

## A morphological character study of the type specimen of *Xerocomus luteovinaceus* ad int.

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**Key words:** *Boletales*, *Boletineae*, *Boletaceae*, *Xerocomus*, *Xerocomellus*, *X. fennicus*, *X. intermedius*, *X. luteovinaceus*, *X. marekii*, *X. ripariellus*. – Mycobiota of Sweden.

**Abstract:** Examination of the type material of *Xerocomus luteovinaceus* ad int. revealed, that the original description of the microscopic characters given by H. ENGEL in ENGEL & al. (1996) has to be corrected. *Xerocomus luteovinaceus* has truncate and striate spores. Furthermore, the size of the spores differs from the original description. The synonymy with *Xerocomellus fennicus* is discussed.

**Zusammenfassung:** Die Untersuchung des Typusmaterials von *Xerocomus luteovinaceus* ad int. zeigte, dass die Originalbeschreibung der Mikromerkmale (H. ENGEL in ENGEL & al. 1996) korrigiert werden muss. *Xerocomus luteovinaceus* hat trunkate und gestreifte Sporen. Die Sporengröße weicht von der Angabe in der Originalbeschreibung ab. Die Identität mit *Xerocomellus fennicus* wird diskutiert.

*Xerocomus luteovinaceus* was invalidly described by H. ENGEL & E. LUDWIG in ENGEL & al. (1996) as “ad interim” based on only one small collection of three basidiomata found by E. LUDWIG in Sweden. E. LUDWIG contributed the macroscopic description of his collection and H. ENGEL investigated the microscopic characters. The description is accompanied by two figures, showing the microstructure of the pileipellis and the spores, respectively, and one colour plate showing the habit. The two figures are too small (only 53 x 35 mm) to make a clear statement about pileipellis structure and especially about spore characters.

Both SCHREINER (2000) and HAHN (pers. comm. 2001) who examined the type specimen reported the spores as striate and truncate, however, without documentation. A hint by Dr ANDY TAYLOR (pers. comm.) towards a possible synonymy of *X. luteovinaceus* with *Xerocomellus fennicus* (HARMAJA) ŠUTARA was the reason to re-evaluate the type-collection. The type collection was divided and deposited in the herbarium LUDWIG and in the herbarium H. ENGEL. Unfortunately, most of the type material in the private herbarium of H. ENGEL is missing, so we could only study material from the herbarium LUDWIG.

## Material and methods

The material consists of a piece of the pileus with pileipellis and hymenophor about  $5 \times 3 \times 2$  mm in size. It is moulded, very hard to soak and mostly collapsed. The dried material was hand cut with a razor blade, and examined in KOH 3% and Congo-Red under a Leitz Laborlux K microscope (objectives  $\times 40$  for pileipellis and hymenium,  $\times 100$  for spores, phase-contrast or brightfield) and subsequently photographed. The drawings are based on the microphotos. Measurements were made with a classical eyepiece micrometer.

**Material examined: Sweden:** SE Sweden, Skåne, Tomelilla Kommun: Sandhammaren, ca 120 m off sea shore, on sandy soil below *Populus* spec., "type" Pr. Nr.: Lu/2956/18788/E, leg. E. LUDWIG, 1. 9. 1992; "type" deposited in the herbarium E. LUDWIG (mainly used up, E. LUDWIG, pers. comm.).

## Description of the phenotype, habitat, phenology and distribution by E. LUDWIG and of the microscopical characters by H. ENGEL

From ENGEL & al. (1996: 184-185; originally in German).

**Characters:** small, bicolorous species. Basic colour daffodil yellow, partly staining vinaceous. Coastal area on sandy soil below *Populus*.

**Pileus:** up to 45 mm in diam., flat convex, daffodil yellow, mostly staining vinaceous in the centre of the pileus or in patches, pileipellis very slimy when wet. (After two nights in the refrigerator pileipellis duller and partly with olive tinges, over large parts now more vinaceous.)

**Tubes:** when young bright yellow, old distinctly olive.

**Pores:** 0.5-1.0 mm in diam., 5-edged,  $\pm$  (1-2 mm) elongate near stipe, concolorous with tubes.

**Stipe:** 45-50  $\times$  6-8 mm, subcylindrical, apically sometimes enlarged, basally  $\pm$  tapering, sometimes bent, full, young almost completely yellow, no ornamentation (neither a net nor flakes), older with a vinaceous zone gradually moving upwards and becoming brown basally.

**Context:** pale yellow, vinaceous in stipe base, when injured blueing in a minute.

**Chemical reactions:** unknown.

**Spores:** (10.0-)11.4-14.3  $\times$  4.3-5.7  $\mu$ m, ellipsoid to fusiform, sordid stramineous to bright yellow, thick-walled, smooth, guttuliferous.

**Cystidia:** about 70  $\times$  15  $\mu$ m.

**Basidia:** 30-55  $\times$  8.5-13.5  $\mu$ m, clavate, hyaline to pale stramineous, 4-spored.

**Stipitipellis:** consisting of long, slender cylindrical and septate hyphae, hyaline to stramineous.

**Hymenophoral hyphae:** mostly persistently hyaline in KOH 5% or Melzers reagent, exceptionally small parts pale stramineous.

**Pileipellis** not described by ENGEL & al. (1996), see below.

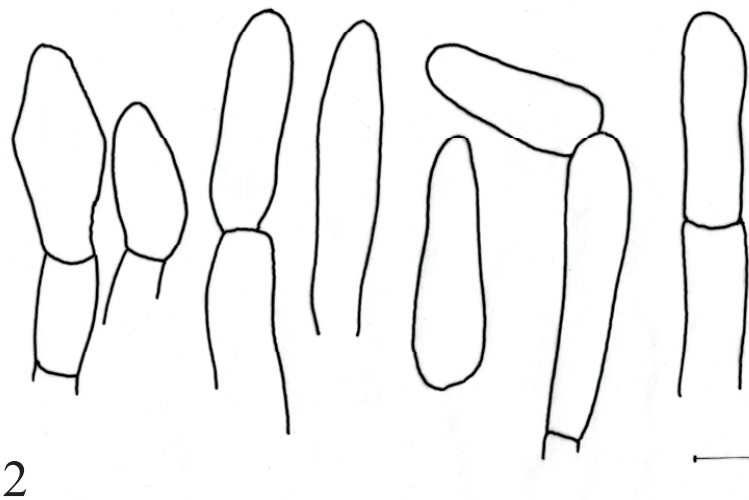
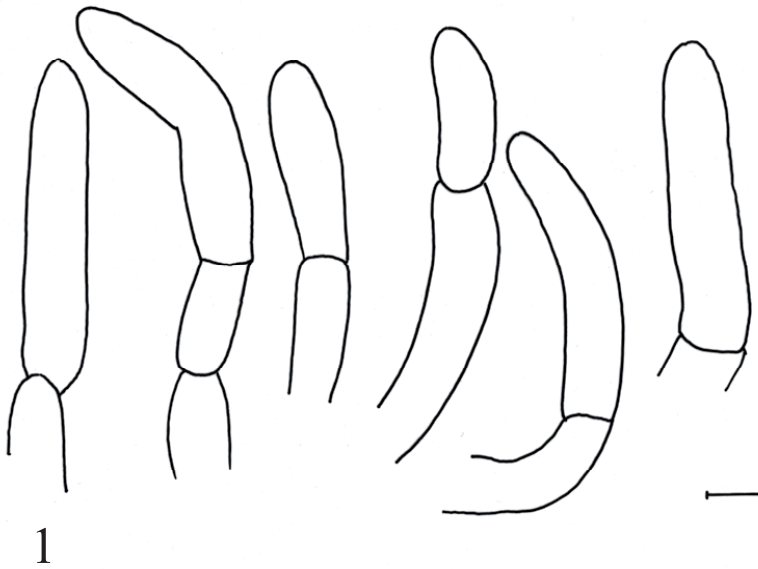
**Distribution:** N Europe (Scandinavia).

**Habitat and phenology:** coastal area of the Baltic Sea, ca 120 m off sea shore, on sandy soil under *Populus*, Sweden.

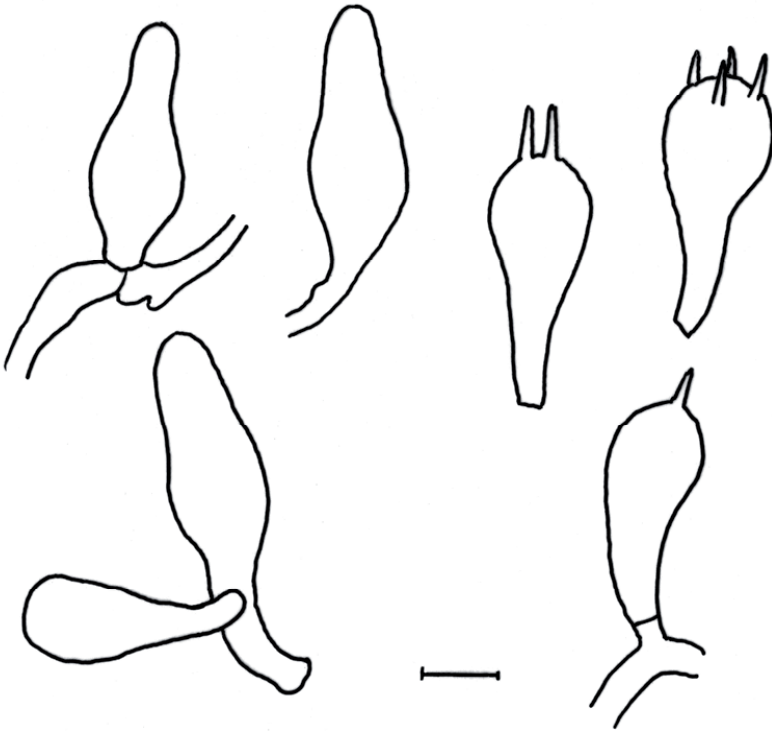
**Results of the re-examination of the type material (Figs. 1-5)**

Spores: mostly truncate and striate, thick-walled,  $(12.8-13.0(-16.3) \times (4.7-5.5(-5.8) \mu\text{m})$ , length-width-quotient  $(2.3-2.6(-3.0)$ ,  $n = 30$ .

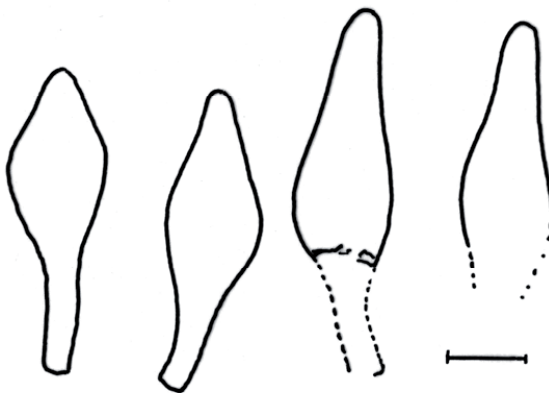
Pileipellis: consisting of  $\pm$  long, cylindrical elements, ca  $43-56 \times 12 \mu\text{m}$ , only exceptionally with short and enlarged end cells, ca  $18-27 \times 15 \mu\text{m}$ . Incrustation not clearly identifiable because of the poor condition of the material.



Figs. 1, 2. *Xerocomus luteovinaceus* ad. int. ("type"), end cells of the pileipellis; bars: 10  $\mu\text{m}$ .



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Figs. 3, 4. *Xerocomus luteovinaceus* ad. int. ("type"), cystidia of the tubes and basidia; bars: 10  $\mu$ m.

Cystidia: short lageniform, ca  $39\text{--}48 \times 10\text{--}14\text{ }\mu\text{m}$ , mostly collapsed.

Basidia: 1-, 2- or 4-spored, ca  $28\text{--}32 \times 11\text{--}13\text{ }\mu\text{m}$ .

Stipitipellis/Caulohymenium: not examined, due to lack of material.

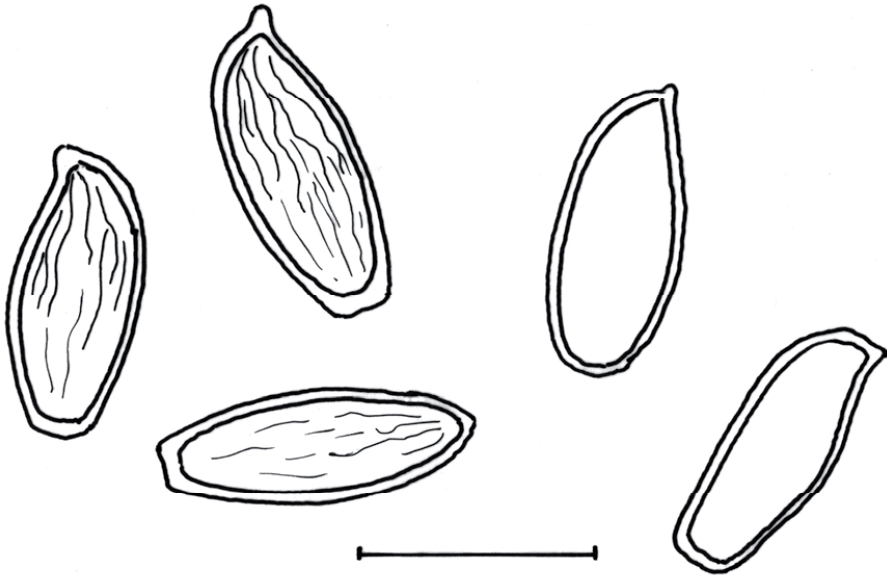


Fig. 5. *Xerocomus luteovinaceus* ad. int. ("type"), spores; bar: 10  $\mu\text{m}$ .

## Discussion

### *Xerocomus luteovinaceus* vs. *Xerocomellus fennicus*

It was the extraordinary yellow colour of the basidiomata which led H. ENGEL & E. LUDWIG to publish *Xerocomus luteovinaceus* ad interim (ENGEL & al. 1996). HARMAJA (1990) described *Xerocomellus fennicus*, showing nearly the same characters, including the truncate and striate spores, implicating conspecificity (HARMAJA 1998 presented *Xerocomellus fennicus* in the year 1998 under the name *Boletellus ripariellus*). Due to similar morphological characters SCHREINER (2000: 158) and KLOFAC (2007: 214) assumed that *Xerocomus luteovinaceus* might merely be a variant of *X. fennicus*. Differences are still found in the colour of the basidiomata, the pileipellis structure and the spore size. Colour characters should be treated with caution and may not to be sufficient for species delimitation. LADURNER & SIMONINI (2003: fig. 169) for instance, show *Xerocomellus fennicus* basidiomata with partly yellow colours, especially at the pileus margin. Furthermore, *X. fennicus* has a pileipellis with enlarged short end cells, while *Xerocomus luteovinaceus* has mainly

longer, slender and cylindrical elements. The pileipellis was not described by ENGEL & al. (1996) but shown in their plate 53 fig. 67, revealing very peculiar cells and cylindrical end cells obviously with incrustations. We have seen only two short and a little bit widened end cells. *Xerocomellus fennicus* has smaller spores than found in the present revision of *Xerocomus luteovinaceus*. The fact, that the spores were larger than reported in the original description and the striation was clearly seen, could be due to longer incubation in KOH 3%. Spores viewed after a very short preparation time were slightly smaller and showed indistinct striation. In fact, the variation of spore size and size and shape of pileipellis elements of xerocomoid fungi is considerable, even within one basidioma. Therefore, differences in size of spores or pileipellis elements alone are not sufficient for delimitation of *Xerocomus luteovinaceus* from *Xerocomellus fennicus*. Length-width-quotients of the spores are quite similar and the spores definitely are striate. In addition, both taxa share the colour of the context and the blueing.

#### Other similar taxa

So far, it is assumed that the following taxa with truncate spores occur in Europe: *Xerocomellus porosporus* (IMLER ex G. MORENO & BON) ŠUTARA, *X. marekii* (ŠUTARA & SKÁLA) ŠUTARA, and *X. fennicus*. *Xerocomellus porosporus* and *X. marekii* both have smooth spores; synonymy of *Xerocomellus porosporus* can further be excluded, because it has dull colours and a red to red brown or dark brown or red-blackish context in the lower part of the stipe (ŠUTARA & SKÁLA 2007, ŠUTARA 2008). In addition, TAYLOR & al. (2012) show that *X. marekii* has to be considered only as a red form of *X. porosporus*.

LADURNER & SIMONINI (2003) supposed that the North American *Xerocomus intermedius* (A. H. SM. & THIERS) HEINEM., RAMMELOO & RULLIER. could be identical with *X. fennicus* (see also RÖDIG 2012). TAYLOR & al. (2012) and TAYLOR & al. (unpubl.), show the genetic match of *Xerocomellus fennicus* and the North American *Xerocomus intermedius*. As the latter is the older taxon of these two, it would have priority.

The synonymy of *Xerocomus luteovinaceus* with *Xerocomellus ripariellus* (REDEUILH) ŠUTARA proposed by NOORDELOOS (2007) cannot be maintained, because the latter does not have truncate spores.

#### Conclusion

There is a bare possibility, that *Xerocomus luteovinaceus* is another, hitherto unidentified taxon with truncate spores. A final clarification could only be done by molecular biological studies. Since in the present case *Xerocomus luteovinaceus* is invalid and its "type" material so scanty and moulded, investing of so much time and effort is not advisable. According to experience, sequencing of moulded material is difficult and, if possible at all, then only with great effort and a lot of time, because the DNA is already degenerated.

There is the necessity to recollect this taxon for further evaluation of its molecular and morphological variability, because the variability of characters appears to be larger than previously shown.

The authors are grateful to WOLFGANG KLOFAC for valuable additions and knowledge updating, to Dr ANDY TAYLOR for drawing the attention to the possibility, that *Xerocomus luteovinaceus* could be a synonym of *Xerocomellus fennicus*, to ERHARD LUDWIG for dedication of type material, and to JANA RÖDIG and MARK RÜGER for helpful discussions.

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