

## CORTINARIUS SUBGENUS MYXACIUM

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*“Une grande confusion a longtemps régné dans l’interprétation de plusieurs cortinaires de la Section Myxacium.” - André Marchand (1983)*

Estimates of the number of species contained within the genus *Cortinarius* vary but all authors agree that it is the largest agaric genus in the world. *Funga Nordica* (2008: p.661) says: “Based on recent phylogenetic studies it is assumed that at least 900 species occur in the Nordic countries, but many are poorly known...” The number for Europe as a whole will certainly be substantially higher, possibly nearer 2000.

To try and make sense of this vast assemblage, authors have traditionally divided *Cortinarius* into subgenera. The divisions vary but commonly include: *Cortinarius*, *Dermocybe*, *Leproclybe*, *Sericeocybe*, *Myxacium*, *Phlegmacium* and *Telamonia*. However, DNA studies by Garnica *et al.* (2005) and other researchers suggest that species placed in *Sericeocybe* and *Leproclybe* mostly belong in a broadly defined *Telamonia*, *Dermocybe* forms a well-defined group while *Phlegmacium* and *Myxacium* are not natural species assemblages. But as no new system has yet been formalised, for the time being we follow *Funga Nordica* in recognising just four convenient (if unnatural) groupings: *Cortinarius* (including *Dermocybe* and *Leproclybe* p.p.), *Myxacium*, *Phlegmacium* and *Telamonia*.

*Phlegmacium* and *Myxacium* are traditionally separated on the extent of viscosity: in *Phlegmacium* the pileus is usually viscid but the stipe dry and there is an arachnoid veil, while in *Myxacium* both the pileus and stipe are viscid with a glutinous veil. But even a casual glance at the species placed in these subgenera will reveal some that do not obey these ‘rules’. For the moment however this division is maintained.

**Tip:** if unsure whether you have a *Myxacium* where the viscosity of the stipe has dried with age or exposure, check for the glossy, varnished

appearance of the veil on the stipe or for bits of leaf debris glued to the stipe.

### Keys to species of subgenus *Myxacium*

The following keys to species include both those which have been recorded in Britain and those which might be expected to occur in suitable habitats. The latter are marked with an asterisk.

*Myxacium*, as currently defined, is an artificial amalgam of three distantly related sections, easily distinguished by spore shape and size (see Fig. 1): Section *Delibuti*, Section *Vibratiles* and Section *Myxacium*. Section *Myxacium* further divides into two rather closely related groups or stirps: *Colliniti* and *Defibulati*. We here discuss only two of these sections, being unfamiliar with most of the species currently listed as British in Section *Vibratiles*.

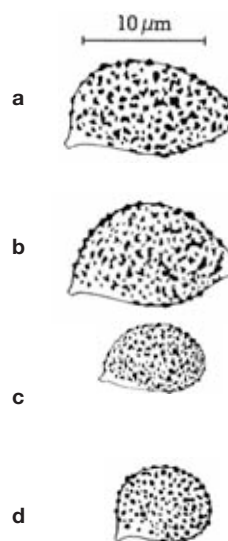


Fig. 1. From top to bottom, typical spores: a) amygdaloid spore of *C. favrei* (Stirps *Colliniti*). b) citriform spore of *C. elatior* (Stirps *Defibulati*). c) ellipsoid spore of *C. croceocaeruleus* (Sect. *Vibratiles*). d) subglobose spore of *C. delibutus* (Sect. *Delibuti*).

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**Abbreviations used in the text:**

**B&K5** = Breitenbach, J. & Kränzlin, F. (2000).

*Fungi of Switzerland* Vol. 5 Cortinariaceae.

**CBIB** = Legon, N. W., & Henrici, A. (2005).

*Checklist of the British & Irish Basidiomycota*.

**CFP** = Brandrud, T.E. *et al.* (1990-1998).

*Cortinarius Flora Photographica* Vols 1-4.

**K&R** = Kühner, R. & Romagnesi, H. (1953).

*Flore Analytique des Champignons Supérieurs*.

**KEY 1. Sections and Stirps:**

1. Spores subglobose; cap and veil yellowish or bluish .....**KEY 2. Sect. *Delibuti***
  - Spores ellipsoid, amygdaloid or citriform; cap yellow, brown or bluish, veil white to bluish...2
2. Taste of flesh and/or cuticle bitter, spores at most 9 µm long (not covered here) .....**Sect. *Vibratiles***
  - Taste of flesh and cuticle mild, spores at least 10 µm long, coarsely ornamented .....**Sect. *Myxacium*..3**
3. Clamps present in cuticular tissue; swollen cells on gill margin absent or inconspicuous and seldom broader than basidia; smell of stipe flesh unremarkable ...**KEY 3. Stirps *Colliniti***
  - Clamps absent throughout; gill margin with persistent swollen cells 15-30 µm wide; smell usually of honey, especially when stipe base is rubbed.....**KEY 4. Stirps *Defibulati***

**KEY 2. Sect. *Delibuti***

1. Pileus 2-8 cm pale to bright yellow or ochraceous, without any violet hues. Lamellae and upper stipe often lilac-violet. Common with a wide range of broad-leaved trees, especially *Betula*.....***C. delibutus***
  - Pileus with some tint of lilac, violet or bluish ..2
2. Pileus and stipe deep violet when young, fading but always with violet tones. Pileus 4-9 cm, stipe clavate; spores 7.5-10 x 6-8.5µm. On calcareous soils in broad-leaved woods, rare .....***C. salor***
  - Pileus and stipe with more greyish-lilac to greyish-ochre colours. Northern species little known in Britain .....3

3. Entire fruitbody uniformly greyish-lilac to grey-blue, strongly glutinous; veil hyphae smooth; spores 6-7 x 5-6 µm. With conifers or broad-leaved trees.....***C. emunctus***
  - Fruitbody with strong contrast between pileus colour and paler stipe, pileus soon fading to ochraceous; veil hyphae encrusted with granular pigment; spores 7.5-10 x 6-8.5 µm. With *Picea* or *Betula*.....4
4. Pileus often with olivaceous tones, convex, brownish-ochre to yellowish from centre, slightly bluish-lilac at margin; lamellae pale violet at first; stipe clavate, soon pale ochre with veil forming adpressed belts .....***C. transiens*\***
  - Pileus greyish-lilac then soon pale ochre; lamellae pale bluish; stipe slender, clavate, pale greyish with faint ochre veil .....***C. betulinus***

**KEY 3. Stirps *Colliniti***

1. With dwarf *Salix* in arctic-alpine sites .....2
  - With other tree hosts or if with *Salix* then in lowland swampy or coastal habitats .....3
2. Spores 11.5-14 x 7-8.5 µm; cap very dark reddish brown, almost blackish at centre; stipe cylindrical-swollen at base; with *Salix* in acidic alpine habitats .....***C. alpinus sensu auct.***
  - Spores 16-20 x 7-9 µm; cap fawn-orange, paler at margin; stipe attenuated at base; with *Salix* in calcareous alpine habitats .....***C. alpinus*\*** *sensu* Boudier
3. With *Salix* or *Populus*, in swampy areas, rarely *Quercus*, *Betula* or *Fagus*. With glutinous brown girdles on the stipe, spores 10.5-12.5 (13) x 6-7 (7.5) µm .....***C. trivialis***
  - With *Picea*, *Pinus* or arctic-alpine *Betula* .....4
4. Stipe with irregular, glutinous violet girdles; pileus strongly glutinous, red brown; spores 13-16 x 7.5-9.5 µm; with *Picea* in Scotland.....***C. collinitus***
  - Stipe smooth or cracking into girdles only at base, white to faintly violet; pileus warm orange to olive-brown; with *Pinus* or *Betula* .....5
5. With *Pinus*; pileus glutinous, warm orange-brown; stipe smooth, white; spores 11.5-14

- (14.5) x 5.5-7 (7.5)  $\mu\text{m}$  ..... ***C. mucosus***
- With *Betula* spp. (and other broadleaves?) in arctic or sub-alpine sites; spores broader 11-13 x 6.5-8.5  $\mu\text{m}$ . Two species that might conceivably occur in Scotland .....6
- 6. Pileus bright orange to orange-brown often with dark centre; stipe white cracking into irregular girdles at base..... ***C. grallipes*\***
- Pileus dull ochre to olivaceous-brown, darker at centre; stipe white to palest violet, smooth....  
..... ***C. fennoscandicus*\***

- (14) x 6.5-7.5 (8)  $\mu\text{m}$ . Broad-leaved woods .....  
..... ***C. pangloius*\***
- Pileus much paler, greyish-clay or yellow, yellow-ochre, saffron, cinnamon to fulvous.....6
- 6. With *Pinus* or *Picea*; pileus greyish-clay to dull ochre-brown; stipe white to pale violaceous, frequent in Scotland, less so further south.....  
..... ***C. mucifluus***
- With *Fagus* or *Quercus*; pileus colours brighter tawny orange to fulvous-ochre.....7
- 7. Pileus tawny orange; stipe white; with *Fagus*. A poorly understood species, not accepted here ..... ***C. arvinaceus***
- Pileus fulvous-ochre to pale buff, conical-wrinkled; stipe with white to cream bands of veil on stipe. Exclusively with *Quercus*? .....  
..... ***C. zosteroides***

**KEY 4. Stirps Defibulati**

- 1. Stipe violaceous, at least in part .....2
- Stipe white (at most with the faintest flush of violet at apex or when very young) .....5
- 2. Pileus large (4-12 cm), dark brown to violet-brown, conical and strongly radially wrinkled ; lamellae dark umber when mature, strongly interveined; stipe fusiform, violet in lower half, cracking into scales; spores 12-14 (15) x 7.5-9.5 (11)  $\mu\text{m}$ ; broad-leaved woods, esp. *Fagus*, uncommon ..... ***C. elatior***
- Usually smaller and less wrinkled; gills paler and not noticeably interveined .....3
- 3. Pileus 3-5 cm, beige, grey-ochre; stipe 3-5 cm, fusiform; resembling a miniature *C. elatior*; spores (9)10-12 (13) x 6-7 (8)  $\mu\text{m}$ . Broad-leaved woods, esp. *Fagus*, seldom recorded (*C. pumilus* of CBIB)..... ***C. livido-ochraceus***
- Pileus 5-7 cm; stipe longer (*C. stillatitius* of CBIB and *Funga Nordica*) .....4
- 4. Spores 11-13  $\mu\text{m}$  long, pileus brownish-ochre, olivaceous-brown to reddish-brown. Common in southern broad-leaved woodlands (widely known as *C. pseudosalor*) ..... ***C. mucifluoides***
- Spores 13-16  $\mu\text{m}$  long; very similar to previous species, usually very glutinous and with darker brown cap colours. Confined to acid northern conifer/birch woodland, esp. with *Picea*; British frequency unknown..... ***C. integerrimus***
- 5. Pileus dark grey-brown, umber, hardly viscid; lamellae livid-clay, stipe white, spores 10.5-13

\* = Not known in Britain

**DESCRIPTIONS OF SPECIES**

**Section Myxacium**

**Stirps Colliniti**

Four species are discussed here; three other boreal species are included in *Funga Nordica*.

***C. collinitus*** (Sowerby:Fr.) Gray (Fig. 2)  
ss. J.E. Lange, *non sensu* Sowerby *nec* Fries  
(= *C. muscigenus* Peck)  
(= *C. caerulipes* (A.H. Smith) Bidaud *et al.*)

The warm orange-brown (very glutinous) pileus combined with pinkish-violaceous bands of veil on the stipe of this *Picea* associate could possibly lead to confusion with species of section *Defibulati* such as *C. integerrimus* or *C. mucifluoides*. However, the veil tends to break into thick glutinous girdles and has clamp connections, as in *C. trivialis*. Its spores are amygdaliform, 13-16 x 7.5-9.5  $\mu\text{m}$  and coarsely warted. In the UK, this rare species seems to be more or less restricted to Scotland, with records from the south few and rather doubtful. Orton (1955) allowed hardwood hosts, but it is probable these were misidentifications, possibly also the records with *Pinus* cited in CBIB.



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Fig. 2. *Cortinarius collinitus*, an uncommon northern species with lavender bands of glutinous veil on the stipe and warm, orange-brown tones in the the pileus. Hermitage, Inver, Perthshire, Scotland, September 1988. Photograph © Alan Outen.



Fig. 3. *Cortinarius alpinus* (= *C. favrei* sensu CBIB) collected by Liz Holden, Loch Etchachen, Northern Cairngorms, Scotland, September 2000, growing with dwarf *Salix*. Photograph © Alan Outen.





Fig. 4. *Cortinarius mucosus*, a northern species associated with *Pinus* and one of the more easily recognisable species in the group. Inverey woods, Aberdeenshire, Scotland. Photograph © Geoffrey Kibby.



Fig. 5. *Cortinarius trivialis* showing the characteristic bands of velar material on the stipe and the often lavender lamellae when young. Under *Salix* by a pond, Kindrogan, Perthshire Sept. 2008. Photograph © Antony Burnham.

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**Nomenclatural note on *C. collinitus***

There are long-standing problems with the use of this name. Sowerby's (1797) original description and illustration is of a species growing with *Quercus* in Honour Oak Park, Peckham, SE London; clearly not the species described here. In CFP Vol. 2 there is a long discussion as to the benefits of retaining the name in the sense of Lange (1938), rather than attempting to interpret Sowerby's description. We follow CFP, *Funga Nordica*, Moser etc in adopting Lange's concept of *C. collinitus*. In CFP Vol. 1 pl. A34 this species was called by the later name *C. muscigenus* Peck (1888), amended in Vol. 2 to *C. collinitus*. Bidaud *et al.* (2000) reject the name *C. collinitus* and choose instead to raise *C. collinitus* var. *typicus* f. *caerulipes* A.H. Smith to species level, but this is clearly predated by *C. muscigenus* Peck. The latter was convincingly demonstrated by Bendiksen *et al.* (1992) to be the same as our European taxon. To accommodate Fries' concept (which is neither that of Sowerby nor that of Lange but of a taxon close to what we now call *C. trivialis*), Bidaud *et al.* (2000) have erected a further species: *C. collinitoides*. Bidaud, in Bon (2001) considers the *C. muscigenus* of B&K5 Fig. 283 to be in fact *C. collinitoides*.

***Cortinarius alpinus* Boudier ss. auct. (Fig. 3)**  
(= *C. favrei* D.M. Henderson)

Recognised by its growth with dwarf *Salix* in montane habitats, its pileus is glutinous, dark red-brown to olivaceous-brown or even blackish-brown at centre. The stipe is white, rarely faintly violet, glutinous but with the veil soon drying and cracking. Spores are 11.5-14 x 7-8.5  $\mu\text{m}$ . In CBIB this species is listed under the later name *C. favrei*, accepting the argument in B&K Vol.5 that the true *C. alpinus* of Boudier is a distinct but rare species with larger spores, rediscovered in the Alpes Maritimes in the 1970's. We here accept the counter-argument (Peintner 2008) that Boudier's spore measurements over a wide range of species are known to be on average 10% too high, and that no herbarium material can be traced, new or old, to justify two different species. We retain *C. alpinus sensu* Boudier in our key however on the chance that a large-spored taxon really does exist

in the Alpes Maritimes, awaiting rediscovery.

***C. mucosus* (Bull.) J.J. Kickx (Fig. 4)**

The dark orange-brown colours of this large glutinous species, combined with white veil on the stipe and long spores (11.5-14(14.5) x 5.5-7(7.5)  $\mu\text{m}$  with a Q of about 2) make it difficult to confuse with other species of this section. The typical habitat is with *Vaccinium* on rather dry, poor soils, often in lichen-dominated sites with 2-needled *Pinus* spp., as in the illustrated collection from Inverey Woods, Aberdeenshire. It may well be a good indicator species for ancient Caledonian pinewoods, as it seems mostly restricted to Scotland in the UK, and a considerable proportion of the records on the Fungal Records Database (<http://www.fieldmycology.net/FRDBI/FRDBI.asp>) are from localities rich in stipitate hydroid species characteristic of such woods.

In more alpine areas consider also the broadleaf associates *C. alpinus*, *C. grillipes* and *C. fenmoscandicus* (see Key).

***Cortinarius trivialis* J.E. Lange (Fig. 5)**  
(? = *C. fulvosquamosus* P.D. Orton)

In the broad sense as treated here, one of the more easily recognisable species of *Myxacium* by virtue of its brown-girdled stipe caused by the rupturing of the glutinous veil, plus habitat typically with *Salix* or *Populus* but also recorded with other hardwood hosts. Spores are 10.5-12.5(13) x 6-7(7.5)  $\mu\text{m}$ . Orton (1977) described a closely related species *C. fulvosquamosus*, paler coloured, particularly in its stipe, which is almost white and with longer spores 12-15 (16)  $\mu\text{m}$  long, associated with *Salix* in sandy coastal habitats. Collections are recorded from Scotland, Wales and England. It is listed in CBIB but *C. trivialis* is so variable, with numerous varieties in the literature that might fit Orton's species, that we choose not to include it separately here, pending the results of molecular studies currently being undertaken by a Nordic group (K. Bendiksen pers.comm.).

Bidaud *et al.* (2000) cover this section of *Myxacium*, and consider *C. trivialis s.str.* to be a taxon without violet in the gills. Lange (1938) described the lamellae as 'livid grey', but it seems likely that - as is common in other species - the



lavender hue is variable and fugitive. Certainly forms are found in the field with quite bright violet lamellae and names exist in the literature for these taxa. A good introduction to the intricacies of this complex is the key to Section *Colliniti* in Tartarat (1988: 55-62).

### ***Stirps Defibulati***

Eight species are discussed here, one of which is rejected and one doubtful. There are a number of unresolved taxonomic and nomenclatural problems. The treatment below is based on several recent works (noted in the descriptions) and we believe represents the current state of knowledge in a still fluid situation. It differs in some respects from both CBIB and *Funga Nordica*. Further molecular studies are badly needed in this group.

### ***Cortinarius arvinaceus* Fr.**

There are considerable problems with this name, for which we can find no convincing modern interpretation. Most describe it, wrongly, as a bright yellow-capped species, with a white stem (possibly flushed palest violet), but they disagree on habitat and spore size. B&K5 have small spores 9.5-13.7 x 6.2-8.2  $\mu\text{m}$  and state that it is confined to chalk soils under *Fagus*. Bidaud, in Bon (2001) thinks that the illustration in B&K5 might be his provisional taxon *C. melleicolor*, while Bidaud *et al.* (2000) describe it with spores 12-14(16) x 7.5-9.5  $\mu\text{m}$  and habitat with *Quercus* and *Carpinus* on sandy-calcareous soils. Soop (2004) does not mention spore size but shows a very bright yellow slender taxon growing with pine in acid soils along with one of the reindeer lichens. Ricken (1910-15) has the largest spores at 15-17 x 8-9  $\mu\text{m}$ . He alone agrees with the type description (Fries, 1838) in describing and illustrating a species under *Fagus* with a tawny orange cap ("*aurantio-fulvus*" of Fries). The current interpretation of this species as bright yellow may have arisen from Fries' reference to Plate 73 (figs 16-18) of Krombholtz (1831-1846) which does indeed show a bright yellow pileus. However, Fries only states that it agrees "*e statura*" and says he has never seen it painted: "*fucatam non vidi*" (he may have seen

an early uncoloured plate of Krombholtz' work which wasn't published until eight years after Fries' description). Even Krombholtz himself describes the cap of *C. arvinaceus* as "*aurantio-fulvus*" despite the garish yellow colouring of the plate. *Funga Nordica* do not include the species at all and it seems likely that *sensu* Fries/Ricken it might be just a white-stemmed form of one of the normally violet-stemmed species. The name might better be abandoned as a *nomen dubium* and the bright yellow taxa with hosts other than *Fagus* illustrated by Soop and B&K5 given new names. Several yellow-capped species have been described by Bidaud *et al.* (2000), one of which might well fit their concepts. Specimens have been recorded as *C. arvinaceus* from several localities in England, Scotland and Northern Ireland usually associated with *Fagus* (one of these is shown on the front cover of this issue of FM). For the time being however we reject this name as a *nomen confusum*.

### ***Cortinarius elatior* Fr. (Figs 6 & 7)**

A large species (4-12 cm across), uncommon in



Fig. 6. A painting of *C. elatior* in Fries (1877-84) showing the coarsely radially wrinkled pileus, deep brown gills and radiant stipe with veil dispersed as ragged bands. The violaceous tones in the print appear to have faded to greys.

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Britain in our experience, usually associated with *Fagus* and other broad-leaved trees. Orton (1955) correctly pointed out that Fries was quite specific in his description of the species: it should have a conical, strongly radially wrinkled brown pileus, sometimes flushed violet; lamellae dark amber



Fig. 7. *Cortinarius elatior* collected under *Fagus*, compares very well with the painting in Fig. 6, especially the dark pileus with deep wrinkling and the dark amber lamellae. Photograph © Shelley Evans.

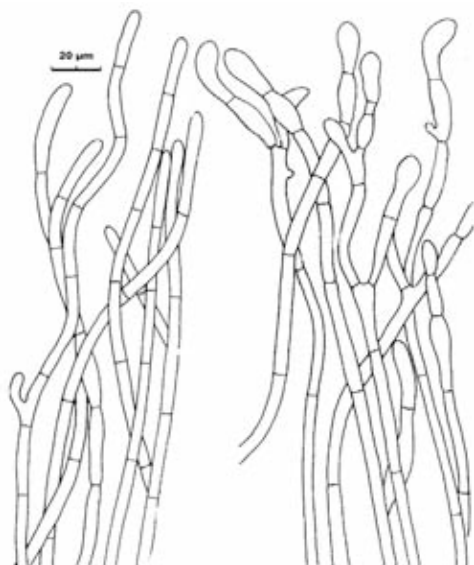


Fig. 8. Left: cuticular hyphae of *C. elatior* showing long narrow hyphae with narrow apical cells. Right: cuticular hyphae of *C. mucifluoides* with shorter, often forked cells and swollen apical cells. After Consiglio *et al.* (2006).

brown to purplish-brown and strongly interveined when mature; stipe radicate with the sticky, violet surface veil breaking up into ragged floccose zones and scales. The spores are 12-14 (15) x 7.5-9.5 (11) µm, limoniform and coarsely warted. The macroscopic features are well illustrated in the plate in Fries (1877-84), reproduced here (Fig. 6). Note that as is common in many of Fries' plates the violaceous tints seem to have faded to grey. These same characters can be seen in the photograph of the collection by Shelley Evans (Fig. 7).

The pileus cuticle consists of an ixotrichoderm (more or less vertical hyphae embedded in a viscous slime) and the width and length of these hyphae can be helpful in differentiating species within this group (see Kärcher, 2004 and Consiglio *et al.*, 2006). In *C. elatior* they are 3-5 µm in width, with narrow apices and with relatively few septa (Fig. 8). Compare these with those of *C. mucifluoides* in the same figure.

This species was called *C. livido-ochraceus* in CFP and hence in CBIB. But we agree with Kärcher (2004) that *C. livido-ochraceus* is a separate and usually much smaller taxon which may turn out to be not uncommon in Britain (see description below).

### *Cortinarius grallipes* Fr.

(? = *C. septentrionalis* of CFP)

This is a rarely reported species described by Fries (1838) as having a viscid, hygrophanous and umbonate pileus, orange-brown when wet, ochre when dry; stipe long, viscid, and yellowish with age. He found it in mixed woods of *Quercus/Populus*.

A recent concept is that of Moser (2001) who has a very good painting and describes it from mixed *Fagus/Betula* woods in Sweden. Its spores are 9.4-14.7 x 6.5-7.7 µm. This description and painting and the original description of Fries both agree remarkably well with *C. septentrionalis* of CFP which we therefore regard as a potential synonym.

There is a British record of *C. grallipes* by Cooke (1881-91 Vol. 5: 738 (734)) but his plate looks very strange, possibly showing a species of *Pholiota*. There is no real evidence that it occurs in Britain. Soop maintains *C. grallipes* as different



from *C. septentrionalis*, oddly describing it as smaller, paler and more olivaceous, which does not agree at all with Fries' description.

***Cortinarius integerrimus* Kühner.**

(= *C. stillatitius* Fr. *sensu auct. p.p.*) (Figs 9 & 19)

A northern species usually associated with *Picea*, but also *Pinus* and *Betula*. Its frequency in Britain is unknown but there are several Scottish collections at Kew. Distinguishing features include the dark brown, extremely glutinous pileus, lamellae with bluish-lilac edges and a smooth stipe with deep violet glutinous veil. Its spores are 13-16 x 7-9  $\mu\text{m}$  (compare particularly with *C. mucifluoides* which has smaller spores and with which it has been confused).

*Funga Nordica*, CFP and CBIB use the name *C. stillatitius* Fr. in a broad sense to include this species and also *C. mucifluoides* (see below). Thus CFP pl. A33 is this. But there is a problem with the name *C. stillatitius* since Fries (1838) described it as a rare species with pileus coated in



Fig. 9. *C. integerrimus* showing the extremely glutinous veil on pileus and stipe. A large-spored species found with *Pinus* or *Betula* in northern woods. Faskally, Perthshire, Scotland, September 2008. Photograph © Geoffrey Kibby.



Fig. 10. *Cortinarius livido-ochraceus*, a painting presumed to be of Berkeley's type collection, filed with it at Kew. Actual size. Reproduced with the kind permission of the Royal Botanic Gardens, Kew.

a bluish slime, which doesn't really fit either of these species. We thus follow Marchand (1983) and Soop (2004) in using Kühner's unambiguous name *C. integerrimus* (considered invalid in *Funga Nordica*, but Kühner (1989) supplied a validating latin description). Some more northerly British records of *C. pseudosalor* almost certainly refer to this species, even if most are of the species here called *C. mucifluoides*.

***Cortinarius livido-ochraceus* (Berk.) Berk.**

(? = *C. pumilus* (Fr.) J.E. Lange). (Fig.10)

Described by Berkeley from broad-leaved woods at King's Cliffe, Northamptonshire, this taxon was considered in both CFP and *Funga Nordica* to provide an earlier name for *C. elatior*. We agree with Kärcher (2004) that this is unlikely. The original description is of a species approximately 2.5 cm across and of a similar height, with a smooth, shining livid-ochraceous pileus and a swollen-tapered, smooth violet stipe. We have examined the type material at Kew and found the spores to be (9)10-12(13) x 6-7(8)  $\mu\text{m}$ . This

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disagrees with the smaller size of 8-10 x 5-6  $\mu\text{m}$  given by Cooke (1883: p.250) who said "The large size given in some books for the spores of this species must be an error". The description in Orton (1955) with even smaller spores 7.5-9 x 4.5-5 must refer, at least in part, to a different taxon entirely.

By contrast Kärcher found larger spores 11.5-14(15) x 6.5-8  $\mu\text{m}$  in his study of a collection agreeing with the type description. He also found that a study of the DNA of collections assigned to *C. elatior*, *C. livido-ochraceus* and *C. mucifluoides* supported their separation as species. Kärcher found the cuticle of his concept of *C. livido-ochraceus* to have broad hyphae 4-9  $\mu\text{m}$  across with end cells sometimes swollen. Examination (by G.K.) of the type material in the herbarium, Kew was unsuccessful in determining the nature of the veil hyphae due to the age and poor condition of the dried material. *C. livido-ochraceus* may well be a frequent species in British broad-leaved woodlands.

Cooke (1886, Vol 5: pl 739(767)) appears to illustrate a collection without violet on the stipe and this plate has been commented upon and



Fig. 11. *C. mucifluoides* with mainly smooth, unwrinkled pileus, pale lamellae and smooth violaceous stipe. Epping Forest, Essex. Photograph © Geoffrey Kibby

referred to by others (Kärcher, Bidaud *et al.* etc), but the discovery of Cooke's original plate in Kew reveals that he actually painted it with a violet stipe and cap as per Berkeley's description (see back cover). It was during the subsequent reproduction in his book that the violet tones were lost.

*Cortinarius pumilus* (Fr.) J.E. Lange is separately listed in CBIB, but we agree with Kärcher that it is likely to be a synonym. The name means 'dwarf'. At species rank it dates only from Lange (1938), see his Plate 89D.

***Cortinarius mucifluoides*** (Rob. Henry) Rob. Henry (Fig. 11)

(= *C. stillatitius* Fr. *sensu auct.*)

(= *C. pseudosalor* J.E. Lange *sensu auct. mult.*)

(= *C. konradianus* Bidaud *et al.*)

We consider this the best name for the common species found chiefly under *Fagus* in the southern counties, listed in CBIB as *C. stillatitius* but more widely known as *C. pseudosalor*. That species was described by Lange from only one collection (and hence for him a rare species) in a wood of *Corylus* and *Quercus*. Although it might well be the same species as that described here, we follow Marchand (1983), Kärcher (2004) and Consiglio *et al.* (2006) in using Henry's name which has a full description with microscopic details. Lange's description lacks much of the detail needed for a determination. *C. mucifluoides* resembles a smaller *C. elatior* with pileus 3-7 cm across, honey-brown to reddish-brown, smooth to only slightly wrinkled. The lamellae are pallid greyish-ochre to pale rust brown. The stipe is fusiform-radicant, with a smooth, viscid violaceous veil which only disrupts upon drying. Its spores are 11-13 x 6.5-7.5  $\mu\text{m}$  and the cuticular hyphae are 5-7  $\mu\text{m}$  across with numerous septa and swollen end cells (Fig. 9). Kärcher's DNA investigations support the separation of this species from *C. elatior*.

***Cortinarius mucifluus*** Fr. (Fig. 12?)

(= *C. pinicola* P.D. Orton)

This species is found under *Pinus* in Scotland, rarer in the south and was described by Fries as "*Pileus livido-argillaceus*", i.e. blue-grey to clay. Soop broadly agrees with this, describing it as "pale grey-brown....margin greyish-white". Fries



Fig. 12. A collection by Antony Burnham from Inverey, Perthshire, Scotland, Sept. 2008 agreeing with Orton's description of *C. pinicola*: "Pileus ochraceous buff to tawny ochraceous.....the [stipe] scales being small and set rather closely". *C. pinicola* has been synonymised with *C. mucifluus* which is shown with a smoother, paler stipe in most illustrations. Photograph © Geoffrey Kibby.

goes on to describe the stipe as "*albus l. coeruleus*", i.e. white or becoming bluish (*l.* is an abbreviation for *vel* = or). Most subsequent authors have ignored the fact that its stipe can include blue in its colour range. Like other members of this group the flesh of the stipe has a strong odour of honey when bruised or rubbed. It has very large citriform spores 12-16 (17) x 7-8.5 (9)  $\mu\text{m}$ . When Orton (1960) described *C. pinicola* he wrote "I think it may be *C. mucifluus* in the original sense of Fries (1838) or at least its main component". But he preferred to reject *C. mucifluus* as a *nomen confusum*. Bidaud *et al.* (2000) treat *C. pinicola* as a variety of *C. mucifluus*, differing in darker colours, though Orton described it as "ochraceous buff to tawny ochraceous".

***Cortinarius zosterooides* P.D. Orton**

(? = *C. collinitus* sensu Sowerby)

(? = *C. elatior* forma *ochraceoplicatus* Bidaud)

Seemingly known only from the five collections cited in Peter Orton's type description in 1983. Katriina Bendiksen (pers. comm.) has examined the type and found it to lack clamp connections

and to possess large, inflated cells on the lamellae margins, placing it in stirps *Defibulati*. It is distinguished by its rather pale, conical pileus, 3.5-8.4 cm across, saffron, sienna or fulvous, paler at the margin and soon strongly wrinkled-striate at least at the margin. The lamellae are deep buff to fulvous-cinnamon. The stipe is slightly ventricose-attenuated, whitish-buff becoming silky-flocculose scaly at the apex, smooth and glutinous below and breaking up into pale cream concentric, sometimes ragged bands (giving rise to the species name from the Greek 'zoster', a girdle). The flesh is whitish and apparently without smell. The spores are 12-15(16) x 7.5-9(10)  $\mu\text{m}$  according to Orton, 12-13.8 x 7.1-8.5  $\mu\text{m}$  as measured by K. Bendiksen. Orton recorded it as growing apparently with *Quercus* in Hampshire and Norfolk. The large spores and wrinkled conical pileus would place it close to *C. elatior* and there is a form of that species - *forma ochraceoplicatus* described in Bidaud *et al.* (2000) which appears to fit Orton's description very well. It might also conceivably be the same as Sowerby's *C. collinitus*, which his painting shows associated with an oak leaf and with bands of pale gluten on the stipe.



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Fig. 13. *Cortinarius delibutus*, young specimens with bright yellow pileus and violet-lilac hues in the young gills and upper stipe. A common species growing with *Betula* throughout Britain. Common Wood, Oxfordshire, 18 October, 2006. Photograph © Penny Cullington.



Fig. 14. *Cortinarius emunctus*, a beautiful species with very glutinous bluish-grey pileus and stipe. In *Betula* and *Populus tremula* woodland at Faskally, Perthshire, Sept. 2008. Photograph © Geoffrey Kibby.

## Section *Delibuti*

Five species are listed as British in CBIB, of which we here recognise four. Molecular studies may well expand this number. All are rather similar and only *C. delibutus* is at all commonly recorded. The group is distinguished by its subglobose spores (Fig. 1) and yellowish or blue universal veil.

### *Cortinarius betulinus* J. Favre

Discussed at length in FM 6(1):3-4 (Kibby, 2005), this is a paler, duller species than *C. delibutus*, with more greyish or bluish-ochre colours. It also differs from *C. delibutus* in having an ixotrichoderm of more or less vertical incrustated hyphae in the pileus cuticle. In *C. delibutus* the cuticle consists of hyphae running parallel to the pileus surface. Known from Scotland and the Quantock Hills in Somerset. Likely to be northern in its distribution and with *Picea* as well as *Betula*.

### *Cortinarius delibutus* Fr. (Fig. 13)

Easily the commonest species in the section, its egg-yolk yellow cap and veil contrast beautifully with the pale violet young gills. Its spores are 6.5-9.5 x 6-7  $\mu\text{m}$ . However, the degree of violet pigmentation in *Cortinarius* species can be quite variable, so this may prove to be an unreliable character for species discrimination. As a number

of forms exist, the species may well turn out to be a complex of closely related taxa. Close to *C. delibutus* (identical?) are *C. illibatus* Fr. (B&K5: 280), whitish-cream with pinkish gills when young and *C. subdelibutus* P.D. Orton, which lacks pinkish or violaceous tones in all parts of the fruitbody. The latter is synonymised with *C. illibatus* in CBIB while *C. illibatus* is mentioned in *Funga Nordica* but is not distinguished from *C. delibutus*, so for the moment we exclude both.

### *Cortinarius emunctus* Fr. (Fig. 14)

A handsome species with greyish-violet colours, typically described in the literature as looking like a viscous *C. alboviolaceus*. Scarcely known in Britain (Scotland only), our collection was from *Betula* and *Populus tremula* woodland at Faskally, Perthshire, although Soop (2004) considers it to be a *Picea* associate. This species is distinguished from similar species in the section by not decolouring to greenish or yellowish, and by the hyphae of the veil lacking incrusting pigment. This collection had subglobose spores 6-7 x 5-6  $\mu\text{m}$  with  $Q = 1.1-1.3$  for 80% of the spores.

In some texts this species is called *C. epipoleus* (e.g. B&K5 278). For Consiglio *et al.* (2004) *C. emunctus* is a taxon with larger spores (> 8  $\mu\text{m}$  long). We follow the interpretation of CFP, CBIB



Fig. 15. *Cortinarius emunctus* as illustrated in Fries (1877-84), showing the bluish-grey colours, umbonate pileus and clear apical zone. Reproduced courtesy of the Royal Botanic Gardens, Kew.



Fig. 16. *Cortinarius epipoleus* in Fries showing the darker colours and more textured pileal surface. Reproduced courtesy of the Royal Botanic Gardens, Kew. [The two fruitbodies have been repositioned to fit the page].



Fig. 17. *Cortinarius salor*, a rare species in Britain distinguished by its strong violet hues on pileus and stipe, combined with subglobose spores. Growing near mixed broad-leaved trees on calcareous soil at Queendown Warren, Kent, Oct. 2008. Collected by Jo Weightman. Photograph © G. Kibby.



Fig. 18. *Cortinarius croceocaeruleus* is a member of Section *Vibratiles* macroscopically similar to *C. salor* (Fig. 17) but with ellipsoid spores (Fig. 1). Photograph © Alan Outen.

and *Funga Nordica*. The type description of *C. emunctus* stresses the stipe apex as 'nude', and the illustration in Fries clearly shows a sharp contrast between the veil and the white flesh above (Fig. 15). Our collection conforms to this. In contrast, Fries' description of *C. epipoleus* makes no mention of this character and the colour plate demonstrates this (Fig. 16). Fries goes on to describe the pileus of *C. epipoleus* as 'almost silky', and the illustration shows radial colour variations, most unlike our species which has more or less even coloration. Therefore we suggest that the interpretations of *C. emunctus* and *C. epipoleus* in both Bidaud *et al.* (1992) and Consiglio *et al.* (2004, pl. B53 & B55) might be the wrong way round. Given the uncertainty of interpretation of *C. epipoleus* it might be better to abandon it as a *nomen confusum*. Some consider it to provide an earlier name for *C. transiens* (Melot) Soop (formerly a variety of *C. salor*), which is an olivaceous species with a clavate stipe, reported from one locality in Scotland but awaiting confirmation.

#### *Cortinarius salor* Fr. (Fig. 17)

A rare species with a colour scheme reminiscent of *Inocybe lilacina* (deep violet, fading to ochraceous-yellow at the centre of the cap). There are very few records for the UK. A recent collection by Jo Weightman from Queendown Warren in Kent showed the purple colours vividly at first, but faded to a duller hue by the time the photo was taken a day later. Another purple and blue coloured *Myxaciium* with which it might be confused is *C. croceocaeruleus*, a member of Section *Vibratiles*, bitter tasting and usually with *Fagus* (Fig. 18). In contrast, the taste of this collection of *C. salor* was unpleasant but not bitter.

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Fig. 19. Painting of *Cortinarius integerrimus* collected in woods near Sheffield, 2006. Painting © Geoffrey Kibby



Comparison of the original painting of *Cortinarius livido-ochraceus* (left) as produced by Cooke and discovered in the herbarium at Kew, and (right) the plate as it appears in the printed volume of Cooke's *Illustrations of British Fungi*. In the printed version all of the violet tones in the viscid coating on the caps and stems have vanished. This has led to confusion in recent treatments of this species where it was thought that Cooke had conceived it as not being violaceous. Reproductions courtesy of the Royal Botanic Gardens, Kew.