

Johan Frederick Klotzsch's pre-1850 material in the Glasgow Museums collections and its significance

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INTRODUCTION

During the preparation of my account of mycology in Scotland (Watling, 1986) I was privileged to examine and comment on an old collection of fungi parcelled in a brown packet which was held in the Kelvingrove Museum, Glasgow and labelled 'Fungi Fleming'. The specimens are now held in the Glasgow Museums Resources Centre at Nitshill.

The Revd. John Fleming amassed a considerable collection of vascular plants, which are now found in the herbaria at the Kelvingrove Museum and Art Gallery in Glasgow and in the Royal Botanic Garden, Edinburgh. Fleming spent the first part of his career in the church but later entered the academic world. He became Professor of Natural Philosophy in Aberdeen in 1834 and ten years later was Professor of Natural Sciences in the Free Church College in Edinburgh. He became President of the Botanical Society of Edinburgh over the period 1847-50. It may be through these last connections that he came by an important fungal collection, which was evidently kept separate from his vascular plant specimens (see Jones, 1980). The fungal collections were apparently donated independently in 1902 by Major J.A. Fleming (Agnes Walker *pers. comm.*) and could have been formerly in the care of the Revd. Colin Smith. The collections are of great significance as they consist mainly of material assembled by Klotzsch, an important German mycologist working in Glasgow under the supervision of the then Professor of Botany William Jackson Hooker. Klotzsch's material was in the main transferred south along with Hooker's other material, when the latter left Glasgow to take up the Directorship of the Royal Botanic Gardens at Kew and where it became the foundation of Kew's international fungarium, (Ainsworth, 1976).

The present collections 1) throw more light on the movements of Klotzsch during 1831 than previously indicated by the material in the herbaria either at Edinburgh (**E**) or Kew, London (**K**) and 2) help to decipher some aspects of Klotzsch's handwriting not possible from the collections elsewhere in the UK. Some specimens are undoubtedly duplicates of

material to be found in E (or *vice versa*) but a clutch of his proposed new species was also revealed. Both these and the Edinburgh collections were unknown to Stafleu & Cowan (1979) when they compiled their account on Klotzsch. The Fleming specimens form the basis of this paper. For a full account of Klotzsch see Ainsworth (1976) and for an interpretation of some of his fungal collections see Reid & Austwick (1963). A full account of Klotzsch's Edinburgh collections is in preparation.

METHODS & MATERIALS

Examination of the exsiccata follows the directions in Henderson *et al.* (1969).

Abbreviations: **E** = Herbarium of the Royal Botanic Garden, Edinburgh; **K** = Herbarium of the Royal Botanic Gardens, Kew, Richmond, Surrey.

Klotzsch's abbreviations on labels: Syst. = Systema Mycologicum, 1821; Elen. = Elenchus Fungorum, 1828.

RESULTS

The specimens are arranged in taxonomic order with the proposed new species separated out as a distinct category.

1. Signed newly proposed species

Basidiomycota

Russulales: Russulaceae

Lactarius smithii. As *Inverary, August, mihi*.

This is *Lactarius mammosus* Fr., recognised by Fries six or so years after Klotzsch's discovery and recently redefined by Heilmann-Clausen *et al.* (1998) and not as generally interpreted in the sense of Moser (1978), which is a quite different agaric. Apart from the general characters and the comments made by Klotzsch of the distinction from *L. glycosmus* (Fr.: Fr.) Fr., *L. uvidus* (Pers.: Fr.) S.F. Gray and *L. fuliginosus* (Fr.: Fr.) Fr., there is no doubt from the spore ornamentation alone that he recognised a new entity. This fungus was long thought in British literature to be named after Worthington Smith

apparently without any dates being checked. This fungus is named in honour of either Revd. D. Colin Smith of Inveraray, minister within the properties of the Duke of Argyll and collector of some of Klotzsch's specimens or (less likely) after Sir James Edward Smith, the founder of the Linnean Society of London.

Ascomycota

Erysiphales: Erysiphaceae

Oidium herbarum No data but possibly found in the Glasgow Botanic Garden.

This represents the anamorph of a member of the Erysiphales. No host is given so no pointer is available to help in identification but one wonders whether this is what later was called *Oidium hortensiae* Jørstad, growing on *Hydrangea*, whose teleomorph is *Microsphaera polonica* Siemaszko.

Mitosporic Fungi

Sphaeropsidales; Sphaeropsidaceae

Sphaeria (Depezea) unedonicola As *Glasgow Bot. Garden, May 1831*.

The genus *Depezea* is now considered to be a synonym of *Asteroma* (Sutton, 1980) based on the type which possesses hyaline, thin-walled, smooth, eguttulate, straight or curved cylindrical conidiospores and therefore not congeneric with the asexual stage of *Diplocarpon rosae* Wolf, rose spot, which has 2-celled conidiospores and now placed in *Marssonina*. *Asteroma* is typified by *A. padi* DC., but in the literature still covers many species of fungi represented purely by darkened, sterile hyphae. This includes Klotzsch's fungus. Many authorities, e.g. Grove (1935), considered this genus to be regularly used in the past for the sporeless stages of a range of pyrenomycetous fungi, possibly species of *Mycosphaerella*. This may have been Klotzsch's thinking when indicating his new taxon. The sporeless stage of *Phyllosticta arbuti* Sacc. (= *Cheilaria arbuti* Desm.) is most commonly seen in British collections but *Septoria* is closely related, differing in the production of scoliosporic conidiospores. *Septoria unedonis* is found on fading leaves of *Arbutus*, but the name is attributed to Roberge & Desmazères and not Klotzsch. *Depezea fraxini* DC. ex St. Amans, for instance, was considered a *Septoria* by Fries (1821). Many members of *Mycosphaerella* inhabit leaves of phanerogams and have either or both *Phyllosticta* and *Septoria* anamorphic stages in their life-cycles. The Glasgow record is apparently quoted in Grove's monograph (1935) but without direct reference to Klotzsch, so the latter author recognised the distinctiveness of his find yet never published his results. A record of what might be this same species from Glamis appears in Stevenson's *Mycologia Scotica* (1879).

2. Signed & unsigned collections mainly from Inveraray August 1831.

*indicates those species found to be duplicates amongst material in the herbarium of the Royal Botanic Garden, Edinburgh and the subject of a separate article (Watling in prep.)

Basidiomycota

Agaricales

Agaricaceae

(Lepiotaceae)

***Lepiota clypeolariodes** Rea As *Agaricus clypeolaria, near Sowerby t.14, Castle Semple, July*.

Klotzsch recognised the significance of this collection and that it differed from Bulliard's *Agaricus clypeolarius*, but closely fitted Sowerby's interpretation of that species. The existence of a second agaric in the complex was not formally recognised until Rea (1922) described *L. clypeolariodes* ninety years later. *L. clypeolaria* is rare but widespread in the British Isles, being found on calcareous loams, generally under deciduous trees, whereas *L. clypeolariodes* is considered a nomen dubium by the Check List authors (Legon & Henrici, 2005). It is patently obvious that there is in Britain a fungus recognised by Klotzsch which in this author's opinion is incorrectly considered dubious!

(Lycoperdaceae)

***Bovista plumbea** Pers. As *Bovista nigrescens, Helensburgh, July 1831*.

There is a Klotzsch collection in Herb. Hooker in E with the same locality of Helensburgh, but this is *B. nigrescens* Pers. Both *B. nigrescens* and *B. plumbea* are regularly recorded and are both widespread, the former being by far the commoner. Both are to be found in grassland and may grow together with *B. plumbea* apparently more frequently in coastal areas. The two species differ microscopically particularly in the morphology of the sterigmatic remnants.

Amanitaceae

Amanita phalloides (Fr.) Link As *Agaricus phalloides, Inverary, August 1831*.

This species is generally associated in Scotland with *Quercus* and although widespread it is more frequent in western areas and in the warmer areas of the east where it occurs on more base-rich soils; it sometimes is associated also with *Fagus*.

***A. rubescens** Pers. As *Agaricus rubescens, Inverary, 1831*.

This species is very common throughout Scotland, occurring with a range of deciduous and coniferous hosts. It is one of the first agarics to fruit after late spring rains. It is very variable and may prove to have several molecularly distinct forms or varieties.

Bolbitiaceae

Conocybe pubescens (Gill.) Kühn. As *Agaricus tener* Schaeffer, on dung in grassland.

This elegant member of the genus grows in troops surmounting horse dung 'apples'; it is common and widespread in suitable places. The characters separating this species from other members of the genus are based on microscopic characters but in macromorphology they all are very similar. The classic name of *Agaricus* or *Galera tenera* covered many of these entities that are now considered to be separate species.

Psathyrellaceae

Coprinopsis atramentaria (Bull.: Fr.) Redhead *et al.*
As *Agaricus atramentarius* in garden on trunk.

This mushroom is a common and widespread inky cap throughout the British Isles, growing on woody remains, old stumps *etc.* It is more widely known as the synonym *Coprinus atramentarius* Bull.: Fr.

Psathyrella spadiceogrisea (Schaeff.) G. Betrand.
As *Agaricus stipatus* Pers. Fr II p. 296, *Fagus woodland for the most part, Pinmore, March and April 1831.*

This epithet covers a whole series of *Psathyrella* spp. but the chronological information of early spring given by Klotzsch is critical and points to *P. spadiceogrisea*. This is a common agaric in the spring, often being one of the earliest of the macromycetes to fruit, especially under *Fagus*. The microscopic characters, the fact that Klotzsch indicates his fungus grew in beech woodland '*for the most part*' and a range of spring dates supports the case for this common fungus. Klotzsch's note could indicate the collection is a mixture of basidiomes from slightly different sites.

Cortinariaceae

Cortinarius bulbosus (Sow.) Fr. As *Agaricus bulbosus* Sowerby, near Glasgow, September.

This species is not well known in the British Isles, although it was described originally from southern England and the only recent records of it are from the same region. At least we know what Klotzsch's interpretation was, as he quotes Sowerby as the author, and that it is not the fungus described by John Bolton under the same name some years earlier. Apparently the only record for Scotland is this of Klotzsch; see Stevenson (1879).

C. iliopodius (Bull.) Fr. As *Agaricus iliopodius* Bull., *Pinmore, August.*

It is really impossible to say to which taxon this collection can be referred except to indicate it is in subgenus *Telamonia*. The epithet is said to refer to the habitat (Rea, 1922) of wet places but Fries (1821) does not support this referring to the foot as muddy coloured; Fries indicates it occurs in oak and beech woods and rarely with pine. Other authors

(e.g. Smith, 1908) indicate that the epithet refers to the colour of the stem, *viz.* as if mudded by soil. Both the latter author and Masee (1911) are apparently familiar with this fungus, although Masee (1902) had earlier omitted it from his *European Fungus Flora: Agaricaceae*.

Generally, members of this subgenus, although rather similar in colour, are rather specific in their habitat requirements and this may indicate a mixed concept, especially as members of this group are notoriously difficult to separate. Which concept Klotzsch followed cannot be ascertained, except he referred his specimens to Bulliard's plate (Bulliard, 1791), although the present author feels that there is a strong possibility that this material refers to *C. umbrinolens* P.D. Orton. This species was introduced (Orton, 1980) as a replacement name for the incorrectly identified *C. rigidus* Fr. This species is widespread and found in damp deciduous woodlands throughout southern Scotland, and on drying takes on a distinctive 'cinnamon then brownish ranging to ochraceous' (vide Berkeley, 1836; p. 88); tan-coloured according to M.C. Cooke (1881). The latter's coloured illustration (Cooke, 1883) depicts a peronate, much more sienna-coloured mushroom not in keeping with *C. umbrinolens*, which is darker in shade. There is every likelihood that Berkeley had Klotzsch's notes available to him; if these included information on this species, it would no doubt have been included in the description.

Rea (1922) apparently knew a fungus under the name used by Klotzsch quite well and states it is not uncommon in woods especially pine and beech. From the adoption of Bulliard's species name, its probable habitat and the fact that in classical literature it was considered common and widespread, it might be expected to be a fungus that Klotzsch would have encountered.

C. iliopodius more recently has been synonymised with *C. alnetorum* (Vel.) Moser, which might reflect, although incorrectly, the epithet. In the sense of M. C. Cooke (1883), which one might have thought to be more in keeping with Klotzsch, it is supposed to be the same as *C. parvoannulatus* Kühn., but this is a rare British species and is more montane in distribution. Like *C. parvoannulatus* Cooke's figure, it is true, depicts an agaric with a peronate ring, which must have influenced Kuhn's decision. These two earlier suggestions are not correct and differ considerably from *C. umbrinolens*, the latter particularly from its small ring. *C. alnetorum* is also not possible, as it is confined to wet alder carrs and although not impossible for the Klotzsch material to be found under alder it does not fit 'common and widespread in beech, pine and mixed woodland' quoted by classical British authors.

Bulliard's plate (578) on which the species is based, is a mixture of different species, although the uppermost line of figures offer a very reasonable rendering of Orton's fungus and certainly not that of either Kühner's or Moser's interpretations.

C. torvus (Fr.) Fr. As *Agaricus torvus*, *Glasgow, September*.

Although fairly common in southern Britain this web-cap is less frequent in Scotland where records are, however, from widespread localities. It is usually associated with *Fagus*, but it has also been found in mixed deciduous woodland.

Entolomataceae

Agaricus prunulus, *Inverary, August*.

There are no spores present in this collection. In the absence of spores, a definitive identification cannot be made. If the ridged spores typical of *Clitopilus prunulus* had been present, Klotzsch's record could have been confirmed. This fungus would certainly be expected to occur around Inverary!

Entoloma (Nolanea) juncina (Kühner & Romagn.) Noordeloos As *Agaricus pascuus*, *Inverary, June., In montane bogs*.

Without field notes it is difficult to place this collection, although in most British texts it has been referred to as *Entoloma (Nolanea) conferendum* (Britzl.) Noordeloos (= *N. staurospora* Bres. - an even more traditional name). The spores of the Klotzsch material, however, are not star-shaped and so cannot be this species. The interpretation by Rea (1922) of this name is apparently the same as *E. vernum sensu* Lundell and is more in keeping with that of Klotzsch's material. The spore morphology, however, agrees more with that of the closely related *E. juncina*. Apparently Persoon's authentic material of *E. pascuum* Pers. has been shown to be a member of the Cortinariaceae (Singer, 1961), and so if this epithet is adopted it must be in the sense of, and based on, Fries' interpretation. This is probably the one adopted by Klotzsch as there is every indication this is a species of *Nolanea*.

Marasmiaceae

***Pleurocybella porrigens (Pers.) Singer** As *Agaricus porrigens on pine trunk, Inverary* no date.

This species is characteristic of remnant Caledonian forest. It has spread to conifer plantations in the British Isles, is now common in Scotland and is apparently extending southwards.

Myceneaceae

Mycena pura (Pers.: Fr.) Kummer As *Agaricus purus, September, Glasgow*.

M. pura is a common, widespread and variable agaric with a strong odour of radishes. It is impossible, from

the material, to say to which form Klotzsch was referring. Undoubtedly on application of molecular techniques several different taxa will be ultimately recognised within this species.

Omphalotaceae

***Gymnopus fusipes (Bull.: Fr.) S. F. Gray** As *Agaricus fusipes, Hamilton, July 1831*.

This is a typical member of the oak mycota growing on old stumps and buried roots. It is found in remnant oak forests such as in the former parkland policies frequented by Klotzsch. Although not common, it is widespread wherever there is the suitable habitat; it is common throughout England.

Physalacraceae

***Strobilurus esculentus (Wulf.) Singer** As *Agaricus esculentus, on Abies, Castle Semple, March 1831*.

There has been much confusion in the identity of members of this genus in the U.K., solved only in the 1990s (see Reid, 1954). Examination of Klotzsch's material in the fungaria of Edinburgh and Kew shows that he, like his contemporaries, lumped some closely related species together. *S. esculentus* is widespread and common and can be distinguished by its habitat preferences and distinctive lanceolate cystidia with crystals at their apex.

Strophariaceae

***Kuehneromyces mutabilis (Schaeff.) Singer & A.H. Sm.** As *Agaricus mutabilis, Inverary, August 1831*.

This species is very common and widespread in Scotland especially on birch stumps and trunks, although it has been recorded on a whole range of deciduous substrates in the British Isles including, but rarely, conifers.

Tricholomataceae

Lepista saeva (Fr.) P. D. Orton As *Agaricus personatus, near Glasgow*.

Formally quite a widespread and frequent agaric in Scotland growing in grassy places often near trees and used as an edible mushroom but it is dramatically less common and almost extinct in some areas as a result of urban sprawl.

Boletales

Boletaceae

Boletus edulis Bull. As *Boletus edulis, Inverary, August 1831*.

This is a keenly sought-after edible species, which is common throughout Scotland and elsewhere in the British Isles. It is associated with a whole range of deciduous trees and is also known from conifer plantations. It is often found in mixed woodland.

Gomphidiaceae

Suillus variegatus (Sow.) Richon & Roze As *Boletus variegatus*, August 1831.

S. variegatus is a common bolete of remnant Caledonian forest and less common in plantations. Although it is widespread in Scotland, it is less common throughout England

Paxillaceae

***Paxillus involutus** (Batsch) Fr. As *Agaricus involutus*, Inverary, August 1831.

This is a very common agaric throughout the British Isles and is found associated with a number of deciduous and coniferous hosts, although recent molecular studies have indicated that this is a complex of closely related taxa. Often these individual entities appear to be associated with particular hosts. It is impossible to tell to which taxon Klotzsch's specimens can be assigned.

Russulales

Lentinellaceae

***Lentinellus cochleatus** (Pers.) P. Karsten As *Lentinus cochleatus* Fr. In *Syst. Myc. I*, p.78, *B. A. denudatus* Pers. *Agaricus cochleatus* Fr. *Syst. Myc. I* p.79, on *Fagus* trunk, Inverary, August 1831.

A widespread but infrequent mushroom in Scotland growing on dead and decayed rootstocks of *Fagus* and also found on *Fraxinus*, a host it more commonly colonises in England. Persoon's variety is now generally taken as a form within the broad spectrum of basidiome shapes. This same fungus has been identified as a fairy club fungus because it can form antler-like structures.

Peniophoraceae

Peniophora quercina (Fr.) Cke. As *Thelephora quercina*, Helensburgh, July 1831.

This is one of Scotland's commonest crust fungi, especially characterised by the strongly developed, thick-walled cystidia and the dark-coloured, curled margin to the basidiome. It is widespread, growing on attached and fallen branches wherever *Quercus* is found.

Russulaceae

***Lactarius acerrimus** Britzel. As *Agaricus flexuosus*, Hamilton, July 1831.

This milk-cap is recognised by its enormous spores. The description 'pileo incarnate vitellinus' is an interesting interpretation of 'flexuosus' by Klotzsch, as present day mycologists apply the epithet to a widely occurring grey-capped milk-cap of beech woods. This interpretation is not in keeping with Klotzsch's remarks and some authorities have suggested this epithet should not be used because of

confusion. *L. acerrimus* is not a common fungus anywhere in the U.K., less so in Scotland, but a western distribution would be expected for this oak associate. There are some well-developed remnant oak forests in the vicinity of Hamilton.

***L. glyciosmus** (Fr.) Fr. As *Agaricus glyciosmus*, Pinnmore, September 1831.

This is a common and widespread milk-cap associated with *Betula* throughout the British Isles and noted for its odour of desiccated coconut.

L. piperatus (L.) Fr. As *Agaricus piperatus*, Inverary, August 1830

This is a widespread milk-cap of rich deciduous woodland where it is associated with both *Fagus* and *Quercus* but it is nowhere common. It was confused by classic authors in the past with what was recognised at a much later date as an independent species, viz. *L. glaucescens* Crossl. This species differs in spore morphology from *L. piperatus* and in the strong orange reaction with potassium hydroxide solution. Both taxa are relatively common in Scotland.

L. pterosporus Romagn. As *Agaricus fuliginosus*, Inverary, August 1831.

In classic British literature no distinction was made between the various segregates of *L. fuliginosus* (Fr.) Fr., which are now all now recognised as separate entities and supported by molecular data. *L. pterosporus* has very distinctive winged basidiospores demonstrated in the Inverary material. This species is probably more widespread in Scotland than the records suggest, and is here associated with *Fagus* and sometimes *Quercus*.

L. vellereus (Fr.) Fr. As *Agaricus vellereus*, Inverary, August 1831.

This spectacular milk-cap is infrequent but widespread in Scotland and is associated with a range of deciduous tree species. On microscopic characters this collection would be referred to var. *velutinus* (Bertill.) Bat.

L. volemus (Fr.) Fr. As *Agaricus volemus*, Inverary, August 1831.

This is a characteristic member of the Scottish oak mycota, recorded most frequently in the south and west, but possibly declining in other parts of the British Isles.

Russula grata Britzel. As *Agaricus foetens*, Garscube, July 1831.

Much confusion has reigned over the identification of members of the *R. foetens* group with *R. foetens* Fr.

in its restricted sense not as frequent as *R. grata* and its allies, which are all species described at later dates. The spore morphology of each of the constituent species is slightly different and Klotzsch's material possesses the basidiospores of *R. grata*, which is in fact probably the commonest member of the group. It is to be found in woodland policies with a range of mixed trees both deciduous and coniferous.

Stereaceae

***Stereum rugosum* (Pers.) Fr. As *Thelephora rugosum*, *Castle Semple*, May 1831.**

A very common and widespread curtain-fungus which when damaged in the fresh condition produces a red latex-like substance. It grows on standing and fallen trunks and attached branches often at the base of tree stocks or where the main trunk has been damaged; it may cover several metres in extent. It is commonly found on *Fagus* and on *Corylus* root stocks, where it may be weakly parasitic but then saprobic. It is recorded on several other hosts, including *Rhododendron*, but apparently rarely on conifers.

Hymenochaetales

***Hymenochaete rubiginosa* (Dicks.) Lév. As *Thelephora rubiginosa* on *Quercus*, *Inverary*, August 1831.**

This species is a characteristic member of the oak forest mycota, although it has been recorded, albeit rarely, on other members of the Fagaceae, Betulaceae, Ulmaceae and even Salicaceae. It is common and widespread throughout the range of *Quercus* in Scotland.

Polyporales

Coriolaceae

***Trichaptum abietinum* (Pers.) Ryvar den As *Polyporus abietinus forma resupinatum*, *Eaglesham*, March 1831.**

This is an exceedingly common bracket fungus on coniferous trash and brushings in plantations, including those of *Pinus*, *Larix* and *Picea*. It is also found on decaying, fallen trunks of pine in their early stages of decay and may take a resupinate form. The latter is the form represented by Klotzsch's specimen, as he rightly notes.

Meripilaceae

***Grifola frondosa* (Dicks.) S. F. Gray As *Polyporus frondosus* *Inverary* Revd. R. D. C. Smith, September**

This is a widespread bracket fungus in the British Isles but nowhere common, although it is less frequent northwards and then it is found in the west or in remnant ancient oak woods. It is usually found on *Quercus*, but it is recorded from many phanerogams though rarely on conifers.

Uredinales

Pucciniaceae

***Puccinia festucae* Plowright As *Aecidium periclymenis*, *Hamilton*, July 1831.**

This is the aecidial stage of a rust fungus named by Schumacher (1803) for which the sexual stage was not demonstrated until ninety years later by Plowright (1893). The aecidial stage as shown by Klotzsch's specimen is on *Lonicera periclymenum*; the teleuto- and uredospore stages form on various species of *Festuca*. This rust is rarely reported in Scotland, especially in its aecidial stage, but it is apparently widespread.

Phragmidiaceae

***Phragmidium tuberculatum* J. B. Müll. *Uredo rosae* *Inverary* August 1831.**

Klotzsch's name refers to an asexual stage (*Uredo*), which in this case was later transferred to *Phragmidium*, a genus which in fact lacks the stage now restricted to *Uredo*. *P. tuberculatum* attacks a whole range of cultivars of rose in addition to members of the *Rosa rugosa* group, although it is rare on the closely related *Rosa canina*. It is infrequent in Scotland, although probably more widespread than records suggest.

Ustilaginales

Ustilaginaceae

***Ustilago hordei* (Pers.) Lagerh. As *Caecoma segetum* Link. No locality and no data.**

This smut also occurs under the name *Ustilago segetum* Roussel. It is found in the spikelets of *Hordeum vulgare* (barley) and in Klotzsch's time this smut was frequently seen infecting plants. Nowadays, with recent plant breeding schemes producing resistant forms, it is more rarely seen. The present collection, however, could be considered the material on which Rabenhorst (1856) made his combination *Ustilago segetum* var. *hordei* (Pers.) Rabenh. There are several varieties of *U. segetum* in the literature and most are now considered to be independent species with their own specific host range.

Ascomycota

Pezizales

Pezizaceae

***Otidea alutacea* (Pers.: Fr.) Masee As *Peziza cochleata*, *Eaglesham*.**

The taxon now called *O. cochleata* (L.: Fr.) Fuckel has slightly larger spores than Klotzsch's specimens - spores 13.2-15.4 x 6-7.2µm; apart from a slightly darker disc it is otherwise very close and probably indicates Klotzsch was relying on macroscopic characters for identification. It is widespread and

rather common in woods along tracks and on bare areas of soil.

Helotiales

Bulgariaceae

Bulgaria inquinans (Pers.: Fr.) Fr. As *Bulgaria inquinans*, *Inverary*.

This is a common disc-fungus on fallen trunks and branches of *Quercus* but also less commonly recorded on *Castanea*, *Betula*, *Carpinus* and *Ulmus*. This species is characterised by the upper four spores in the ascus being dark brown whilst the lower four are hyaline.

Sclerotiniaceae see **Botrytis** below

Diatrypales

Diatrypaceae

Diatrype stigma (Hoffm.: Fr.) Fr. As *Sphaeria stigma*, *Bankhead*, May 1831.

This is an exceedingly common fungus on fallen branches of a wide range of deciduous trees and especially abundant on *Crataegus* branches. The fungus forms fuscous or purplish black effuse crust-like fruiting bodies on decorticated wood, with the roughened surface revealing the presence of the perithecia.

Eutypa lata (Pers.) Tul. & C. Tul. As *Sphaeria stigma*, on *Fraxinus*, *Bankhead*, May 1831.

This also is an exceedingly common fungus on fallen branches and sometime larger diameter twigs of a range of deciduous trees, including *Fraxinus*, although *Acer* possesses its own specific member of the genus. *E. lata* forms effuse fruiting bodies within the decorticated wood through which the perithecia protrude to give a roughened texture on handling.

Dothideales

Dothideaceae

Mycosphaerella hedericola Lindau As *Sphaeria (Depezea) hedericola*, on *Hedera*. No locality and no date.

This is a widespread micro-fungus forming dark brown patches on living *Hedera* leaves in the centre of which are irregular spots that enclose the minute perithecia.

Hysteriales

Hysteriaceae

Hysterographium fraxini (Wahlenb.) Corda As *Hysterium fraxini*, *Hamilton*.

This fungus was rather widespread and quite frequent in former times on the bark of branches and twigs of *Fraxinus*, but is now uncommon in the British Isles except for some parts of Wales.

Hypocreales

Hypocreaceae

Hypocrea rufa (Pers.) Fr. See **Trichoderma** below

Hypomycetaceae

Hypomyces chrysospermum Tul. As *Sepedonium mycetophilum*, on *putrescent fungus*. No locality and no date.

This is a very common fungus, which attacks a wide range of members of the Boletales, converting the fruiting bodies into a bright yellow mass of thick-walled conidia. In this anamorphic stage it is better known as *Sepedonium chrysospermum* (Bull.) Link. The teleomorph of *H. chrysospermum* is rather rare in Scotland.

Hypomyces sp. See **Mycogone rosea** Link below

Mitosporic Fungi

Moniliales

Botrytis cinerea As *Sclerotium durum* var. *Hyacinthii*, *Inverary*, Aug. 1831. *Elench*.pg. 44.

Sterile sclerotia are notoriously difficult to identify to species level but *S. durum* is consistently taken as belonging to the 'Grey Mould', whose teleomorphic stage is *Botryotinia fuckeliana* (de Bary) Whetzel. As indicated by Klotzsch, the sclerotia are very common on the dead scapes of the English blue bell. The connection of the sclerotia and the grey mould was obviously made by Klotzsch although not fully appreciated that the *Botrytis* on '*Sclerotio duro ad caulis hyacinthus*' was one and the same thing. The actual mould had formed the sclerotia as one of its asexual stages. Thus he had collected *Botrytis* twice. It is in fact the very common and troublesome 'Grey mould' that is the scourge of horticulturists.

Mycogone rosea Link As *Mycogone rosea*, on *putrescent fungus*, *Inverary*, August 1831.

This is an anamorphic *Hypomyces* which is widespread although far less frequent than *Sepedonium chrysospermum*, q.v. The former grows on a range of *Agaricus* spp. and *Inocybe* species, two quite different genera of agarics in different families, which indicates there is a complex of species all with the upper cell of the conidium rose-coloured and the lower, smaller cell, pale.

Trichoderma viride Tode As *Trichoderma viride*, July 1830.

T. viride is really a complex of species with the teleomorph of the true *T. viride* generally considered to be *Hypocrea rufa* (Pers.) Fr., a member of the Hypocreales. The differences can be seen only microscopically, but the green pulvinate colonies on rotten wood are characteristic.

There is a Klotzsch collection from Garscube as *Ag. melaleucus* Pers., which would now be considered to be *Melanoleuca melaleuca* (Pers.) Murrill. It is in a bad state of preservation but lacks the amyloid

ornamented basidiospores that characterise members of this genus. The identity is unknown.

DISCUSSION

The Fleming material, especially when coupled with material from the Edinburgh and Kew Botanic Gardens, emphasises why the young Klotzsch had been chosen by Hooker to come to Britain and undertake the exercise of curating his fungal specimens and expand his fungal herbarium. It is obvious that Klotzsch had been well schooled by his former Professor, J.H.F. Link, to the extent that he recognised collections that were new to science. He failed to follow many up with formal publication, returning to Germany and moving on in his career. The range of species he collected allows present-day workers to gain some idea of the distribution in the 1800s of the widespread taxa collected and the concept for these species then understood. The identity of the elusive *Cortinarius ileopodius* may well have been solved had people taken note of the specimens in Fleming's care. The fact that Fleming possessed this very important collection of Klotzsch material indicates he was in contact with the cream of Scottish mycologists.

ACKNOWLEDGEMENTS

I am grateful to Richard Weddle, who encouraged me to bring these data together, looked over the draft manuscript and suggested some improvements.

REFERENCES

- Ainsworth, G. C. (1976). *Introduction to the History of Mycology*. Cambridge University Press, London.
- Berkeley, M. J. (1836). Fungi. In Dr. W.J. Hooker's *British Flora*. Longman *et al.*, UK.
- Bulliard, J.B.F. (1791). Histoire des Champignons de la France. In *Herbier de la France*. Paris.
- Cooke, M. C. (1881-1891). *Illustrations of British Fungi*. Williams & Norgate, London.
- Cooke, M. C. (1883-91). *Handbook of British Fungi*. Macmillan, UK.
- Fries, E.M. (1821). *Systema Mycologicum*. Lund, Griefswald.
- Grove, W. B. (1935). *British Stem & Leaf Fungi, Vol. 1*. Cambridge University Press, Cambridge.
- Heilmann-Clausen, J., Verbeken, A. & Vesterholt, J. (1998). *Fungi of Northern Europe. The genus Lactarius*. Copenhagen.
- Henderson, D.M., Orton, P.D. & Watling, R. (1969). *British Fungus Flora. Agarics and Boleti*. Introduction. HMSO, Edinburgh.
- Jones, G. (1980). The herbarium of the Glasgow Museum & Art Gallery. *Glasgow Naturalist* 20, 51-56.
- Legon, N.W. & Henrici, A. (2005). *Checklist of the British & Irish Basidiomycota*. Royal Botanic Gardens Kew. Richmond.
- Massee, G. (1902). *European Fungus Flora. Agaricaceae*. Duckworth, London.
- Massee, G. (1911). *British Fungi with a Chapter on Lichens*. Routledge, London.
- Moser, M. (1978). Basidiomycetes. II Röhrlinge und Blätterpilze 4 IIb. *Kleine Kryptogamenflora*. Gustav Fischer, Stuttgart.
- Orton, P.D. (1980). Notes on British agarics. *Notes Royal Botanic Garden Edinburgh* 38, 315-330.
- Plowright, C. B. (1893). Experimental researches on the life history of certain Uredineae. *Grevillea* 21, 101-120.
- Rabenhorst, G.L. (1856). *Klotzschii Herbarium Vivum Mycologicum*. (Editio nova), Berlin.
- Rea, C. (1922). *British Basidiomycetae*. Cambridge University Press, Cambridge.
- Reid, D.A. & Austwick, P. (1963). Annotated list of the less common Scottish basidiomycetes (exclusive of rusts and smuts). *Glasgow Naturalist* 18, 255-336.
- Reid, D.A. (1954). The Marasmius "conigenus" complex in Britain. *Kew Bulletin* 9, 279-281.
- Schumacher, C.E. (1801-03). *Enumeratio Plantarum Saellandiae*. Copenhagen.
- Singer, R. (1961). Type studies X. *Persoonia* 2, 1-62.
- Stafleu, F.A. & Cowan, M.S. (1979). *Regnum Vegetabile: Taxonomic Literature Vol. II, H-Le*. Bohn, Scheltema, & Holkema, Utrecht.
- Smith, Worthington, G. (1908). *Synopsis of the British Basidiomycetes*. British Museum, London.
- Stevenson, J. (1879). *Mycologia Scotica*. Edinburgh.
- Sutton, B. (1980). *The Coelomycetes*. CABI, Slough.
- Watling, R. (1986). 150 years of paddock stools: a history of agaric ecology and floristics in Scotland. *Trans. Bot. Soc. Scot.* 45, 1-42.

