

**Nomenclatural study and current status of the names  
*Boletus emileorum*, *Boletus crocipodius* and *Boletus  
legaliae* (*Boletales*), including typification of the first two**

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A comprehensive nomenclatural study including dates of valid publication, etymology and original spellings of the names *Boletus* “*emilei*”, *Boletus* “*crockipodius*” and *Boletus* “*le-galiae*” led us to correct them in accordance with the current Melbourne Code. Consequently, any current name based on these incorrect basionyms also has to be corrected.

The original epithet *emilei* has been corrected by many authors, but never to its correct spelling *emileorum* according to the data of the protologue. As for the epithet *crockipodium*, all authors consulted have corrected it to *crocipodium* without any explanation, and its correct etymology has never been conveniently explained after its original publication by Letellier. We also provide good evidence on the correct date of publication of this name, always misdated in the literature. The epithet *le-galiae* (with a hyphen), unanimously corrected to *legaliae* has been very recently resurrected, but according to our nomenclatural study the correct spelling is *legaliae*.

The valid publication and taxonomic status of the current combinations *Leccinellum crocipodium*, *Baorangia emileorum*, and *Rubroboletus legaliae* have also been studied. Finally, all the previous typifications of the three names have been revisited and we conclude that those of *Boletus crocipodius* and *Boletus emileorum* have not been effective and, therefore, a new typification is carried out here.

**Key words:** fungi, nomenclature, *Leccinellum crocipodium*, *Baorangia emileorum*, *Rubroboletus legaliae*.

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Autoři předkládají vyčerpávající nomenklatorickou studii, zahrnující údaje o platném zveřejnění, etymologii a původním pravopisu jmen *Boletus “emilei”*, *Boletus “crokipodius”* and *Boletus “le-galiae”*, která vede k opravám uvedených jmen v souladu s aktuálním Melbournským kódem. Současně jsou opravena i všechna stávající jména, založená na těchto nesprávně psaných basionymech.

Původní epiteton *emilei* bylo opraveno již mnoha autory, ale nikdy do správné podoby *emileorum*, vycházející z údajů v protologu. Pokud jde o epiteton *crokipodius*, všichni autoři je opravují do podoby *crocipodium* bez bližšího vysvětlení; správná etymologie nebyla nikdy uspokojivě vysvětlena od Letellierova původního zveřejnění tohoto jména. Současně tato práce přináší důkazy o správném datu jeho zveřejnění, uváděném chybně v dostupné literatuře. Epiteton *le-galiae* bylo jednoznačně opraveno na *legaliae*; i když recentně došlo ke vzkríšení formy se spojovníkem, na základě předloženého rozboru je správný pravopis *legaliae*.

Studie též hodnotí platnost zveřejnění a taxonomický status stávajících kombinací *Leccinellum crocipodium*, *Baorangia emileorum* a *Rubroboletus legaliae*. Byla revidována veškerá dosavadní typifikace uvedených jmen, přičemž v případech *Boletus crocipodius* a *Boletus emileorum* nebylo vystavení typů seznáno účinným; na základě toho jsou zde vystaveny nové typy těchto dvou jmen.

## INTRODUCTION

During the last years, the use of molecular methods to establish the phylogenetic relationship between various taxa has played a significant role in mycological taxonomy. Today, most journals do not accept the publication of new taxa without a phylogenetic study which includes both the new taxon as well as closely related ones. The result of the application of molecular techniques in the classification of species belonging to the family *Boletaceae* Chevall. has caused a large number of taxonomic changes with the creation of many new genera, resulting in many nomenclatural changes. These nomenclatural novelties have been published in literature in such a scattered way that it is very difficult for mycologists who are not specialists in this group of species to know the currently correct names.

For this reason, one of the authors of this paper (Della Maggiora 2016) recently published a list of names including all the nomenclatural changes which have occurred in the family *Boletaceae*. In this compilation, the author points out that the specific epithet of *Boletus legaliae* Pilát & Dermek [*“le-galiae”*], unambiguously used without a hyphen in all monographs and general mycology guides, was recently written in its original spelling *“le-galiae”*, that is with a hyphen, in a nomenclatural study in which Mikšík et al. (2016) adopted and recommended this spelling. On the contrary, according to the results of our nomenclatural study, the correct spelling is *legaliae* (without a hyphen), a form in compliance with nomenclatural stability. Therefore, the correct name of its current combination is *Rubroboletus legaliae* (Pilát & Dermek) Della Maggiora & Trassinelli.

Some doubts arose concerning the valid publication of the combination *Boletus crocipodius* Letell. [*“crokipodius”*] in the genus *Leccinellum* Bresinsky & Manfr. Binder in Bresinsky & Besl (2003) and Della Maggiora (2014), because the

reference to the basionym was in both cases incorrect or contained errors. For this reason, Della Maggiora consulted the first author of this work on some nomenclatural questions and during his study it was found that the name *Boletus crocipodius* presented nomenclatural problems regarding valid publication, publication date, correct spelling, etymology and typification. The validity of the basionym *Boletus crocipodius* as well as that of the combination “*Leccinellum crocipodium* (Letell.) Bresinsky & Manfr. Binder” have been investigated because some authors do not consider them validly published. We think that the current correct combination is *Leccinellum crocipodium* (Letell.) Della Maggiora & Trassinelli. Moreover, it is shown that the correct date of publication of *Boletus crocipodius* is different from the one indicated by all authors, including the official repositories (Mycobank and Index Fungorum). Curiously, according to our data, the actual publication date has never been used either in literature or in the official repositories. Considering the original spelling, we have, surprisingly, not found any work that satisfactorily explains its etymology and takes into account the name “*bolet à pied râpeux*” (bolete with rough stem) used by Letellier for this taxon in the original publication. Regarding the typification, no author has effectively typified *Boletus crocipodius*. For this reason, in this paper, a lectotype and an epitype have been designated for this name in order to contribute to its nomenclatural stability.

Finally, the correct spelling of the name *Boletus emilei* Barbier is also analysed and discussed. The epithet *emilei* has never been corrected, neither in literature nor in the official repositories, to its correct spelling *emileorum*, with the exception of Della Maggiora (2016), who, according to the nomenclatural conclusions of our study, correctly published it in the current combination *Baorangia emileorum* (Barbier) Vizzini, Simonini & Gelardi. The orthographic variants *emilii*, *aemilii*, *aemilei*, *emileri* and *aemilli* have been used instead of *emilei*, but never *emileorum*, which is the correct epithet in accordance with the International Code of Nomenclature for algae, fungi, and plants (henceforth ICN) of Melbourne (McNeill et al. 2013). As *Boletus emilei* was validly published for the first time in 1914 (and not in 1915), it has been also analysed and re-evaluated, and a new typification of this name has been made, since the previous one proposed by Bertolini & Simonini (2013) has not been effective.

The nomenclatural problems of the epithets *crocipodium*, *emileorum* and *legaliae* are reported and discussed in the chronological order of the original publication of their respective basionyms.

The spelling of the invalidly published names, indicated by a single dash, has been corrected (even though unnecessary because they do not have a nomenclatural status) just to highlight which would be the correct epithet in case they had been validly published.

RESULTS AND DISCUSSION

NOMENCLATURAL PROBLEMS OF *LECCINELLUM CROCIPEDIUM*

***Leccinellum crocipodium*** (Letell.) Della Maggiora & Trassinelli in Della Maggiora, Index Fungorum 171: 1, 2014

- ≡ *Boletus crocipodius* Letell., Fig. Champ.: Tab. 666, 1835 [*crokipodius*] [basionym]
- ≡ *Krombholzia crocipodia* (Letell.) Gilbert, Les livres du mycologue. Tome III. Les Bolets: 177, 1931
- ≡ *Krombholziella crocipodia* (Letell.) Maire, Publ. Inst. Bot. Barcelona 3(4): 47, 1937
- ≡ *Trachypus crocipodius* (Letell.) Romagn., Rev. Mycol. 4: 141, 1939
- ≡ *Leccinum crocipodium* (Letell.) Watling, Trans. Proc. Bot. Soc. Edinb. 39(2): 200, 1961
- *Leccinellum crocipodium* (Letell.) Bresinsky & Manfr. Binder in Bresinsky & Besl, Regensburg. Mykol. Schriften 11: 233, 2003 [*Nom. inval.* Art. 41.5, basionym reference incorrect, not correctable under Art. 41.8]

**Valid publication of *Boletus crocipodius***

Rauschert (1987) considered the name *Boletus crocipodius* invalidly published (“*nom. nud.*”) because the original publication lacks an original diagnosis, whereas the related plate which, according to Art. 38.7, could serve as a substitute for the original diagnosis does not show any details helping identification. This author stated that only with good will, as shown by Gilbert (1931), Figure B of the Letellier’s original plate can be interpreted as representative of the current concept of *Leccinellum crocipodium*. Therefore, according to Rauschert’s opinion, since the interpretation of Figure B is controversial, Letellier’s plate cannot be considered an “illustration with analysis” as required by Art. 38.10. This is the reason why Rauschert used the name *Leccinum tessellatum* (Kuntze) Rauschert, based on the illegitimate basionym *Boletus tessellatus* Gillet (1878) (being a later homonym of *Boletus tessellatus* Rostk., 1844), which he considered a heterotypic synonym of *Leccinum crocipodium*.

Nevertheless, in Rauschert’s reasoning, nomenclature and taxonomy were mixed when he considered Letellier’s name not to be validly published, which is incorrect. The name *Boletus crocipodius* was validly published in accordance with the ICN, since Letellier’s plate shows details aiding the identification of the taxon and, therefore, it conforms to Art. 38.7. Whether all the figures included in the plate belong to the same taxon or not, depends on the interpretation of each taxonomist. Therefore, this interpretation has no effect on the application of nomenclature rules.

In fact, contrarily to Rauschert’s position, Gilbert (1931) observed that “au moins une de figures (pl. 666, f. B) est facilement reconnaissable, ainsi que l’admet Kallenbach, lui-même” [at least one of the figures (pl. 666, f. B) is easily recognisable, as also Kallenbach himself admits]. Simultaneously, this author stated that Gillet’s plate

Number 80 (Gillet 1878), named *B. tessellatus*, “est reconnaissable mais sa valeur représentative est mediocre” (is recognisable but its representative value is mediocre) and he preferred to use the name *Krombholzia crocipodia* (Letell.) Gilbert instead of recombining the epithet *tessellatus* in the genus *Krombholzia* P. Karst.

Maire (1937) also preferred to use *Krombholziella crocipodia* [“*crokipodia*”], considered Figure B representative and indicated the basionym “*Boletus crocipodius* Letellier, t. 666, fig. B”, maintaining *Krombholzia tessellata* (Kuntze) Maire (1933) as a synonym.

Finally, Redeuilh (1988b) in his nomenclatural work on the *Boletaceae* family, and then Lannoy & Estadès (1995) in their monograph on the genus *Leccinum* S.F. Gray in Europe, considered Figures A and B representative of *Krombholziella crocipodia* and *Leccinum crocipodium*, respectively. Thus, they used these names and considered the illegitimate names *Boletus tessellatus* Gillet and *Boletus nigrescens* Richon & Roze (the latter being a later homonym of *Boletus nigrescens* J.F. Gmelin, 1792) to be heterotypic synonyms with no priority.

At this point, it is important to remember that the plates of many ancient works were hand-coloured. Therefore, the colours could vary markedly from one plate to another, which occurred in the work of Letellier (1835), not only between different editions, but also within the same edition. This fact can be easily verified by comparing the plate 666 of the first edition, which we received from the botanic library of the Muséum National d’Histoire Naturelle (MNHN) with the plate 666 published by Muñoz (2005). The latter plate also belongs to the first edition because it presents the same black sketches which serve as outlines for the coloured drawing, which are different between editions. The publication of Muñoz (2005) shows the context under the cuticle and the stem surface of Figure A, as well as pores and stem of Figure C, with an emphasised red colour. These red tones are not present in the pileus nor in the pores in the first edition of MNHN, with only a barely noticeable red on the stems (Fig. 1). In the plate of the second edition of MNHN, the figures are paler in both colours and base sketches so that the colours appear overall much changed with light blue tones in the stem of Figure B, while Figure C shows an olivaceous pileus surface and a stem red in its mid-part, and the base sketches in the centre of the pileus of Figure B are somewhat different. This would explain why, to some authors, Figure B is representative of *Boletus crocipodius*, while others find both Figures A and B satisfactory.

However, we agree with Redeuilh (1990b) that, on the one hand, *Boletus crocipodius* was validly published in accordance with Art. 38.7 and 38.10 of the current ICN (corresponding to Art. 42.2 and 44.2, as mentioned by Redeuilh and referred to the code in force in 1988). On the other hand, taking into account the variability of *Leccinellum crocipodium*, at least Figures A and B of Plate 666 (Redeuilh 1990b) are in agreement with the present concept of this taxon, especially in the copy of the first edition of MNHN.



**Fig. 1.** *Leccinellum crocipodium*, illustration in Letellier, Figures des Champignons: Tab. 666, 1835, as *Boletus crocipodius*. © MNHN (Paris) – Direction des collections – Bibliothèque centrale.

### Valid publication of *Leccinellum crocipodium*

The current combination *Leccinellum crocipodium* has been proposed twice, in both cases incorrectly. However, whereas that of Bresinsky & Binder (Bresinsky & Besl 2003) has been invalidly published, the one by Della Maggiora & Trassinelli (Della Maggiora 2014) is correctable and, therefore, validly published.

Bresinsky & Binder mentioned, as the basionym, “*Krombholzia crocipodia* Letell. ex E.J. Gilbert, Les Bolets, p. 177, 1931”, believing that *Boletus croci-*

*podius* was an invalidly published name, then validated by Gilbert in 1931. Without doubt, as discussed above, *B. crocipodius* was validly published by Letellier. Thus, in accordance with Art. 41.5, since there is no reference to the basionym in their combination, nor a complete and direct reference to the work in which it was published, Bresinsky & Binder's combination was invalidly published. None of the cases of Art. 41.8 in which an indirect reference to the basionym can be treated as a correctable error, can be applied. The only assumption which could be applied would be Art. 41.8(a) if Gilbert (1931) had not mentioned Letellier when he published the combination in *Krombholzia*. However, Gilbert (1931) clearly mentioned Letellier by associating his name with the taxon on page 179, where he stated: "Ce Bolet doit porter avec plus raison le nom *K. crocipodia* (Letellier, *pro parte*)" [This bolete has to lead, even more so, the name *K. crocipodia* (Letellier, *pro parte*)]. Gilbert wrote *pro parte* because, as explained above, he only considered Figure B recognisable as belonging to the species which he called *K. crocipodia*. Furthermore, Bresinsky & Binder mentioned Letellier, but they should have cited his work in which the basionym was published instead of that of Gilbert (1931).

Concerning Della Maggiora & Trassinelli (Della Maggiora 2014), these authors reported, as the basionym, "*Boletus crocipodius* Letell., Hist. Champ. Fr. (Paris): tab. 666 (1838)", but in this reference, both the title of the work and the date are wrong. The error in the title is explained in this paragraph, while the error in the date is explained in the following paragraph, where dates provided by other authors are also analysed and discussed. As justified by the authors of the new combination, the error in the citation of the work has two sources. Firstly, the Index Fungorum database (the official repository where the name has been registered) does not allow data correction in the original work (occurring, in this case, in both title and date) which automatically appears when the name is published. This issue can be easily confirmed by examining other names published in Letellier's same work and registered in this repository, such as *Rhytisma riccioides* Letell. The entire reference reported for this name in Index Fungorum appears as "*Rhytisma riccioides* Letell., Hist. Champ. Fr. (Paris): tab. 629 (1831)", which is the same wrong reference as in *Boletus crocipodius*. This happens despite the page image of Saccardo's work, which this repository provides, mentioning Letellier's work as "Champ. Bull.". Saccardo indicated the work with two abbreviated words included in the full title of Letellier's work (see below), although in a different form with respect to the standard one currently used, "Fig. Champ.", indicated by Stafleu & Cowan (1979). Secondly, the error can also be explained by virtue of the correct title of Letellier's work: Figures des champignons servant de supplément aux planches de Bulliard. Indeed, Letellier's work begins with Plate 603, thus it could be the continuation of *Herbier de la France* (Bulliard 1780–1798), as Gilbert stated (1931; see below) or *Histoire des*

Champignons de la France (Bulliard 1791, Bulliard 1792, Bulliard & Ventenat 1809, Ventenat 1812), since both of these works end with Plate 602. Even though Letellier does not mention any of Bulliard's specific works, since Letellier's work dealt with fungi, it is more logical to think that it was conceived as a continuation of *Histoire des Champignons de la France*, which deals with fungi only. In any case, in the basionym indication reported in Della Maggiora (2014) there is no data omission, with author and plate number correctly cited. Therefore, according to Art. 41.6, the combination was validly published, although the title and the publication year of the work have to be corrected to "Figures de champignons..." and "1835" (see below), respectively, as is done in this paper.

### **Date of valid publication of *Boletus crocipodius***

According to Gilbert (1931), the first edition of Letellier's work *Figures des Champignons* was published as a continuation of Bulliard's work *Herbier de la France* (although we think that it was a continuation of *Histoire des Champignons*, see above), because the first plate is provided with the number 603, whereas the last one has the number 710. Gilbert (1931) also indicated that this work was published in 18 fascicles, each including 6 plates, in the period ranging from 1829 to 1842, that Plate 666, which represents *Boletus crocipodius*, was published in Instalment 11 and that the date of publication was "1838 environ" (around 1838). Later, again Gilbert (1941) pointed out that the 11<sup>th</sup> fascicle appeared before 1836 because he noted that the cover of Fascicle 13 is provided with the date 1836. Moreover, he reported that the first fascicle of the second edition appeared in 1839. Stafleu & Cowan (1979) did not provide any additional data on the dates of publication of each fascicle in the first edition. The publication dates attributed to Plate 666 by the following authors are quite different: "before 1836" by Gilbert (1941); 1836 by Redeuilh (1988b) and Lannoy & Estadès (1995); 1838 by Singer (1967), Rauschert (1987), Šutara (1989) and Muñoz (2005); 1842 by Watling (1961); 1829–1842 by Alessio (1985). The date indicated by Watling refers to the second edition, since according to Stafleu & Cowan (1979) the 8<sup>th</sup> fascicle of the second edition was published in 1840. Alessio reported the dates of all the fascicles of the first edition.

For this reason, we consulted several journals in which bibliographic novelties of the time had been published, as well as mycological literature and catalogues available on the internet. We found publication announcements of some fascicles, which in some cases explicitly indicate the plate numbers that they contain. The correct publication of the dates of Letellier's names serve as a guide for mycologists to know the actual priority of the novelties published in the above mentioned fascicles, and, consequently, contribute to their nomenclatural stability. These announcements are listed below: Livraisons 1–2: announced in *Bibliographie de la France* 19 année (33 of the collection), No 22 of 29 May 1830: 357. It includes Plates 603 to 614 and provides information for both fascicles, but without a separate publication date of the first fascicle. However, according to Gilbert, it should be 1929, the year corresponding to the beginning of Letellier's work.



Livraison 3: announced in *Bibliographie de la France* 19 année (33 of the collection), No 39 of 25 September 1830: 648. It includes Plates 615 to 620.

Livraison 4: announced in *Bulletin des Sciences Naturelles et de Géologie* XXIII: 97. 1830. It includes Plates 621 to 626.

Livraison 5: announced in *Bulletin des Sciences Naturelles et de Géologie* XXVI: 179. 1831. It explicitly indicates that Plates 627 to 632 “vient d’apparaître” (just appeared).

Livraisons 5–6: announced in *Bibliographie de la France* 21 année (35 of the collection), No 12 of 24 March 1832: 174. It explicitly indicates that it includes Plates 627 to 638 and provides information for both fascicles, but without a separate publication date of Fascicle 6.

Livraison 11: the online WorldCat catalogue reports 1835 as the publication date of this fascicle, based on the title page of a copy of Letellier’s work conserved at the Muséum National d’Histoire Naturelle. It includes Plates 663 to 668.

Livraison 13: published in 1836 based on a copy seen by Gilbert (1941). It includes Plates 675 to 680.

Livraison 14: announced in *Bibliographie de la France* 27 année (41 of the collection), No 29 of 21 July 1838: 346. It explicitly indicates 6 plates, in particular from No. 681 to 686.

Livraison 16: announced in *Bibliographie de la France* 29 année (43 of the collection), No 52 of 26 December 1840: 346. It explicitly indicates 6 plates, in particular from No. 693 to 698.

Using the information obtained from the WorldCat catalogue, we contacted Florence Tessier, responsible for the botanical library of the Muséum National d’Histoire Naturelle. She confirmed that the title page of Fascicle 11, which includes Plate 666, is provided with the date 1835. Therefore, this is the actual publication date of *Boletus crokipodius*. Both the fascicle number and the publication year were handwritten in all the fascicles we checked.

### **Etymology of the original epithet *crokipodius***

We did not find any work satisfactorily explaining the etymology of the epithet used by Letellier. Only Redeuilh (1988b) and Alessio (1989) gave comments in this regard. Redeuilh (1988b) stated that the common name “Bolet à pied râpeux” which Letellier (1835) included under the original plate, “sauf erreur, est sans lien étymologique avec *crokipodius* ou *crocipodius*” (except errors, has no etymological relationship with the epithet *crokipodius* or *crocipodius*). For their part, Alessio (1989) and Calzada (2007) reported that the word *crocipodium* referring to this *Boletus* means “with yellow stem”. According to our etymological study and the protologue, both of the above statements are wrong.

In addition to Plate 666, the only information provided by Letellier was the common name “Bolet à pied râpeux” (bolete with rough stem) and the scientific name “*Boletus crokipodius*”. Despite the fact that these are the only available data in the protologue, neither the common name nor the epithet with the letter “k” have been considered in the mycological literature, not only to explain its etymology but neither to correct the taxonomic interpretation of Letellier’s plate. Only Redeuilh (1988b), in a comment that he attributed to Romagnesi, stated “l’ortographe *crokipodius*, étymologiquement injustifiable avec un *k*, pourrait être l’indication de la prononciation voulue par Letellier” (the orthographic form

*crokipodius*, etymologically unjustifiable with a “k”, might be the indication of a desired pronunciation by Letellier). After studying the etymology of the epithet *crokipodius* / *crocipodius*, we completely agree with Romagnesi’s statement, as we shall see later, but he did not clarify the correct etymology of the name either. We want to point out that Romagnesi graduated in higher-level studies (Roger 1999) and was professor in ancient languages at secondary school (Courtecuisse 1999).

According to Liddell & Scott’s online dictionary, A Greek-English Lexicon (Liddell & Scott on-line), the root κρόκ- has two main meanings: saffron or saffron-yellow coloured and small flock or little wool ball.

With the meaning of saffron, we can find:

κρόκεος, κροκόεις, κρόκος, κροκήιοσο, κροκωτός = saffron-yellow coloured;  
κρόκινος = of saffron;  
κροκόβαπτος, κροκωτός = saffron-yellow dyed;  
κροκόπεπλος = with yellow veil;  
κρόκος = 1) *Crocus*, 2) saffron.

With the meaning of flock or nap of wool:

κρόκη, κροκός = the flock or nap on woollen cloth;  
κρόκαις = with cloths of soft wool;  
κρόκαισι = with flocks of wool.

Therefore, it is clear that the second meaning, “with a stem adorned with small flakes or wool balls”, is the one we have to use for the etymology of the epithet used by Letellier. Indeed, this agrees with the common name used by Letellier “Bolet à pied râpeux” (bolete with rough stem) and with the clearly visible granules that this author drew in all the figures.

Hence, neither the statement of Redeuilh (1988b), who did not attribute any connection of the name to its etymology, nor that of Alessio (1989), who reported it as meaning “yellow stem” is correct.

In addition, this etymological root also explains why Letellier preferred *crokipodius* instead of *crocipodius*. The reason, in our opinion and in agreement with Romagnesi, in the note published by Redeuilh (1988b), is that Letellier wanted to look for an etymological distinction from the *croci*- root, meaning saffron coloured. For this purpose, Letellier used the *croki*- root, which would exclude its interpretation as an epithet referring to the stem colour, because the author wanted to refer to the nature of the stem surface.

### **Correct spelling of the original epithet *crokipodius***

In order to know which the correct spelling is, we first have to remember that the letter “k” is very rare in Latin. It was used only in a very few words and almost exclusively before the letter “a”, even rarer before “o”, but never in association

with letters “e” or “i”. In the latter cases (“ke” and “ki”), the words taken from Greek were always transliterated into “ce” or “ci”. Even in cases when the letter “k” was used in Latin, it was almost always in pre-existing words with “c”, such as *calendas* / *kalendas*, *caput* / *kaput*, *Carolus* / *Karolus*, *Carthago* / *Karthago*.

Letellier could have written the epithet in the form *krokopodius* using Latin letters equivalent to the Greek letters κρόκ- and the connecting vowel “o” for names composed from Greek. However, he transliterated the first “k” into Latin as a “c” and used the connecting vowel “i” for names composed in Latin. So, the second Greek “k” had to be also transliterated as “c” according to Latin spelling, since, as we said before, there are no Latin words with “ke” or “ki” syllables.

In conclusion, according to Art. 60.1, the original spelling *crokipodius* has to be considered an orthographic error and has to be corrected to *crocipodius*, an epithet which is in agreement with botanical tradition, regardless its etymological meaning.

### **Typification of *Boletus crocipodius***

Redeuilh (1988b) reported that Maire (1937) designated the lectotype of *B. crocipodius* by using Figure B of Letellier as representative of the species. Maire mentioned “*Boletus crocipodius* Letellier t. 666, fig. B” as the basionym of *Krombholziella crocipodia*. As reported above, six years earlier, Gilbert (1931) also observed that Figure B was easily recognisable as *Krombholziella crocipodia*.

However, neither Gilbert (1931) nor Maire (1937) clearly cited the type element by using the term *typus* or an equivalent, therefore neither of the two authors met the requirements for a lectotype designation, as indicated by Art. 7.10.

According to the consulted references, the name *B. crocipodius* was typified for the first time by Lannoy & Estadès (1995), who designated Figures A and B of Plate 666 as the lectotype (although they used the informal term “virtual type” not foreseen by ICN). However, since they simultaneously indicated two elements as the type, they did not comply with Art. 7.2 requiring a type designation through a single element (“that element”), nor with Art. 9.2 which requires that the lectotype “is a specimen or illustration”, meaning a single specimen or a single illustration. Therefore, we have to consider that this typification was not effective.

Later, Den Bakker & Noordeloos (2005) considered Letellier’s plate as the holotype and designated as the epitype the collection of R. Walley from the Ardennes (France), which is well characterised from a molecular point of view by the ITS and *Gapdh* sequences deposited in GenBank with accession numbers AF454589 and AY538784, respectively. Again, Plate 666 cannot be considered as the holotype because Letellier did not explicitly indicate that he used a single element. The epitype designation was not achieved since it did not meet Art. 7.10 including the phrase “*hic designatus*” or an equivalent, mandatory since 1 January 2001.

As commented previously, the colours of the plates included in Letellier's work are very different within the same edition as well as among different editions. Thus, included in the first edition, there are copies (Muñoz 2005), in which the cap surface and the upper part of the stem of Figure A as well as the hymenophore of Figure C clearly show red tones, whereas the stem of Figure B shows blue-green tones (very likely the one consulted by Šutara 1989, judging by his observations). On the other hand, other copies within the first edition, such as the one we received from the botanical library of the Muséum National d'Histoire Naturelle, do not show red tones in the same parts. In this copy we can see yellow tones in the flesh under the cuticle of Figures A and B, whereas the stem in Figure B is completely yellow. For this reason, we publish in this contribution for the first time Plate 666 of the first edition conserved at the Muséum National d'Histoire Naturelle, in which Figure B which we designate as the lectotype (see below) perfectly corresponds to the current interpretation of *Boletus crocipodius*. Curiously, in this copy, spores which should be represented in Figure F are missing.

However, since some authors (Gilbert 1931, Maire 1937, Redeuilh 1988b, Lannoy & Estadès 1995) considered at least Figure B of Letellier's plate to be representative for *Leccinellum crocipodium* and rejected Figure C, whereas in the opinion of others (Alessio 1988, Šutara 1989) Plate 666 represents different taxa and used for them other names instead of *Boletus crocipodius*, we think that Letellier based his plate on more than one element. For this reason, the entire plate cannot be selected as the holotype as defined in Art. 9.1.

Accordingly, we proceed below to designate as the lectotype Figure B, which we consider to be the best representative element for *Boletus crocipodius*.

In addition, since the name *Boletus crocipodius* has been published without microscopic characters useful for its identification and there are no extant specimens related to the original material, we also proceed to designate in an effective way the epitype previously proposed by Den Bakker & Noordeloos (2005) in order to unequivocally characterise this taxon and to contribute to its nomenclatural stability.

**Lectotype** (designated here; MycoBank: MBT 377262): [icon] *Boletus crocipodius* ["*crokipodius*"]. Bolet à pied râpeux: plate 666, figure B, in Letellier, J. H., Figures des champignons servant de supplément aux planches de Bulliard, peintes d'après nature et lithographiées, 11<sup>ème</sup> livraison, 1835.

**Epitype** (designated here; MycoBank: MBT 377263) which supports the lectotype cited above: [specimen] *Leccinum crocipodium*, France, Ardennes, Sommeau/Beaumont-en-Argonne, F. de Belval, 20 September 1999, coll. Walley R. 1659 (L, isoepitype in GENT).

### **Current status of *Leccinellum crocipodium***

Some authors considered *Boletus crocipodius* a name invalidly published (Rauschert 1987, Alessio 1985) or doubtful (Alessio 1989, Šutara 1989) and used other names to designate the current *Leccinellum crocipodium*, such as



**Fig. 2.** *Leccinellum crocipodium*, Montioni, Suvereto, Livorno Province, Italy, under *Quercus cerris*, 12 June 2012 (not documented by a voucher). Photo R. Trassinelli.

*Leccinum tessellatum* (Kuntze 1898) Rauschert, *Leccinum nigrescens* Singer 1947, and *Leccinum luteoporum* (Bouchinot ex Costantin & Dufour 1895) Redeuilh<sup>1</sup>.

However, the three last names are more recent than *Boletus crocipodius*, which is the name here considered to be validly published and unanimously inter-

<sup>1</sup> This last name is usually mistakenly reported as *Krombholziella crocipodia* var. *luteopora* ["*luteoporus*"] (Bouchinot) Bon (1985), *Leccinum luteoporum* (Bouchinot) Šutara (1989) or *Krombholziella luteopora* (Bouchinot) Alessio (1991), but these three combinations were not validly published. Indeed, they do not contain a complete and direct reference to the author and place of valid publication of the basionym (Costantin & Dufour 1895), as requested by Art. 41.5, but to a work by Barbier (1904), in which in turn the place of publication of the basionym is mentioned. Note that although Costantin & Dufour (1895) attributed the basionym to Bouchinot as *Boletus scaber* var. *luteoporus* Bouchinot, they did not indicate, in any part of the work, that Bouchinot contributed to the original description and therefore, according to Art. 46.5, the correct authorship in *Leccinum* is Bouchinot ex Costantin & Dufour, or only Costantin & Dufour, 1895, as Redeuilh (1988b) reported. Other combinations, such as *Boletus luteoporus* (Bouchinot ex Costantin & Dufour) Barbier, 1904, and *Krombholzia luteopora* (Bouchinot ex Costantin & Dufour) Singer, 1939, were validly published.

preted in the sense of the current *Leccinellum crocipodium*. This final epithet has been used in all the recent monographs of the family *Boletaceae* (Lannoy & Estadès 1995, Muñoz 2005, Calzada 2007), European mycology guides (Bon 2012, Buczacki et al. 2012, Courtecuisse & Duhem 2013, Knudsen & Vesterholt 2012) and papers on phylogeny (Binder & Besl 2000, Den Bakker et al. 2004a, 2004b, Den Bakker & Noordeloos 2005, Dentinger et al. 2010, Feng et al. 2012, Nuhn et al. 2013, in particular).

Consequently, when *Leccinellum crocipodium* (Fig. 2) is considered a synonym of *Leccinum tessellatum*, *Leccinum nigrescens* and *Leccinum luteoporum*, as done in this work, the name *Leccinellum crocipodium* should be used since it has priority over the others.

#### NOMENCLATURAL PROBLEMS OF *BAORANGIA EMILEORUM*

***Baorangia emileorum*** (Barbier) Vizzini, Simonini & Gelardi in Vizzini, Index Fungorum 235: 1, 2015 [*“emilei”*]

- ≡ *Boletus emileorum* Barbier, Bull. Soc. Mycol. Côte-d’Or 8: 12, 1914 [*“emilei”*; “Cote”] [basionym]
- ≡ *Xerocomus emileorum* (Barbier) Gilbert, Les livres du mycologue. Tome III. Les Bolets: 149, 1931 [*“aemili”*]
- *Boletus emileorum* Barbier, Bull. Soc. Mycol. France 31(3–4): 53, 1915 [*“emilei”*] [Art. 6.3, Note 2, a later isonym of *Boletus emileorum* Barbier (1914) without nomenclatural status]

#### **Valid publication of *Boletus emileorum***

Barbier published the description of *B. emileorum* twice, a year apart. The first time in the Bulletin de la Société Mycologique de la Côte-d’Or (Barbier 1914), then in the Bulletin trimestriel de la Société Mycologique de France (Barbier 1915). According to our data, with the exception of Redeuilh (1988a, 1990a), all the consulted works and official repositories consider the name *Boletus emileorum* as validly published in 1915. Bertolini & Simonini (2013) considered the publication of 1915 valid, stating that the publication in 1914 does not comply with Art. 36.1(b), since Barbier wrote that the species he wanted to describe were “probablement nouvelles” (probably new) and “nous allons décrire les caractères de deux espèces en leur donnant un nom, qui deviendra définitif si aucune réclamation de priorité ne se produit” (we are going to describe the characters of two species to give them a name, which will become definitive if there is no priority claim). We think that the meaning of the two statements can be found in the fact that Barbier doubted that someone before him had already given a name to the same species, not that he had doubts about the acceptance of the names themselves. Barbier explained that his master Boudier had not been able to identify these species at first sight because he was travelling and could not consult his extensive library and, for this reason, the species could have been

already described. However, at the same time Barbier stated that, considering it an unlikely event, he had decided to describe them as new.

Therefore, we consider *Boletus emileorum* originally published in 1914 and, as a consequence, the name published in 1915 as a later isonym without a nomenclatural status.

### **Valid publication of *Baorangia emileorum***

According to Art. 41.8(a), the combination *Baorangia emileorum* is validly published, although the work mentioned in the basionym is the one of Barbier from 1915 (Vizzini 2015), because in the latter one there is no reference to the original work of 1914.

### **Etymology and correct spelling of the original epithet “*emilei*”**

Barbier explicitly stated twice (Barbier 1914, 1915) that “*Boletus emilei*” was dedicated to both Émile Boudier and Émile Boirac. In 1914 Barbier wrote: “Le première est un Bolet que nous nommerons *Boletus Emilei*, rendant par là un même hommage reconnaissant à notre éminent conseiller en mycologie, M. EMILE BOUDIER, et à notre dévoué Président de la Société mycologique de la Côte-d’Or, M. le Recteur EMILE BOIRAC” (The first one is a bolete that we call *Boletus Emilei*, thus paying tribute, at the same time, to our eminent counsellor in mycology Mr. EMILE BOUDIER and to our dedicated President of the Mycological Society of the Côte-d’Or, Mr. Rector EMILE BOIRAC). In the same way, in 1915 he wrote “Espèce ainsi nommée en témoignage de reconnaissance à nos très bienveillants Maître et Chef, le grand mycologue E. BOUDIER et M. le Recteur E. BOIRAC, président de la Société Mycologique de la Côte-d’Or” (species named as a token of gratitude to our kind benefactors, the great mycologist E. BOUDIER and Mr. Rector E. BOIRAC, President of the Mycological Society of the Côte-d’Or). Since there are no doubts that the epithet was created in honour of two people, both with the first name Émile (which Barbier wrote without an accent on the first “e”), therefore, according to Art. 60.12 (see examples 37 and 38) and Rec. 60C.1, the epithet has to be corrected to *emileorum*, a plural genitive which means “of the two Émiles” in place of *emilei* used by Barbier, a singular genitive which means “of Émile”.

The correct epithet *emileorum* has never been used in literature nor in an official repository, but besides being the correct one according to ICN, its introduction will result in good nomenclatural stability because currently six different variants of the same epithet are used: the original “*emilei*” (Bertéa 1990, Lannoy & Estadès 2001, Estadès & Lannoy 2004, Šutara et al 2009, Bertolini & Simonini 2013, Vizzini 2015, among others), “*aemilii*” (Gilbert 1931, Blum 1962, Singer 1967, Alessio 1985, 1991, Galli 1987, Foiera et al. 2000, Calzada 2007, Courtecuisse

& Duhem 2013, among others), the less common “*emilii*” (Redeuilh 1988b, 1990a, Estadès 1988, Galli 1998, Bollmann et al. 2007, among others), and rarely also “*aemilei*” (Bertéa 1990, Lacombe 2012), “*emileri*” (Bourgeois 1955) and “*aemilli*” (Wang et al. 2002, Lukić 2009, Erjavec et al. 2012). These six variants are, or have the form of, singular genitives and the last three spellings are very likely just typographical errors.

A few years after the original publication, Trotter (1925) changed the epithet in “*aemilii*”. Trotter did not explain this correction, but Alessio (1985) elucidated it from a classical Latin point of view. In particular, he stated that Émile corresponds in Latin to *aemilius*, whose singular genitive would be “*aemilii* = of Émile”. This correction is not acceptable for three reasons. Firstly because, according to ICN and as Alessio himself admitted, the name was dedicated to two people with the name Émile, but “*aemilii*” is singular, meaning “of Émile”. The second reason is that Latin can be used for names for which a well-established Latinised form exists, as indicated by Rec. 60C.2, but in this case, Barbier based his epithet on the name Émile, which is a French name, not a Latin one. That is why we have to apply Rec. 60C.1, which, through Art. 60.12, forces us to use *emileorum*. Art. 60.3 give us the third reason by stating: “The liberty of correcting a name is to be used with reserve, especially if the change affects the first syllable and, above all, the first letter of the name”.

Concerning the correction “*emilii*” introduced by Redeuilh (1988a), this change is wrong. Redeuilh justified this form by stating that the Latin termination “*ii*” is well established for the name “Émile”, according to Rec. 73C.2 of the code in force at the time (Greuter et al. 1988), and it replaces the termination “*ei*” already foreseen by the Code through Rec. 73C.1(a). However, once Barbier used the French name Émile to compose the Latinised epithet, only Rec. 73C.1 was mandatory through Art. 73.10. Thus, *emileorum* is the correct epithet in plural genitive form for a name honouring two people called Émile. Subsequently, although he continued to use the epithet “*emilii*”, the same author observed that the correct epithet was probably “*aemilei*” (Redeuilh 1990a), which is incorrect, being a singular genitive.

In conclusion, according to ICN, the correct spelling of the specific epithet is *emileorum*, as is used in this work.

### **Typification of *Boletus emileorum***

According to the consulted literature, the name *Boletus emileorum* was typified by Bertolini & Simonini (2013) who selected as the holotype Plate V, Figure a, published in 1915, which these authors reproduced in their paper. They also indicated as the epitype specimen AMB 12646 from the Bois de Bèze (France), the same forest where Barbier’s original specimens were collected.



However, since *Boletus emileorum* was validly published in 1914, the plate of 1915 is not part of the original material as defined by Art. 9.3, as it is only a plate published after the protologue. Moreover, even though the 1915 publication was valid, this plate could not have been designated as the holotype since Barbier (just as in 1914) mentioned the same three syntypes: Bèze 1899, 1900 and 1912 ["1902"]. These syntypes were confirmed by the study of Barbier's unpublished notes included in the archives of the Société Mycologique de la Côte d'Or. Bertéa (1990), Redeuilh (1990a) and Bertolini & Simonini (2013) published the content of these notes and reported that Barbier studied three specimens collected on September 4, 1899, August 20, 1900, and in August 1912. Barbier (1915) reported that the last syntype was collected in 1902, but in the publication of 1914 and in his unpublished notes he stated that the third collection was made in 1912.

As mentioned above, the epitype designation carried out by Bertolini & Simonini (2013) was not effective and, since the assumed holotype does not exist, the epitype supporting it does not exist either (see Art. 9.20 and its note 7).

Following Art. 9.12, we have to designate a lectotype from the syntypes representing the only original material mentioned in 1914. We have tried to locate the syntypes, but without success. Stafleu & Cowan (1979) reported that Barbier's herbarium is unknown. Jean-Claude Verpeau, current president of the Société Mycologique de la Côte d'Or, informed us that they do not have original specimens of *Boletus emileorum* nor Barbier's other collections in the society's herbarium. Moreover, he does not know other herbaria where these collections would be conserved. Lastly, since Barbier (1914) reported that he sent Boudier samples of this species, we also contacted the PC herbarium, which informed us that there is not any original material related to *Boletus emileorum* deposited there.

However, Redeuilh (1990a) published some of Barbier's unpublished notes containing an illustration which served as a model for the illustration published by Barbier in 1915 and revealed the existence of a spore print on the right side of that illustration. Thanks to Bertéa (1990) we know that the spore print belongs to the specimen of September 4, 1899. In Barbier's unpublished notes, together with this illustration, just below the spore print, we can read "spores comme celles de 1900 ci-contre, les gouttes ont conflué par le vieillissement" (spores like those of the 1900 on the other side, the guttules have converged by aging). This confirms that the spore print belongs to the specimen of 1899, because on the left side of the sheet we can observe spores with non-confluent guttules, whereas the notes of the 1912 collection are on a separate sheet (Bertéa 1990). Jean-Claude Verpeau confirmed us that there was a small pocket containing the spore print attached to the illustration.

This means that the spore print would be part of a syntype and, therefore, part of the original material which could be designated as the lectotype.

However, Jean-Claude Verpeau also informed us that Barbier’s unpublished notes and illustration were delivered to Redeuilh for his study and publication of his paper on this species (Redeuilh 1990a), but this mycologist died in 2004. Since Redeuilh was president and vice-president of the Société Mycologique de France, we contacted Patrice Lainé, a member of the board of directors. Lainé informed us that nothing had been donated to the society and, according to his knowledge, Redeuilh’s books and microscope had been sold, whereas the mycological documents had been thrown away. Likewise, the Italian mycologist Nicola Sitta, who purchased part of Redeuilh’s journals and book collection on *Boletales*, informed us that there is no unpublished material of Barbier in his bibliography. So, currently, the unpublished illustration and the related spore print are missing or, most likely, no longer exist.

As we have stated above, since there is no original material, we select below as the neotype the same collection proposed by Bertolini & Simonini (2013) as the epitype, in order to unequivocally characterise this taxon and contribute to its nomenclatural stability.

Neotype (designated here; MycoBank: MBT 377264): [specimen] “*Boletus emilei* Barbier”, France, reg. Bourgogne, distr. Dijon, cant. Mirabeau-sur-Bèze, Bois de Bèze, alt. 270 m s.l.m., misto latifoglie, 13-IX-2008, leg. Jules Gardiennet (AMB 012646).

### **Current status of *Baorangia emileorum***

Bertéa (1988) published a new taxon named *Boletus spretus* with a brief Latin description and without illustrations. Two years later, the same author (Bertéa 1990) published a more comprehensive description and also included a comparative study of *Boletus spretus* and “*Boletus aemilii* Barbier” based on the two descriptions of Barbier (1914, 1915) as well as his unpublished notes. Bertéa mentioned, on the one hand, some morphological differences between the two taxa and, on the other hand, that Jean-Claude Verpeau informed him that “*Boletus emilei*” had no longer been found after the three collections related to the original description. Finally, Bertéa concluded that “le nom d’*aemilei* [sic] est à écarter comme *nomen dubium* tant que des récoltes nouvelles n’auront pas été effectuées sur les lieux même de prospection de Barbier” (the name *aemilei* [sic] has to be discarded as a *nomen dubium* since new collections were not made at the same collecting sites as Barbier’s ones). Later, some authors followed Bertéa and used the name *Boletus spretus*, whereas others considered Barbier’s name a non-ambiguous name and used it with different spelling variants, as discussed above. However, it should be noted that in most of the consulted works, the two names are considered synonymous. Recently, Bertolini & Simonini (2013) showed that Jean-Claude Verpeau and M.B. Robert regularly collected *Baorangia emileorum* in the forest (Bois de Bèze) where Barbier gathered the specimens



**Fig. 3.** *Baorangia emileorum*, Navalvillar de Ibor, Cáceres Province, Spain, under *Castanea sativa*, 7 Oct. 2007 (not documented by a voucher). Photo C. Gelpi.

observed for the original description and published two photos of collections made in 1998 and 2008 in this forest (the latter designated here as neotype). Likewise, Jean-Claude Verpeau informed us that there is also a file related to *Baorangia emileorum*, under Number 563, on the web page of the Société Mycologique de la Côte d'Or, which refers to a collection made in 2015 in the place where Barbier usually gathered his specimens (<http://www.societe-mycologique-de-la-cote-dor.org/index.php?fiche=2237>).

In conclusion, *Baorangia emileorum* (Fig. 3) is not a doubtful name, with priority over *Boletus spretus*. Therefore, when the two species are considered synonyms, the name *Baorangia emileorum* should be used.

NOMENCLATURAL PROBLEMS OF *RUBROBOLETUS LEGALIAE*

***Rubroboletus legaliae*** (Pilát & Dermek) Della Maggiora & Trassinelli in Della Maggiora, *Index Fungorum* 246: 1, 2015

- ≡ *Boletus legaliae* Pilát & Dermek in Pilát, *Houby Československa ve svém životním prostředí*: 52, 1969 [*le-galiae*] [basionym]
- *Boletus purpureus* var. *legaliae* Pilát in Pilát & Ušák, *Naše Houby II, Kritické druhy našich hub*: 4, 1959 [*le-galiae*] [*Nom. inval.* Art. 40.1, no type indicated]
- *Boletus purpureus* var. *legaliae* Pilát in Pilát & Ušák, *Mushrooms and other fungi*: 4, 1961 [*le-galiae*] [*Nom. inval.* Art. 40.1, no type indicated]
- *Boletus legaliae* Pilát in Blum, *Rev. Mycol. (Paris)* 33(1): 124, 1968 [*Le Galliae*] [*Nom. inval.* Art. 40.1, no type indicated]
- *Rubroboletus legaliae* Mikšík, *Index Fungorum* 207: 1, 2014 [*Nom. inval.* Art. 41.5, basionym reference incorrect, not correctable under Art. 41.8]
- *Suillillus legaliae* Blanco-Dios, *Index Fungorum* 211: 1, 2015 [*Nom. inval.* Art. 41.5, basionym reference incorrect, not correctable under Art. 41.8]

**Valid publication of *Boletus legaliae***

The epithet *legaliae* was published, as “*le-galiae*”, for the first time by Pilát & Ušák (1959), who assigned it to a variety of *Boletus purpureus*. However, since the type was not indicated in accordance with Art. 40.1, this name was not validly published. The authors included in their description a plate showing various specimens. In addition, they mentioned two plates published by Le Gal (1948), Figures 57a, 58, 60 and 169, included in a previous work by Pilát (1952), and Plate 928 reported by Bresadola (1931). Thus, since Pilát & Ušák (1959) did not mention a specimen nor a single illustration, their type indication is not acceptable in accordance with Art. 40.3, which in turn prevents the application of Art. 40.1.

The same variety was also invalidly published by Pilát & Ušák (1961) in a new English edition of their work from 1959.

Afterwards, Pilát published the epithet *legaliae* again in a paper authored by Blum (1968), this time at the species rank, as “*Boletus Le Galliae*”. Once again, he did not indicate the type, required by Art. 40.1, because he did not cite any single element to serve as type indication. Since Pilát quoted Le Gal “= *lupinus* Bres. sensu Le Gal, 1948”, it could be interpreted as a reference to elements present in Le Gal’s work (1948). However, Le Gal did not refer to a single element serving as type indication, although she mentioned at least four collections and three plates, the one published by Bresadola (1931) and two other ones included in her own paper.

Finally, a year later, Pilát & Dermek (Pilát 1969) validly published *Boletus legaliae* using the epithet “*le-galiae*”. These authors designated a type and provided a complete and direct reference to a Latin diagnosis previously published in “Pilát et Ušák, *Mushrooms and other Fungi*, tab. 4, 1959”, in accordance with Art. 38.13. The error in the year of publication, 1961 instead of 1959, does not preclude its validity. Art. 38.13 requires that the type reference has to be in accordance

with Art. 41.5 containing a cross reference to Art. 41.6, which in turn ratifies that no error (provided there are no omissions) affects valid publication. Although Art. 41.6 applies to basionyms and replaced names, through its quotation by Art. 41.5, it is also applicable to references to an earlier Latin diagnosis.

Therefore, the date of valid publication of *Boletus legaliae* is 1969.

### **Authorship of the name *Boletus legaliae***

The authorship of this name is referenced inconsistently in literature. Just to list some examples, Foiera et al. (2000) used “(Pilát) ex Pilát & Dermek”, Bollmann et al. (2007) used “(Pilát) Blum”, Mikšík et al. (2016) mentioned as authors “Pilát ex Pilát & Dermek” and the official repositories Index Fungorum and MycoBank only indicate “Pilát & Dermek” as done by Šutara et al. (2009). In the protologue, the name is ascribed to “Pilát & Dermek” (as Pilát et Dermek), whereas Pilát (1969) is the author of the publication. Therefore, according to Art. 46.2, last sentence, since publication and name have an author in common, the authorship has to be accepted as ascribed in the protologue, that is “*Boletus legaliae* Pilát & Dermek”, even if the valid publication of the name is based on a Latin diagnosis published in a previous work authored by Pilát.

### **Valid publication of *Rubroboletus legaliae***

The combination *Rubroboletus legaliae* was published for the first time by Mikšík (2014), but with reference to the invalid basionym “*Boletus legaliae* Pilát, Revue Mycol. Paris 33: 124 (1968)”, instead of the true one. Therefore, according to Art. 41.5, the combination is also invalidly published because none of the options of correction listed in Art. 41.8 can be applied to this case.

For the same reason, the combination *Suillellus legaliae* (Blanco-Dios 2015) was also invalidly published, being based on the same invalid basionym as indicated by Mikšík (2014).

The combination *Rubroboletus legaliae* was validly published by Della Maggiora & Trassinelli (Della Maggiora 2015), who provided a complete and direct reference to the actual basionym.

### **Etymology and correct spelling of the original epithet “*le-galiae*”**

Pilát (in Pilát & Ušák 1959, 1961) explicitly stated that the epithet “*le-galiae*” is dedicated to Marcelle Le Gal, and that he used this name to identify his collections from Czechoslovakia with those published by Le Gal (1948) with the name “*Boletus lupinus sensu Bresadola non Fries, nec auct. al.*” collected in France. In these two works, where the name was invalidly published, Pilát consistently used the spelling “*le-galiae*”, that is by combining the two elements of the name with a hyphen.

On the contrary, in the valid publication, the indication of the epithet “*le-galiae*” was not consistent. In the text Pilát (1969) used “*le-galiae*” but in the index “*le galiae*”, that is with a space instead a hyphen, was used.

After the original publication of Pilát & Dermek (Pilát 1969), the epithet “*le-galiae*” (excluding works where these authors contributed) was systematically corrected to “*legaliae*”. In the literature we found the form “*le-galiae*” in just four works: Singer & Kuthan (1976), Šebek (1979), Michael et al. (1983) and Halama (2016). However, Halama (2016) explicitly declared that he used the hyphen in agreement with Mikšík et al. (2016, cited as 2015<sup>2</sup>). Thus, for 32 years, all authors (with the exception of Pilát and Dermek) used the epithet *legaliae* until Mikšík et al. (2016) resurrected the form *le-galiae* in the combination *Rubroboletus le-galiae* which, a few months before, Della Maggiora & Trassinelli (Della Maggiora 2015) had correctly combined as *R. legaliae*.

Mikšík et al. (2016) stated that the form “*le-galiae*” is the original one and, thus, has to be maintained because it is not explicitly included within the correction cases foreseen by Art. 60.9. These authors also observed that “the maintenance or suppression of a hyphen after the particle of Marcelle Le Gal is debatable anyway”, and that “analogous cases of surnames with particle (such as “Le Rat”, “Le Testu” or “de Bary”) are treated in various ways by original authors, as well as corrected, or not, by bibliographic databases (e.g. Index Fungorum or MycoBank) without clear guidelines”.

According to our nomenclatural study, Art. 60.9 can be applied to this case because it specifically (although not exclusively) deals with the correction of epithets originally published with a hyphen. Based on the study of nomenclatural arguments introduced by Mikšík et al. (2016), as well as those of our own, we conclude that the correct epithet is “*legaliae*”. This form contributes to the stability of an epithet almost unanimously accepted in its form without a hyphen from the moment of its creation to the present.

The different nomenclatural arguments which consistently indicate that the correct spelling is *legaliae* are the following:

- A. – Art. 60.9 through its cross references to Art. 23.1, Art. 60.1 and Art. 61.1.
- B. – Recommendation 60C.5(c).
- C. – Point 13 of the preamble.

Ad A. – Art. 60.9 through its cross references to Art. 23.1, Art. 60.1 and Art. 61.1

Mikšík et al. (2016) stated that the correction of the original epithet *le-galiae* to *legaliae* is not explicitly covered by Art. 60.9, which imposes the corrections of original spellings, but their statement is not correct.

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<sup>2</sup> This paper was unofficially released via the academic social network ResearchGate on 1 July 2015 and dated October 2015 and December 2015 in the printed version but effectively published on 2 March 2016 according to a personal communication of editor in chief Régis Courtecuisse.

Art. 60.1 imposes that the original spelling has to be maintained except for the correction of typographical and orthographic errors, and for some standardisations. Among the standardisations referred to in Art. 60.9 the “hyphen” is included.

Likewise, Art. 61.1 establishes that only one of the orthographic variants of any one name is treated as validly published: the form that appears in the original publication. However, again it indicates, among others, those cited in Art. 60 as exceptions.

Art. 60.9 is written in two parts: the first is a true standardisation and requires the elimination of the hyphen in a compound epithet as in our case. The second part is not a standardisation because it uses the verb “to permit”, meaning that there is no obligation to combine with a hyphen those epithets which, in the original orthographic form, are composed of terms which usually appear as independent words or in which the letters before and after the hyphen are the same. Thus, for example, the epithet of both *Athyrium austro-occidentale* Ching (see ICN Art. 60.9, Ex. 25), and *Loranthus pseudoodoratus* Qiu & Gilbert (Rijckevorsel 2016) are correct. The second one does not have to be modified to include a hyphen (*pseudo-odoratus*), although it is permitted (that is, Ex. 26 is limited to the cases covered by Art. 23.1).

Therefore, in accordance with Art. 60.9, the epithet *le-galiae* has to be corrected to *galiae* because it is not composed of two words which usually stand independently.

From a first analysis of this composition, it turns out that the word “*galiae*” is Latin and it can be used independently, whereas this does not occur for the particle “*le*”, a French definite article without an equivalent in Latin (in Latin there are no definite articles). Therefore, “*le*” does not stand as an independent word.

A deeper analysis reveals that the expression “words that usually stand independently” (Art. 60.9) is not precise, since at first glance epithets like *ciliatoglandulifer* or *atropurpureum*, being composed of words like “*ciliato*” and “*glandulifer*”, “*atro*” and “*purpureum*”, could be used in an independent form. However, the terms used separately should make sense in their own context, not in the form of a derivative. Indeed, we can encounter the forms *ciliatus*, *ciliata*, *ciliatum*, and *ater*, *atra*, *atrum*, but we cannot use the epithet “*ciliato*” or “*atro*”, because they cannot stand independently. For this reason, there is no hyphen between the two elements composing the epithets included in Ex. 24 of Art. 60.9.

This is why Art. 60.9 has to be interpreted as “words that, **contextually**, usually stand independently”.

This is even more explicit in the epithets *neobudarium* (of the New Hebrides) and *novae-angliae* (of New England) used in examples 24 and 26, respectively, of the same article. In both cases, the two elements composing the epithets are in Latin and the first element means “new”, but whereas we cannot write in any context *Neo Ebudae*, we can correctly write *Nova Anglia*. This is why, in *Neo Ebudae*, the particle *neo* “cannot stand independently”, whereas the word *Nova* can be used separately. As a result, we could write *Novae Ebudae* and compose the epithet *novarum-ebudarium*.

In order to use the words in their context correctly, both terms have to be in the same language (not necessarily Latin). So, in a hypothetical example, if we consider the word *hula* from Hawaiian, the epithets *hula-hula* and the Latinised *hulae-hulae* would be correct, but not *hula-hulae*, which is composed by words in two different languages.

In conclusion, since “*Le*” is French and “*Galiae*” is Latin, the hyphen is not permitted and it has to be removed from the original epithet.

#### Ad B. – Recommendation 60C.5(c)

Although the Code recommendations are not mandatory, according to Rec. 60C.5(c), in the composition of new epithets based on personal names, a prefix which consists of an article or contains an article should be directly joined to the name (without a hyphen). This is clear from examples, reported to be correct, like the forms *leclercii* for Le Clerc, *lafarinae* for La Farina and *logatoi* for Lo Gato. Again, the use of *galiae* would be completely congruent with this recommendation.

Ad C. – Point 13 of the preamble

Mikšík et al. (2016) stated that “analogous cases of surnames with particle (such as “Le Rat”, “Le Testu”, or “De Bary”) are treated in various ways by original authors, as well as corrected, or not, by bibliographic databases (e.g. Index Fungorum or MycoBank) without clear guidelines”.

Actually, this is not entirely true, because point 13 of the ICN preamble establishes that “in the absence of a relevant rule or where the consequences of rules are doubtful, established custom is followed”, which serves as a guide to know which is the correct epithet. Therefore, in order to follow the customary use, we need to know which is the:

- C.1. – Use of the epithet *legaliae* / *le-galiae* within the genera *Boletus* and *Rubroboletus*;
- C.2. – Use of the epithet *legaliae* / *le-galiae* within other genera;
- C.3. – Use of similar epithets containing an article.

Ad C.1. – Use of the epithet *legaliae* / *le-galiae* within the genera *Boletus* and *Rubroboletus*

As we have already pointed out in the introduction, without taking into account the works of Pilát and Dermek (who consequently use *le-galiae*), the *le-galiae* form was only used 3 times before the publication of Mikšík et al. (2016). The generic and widely used guides for fungi identification in Europe (Eyssartier & Roux 2011, Knudsen & Vesterholt 2012, Bon 2012, Buczacki et al. 2012, Courtecuisse & Duhem 2013), monographic works on the *Boletaceae* family (Alessio 1985, Lannoy & Estadès 2001, Estadès & Lannoy 2004, Muñoz 2005, Calzada 2007, Šutara et al. 2009, Kibby 2011) and specific papers on this taxon (Anderson 2013) always used the form *legaliae*. The well-known web page on *Boletales* <http://boletales.com> also uses *legaliae*. This consideration explains our concern about the effects on the nomenclatural stability that would cause use of the spelling *le-galiae*.

On the other hand, after the publication by Mikšík et al. (2016), we found only one paper that, in agreement with these authors, used the form *le-galiae* (Halama 2016). In recent years, other Czech and Slovak authors, who should have been influenced by Pilát and Dermek’s works, preferred *legaliae* (Hagara et al. 1999, Papoušek 2004, Hagara 2014, Janda et al. 2017), including Mikšík (2012) himself.

Ad C.2. – Use of the epithet *legaliae* / *le-galiae* in other genera

It is clear that Pilát & Ušák (1959) were the first to use the epithet *legaliae* (as *le-galiae*), so there was no previous use of this epithet. However, when Mikšík et al. (2016) proposed *le-galiae* as the correct form, there were already three species of fungi dedicated to Marcelle Le Gal in the databases which they cited and in all the cases the spelling used was *legaliae*:

- *Scutellinia legaliae* Lohmeyer & Häffner, Westfäl. Pilzbriefe 10–11(8a): 204, 1983.
- *Lachnum legaliae* W.Y. Zhuang & Zheng Wang, Mycotaxon 69: 346, 1998 [“*legalii*”].
- *Clitocybe legaliae* E. Ludw., Pilzkompendium (Berlin) 3: 146, 2012.

Also in the online databases mentioned by Mikšík et al. (2016), Index Fungorum and MycoBank, no results are found in a search for the epithet in the form *le-galiae*. This fact proves the need of a systematic correction of the spelling *le-galiae* and a consistent use of *legaliae*, which we uphold here.

Ad C.3. – Use of similar epithets containing a particle

Regarding the common use of other epithets with a particle, since there are many, we focused our study on three different groups. First, we considered those quoted by Mikšík et al. (2016), then those cited in Rec. 60C.5(c) of the ICN, which we consider as representative cases. Finally we quantified the corrections which would be required in the IPNI database, if Proposals 284 or 285 (Hartley et al. 2016), concerning the retention or omission of the hyphen in this type of epithets, were accepted.

Let us recall the fact that Mikšík et al. (2016) stated: “analogous cases of surnames with particle (such as “Le Rat”, “Le Testu” or “de Bary”) are treated in various ways by original authors, as well as corrected, or not, by bibliographic databases (e.g. Index Fungorum or MycoBank) without guidelines”.

From 131 plant names and 4 fungal ones dedicated to Le Testu, 121 were published with a space between the two elements of the epithet (*le testui*, *le testuanum* and *le testuana*) and 14 with joined ele-



ments (*letestui*, *letestuanum* and *letestuana*). From 21 plant names (no fungal ones) dedicated to Le Rat, 19 were published with a space between the two elements (*le rati*, *le ratii*, *le ratiæ*, *le ratorum* and *le ratianum*) and 2 with joined elements (*leratii* and *leratiana*). Finally, from 10 plant and fungal names dedicated to De Bary, 6 were published with a space between the two elements (*de baryi*, *de baryana*, *de baryanus* and *de baryanum*) and 4 with joined elements (*debaryana* and *debaryanum*).

Thus, in the original description of a taxon, authors wrote the epithets of a plant or a fungus name dedicated to Le Testu, Le Rat or De Bary either with or without a space, but never with a hyphen. According to the current ICN, the elements cannot be separated (Art. 23.1). Consequently, following the most accepted use and in accordance with point 13 of the preamble, names with a space between the two elements have to be joined without a hyphen.

In the study of the examples reported under Rec. 60C.5(c) we found only one epithet dedicated to each of the first three, Le Clerc (*leclercii*), Du Buysson (*du buyssonii*), La Farina (*lafarinae*) and none to Lo Gato. Again, there are no epithets with elements united with a hyphen, but there are two epithets with the two elements united.

Recently, Hartley et al. (2016) published two proposals aimed at the standardisation of epithets based on names containing a preposition or a definite article (*le*, *la*, *de*, *von* and *van*). The purpose is to have a single criterion for correcting names by joining elements without a hyphen (Proposal 284) or with a hyphen (Proposal 285). Unfortunately, the proponents only indicate that 135 and 209 changes, respectively, should be necessary in the IPNI and WCSP databases if Proposal 284 were accepted, but they did not estimate the needed changes if Proposal 285 were approved. Since our studies show that the use of a hyphen to combine two elements in this type of names is very rare, and believing that the implementation of Proposal 285 would be very prejudicial to nomenclature stability, we calculated how many changes would be needed in IPNI if Proposal 285 were accepted. According to the data we obtained, in the case that Proposal 284 were accepted, the number of changes in IPNI would be 127, but if Proposal 285 were accepted, the number of changes would be 662. Therefore, independent of the original spelling (where names combined with a hyphen are very rare), the implementation of Proposal 284 would be much more beneficial for nomenclatural stability.

As a conclusion of this in-depth study, Art. 60.9 (through its cross references to Art. 23.1, 60.1 and 61.1), Recommendation 60C.5(c), botanical tradition, Myco-Bank, Index Fungorum and IPNI databases consistently indicate that *legaliae* should be used, whereas no reasons were found to use the epithet in the original form *le-galiae*.

Fortunately, Proposal 284 was accepted and Proposal 285 was rejected at the Shenzhen congress. In addition, the voted examples proposed by Hartley et al. (2016) will be incorporated in the ICN as amended examples. This distinction is very important because an amended example contains cases explicitly covered by the ICN as defended by us in this paper while a voted example covers situations not fully or explicitly covered by the ICN, as defended by Mikšík et al. (2016).



**Fig. 4.** *Rubroboletus legaliae*, Prodašice, Central Bohemia, Středolabská tabule plateau, Czech Republic, under *Quercus* and *Carpinus*, 5 Sept. 2015 (PRM 934871). Photo J. Borovička.

### **Typification of *Boletus legaliae***

Pilát (1969) correctly holotypified this name as follows:

**H o l o t y p e:** Czech Republic, Central Bohemia, Lysá nad Labem, September 1949, leg. A. Lukavec (PRM 647975).

Recently, Janda et al. (2017), in an excellent paper containing numerous photographs covering the entire variability of *B. legaliae*, carried out its epitypification as follows:

**E p i t y p e** (MycoBank: MBT 375223): [specimen] Czech Republic, Central Bohemia, Záhornice near Městec Králové, on bank of Jakubský Pond, alt. 205 m, under *Quercus* and *Corylus*, 5 September 2015, leg. & det. V. Janda & T. Pavelka (PRM 945076).

### **Current status of *Rubroboletus legaliae***

In the current mycological literature, *Rubroboletus legaliae* (Fig. 4) is a correct and unanimously accepted name.

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