

NOTES ON CANTHARELLUS SECT. LEPTOCANTHARELLUS

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Cantharellus sect. *Leptocantharellus* Peck is an earlier name for *Cantharellus* subgen. *Phaeocantharellus* Corner. The European species fall apart in two groups (Lepto-Plicati and Lepto-Phlebini) on the basis of the hymenophoral configuration. Most of the older names provided in profusion for the few European species of the section are scrutinized for the correctness of their application. The author prefers the name *Cantharellus tubaeformis* Fr. 1821 for what is often treated as two (or more) species, *C. tubaeformis* and *C. infundibuliformis*; he selects the name *C. xanthopus* (Pers.) Duby for *Craterellus lutescens* sensu Fr. Attention is drawn to what may appear to be a distinct species, viz. *C. melanoxeros* Desm.

The following is not a thorough taxonomic treatment of the section mentioned above. A more correct title for this paper would perhaps have been, 'Notes on the correct interpretation of most of the specific names proposed for European species of *Cantharellus* sect. *Leptocantharellus* Peck.' These notes form a kind of precursor to another paper now in preparation.

CANTHARELLUS SECT. LEPTOCANTHARELLUS PECK

Cantharellus subtrib. *Phlebini* Fr., Elench. 1: 50. 1828, in part. — Lectotype: *Cantharellus lutescens* (Pers.) per Fr. sensu Fr., Syst. mycol. 1: 320. 1821.

Cantharellus sect. *Leptocantharellus* Peck in Bull. New York St. Mus. 1 (2): 35, 40. 1887. — Lectotype: *Cantharellus infundibuliformis* "Scop." [sensu Peck].

Cantharellus sect. *Infundibuliformes* Konr. & M., Ic. sel. Fung. 6: 504. 1937 (lacking Latin description). — Lectotype (Heinemann in Bull. Jard. bot. Brux. 28: 421. 1958): *Cantharellus tubaeformis* "Fr. ex Bull." [sensu Konr. & M.].

Cantharellus sect. *Tubaeformes* Sm. & Morse in Mycologia 39: 500. 1947 (lacking Latin description; "*Tubaeformis*"). — Lectotype: *Cantharellus tubaeformis* Fr.

Cantharellus subgen. *Phaeocantharellus* Corner, Monogr. canth. Fungi 30, 60. 1966. — Holotype: *Cantharellus tubaeformis* Fr.

The few European representatives of this section belong to the most common mushrooms and it is therefore not very surprising, that they have been so badly confused that digging into their history and nomenclature drives even an old hand at such matters to utter despair. Not willing to accept defeat I have tried to bring some order out of the chaos, but I am not convinced that I have succeeded satisfactorily.

The section embraces the 'thin' cantharelles, viz. those in which the stalk of the fruitbody soon becomes hollow and the fruitbody itself more or less tubiform and usually perforated above the stalk. The species have been placed there and back

in *Cantharellus* [Adans.] Fr. and *Craterellus* Pers. In one of them the hymenium varies from almost smooth to more or less strongly radially veined but the veins never become really broad and gill-like. Fries placed this species in *Craterellus* and it has since served as a magnet that has attracted other, obviously related, species to the genus. These, the other species of the section, have the strongly folded hymenium of the same type that is found in the well-known *Cantharellus cibarius* Fr., the type species of the genus *Cantharellus* and of *Cantharellus* sect. *Cantharellus*. In the latter section the stipe (as a rule) remains solid (or may become softer-spongy within) and the cap does not become perforated. Section *Cantharellus* shows precisely the same variation in hymenial configuration. For a long time most authors have placed the species of section *Leptocantharellus* with the strongly folded hymenophore alongside *C. cibarius* in the genus *Cantharellus*.

Corner (1966: 30, 60) recently raised section *Leptocantharellus* to the rank of a subgenus which he called *Cantharellus* subgenus *Phaeocantharellus* Corner. In my opinion the epithet he preferred is not an improvement upon Peck's, not only because the prefix 'Phaeo-' is usually associated with dark-coloured spores, but also because some species or forms lack the pigments that render the surface of the cap "brown, grey, fuscous, fuliginous, or black". These colours are lacking in *Cantharellus melanoxeros* and may occasionally be absent in the other species in which cases the cap is nearly always yellow.

I considered treating this group as a distinct genus. For the present, however, there are enough unanswered objections for remaining conservative. For instance, I have found it difficult to fit *Cantharellus subramosus* (Bres.) Britz. into the above scheme. This was originally described as a mere variety of *C. tubaeformis* (Bresadola, 1887: 87 pl. 97, as "*Cantharellus infundibuliformis* Scop. var. *subramosus* Bres.") and the closely related (but perhaps not specifically distinct) *C. ianthinoxanthus* (Maire) Kühner.

The European species can easily be divided into two stirpes on the basis of the hymenial configuration. I prefer to call them Lepto-Plicati and Lepto-Phlebini in order to keep them apart from the corresponding stirpes of *Cantharellus* sect. *Cantharellus* (Eu-Plicati and Eu-Phlebini). In the former group the hymenium is thrown into the well differentiated, almost gill-like, and rather distant folds that are typical of *Cantharellus cibarius*. An example of the Lepto-Plicati is *Cantharellus tubaeformis* Fr., often also called *C. infundibuliformis* (Scop.) per Fr. The Lepto-Phlebini have a hymenium that may remain almost smooth, though it is usually thrown into much more irregular and always low, vein-like (rather than gill-like) folds. This latter hymenial configuration is found in "*Craterellus*" *lutescens* sensu Fr. It is not my intention to establish these 'stirpes' as taxonomic subdivisions of sections *Cantharellus* and *Leptocantharellus*; here they are distinguished merely for the sake of convenience in order to make it possible to indicate briefly the two hymenophoral types.

In the present paper the following European species are taken into consideration:

1. Hymenium becoming strongly folded, the principal folds resembling thickish and obtuse gills comparable with those of *Cantharellus cibarius*. **Lepto-Plicati**.—*Cantharellus tubaeformis* Fr., *C. melanoxeros* Desm., *C. cinereus* Pers. per Fr.
1. Hymenium remaining almost smooth or usually becoming strongly wrinkled by vein-like folds. **Lepto-Phlebini**.—*Cantharellus xanthopus* (Pers.) Duby [= *Craterellus lutescens* (Pers. per Fr.) Fr. sensu Fr.].

aurora. — *Agaricus aurora* Batsch, Elench. Fung. 94, 175 pl. 9 f. 36. 1783 (devalidated name); ≡ *Merulius aureus* Pers. 1825.

This was originally published as *Agaricus aurora* Batsch; the protologue is sufficiently detailed to identify it with Fries's "*Craterellus*" *lutescens* (= *Cantharellus xanthopus*). The figure is very poor and in Persoon's copy of Batsch's book it is so strongly reddish coloured on stalk and hymenium that it is not really surprising that Persoon did not venture to identify it with his own *Merulius xanthopus* (q.v.). This difference in colour is really impressive if Persoon's figure of *Merulius xanthopus* is compared side by side with that of *Agaricus aurora*. By contrast, however, Batsch's description is to the point; for instance, "Der Adern sind wenig, und sie haben mehr die Gestalt von Runzeln". Moreover, "*Craterellus*" *lutescens* does vary in colour. Many freshly collected specimens often show the golden yellow hymenium as though Dawn with her rose-tinted hands had lit it. Compare also Fries (1838: 532, sub *Craterellus lutescens*): "Hymenium luteum; in rubellum [!], aurantium l. caesium vergens".

Persoon maintained Batsch's species under a slightly altered name without having seen any specimens.

aureus, see *aurora*.

cantharelloides. — *Helvella cantharelloides* Bull., Herb. Fr. pl. 473 f. 3. 1789 (devalidated name); *Agaricus cantharelloides* (Bull.) Sow. 1796 (devalidated name), not *A. cantharelloides* Bull. 1790 (devalidated name); *Merulius cantharelloides* (Bull.) per Purt. 1821; *Craterellus cantharelloides* (Bull. per Purt.) Quéf. 1896.

Below, this taxon is mentioned repeatedly. Persoon (1801: 489) cited it in the synonymy of his *Merulius lutescens* (see p. 270); I have tried to demonstrate that it is a yellowish form of *Cantharellus tubaeformis* Fr. 1821. As pointed out on p. 271, Fries (1821: 320) at first cited Bulliard's species as representative of his conception of *Cantharellus lutescens* (Pers.) sensu Fr. (= *C. xanthopus* Pers.), where it clashes with Fries's description under that name. Therefore, it is not surprising that Fries (1838: 366) later on listed it as representative of his new taxon *Cantharellus tubaeformis* **C. lutescens*, where it appears to fit in rather well.

cervinus. — *Merulius* **cervinus* Pers., Mycol. europ. 2: 20. 1825.

The protologue indicates, "Pileus in unico specimine hactenus a me reperto, non bene explicatus fuit, vix unc. 1 latus." No material under this name could be located in Persoon's herbarium, but there is a specimen (consisting of a single

fruitbody the cap of which is poorly developed) labelled thus: "*Merulius lutescens* ? var. / *Merulius tumidulus*: Species propria ? / *Merulius gilvus*. Mycol. Europ." (L 910.255-36). The name *Merulius gilvus* was not published in Persoon's "Mycologia europaea"; from general evidence I conclude that Persoon eventually rejected the epithet 'gilvus', replacing it with 'cervinus', and that the specimen mentioned represents the type of the name *Merulius cervinus*. The description and the rest of the protologue closely agree with it. The specimen represents Fries's "*Craterellus*" *lutescens* (= *Cantharellus xanthopus*).

In the original publication the epithet 'cervinus' was preceded by an asterisk. Authors have often taken this sign as an indication of a subspecies or variety, but in Persoon's publications, for various reasons (cf. Rogers & al., 1942: 3) it seems to denote instead a species difficult to insert at the correct place.

cinereus. — *Cantharellus cinereus* Pers. in Neues Magaz. Bot. 1: 106. 1794 (devalidated name); *Merulius cinereus* (Pers.) Pers., Icon. Descr. 10 pl. 3 fs. 3, 4. 1798 (devalidated name); *Cantharellus cinereus* (Pers.) per Fr. 1821.

The species is well known and has seldom been confused. It is the same species that Bulliard (1789: pl. 465 f. 2; 1791: 292) published as *Helvella hydrolips* Bull.

Persoon (1798: 10 pl. 3 fs. 3, 4) depicted a tuft of fruitbodies of which the central one was well-developed and much bigger than the others. It is likely that this big fruitbody has been lost, but that the small ones are among those glued to a sheet in Persoon's herbarium (L 910.255-14) bearing his own label, "*Merulius cinereus* Syn. fung." (Persoon, 1801: 490).¹

There are two other sheets in his herbarium with specimens that he assigned to this species. Judging by the handwriting, one (L 910.255-61) was sent by Raddi, "Espèce de *Merulius* très rare chez nous"; Persoon added, "*Merulius cinereus*, Syn. fung." The other (L 910.255-27) is labelled in Persoon's handwriting, "*Merulius cinereus*. *Helvella Hydrolips*. Bull."

All these specimens belong to the species in its current sense.

hispidulus. — *Merulius hispidulus* Scop., Fl. carn., Ed. 2, 2: 462. 1772 (devalidated name); Fr., Epicr. 366. 1838 ("*hispidus*"; as synonym); *Merulius hispidulus* Scop. per O.K., Rev. Gen. Pl. 2: 862 ("*hispidus*"); 3 (2): 494. 1898 (corrected).

Careful reading of the protologue does not readily suggest a species of section *Leptocantharellus*. I still hesitate to make up my mind about this. I would prefer

¹ European mycologists who have paid attention to clamp connections agree about the absence of clamps in *Cantharellus cinereus*; on this account it has even been transferred to *Pseudocraterellus* Corner. This and another specimen of Persoon's show the correctness of the current interpretation. No clamps were to be found either in the subhymenium or at the base of the basidia. *Cantharellus cinereus* of Corner (1966: f. 24) seems to be something else in view of the presence of clamp connections. I would conclude from the description that *Cantharellus fuliginus* Corner (1966: 65) from Borneo agrees more closely with the European conception of *C. cinereus*.

to enter the name as a nomen dubium. If it is assumed that there can be no doubt that a species of section *Leptocantharellus* is involved it could suggest Fries's "*Craterellus*" *lutescens* (= *Cantharellus xanthopus*), had not the hymenophore been described in precisely the same words as that of *Merulius cantharellus* (L.) Scop. ≡ *Cantharellus cibarius* Fr. Thus Fries (1821: 319; 1874: 457, "*hispidus*") might have been correct in referring it both to *Cantharellus tubaeformis* Fr. 1821 and to his later interpretation of this name (which is now often held to be the same as *C. tubaeformis* Fr. 1821). Kunze (1891: 862) re-introduced Scopoli's name for the Friesian conception of 1874, viz. Fries's second interpretation of *C. tubaeformis*, on the basis of Fries's disposition of Scopoli's name.

hispidus, see *hispidulus*.

infundibularis, see *infundibuliformis*.

infundibuliformis. — *Merulius infundibuliformis* Scop., Fl. carn., Ed. 2, 2: 462. 1772 (devalidated name); *Cantharellus infundibuliformis* (Scop.) per Fr., Epicr. 366. 1838; *Craterellus infundibuliformis* (Scop. per Fr.) Quél. 1888; ≡ *Merulius infundibularis* O.K. 1891.

The devalidated protologue is of interest in so far as it contains a very early, although brief, account of the development of an 'agaric' fruitbody:

"In prima aetate est stipes subulatus, flavus, parvulus gerens pileolum. Hic sensim crescens flavescit, marginem inflectit, in media deprimitur; adultus vero marginem elevat, lobatum facit."

The hymenophoral configuration is described in precisely the same words as that of *Merulius cantharellus* (L.) Scop. ≡ *Cantharellus cibarius* Fr.: ". . . lamellis venosis, ramosis . . .".

The concise description of the various stages of development of the fruitbody certainly suggests a species of section *Leptocantharellus* and the characterization of the hymenophore, just as the citation of Vaillant's plate 11, figures 9, 10, tend to exclude Fries's "*Craterellus*" *lutescens* (= *Cantharellus xanthopus*). The description in the first edition of Scopoli's flora (as reproduced in Scopoli's protologue) states, "*Agaricus* . . . luteus . . .", while the passage quoted above calls the cap 'flavescens'; no other colour indications are included. When Fries (1838: 366) accepted Scopoli's name as *Cantharellus infundibuliformis* he called the cap of the taxon to which he applied it "fuligineo-flavido" and evidently assumed that the yellow colour mentioned by Scopoli was restricted to the stalk and underside of the cap. The most convenient expedient, not positively contradicted by the scanty information available in Scopoli's account, is to agree with Fries's interpretation.

At first Fries (1821: 319) suppressed *Merulius infundibuliformis* and made it a synonym of *Cantharellus tubaeformis* Fr. Subsequently he re-introduced the name and distinguished between *C. tubaeformis* (re-defined) and *C. infundibuliformis* (Fries, 1838: 366) as follows:

Cantharellus tubaeformis, "pileo . . . flocculoso subfusco . . . , stipite . . . *aurantio-fulvente* . . . , lamellis . . . multifido-ramosis luteis fulgineisve nudis".

Cantharellus infundibuliformis, "pileo . . . floccoso-rugoso fulgineo-flavido . . . , stipite . . . *flavo*, lamellis . . . dichotomis flavis cinereisve, *demum pruinatus*".—Italics are as in the original.

From then on mycologists have tried to distinguish between the two. Notwithstanding opinion to the contrary, with Konrad (1929: 74–77) as its most energetic exponent, that only one species was involved, the two 'species' survive in many recent publications by European mycologists.

As it proved not really feasible to keep the two (or at least the fungi identified with them) apart according to the features emphasized by Fries (colour of stalk and pruinosity of the hymenophore) several other features have been introduced. Thus Ricken (1910: 3) believed that in *C. tubaeformis* the cap is never pervious, that the stalk is "fuchsgelb" (apparently a translation of 'aurantio-fulvens') and at first stuffed, and that it grows exclusively in frondose woods, while in *C. infundibuliformis* the cap is typically umbilicate-pervious, the stalk vividly yellow, and that it is to be found especially in coniferous woods. He also described the spores of *C. tubaeformis* as much narrower than in the other species. Konrad (*l.c.*) reviewed these as well as other so-called differences indicated by various authors and concluded that they were worthless, or non-existent, as in the case of the narrower spores claimed for one of the 'species' by Ricken. Konrad had the courage to recognize only a single species, which he called *C. tubaeformis*. Donk (1933: 9) pointed out that what Fries had originally called *C. tubaeformis* (1821) later became his *C. infundibuliformis* (1838) and that *C. tubaeformis* had been given a new meaning. He agreed with Konrad that the correct name for the common species was *C. tubaeformis* (1821) rather than *C. infundibuliformis* (1838).

For some further remarks on *C. tubaeformis* sensu Fr. 1838, see 'tubaeformis (bis)'.

lutescens. — *Merulius lutescens* Pers., Syn. Fung. 489. 1801 (devaluated name); *Cantharellus lutescens* (Pers.) per Fr., Syst. mycol. 1: 320. 1821 & Elench. 1: 51. 1828, misapplied, not *Cantharellus lutescens* (Fr.) Kickx 1867; *Merulius tubaeformis* var. *lutescens* (Pers. per Fr.) Pers., Mycol. europ. 2: 17. 1825; *Craterellus lutescens* (Pers. per Fr.) Fr., Epicr. 532. 1838, misapplied.

As will be shown below, Fries interpreted this species incorrectly when he revaluated the name as *Cantharellus lutescens* (Pers.) per Fr. What then did Persoon (1801: 489) describe as *Merulius lutescens*? His phrase runs, "pileo umbilicato glabro lutescente, venis cinereo-rutilis, stipite cavo luteo." The colour of the cap in combination with that of the hypophore at once rules out Fries's "*Craterellus*" *lutescens* (= *Cantharellus xanthopus*). Little is said about the exact nature of the veins (although it is worthy of note that these were called 'veins' rather than 'folds'). In his synonymy Persoon cited both *Helvella cantharelloides* Bulliard (1789: pl. 473f. 3) and *Agaricus cantharelloides* (Bull.) Sowerby (1796: pl. 47); these illustrations belong to the very best of those of *Cantharellus tubaeformis* Fries 1821. Persoon's citations

as well as his description of the hymenophore as "cinereo-rutilus" have convinced me that Persoon's fungus had the folds of the *Lepto-Plicati*.

This is not all, however. Persoon kept a specimen in his herbarium (L 910.255-37) annotated in his own handwriting, "*Merulius lutescens* Syn. fung. p. [489]. Decand. Syn. p. 26 / Automno in Sylvis." It clearly shows the gill-like folds of the *Lepto-Plicati*. In later work Persoon (1825: 17) subordinated his species to *Merulius tubaeformis* sensu Bull., which is incontestably characterized by gill-like folds ("plicis rectis lutescente-cinereis pruinatis"). Taken together all this evidence leads to the conclusions first, that the original *Merulius lutescens* Pers. is conspecific with, or at least close to, *Cantharellus tubaeformis* Fr. 1821, and secondly that there can be no doubt that Fries misinterpreted the Persoonian species when he revalidated the name by associating it with a description of a species with the vein-like folds of the *Lepto-Phlebini*, viz. *Cantharellus lutescens* sensu Fr. 1821 (= *Cantharellus xanthopus*).

The next step is to agree on precisely what form Persoon had in mind. The protologue states that the cap is 'lutescens'. This might point to *Cantharellus melanoxeros*, but in my opinion the references to the published coloured plates indicate rather that Persoon had before him the brown-capped species (*Cantharellus tubaeformis* Fr. 1821) suffused with a yellowish tinge such as occurs in forms (when young) that have a more brightly yellow hymenophore and stalk than is usual. Thus it was the same form that Fries was later to call *Cantharellus lutescens* Fr. 1838 (*q.v.*) and which I interpret as merely an insignificant form of *Cantharellus tubaeformis* Fr. 1821. The above closely agrees with Persoon's own conclusion (1825: 17), in which he finally reduced his *Merulius lutescens* as a variety to *M. tubiformis*, citing *Helvella cantharelloides* Bull. (1789: pl. 473 f. 3) under the variety with the remark "var. luxurians".

Fries's revalidating description (1821) of the name *Cantharellus lutescens* leaves nothing to be desired in so far as the fungus he had in mind can be recognized immediately; his only error was that he associated it with the wrong name. His description is of a species now also known as "*Craterellus*" *lutescens*, which has the vein-like hymenophoral folds of the *Lepto-Phlebini*, and which I now call *Cantharellus xanthopus* (*q.v.*), whereas the name he selected for it (*Merulius lutescens* Pers.) is that of a species of the group with gill-like folds, the *Lepto-Plicati*. His references are more ambiguous; a few represent the species he had in mind, others disagree and refer to an element with gill-like folds, as is the case with the citation of *Helvella cantharelloides* Bulliard (1789: pl. 473 f. 3). It was this foreign element that Fries (1838: 366) later excluded as *Cantharellus lutescens* 1838 (*q.v.*).

When Fries (1838: 366) transferred his conception of *C. lutescens* 1821 to *Craterellus* he elaborated one of his original references ("Mer. lutesc. Pers. syn. p. 489") into "Mer. lutesc. Pers. syn. ex ips[o] determin. et Alb. et Schwein. p. 234. eximie!" And compare under *Cantharellus* (not *Craterellus*) *lutescens* Fr. in the same work (p. 366): "*Merulius lutescens* Vulgo, non Pers.!, [nec] Alb. Schw.! [nec] Fr." This implies that Fries had seen an unspecified collection named *Merulius lutescens* [sensu Fr. 1821] by Persoon. Considering Persoon's real conception of his own *Merulius*

lutescens (as discussed above) this must have been a misnamed specimen sent to Fries, perhaps by one of Persoon's correspondents. I have reason to conclude that Fries had not seen any such specimen when he wrote the "Systema", volume 1; at that time he was guided by what von Albertini & von Schweinitz (1805: 234) had written about *Merulius lutescens* Pers. A free translation of the pertinent Latin passage reads:

"*Merulius lutescens* [Pers., Syn.]. This species has true *veins* which are swollen, vaguely decurrent, flexuose, and crowded, in contrast to the following species [*M. tubiformis*], which has thickish *folids* that are straight and distant. This is (. . .) a completely satisfactory diagnostic character for distinguishing between the two species. . . ."

The conclusion that Fries misapplied the name *Merulius lutescens* Pers. is not novel. For instance Quélet (1896: 619-620) already commented on this when he remarked about Persoon's species, "je le rapporterais plutôt à la variété *lutescens* de *cantharelloides* [= *Cantharellus tubaeformis* var. *lutescens* (Fr.) Gillet], à cause de la couleur grise „venis cinereo-rutilus" que Persoon donne à l'hymenium".

As discussed here elsewhere, Fries admitted from the start that his *Cantharellus tubaeformis* was not the same as Schaeffer's fungus named *Helvella tubaeformis*. He cited *Helvella tubaeformis* Schaeff. as a synonym of his *C. lutescens* (1821); it would certainly have been the preferable name (basionym) for the species. Quélet (1896: 619) tried to redress this arbitrary elimination of Schaeffer's name by adopting it again for Fries's "*Craterellus*" *lutescens* (= *Cantharellus xanthopus*). On that occasion Quélet also identified Bulliard's plate 461 "f. A." (viz. *Helvella tubaeformis* var. *lutea* Bull.) with Schaeffer's fungus; this is the same conclusion defended here.

The next problem is to decide on the correct name for "*Craterellus*" *lutescens* sensu Fr. The epithet of the name *Helvella tubaeformis* Schaeff. may not be restored in the form of '*Cantharellus tubaeformis* (Schaeff. per Mérat) John Doe'; as a later homonym this would clash with '*Cantharellus tubaeformis* Fr. 1821', which must be regarded as technically a new name (discussed on p. 280).

The following epithet to be weighed is 'lutescens' itself. As pointed out above, when Fries revalidated *Merulius lutescens* Pers. as *Cantharellus lutescens* he misapplied the name, but at the same time he firmly believed he was right about the species and he ascribed the name to Persoon unequivocally; he cited it in the index to the "Systema", volume 1 (p. 515) as "*lutescens* (Mer.) P." and as "*Mer. lutesc.* Pers. syn. p. 489" in synonymy (p. 320). In all his later work he explicitly defends Persoon's name as the correct one; compare for instance the reference "*Merulius lutescens* Vulgo, non Pers.!" when he introduced a second name *Cantharellus lutescens* (1838) for what was almost certainly the correct interpretation of *Merulius lutescens* Pers. Others were wrong, not he. This evidence shows that Fries was firmly convinced that his conception was correct, or, to put it otherwise, that his conception included the type of the devalidated name. To my way of thinking Fries's view should be respected. If the type is to be regarded as differing specifically from Fries's conception it must still be retained as basis for the correct use of the name.

In accepting this view, the name *Cantharellus lutescens* (Pers.) per Fr. sensu originario

becomes a name published simultaneously with *Cantharellus tubaeformis* Fr. 1821 for the same species. It is to be dropped because it was the name first reduced to the synonymy of the other (Persoon, 1825: 17).

Another school of thought will not hesitate to re-typify Fries's name by selecting as type a hypothetical Swedish collection Fries had studied when he drew up the description of his misapplication, or else a neotype answering to that description. Hereby attention is drawn to a specimen named by Fries himself and described and depicted by Petersen (1969: pl. 12f. 2). This reasoning would make '*Cantharellus lutescens* Fr. 1821 (non *Merulius lutescens* Pers.)' the correct name for the species with veins (Lepto-Phlebini). Even those to whom this reasoning appeals will perhaps concede that a Babylonian confusion of tongues is unavoidable when "*Craterellus*" *lutescens*² is returned to the fold of the genus *Cantharellus* in which two other species bearing the name *Cantharellus lutescens* have been flourishing. The two names I have in mind are (i) *Cantharellus lutescens* (Fr. 1838) Kickx used in at least four or five different applications³ and (ii) *C. lutescens* (Pers.) per Fr. in its original sense. For situations of this kind the "Code" has provided the escape provision that such a name can be made impriorable by considering it a nomen ambiguum. The two opinions about the correct typification can thus point to the "Code" for rejecting the further use of the name *Cantharellus lutescens* [(Pers.) per] Fr. 1821.

The last step is to select the correct name for Fries's conception from three simultaneously published ones: *Merulius aureus* Pers. (q.v.), *M. cervinus* Pers. (q.v.), and *M. xanthopus* Pers. (q.v.). Since none of the three has as yet been reduced to the synonymy of any one of the others I herewith select *Merulius xanthopus* as basionym and accept as the correct name for *Cantharellus lutescens* sensu Fr. 1821 *Cantharellus xanthopus* (Pers.) Duby (basionymum, *Merulius xanthopus* Pers., Mycol. europ. 2: 19. 1825; synonyma, *Merulius aureus* Pers. et *M. cervinus* Pers.).

lutescens (bis). — *Cantharellus tubaeformis* [subsp.] *C. lutescens* Fr., Epicr. 366. 1838; *Cantharellus lutescens* (Fr.) Kickx 1867, not *C. lutescens* (Pers.) per Fr. 1821; *Cantharellus tubaeformis* var. *lutescens* (Fr.) Gillet 1867, not *C. tubaeformis* var. *lutescens* J. E. Lange 1940.

² It would even seem that *Cantharellus lutescens* sensu Fr. has been misapplied. I find it difficult to identify *C. lutescens* sensu Smith (1968: 158 f. 10) from North America with the European species. Although the American fungus belongs to the Lepto-Phlebini, the colours of the cap and a few other items are not consistent with those of the normal European fungus.

³ *Cantharellus lutescens* Fr. 1838, sensu originario = *C. tubaeformis* Fr. 1821 (forma); sensu Secretan (as *Merulius*) & sensu Konrad & Maublanc (as *C. tubaeformis* var. *lutescens*) = *C. melanoxeros*; sensu Smith (1953: 55 pl. 2), perhaps an unnamed (North American) species, which Smith (1968: 157 fs. 12, 14) now calls *Cantharellus minor* Peck, another name he misapplied. (The true *C. minor* belongs to section *Cantharellus*!). What Smith now calls *C. lutescens* (see preceding foot-note) is a member of the Lepto-Phlebini. In his observations he failed to compare *C. lutescens* sensu A. H. Sm, 1953 with *C. lutescens* sensu Peck (1900: 157 pl. 56 fs. 1-8), which might or might not appear to be still another species incorrectly named *C. lutescens*. No doubt still more misapplications of this name can be unearthed.

Cantharellus tubaeformis var. *lutescens* J. E. Lange, Fl. agar. dan. 5: ii ("Lange n. var."), 85 ["(Bull.) Lange"] pl. 198 f. K. 1940, not *C. tubaeformis* var. *lutescens* (Fr.) Gillet 1876.

The introduction of a new taxon of this name, distinct from both (i) *Merulius lutescens* Pers. and (ii) Fries's misinterpretation of this species under the name *Cantharellus lutescens* (which Fries later on transferred to *Craterellus*) has unfailingly led to almost inextricable confusion among all three. This point, however, will not be pursued at any length as it is not essential to a correct understanding of the taxa scrutinized here. (But compare under the preceding discussion; it would seem that the name *Cantharellus lutescens* Fr. 1838 has been misapplied, *inter alia* to the taxon below called *Cantharellus melanoxeros*.)

The protologue of *Cantharellus lutescens* Fr. 1838 was appended to the treatment of *C. tubaeformis*. The binominal name was preceded by an asterisk which is now often taken, perhaps incorrectly so, as indicating a subspecies. For this reason it will sometimes be found cited as *Cantharellus tubaeformis* subsp. *lutescens*. Some authors have considered that the asterisk indicates a variety, so that the form *C. tubaeformis* var. *lutescens* is also encountered. The taxon itself Fries considered intermediate ("Praec. cum sq. jungit") between *C. tubaeformis* ("pileo . . . flocculoso subfusco . . .") and *C. infundibuliformis* ("pileo . . . floccoso-rugosa fuliginéo-flavido . . ."): it was characterized as "pileo convexo-umbilicato, laeviusculo subregulari, lamellis minus divisivis." There is no indication that it ought to have a yellow cap lacking brown colours! The evidence points to the contrary. Fries gave several references, one of which ("*Merulius lutescens* Vulgo, non Pers.!") may indicate that other mycologists had correctly interpreted Persoon's species, although Fries remained convinced that the error he himself had made was not his own. The citation of "Desmaz. ! Exs. n. 365" (rather than of No. 409, see under *Cantharellus melanoxeros*) confirms that a form with a brown (rather than pale yellow) cap was involved. Desmazières's distribution is here selected as type.

Desmazières was one of the mycologists who adhered to the original conception of *Merulius lutescens* Pers. (cf. Fries's remark "*Merulius lutescens* Vulgo . . ."). He called the material that Fries regarded as typical of his new taxon "*Cantharellus lutescens*, Fries Syst. Myc. . . *Merulius lutescens*, Pers. syn." It may be recalled that he was in close contact with Persoon himself and had repeatedly sent collections to him for determination.

Lange (1936: 40; 1940: 85 pl. 198 f. K) also conceived the present Friesian taxon as brown-capped; he considered it distinct from Konrad's interpretation (see under *Cantharellus melanoxeros*). The publication of Lange's conception of *Cantharellus tubaeformis* var. *lutescens* in 1940, after his death, as a new variety is apparently due to an editorial slip of the pen.

The author's citation of the name *Cantharellus lutescens* Fr. 1838 is often given as "Bull." This error is due to the fact that after the phrase defining the taxon, Fries merely cited "Bull. t. 473. f. 2 [= 3]" and failed to mention the name Bulliard

had given to the species he depicted, viz. *Helvella cantharelloides* Bull. (not *Agaricus cantharelloides* Bull.). The fruitbodies depicted are consistent with the other citations and support my conclusion about what Fries had in mind: a fungus with yellow stalk and hymenophore and a brown cap, not the pale yellow cap of *C. melanoxeros*.

As to the taxonomic status of *Cantharellus lutescens* Fr. 1838, I am not prepared to rate it very high. In occasional but ample collections of *C. tubaeformis* fruitbodies that have a rather brighter yellow hymenophore and stalk than others of the same size are often found. The fruitbodies that Bulliard depicted under the name *Helvella cantharelloides* (taken by Fries as typical of his taxon) are an example. Eventually, however, the colour changes according to the typical pattern of the species. Some populations may have a bigger amount of yellow colouring matter; the brown colour of the cap then also becomes suffused with yellow. Pouchet & Jossierand (1957) observed in *Cantharellus lutescens* sensu Fr. 1821 (= *C. xanthopus*) that the yellow pigment could vary independently of the other colours (schizochroism); they even observed a collection in which the yellow pigment was absent and the colour of the normally yellow parts milk-white. *Cantharellus lutescens* Fr. 1838 appears scarcely worth maintaining as a distinct taxon; I am inclined to regard it as nothing but a condition with a higher content of yellow pigment that may remain unmasked or unchanged for a longer period than usual, but hardly remains predominant in the hymenophoral surface until the end.

m e l a n o x e r o s. — *Cantharellus melanoxeros* Desm., Pl. crypt. N. Fr. No. 409. 1829; Desm. *apud* Duby, Bot. gallic. 2: 799. 1830.

As the result of its being reduced to the synonymy of *Cantharellus tubaeformis* by Fries (1838: 366, "var. ?") this species is now completely forgotten. The name was validly published and the type distributed by Desmazières (1829: No. 409); next year Duby (1830: 799) once more validly published the name *Cantharellus melanoxeros* Desm. "ined. in litt."

Desmazières sent material to Persoon with the following notes:

"No. 1. / *Cantharellus melanoxeros*, Desmaz. (Vid: icon. 1.) / La consistance de cette espèce est un peu coriace. Son pédicule est plein, souvent aplati, d'un jaune assez vif, et long de 3 à 4 centimètres, il s'évase au sommet en un chapeau concave, comme satiné et d'une couleur nankin en dessus un peu plus foncé en dessous, c'est à dire d'un nankin tirant sur le lilac. Ses bords sont ondulés, velus à la loupe et paroissent un peu plus épais que le reste du chapeau. Les sporules contenues dans les thèques sont ovoïdes. Ce champignon croit en 8bre dans un bois près de Lille. Ses individus sont solitaires ou réunis deux à quatre par la base des fascicules. Il noirsit [!] promptement par la dessiccation d'où lui vient le nom spécifique que je lui ai donné / H.D."—Herbarium Persoon (L 910.262-774). — I have been unable to locate the illustration mentioned at the beginning of this quotation.

Further material communicated by Desmazières is in Splitgerber's herbarium (L 910.22-3856).

A study of the above-mentioned material has convinced me that it belongs to the *Lepto-Plicati*. The yellow colours, even of the surface of the cap, and the

pronounced blackening of the drying (rotting?) specimens suggest at once the fungus that Secretan (1833: 466) described as *Merulius lutescens* Pers. (var. A) and that Konrad (1929: 77; 1930: 152) described and depicted (Konrad & Maublanc, 1930: pl. 500 f. 2) under the name *Cantharellus tubaeformis* var. *lutescens* "Fries". Still another name for this fungus may be *Cantharellus tubaeformis* var. *pallidus* Gillet. The names used by Secretan, Konrad, and Konrad & Maublanc are evidently misapplications since Fries's taxon had a cap that was not essentially different in colour from what at that time he considered to be typical *Cantharellus tubaeformis*, 'subfuscus expallens' (Fries, 1838: 366), as discussed here on p. 274. The autonomous status and correct rank of the taxon described by Desmazières and Konrad is open to discussion, but because the taxon appears distinct and to the best of my knowledge indications are lacking that it intergrades into typical *C. tubaeformis*, I can see no objection to accepting it as a species, the correct name of which is then *Cantharellus melanoxeros*. It seems to have a distribution area of its own; it is now known (presumably) from the north of France and Switzerland.

It is of interest to note that Smith (1953: 55 pl. 2) concluded that in North America a species occurs that he considers distinct from "*C. tubaeformis*; *C. infundibuliformis*" and that he calls "*Cantharellus lutescens* Fries".⁴ Its spore deposit is "ochraceous salmon", the colour of the cap is "bright orange yellow ('capucine yellow' and fading to 'pale yellow orange'), in age in faded caps often near 'cinnamon-buff' and, when dried, grayish"; it grows "on barren sandy soil in open oak and pine woods. . . . *Cantharellus tubaeformis* [sensu A. H. Smith] lacks the conspicuous orange-yellow colour, grows in bogs (frequently under larch), and has a white spore deposit." Smith was convinced that it represents an easily recognizable species. Although it is tempting to connect the European fungus with the one from Michigan, very likely the two do not belong to the same species. Konrad (1929: 77) stated about his 'lutescens' that the spores form a white deposit and the caps are "jaune-pâle" with the stalk "jaune plus ou moins vif". It seems to agree more closely with *Cantharellus infundibuliformis* var. *luteolus* Peck (1887: 41) from North America, presumably New York State; this was described as having a dingy-yellow cap, very distant gills, and a yellow stalk, tinged with red or orange.

o c r e a t u s. — *Craterellus ocreatus* Pers., Mycol. europ. 2: 5 pl. 13 f. 2. 1825.

The original figure published shows a completely smooth hymenium and, like Persoon, subsequent authors have referred this species to *Craterellus*, either as a species near to, or as a variety of, *Craterellus cornucopioides* (L. per Fr.) Pers. On the

⁴ That is, *Cantharellus lutescens* (Fr.) Kickx 1867 (original sense), not *Cantharellus lutescens* (Pers.) per Fr. 1821, a prior name. The latter species, as interpreted by Fries in 1821, is what Fries later on called *Craterellus lutescens* (= *Cantharellus xanthopus*). If the fungus described by Smith should prove to be a distinct species it is likely that it has no current name. Smith (1968: 157 fs. 12, 14) now calls it *Cantharellus minor* Peck, in my opinion incorrectly so. (See also foot-note 3).

same plate *Merulius xanthopus* Pers. (see below) is depicted; in general the resemblance between size and shape of the fruitbodies of the two species is rather striking. Might this be an extreme variation of "*Craterellus*" *lutescens* sensu Fries (= *Cantharellus xanthopus*) ?

Exploration of Persoons herbarium failed to disclose any specimen named *C. ocreatus*, but to one sheet some specimens were glued that showed that at least one group of fruitbodies had served as the model of the left hand figure of *C. ocreatus*; there can be no doubt that it was the type collection of *C. ocreatus* that was found. It is labelled, "*Craterellus melanopus* [!]. / Gallia (Versaliis)" (L 910.256-1379). The blackening of the stalks may be natural but it is quite likely that a process of rotting and the evident activities of maggots contributed to this colour. The specimens represent *Craterellus cornucopioides*, or a closely related taxon.

In this connection I am thinking of *Craterellus konradii* R. Maire & Bourd. apud Konrad & Maublanc (1930: pl. 500 f. 2). It has been reduced by Imbach (1936) to *Craterellus cornucopioides*; he maintained that Konrad himself had come to share his view. I am not at all sure that Konrad (1932: 87) was really correct when he rejected identification with *Craterellus ocreatus*: "La même plante à été recoltée autrefois dans la région de Besançon par M. Bataille, qui l'avait déterminée sous le nom erroné de *Craterellus ocraceus* [!] Persoon." Corner's suggestion (1966: 251) that *C. konradii* is a species of *Podoscypha* Pat. can scarcely be correct.

It is interesting to note the following observation by Maire (1932: 226): "Le Champignon [*C. konradii*] tout entier noircit par fermentation à l'humidité; ce noircissement commence par la base du pied, mais ne s'observe que sur des specimens altérés; les specimens bien vivants ne noircissent pas par la dissiccation." This would well explain Persoon's herbarium name *Craterellus melanopus*.

pruinatus. — *Agaricus pruinatus* Batsch, Elench. Fung. 175 pl. 9 f. 35. 1783 (devalidated name); *Merulius pruinatus* (Batsch) per Secr., Mycogr. suisse 2: 467. 1833.

The description and figure show *Agaricus pruinatus* Batsch to be *Cantharellus tubaeformis*. Persoon (1825: 17) also referred it to *Cantharellus tubaeformis* [sensu Persoon], "mala", and Fries (1838: 366), under *Cantharellus infundibuliformis*, remarked, "Batsch f. 35, ipso in Myc. Eur. concedente, hujus var." The leading feature referred to in the specific epithet is, "lamellis . . . pruinatis".

Secretan's description (1833: 467) agrees closely with Batsch's account.

tubaeformis. — *Helvella tubaeformis* Schaeff. Fungi Bavar. nasc. 4: 104 [pl. 157]. 1774 (devalidated name); *Merulius tubaeformis* (Schaeff.) Pers., Comment. Schaeff. Ic. pictas 62. 1800 (devalidated name); *Merulius tubaeformis* (Schaeff.) per Mérat, Nouv. Fl. Paris, 2e Ed., 1: 47. 1821; *Craterellus tubaeformis* (Schaeff. per Mérat) Quél. in C.r. Ass. franç. Av. Sci. 24 (2): 619. 1896, not *C. tubaeformis* (Fr.) Quél. 1888.

There can be no doubt about the identity of the species originally described under this name; it is the one Fries (1821: 320) described under the misapplied

name *Cantharellus lutescens* (Pers.) and later transferred to the genus *Craterellus*, which I now call *Cantharellus xanthopus*. It would seem that Persoon (undoubtedly under the influence of Bulliard) prepared the way for the transfer of the name from the original taxon to the one later to be called *Cantharellus tubaeformis* Fr. 1821. At first, when he redefined Schaeffer's species (Persoon, 1800: 62), there was little wrong, but the statement "non raro in fagetis" is an indication that his conception did not accord completely with that of Schaeffer. It is clear that the following year (Persoon, 1801: 489) his conception had changed into a mixtum compositum: compare "plicis rectis flavo-subcinereis" [*Cantharellus tubaeformis* Fr. 1821] and "Venae nunc flavae, nunc aurantiae, aut incarnato-flavae [*Helvella tubaeformis* Schaeff. sensu stricto] utplurimum cinereo-flavae [*Cantharellus tubaeformis* Fr. 1821]." The accent had shifted very far in the direction of *C. tubaeformis* Fr. 1821. That this was Persoon's final interpretation is shown by several collections in his herbarium. It should be remembered that, surprisingly enough, Persoon did not know the one common European species of the Lepto-Phlebini (or at least did not recognize it as distinct) until late in his life (1825, see under 'xanthopus'). It was left to von Albertini and von Schweinitz clearly to define it (see p. 272). Fries's first treatment of *Merulius tubiformis* (1815: 97) shows that he had already excluded Schaeffer's species from his conception and that he was then following Persoon's later interpretation.

When Fries again separated the two species, he caused new confusion by reserving the epithet 'tubaeformis' for the misnamed fungus and misapplying the epithet 'lutescens' of *Merulius lutescens* Pers. to what Schaeffer had originally called *Helvella tubaeformis*.

It was left to Quélet (1896: 619) to re-instate *Helvella tubaeformis* Schaeff. as *Craterellus tubaeformis* for Fries's "Craterellus" *lutescens* (= *Cantharellus xanthopus*), but this correction has found little following. At the same time he replaced the name *Craterellus tubaeformis* Fr. 1821 by *Craterellus cantharelloides* (Bull.), basionym, *Helvella cantharelloides* Bull. [not *Agaricus cantharelloides* Bull., which is *Hygrophoropsis aurantiacus* (Wulf. per Fr.) Maire apud Mart.-Sans].

Helvella tubaeformis Schaeff. sensu Bull.—Much of the misunderstanding as to the correct interpretation of 'Cantharellus tubaeformis' is due primarily to Bulliard. The puzzle about what he was depicting (1789: pl. 461) and describing (1791: 294) under the name *Helvella tubaeformis* is not easily solved. It must be stressed from the start that he took the name from Schaeffer; he cited "*Elvela tubaeformis* Schaeff. . . . Tab. 157" in his synonymy (1791: 294).⁵ As concluded above it is beyond any possible doubt that Schaeffer's species is the species that is now often known as the "Craterellus" *lutescens* of Fries (= *Cantharellus xanthopus*). This is significant.

Bulliard depicted two forms on his Plate 461. In his text he differentiated these

⁵ On the plate the reference is an indirect one: L'*Helvella* en trompette. Fl. Fr.", which stands for Lamarck [1779: (123)], '*Helvella* en trompette. Schaeff. t. CLVII.'

into *Helvella tubaeformis* var. *lutea* Bull., represented by the top figures (fs. A, C) and *H. tubaeformis* var. *fulva* Bull., represented by the lower figures (fs. B, D). In my opinion a cursory inspection of the plate without reference to the text could easily lead to the conclusion that only a single species was involved. Both varieties have a zoned cap and the hymenium is shown as being thrown into a regular kind of folds dichotomizing regularly like in not too old fruitbodies of the *Lepto-Plicati*. More careful examination of the drawings of the halved fruitbodies, however, leaves one completely in the dark as to whether these folds are low and flat or almost gill-like. The text at the bottom of the plate and the text of the "Histoire" reads "nervures . . . ordinairement peu saillantes" (text on plate) and "Les nervures . . . ont quelquefois une telle ressemblance avec les feuillettes de certains agarics, que si l'on n'est pas prevenu, on la placera nécessairement parmi les espèces de ce dernier genre . . ." However, it is not made clear which of the figures of the plate is to be associated with the low and which with the gill-like folds. In any case this is more than sufficient to justify the suspicion that perhaps two species are involved.

Bulliard himself came to the same conclusion: he annotated his variety *lutea*, "An-ne species distincta." The shape of the fruitbodies (stalks definitely tapering downwards) of this 'variety', as well as the colour of the hymenophore ("subtus luteus seu aurantiacus" and "surface inférieure jaune ou orangée") suggest Fries's "*Craterellus lutescens* (= *Cantharellus xanthopus*), and I am now convinced that variety *lutea* (fs. A, C) really belongs to that species, even though not only were the folds of the hymenophore drawn too schematically, even to such a degree as to render them strongly misleading, but the bright colour of the hymenophore and the stalk were also rendered too dull. The "nervures . . . ordinairement peu saillantes" apparently go with this variety.

The other form, variety *fulva*, has a more inflated stalk, not gradually tapering downwards, and the colour of the hymenophore is stated to be "cinereo-cervinus" and "fauve clair, ou d'une légère teinte rose". If these features are associated with the gill-like folds then this variety emerges as a species distinct from the former variety, viz. as *Cantharellus tubaeformis* Fr. 1821! That this association is legitimate is underlined by Bulliard's remark that in his species the veins at the underside may sometimes so strongly resemble the gills of certain agarics that it is easy to err and to place specimens in the genus *Agaricus*, "comme j'avois cru le devoir faire moi-même, lorsque j'en ai publié [*Agaricus cornucopioides*], pl. 208". This plate he cited under *A. tubaeformis* var. *fulva*! In this connection it is worth mentioning that Bulliard indicated no difference between his *H. tubaeformis* and *H. cantharelloides* Bull. (= *Cantharellus tubaeformis*) other than the zoned surface of the cap in the former.

Bulliard considered this second taxon, variety *fulva*, which answers only imperfectly to Schaeffer's *Helvella tubaeformis*, to be the typical form; this follows from the remark added to the other variety, "An-ne species distincta." Fries's later conclusion (1874: 458), under *Cantharellus infundibuliformis*, comes close to the one amplified here: "Bull. t. 461 hic potissimum, sed e texta confusa species." However, he did

not definitely identify variety *lutea* with his "*Craterellus*" *lutescens* (= *Cantharellus xanthopus*).

The identification of variety *fulva* with *Cantharellus tubaeformis* Fr. 1821 should not be made too quickly. Some objections are still valid. Bulliard kept his compound interpretation of *Helvella tubaeformis* separate from his *H. cantharelloides* (quite readily recognized as a form of the true *Cantharellus tubaeformis*) because of the zonate surface of the cap in his *H. tubaeformis*. It is not easy to get around this feature except by assuming that Bulliard emphasized too strongly a faint zonation that may sometimes be observed, especially upon drying, in which case he entered it in highly stylized figures to the point of exaggeration.

The conclusion that the 'typical' part of *Helvella tubaeformis* sensu Bull. is *Cantharellus tubaeformis* Fr. 1821 is of importance in connection with the typification of the following name.

t u b a e f o r m i s (bis). — *Cantharellus tubaeformis* Fr. Syst. mycol. 1: 319, 515; *Craterellus tubaeformis* (Fr.) Quél., Fl. mycol. Fr. 36. 1888, not *C. tubaeformis* (Schaeff. per Mérat) Quél. 1896.

The preceding notes make it necessary to decide about the identity of what Fries (1821: 319, described under this name in the starting-point book. First, it should be pointed out that he explicitly excluded from his conception the species for which the name was introduced (*Helvella tubaeformis* Schaeff.): in synonymy he cited "*M. tubaeformis* Pers. syn. 489 (nec Schaeff.)" (p. 320) and "*Elv. tubaeformis* Schaeff. t. 157" (p. 320) re-appears as a synonym of *Cantharellus lutescens* sensu Fr. 1821 = "*Craterellus*" *lutescens* (= *Cantharellus xanthopus*). Secondly, he explicitly ascribed the name to Bulliard: he cited "*Helv. tubaeformis* Bull. t. 461" (p. 319) in the synonymy; and in the index of the volume (p. 515) he entered the name as "[*Cantharellus*] *tubaeformis* (Hlv.) Bull." Thirdly, except for one or two at least partially erroneous citations and the exclusion of his variety β , both his description and the numerous other citations are consistent with what Fries (1838: 366) later on was to call *Cantharellus infundibuliformis*. I wonder why in 1821 he added the comment "Huc potissimum Sowerb. t. 47. *A. cantharell.*" and without more confidently entering the citation as belonging to his *C. tubaeformis*.

The question now is: to whom must the authorship of the name be ascribed. As stated above, Fries attributed the name to Bulliard, who did not introduce a new name but applied one of Schaeffer's; Bulliard (1791: 294) cited "*Elvela tubaeformis*, Schaeff. fung. tom. II. Tab. 157" in his synonymy.⁶ Since Fries excluded the type the admission of a 'new' name, viz. *Cantharellus tubaeformis* Fries, is required. This name, I would add, should be based on a specimen collected by Bulliard in France, which amounts to selecting as type of *Cantharellus tubaeformis* Fr. 1821 the specimens

⁶ This reference is followed by "... Mich. gen. Tab. 82. Fig. 2 ?" It is not clear whether the question-mark also refers to Schaeffer's name, but in this case this is immaterial. Compare also footnote 5.

depicted on Bulliard's plate 461 figures B and D. It might perhaps be preferable to select the type from the material represented in Fries's protologue by the indication "v.v.", thus a hypothetical Swedish collection agreeing with Fries's description, but I am not sure whether this would be correct. As long as the lectotype suggested here (Bulliard's fs. B, D) is accepted as representing what Fries described under *C. tubaeformis* in 1821 there will be no need to deviate from this choice.

As to the conception of *C. tubaeformis* that Fries introduced in 1838, when he started to call his conception of 1821 *Cantharellus infundibuliformis* (q.v.), it was tentatively admitted by Donk (under the influence of Bresadola's interpretation, 1929: pl. 477) as a closely allied species with more intensely coloured stalk and hymenophore (it had been described as "aurantio-fulvus aut fere flammens demum aliquantulum expallens"). At the same time Donk thought it might have to be identified with *Merulius villosus* Pers. This opinion was tentative because he had not seen fresh or other material of the hypothetical species. Recently Corner (1966: 60, 70, 74) was still maintaining two taxa which he distinguished in his key thus: "stem tawny orange. Gill-folds orange, then yellow", *C. tubaeformis*, and "Stem and gill-folds (at first) clear yellow", *C. infundibuliformis* (q.v.). His *C. infundibuliformis* is in any case the species that Fries called *C. tubaeformis* in 1821.

I now believe that *Merulius villosus* represents merely *C. tubaeformis* (Fries, 1821), as discussed below. The colours of the stalk on the hand-coloured plates, at least in certain copies of Persoon's figure (1798: pl. 6 f. 1) and even more in that of Ditmar (1804: pl. 30, as *Cantharellus*), were either exaggerated from the first and suggested by vividly coloured specimens such as are sometimes encountered, or in the course of time they may have altered. Other citations, such as of *Helvella tubaeformis* var. *lutea* Bulliard (1789: pl. 461 fs. A, C; 1791: 294; see in this paper p. 279) simply refer to Fries's "*Craterellus*" *lutescens* (= *Cantharellus xanthopus*) with the folds so poorly rendered that they suggest the distant, but much more regularly dichotomized gill-like folds of *C. tubaeformis* Fr. 1821. Bresadola's interpretation remains an enigma to me, but in any case I strongly doubt whether he had come across the true *Cantharellus tubaeformis* of Fries's later work.

villosus. — *Merulius villosus* Pers., Ic. Descr. Fung. 17 pl. 6 f. 1. 1798 (devalidated name); *Cantharellus villosus* (Pers.) Ditm. in Deutschl. Fl. (ed. Sturm), Pilze 1: 61 pl. 30. 1814 (devalidated name); *Merulius villosus* Pers. per Pers., Mycol. europ. 2: 18. 1825.

Investigation of the identity of a taxon of *Cantharellus* sect. *Leptocantharellus* makes it necessary first to decide whether it belongs to the Lepto-Plicati or the Lepto-Phlebini. The devalidated protologue of *M. villosus* leaves little doubt on this point, "plicis distantibus cinereo-pallidis . . . Plicae non valde decurrunt, pruinatae." The figure renders it incontrovertible that indeed *M. villosus* has gill-like folds. The colour of the stalk is given as 'lutescens'. These features, in combination with the habit depicted, lead to the conclusion that *Merulius villosus* is conspecific with *Cantharellus tubaeformis* Fr. 1821, or at least very closely related to it. The main

feature, seen in the picture and indicated in the specific epithet, is in the surface of the cap, which is stated to be 'squamoso-villosus'. I have seen fully annotated material from France in which this feature was clearly depicted in the accompanying watercolour drawing, but in the dried fruitbodies the 'squamules' were no longer clearly distinguishable. I refer the collection to *Cantharellus tubaeformis* Fr. 1821. In my opinion this is also the correct disposition of *M. villosus*. No material was to be found in Persoon's herbarium.

Quélet (1896: 619) came to practically the same conclusion. He reduced *M. villosus* to the rank of a variety of what he called *Craterellus cantharelloides* (Bull.) Quélet. [= *Cantharellus tubaeformis* Fr. 1821], "caractérisé par un peridium un peu laineux et ordinairement brun, ce qui le fait ressembler à *tubaeformis* Schaeff. [= "*Craterellus*" *lutescens* of Fries 1821 = *Cantharellus xanthopus*]."

xanthopus. — *Merulius xanthopus* Pers., Mycol. europ. 2: 19. 1825; *Cantharellus xanthopus* (Pers.) Duby, Bot. gallic. 2: 799. 1830.

The type collection has been preserved in Persoon's herbarium (L 910.255-535); it consists of a few fruitbodies depicted in the published figure. They were sent to Persoon by de Chaillet (who collected in the neighbourhood of Neuchâtel, Switzerland). It was accompanied by the following annotations:—

"*Merulius flavipes* Pers.: marginatus ou fimbriatus. vix [?] aureus, quoique la difference ne soit pas considerable seche, elle etoit frappante frais par une belle couleur - Jaune d'Or, je n'en ai trouvé que deux touffes sans aucun melange. / Pinetis 8bre celui ci est le plus marqué pour le fimbriatus. / 1822 = 22."

Persoon labelled this collection "*Merulius xanthopus* Myc. Europ. 2. p. 19 t. XIII. t. 1." There is a second sheet (L 910.255-520) that he also labelled, "*Merulius xanthopus* M. Europ." The two fruitbodies on this sheet are not among those depicted in "Mycologia europaea". In addition there is a watercolour drawing (L 910.255-521) annotated thus by de Chaillet:

"*Merulius flavipes* Pers.: / Je l'ai trouvé abondamment cette année, il ne me paroît pas differer de celui que je vous ai envoyé en 1818. Sous un No. 34: il me paroît que fries en fait son *Cantharellus Lutescens*. Venae flavae il me paroît differer beaucoup. / Pinetis 8bre." — Persoon added "*Merulius xanthopus* Myc. Europ."

The two sheets with the material mentioned above clearly show that *Merulius xanthopus* belongs to the same species that Fries called "*Craterellus*" *lutescens*. The drawing just mentioned is poor and without any further knowledge I would scarcely have referred it to the same species with any confidence. It shows the yellow colour that remains in dried specimens (without pinkish or orange tints) as excessively pale.

The reasons for choosing the name *Merulius xanthopus* as basionym for the correct name of what Fries called "*Craterellus*" *lutescens* are discussed on page 273.

RECAPITULATION

<i>aurora</i> , Agaricus, Batsch (d.n.)	= <i>Cantharellus xanthopus</i>
<i>auroreus</i> , Merulius, Pers.	= <i>C. xanthopus</i>
<i>cantharelloides</i> , Helvella, Bull. (d.n.)	= <i>C. tubaeformis</i> Fr. 1821
—, Merulius, (Bull.) per Purt.	= <i>C. tubaeformis</i> Fr. 1821
<i>cervinus</i> , Merulius, Pers.	= <i>C. xanthopus</i>
<i>cinereus</i> , Cantharellus, Pers. (d.n.)	= <i>C. cinereus</i> Pers. per Fr.
<i>dilatatus</i> , Merulius, Pers.	= <i>C. tubaeformis</i> Fr. 1821
<i>hispidulus</i> , Merulius, Scop. per O.K.	= <i>C. tubaeformis</i> Fr. 1821 ?
<i>hispidus</i> , see <i>hispidulus</i>	
<i>hydrolips</i> , Helvella, Bull. (d.n.)	= <i>C. cinereus</i>
—, Merulius, (Bull.) per Mérat	= <i>C. cinereus</i>
<i>infundibuliformis</i> , Merulius, Scop. (d.n.)	= <i>C. tubaeformis</i> Fr. 1821
—, Cantharellus, (Scop.) per Fr.	= <i>C. tubaeformis</i> Fr. 1821
<i>infundibularis</i> , Merulius, O.K. ≡	
Merulius <i>infundibuliformis</i> Scop., q.v.	
<i>luteolus</i> , Merulius, O.K. ≡ <i>C. lutescens</i>	
Fr. 1838 q.v.	
<i>lutescens</i> , Merulius, Pers. (d.n.)	= <i>C. tubaeformis</i> Fr. 1821
— sensu Secr. (var. A)	= <i>C. melanoxeros</i>
—, Cantharellus, (Pers.) per Fr. sensu	
orig. 1821 (nomen ambiguum)	= <i>C. tubaeformis</i> Fr. 1821
<i>lutescens</i> , Cantharellus, sensu Fr. 1821	= <i>C. xanthopus</i>
<i>lutescens</i> , Cantharellus, Fr. 1838 (subsp.),	
Kickx	= <i>C. tubaeformis</i> Fr. 1821
— sensu Konr.	= <i>C. melanoxeros</i>
<i>lutescens</i> , <i>C. tubaeformis</i> var. ~, J. E.	
Lange	= <i>C. tubaeformis</i> Fr. 1821
<i>melanoxeros</i> , Cantharellus, Desm.	= <i>C. melanoxeros</i> Desm.
<i>ocreatus</i> , Craterellus, Pers.	= <i>Craterellus</i> cf. <i>cornucopioides</i> (L. per Fr.) Pers.
<i>pallidus</i> , Cantharellus <i>tubaeformis</i> var. ~,	
Gillet	= Cf. <i>C. melanoxeros</i>
<i>pruinatus</i> , Merulius, Batsch per Secr.	= <i>C. tubaeformis</i> Fr. 1821
<i>tubaeformis</i> , Helvella, Schaeff. (d.n.)	= <i>C. xanthopus</i>
—, Merulius, (Schaeff.) per Mérat	= <i>C. xanthopus</i>
— sensu Bull., in part (var. <i>lutea</i>)	= <i>C. xanthopus</i>
— sensu Bull. in part (var. <i>fulva</i>)	= <i>C. tubaeformis</i> Fr. 1821
<i>tubaeformis</i> , Cantharellus, Fr. 1821	= <i>C. tubaeformis</i> Fr.
<i>villosus</i> , Merulius, Pers. per Pers.	= <i>C. tubaeformis</i> Fr. 1821
<i>xanthopus</i> , Merulius, Pers.	= <i>C. xanthopus</i> (Pers.) Duby

REFERENCES

- ALBERTINI, J. B. VON & L. D. VON SCHWEINI[T]z (1805), *Consp. Fung. nisk.*
 BRESADOLA, G. (1887), *Fungi trident. 1.* — (1929), *Iconogr. mycol. 10.*
 BULLIARD, J. B. F. ["PIERRE"] (1789), *Herb. Fr.* — (1791), *Hist. Champ. Fr. 1.*
 CORNER, E. J. H. (1966), *Monogr. canth. Fungi.*
 DITMAR, L. P. F. (1814) in *Deutschl. Fl.* (ed. Sturm), *Pilze 1.*
 DONK, M. A. (1933), *Revis. niederl. Homob.-Aph. 2.*

- DUBY, J. E. (1830), *Bot. gallic.* 2.
 FRIES, E. M. (1815), *Obs. mycol.* 1. — (1821), *Syst. mycol.* 1. — (1838), *Epicr.* "1836-1838".
 — (1874), *Hym. europ.*
 IMBACH, J. (1936) *in Schweiz. Z. Pilzk.* 14.
 KONRAD, P. (1929) *in Bull. Soc. mycol. Fr.* 45. — (1930) *in Schweiz. Z. Pilzk.* 8.
 KONRAD, P. & A. MAUBLANG (1929, 1930), *Ic. sel. Fung.* 5.
 KUNZE, C. E. O. (1891), *Rev. Gen. Pl.* 2.
 LAMARCK, J. B. A. P. M. DE (1779), *Fl. franç.* 1. "1778".
 LANGE, J. E. (1936) *in Dansk bot. Ark.* 9 (1). — (1940), *Fl. agar. dan.* 5.
 MAIRE, R. (1932) *in Bull. Soc. mycol. Fr.* 46.
 PECK, C. H. (1887) *in Bull. New York St. Mus.* 2. — (1900) *in Mem. New York St. Mus.* 3 (4).
 PERSOON, C. H. (1798), *Ic. Descr. Fung. Fasc.* 1. — (1800), *Comment. Schaeff. Ic. pictas.* —
 (1801), *Syn. Fung.* — (1825), *Mycol. europ.* 2.
 PETERSEN, R. H. (1959) *in Persoonia* 5.
 POUCHET, A. & M. JOSSERAND (1957) *in Bull. Soc. Nat. Oyonnax* 10-11.
 QUÉLET, L. (1896) *in C.r. Ass. franç. Av. Sci.* 24 (2) [Bordeaux 1895].
 RICKEN, A. (1910), *Blätterp.*
 R[OGERS], D. P. & *al.* (1942), *Index bot. Pers. Mycol. europ.*
 SECRETAN, L. (1833), *Mycogr. suisse* 2.
 SMITH, A. H. (1953) *in Pap. Michigan Acad. Sci.* 38. — (1963) *in Michigan Bot.* 7.
 SOWERBY, J. (1796), *Col. Fig. Engl. Fungi* 1.