascospores 3–7 septate, 25–35(–45) \times 6–9 μm , finally brownish in some specimens; perithecia *c.* 0.5 mm diam, black; parasitic on squamules of *Normandina pulchella*, bleaching the thallus, sometimes perhaps independently lichenized; widespread but rather rare. See Henssen (1976). Fig. 117.
. **“Sphaerulina” chlorococca** (Leighton) R. Sant.
Ascospores 3–5 septate, 23–27 \times 4–5 μm ; perithecia golden; on *Collema*; Perthshire **“Sphaerulina” dolichotera** (Nyl.) Vouaux
- 87(2) Ascomata stalked **and(or)** ascospores forming a mazaedial mass 88
Ascomata sessile and ascospores not forming a mazaedial mass 98
- 88(87) Ascospores hyaline or greenish, ornamented with spiral bands 89
Ascospores pale brown to dark brown, ornamentation various 90
- 89(88) Ascospores (0–)1 septate, 6.5–8 \times 2–3 μm ; anamorph absent; apothecia distinctly stalked, 0.6–1.8(–2.5) mm tall; lichenized or parasitic on *Psilolechia lucida*, more rarely on *P. clavulifera*; scarce, widespread in upland areas from Dartmoor to the Scottish Highlands. See Tibell (1978). Fig. 66.
. **Microcalicium arenarium** (Hampe ex Massal.) Tibell
Ascospores (1–)3 septate, 11.5–15 \times 3.5–4 μm ; anamorph present, preceding the apothecia (see 196b); on various Caliciales, perhaps sometimes lichenized; East Inverness. See Tibell (1978) and Hawksworth (1981). Fig. 67.
. **Microcalicium disseminatum** (Ach.) Vainio
[syn. *M. subpedicellatum* (Schaerer) Tibell]
- 90(88) Ascospores 1-septate 91
Ascospores non-septate 95
- 91(90) Ascospores coarsely ornamented, exceeding 5 μm in width 92
Ascospores smooth-walled, not exceeding 5 μm in width 93
- 92(91) Ascospores (9–)11–15(–18) \times 5–8 μm , irregularly coarsely verrucose; apothecia stalked or \pm sessile; on a yellowish green sorediate crust, perhaps lichenized; South Northumberland. See Hawksworth (1975a). Fig. 20 **Calicium corynellum** (Ach.) Ach.
Ascospores 11–15 \times 6–8 μm , coarsely spirally striate at first but developing into irregular ridges and cracks with age; apothecia all sessile; parasymbiotic or parasitic on *Pertusaria coccodes*, inhibiting the

production of isidia; rare, but scattered through the range of the host in the British Isles. See Tibell (1969, 1971). Fig. 28.

. . . **Cyphelium sessile** (Pers.) Trevisan

[**Cyphelium marcianum** B. de Lesd., with immersed apothecia, ascospores $11-13 \times 6-8 \mu\text{m}$ with fewer shallower fissures than *C. sessile*, has recently been determined from the British Isles by Dr L. Tibell (Argyllshire, Seil, Easdale, Dùn Mòr, on *P. pseudocorallina*, 25 June 1980, *B. J. Coppins* 4927, UPS).]

- 93(91) Ascospores exceeding $2 \mu\text{m}$ in width 94
 Ascospores $5-7 \times 1.5-2 \mu\text{m}$; on *Chaenotheca trichialis*; East Inverness.
 See Hawksworth (1978) and Tibell (1975). Fig. 23.
 . . . **Chaenothecopsis epithallina** Tibell
- 94(93) Ascospores $(6-7-9(-10) \times 2-3(-3.5) \mu\text{m}$; apothecia stalked; parasitic
 on squamules of *Cladonia* species, especially *C. polydactyla*; East
 Inverness and West Sutherland. See Hawksworth (1978). Fig. 24.
 . . **Chaenothecopsis parasitaster** (Bagl. & Car.) D. Hawksw.
 Ascospores $8-11 \times 2.5-3.5 \mu\text{m}$; apothecia \pm sessile; saprophytic or on
 a whitish crustose lichen on oak; Jersey, no recent records.
 . . . "Calicium" **retinens** Nyl.
- 95(90) Ascospores \pm globose 96
 Ascospores ellipsoid, $10-15.5 \times 6.5-9 \mu\text{m}$; parasymbiotic on *Pertusaria*
species, especially *P. leioplaca*; New Forest, no recent
 records. See Löfgren & Tibell (1979).
 . . . **Sphinctrina tubiformis** Massal.
- 96(95) Apothecial stalk at least as tall as the hymenial layers; excipulum dull
 brown, K- 97
 Apothecial stalk shorter than the hymenial layers, apothecia some-
 times \pm sessile; excipulum reddish, K+ red; ascospores
 $5-7.5 \times 4.5-7 \mu\text{m}$, ornamentation of irregularly shaped pits and
 furrows; parasymbiotic on *Pertusaria* species, especially *P. pertusa*;
 widespread and often common. See Löfgren & Tibell (1979). Fig.
 120 **Sphinctrina turbinata** (Pers.) de Not.
- 97(96) Ascospores $7-9.5 \mu\text{m}$ long, ornamentation distinct, of regular circular
 pits; apothecial stalk \pm as tall as the hymenial layers, black; parasitic
 on *Lecanora* thalli or with a brownish granular thallus; south-east
 England, scarce. See Löfgren & Tibell (1979). Fig. 119.
 . . . **Sphinctrina anglica** Nyl.
 Ascospores $4.5-6.5 \mu\text{m}$ long, ornamentation indistinct; apothecial
 stalk usually slightly taller than the hymenial layers, light to dark
 brown; parasymbiotic or parasitic on *Pertusaria pertusa*, also known
 on *Diploschistes* and from other *Pertusaria* species; Channel Islands
 and Co. Galway, no recent records. See Löfgren & Tibell (1979).
 . . . **Sphinctrina leucopoda** Nyl.
- 98(87) Ascomata lirelliform 99
 Ascomata apothecia, lecideoid, arthonioid or effuse 106
- 99(98) Lirellae \pm elongate 100

- Lirellae in the form of star-shaped clusters; ascospores 1-septate, *c.* $9 \times 3.5 \mu\text{m}$, brown; on *Sticta canariensis* (blue-green phycotype); Co. Galway.
 . . . **Hemigrapha astericus** (Müll. Arg.) R. Sant. ex D. Hawksw.
- 100(99) Ascospores 1-septate, brown 101
 Ascospores 3-or more septate, hyaline or brown 102
- 101(100) Ascospores $13-18 \times 4-6(-7) \mu\text{m}$; on *Phaeographis dendritica* and perhaps other *Phaeographis* species; widespread in the south and west.
 . . . **Melaspilea lentiginosa** (Lyell ex Leighton) Müll. Arg.
 Ascospores $18-22 \times 9-12 \mu\text{m}$; on *Verrucaria*; South Lancashire, no recent records. See Dennis (1978).
 . . . **Melaspilea leciographoides** Vouaux
- 102(101) Ascospores 3-septate; asci 4-8 spored 103
 Ascospores (5-)6-septate, $21-28 \times 4.5-6 \mu\text{m}$; asci 4-spored; on *Pertusaria leioplaca*; Merioneth and Western Scotland. See Coppins & James (1979) . **Opegrapha pertusariicola** Coppins & P. James
- 103(102) Ascospores mainly less than $18 \mu\text{m}$ in length 104
 Ascospores $(18-)20-22.5(-24) \times (4-)6.5-7 \mu\text{m}$; on *Dermatocarpon miniatum*; Colonsay. See Hawksworth (1982b).
 . . . **Opegrapha pulvinata** Rehm
- 104(103) Ascospores remaining hyaline; on *Thelotrema* 105
 Ascospores finally brownish and verrucose, $13-15(-22) \times 5-8 \mu\text{m}$; asci 8-spored; lirellae short and broad with a narrow slit; on pyrenocarpous and other crustose lichens on limestones, *Caloplaca cirrochroa* and *Xanthoria parietina*; widespread. See Vězda (1970).
 . . . **Opegrapha parasitica** (Massal.) Vězda
 [syn. *O. persoonii* auct.]
- 105(104) Lirellae gaping to expose the hymenium; asci 4-spored; ascospores $14-16.5 \times 4.5-6 \mu\text{m}$; on *Thelotrema subtile*; western Scotland. See Coppins & James (1979) **Opegrapha sp. A**
 Lirellae with a slit-like opening; asci 6-8 spored; ascospores $14-16 \times 4.5-6 \mu\text{m}$; on *Thelotrema monosporum*, and more rarely *T. lepadinum*; western Scotland. See Coppins & James (1979).
 . . . **Opegrapha sp. B**
- 106(98) Ascospores brown 107
 Ascospores hyaline 126
- 107(106) Ascomata arthonioid 108
 Ascomata lecideoid 109
- 108(107) Ascospores $12-17 \times 5.5-6.5(-7.5) \mu\text{m}$, pale brown, 1-septate, verruculose; parasitic, forming bleached patches on thalli of *Diplotomma alboatrum* and *D. chlorophaeum*; West Kent, Caithness and Co. Cork. See Hawksworth (1980a). Fig. 12.
 . . . **Arthonia punctella** Nyl.

- Ascospores $29 \times 13 \mu\text{m}$, pale brown, 1-septate; doubtfully lichenicolous, on *Plex*; Caernarvonshire, no recent records.
 . . . **Arthonia punctilliformis** Leighton
- 109(107) Apothecia marginate, often concave, excipular tissues distinct; asci I+ blue at least in parts 110
 Apothecia emarginate, strongly convex, lacking distinct excipular tissues even when young; asci I- 122
- 110(109) Interascal tissue (hamathecium) of branched and anastomosing net-like paraphysoids 111
 Interascal tissue (hamathecium) of simple or sparsely branched paraphyses 112
- 111(110) Ascospores $(9-11-17 \times 6-10 \mu\text{m})$, not guttulate, 1-septate; apothecia $0.2-0.8 \text{ mm}$ wide, black; lichenicolous lichen on *Baeomyces rufus*; rare, north-east England and Ireland. See Hafellner (1978, 1979).
 . . . **Epilichen scabrosus** (Ach.) Clem.
 Ascospores $18-23 \times 11-15 \mu\text{m}$, guttulate, 1-septate; apothecia $0.4-0.7 \text{ mm}$ wide, black; hyphae I+ violet; parasymbiotic on saxicolous *Pertusaria* species; rare, Outer Hebrides, North Wales and Ireland. See Hafellner & Poelt (1976) and Hafellner (1979).
 . . . **Rhizocarpon advenulum** (Leighton) Hafellner & Poelt
- 112(110) Ascospores with 1-3 transverse septa, muriform or not . . . 113
 Ascospores with 4 or more transverse septa, usually muriform . . . 120
- 113(112) Asci without a distinct I+ blue cap, with an I+ blue internal apical tholus 114
 Asci with a distinct I+ blue gelatinous cap or sheath, internal tissues I- 115
- 114(113) Ascospores $(14.5-16-21(-23) \times 6.5-8.5 \mu\text{m})$, 1-3 septate; lichenicolous lichen with its phycobiont in an internal thallus within the host, on *Physconia pulverulacea*; Mid-Perthshire. See Hafellner (1979) and Hafellner & Poelt (1980). Fig. 19.
 . . . **Buellia pulverulenta** (Anzi) Jatta
 Ascospores $20-22 \times 7.5-9 \mu\text{m}$, 3-septate to submuriform; on *Caloplaca teicholyta*; Co. Galway.
 . . . **Diplotomma murorum** (Massal.) Coppins
- 115(113) Ascospores 1-septate 116
 Ascospores 2-3 septate 118
- 116(115) Apothecia immersed at the base, excipular tissues extending well into the host thallus 117
 Apothecia \pm superficial, excipular tissues scarcely extending into the host thallus, black, marginate, $0.3-0.6 \text{ mm}$ diam; ascospores $(11-12-17 \times 4.5-6.5 \mu\text{m})$, slightly verruculose; parasymbiotic on *Lobaria pulmonaria*; rare, Argyllshire and Dorset. See Hawksworth (1975a) and Hafellner (1979). Fig. 30.
 . . . **Dactylospora lobariella** (Nyl.) Hafellner

- 117(116) Apothecia with striate margins, 0.25–0.7 mm diam; hymenium 65–85 μm tall; ascospores 8.5–16 \times 4–7 μm ; on a sterile crustose lichen (perhaps a *Pertusaria* species); Midlothian. See Vězda (1963) and Hafellner (1979).
 . . . **Dactylospora saxatilis** (Schaerer) Hafellner
 Apothecial margins not striate, 0.3–0.8 mm diam; hymenium 55–65 μm tall; ascospores 9–14.5 \times 4–7 μm ; on *Baeomyces rufus*; Berwickshire, North-East Yorkshire and western Ireland. See Hafellner (1979).
 . . . **Dactylospora athallina** (Müll. Arg.) Hafellner
- 118(115) Ascospores not exceeding 18 μm in length 119
 Ascospores 18–22 \times 6–9 μm ; apothecia 0.4–0.5 mm diam; parasymbiotic on *Lecanora rupicola*; Angus.
 . . . **Dactylospora lamyi** (Rich.) Arnold
- 119(118) Ascospores 1–2(–3) septate, (9.5–)12–15(–16) \times (3.5–)4.5–6(–7) μm ; hypothecium greyish brown; parasymbiotic on *Ochrolechia parella*; widespread, South Hampshire north to Shetland, Ireland. See Dennis (1978). Fig. 32. **Dactylospora parellaria** (Nyl.) Arnold
 Ascospores (1–)3 septate, 9–15(–17) \times 3.5–5 μm ; hypothecium reddish brown; parasymbiotic on corticolous *Pertusaria* species, especially *P. albescens*, *P. hymenea* and *P. pertusa*, and also on *Ochrolechia turneri*; widespread and locally common but becoming rarer in the north. See Hafellner (1979). Fig. 31.
 . . . **Dactylospora parasitica** (Flörke) Zopf
- 120(112) Ascospores exceeding 8 μm in width 121
 Ascospores 15–23(?–27) \times 4–6 μm , (3–)5–7 septate to muriform; on an unidentified crustose muscicolous lichen; Breadalbane Mountains.
 . . . **Dactylospora urceolata** (Th.Fr.) Arnold
- 121(120) Ascospores (21–)30–45(–54) \times 11–24 μm , with 5–9 transverse and 2–5 longitudinal septa; asci 4–8 spored; a facultatively lichenicolous parasite of *Lecanora gangaleoides* in South Devon, taking over the algae of the host to form an independent lichen with a smooth areolate lead-coloured C+ rose thallus.
 . . . **Diploschistes caesioplumbeus** (Nyl.) Vainio
 Ascospores (20–)25–30(–35) \times (8–)12–15 μm , with 5 transverse and 1–2 longitudinal septa; asci usually 4-spored; a facultatively lichenicolous parasite on scyphose *Cladonia* species, taking over the algae from the host to form a whitish C+ rose crust and later becoming independent; widespread but rather rare. See Ozenda & Clauzade (1970: 275). Fig. 34. **Diploschistes muscorum** (Scop.) R. Sant.
- 122(109) Ascospores 1-septate 123
 Ascospores 2–3 septate, 14–17(–20) \times 5–7 μm ; anamorph *Vouauxiomyces ramalinae* (see 193b); parasitic on the apothecia (and rarely also the thallus) of *Ramalina calicaris*, *R. fastigiata* and *R. fraxinea*; scarce, South Devon, North-East Yorkshire and Co. Galway. See Nordin (1964). Fig. 3. **Abrothallus suecicus** (Kirschst.) Nordin

- 123(122) Apothecia epruinose, 0.15–0.3 mm diam 124
 Apothecia with an iridescent green pruina when young, 0.3–0.7 mm diam; ascospores (10–)14–18(–22) × 5–7 μm; hyphae I–; anamorph *Vouauxiomyces santessonii* (see 194b); parasitic on the thallus of grey *Parmelia* species, especially *P. saxatilis* on which it forms galls, *P. omphalodes*, *Platismatia glauca* (forming convoluted galls), *Sticta limbata*, *S. sylvatica* and other foliose lichens; widespread and common. See Hertel (1971). Fig. 2.
 . . . **Abrothallus parmeliarum** (Sommerf.) Arnold
- 124(123) Apothecia arising directly on the host thallus 125
 Apothecia arising on pinkish terminal galls (see 216b) on *Usnea* species; scarce; doubtfully distinct from *A. parmeliarum* (123b). See Galløe (1950). **Abrothallus usneae** Rabenh.
- 125(124) Ascospores 9–13 × 5–7 μm; hyphae I+ blue; anamorph usually absent (not seen in British material); parasymbiotic on the thalli of brown *Parmelia* species, especially *P. glabratula*; rare, South Devon to West Ross-shire. See Hawksworth & Minter (1980). Fig. 1.
 . . . **Abrothallus bertianus** de Not.
 Ascospores 9.5–11 × 3–5 μm; anamorph *Vouauxiomyces truncatus* (see 194a) usually present and preceding the formation of the apothecia; parasymbiotic on *Parmelia caperata* and *P. perlata*; widespread, especially in the south-west. **Abrothallus microspermus** Tul.
- 126(106) Ascomata arthonioid, effuse 127
 Ascomata lecideoid, discrete 135
- 127(126) Ascospores non-septate 128
 Ascospores 1–3 septate 129
- 128(127) Ascospores elongate-ellipsoid to subfusiform, apices with 1–3 μm thick caps, (12–)14–16(–18) × 2–3.5 μm; causing extensive black and shiny geniculate deformations on *Bryoria capillaris* and *B. fuscescens*; East Inverness-shire and Mid-Perthshire. See Hawksworth (1978). Fig. 85. **Phacopsis huuskonenii** Räsänen
 Ascospores 8.5–12 × 3.5–5 μm; ascomata immersed on the underside of *Peltigera* thalli; a specimen from South Devon (South Molton, 17 May 1972, *M. C. Clark*, IMI 247732) appears to belong here, new to the British Isles. “**Agyrium**” **flavescens** Rehm
- 129(127) Ascospores 1-septate 130
 Ascospores 2–3 septate 132
- 130(129) Ascomata 0.2–0.5(–0.8) mm diam 131
 Ascomata 0.1–0.2(–0.3) mm diam, reddish brown; hymenium I+ red (directly); ascospores 10–14 × 3.5–5 μm; on thalli of *Phaeophyscia orbicularis* and *Xanthoria parietina*; scarce, East Kent, South Hampshire and Mid-Perthshire. See Vězda (1970) and Hawksworth (1975a). Fig. 9. **Arthonia epiphyscia** Nyl.

- 131(130) Ascospores $9-15 \times 3-6 \mu\text{m}$; ascomata black, 0.2–0.4 mm diam; hymenium I+ blue (not or only slowly changing from blue to reddish); parasymbiotic to parasitic in the apothecia of *Lecanora* species, especially *L. dispersa*, eventually filling the disc and turning it black; widespread. Fig. 8. . . . **Arthonia clemens** (Tul.) Th. Fr.
 Ascospores $10-18(-20) \times 3-6 \mu\text{m}$; ascomata dark reddish brown, 0.5 mm diam; hymenium I+ orange red (directly); on old *Peltigera* thalli; widespread but mainly in the west. See Vězda (1963). Fig. 10. . . . **Arthonia fuscopurpurea** (Tul.) R. Sant.
- 132(129) Ascomata with a continuous hymenium, unilocular 133
 Ascomata with the hymenium interrupted by sterile black masses of tissue, appearing multiloculate in vertical section; ascospores $(16-18-25) \times 5-9 \mu\text{m}$, 3-septate; asci (4–)8 spored; parasymbiotic on thalli of *Lobaria pulmonaria*, forming galls which take the form of apothecium-like structures with thalline margins; widespread in the west from Cornwall north to West Inverness-shire. See Vězda (1970). Fig. 61.
 . . . **Lichenomyces lichenum** (Sommerf. ex Nyl.) R. Sant.
 [syn. *Arthonia stictarum* (Tul.) Th. Fr.]
- 133(132) Ascospores exceeding $5 \mu\text{m}$ in width, 2–3 septate 134
 Ascospores $10-12 \times 3-4 \mu\text{m}$, 3-septate; on schists, doubtfully lichenicolous; Inverness. **Arthonia myriocarpella** Nyl.
- 134(133) Ascospores $11-19 \times 3.5-5.5 \mu\text{m}$; asci often intermixed with those of the host; parasymbiotic in the apothecia of *Lecidella* species; scarce, Cornwall north to Shetland. See Hertel (1969).
 . . . **Arthonia intexta** Almq.
 Ascospores $13-16 \times 5-6 \mu\text{m}$; asci arranged in compact black ascomata; parasymbiotic to parasitic in the apothecia of *Lecanora rupicola*, the apothecia of which turn black; widespread and locally very common. Fig. 11. **Arthonia glaucomaria** (Nyl.) Nyl.
- 135(126) Ascospores mainly exceeding $20 \mu\text{m}$ in length 136
 Ascospores mainly not exceeding $20 \mu\text{m}$ in length 142
- 136(135) Ascospores 8–15 septate 137
 Ascospores 0–7 septate 138
- 137(136) Ascospores (8–)12–15 septate, $(20-30-50(-70)) \times 2-2.5(-4) \mu\text{m}$; parasymbiotic on *Baeomyces rufus*, thallus remaining whitish to grey; widespread but local. See Swinscow (1962).
 . . . **Arthrorhaphis grisea** Th. Fr.
 [syn. *Gongylia sabuletorum* (Fr.) B. Stein]
 Ascospores 8–11 septate, $(35-50-70(-100)) \times 2-4(-5) \mu\text{m}$; parasitic on *Baeomyces rufus* at first, later forming an independent citrine green powdery thallus; widespread in upland areas, becoming common in the Scottish Highlands. **Arthrorhaphis citrinella** (Ach.) Poelt
- 138(136) Ascospores exceeding $5 \mu\text{m}$ in width 139
 Ascospores not exceeding $5 \mu\text{m}$ in width 140

- 139(138) Apothecia superficial, convex, reddish to black, 0.5–0.75 mm diam; ascospores 3–5(–7) septate, 18–40 × 5–8 μm; on *Peltigera* thalli; Ben Lawers, no recent record. See Dennis (1978).
 . . . **Bacidia killiasii (Hepp) D. Hawksw. comb. nov.**
 [Basionym: *Biatora killiassi* Hepp, in Killias, *Jber. naturf. Ges. Graubündens*, n.f. 6: 246 (1861).]
 Apothecia immersed, concave, only the disc exposed, brown to black, 0.2–0.4 mm diam; ascospores to 3-septate, 20–24 × 6–8 μm; parasitic on thalli of *Peltigera* species, the apothecia forming in neat circular groups in bleached white patches; widespread, South Devon to the Scottish Highlands. See Hawksworth (1980b). Fig. 91.
 . . . “**Phragmonaevia**” **peltigerae** (Nyl.) Rehm
- 140(138) Ascospores exceeding 2 μm in width, 0–3 septate 141
 Ascospores (22–)25–32(–35) × 1.5–2 μm, 1-septate, guttulate, acicular to slightly sigmoid; apothecia immersed, reddish brown to dark brown; asci odontotremoid, I–; parasymbiotic to parasitic on *Pertusaria albescens* and *Huilia* species; rare, Cumberland, North Wales and Co. Kerry. See Hawksworth (1980a). Fig. 92.
 . . . **Pleospilis ascaridiella (Nyl.) D. Hawksw. comb. nov.**
 [Basionym: *Lecidea ascaridiella* Nyl., *Flora, Jena* 51: 162 (1868); syn. *Spilomela ascaridiella* (Nyl.) D. Hawksw.]
- 141(140) Asci lecanorine, I+ blue; apothecia superficial, lecideine, 0.2–0.5 mm diam, exciple not extending into hairs; ascospores 3-septate, 16–28(–30) × 3–4 μm; parasymbiotic on *Parmeliella plumbea*; Lake District and West Ross-shire. See Santesson (1960).
 . . . **Bacidia plumbina** (Anzi) R. Sant.
 Asci odontotremoid, I–; apothecia ± immersed, 0.1–0.2 mm diam, exciple cells extended into pale brown hairs 10–15 × 2.5–3 μm; ascospores (0–)3 septate, 20–28(–38) × 2.5–3.5 μm; on thalli of *Haematomma caesium*; Argyllshire and Kintyre. See Sherwood *et al.* (1981) . . . **Skyttea fuispora** Sherw., D. Hawksw. & Coppins
- 142(135) Ascospores 1–3 septate 143
 Ascospores non-septate 151
- 143(142) Ascospores 1-septate 144
 Ascospores 3-septate, 8–20 × 2–3.5 μm; on *Catapyrenium lachneum*; Co. Cork, material not located, no recent records.
 . . . “**Mycobilimbia**” **endocarpicola** (Lindsay) Vouaux
- 144(143) Ascospores exceeding 8 μm in length. 145
 Ascospores 6–8 × 2–3 μm; parasitic on *Lecanora subcarnea*; Merioneth, no recent records.
 . . . “**Scutula**” **cristata** (Leighton) Sacc. & D.Sacc.
- 145(144) Apothecial discs exposed, exciple not extending into hairs; asci and hymenium I± blue 146
 Apothecial discs urceolate, with a pore-like opening, exciple extending into pale hairs around the pore, hairs 20–30 × 2–3 μm, K+ aeru-

- gynose green; subhymenium K + deep purple; asci and hymenium I—; ascospores 0–1 septate, biguttulate, $8\text{--}13 \times 2\text{--}3 \mu\text{m}$; parasymbiotic to parasitic on thalli of *Thelotrema lepadinum*; widespread and often common. See Sherwood *et al.* (1981). Fig. 114.
 . . . **Skyttea nitschkei** (Körber) Sherw., D. Hawksw. & Coppins
- 146(145) Apothecia superficial, dark reddish brown to black 147
 Apothecia immersed, scattered, colourless to pale brown, $0\cdot2\text{--}0\cdot5$ mm diam, sometimes confluent; ascospores (0–)1 septate, $12\text{--}16 \times 4\text{--}6 \mu\text{m}$; parasymbiotic on *Peltigera* thalli which are scarcely discoloured; Argyllshire, Peebleshire and West Sutherland. See Hawksworth (1980b). Fig. 90.
 **"Phragmonaevia" fuckelii** Rehm
- 147(146) Epithecium reddish brown or olivaceous 148
 Epithecium bluish green 149
- 148(147) Apothecia $0\cdot2\text{--}0\cdot3$ mm diam, epithecium olivaceous, hypothecium olivaceous; ascospores $10\text{--}16 \times 3\text{--}4 \mu\text{m}$; on podetia of *Cladonia pocillum*; Dorset. **"Scutula" epicladonia** (Nyl.) Sacc.
 Apothecia $0\cdot15\text{--}0\cdot3$ mm diam, epithecium dark reddish brown, hypothecium pale yellowish brown; ascospores $11\text{--}20 \times (3\text{--}) 3\cdot5\text{--}6(-6\cdot5) \mu\text{m}$; parasymbiotic on *Stereocaulon vesuvianum*; South Devon and East Ross-shire. Fig. 111.
 **"Scutula" stereocaulorum** (Anzi) Körber
- 149(147) Apothecia scattered 150
 Apothecia aggregated into dense groups, $0\cdot2\text{--}0\cdot6(-0\cdot8)$ mm diam, black; ascospores (9–) $10\text{--}14 \times 3\cdot5\text{--}4\cdot5 \mu\text{m}$; on thalli of *Aspicilia calcarea*; widely distributed, especially in the west northwards from Somerset. See Dennis (1978). Fig. 21.
 **Catillaria episema** (Nyl.) H. Olivier
 [syn. *Scutula episema* (Nyl.) Zopf]
- 150(149) Apothecia $0\cdot2\text{--}0\cdot4$ mm diam, reddish black; ascospores $9\text{--}12 \times 3\text{--}4\cdot5 \mu\text{m}$; on *Peltigera* thalli; scarce, Scottish Highlands. Fig. 110.
 **"Scutula" epiblastematica** (Wallr.) Rehm
 Apothecia $0\cdot3\text{--}0\cdot6$ mm diam, pale fawn to almost black; ascospores $(10\cdot5\text{--})11\text{--}14(-14\cdot5) \times 3\cdot5\text{--}4\cdot5 \mu\text{m}$; on *Solorina saccata*; Mid-Perthshire (Blair Atholl, Tulloch Hill, 22 August 1980, P. B. Topham, IMI 253554), new to the British Isles. [N.B. *Solorinaria* (Nyl.) P. Karsten, on *Solorina bispora*, is a different species so far not found in the British Isles.]
 **"Scutula" krempelhuberi** Körber
- 151(142) Ascospores ellipsoid to subcylindrical or fusiform 152
 Ascospores subglobose, $5\text{--}9 \mu\text{m}$ diam; apothecia $0\cdot2\text{--}0\cdot35$ mm diam, black, marginate; ascus apex not strongly thickened, I—, long-stalked; paraphyses filamentous, not expanded apically, simple; on thalli of *Ochrolechia tartarea*, and rarely *O. frigida* and *Thammodia*

- vermicularis*; western Scotland and the Scottish Highlands. Fig. 50.
 " **Lecidea** " **associata** Th.Fr.
- 152(151) Ascospores exceeding $4\ \mu\text{m}$ in width 153
 Ascospores not exceeding $4\ \mu\text{m}$ in width 160
- 153(152) Apothecial disc lacking a sterile central umbo 154
 Apothecial disc with a sterile central umbo, 0.1–0.6 mm diam; ascospores $11\text{--}15 \times 7\text{--}9\ \mu\text{m}$; a lichenicolous lichen with an independent whitish thallus which is often K+ red and medulla I+ violet, and occurs on *Huilia* species (doubtfully also *Lecidea lapicida*); Merioneth and the Scottish Highlands. See Hertel (1970).
 **Lecidea umbonella** Nyl.
 [The var. **alumnula** (Nyl.) Hertel differs in that the thallus is K- and medulla I-; a lichenicolous lichen also on a *Huilia* species; Co. Galway, no recent records.]
- 154(153) Lichenicolous lichens forming an independent thallus 155
 Lichenicolous fungi not forming an independent lichenized thallus.
 157
- 155(154) Thallus C- 156
 Thallus C+ red (gyrophoric acid), dark brown to almost black; apothecia to 1.2 mm diam; ascospores $12\text{--}20 \times 6.5\text{--}10\ \mu\text{m}$; on a wide range of crustose lichens on siliceous rocks; widespread, especially in the north and west. See Hertel (1970).
 **Lecidea furvella** Nyl. ex Mudd
- 156(155) Thallus greenish brown, granular, transformed from that of the host, K+ yellow; apothecia black, strongly convex, 0.2–0.5(–0.7) mm diam; ascospores $(8.5\text{--})9.5\text{--}11.5 \times 4.5\text{--}5.5\text{--}(6)\ \mu\text{m}$; on *Lecanora varia*; Shropshire, East Kent and Berwickshire. See Poelt (1974) and Hawksworth (1982b). **Lecidea insidiosa** Th.Fr.
 Thallus brownish to olivaceous, areolate, usually K-; apothecia black, between the areolae, 0.1–0.6 mm diam; ascospores $8\text{--}14 \times 4.5\text{--}7\ \mu\text{m}$; on *Lecanora rupicola*; widespread and locally abundant. See Hertel (1970). **Lecidea insularis** Nyl.
- 157(154) Apothecia reddish brown, dark brown or black 158
 Apothecia colourless to pale brown, immersed 146b
- 158(157) Epithecium bluish or greenish blue 159
 Epithecium reddish brown; apothecia erumpent, becoming convex, reddish brown, sometimes blood-coloured, 0.15–0.3(–0.5) mm diam; ascospores broadly fusiform, distinctly attenuated at the apices, $14\text{--}22 \times 5\text{--}7\ \mu\text{m}$; parasitic on *Parmelia saxatilis* and *P. sulcata*, infected areas of the thallus becoming bleached, more rarely on other foliose lichens; widespread. Fig. 78.
 **Nesolechia oxyspora** (Tul.) Massal.
- 159(158) Ascospores $7\text{--}12\text{--}(13) \times (4\text{--})5\text{--}6\text{--}(7)\ \mu\text{m}$, apices rounded; epithecium smoky blue, greenish blue or emerald; parasitic on the thallus of

Candelariella vitellina; widespread, northwards from Cornwall.

. . . **Lecidea vitellinaria** Nyl.

Ascospores 9–13 × 5–7 μm, apices attenuated; epithecium bright pale blue; on *Lecanora polytropa*; Angus, Midlothian, Mid-Perthshire and the Isle of Skye. **Lecidea supersarsa** Nyl.

160(152) Apothecia black 161

Apothecia superficial, shortly stipitate, very pale orange, translucent, (0.25–)0.3–0.4 mm diam; excipulum paler; asci unitunicate, apex with an I+ blue annular ring; ascospores (7–)8–10(–12) × 2–3(–3.5) μm; parasitic on thalli of *Peltigera* species, discolouring the thallus bluish green; Herefordshire and Norfolk. See Hawksworth (1980b). Fig. 84.

. . . **Pezizella epithallina** (Phill. & Plowr.) Sacc.

161(160) Apothecial disc urceolate, opening pore-like or cruciate, the recurved exciple margin extending into hairs 162

Apothecial disc lecidine, exposed from an early stage, exciple margin not extending into hairs 170

162(161) Ascospores exceeding 10 μm in length 145b

Ascospores not exceeding 10 μm in length 163

163(162) Ascospores 1.5–2 μm wide 164

Ascospores 2.5–3.5 μm wide 165

164(163) Hymenium colourless; apothecia 0.1–0.15 mm diam; hairs with a refractive internal apical thickening to 15 μm long; ascospores 6–7(–7.5) × 1.5–2 μm; on thalli of *Verrucaria* cf. *viridula*; Dunbartonshire. See Hawksworth (1982b). Fig. 115.

. . . **Skyttea spinosa** D. Hawksw. & Coppins

Hymenium bright green; apothecia 0.12–0.34 mm diam; hairs lacking a refractive internal apical thickening; ascospores 5–7 × 1.5–2 μm; associated with thalli of *Micarea denigrata*, probably lichenicolous; Clackmannanshire. See Hawksworth (1982b).

. . . **Skyttea viridis** D. Hawksw. & Coppins

165(163) Apothecial margins entire or with fine radial striations 166

Apothecial margins regularly divided by 3–4 cruciately arranged fissures; ascospores 7–8.5(–9.5) × 3–3.5 μm; parasymbiotic on thalli of *Diploicia canescens*; rare, Isles of Scilly, South Devon, East Perthshire and Co. Mayo. See Sherwood *et al.* (1981). Fig. 113.

. . . **Skyttea cruciata** Sherw., D. Hawksw. & Coppins

166(165) Exciple brown to black in surface view 167

Exciple olive green in surface view; hairs 15–20 × 3–3.5(–4) μm; ascospores 7–8.5 × 3–3.5 μm; apothecia 0.1–0.2 mm diam; parasymbiotic on thalli of *Mycoblastus sterilis*; frequent, northern England, Scotland and Co. Kerry. See Sherwood *et al.* (1981).

. . . **Skyttea gregaria** Sherw., D. Hawksw. & Coppins

167(166) Apothecia mainly exceeding 0.2 mm diam, erumpment to ± superficial 168

- Apothecia 0.1–0.2 mm diam, \pm immersed 169
- 168(167) Apothecia 0.2–0.4 mm diam; hairs 15–30 \times 2–3.5 μ m; ascospores 7–8.5(–9) \times (2–)2.5–3.5 μ m; parasymbiotic on the thalli and rarely also the apothecia of *Lecanora chlorotera* s. lat. and *L. saligna*; Essex and Mid-Perthshire. See Hawksworth (1980a) and Sherwood *et al.* (1981). Fig. 116.
Skyttea thallophila (P. Karsten) Sherw. & D. Hawksw.
 [syn. *Pyrenopeziza thallophila* (P. Karsten) Sacc.]
 Apothecia 0.15–0.44 mm diam; hairs 12–25 \times 1.5–2 μ m; ascospores 6–8 \times 3–3.5 μ m; forming galls on *Evernia prunastri*; the apothecia very rare, South Devon and West Suffolk. See Grummann (1960).
 . . . **Skyttea lettaui** (Grumm.) D. Hawksw.
 [syn. *Pyrenopeziza lettaui* Grumm.]
- 169(167) Hairs 20–30 \times 1.5–2 μ m; ascospores 4–7 \times 2.5–3.5 μ m; parasymbiotic on the thalli of *Buellia punctata*; Lancashire, North Lincolnshire, South-East Yorkshire and Angus. See Sherwood *et al.* (1981). Fig. 112 . . . **Skyttea buelliae** Sherw., D. Hawksw. & Coppins
 Hairs 40–50 \times 2.5–3 μ m; ascospores 7–8 \times 3.5 μ m; on *Lecanora atra* and an undetermined *Lecidea* s. lat. species; Co. Galway and Yorkshire, no recent records. See Sherwood *et al.* (1981).
Skyttea elachistophora (Nyl.) Sherw. & D. Hawksw.
- 170(161) Hypothecium brown; ascospores 6–10 \times 2–3 μ m; on *Cladonia squamules* and perhaps also *Cetraria* species; Isle of Skye, Perthshire and South Aberdeen . . . **Lecidea puncta** (Massal.) Jatta
 Hypothecium reddish violet; ascospores c. 10 \times 3.5 μ m; parasitic on *Cladonia uncialis*; Co. Dublin, no recent records .
 . . . **Lecidea cladoniaria** Nyl.
- 171(1) Spores conidia 172
 Spores basidiospores **or** sclerotial bodies **or** pink galls present 216
- 172(171) Conidia arising from within pycnidial conidioma 173
 Conidia not arising from within pycnidial conidioma . . . 197
- 173(172) Conidia pale brown to dark brown 174
 Conidia hyaline 185
- 174(173) Conidia arising singly 175
 Conidia arising in chains 183
- 175(174) Conidia non-septate 176
 Conidia 1-septate, truncate at the base, sometimes with a marginal frill, 4–7.5 \times 2–3 μ m; conidiogenous cells annellate; parasymbiotic to parasitic in the apothecia and more rarely the thalli of *Caloplaca*, *Lecanora* and *Pertusaria* species, also on thalli of *Evernia prunastri*; widespread, especially in the west. See Hawksworth & Dyko (1979). Fig. 60.
 . . . **Lichenodiplis lecanorae** (Vouaux) Dyko & D. Hawksw.

- 176(175) Conidia verruculose, subglobose or globose; conidiogenous cells \pm hyaline 177
 Conidia smooth-walled, ellipsoid and with a truncated base; conidiogenous cells brownish 182
- 177(176) Pycnidia mainly exceeding 0.1 mm diam 178
 Pycnidia mainly not exceeding 0.1 mm diam 180
- 178(177) Conidia mainly exceeding 3.5 μ m in length 179
 Conidia (2-)2.5-3.5(-4) \times 2-3 μ m; parasitic on the podetia of scyphose *Cladonia* species, discolouring the podetia brownish, East Suffolk. See Hawksworth (1977b). Fig. 57.
 . . . **Lichenoconium pyxidatae** (Oudem.) Petrak & H. Sydow
- 179(178) Conidia (2.5-)3-4.5(-6) μ m; conidiogenous cells (5-)6-8(-11) \times (2-)2.5-4 μ m; on *Cetraria sepincola*, *Cetrelia olivetorum*, *Xanthoria parietina* and especially *X. polycarpa*, infected apothecia becoming black; widespread but rather rare. See Christiansen (1956), Hawksworth (1977b) and Hawksworth & Minter (1980). Fig. 59.
 . . . **Lichenoconium xanthoriae** M.S.Christ.
 Conidia 5-7(-7.5) \times 3.5-5(-6) μ m; conidiogenous cells (7-)8-10 (-12) \times (2.5-)3-3.5 μ m; in apothecia of *Usnea florida*; Co. Wicklow. See Hawksworth (1977b). Fig. 54.
 . . . **Lichenoconium cargillianum** (Lindsay) D. Hawksw.
- 180(177) Pycnidia mainly exceeding 0.05 mm diam; conidia mainly exceeding 3.5 μ m diam 181
 Pycnidia (0.02-)0.03-0.05(-0.06) mm diam; conidiogenous cells (3.5-)4-5(-6) \times (2-)3-3.5(-4) μ m; conidia 2-3.5(-4) μ m diam; pathogenic to a wide range of lichens, causing bleached lesions or necrotic patches, on foliose lichens usually with several pycnidia in each infection spot, the spots surrounded by a black margin; hosts include *Evernia prunastri*, *Cladonia coniocraea*, *Hypogymnia physodes* (forming holes in the lobes; very common), *Lecanora chlarona*, *L. conizaeoides* (see Christiansen 1980), *Parmelia caperata*, *P. crinita*, *P. laevigata* and *Pertusaria hymenea*; widespread and often common. See Hawksworth (1977b, 1981). Fig. 55.
 . . . **Lichenoconium erodens** M. S. Christ. & D. Hawksw.
- 181(180) Conidiogenous cells (4-)5-7(-8) \times (2-)3-3.5(-4) μ m; conidia (2.5-)3-4.5(-5.5) μ m diam; pycnidia (0.03-)0.04-0.08(-0.1) mm diam; parasymbiotic to parasitic on *Evernia prunastri*, *Lecanora conizaeoides* (the apothecia turning jet black; see Christiansen 1980), *Parmelia borrieri*, *P. pastillifera* and especially *P. sulcata*; on *Parmelia* species a single pycnidium is usually found in each infection spot, the spot surrounded by a black margin; less pathogenic than 180b. See Hawksworth (1977b). Fig. 56.
 . . . **Lichenoconium lecanorae** (Jaap) D. Hawksw.
 Conidiogenous cells (5-)7-9(-11) \times (2-)2.5-3.5(-4) μ m; conidia (2.5-)3-4(-5) μ m diam; pycnidia (0.04-)0.05-0.08(-0.1) mm

diam; parasymbiotic to parasitic, often associated with other lichencolous fungi so perhaps tending to invade already weakened thalli; on a wide range of hosts including *Bryoria fuscescens*, *Cladonia arbuscula*, *Parmelia conspersa*, *P. exasperata*, *P. glabratula*, *P. pulla*, *Physcia aipolia*, *Ramalina calicaris* and *R. siliquosa*; mainly in the apothecia which are turned dark brown to black, only rarely spreading beyond. See Hawksworth (1977b). Fig. 58.

. . . **Lichenoconium usneae** (Anzi) D. Hawksw.

- 182(176) Pycnidia 0.04–0.06 mm wide; pycnidial wall poorly developed; conidia olivaceous brown, $3-4 \times 1.5-2 \mu\text{m}$; parasitic in the hymenium and on the thallus of *Opegrapha niveoatra*, more rarely on *O. herbarum*, eventually occupying almost the whole hymenium; Berwickshire, Dunbartonshire, Midlothian and Peeblesshire. See Hawksworth (1981). Fig. 47.

. . . **Laeviomycetes opegraphae** D. Hawksw.

- Pycnidia 0.1–0.25(–0.3) μm diam; conidia reddish brown, $3.5-6 \times 2.5-3.5 \mu\text{m}$; parasymbiotic on the thallus of *Pertusaria leioplaca*, more rarely on *Buellia disciformis* and *P. pertusa*; widespread. See Hawksworth (1975b, 1977b, 1981). Fig. 48.

. . . **Laeviomycetes pertusariicola** (Nyl.) D. Hawksw.

[syn. *Lichenoconium pertusariicola* (Nyl.) D. Hawksw.]

- 183(174) Conidia non-septate, pale brown 184
Conidia 1-septate, dark brown, $(10-12-15(-17) \times 5-7(-8) \mu\text{m}$; pycnidia cupuliform, arising in raised pustular black patches mainly 1–2 mm wide; on *Parmelia laevigata*, finally leaving holes in the lobes; western Scotland. See Hawksworth (1978). Fig. 135.

. . . **"Vouauxiella" uniseptata** D. Hawksw.

- 184(183) Conidia smooth-walled, $(5-6-8(-9) \times 3-4 \mu\text{m}$; parasymbiotic to parasitic in the apothecia of *Lecanora* species, especially *L. chlarotera*, mainly at the edges of the discs adjoining the thalline margin, infected discs often decolorized giving them a piebald appearance; widespread and locally common. See Hawksworth (1976) and Sutton (1980). Fig. 134.

. . . **Vouauxiella lichenicola** (Lindsay) Petrak & H. Sydow

- Conidia verrucose, $6-9 \times 3.5-5 \mu\text{m}$; host range and symptoms as in 184a, with which it sometimes grows; widespread but scarcer than *V. lichenicola*. See Hawksworth (1976) and Sutton (1980). Fig. 136.

. . . **Vouauxiella verrucosa** (Vouaux) Petrak & H. Sydow

- 185(173) Conidia unbranched 186
Conidia with a distinct stem and two diverging apical arms, $6-11.5 \times 1.5-2 \mu\text{m}$; conidiogenous cells catenate; parasitic on a wide range of foliose lichens including *Lobaria pulmonaria*, *Platismatia glauca*, *Parmelia borreri* and especially *P. sulcata*, forming black-margined decolorized necrotic patches; South Devon, West Somerset and Kintyre. See Hawksworth (1976, 1981). Fig. 27.

. . . **Cornutispora lichenicola** D. Hawksw. & B. Sutton

- 186(185) Conidia 1-septate 187
 Conidia non-septate 189
- 187(186) Conidia narrowly ellipsoid, straight 188
 Conidia L-shaped, (0–)1(–2) septate, 8–10(–11·5) × 1·5–2 μm; forming pale brownish necrotic patches on thalli of *Evernia prunastri*; Pembrokeshire. See Hawksworth (1982*b*). Fig. 42.
 . . . **Everniicola flexispora** D. Hawksw.
- 188(187) Pycnidial wall cellular; conidiogenous cells 4–8 × 2·5–3 μm; conidia 8·5–10 × 3–4 μm; on an unidentified crustose lichen on trees; Essex, no recent record. See Hawksworth (1978). Fig. 14.
 . . . **Ascochyta lichenoides** (A.L.Sm.) D. Hawksw.
 Pycnidial wall hyphal; conidiogenous cells 10–20 μm tall, 3–4 μm wide at the base tapering to 1·5–2·5 μm wide at the apex; conidia (7·5–)9–11(–14) × (2·5–)3–4 μm; forming tuberculate convex galls on *Cladonia conoidea* podetia; West Sussex. See Hawksworth (1981). Fig. 41 . **Epicladonia sandstedei** (Zopf) D. Hawksw.
- 189(186) Conidiogenous cells usually arising singly, lining the pycnidial cavity; conidia arising apically from the conidiogenous cells . . . 190
 Conidiogenous cells arising in irregular branched chains of almost rectangular cells which ramify through the pycnidial cavity; conidia arising at the apex of the chains and also laterally; conidia lacrimiform, narrowed to a pointed base, (6–)6·5–10(–11) × (2–)3–4·5(–6) μm; on the underside of squamules of *Cladonia foliacea*; Shropshire, no recent British records. See Hawksworth (1981). Fig. 62.
 . . . **Lichenosticta alcicornaria** (Lindsay) D. Hawksw.
- 190(189) Conidia bacillariform, ellipsoid or obpyriform, rounded or truncated at the base 191
 Conidia lens-shaped to pyriform, pointed at one or both ends, (7–)8–10(–10·5) × 4–5·5(–6) μm; pycnidia immersed, orange to brownish; forming convex gall-like swellings on podetia of *Cladonia uncialis*; rare, Scottish Highlands. See Hawksworth (1981). Fig. 16.
 . . . **Bachmanniomyces uncialicola** (Zopf) D. Hawksw.
- 191(190) Pycnidia brown or black 192
 Pycnidia whitish to pale orange, with a deep reddish ring around the ostiole, superficial, (0·1–)0·15–0·2(–0·3) mm diam; conidia ellipsoid to obovoid, (5–)6–8 × (2–)3–4 μm; on old thalli of *Peltigera spuria*; Worcestershire. See Hawksworth (1981, 1982*b*). Fig. 53.
 . . . **Libertiella malmedyensis** Spég. & Roum.
- 192(191) Conidia distinctly truncated at the base; conidiogenous cells annellidic 193
 Conidia with a rounded base; conidiogenous cells phialidic, lacking annellations 195
- 193(192) Conidia exceeding 6 μm in length 194
 Conidia 3–5(–6) × 2–3·5(–4) μm; anamorph of *Abrothallus suecicus*

- (see 122b). See Hawksworth (1981). Fig. 137.
 . . . **Vouauxiomyces ramalinae** (Nordin) D. Hawksw.
- 194(193) Conidia $6.5-8 \times 4-5.5 \mu\text{m}$; anamorph of *Abrothallus microspermus* (see 125b); See Hawksworth & Dyko (1979) and Hawksworth (1981). Fig. 139.
 . **Vouauxiomyces truncatus** (B. de Lesd.) Dyko & D. Hawksw.
 Conidia $(7-)7.5-10.5(-11.5) \times (5-)5.5-7(-7.5) \mu\text{m}$; anamorph of *Abrothallus parmeliarum* (see 123b). See Hawksworth (1981). Fig. 138. . . . **Vouauxiomyces santessonii** D. Hawksw.
- 195(192) Pycnidial wall entire, cells around the ostiole not readily separating. . . . 196
 Pycnidial base formed largely by the conidiogenous cells, ostiolar cells readily separating, pycnidia $0.02-0.04$ mm diam; conidia subcylindrical, $2-3.5 \times 1.5 \mu\text{m}$; parasymbiotic in the apothecia of *Chrysothrix chrysophthalma*, giving them a black-spotted appearance; Scottish Highlands. See Hawksworth (1981). Fig. 69.
 . . . **Minutophoma chrysophthalmae** D. Hawksw.
- 196(195) Conidiogenous cells subglobose to short-ampulliform, $2-3 \times 1-2 \mu\text{m}$; conidia narrowly ellipsoid to slightly reniform, $5-7 \times 1.5-2 \mu\text{m}$; parasitic on thalli of *Parmelia caperata*, *P. laevigata*, *P. perlata*, *P. reticulata* and *P. sulcata*, forming pale brownish decolorized patches with black margins; widespread, especially in the west. See Hawksworth (1981). Fig. 89.
 . . . **Phoma cytospora** (Vouaux) D. Hawksw.
 Conidiogenous cells subcylindrical to elongate-ampulliform, $6-9 \times 2-3 \mu\text{m}$; conidia subglobose, $2-3 \times 1.5-2 \mu\text{m}$; anamorph of *Microcalicium disseminatum*. Fig. 67 (right). . . . 89b
- 197(172) Conidia hyaline or pinkish at maturity 198
 Conidia pale brown to dark brown at maturity 205
- 198(197) Conidiophores arising separately 199
 Conidiophores arising in compact convex sporodochia 204
- 199(198) Conidia all remaining non-septate at maturity 200
 Conidia 1-4 septate at maturity 201
- 200(199) Conidiogenous cells arising singly, annellidic; conidia cymbiform, base truncate and highly refractive, $(8-)9-11(-14) \times 3-3.5(-4) \mu\text{m}$; forming ochre-yellow convex galls on *Nephroma laevigatum*, the conidiophores giving the galls a frosted appearance; rare, North Devon and Argyllshire. See Hawksworth (1977a). Fig. 106.
 . . . **Refractohilum galligenum** D. Hawksw.
 Conidiogenous cells arranged on a subglobose vesicle at the apex of the conidiophore, phialidic; conidia subglobose, $2.5-3.5(-4) \mu\text{m}$ diam; saprophytic, overgrowing old pyrenocarpous lichen thalli; occasional. See Raper & Fennell (1965).
 . . . **Aspergillus glaucus** Link

- 201(199) Conidia 1-septate 202
 Conidia (2-)3(-4) septate, fusiform to obclavate, with a narrow apical tail, overall $35-65 \times 5.5-7 \mu\text{m}$; associated with galls formed by *Pyr-enidium actinellum* on *Peltigera collina*; Co. Kerry. See Hawksworth (1980b). Fig. 131. . . . **Trichoconis lichenicola** D. Hawksw.
- 202(201) Conidia arising singly, slightly truncate at the base 203
 Conidia arising in chains, mainly strongly truncate at both ends, $8-13 \times 3-3.5 \mu\text{m}$, walls uneven, guttulate; thallus pinkish to creamy white, tufts of conidiophores occurring over host ascomata reacting C+ red (lecanoric and schizopeltic acids); a parasitic lichen, taking over *Trentepohlia* from *Enterographa crassa*, *Lecanactis abietina* and *L. premnea*, killing the host mycobiont, and forming an independent lichenized thallus; not uncommon in Co. Kerry, also known from Co. Waterford. See Hawksworth *et al.* (1980). Fig. 18.
 . . . **Blarneya hibernica** D. Hawksw., Coppins & P. James
- 203(202) Conidia $15-25 \times 5-6.5(-7) \mu\text{m}$; conidiogenous cells $(15-20-25(-30) \times 6(-8) \mu\text{m}$; forming gall-like convex swellings on *Peltigera* thalli; Kirkcudbrightshire and the Isle of Mull. See Hawksworth (1980a). Fig. 105.
 . . . **Ramularia peltigericola** D. Hawksw.
 Conidia $12-23(-35) \times 8-10(-13) \mu\text{m}$; conidiophores to 2 mm tall and $4-5 \mu\text{m}$ wide; overgrowing pyrenocarpous lichens on limestone, saprophytic; occasional. See Barron (1968).
 . . . **Trichothecium roseum** (Pers.) Link
- 204(198) Sporodochia uneven, pale pink; conidia $(4-)6-7 \mu\text{m}$ diam, indistinctly verruculose; anamorph of *Nectriella robergei* (see 60a). See Hawksworth (1981). Fig. 75 (below). **Illosporium carneum** Fr.
 Sporodochia convex, orange to bright pink or rose; conidia $6-10 \mu\text{m}$ diam, smooth-walled, separating only with difficulty; parasitic on thalli of *Hypogymnia physodes*, *Lecanora conizaeoides*, *Parmelia crinita*, *P. glabratula*, *P. omphalodes*, *P. perlata*, *P. saxatilis*, *P. sulcata*, *Pertusaria corallina*, *P. pseudocorallina*, *Physcia tenella*, *Platismatia glauca*, *Umbilicaria polyrrhiza*, and *Xanthoria parietina*; widespread. See Hawksworth (1981). Fig. 46.
 . . . **Illosporium corallinum** Roberge
- 205(197) Conidia globose, ellipsoid, doliiform or obclavate 206
 Conidia palmate, consisting of about 50 radiating multiseptate arms, pale brown, $120-160 \mu\text{m}$ diam; on *Schismatomma decolorans*; Dorset. See Hawksworth (1979c). Fig. 103.
 . . . **Psammia stipitata** D. Hawksw.
- 206(205) Conidia non-septate 207
 Conidia septate, multicellular, or lobed 209
- 207(206) Conidiophores arising singly or in small groups, not forming synnemata 208
 Conidiophores adhering together to form capitate (*Calicium*-like)

synnemata, to 250 μm tall and 25–60 μm thick; conidia globose, coarsely verrucose, (8–)9–12(–14) μm diam; on *Thrombium epigaeum* (or its phycobiont?); Caernarvonshire and Herefordshire. See Hawksworth (1977a). Fig. 51.

Leightonimyces phillipsii (Berk. & Leighton) D. Hawksw. & B. Sutton

- 208(207) Conidiophores arranged in tufted sporodochia, (50–)100–300 μm diam; conidiogenous cells holoblastic; conidia smooth-walled, adhering in short chains, (3·5–)4–7(–8) μm diam; parasymbiotic on thalli of *Pertusaria* cf. *ophthalmiza*; West Inverness. See Hawksworth (1979c). Fig. 108.
 . . . **Sclerococcum simplex** D. Hawksw.
 Conidiophores immersed in the hymenium of the host, not forming sporodochia; conidiogenous cells phialidic; conidia verruculose, not adhering in chains, 3·5–6 μm diam; parasitic on the apothecia of *Xanthoria parietina*, the apothecia turning sooty black and the thallus also eventually being killed; locally abundant in south-west England. See Hawksworth & Punithalingam (1973), Hawksworth (1979c). Fig. 141.
 . . . **Xanthoriicola physciae** (Kalchbr.) D. Hawksw.
- 209(206) Conidia broadly clavate, doliiform, ellipsoid to cylindrical, not muriform 210
 Conidia subglobose to ellipsoid, muriform, lobed, or consisting of aggregations of cells 214
- 210(209) Conidiophores \pm superficial; conidia brown to dark brown, broadly clavate or doliiform with one or both ends truncated. 211
 Conidiophores immersed; conidia pale brown, ellipsoid, with rounded ends, 1-septate, 5–8(–9) \times 4–6 μm ; in the apothecia of *Caloplaca citrina* and *Lecanora dispersa*, probably parasitic; probably widespread, at least in lowland England. See Hawksworth (1979c). Fig. 17 **Bispora christiansenii** D. Hawksw.
- 211(210) Conidia 1- or 2-septate 212
 Conidia 2–17 septate, sometimes branched, 12–70 \times 5–7 μm ; a widespread lignicolous saprophyte overgrowing *Lecanora conizaeoides* and other moribund crustose lichens on bark; Warwickshire and western Scotland. See Ellis (1976).
 . . . **Taeniolina scripta** (P. Karsten) P. M. Kirk
 [syn. *Taeniolella scripta* (P. Karsten) S. Hughes]
- 212(211) Conidia mainly 1-septate, adhering in erect chains, separating only with difficulty 213
 Conidia 2-septate, the septa with central pores, upper two cells dark brown, the lower cell subhyaline to pale brown, 25–30(–40) \times 11–13 μm ; conidiophores 80–150 \times 5–8 μm ; on decaying thalli of *Lobaria pulmonaria*, perhaps saprophytic; Kintyre. See Hawksworth (1979c). Fig. 44.
 . . . **Endophragmiella hughesii** D. Hawksw.

213(212) Conidia 18–25 × 7–9 μm; conidiophores arising as stiff unbranched dark brown hairs, 40–80(–150) × 7–9 μm; parasitic on thalli of *Phaeophyscia orbicularis* and *Physconia pulverulacea*; Hampshire, Perthshire, Wiltshire and South Tipperary, probably common. See Hawksworth (1979c). Fig. 129.

. . . **Taeniolella phaeophysciae** D. Hawksw.

Conidia 7–11 × 3·5–5(–6) μm; conidiophores poorly developed, pale brown, 15–30(–50) × 3·5–6 μm; parasitic on the apothecia of *Lecanora campestris* and especially *L. chlarotera* s. lat., also the thallus of *Hypocomyce scalaris* and *Thelotrema subtile*; Buckinghamshire, Hampshire, Inner Hebrides, Perthshire and South Devon. See Hawksworth (1979c). Fig. 128.

. . . **Taeniolella delicata** M. S. Christ. & D. Hawksw.

214(209) Conidia multicellular, walls evenly thickened 215
 Conidia single-celled, irregularly subglobose to ellipsoid, walls plicately folded, the exposed ridges strongly thickened, 6–17(–20) × 5–10 μm; parasymbiotic to parasitic on the thalli of *Lecanactis lyncea* and more rarely *Opegrapha atra*; scattered throughout the range of *L. lyncea* in the British Isles. See Hawksworth (1975b). Fig. 68.

. . . **Milospium graphideorum** (Nyl.) D. Hawksw.

215(214) Conidia composed of 2–6(–9) ± fused subglobose cells, (8–)10–15 (–17) μm diam overall, individual cells (4–)6–10 μm diam; conidiogenous cells integrated into compact black sporodochial tufts 0·1–0·5 mm diam; parasymbiotic on *Pertusaria corallina* and more rarely *P. pseudocorallina*, tending to depress the formation of isidia; widespread and common in upland areas. See Hawksworth (1975b) and Hawksworth & Jones (1981). Fig. 109.

. . . **Sclerococcum sphaerale** (Ach.) Fr.

Conidia composed of 50 or more ± fused subglobose cells, 25–50 μm diam to 100 × 50 μm; conidiogenous cells dispersed, not aggregated into compact sporodochia; individual cells mainly 5–10 μm diam; usually occurring as a lignicolous saprophyte but pathogenic to *Lecanora conizaeoides*; widespread. See Ellis (1976) and Hawksworth (1979c). . . . **Monodictys lepraria** (Berk.) M. B. Ellis

216(171) Spores basidiospores, or sclerotial bodies present 217
 Spores unknown; pale pinkish to brownish convex galls ('carpoids'), 0·5–2 mm wide; terminating branches of caespitose and pendulose *Usnea* species; causal agent unknown; widespread in the south and west. See Galløe (1950) and Hawksworth (1982a).

. . . " **Biatoropsis usnearum** Räsänen "

217(216) Basidioma agaricoid; cap milky coffee to snuff brown, 5–20 mm wide; stipe 10–30 × 0·7–2 mm; basidia 4-spored; basidiospores (7–)8–11 × (4–)4·5–5 μm; parasitic on thalli of *Peltigera hymenina*, killing the thallus; Scottish Highlands and Wales. See Orton (1977).

. . . **Omphalina cupulatoides** Orton

Basidioma corticioid, effuse, creamy to buff; basidia 2(–4) spored; basidiospores $5\text{--}9\text{--}(12) \times 2.5\text{--}7 \mu\text{m}$; basidioma seasonal and rather rare; mycelium with numerous subglobose creamy sclerotial bodies; forming massive circular brown lesions with white funiculose margins in colonies of pleurococcoid algae and *Lecanora conizaeoides*, also parasitic on a wide range of other crustose and foliose lichens; extremely common and widespread within the range of *L. conizaeoides* in the British Isles. See Arvidsson (1979). Fig. 15.

. . . **Athelia arachnoidea** (Berk.) Jülich

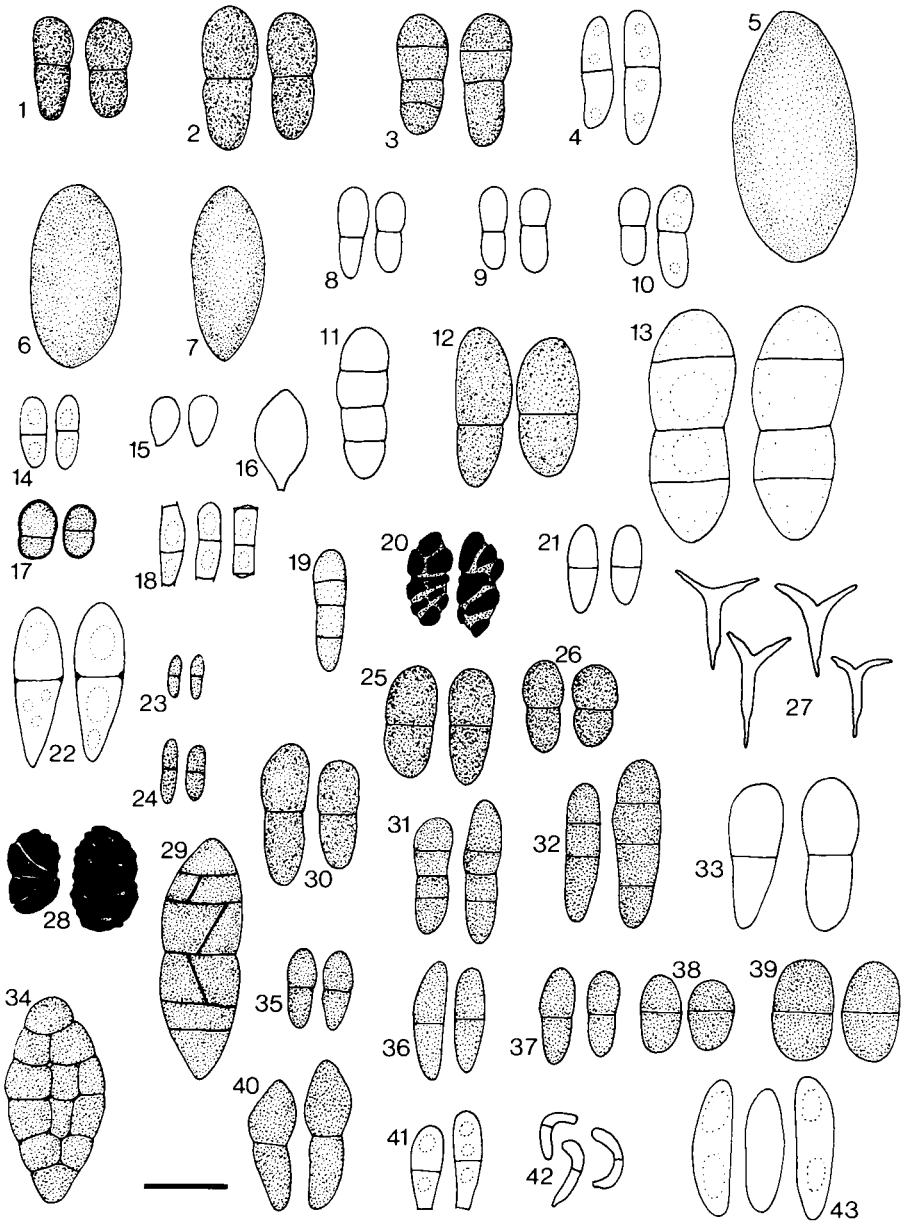
I am grateful to the numerous colleagues who have sent me material of lichenicolous fungi for determination. It is a result of their demand for the publication and revision of my manuscript keys that this paper is presented here. I am especially grateful to Dr B. J. Coppins for looking over the revised version of the keys prior to publication and providing additional records for some of the taxa included.

REFERENCES

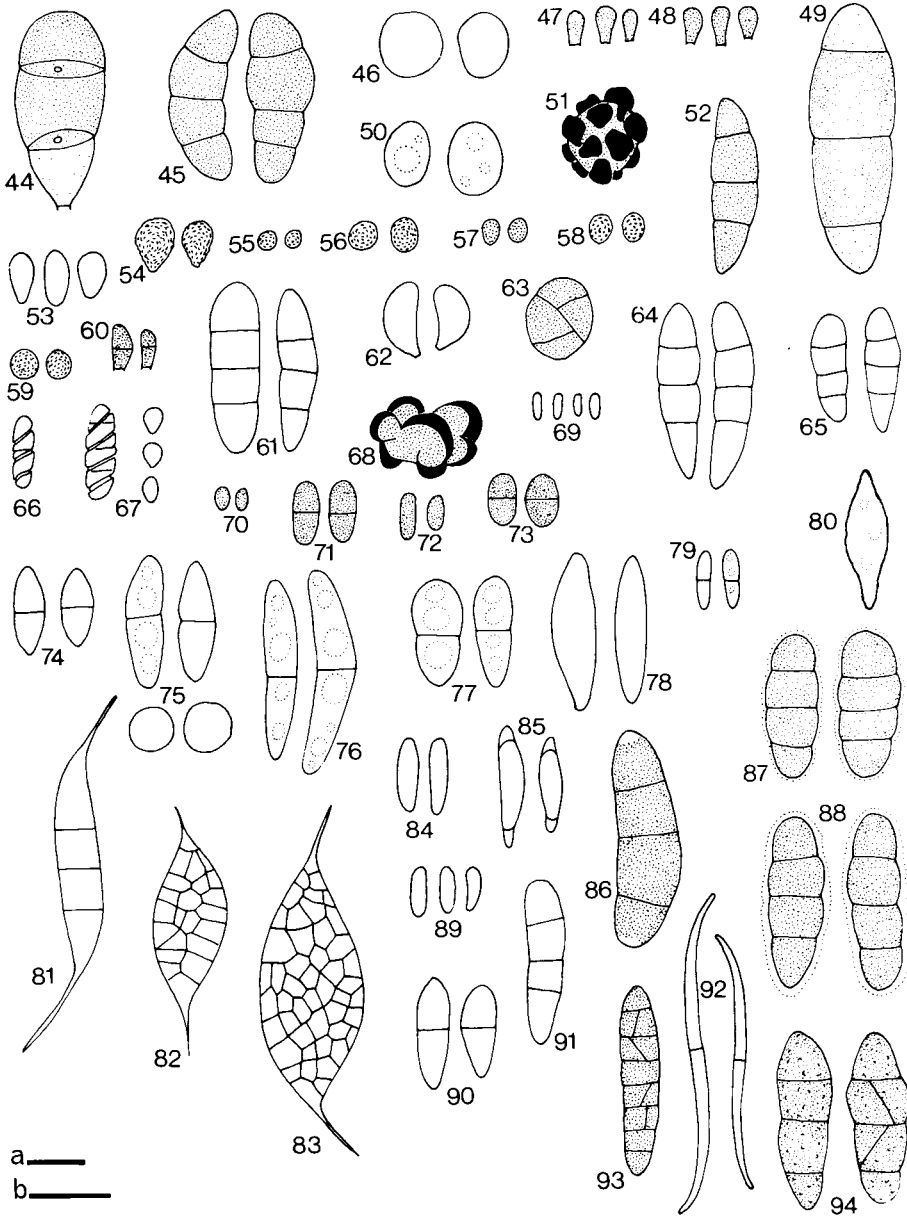
- Ahti, T. (1973) Notes on the lichens of Newfoundland. 2. *Thelocarpon epibolum* Nyl. *Ann. bot. fenn.* **10**: 66–67.
- Ainsworth, G. C. (1971) *Ainsworth & Bisby's Dictionary of the Fungi*. 6th edition. Kew: Commonwealth Mycological Institute.
- Ainsworth, G. C., Sparrow, F. K. & Sussman, A. S. (Eds) (1973) *The Fungi. An Advanced Treatise*. Vols 4A and 4B. New York & London: Academic Press.
- Arnold, G. C. A. (1874) Lichenologische Fragmente XVI. *Flora, Jena* **57**: 81–89, 97–110, 137–144, 150–155, 173–175.
- Arvidsson, L. (1979) Svampangrepp på lavar—en orsak till lavöken. *Svensk bot. Tidskr.* **72**: 285–292.
- Barron, G. L. (1968) *The Genera of Hyphomycetes from Soil*. Baltimore: Williams & Wilkins.
- Booth, C. (1959) Studies of pyrenomycetes. IV. *Nectria* (Part I). *Mycol. Papers* **73**: 1–115.
- Christiansen, M. S. (1956) A new species of the form-genus *Lichenoconium* Petr. & Syd. (Fungi Imperfecti), *L. xanthoriae* sp.n. *Friesia* **5**: 212–217.
- Christiansen, M. S. (1980) *Lichenoconium erodens* and some other fungi parasitic on *Lecanora conizaeoides*. *Lichenologist* **12**: 149–151.
- Clauzade, G. & Roux, C. (1976) *Les Champignons Lichénicoles non Lichénisés*. Montpellier: Université des Sciences et Techniques du Languedoc.
- Coppins, B. J. & James, P. W. (1979) New or interesting British lichens IV. *Lichenologist* **11**: 139–179.
- Dennis, R. W. G. (1978) *British Ascomycetes*. 2nd edition. Vaduz: J. Cramer.
- Ellis, M. B. (1976) *More Dematiaceous Hyphomycetes*. Kew: Commonwealth Mycological Institute.
- Eriksson, O. (1981) The families of bitunicate ascomycetes. *Opera bot.* **60**: 1–220.
- Galløe, O. (1950) *Natural History of the Danish Lichens*. Part VIII. Copenhagen: Munksgaard.
- Grumann, V. J. (1960) Die Cecidien auf Lichenen. *Bot. Jb.* **80**: 101–144.
- Hafellner, J. (1978) *Catolechia* Flotow ex Massalongo emend. Körper und *Epilichen* Clements ex Hafellner—zwei nahe verwandte Flechtengattungen. *Nova Hedwigia* **30**: 673–692.
- Hafellner, J. (1979) *Karschia*. Revision einer Sammelgattung an der Grenze von lichenisierten und nichtlichenisierten Ascomyceten. *Beih. Nova Hedwigia* **62**: 1–248.
- Hafellner, J. & Poelt, J. (1976) *Rhizocarpon schedomyces* spec. nov., eine fast delichenisierte parasitische Flechte, und seine Verwandten. *Herzogia* **4**: 5–14.
- Hafellner, J. & Poelt, J. (1980) Der 'Flechtenparasit' *Buellia pulverulenta*—eine blein bend interneparasitische Flechte. *Phyton, Horn* **20**: 129–133.
- Hawksworth, D. L. (1974) *Mycologist's Handbook*. Kew: Commonwealth Mycological Institute.
- Hawksworth, D. L. (1975a) Notes on British lichenicolous fungi, I. *Kew Bull.* **30**: 183–203.
- Hawksworth, D. L. (1975b) A revision of lichenicolous fungi accepted by Keissler in *Comiothecium*. *Trans. Br. mycol. Soc.* **65**: 219–238.
- Hawksworth, D. L. (1976) New and interesting microfungi from Slapton, South Devonshire: Deuteromycotina III. *Trans. Br. mycol. Soc.* **67**: 51–59.
- Hawksworth, D. L. (1977a) Three new genera of lichenicolous fungi. *Bot. J. Linn. Soc.* **75**: 195–209.

- Hawksworth, D. L. (1977b) Taxonomic and biological observations on the genus *Lichenocomium* (Sphaeropsidales). *Persoonia* **9**: 159–198.
- Hawksworth, D. L. (1978) Notes on British lichenicolous fungi: II. *Notes R. bot. Gdn Edinb.* **36**: 181–197.
- Hawksworth, D. L. (1979a) Studies in the genus *Endococcus* (Ascomycotina, Dothideales). *Bot. Notiser* **132**: 283–290.
- Hawksworth, D. L. (1979b) The identities of three species described in *Verrucaria* by Thomas Taylor. *Nova Hedwigia* **30**: 549–556.
- Hawksworth, D. L. (1979c) The lichenicolous Hyphomycetes. *Bull. Br. Mus. nat. Hist., Bot.* **6**: 183–300.
- Hawksworth, D. L. (1980a) Notes on British lichenicolous fungi: III. *Notes R. bot. Gdn Edinb.* **38**: 165–183.
- Hawksworth, D. L. (1980b) Notes on some fungi occurring on *Peltigera*, with a key to accepted species. *Trans. Br. mycol. Soc.* **74**: 363–386.
- Hawksworth, D. L. (1981) The lichenicolous Coelomycetes. *Bull. Br. Mus. nat. Hist., Bot.* **9**: 1–98.
- Hawksworth, D. L. (1982a) Secondary fungi in lichen symbioses: parasites, saprophytes and parasymbionts. *J. Hattori bot. Lab.* **52**: 357–366.
- Hawksworth, D. L. (1982b) Notes on British lichenicolous fungi: IV. *Notes R. bot. Gdn Edinb.* **40**: 129–151.
- Hawksworth, D. L. (1982c) Co-evolution and the detection of ancestry in lichens. *J. Hattori bot. Lab.* **52**: 323–329.
- Hawksworth, D. L. (1983) The identity of *Pyrenidium actinellum* Nyl. *Trans. Br. mycol. Soc.*: in press.
- Hawksworth, D. L., Coppins, B. J. & James, P. W. (1980) *Blarneya*, a lichenized hyphomycete from southern Ireland. *Bot. J. Linn. Soc.* **79**: 357–367.
- Hawksworth, D. L. & Dyko, B. J. (1979) *Lichenodiplis* and *Vouauxiomyces*: two new genera of lichenicolous Coelomycetes. *Lichenologist* **11**: 51–61.
- Hawksworth, D. L., James, P. W. & Coppins, B. J. (1980) Checklist of British lichen-forming, lichenicolous and allied fungi. *Lichenologist* **12**: 1–115.
- Hawksworth, D. L. & Jones, D. (1981) *Sclerococcum sphaerale* obtained in pure culture. *Trans. Br. mycol. Soc.* **77**: 485–489.
- Hawksworth, D. L. & Minter, D. W. (1980) New and interesting microfungi from the 1978 Exeter foray. *Trans. Br. mycol. Soc.* **74**: 567–577.
- Hawksworth, D. L. & Pirozynski, K. A. (1977) The generic names *Paranectria* and *Paranectriella* and their synonyms. *Can. J. Bot.* **55**: 2555–2557.
- Hawksworth, D. L. & Punithalingam, E. (1973) New and interesting microfungi from Slapton, South Devonshire: Deuteromycotina. *Trans. Br. mycol. Soc.* **61**: 57–69.
- Hawksworth, D. L., Sutton, B. C. & Ainsworth, G. C. (1983) *Ainsworth & Bisby's Dictionary of the Fungi*. 7th edition. Kew: Commonwealth Mycological Institute. (In press.)
- Henssen, A. (1963) Eine Revision der Flechtenfamilien Lichinaeace und Epehebaeace. *Symb. bot. upsal.* **18**(1): 1–123.
- Henssen, A. (1976) Studies in the developmental morphology of lichenized ascomycetes. In *Lichenology: Progress and Problems* (D. H. Brown, D. L. Hawksworth & R. H. Bailey, eds): 107–138. London, New York & San Francisco: Academic Press.
- Hertel, H. (1969) *Arthonia intexta* Almqu., ein vielfach verkannter fruchtkörperloser Flechtenparasit. *Ber. dt. bot. Ges.* **82**: 209–220.
- Hertel, H. (1970) Parasitische lichenisierte Arten der Sammelgattung *Lecidea* in Europa. *Herzogia* **1**: 405–438.
- Hertel, H. (1971) Über holarktische Krustenflechten aus den venezuelanischen Anden. *Willdenowia* **6**: 225–272.
- Hughes, S. J. (1951) Studies on micro-fungi. VIII. *Orbicula* and *Lilliputia*. *Mycol. Papers* **42**: 1–27.
- Janex-Favre, M.-C. (1965) Sur le pyrénomycète lichénicole *Pharcidia gyrophorarum* Zopf et la position systématique du genre *Pharcidia* Körber. *C. r. hebdom. Séanc. Acad. Sci., Paris* **261**: 4803–4806.
- Keissler, K. (1930) Die Flechtenparasiten. *Rabenh. Krypt.-Fl.* **8**: i–ix, 1–712.
- Lindsay, W. L. (1869) Enumeration of micro-lichens parasitic on other lichens. *Q. Jl microsc. Sci., n.s.* **9**: 49–57, 135–146, 342–358.
- Löfgren, O. & Tibell, L. (1979) *Sphinctrina* in Europe. *Lichenologist* **11**: 109–137.
- Mitchell, M. & Henssen, A. (1966) New or noteworthy lichens from Ireland. *Ir. Nat. J.* **15**: 143–145.
- Nordin, I. (1964) *Abrothallus suecicus*, a common lichenicolous fungus. *Svensk bot. Tidskr.* **58**: 225–232.

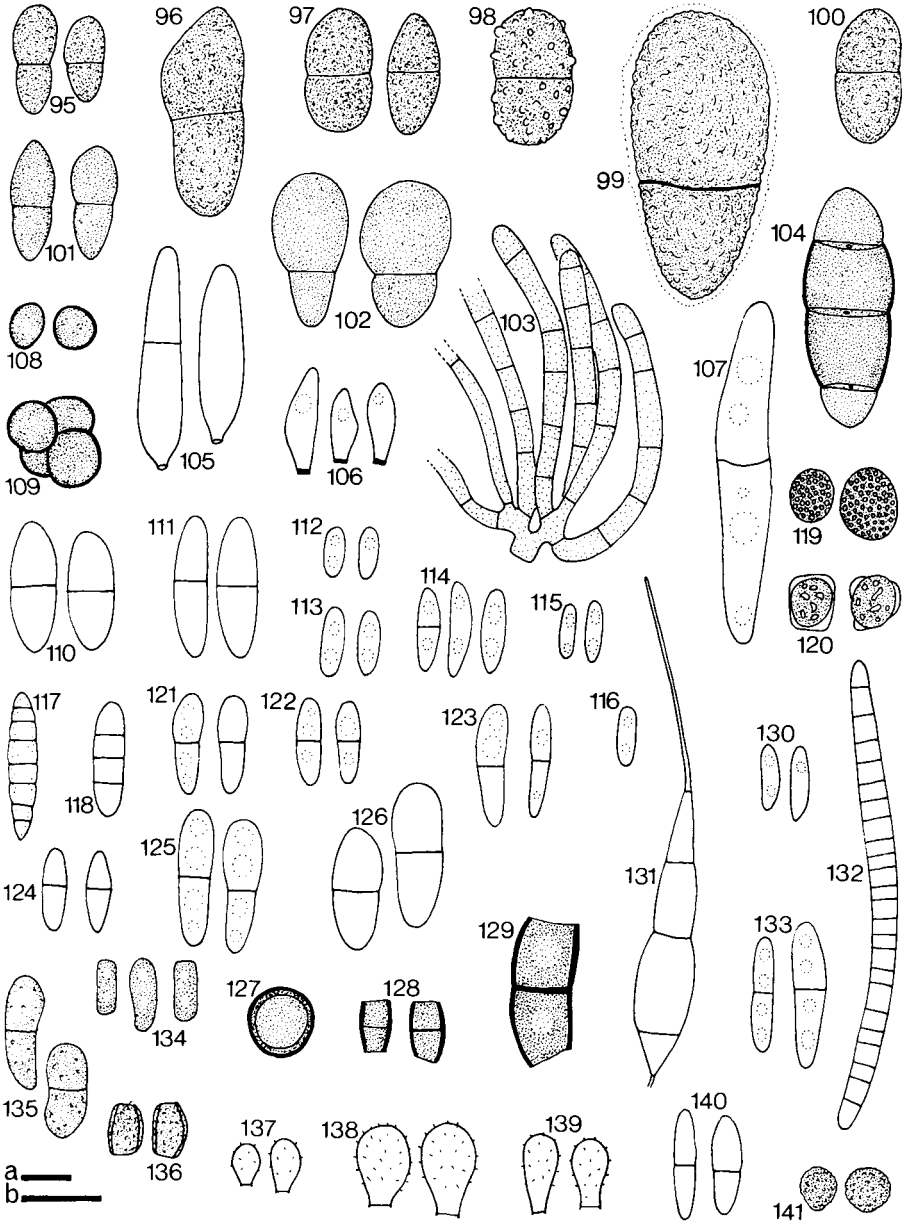
- Olivier, H. (1905-07) Les principaux parasites de nos lichens français. *Bull. internat. géogr. Bot.* 15: 206-220, 273-284; 16: 42-48, 187-200, 253-264; 17: 123-128, 162-176, 232-240.
- Orton, P. D. (1977) Notes on British agarics: V. *Kew Bull.* 31: 709-721.
- Ozenda, P. & Clauzade, G. (1970) *Les Lichens. Étude biologique et flore illustrée*. Paris: Masson & Cie.
- Poelt, J. (1974) Die parasitische Flechte *Lecidea insidiosa* und ihre Biologie. *Plant Syst. Evol.* 123: 25-34.
- Raper, K. B. & Fennell, D. I. (1965) *The Genus Aspergillus*. Baltimore: Williams & Wilkins.
- Riedl, H. (1969) Beobachtungen an *Pleospora Hookeri* (Borr.) Keissler und einigen weiteren *Pleospora*-Arten. *Sydowia* 22: 395-402.
- Salisbury, G. (1966) A monograph of the lichen genus *Thelocarpon*. *Lichenologist* 3: 175-196.
- Santesson, R. (1960) Lichenicolous fungi from northern Spain. *Svensk bot. Tidskr.* 54: 499-522.
- Sherwood, D. L., Hawksworth, D. L. & Coppins, B. J. (1981) *Skyttea*, a new genus of odontotremoid lichenicolous fungi. *Trans. Br. mycol. Soc.* 75: 479-490.
- Smith, A. L. (1926) *A Monograph of the British Lichens*. Part II. 2nd edition. London: British Museum (Natural History).
- Sutton, B. C. (1980) *The Coelomycetes*. Kew: Commonwealth Mycological Institute.
- Swinscow, T. D. V. (1962) Pyrenocarpous lichens: 2. *Lichenologist* 1: 242-250.
- Swinscow, T. D. V. (1965) Pyrenocarpous lichens: 8. The marine species of *Arthopyrenia* in the British Isles. *Lichenologist* 3: 55-64.
- Swinscow, T. D. V. (1966) Pyrenocarpous lichens: 10. *Lichenologist* 3: 233-235.
- Swinscow, T. D. V. (1967) Pyrenocarpous lichens: 11. A new species of *Arthopyrenia*. *Lichenologist* 3: 415-417.
- Tibell, L. (1969) The genus *Cyphelium* in northern Europe. *Svensk bot. Tidskr.* 63: 465-485.
- Tibell, L. (1971) The genus *Cyphelium* in Europe. *Svensk bot. Tidskr.* 65: 138-164.
- Tibell, L. (1975) The Caliciales of boreal North America. *Symb. bot. upsal.* 21(2): 1-128.
- Tibell, L. (1978) The genus *Microcalicium*. *Bot. Notiser* 131: 229-246.
- Vězda, A. (1963) Příspěvek k poznání lichenikolních hub v Československu I. *Česká Mykol.* 17: 149-159.
- Vězda, A. (1970) Příspěvek k poznání lichenikolních hub v Československu III. *Česká Mykol.* 24: 220-229.
- Vouaux, L. (1912-14) Synopsis des champignons parasites de lichens. *Bull. Soc. mycol. Fr.* 28: 177-256; 29: 33-128, 399-494; 30: 135-198, 281-329.
- Watson, W. (1948) List of British fungi parasitic on lichens or which have been included as lichens (or vice versa), with some notes on their characters and distribution. *Trans. Br. mycol. Soc.* 31: 305-339.
- Zehetleitner, G. (1978) Über einige parasitische Arten der Flechtengattung *Verrucaria*. *Nova Hedwigia* 29: 683-734.
- Zopf, F. W. (1896) Uebersicht der auf Flechten schmarotzenden Pilze. *Hedwigia* 35: 312-366.



FIGS 1-43. Spores of selected species. See Index for legends. Scale = 10 μ m.



Figs 44-94. Spores of selected species. See Index for legends. Scales = 10 μ m. Figs 44-81, 84-94 scale (b); Figs 82-83 scale (a).



FIGS 95–141. Spores of selected species. See Index for legends. Scales = 10 μ m. Figs 95–131, 133–141 scale (b); Fig. 132 scale (a).

Index to Fungi and Lichens

This index includes the names of the 218 taxa keyed out in this work, together with synonyms cited, and also lists the host lichens mentioned. The host lists are not exhaustive for the commoner taxa and only lichens from which the fungi are known in the British Isles are given.

Numbers in **bold face** refer to the spore illustrations.

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