Acta Musei Nationalis Pragae, Series B, Historia Naturalis, 61 (1–2): 1–52 issued June 2005
Sborník Národního muzea, Serie B, Přírodní vědy, 61 (1–2): 1–52

THE GENUS GYMNOPILUS (FUNGI, AGARICALES) IN THE CZECH REPUBLIC WITH RESPECT TO COLLECTIONS FROM OTHER EUROPEAN COUNTRIES

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Holec, J. (2005): The genus Gymnopilus (Fungi, Agaricales) in the Czech Republic with respect to collections from other European countries. – Acta Mus. Nat. Pragae, Ser. B, Hist. Nat., 61 (1–2): 1–52. Praha. ISSN 0036-5343.

The genus *Gymnopilus* (Fungi, Agaricales, *Cortinariaceae*) was monographically studied. The study is based on a thorough observation of macro- and microcharacters using numerous personal and herbarium collections from the Czech Republic. Selected collections from Austria, Bulgaria, Croatia, Finland, Germany, Italy, Poland, Romania, Russia, Slovakia, Sweden, and Ukraine were also used for a better understanding of the species concept. In each species, macro- and microcharacters, fructification period, substrates, relation to vegetation and altitude, and distribution are evaluated in detail. Taxonomic remarks on all species are added and contemporary literature on *Gymnopilus* is summarised. A key for the identification of species growing in the Czech Republic is provided. The following species were recognised in this area: *Gymnopilus spectabilis* (taxon with robust fruitbodies), *G. bellulus, G. josserandii, G. flavus, G. fulgens, G. decipiens, G. penetrans* (= *G. hybridus*), *G. sapineus* and *G. picreus*. The following names commonly used in contemporary literature are either not recognised in the Czech Republic or considered doubtful or hardly interpretable taxa: *Gymnopilus stabilis*, *G. junonius* s. str. (taxon with slender fruitbodies), and *G. liquiritiae*. Line drawings and photographs of important microcharacters are provided for each species. Colour photographs of 6 species are added.

■ macromycetes, Basidiomycetes, *Cortinariaceae*, *Gymnopilus*, taxonomy, nomenclature, ecology, substrates, distribution, macrocharacters, microcharacters, identification key

Received March 8, 2005

Introduction

Basic works on *Gymnopilus* taxonomy in Europe

The genus *Gymnopilus* P. Karst. 1879 (Fungi, Agaricales) includes interesting and important saprotrophic, mostly wood-inhabiting fungi occurring all over the world. The history of its study was described by Hesler (1969). The classical delimitation of *Gymnopilus* was summarised by Kühner (1980) and Singer (1986). The most important characters of *Gymnopilus* are: presence of lamellae, stipe never eccentric, presence of a cortinoid to membranaceous veil, taste mostly bitter, spore print rusty brown ("ferrugineous-fulvous"), spores with verrucose to rugulose ornamentation, no germ pore and mostly dextrinoid wall, presence of cheilocystidia which are more or less ventricose below and possess a subcapitate to capitate apex, all hyphae with clamp connections.

In traditional classification, *Gymnopilus* is placed either into *Cortinariaceae* (Singer 1986) or, based on its saprotrophic way of life and presence of styryl-pyrones bis-noryangonin and hispidin (e.g. Dangy-Caye et Arpin 1974, Rees et Ye 1999, Rees et Strid 2001), into *Strophariaceae* (Kühner 1980).

The genus has never been monographically elaborated in the Czech Republic and the same counts for the whole of Europe. There are several recent studies from some countries or larger areas, which differ in their taxonomic concepts and resulting number of accepted taxa, quality of elaboration (both factual and formal) and number of collections studied.

1. "The classical" concept is represented by Kühner et Romagnesi (1953), Moser (1983), Orton (1993), Breitenbach et Kränzlin (2000) and Keller et Moser (2001). In all these works, the delimitation of taxa is similar (although substantial differences occur) and the number of species recognised is about 10–15. The results are based on a limited number of collections studied and problematic points are not discussed. A nice summary of these works are the descriptions (partly original, partly compiled) and perfect iconography published by Ludwig (2000, 2001).
2. A detailed monographic study of species occurring in Norway (Høiland 1990) based on a large number of collections, detailed analysis of some characters and an effort to respect the original concepts of the species. Some taxonomic and nomenclatural problems are discussed and some solutions are proposed (e.g. a proposal to replace the type species of the genus *Gymnopilus* – *G. liquiritiae* – by *G. picreus* or a synonymisation of the names *G. sapineus, G. penetrans* and *G. hybridus*). However, the number of taxa treated is rather low (6).
3. A survey of European taxa (Bon et Roux 2002) using a concept of "narrow" species and trying to present many taxa previously omitted or not known from Europe. The authors recognise 24 species. Unfortunately, the number of collections studied is low and some formal errors decrease the quality of the work (poorly reproduced photographs, poor quality of line drawings, many small errors or omissions in the text). However, some new ideas are introduced which deserve further research.

Except for these basic publications, many valuable papers dealing with one or several species have been published. They are discussed in the chapter Results. For example, new European taxa were described by Romagnesi (1976: *Gymnopilus corsicus, G. spadiceus*; 1979: *G. pseudofulgens*) and recently by Moser et al. (2001: *Gymnopilus turficola*). A find of *Gymnopilus corsicus* is discussed by Maurice (2001).

My work on *Gymnopilus* was started after finishing the European monograph of the genus *Pholiota* Holec (2001a). Some excluded or doubtful taxa of *Pholiota* proved to be *Gymnopilus* species. Consequently, I tried to elaborate this genus in a detailed way, at least in the Czech Republic and some adjacent regions. In the preparatory phase, several shorter contributions were published (Holec 2001b, 2002, Holec et al. 2003). This publication is a summary of my studies on *Gymnopilus* in the period 2001–2004.

Aims of this study

1. To check which species are known from the Czech Republic.
2. To evaluate their delimiting characters.
3. To produce thorough descriptions of macro- and microcharacters based on personal observations and study of a large number of fresh and herbarium collections.
4. To compare and evaluate different species concepts used in Europe.
5. To clear up some problems in *Gymnopilus* taxonomy and nomenclature.

Survey of recent literature on *Gymnopilus*

Publications on the taxonomy of *Gymnopilus* in Europe have been cited above. There are also floras or check lists of *Gymnopilus* species from some countries or regions in Europe. They are cited in the chapter Methods, paragraph "Data on distribution of *Gymnopilus* species in Europe".

In the past decades, the genus *Gymnopilus* in Mexico, Central America and the Caribbean has been taxonomically studied by Laura Guzmán-Dávalos, sometimes with collaborators (e.g. Guzmán-Dávalos 1994, 1995, 1996a, 1996b, 1997; Guzmán-Dávalos et Guzmán 1986, 1995; Guzmán-Dávalos et Ovrebo 2001). Recently, Guzmán-Dávalos (2003) started with type studies in *Gymnopilus*, while publishing the results obtained in 22 species, mostly from Central and North America.

New species and new records from India are described by Thomas et al. (2003) and older works on *Gymnopilus* from India are cited.

Australian species of *Gymnopilus* and their relationship to Northern Hemisphere taxa were studied by Rees (2003), Rees et Lepp (2000), Rees et Strid (2001), Rees et Ye (1999), and Rees et al. (1999, 2002). Red to purple-coloured species from Europe and Southern Hemisphere were compared (using classical and molecular methods) by Rees et al. (2004). They confirmed the existence of only two separate species: *Gymnopilus dilepis* and *G. purpuratus*.

The ultrastructure of the spore wall of some *Gymnopilus* species was studied by Clémençon (1974, in the TEM), Keller (1997, in TEM and SEM) and Rees, Orlovich et Marks (1999, in SEM).

The works on the presence of styryl-pyrones in *Gymnopilus* species were summarised by Høiland (1990). There are also studies on the presence of hallucinogenous substances (e.g. psilocybin, psilocin and baeocystin) in some species of *Gymnopilus* (e.g. *G. purpuratus*) published e.g. by Hatfield et al. (1978), Kreisel et Lindequist (1988), Gartz (1989), Giacomoni (1997) and summarised by Stijve (1995). *Gymnopilus spectabilis* is considered a hallucinogenic fungus in Japan (Stijve 1995), however, it does not contain psilocybin but a substance from the group of neurotoxic oligoisoprenoids (Tanaka et al. 1993). Stijve et Kuyper (1988) proved that *Gymnopilus spectabilis* and *G. fulgens* do not contain psilocybin or any related tryptamine derivates. Using the lignin test, Klán (1990) showed that *G. sapineus* does not contain amanitins or tryptamine derivates.

Mycelial morphology, rhizomorph anatomy and primordium formation of *Gymnopilus penetrans* was studied by Clémençon (2002). Cultural studies of 5 species were performed by Fausto-Guerra et al. (2002). Both brown-rot and white-rot species were recorded, but all species were mainly cellulose decomposers. Older publications on the cultural characters of *Gymnopilus* were summarised in the mentioned works. Enzyme activity of the mycelium of *G. hybridus* was studied by Klán et Baudišová (1990: 207).

The only cladistic analysis based on macro- and microcharacters of 6 species from Norway was performed by Høiland (1990).

Quite recently, some *Gymnopilus* species were studied using DNA techniques, mostly an analysis of ITS sequences of the nuclear ribosomal gene (for a survey of these works see Guzmán-Dávalos et al. 2003). *Gymnopilus sapineus, G. penetrans* and *G. spectabilis* (used as an outgroup) were included by Peintner et al. (2001) in their study of sequestrate fungi belonging to *Cortinariaceae*. Similarly, 5 species of *Gymnopilus* were used by Thomas et al. (2002) when describing *Anamika*, a new genus of *Cortinariaceae* related to *Hebeloma*. Moser et al. (2001) studied phylogenetic relationships of their new species *Gymnopilus turficola* by comparing its ITS sequences with 7 species of *Gymnopilus*. Moncalvo et al. (2002, 4 species studied) found a gymnopiloid clade within euagarics which contains the gymnopilus clade and *Galerina paludosa*. Rees et al. (2002) studied the phylogeny of 30 *Gymnopilus* species from Australia and the Northern Hemisphere. They found that *Gymnopilus* is only monophyletic if it includes *Galerina eucalyptorum* and *Pyrrhoglossum pyrrhum* – the type species of *Pyrrhoglossum*. Their next study (Rees et al. 2003) proved that the genus *Gymnopilus* is really monophyletic. Guzmán-Dávalos et al. (2003) analysed DNA sequences of 29 *Gymnopilus* species to test the traditional infrageneric classification of *Gymnopilus* based on the presence of membranaceous or arachnoid veil (2 groups: *Annulatae* and *Gymnopilus* = *Cortinatae*, see Romagnesi 1943, Singer 1986). The genus proved to be monophyletic. However, the traditional groups (subgenera) were not recovered. Five well-supported clades were identified.

Data on *Gymnopilus* from the Czech Republic

There is only a small number of detailed contributions on *Gymnopilus* taxonomy in mycological literature regarding the area of the Czech Republic. Svrček (1965) described a find of the rare species *Gymnopilus fulgens*. Antonín (in Antonín et Škubla 2000) described the new species *Gymnopilus josserandii*, a correct name for the invalidly published *Gymnopilus subsphaerosporus* (Joss.) Kühner et Romagn. Recently, several works have been published by the present author (Holec 2001b, 2002, Holec et al. 2003).

Concerning older literature, Velenovský (1920–1922: 551–513, 918) treated 5 species belonging to *Gymnopilus* (under the generic names *Flammula* and *Pholiota*): *G. penetrans, G. hybridus, G. sapineus, G. liquiritiae,* and *G. spectabilis.* No *Pholiota* and *Flammula* described by him as new species belong to *Gymnopilus* (Holec 1999).

Citations of *Gymnopilus* species in mycofloristic and ecological publications are of limited value for the taxonomy as the identification cannot be verified in most cases (no herbarium specimens available, no remarks on macro- and microcharacters). For this reason, such references are not included here. The best source of information on taxonomy, distribution and ecology of individual species are the herbarium specimens kept at important herbaria in the Czech Republic. They were widely used for the preparation of this publication.

Some reliable mycofloristic contributions can be used as a source of data on the distribution and ecology of *Gymnopilus* species, e.g. Svrček et Kubička (1971: 107, Žofínský prales: *G. bellulus, G. picreus, G. sapineus*), Černý et Kříž (1972: 123, Ranšpurk: *G. junonius*), Antonín et al. (2000: 62, Cahnov, Ranšpurk etc.: *G. junonius*), Antonín et Vágner (2000: 69, Podyjí National Park: *G. hybridus, G. picreus, G. spectabilis, G. stabilis*), Svrček (1990: 86, Krkonoše Mts.: *G. sapineus*).

Materials and Methods

Field work and study of macrocharacters

Fresh fruitbodies were collected mainly in the Czech Republic. The most intensive field work was carried out in the Šumava Mountains (= Bohemian Forest), southern Bohemia, the České Švýcarsko (= Czech Switzerland) National Park (northern Bohemia) and in the Beskydy Mountains (north-eastern Moravia). Several finds are from Slovakia and Austria. The habitat of all finds was carefully noted, especially forest type, substrate (including tree species and stage of decay), and elevation. Well-developed fruitbodies were photographed both in the field and in the laboratory. Macrocharacters of all collections were thoroughly observed and recorded. Fruitbodies were dried at 30–40 °C in a mobile electric drier. They are deposited in the herbarium of the Mycological Department, National Museum, Prague (PRM).

All fresh fruitbodies were considered for description of macrocharacters in this work. The descriptions are complemented with data from herbarium documentation (field notes, photographs, etc.) found in some herbaria (especially PRM, BRNM, CB, BRA, W, WU). Consequently, the descriptions are mostly based on rich primary data showing the variability of *Gymnopilus* species in Central Europe. All deviating or less frequent characters are marked by phrases like "sometimes", "in some fruitbodies" etc. When fresh material was not available, literature data were used and properly cited. Descriptive terminology is taken from Bas et al. (1988: 54–64). The colour codes are according to Kornerup et Wanscher (1981).

Study of microcharacters

The microcharacters were studied on dried fruitbodies (of personal collections and herbarium material). Almost all examinations were made using an Olympus BH-2 microscope. The observations and measurements were made on material mounted in a 5 % KOH solution. Pigmentation of hyphae of the pileus and stipe cuticle was studied in pure water and their arrangement was observed in radial sections and scalps. Iodine reactions were studied in Melzer's reagent prepared according to the formula given in Moser (1983), cyanophilous reaction in cotton blue (according to Kotlaba et Pouzar 1964, Singer 1986) after short boiling.

At least five randomly selected cheilocystidia, pleurocystidia, and basidia were measured per collection. The length of basidia was measured excluding the sterigmata. For spore size measurements, 20 randomly selected mature spores were used per collection (10 spores during visits of foreign herbaria to save time). Immature spores (extremely small or having a thin wall and hyaline content) or aberrant spores (1.5–2 times longer than the normal ones) were not measured. Spores were measured without the hilar appendix ("apiculus"). All measurements were carried out on preparations from lamellae (not from spore prints) to measure both personal collections and herbarium specimens in the same way. The spores were measured directly in preparations at the magnification of 1250x using an eyepiece micrometer with a fine scale (basic unit 0.8 µm) which enabled very accurate measurements. The measured values were recorded in units of this scale (relative values). Their conversion to absolute values was calculated after finishing all measurements. Marginal values of spore sizes are given in brackets and represent at most 10 % of all spores measured in each species. These values are not considered for the purpose of species delimitation and identification.

Descriptions of microcharacters are based on a detailed examination of at least 2 representative collections per species. However, all specimens listed in chapter "Collections studied" were examined, all deviations were recorded and incorporated into descriptions. Spore size was measured in all collections studied. Illustrations of microcharacters were drawn at a magnification of 1250x using a drawing tube.

Standard works used in this work, terminology

Abbreviations of author's names: Brummitt et Powell (1992). Abbreviations of old taxonomic works and data of their publication: Taxonomic literature (Stafleu et Cowan 1976–1988). Journal abbreviations: Botanico-Periodicum-Huntianum (Lawrence et al. 1968). Standard taxonomic,

nomenclatural, and bibliographic abbreviations: Botanical Latin (Stearn 1986). Acronyms of herbaria: Index Herbariorum (Holmgren et al. 1990). Terms for description of macro- and microcharacters: Flora Agaricina Neerlandica, vol. 1 (Bas et al. 1988: 54–64). The term suprahilar disc instead of plage is used here for the smooth area in the region of the suprahilar depression in accordance with Pegler et Young (1971: 21) and Rees, Orlovich et Marks (1999).

Data on distribution of *Gymnopilus* species in Europe

For all species, the following publications were consulted: Dennis et al. (1960: Great Britain), Kreisel et al. (1987: eastern part of Germany), Høiland (1990: Norway), Krieglsteiner (1991: Germany), Ryman (1992: Norway, Sweden, Finland, Denmark), Orton (1993: Great Britain), Kuyper (1995: The Netherlands), Breitenbach et Kränzlin (2000: Switzerland), Ludwig (2001: mostly Germany, but also Sweden), Keller et Moser (2001: Austria), Bon et Roux (2002: especially France, rarely Italy, Belgium, Slovakia), Škubla (2003: Slovakia), Enderle (2004: the vicinity of Ulm, Germany). These works are not cited in paragraphs on the distribution of each species. Except for these collective publications, papers dealing with individual species were used and cited.

Iconography

In the paragraph Selected illustrations, iconographies were cited as follows:

Bon et Roux: Bon M. et Roux P. (2002): Le genre Gymnopilus P. Karst. en Europe. – In: Fungi non delineati, vol. 17: 1–52, Alassio.

Breitenbach et Kränzlin: Breitenbach J. et Kränzlin F. (2000): Pilze der Schweiz. Vol. 5. – 340 p., Luzern.

Bresadola: Bresadola J. (1927–1960): Iconographia mycologica. Vol. 1–28. – Milano.

Cetto: Cetto B. (1970–1993): I funghi dal vero. Vol. 1–7. – 3042 figs., Trento.

Dähncke: Dähncke R. M. (1993): 1200 Pilze in Farbfotos. – 1179 p., Aarau.

Fries: Fries E. (1867–1884): Icones selectae Hymenomycetum nondum delineatorum, vol. 1–2. – Stockholm.

Hagara et al.: Hagara L., Antonín V. et Baier J. (1999): Houby. [Fungi]. – 416 p. Praha (in Czech).

Lange: Lange J. E. (1935–1940): Flora agaricina danica. Vol. 1–5. – Copenhagen.

Ludwig: Ludwig E. (2000): Pilzkompendium. Band 1. Abbildungen. – 192 p., Eching.

Moser et Jülich: Moser M. et Jülich W. (1985–2002): Farbatlas der Basidiomyceten. Lieferung 1–20. – Stuttgart.

Phillips: Phillips R. (1981): Mushrooms and other fungi of Great Britain & Europe. – 288 p., London.

Ryman et Holmåsen: Ryman S. et Holmåsen I. (1992): Pilze. – 718 p., Braunschweig (German edition of "Svampar – en fälthandbok").

Abbreviations used in the text

(only those which are not included in the standard works listed above)

CR: Czech Republic, E: length/width ratio of the spores, ICBN: International Code of Botanical Nomenclature (Greuter et al. 2000), L: number of lamellae reaching up to the stipe, l: number of lamellulae between two lamellae, SEM: scanning electron microscope, Q: mean value of E (= length/width ratio of the spores) for all spores studied.

Abbreviations used in line drawings

B: basidia, BD: basidioles, CH: cheilocystidia, P: pleurocystidia, PC: pileocystidia, S: spores, TC: terminal cells of hyphae on pileus cuticle, TCS: terminal cells of hyphae from stipe cuticle.

Results

Taxonomy, ecology and distribution of the genus *Gymnopilus* in the Czech Republic

Gymnopilus P. Karst., Bidrag Kännedom Finlands Natur Folk 32: xxi, 1879.

= *Fulvidula* Romagn., Rev. Mycol. 1: 209, 1936 (invalid name – without Latin description, see Donk 1962: 101).

Type: *Gymnopilus liquiritiae* (Pers.) P. Karst. The history of typification was described by Donk (1962: 117–118). Høiland (1990) wrote that this choice was mechanical, the name *G. liquiritiae* is hard to interpret and has been variously interpreted during the years. He proposed a new lectotype, *Gymnopilus picreus* (Pers.: Fr.) P. Karst. I fully agree with his arguments. It is also possible that *G. liquiritiae* is a synonym of *G. picreus* – a sanctioned name which must be preferred. For a detailed discussion see under *G. liquiritiae* in the chapter "Comments on some taxa not reported from the Czech Republic".

Key to the species of the genus *Gymnopilus* based on taxa known from the Czech Republic*

1. Fruitbodies with a distinct membranaceous annulus, robust, medium-sized to large . . . *Gymnopilus spectabilis,* p. 5

1.* Fruitbodies without membranaceous annulus, small to medium-sized 2

2. Fruitbodies with traces of purple to violet colour . . . 3

2.* Fruitbodies without purple or violet colour (at most with orange or red tinges) 4

3. Spores large [8.0–9.5(–11) × 6.0–6.8(–7.2) µm], pileus tomentose-fibrillose to fibrillose-scaly . . . . . *Gymnopilus igniculus,* p. 8

3.* Spores smaller (6–8.5 × 4–6 µm, "average" spores without extremely large ones), pileus with more distinct, mostly erect scales covering the whole surface . . . . . *Gymnopilus purpuratus, G. luteifolius, G. peliolepis, G. dilepis* (taxa not known from the Czech Republic, for differences, see discussion under *G. igniculus*)

4. Spores small, most of them measuring up to 6.0 × 4.5 µm 5

4.* Spores on average larger than 6) × 4 µm 7

5. Growing on decaying wood 6

5.* Growing in grassy places in tufts of grasses, typically among *Dactylis glomerata*, spores mostly 5.0–6.0 × 3.5–4.5 µm . . . . . *Gymnopilus flavus,* p. 15

6. Pileus bright coloured (rusty orange to rusty brown with orange tinge), surface slightly lustrous, lamellae bright (deep yellow, then yellow-brown to yellow-rusty), spores prolonged (ellipsoid to amygdaliform-ellipsoid: length/width ratio mostly 1.4–1.9) with a distinct suprahilar depression, mostly 4.5–6.0 × 3.0–3.5 µm, cheilocystidia narrowly lageniform with more or less prominent globose head which is not sharply divided from the neck . . . . . *Gymnopilus bellulus,* p. 11

6.* Pileus dull coloured (ochre-brown, dark brown to rusty brown), surface fibrillose-tomentose, lamellae dark (dark brown at maturity), spores subglobose but also broadly ellipsoid to broadly obovoid in side view (length/width ratio mostly 1.1–1.4), without suprahilar depression, mostly 4.5–6.0 × 3.5–4.5 µm, cheilocystidia very distinctive (tibiiform with a narrowly lageniform or cylindrical basal part, long narrow neck and distinct globose head, often with slightly thickened and rusty brown wall) . . . . . *Gymnopilus josserandii,* p. 13

7. Growing on peat, soil or burnt substrates (ash, charcoal etc.) 8

7.* Growing on wood, often strongly decayed or hidden in soil, but never on burnt wood 10

8. Spores large, mostly 8–11 × 5–7 µm, stipe with dark red-brown lower part, habitat: peat-bogs or sand-dune heaths on peaty soil, growing on peat or peaty soil or directly among *Sphagnum* and other mosses or among lichens. . . . . *Gymnopilus fulgens,* p. 17

8.* Spores smaller, mostly 6–9(–10) × 4–5 µm, stipe without dark red-brown lower part, habitat and substrate other 9

9. Pileus dirty yellow-brown, rusty brown to greyish brown with fibrillose-tomentose to tomentose-scaly surface, spores longer: 7–9(–10) × 4–5 µm, taste completely mild . . . . . *Gymnopilus decipiens,* p. 18

9.* Pileus bright coloured: orange red-brown, surface smooth, at most finely fibrillose-scaly, spores shorter: (6–)6.5–7.5(–8.5) × (3.5–)4.0–4.8(–5.5) µm, taste bitterish . . . . . *Gymnopilus odini,* p. 38
(not documented from the Czech Republic; other species growing on soil or burnt substrates but hitherto not known from Central Europe: *Gymnopilus pseudofulgens, G. humicola*; for differences see discussion under *G. decipiens*)

10. Spores large, mostly 8.5–10.5 × 5.5–6.5 µm, coarsely ornamented, with suprahilar disc, without suprahilar depression, fruitbodies small, rarely medium-sized (pileus 5–55 mm, mostly up to 40 mm), pileus at centre typically orange-brown, red-brown to reddish rusty brown (but also yellow-rusty to rusty brown when dry), lamellae vividly deep yellow for a long time, stipe typically dark rusty brown to umber-brown with a red or violet tinge . . . . . *Gymnopilus picreus,* p. 35

10.* Spores smaller, mostly 7–9 × 4–5 µm, moderately ornamented, without suprahilar disc, with more or less distinct suprahilar depression, fruitbodies mostly medium-sized, pileus and stipe without red tinges and not very dark 11

11. Hyphae of upper layer of pileus cuticle narrow, 3–10(–12) µm in diam., cylindrical, pileus surface principally smooth but rusty ochre to rusty brown fibrillose-striped to appressed fibrillose-scaly, young pilei covered with white to greyish-white velum, pileus context pale yellow, young lamellae pale yellow, stipe covered with white tomentose-fibrillose velum remnants . . . . . *Gymnopilus penetrans,* p. 19 . . . . . (= *G. sapineus* sensu Høiland 1990)

11.* Hyphae of upper layer of pileus cuticle broad, (4–)6–20 µm in diam. (mostly 8–16 µm), coarsely incrusted, with narrowly clavate, clavate to pyriform terminal cells, pileus surface fibrillose-tomentose, tomentose to tomentose-scaly, without velum, pileus context mostly deep yellow, lamellae typically deep yellow when young, stipe yellow fibrillose-tomentose . . . . . *Gymnopilus sapineus,* p. 24
sensu Kühner et Romagnesi (1953), Ludwig (2000, 2001), Breitenbach et Kränzlin (2000) etc.; non *G. sapineus* sensu Fries (1821), Høiland (1990).

Gymnopilus spectabilis (Weinm.: Fr.) A. H. Smith

(Text-fig. 1; Pl. 3, figs 2–3; Pl. 4, figs 1–2; Pl. 9)

Bas.: *Agaricus spectabilis* Weinm., published in Fries, Elench. fung. 1: 28, 1828.

≡ *Agaricus spectabilis* Weinm.: Fr., Elench. fung. 1: 28, 1828.
≡ *Gymnopilus spectabilis* (Weinm.: Fr.) A. H. Smith, Mushrooms and their natural habitats: 471, 1949.
≡ *Pholiota spectabilis* (Weinm.: Fr.) P. Kumm., Führ. Pilzk.: 84, 1871.
≡ *Fulvidula spectabilis* (Weinm.: Fr.) Romagn., Bull. Soc. Mycol. France 48: 89, 1943 (“1942”), invalid combination as the generic name *Fulvidula* is published invalidly.

= *Agaricus quercicola* Lasch, Linnaea 4: 545.

= *Pholiota aurantiaca* Thesleff, Bidrag Kännedom Finlands Natur Folk 79(1): 34, 1920 (for type study see Holec 2001a: 181).

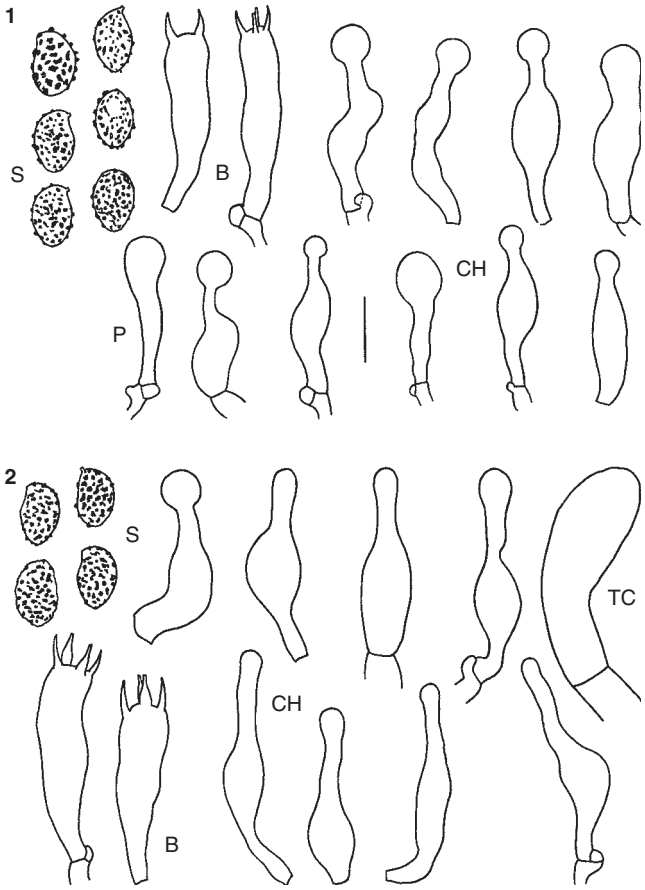
= *Pholiota gigantea* R. Naveau, Natuurwetenschappelijk Tijdschrift 5: 77, 1923 (for type study see Holec 2001a: 188).

= ?*Pholiota grandis* Rea, British Basidiomycetae: 118, 1922 (for taxonomic discussion see Holec 2001a: 189).

= ?*Agaricus (Pholiota) villosus* Fr., Elench. fung. 1: 28, 1828.
≡ ?*Pholiota villosa* (Fr.) Sacc., Syll. fung. 5: 752, 1887 (for taxonomic discussion see Holec 2001a: 206–207).

Selected illustrations: Lange: fig. 108B (as *Pholiota spectabilis*). – Phillips: p. 144 (as *G. junonius*). – Ryman et Holmåsen: p. 482 (as *G. junonius*). – Dähncke: p. 699. – Moser et Jülich: III Gymnopilus 1, top figure. – Breitenbach et Kränzlin: fig. 144 (as *G. junonius*). – Ludwig: fig. 31.4. A, B, C (as *G. junonius*). – Hagara et al.: p. 291, fig. 425. – Bolets de Catalunya: vol. 3, fig. 119. – Cetto: fig. 919, fig. 2669.

Characteristics in brief: Fruitbodies singly or in clusters, large to very large, fleshy; pileus 50–150(–200) mm, dry, bright yellow, ochre-yellow, orange-yellow, ochre-rusty to rusty orange, surface distinctly innately tomentose-fibrillose to tomentose-scaly, the covering being yellow, yellow-



Text-fig. 1. ***Gymnopilus spectabilis:*** **1 – Kněževes (PRM 892723); 2 – dike between Naděje and Víra fish-ponds, JH 482/02 (PRM). For explanations see Material and Methods. Scale bar = 10 µm.**

rusty to rusty brown; stipe with cylindrical upper part but with fusiformly inflated to thickly bulbous lower part and fusiformly attenuated base, with prominent membranaceous annulus when young; taste distinctly bitter, spores large, mostly 8.5–10.5 × 5.5–6.8 µm, ellipsoid, ovoid-ellipsoid to amygdaliform-ellipsoid, medium to coarsely verrucose to verrucose-rugulose. Growing as a saprophyte or parasite on wood of deciduous trees, rarely of conifers, in areas with a warm or temperate climate, never in mountains, common.

Description: Fruitbodies growing singly or in fascicles. Pileus 30–150(–200) mm, fleshy, at first subglobose, then convex or broadly obtusely conical, sometimes planoconvex when old, margin slightly inflexed, without umbo, surface dry, mat, not translucently striate, not hygrophanous, ground colour bright yellow, ochre-yellow (5B8), orange-yellow, ochre-rusty to rusty orange (6C8) at centre (depending on age and weather), towards the margin bright yellow (4A7–8) when fresh, the entire surface distinctly innately tomentose-fibrillose to tomentose-scaly, scales densely arranged, mostly appressed but slightly upraised when old, this covering being yellow, yellow-rusty to rusty brown, pileus margin sometimes with overlapping, tomentose-membranaceous, bright yellow to yellow-ochre veil remnants. Lamellae crowded, L = 50–80, l = 1–7, 4–12(–15) mm high, segmentiform or slightly ventricose, near the stipe emarginate and decurrent with a small tooth, rarely slightly decurrent, at first pale yellow to sordid yellow, at maturity rusty yellow to yellow-brown with a rusty tinge, rusty brown spotted, edge even or finely irregularly serrulate, pale yellow. Stipe very variable in shape and size (depending on sort of stipe insertion, age and size of the whole fruitbody or cluster), 50–150(–200) × 10–30(–40) mm, upper part cylindrical, in lower part either fusiformly inflated with conicaly attenuated or even rooting base or thick bulbous (up to 50 mm, in extreme cases even up to 100 mm), mostly with fusiformly attenuated base, annulus (veil remnant) prominent, about 5–15 mm broad, upright, membranaceous, bright yellow to rusty yellow, partly missing at maturity and remaining only as a disrupted fibrillose-tomentose annular zone on stipe surface, stipe pale (lemon) yellow and smooth above the annulus, below the annulus yellow, yellow-ochre to ochre, surface ochre rusty to rusty fibrillose-grooved, spotted to marbled. Context thick, fleshy, in young fruitbodies yellowish-white to pale yellow in pileus, but yellow-ochre below pileus cuticle and above the lamellae, in stipe pale yellow to deep lemon yellow, in base brownish, in older fruitbodies darker, bright yellow to yellow-rusty, with 5 % KOH immediately orange to orange-brown. Taste immediately distinctly bitter. Smell indistinct or aromatically fruity on section.

Spores (8.0–)8.5–10.5(–11.2) × (5.2–)5.5–6.8(–7.2) µm, E = 1.35–1.80, Q = 1.50, ellipsoid to amygdaliform-ellipsoid in side view, with suprahilar depression; ellipsoid, ovoid-ellipsoid to amygdaliform-ellipsoid in face view, rusty yellow in KOH, hilar appendix small but visible, ornamentation very variable in appearance and degree of development, in fully developed spores medium to coarse, verrucose to verrucose-rugulose, up to 1 µm high, in some spores poorly developed or fully absent, with small and sometimes poorly developed suprahilar disc, spore protoplasm colouring vinaceous reddish brown in Melzer's reagent (dextrinoid) but wall remaining bright yellow to yellow-rusty. Basidia 26–31 × 6–8 µm, 4(2)-spored, narrowly clavate or cylindrical with 1–2 slight constrictions. Basidiolae 6–19 × 5–6 µm, narrowly clavate. Cheilocystidia abundant at edge or mixed with basidiolae, 21–37 × 5–9 µm, variable in shape, mostly lageniform to narrowly lageniform but also narrowly to moderately fusiform, utriform, clavate, mostly with a cylindrical or subcapitate to capitate upper part, head 3–6(–8) µm, thin-walled, hyaline, sometimes with a granular or homogeneous yellow content. Pleurocystidia absent. Lamellar trama regular, of parallel hyphae 3–12 µm broad, cells cylindrical, hyaline. Velum (from annulus) composed of parallel to slightly interwoven hyphae 5–12 µm broad, cells cylindrical, mostly hyaline, some of them with yellow-rusty granular content, wall only slightly yellow-rusty incrusted. Pileus cuticle a cutis of densely arranged hyphae 4–10 µm broad, the whole layer yellow, cells yellow-rusty incrusted, cylindrical, this layer covered with a thin layer of ascending and interwoven velum hyphae (see above), in a scalp visible as a loose net or cords of velum hyphae forming the fibrillose to scaly pileus covering, cells

yellow-rusty incrusted, with slightly clavate terminal cells; pileocystidia absent. Stipe cuticle a cutis, yellow-rusty coloured, cells cylindrical, 2–6 µm broad, terminal elements capitate or clavate, at places covered with nests of ascending velum hyphae (see above); true caulocystidia resembling cheilocystidia sometimes present but rare. Clamp connections abundant in all tissues.

Fructification: August – October (CR).

Ecology: In the Czech Republic, *G. spectabilis* is mostly found as a saprophyte on dead wood of broadleaved trees, especially on stumps, fallen trunks and wood in soil (roots etc.). Less frequently it grows as a parasite on roots or on the base of living trees. Most finds are from *Quercus* spp. (*Q. robur* if the tree species was noted). Other known hosts from the CR: *Malus domestica, Pyrus communis, Acer pseudoplatanus, Populus alba, Salix caprea, Carpinus betulus, Tilia, Betula, Ulmus, Corylus*. Finds from conifers (*Pinus*) are known from Southern Bohemia (M. Beran, personal communication, collections in CB). I personally studied at least two collections from conifers (*Pinus*: WU 7308, *Pinus nigra*: Fungi Exsiccati Suecici no. 2718). It well corresponds with the data from North America (Hesler 1969) where the species grows on wood of conifers and deciduous trees. Høiland (1990) mentions finds on *Fagus* from Norway. In southern Europe, the species is known from e.g. *Erica arborea* or *Eucalyptus* (Bon et Roux 2002). In the CR, *G. spectabilis* grows both in natural forests as well as in man-influenced or man-made habitats (especially in parks, gardens, on fish-pond dikes, in avenues etc., along forest roads or forest paths, mostly on old trunks or stumps). It is mostly found in lowlands and occurs also in the hills up to altitude of about 500 m. It has never been found in mountains.

Distribution: *Gymnopilus spectabilis* is rather common in suitable habitats of the Czech Republic (see Ecology). It is distributed in areas with a warm or temperate climate (called "thermophyticum" and "mesophyticum" in the CR, see Hejný et Slavík 1988). The species is common in most European countries except for mountainous areas (which is well seen e.g. in the map by Krieglsteiner 1991: 742). In Scandinavia, it only grows in southern regions (in the temperate and hemiboreal zone).

Discussion: *Gymnopilus spectabilis* is well recognisable by its robust fruitbodies mostly growing in clusters, tomentose-fibrillose to tomentose-scaly pileus covering, presence of a prominent annulus (when young), bitter taste and large spores with coarse verrucose to verrucose-rugulose ornamentation. The fruitbodies are very variable in size, shape and colour which depends on their age, sort of stipe insertion and weather conditions. Extremely large fruitbodies with a swollen stipe base (up to 100 mm) are found in some cases.

In the literature, small and slender forms are mentioned, mostly under name *Gymnopilus junonius* (Fr.: Fr.) P.D. Orton. However, in the last four decades of the 20th century, the name *G. junonius* has been used both for slender and robust forms (the forms were considered conspecific by most authors) instead of the name *G. spectabilis*. Both *G. junonius* and *G. spectabilis* are sanctioned names, but *G. junonius* is older. If the two names really represent the same species, then *G. junonius* must be used as the correct name. However, even some recent authors (Bon et Roux 2002, Robich 1989) report finds of a slender fungus named *G. junonius* or *G. spectabilis* var. *junonius*. I personally do not know such a fungus (neither from nature nor from herbaria), but until its relation to robust forms (*G. spectabilis*) is checked, I prefer to use the traditional name *G. spectabilis* for the robust forms which I know from the Czech Republic. Another reason is the fact that some important parts of Fries' description of *G. junonius* (Fries 1821: 244, 1874: 223) are in contradiction to the collections I know from the CR. Fries writes that *Agaricus junonius* is small ("minor": pileus up to 5 cm), has glabrous pileus surface, cylindrical stipe ("stipite aequali") and grows solitarily. All these characters disagree with the robust fungus widely known as *G. spectabilis* and, in my opinion, the name *G. junonius* in its original sense is not applicable for it.

The name *Agaricus spectabilis* was created by Johannes Anton Weinmann, probably in a letter sent to Fries together with dried fruitbodies from the vicinity of Petropolin (= St. Petersburg) and published by Fries (1828) in Elenchus fungorum (where it is simultaneously sanctioned). This can be deduced from Fries' abbreviations "in litt." (= in correspondence, which means a description obtained from Weinmann used for part of his broader description of *A. spectabilis*) and "v. s." (= vidi siccum: dried fruitbodies obtained from Weinmann). Fries really ascribed the name to Weinmann, which is clear from Index alphabeticus (Fries 1832: 42) where it is cited as *A. spectabilis* Weinm.

According to Dennis et al. (1960: 70), the name was published in Weinmann (1824). At the moment, I have no possibility to check this as the book is not available from any Czech library.

In later works, Fries (1838: 166, 1874: 221) cited the name as *A. spectabilis* Fr., Elench. fung. 1: 28, 1828 (non Weinm.) which means that he taxonomically and nomenclaturally excluded Weinmann from his concept of *A. spectabilis*. He probably insisted that the Weinmann's part of the original description does not correspond to his own part based on fresh fruitbodies seen by him (see abbreviation "v. v." = vidi vivum in Elenchus). However, this has no influence on the fact that the basionym *A. spectabilis* was created by Weinmann.

Recently, the name *Gymnopilus pampeanus* (Speg.) Singer commonly used for collections from Southern Hemisphere was added to the synonymy of *G. spectabilis* by Rees et Strid (2001).

Collections studied:

Austria – Burgenland, Oberpullendorf, *Pinus*, on stump, 17 Aug 1988, leg. W. Klofac (WU 7308). – Niederösterreich, Maissau, Grünhof, 23 Sep 1998, leg. ? (illegible) (WU 18398). – Niederösterreich, W of Pulkau, Pulkautal, on stump (*Carpinus* forest), 21 Oct 1979, leg. G. and M. A. Fischer (WU 0340). – Niederösterreich, Wien, Galitzinberg, on stump near the ground (*Fagus*?, *Quercus*?), 23 Sep 1984, leg. Reisinger (WU 3556). – Niederösterreich, Wien, Lainzer Tiergarten, *Fagus*, on stump, 18 July 1982, leg. W. Zöhrer (WU 2345).

Bulgaria – Burgas, between Lovno chanče and Slančev Brig, on soil on forest path, 20 Aug 1982, leg. F. Kotlaba (PRM 830098). – Ropotamo, Arkutino reserve, *Quercus*, at base and on roots, 11 June 1978, leg. J. Kuthan (PRM 824635).

Czech Republic – Bohemia, Český Brod, *Tilia*, on trunk, Sep 1936, leg. J. Sýkora (PRM 28583). – České Švýcarsko National Park, Mezní Louka near Hřensko, Kozí hřbety, *Quercus robur*, roots at base of a living trunk, 28 Sep 2002, leg. J. Holec, JH 305/02 (PRM 896824). – Horní Cerekev, 2 km NE (direction of Nový Rychnov), *Tilia*, 14 Oct 1979, leg. F. Šejnost (CB 2221). – Hradec Králové, 5 km SE of the town, *Fagus sylvatica*, 22 Sep 1985, leg. J. Valter (CB 6345). – Praha, Seminářská zahrada public garden, *Pyrus*, 30 Oct 1961, leg. Chromcová (PRM 616093). – Praha-Stromovka, *Quercus*, on strongly decayed trunk, 27 Aug 1950, leg. Z. Pouzar (PRM 729213). – Rakovník, Kněževes, on wood in soil, 25 Sep 1998, leg. V. Bazika (PRM 892723). – Southern Bohemia, 1 km NW of Rakovice, *Tilia*, at base, leg. M. Koch (CB 5386). – Southern Bohemia, 1 km W of Chýnov, *Populus*, on stump, 6 Oct 1985, leg. J. Valter (CB 6346). – Southern Bohemia, Frahelž near Třeboň, dike between Naděje and Víra fish-ponds, *Quercus*, on stump at soil level, 11 Oct 2002, leg. J. Holec, JH 482/02 (PRM). – Hluboká nad Vltavou, park in front of Ohrada castle, *Quercus*, on stump, 11 Oct 2002, leg. J. Holec, JH 479/02 (PRM). – Hluboká nad Vltavou, bank of Munický rybník fish-pond, *Populus alba*, on stump, 11 Oct 2002, leg. J. Holec, JH 480/02 (PRM 900671). – České Budějovice, embankment by the Vltava river, *Tilia*, on stump, 25 Sep 1984, leg. M. Janoušek (CB 3921). – Southern Bohemia, Klec, dike of Dobrá Vůle fish-pond, *Alnus glutinosa*, on stump, 16 Sep 1986, leg. T. Papoušek (CB 4623). – Southern Bohemia, Klec, dike of the Láska fish-pond, *Corylus avellana*, at base, 9 Oct 1980, leg. J. Váňa (CB 2499). – Southern Bohemia, Klec, dike of the Naděje fish-pond, *Quercus*, on stump, 21 Aug 1983, leg. J. Novotný (CB 3692). – Southern Bohemia, Malešice, on dike of a fish-pond, in grass under *Quercus*, 15 Oct 1989, leg. Z. Vrzák (CB 5671). – Southern Bohemia, Třeboň, *Betula*, at base, 29 Aug 1958, leg. R. Veselý (PRM 519210). – Southern Bohemia, Turovec, near Luční fish-pond, *Pinus sylvestris*, on stump, 16 Sep 1988, leg. M. Beran (CB 5929). – Veselí nad Lužnicí, Bošilec, near Hliníř fish pond, *Quercus*, on stump, Sep 1979, leg. Chalupský (PRM 889214). – Brno-Židenice, *Malus domestica*, old stump, 28 Sep 1964, leg. K. Koncerová (BRNM 312592). – Moravia, Břeclav, Lanžhot, *Quercus*, 12 Sep 1967, leg. M. Svrček (PRM 629482). – Břeclav, Lanžhot, Cahnov floodplain forest, *Quercus robur*, at base of a dead trunk, 10 Oct 1965, leg. F. Kotlaba and J. Lazebníček (PRM 617465). – Ditto, *Ulmus*, on fallen trunk, 6 Oct 1967, leg. J. Lazebníček and A. Vágner (BRNM 312591). – Moravia, Lanžhot, Myslivecký palouk, *Quercus*, on stump, 22 Oct 1998, leg. V. Antonín (BRNM 642470). – Břeclav, Lanžhot, Ranšpurk virgin (floodplain) forest, *Quercus robur*, on decayed stump, 14 Aug 1979, leg. L. Kubičková (PRM 821870). – Moravia, Heroltice, coniferous tree, on stump, 22 Sep 1962, leg. K. Koncerová (BRNM 312393). – Moravia, Letovice, *Malus domestica*, on injured trunk, 12 Sep 1971, leg. V. Benešová (BRNM 301809). – Moravia, Vlkov, Ondrušky, coniferous forest (*Picea*, *Pinus*), 17 Sep 1974, leg. H. Hurtová (BRNM 289660). – Znojmo, Božice, Hoja, *Carpinus betulus*, on decayed stump, 29 Aug 1971, leg. Z. Pouzar and F. Kotlaba (PRM 796550). – Nový Bydžov, Kobylice, on stump of a broadleaved tree, 6 Oct 1989, leg. L. Drahokoupil (PRM 873975). – Ostrava-Třebovice, Turkov nature monument, *Quercus*, on soil among roots, 1 Oct 2002, leg. H. Deckerová (PRM 900663). – Ostrava, Polanka, Přemyšovský mokřad nature reserve, *Salix caprea*, on roots of a fallen trunk, 4 Oct 2002, leg. J. Holec, JH 336/02 (PRM 900664). – Czech Silesia, Javorník, Račí údolí valley, *Malus*?, on trunk, 12 Sep 1945, leg. V. Pospíšil (BRNM 312569).

Romania – Cluj, Hoia-Cluj, *Quercus*, 28 Oct 1956, leg. G. Silaghi (PRM 533794).

Sweden – Göteborg, Hisingen, Rya skog (Fungi Exsiccati Suecici no. 2718), *Pinus nigra*, on stump, 9 Sep 1952, leg. F. Karlvall (PRM 576613). – Göteborg, Slottsskogen (Fungi Exsiccati Suecici no. 2022), on stumps of *Quercus* and *Corylus*, Oct 1951, leg. F. Karlvall (PRM 729196).

Gymnopilus igniculus

Deneyer, P.-A. Moreau et Wuilbaut

(Text-fig. 2)

Gymnopilus igniculus Deneyer, P.-A. Moreau et Wuilbaut, Doc. Mycol., vol. 32, no. 125: 11, 2002 (the species was at first published without Latin description and type designation in Bon et Roux 2002: p. 4, p. 15–16)

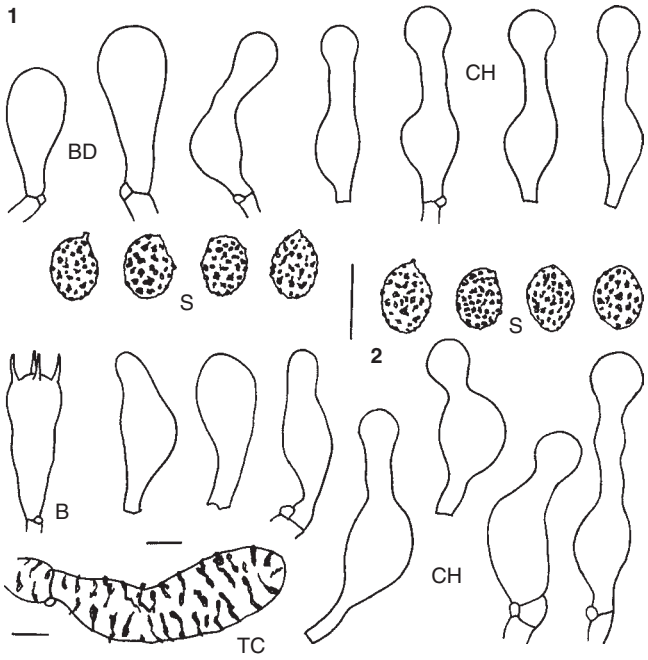
Selected illustrations: Bon et Roux (2002: pl. 1-B), Wuilbaut (2002: p. 31), Holec et al. (2003: 165–166).

Characteristics in brief (based on finds from the Czech Republic): Fruitbodies small to medium-sized, pileus 15–40 mm, pileus covering tomentose-fibrillose when young and fibrillose-squamulose to distinctly scaly at maturity, purplish to vinaceous or reddish brown on yellow ground, veil whitish membranaceous to fibrillose, ring lacking, stipe distinctly longitudinally purplish brown fibrillose on dirty white or slightly violaceous ground, context yellowish with reddish violaceous tinge, smell fungoid, spores relatively large, 8.0–9.5(–11) ×6.0–6.8(–7.2) µm, broadly ellipsoid, with rough verrucose to verrucose-rugulose ornamentation, shape of cheilocystidia variable, pleurocystidia absent. Growing on decaying wood on burning coal mine dumps.

Description (based on fruitbodies from the Czech Republic which were thoroughly described by Holec et al. 2003): Basidiocarps single or in small groups, never cespitose. Pileus (7–)15–40 mm broad, broadly conical to convex, involute at margin when young, then convex with applanate centre and inflexed margin, almost applanate with slightly inflexed margin in the end, entirely distinctly tomentose when young, then except for centre ± adpressed radially fibrillose, almost pyramidal fibrillose-squamulose at centre and radially adpressed fibrillose towards margin when old, vesture purplish or vinaceous brown (9–11E6–7, 10F7), with paler margin (9E7) when young, then vinaceous only at centre and paler, purplish ochraceous brown (8–9D7–8) towards margin, when old reddish brown (9D–E7) at centre and paler (8–9D6) towards margin, ground yellowish to pale dirty yellow; margin sometimes decorated with almost membranaceous velar remnants. Lamellae rather distant, L = 18–24, l = 2–3, broadly adnate or emarginate and shortly decurrent with tooth, ± horizontal, light yellow (3A4) to orange-yellow (4–5A5), with concolorous, irregularly serrulate, finely pubescent edge. Stipe 20–80 × 2–6 mm, cylindrical, sometimes slightly clavate (up to 7 mm) or attenuated towards base, often curved, distinctly longitudinally purplish brown (10D5–6, 10–11E6–7)

fibrillose or fibrillose-squamulose on dirty white or slightly violaceous ground, whitish or with violaceous tinge, less distinctly fibrillose (paler than other parts of stipe) and sometimes striate (decurrent lamellar tooth) at apex; with dirty whitish basal mycelium. Velum membranaceous, dirty whitish or pale dirty brownish, at margin yellowish when young, its remnants sometimes distinct at pileus margin and near stipe apex (when young) and only as indistinct fibrils on stipe surface (when old). Context hollow in stipe, whitish to yellowish, in stipe apex and above lamellae more distinctly yellow, pale violaceous under pileipellis, slightly violaceous (reddish) in stipe middle; with fungoid or indistinct smell and bitterish taste.

Spores 8.0–9.5(–11) × 6.0–6.8(–7.2) µm, E = 1.25–1.50, Q = 1.39, broadly ellipsoid, with small but distinct suprahilar depression visible in side view, rusty yellow in KOH with darker, rusty brown wall which is slightly thick-walled, surface densely covered with low but large (up to 1.5 µm broad) and irregular verrucose to rugulose-verrucose ornamentation, hilar appendix tiny, spore protoplasm distinctly dextrinoid (staining vinaceous reddish brown) in Melzer's reagent with the wall remaining rusty yellow. Basidia 24–28 × 8–9 µm, mostly 4-spored, rarely 2- or 1-spored, clavate to subutriform, sometimes with a slight medial constriction, clamped. Basidioles 10–30 × 3–9 µm, cylindrical when young, then distinctly clavate, some of them filled with a homogeneous yellow-rusty pigment (in 5 % KOH), clamped. Cheilocystidia 24–35 × 6–10 µm, arranged in "nests" on edge or mixed with basidioles, narrowly clavate to fusiform-lageniform when young, then typically lageniform to subutriform with 3–4 µm broad neck and more or less distinct globose head 5–8 µm in diameter, thin-walled, hyaline, clamped. Pleurocystidia not observed. Lamellar trama regular to subregular, consisting of parallel hyphae 3–20 µm broad, narrower hyphae located near the subhymenium, cells cylindrical, slightly fusiform to narrowly ellipsoid, with hyaline content and yellowish wall, non-dextrinoid, clamped, subhymenium of densely arranged hyphae. Pileus cuticle a cutis, 60–70 µm thick, 2–layered, upper layer thin, dark reddish to violet brown in KOH, consisting of densely and radially arranged (parallel in a section) hyphae 4–20 µm broad, cells cylindrical to narrowly fusiform or narrowly ellipsoid, with distinct violet to reddish brown incrustations arranged in a tiger pattern, terminal cells indistinct, subfusoid to narrowly clavate, lower layer thick, less coloured, yellow in KOH, of loosely arranged parallel to slightly interwoven hyphae with less distinct incrustations, this layer gradually passing into the pileus context made up of cylindrical, narrowly fusiform to narrowly ellipsoid hyphae up to 25 µm broad, hyaline or pale brownish in KOH. When a pileus scalp is observed, the pileus surface is covered with fascicles or a sparse net of cells forming the upper layer of the pileus cuticle. Stipe cuticle a cutis of densely arranged, parallel, cylindrical hyphae 3–8 µm broad, yellow-brown with violet tinge, cells with yellow-brown to rusty brown incrustations, slightly thick-walled, clamped, terminal cells indistinct, cylindrical;



Text-fig. 2. ***Gymnopilus igniculus*****: 1 – Ostrava-Radvanice, 24 April 1999 (BRNM 686264); 2 – Ostrava-Radvanice, 1 May 1999 (PRM 900986). For explanations see Material and Methods. Scale bar = 10 µm.**

caulocystidia not observed, but a sparse net of interwoven, yellow-brown incrusted veil hyphae 2–8 µm broad covering the cuticle. Stipe context made up of cylindrical to subellipsoid, slightly thick-walled, yellowish hyphae up to 15 µm broad, mixed with 5–10 µm broad branched hyphae with yellow content in KOH. Clamp connections present in all tissues. Fragments of lamellae exuding a bright yellow pigment when mounted in 5 % KOH.

Fructification: April–May (CR), February, October, December (Belgium: see Deneyer et al. 2002).

Ecology (for detailed data see Holec et al. 2003): In the Czech Republic, *Gymnopilus igniculus* was found on a burning coal mine dump in the city of Ostrava where it grew on decaying wood of *Fraxinus*. The dump is composed of silty shales, claystones, siltstones and fossil soil with Stigmaria; to a lesser extent of fine-grained sandstones. At present, most parts of the dump are reclaimed and planted mainly with *Betula* stands (30–40 years), mixed stands (*Betula, Tilia, Populus, Quercus, Fagus*) and somewhere also with stands of *Pinus nigra* or *Quercus robur*. In some places, heat and gasses escape from lower parts of the dump containing coal with a relatively high content of sulphur. Consequently, the soil of the collecting site was rather warm. During collecting days, its surface reached a temperature of about 45 °C. Although the site was insolated, it was moist due to the escaping humid heat and gasses. The surface was overgrown by the moss *Aulacomnium palustre*, the grass *Setaria pumila* and a tree stand of *Fraxinus excelsior*. In Belgium, the species grows in the same artificial habitat – burning coal dump (40 °C on surface, see Bon et Roux 2002: 16).

Distribution: So far, *Gymnopilus igniculus* is known only from Belgium, where it was described from (Deneyer et al. 2002), the Czech Republic (Holec et al. 2003) and probably also from France (see Discussion).

Discussion: The taxonomy, ecology and distribution of *Gymnopilus igniculus* was thoroughly discussed by Holec et al. (2003). A shortened discussion is presented here.

The most important characters of fruitbodies of *G. igniculus* from the Czech Republic are given in the paragraph Characteristics in brief. The fruitbodies agree in the most essential characters with those of *Gymnopilus igniculus* described from Belgium (Deneyer et al. 2002). However, there are also differences. The fruitbodies from Belgium are slender and possess small purplish scales on a yellow ground, and are not completely purple-fibrillose like the fruitbodies from Ostrava. At first view, the fruitbodies from the two countries are different. However, when the descriptions are compared, the differences with the original *G. igniculus* are only quantitative: the Belgian fruitbodies have a pileus cuticle thin and soon differentiated into scales, with very few fibrils; those from the Czech Republic have a thicker pileus cuticle which dissociates less into scales or only with age. When the young fruitbodies are compared, they are almost identical. Possibly, Deneyer et al. (2002) described in fact local populations with smaller and slender fruitbodies with an underdeveloped pileus cuticle, whilst the material from the Czech Republic represents robust and more coloured fruitbodies.

In addition, such more robust fruitbodies were also found in France (burning dump Pinchonvalles, Avion, Pas-de-Calais) by J. Vast and R. Courtecuisse (see note by R. Courtecuisse at the end of the paper by Deneyer et al. 2002: p. 16). In this case, the pileus surface was also fibrillose but later divided (broken) into appressed scales (we saw a photograph kindly provided by R. Courtecuisse). Maybe this aspect was caused by insolation, as the fruitbodies were collected in June.

The fruitbodies from the Czech Republic and France also differ from the Belgian ones by their smell and taste. The smell of the first ones was not very distinctive while a prominent farinaceous-herbaceous smell and taste was noted in the Belgian material. External conditions (temperature or drought?) may be responsible for this discrepancy, similarly as in the previous case.

A trophic difference can also be pointed out between the original localities and French and Czech sites: all collections from Belgium, small and slender, grow between mosses (*Campylopus*), the mycelium growing from a layer of moss litter. The robust fruitbodies collected by Courtecuisse and Graca are associated with wood remnants, perhaps a more favourable substrate for their development.

Gymnopilus igniculus obviously has a greater variability of macrocharacters than was observed in the original collecting sites in Belgium. The more robust forms from the Czech Republic and France having a fibrillose pileus covering which later separates into scales may be somewhat different due to fructification in spring (the Belgian fruitbodies were collected from October to February). In this period the insolation is higher and air humidity lower which may cause a different development of the pileus cuticle.

Gymnopilus species with purplish, violaceous or vinaceous tinged fruitbodies are rare in Europe. They mostly represent species imported from the tropics or subtropics. It is e.g. *Gymnopilus purpuratus* (Cooke et Massee) Singer, described from tree fern stems in the Royal Botanic Gardens, Kew (Cooke et Massee, Grevillea 18: 73, 1890; Cooke 1883: 375; coloured picture: Cooke 1881–1891: plate 964). Fruitbodies identified as *G. purpuratus* were also found in the greenhouse of the Botanical Garden in Zürich (Breitenbach and Kränzlin 2000: 140). The name *G. purpuratus* was further used for collections from compost heaps of wood and bark remnants in the Ribnitz-Damgarten district in Germany (Kreisel and Lindequist 1988, Ludwig 2001: 154, coloured picture by Ludwig 2000: p. 45). Röllin (1998) published finds identified as *Gymnopilus* cf. *peliolepis* from the base of a palm tree in an office in Genève, Switzerland. A find of *Gymnopilus dilepis* (Berk. et Broome) Singer from a pot with *Philodendron* purchased from a supermarket in Great Britain was published by Watling (1998); a more recent, abundant find, on a heap of woodchips, has been illustrated by T. Leech in Henrici (2002: back cover). Finally, Bon and Roux (2002) used the name *Gymnopilus luteifolius* (Peck) Singer for *G. purpuratus* s. Breitenbach et Kränzlin (2000) and the name *Gymnopilus peliolepis* (Speg.) Singer for *G. purpuratus* s. Ludwig (2000, 2001).

These finds of *Gymnopilus* having purplish or violet colours differ from *Gymnopilus igniculus* in smaller spores mostly measuring 6–8.5 × 4–6 µm ("average" spores without extremely large ones which are often present in *Gymnopilus*) and in more distinct, mostly erect scales covering the whole pileus surface. Moreover, *Gymnopilus purpuratus* s. Kreisel and Lindequist (1988) differs in the presence of abundant pleurocystidia and in blue to blue-greenish colour changes on the stipe surface and in the context.

The discussion on violet-coloured species of *Gymnopilus* in Europe (Holec et al. 2003) clearly showed how poor our knowledge of this group in Europe is and how difficult it is to identify the finds. The reasons are the rarity of such finds, evident tropical or subtropical origin of collections from indoors or greenhouses and the difficulty to judge the variability of European records with respect to species described from other continents.

Quite recently, this group of *Gymnopilus* was thouroughly revised by Rees et al. (2004), also using molecular data from ribosomal ITS sequences. The authors used available collections of most taxa discussed above (and others) from Europe, Sri Lanka, Australia, South and North America. They proved the existence of two separate but closely related species: *Gymnopilus purpuratus* and *Gymnopilus dilepis*, which include most of the collections reported above; moreover, *Gymnopilus luteofolius* and *Gymnopilus megasporus* Grgurinovic also were recognised as good species separated from *G. purpuratus* (but closely related). However, no collections of *G. igniculus* were studied and its relation to other purple to vinaceous-coloured species remains unresolved.

Collections studied:

Belgium: Cuesmes, "Terril du Levant", among *Campylopus retroflexus* on hot mineral ground (charcoal), 9 Dec. 2001, leg. Y. Deneyer, P.-A. Moreau, J. Nuytinck and J. J. Wuilbaut (herb. PAM 01120901: fruitbodies not formally designated as isotype, but originating from the 30 original fruitbodies from which the holotype deposited in BR was selected; all these specimens were collected at the same site (about 20 m^2). For more details see Holec et al. (2003).

Czech Republic: Silesia region, Ostrava-Radvanice, burning coal mine dump, on decaying wood of *Fraxinus*, 24 April 1999, leg. M. Graca (BRNM 686264); ibid., 1 May 1999 (PRM 900986).

Gymnopilus bellulus (Peck) Murrill

(Text-fig. 3; Pl. 2; Pl. 3, fig. 1; Pl. 10)

Bas.: *Agaricus bellulus* Peck, Bull. Buffalo Soc. Nat. Sci. 1: 51, 1873.

≡ *Gymnopilus bellulus* (Peck) Murrill, North American Flora, vol. 10, part 3: 200, 1917.

≡ *Naucoria bellula* (Peck) Sacc., Syll. fung. 5: 841, 1887.

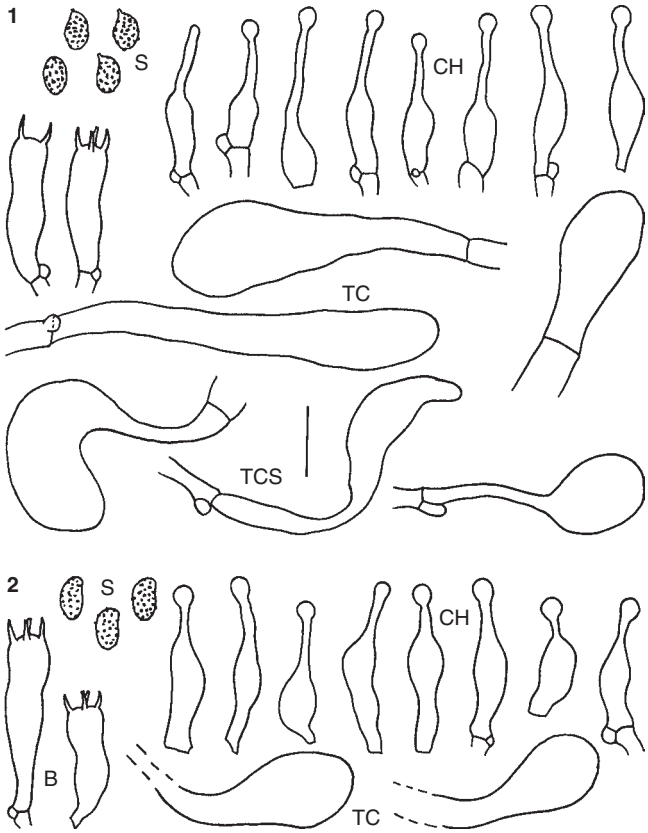
≡ *Flammula bellula* (Peck) Pilát, Klíč k určování našich hub hřibovitých a bedlovitých (Agaricalium europaeorum clavis dichotomica): 351, 1952 ("1951").

= *Gymnopilus microsporus* (Singer) ex Singer, Lilloa 22: 561, 1951 ("1949").

Selected illustrations: Breitenbach et Kränzlin, vol. 5: fig. 141. – Moser et Jülich: III *Gymnopilus* 2, bottom figure. – Ludwig: fig. 31.6. – Bon et Roux: pl. 3-A.

Characteristics in brief: Fruitbodies small, pileus 5–25 mm, hemisphaerical, conical-convex to convex, surface not glossy (mat) or slightly lustrous, smooth to finely rugulose, but under lens distinctly tomentose-rugulose to finely rugulose-rugged, rusty orange to rusty brown with orange tinge, margin paler, yellow to yellow-ochre, lamellae deep yellow, then yellow-brown to yellow-rusty, stipe 10–35 × 1–3 mm, yellow-rusty in the upper part, towards the base yellow-brown, ochre-brown to rusty brown, surface pale yellow, yellow to yellow-rusty fibrillose-tomentose, taste bitter, spores small, mostly 4.5–6.0 × 3.0–3.5 µm, E = (1.3–)1.4–1.9(–2.0), Q = 1.63, ellipsoid to amygdaliform-ellipsoid with a distinct suprahilar depression, medium to coarsely verrucose, cheilocystidia narrowly lageniform with more or less prominent globose head which is not sharply separated from the neck, hyphae on pileus and stipe surface with clavate terminal elements up to 14 µm broad. Growing on strongly decayed wood (especially trunks) of conifers in natural or near-natural forests, preferably in the mountains.

Description: Fruitbodies growing individually or in small groups, never caespitose. Pileus 5–25 mm, hemisphaerical to conical-hemisphaerical with inflexed margin when young, then campanulate-convex, conical-convex to convex, sometimes with a low broad umbo, margin somewhat overlapping lamellae, at most slightly hygrophanous but mostly dry, not translucently striate, surface not glossy or only slightly lustrous, smooth to finely rugulose but under lens distinctly tomentose-rugulose to finely rugulose-rugged, not scaly, colour rusty orange to rusty brown (6D8), mostly with orange tinge, margin paler, yellow, yellow-rusty or yellow-ochre. Lamellae crowded, L = 22–30, l = 1–3, 2–4 mm high, more or less ventricose, near stipe emarginate and decurrent with a small tooth, at first pale yellow, then deep yellow, at maturity yellow-brown to yellow-rusty, edge concolorous. Stipe 10–35 × 1–3 mm, base sometimes slightly bulbous, cylindrical, often curved, at first with pale yellow cortinoid traces of velum (towards pileus margin), soon disappearing, ground colour yellow-rusty in upper part, towards the base yellow-brown, ochre-brown to rusty brown, surface pale yellow, yellow to yellow-rusty fibrillose-tomentose, base sometimes whitish tomentose. Odour indistinct. Taste distinctly bitter.



Text-fig. 3. *Gymnopilus bellulus*: 1 – Srní, Dračí skály protected area, JH 534/01 (PRM); 2 – České Žleby, Spáleniště mountain, JH 286/98 (PRM). For explanations see Material and Methods. Scale bar = 10 µm.

Spores small, 4.5–6.0(–6.5) × 3.0–3.5(–4.0) µm, E = (1.3–)1.4–1.9(–2.0), Q = 1.63, yellow to rusty yellow in KOH, ellipsoid, amygdaliform-ellipsoid to ovoid ellipsoid in front view, ellipsoid to amygdaliform-ellipsoid with distinct suprahilar depression in side view, wall rusty brown, medium to coarsely verrucose, without suprahilar disc, slightly dextrinoid (with pale reddish brown tinge in Melzer's reagent), mature spores acyanophilous or only slightly cyanophilous, immature ones or those with a broken wall distinctly cyanophilous. Basidia 4(2–)-spored, 16–24 × 5–6 µm, cylindrical to narrowly clavate with median constriction. Basidioles 16–18 × 5 µm, narrowly clavate. Cheilocystidia numerous, rarely intermixed with basidiolae and basidia, small, (16–)20–26 × 4–6 µm, narrowly lageniform with inflated

basal part, long cylindrical neck (1.5–2.5 µm) and more or less prominent globose head (2–3.5(–5) µm) but head not sharply divided from the neck, sometimes also without head, thin-walled, hyaline. Pleurocystidia absent. Lamellar trama regular, of densely arranged hyphae 4–16 µm broad, cells cylindrical or slightly fusiform, with yellow membranal pigment, trama completely pale yellow, subhymenium thin, of densely arranged hyphae. Pileus cuticle (section) a cutis of densely arranged parallel hyphae 3–8 µm broad, cells cylindrical or slightly inflated, with rusty brown incrustations, entire layer yellow- to rusty brown, in scalp covered with a loose net of interwoven cylindrical hyphae (veil hyphae?) 3–13 µm broad with distinctly clavate terminal elements up to 14 µm broad, rusty brown incrusted (in a "tiger" pattern), pileocystidia resembling cheilocystidia not observed. Stipe cuticle a cutis of densely arranged cylindrical hyphae 3–8 µm broad, cells rusty brown incrusted, terminal elements sometimes slightly capitate, this layer covered with loosely arranged protruding and curved hyphae (veil hyphae?), locally forming nests of interwoven hyphae 3–6 µm broad, rusty brown incrusted, with distinctly clavate to sphaeropedunculate terminal elements up to 12 µm broad, caulocystidia rare, resembling cheilocystidia, lageniform or cylindrical with capitate head. Clamp connections present in all tissues. Fragments of lamellae exuding yellow pigment when mounted in KOH.

Fructification: July – October.

Ecology: Based on data from the Czech Republic, *Gymnopilus bellulus* is a saprophyte growing on thick fallen trunks of *Abies alba* and *Picea abies*. The trunks are in later stages of decay characterised by the absence of bark, soft wood and mostly by the presence of moss covering. Except for conifers, there are also rare finds from wood of *Fagus*. All my collections from the Czech Republic as well as the herbarium specimens I have studied from this area originate from natural to near-natural forests mostly designated as protected areas. A first type are so-called "mixed mountainous forests" composed of *Fagus, Picea* and *Abies* (typical example: the "Boubínský prales" and "Žofínský prales" virgin forests) with admixture of *Acer pseudoplatanus*. Another habitat of *G. bellulus* is represented by natural mountainous *Picea abies* forests (climax spruce forests). In both habitats, *G. bellulus* grows only at sites with a rich presence of fallen trunks of old thick trees. This means that the species is lacking in cultural forests where all fallen trunks are removed. Concerning altitude, *G. bellulus* grows in the montane to supramontane zone (730–1340 m a.s.l., see collections studied).

I have also studied collections from Slovakia, Austria, Ukraine and Italy. In all cases, the data on ecology were similar (growth in natural to near-natural mountainous forests on wood of *Picea* or *Abies*). Also occurrence on *Larix* and *Pinus cembra* are reported by Breitenbach et Kränzlin (2000) and on *Taxus* by Orton (1993). Preference of *G. bellulus* for mountainous areas is also confirmed by a map by Krieglsteiner (1991) from Germany which clearly shows that the species grows there in the mountains only. On the other hand, Orton (1993) reports finds from Great Britain which are from lowlands. In accordance with my data, Høiland (1990) also writes that *G. bellulus* is "confined to mature or even virgin forest types" (to damp shady *Picea* forests in Norway).

Distribution: In the Czech Republic, *Gymnopilus bellulus* is documented from several mountain ranges (Šumava, Novohradské hory, Krkonoše, Beskydy). Generally, it is a rare species which is, however, typical and scattered in appropriate locations (see Ecology). Its records in suitable habitats of some other mountains are to be expected (e.g. Jeseníky, Králický Sněžník, etc.). The species is also known from the Carpathians in Slovakia and Ukraine (see Škubla 2003 and the collections studied). In Europe, it is further known from e.g. Italy, Switzerland (Breitenbach et Kränzlin 2000), Germany (Krieglsteiner 1991), Austria (Keller et Moser 2001) and France (e.g. Josserand 1948, Bon et Roux 2002), mostly from the Alps, but also from the Massif Central, Jura, Schwarzwald, Schwäbische and Frankische Alb. Except for the mountains, it is rarely found in lowlands (e.g. France, Great Britain, see Bon et Roux 2002, Orton 1993). In Scandinavia, *G. bellulus* is reported only from Norway (Høiland 1990). The species seems to be rare everywhere.

Discussion: *Gymnopilus bellulus* is well distinguishable according to its small fruitbodies having relatively bright colours (pileus with orange tinge, lamellae at first deep yellow), bitter taste, small spores with distinct suprahilar depression, coarse ornamentation and length/width ratio mostly 1.4–1.9, small lageniform cheilocystidia with more or less distinct head and other characters summarised in the paragraph "Characteristics in brief". *Gymnopilus josserandii* also has small fruitbodies and small spores but it differs in the characters discussed under that species.

Some authors (e.g. Moreno et Esteve-Raventós 1990) are convinced that *G. bellulus* in the sense of European authors is different from the original American *G. bellulus* by Peck. They suggested to use the name *Gymnopilus microsporus* (Singer) ex Singer for the European *G. bellulus*. The name *G. microsporus* is based on the Latin description and illustration of *Flammula liquiritiae* (Pers.) P. Kumm. sensu Bresadola (Icon. mycol., vol. 16, text + tab. 783, 1930). However, *Flammula liquiritiae* sensu Bresadola is a fungus which is difficult to interpret.

To clear up all these discrepancies, I made a critical study of *Gymnopilus bellulus* and *G. microsporus*, including the type studies and detailed analysis of the original and recent concepts of these species. The results will be published separately (probably in Mycotaxon in 2005 or 2006). The basic conclusions are that the American and European collections of *G. bellulus* seem to be identical, and that *G. microsporus* typified by the illustration by Bresadola is a hardly interpretable name which should be rejected. As Singer's material of *G. microsporus* is identical with *G. bellulus*, *Gymnopilus microsporus* can be considered a synonym of *G. bellulus*.

Collections studied:

Austria – Niederösterreich, Hohenberg, Lahnsattel, *Abies*, 30 June 1992, leg. A. Hausknecht (WU 10824). – Niederösterreich, Lunz/See, Rotwald: NSG Kleiner Urwald, wood of conifer (*Abies*?), 29 Aug 1996, leg. A. Hausknecht (WU 16262). – Oberösterreich, St. Konrad, *Picea abies*, on wood, 5 Oct 1984, leg.

I. Krisai (herb. I. Krisai 3074). – Steiermark, Pöllau, Höllgraben, decayed conifer trunk (*Picea*?, *Abies*?), 12 Sep 2002, leg. J. Holec, JH 172/02 (PRM). – Ditto, *Abies alba*, decayed trunk covered with mosses, 12 Sep 2002, leg. J. Holec, JH 171/02 (PRM).

Czech Republic – Krkonoše Mts., Špindlerův Mlýn, on strongly decayed wood (*Picea-Fagus* forest), 8 Sep 1946, leg. J. Kubička (PRM 520916). – Šumava Mts., Boubín mountain, Boubínský prales virgin forest, Aug 1936, leg. J. Herink (PRM 27788). – Šumava Mts., České Žleby, Spáleniště mountain, *Abies alba*, on decayed trunk among mosses, 26 Oct 2002, leg. J. Holec (PRM 900962). – Ditto, *Abies alba*, on decaying trunk, 13 Oct 1997, leg. J. Holec, JH 763/97 (PRM 891944). – Ditto, *Abies alba*, on decayed trunk, 26 Oct 2002, leg. J. Holec, JH 522/02 (PRM). – Ditto, *Picea abies*, on decaying trunk among mosses, 14 July 1998, leg. J. Holec, JH 286/98 (PRM 897048). – Ditto, *Abies alba*, on decayed trunk among mosses, 3 Aug 1998, leg. J. Holec, JH 347/98 (PRM 897099). – Šumava Mts., Lenora, Radvanovický hřbet mountain ridge, *Abies alba*, on decaying trunk among mosses, 13 July 1998, leg. J. Holec, JH 261/98 (PRM 897028). – Šumava Mts., Nová Pec, Plechý mountain, *Picea abies*, on decayed trunk, 26 Aug 1996, leg. J. Holec, JH 317/96 (PRM 889100). – Šumava Mts., Nová Pec, between Plechý mountain and Trojmezí, *Picea abies*, on decayed trunk among mosses, 15 July 1998, leg. J. Holec, JH 299/98 (PRM 897058). – Šumava Mts., Prášily, Ždanidla mountain, *Picea abies*, on decaying trunk among mosses, 9 July 1998, leg. J. Holec, JH 211/98 (PRM 896984). – Šumava Mts., Srní, Dračí skály protected area, *Abies alba*, on decaying trunk, 29 Sep 2001, leg. J. Holec, JH 534/01 (PRM). – Ditto, *Abies alba*, on decaying trunk, 10 Oct 2002, leg. J. Holec, JH 461/02 (PRM). – Šumava Mts., Zátoň near Lenora, Boubínský prales virgin forest, *Abies alba*, on decaying trunk, 2 Oct 2001, leg. J. Holec, JH 589/01 (PRM). – Šumava Mts., Železná Ruda, Debrník protected area, on decaying trunk of a conifer (*Picea*?, *Abies*?), 8 July 1998, leg. J. Holec, JH 181/98 (PRM 896964). – Novohradské hory Mts., Žofínský prales virgin forest, *Fagus*, on wood, 29 Sep 1969, leg. J. Kubička (PRM 830924). – Ditto, *Fagus*, on trunk, 21 Sep 1991, leg. V. Antonín (BRNM 553290). – Beskydy Mts., Morávka, Travný, *Picea abies*, on decayed trunk, 17 Sep 1987, leg. Z. Pouzar (PRM 852262). – Moravskoslezské Beskydy Mts., district Frýdek-Místek, Bílá, Salajka nature reserve, *Abies alba*, on dead trunk, 15 Aug 1970, leg. J. Kuthan (BRA). – Moravskoslezské Beskydy Mts., Velké Karlovice-Lesková, Razula nature reserve, *Abies alba*, on decayed trunk, 28 Aug 1972, leg. J. Kuthan (BRA).

Italy – Trento, Paneveggio, wood of a conifer, 4 Oct 1989, leg. R. Schütz (WU 8143). – Trento, Passo di Manghen, on twigs, 11 Sep 1987, leg. I. Krisai (herb. I. Krisai 4332).

Ukraine – Eastern Carpathians, near Dilove (Trebušany), Berlebash stream valley (Berlebaš), *Picea abies*, Aug 1937, leg. A. Pilát (PRM 488229). – Eastern Carpathians, near Dilove (Trebušany), Biliyi stream valley (Bílý potok), *Picea abies*, Aug 1935, leg. A. Pilát (PRM 20492). – Eastern Carpathians, near Dilove (Trebušany), Biliyi stream valley (Bílý potok), *Picea abies*, Aug 1935, leg. A. Pilát (PRM 20232).

Gymnopilus josserandii Antonín

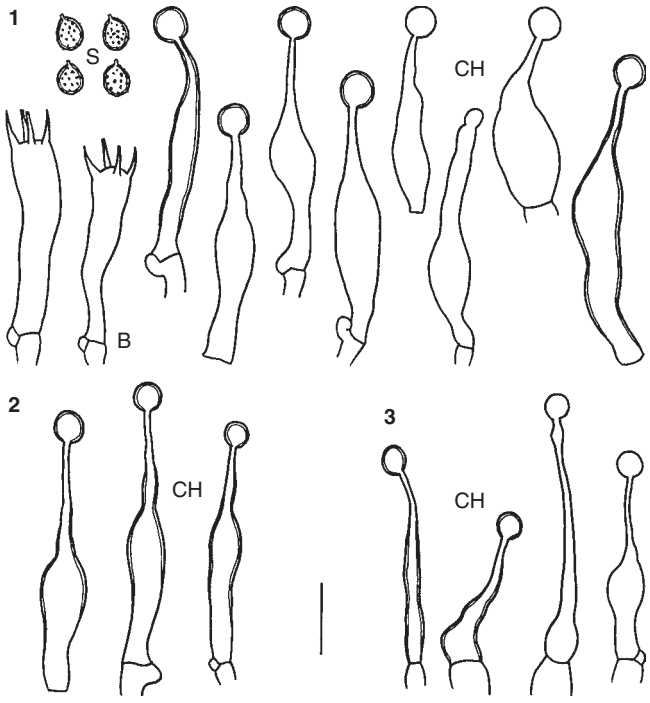
(Text-fig. 4, Pl. 1, Pl. 11)

Gymnopilus josserandii Antonín, Fungi non delineati 11: 13, 2000.
= *Naucoria subsphaerospora* Joss., Bull. Soc. Mycol. France 64: 21, 1948 (invalid name: published without Latin diagnosis).
≡ *Gymnopilus subsphaerosporus* (Joss.) Kühner et Romagn., Fl. anal. champ. supér.: 323, 1953 (invalid combination: based on invalidly published basionym).

Selected illustrations: Moser et Jülich: III *Gymnopilus* 4, top figure (as *G. subsphaerosporus*). – Antonín et Škubla, Fungi non delineati 11: photo no. 5, 2000. – Breitenbach et Kränzlin, vol. 5: fig. 150 (as *G. subbellulus*). – Holec, Czech Mycol. 53(2): fig. 3 between pages 138 and 139, 2001. – Ludwig: fig. 31.3. (as *G. subsphaerosporus*).

Characteristics in brief: Fruitbodies small (pileus up to 25 mm), surface fibrillose-tomentose, colour ochre-brown, dark brown to rusty brown, lamellae typically dark brown at maturity, spores mostly 4.5–6.0 × 3.5–4.5 µm, E = 1.1–1.4(–1.5), Q about 1.25, subglobose but also broadly ellipsoid to broadly obovoid in side view, without suprahilar disc and suprahilar depression, verrucose, cheilocystidia typically tibiiform with narrowly lageniform, cylindrical or narrowly fusiform basal part, long narrow neck, distinct globose head and often thickened, rusty brown wall, pleurocystidia absent, caulocystidia of the same shape as cheilocystidia. Rare mountainous species growing mostly in natural and seminatural but also in man-made mixed or coniferous forests on strongly decayed wood of *Picea* or *Abies*, especially on old stumps.

Description: Fruitbodies growing singly or in small groups. Pileus 3–25 mm, at first subglobose to conical-subglobose with involute margin, then convex to plano-convex or broadly campanulate, mostly with a broad low umbo, surface mat, dry but rarely slightly hygrophanous, finely fibrillose-tomentose to distinctly tomentose, sometimes to-



Text-fig. 4. ***Gymnopilus josserandii*****: 1 – Zátoň near Lenora, Pažení mountain, JH 216/01 (PRM); 2 – Prášily, Ždanidla mountain, JH 52/02 (PRM); 3 – JH Zátoň near Lenora, Boubínský prales virgin forest, 580/01 (PRM). For explanations see Material and Methods. Scale bar = 10 µm.**

mentose-scaly, colour variable, pale ochre, ochre to brown-ochre (5D7) when dry, but dark brown to rusty brown (6D8) when moist, old fruitbodies with rusty brown to purplish orange tinge, fibrillose-tomentose surface being yellow to yellow-brown, drying surface being yellow-rusty (5B7). Lamellae rather sparse, L = 24–35, l = 1–3, 2–3 mm high, ventricose, near the stipe with a small decurrent tooth, yellow with orange tinge when young, then sordid ochre-brownish (5D8), at maturity brown (6DE6), rusty brown (6D8) to typically dark brown (7E7), edge concolorous. Stipe 10–35 × 0.15–0.4 mm, cylindrical or gradually thickened towards base, concolorous with pileus: beige-ochre, ochre-brown, ochre-rusty to rusty brown, surface distinctly fibrillose-tomentose, covering pale yellow to yellow. Taste mild (without traces of bitterish taste). Smell indistinct.

Spores (4.0–)4.5–6.0(–6.4) × (3.2–)3.5–4.5(–4.8) µm, E = 1.1–1.4(–1.5), Q = 1.17–1.33 (variability measured in 4 specimens), mostly subglobose but also broadly ellipsoid to broadly obovoid in side view, without suprahilar depression, in front view subglobose, broadly ellipsoid to broadly lacrymoid; sometimes with a slightly polygonate outline, rusty ochre in KOH, wall rusty brown, medium thick, distinctly but not coarsely verrucose, normal spores acyanophilous, those with broken wall cyanophilous without any reaction in Melzer's reagent or very slightly dextrinoid (with reddish brown hue on mature spores and spores with a broken wall). Basidia 20–30 × 5–7 µm, narrowly cylindrical to narrowly clavate, often with median constriction, 4(2-) spored, sterigmata long, thin, 4–6 µm. Cheilocystidia long, 25–45 × 4–8(–10) µm, forming a sterile band on the edge, tibiiform with narrowly lageniform, cylindrical or narrowly fusiform basal part, long narrow neck (1.0–2.0 µm) and distinct globose head (3.5–5 µm), sometimes with slightly thickened and rusty brown wall, especially in the head (up to 1 µm), content sometimes homogeneously yellow-brown; rarely with hyaline lageniform cystidia non-capitate. Pleurocystidia absent. Lamellar trama regular, hyphae 4–10(–14) µm broad, near the subhymenium only 2–4 µm, cells cylindrical to slightly inflated (somewhere almost barrel-shaped), with distinct yellow-brown membranal and incrusting pigment, subhymenium not gelatinous, of densely arranged interwoven hyphae. Pileus cuticle (section) a cutis, not gelatinised, 30–50 µm thick, formed by densely arranged parallel hyphae 4–12(–14) µm broad, cells cylindrical, with yellow membranal pigment and coarse rusty brown incrustations, under it a hypodermium of parallel to slightly flexuously interwoven hyphae 4–8 µm broad, with same type of pigmentation, in scalp visible as a loose net of interwoven hyphae, terminal cells sometimes slightly clavate, pileocystidia absent. Stipe cuticle 2-layered, lower layer a cutis of parallel, densely arranged, cylindrical hyphae 2–8 µm broad, with yellow-rusty membranal pigment and rusty brown incrustations, from which emerge nests of loosely arranged and interwoven hyphae 2–6 µm broad, cylindrical but with lageniform-fusiform outgrowths or terminal elements and with numerous caulocystidia resembling cheilocystidia in shape and size but often narrower (with cylindrical body). Clamp connections present in all tissues.

Fructification: July – October (CR). The species produces fruitbodies already in summer.

Ecology: In the Czech Republic, *G. josserandii* is known from montane forests at an altitude of about 750 to 1150 m. The forests are stands of *Fagus, Picea*, *Abies* and *Acer pseudoplatanus* (so called mixed montane forest) or pure *Picea* forests (or with admixed *Fagus*). The species is mostly found in natural stands (e.g. the "Boubínský prales" virgin forest in the Šumava Mts. and "Žofínský prales" virgin forest in the Novohradské hory Mts.) or near-natural forests, but finds from man-made spruce forests are also known (see Holec 2001b). *Gymnopilus josserandii* prefers wood of *Picea abies* but it was also found on *Abies alba*. Records from broadleaved trees are also reported (e.g. Josserand 1948, but with a question mark). The species is typical of strongly decayed stumps of old trees, mostly covered with mosses. I have never seen it on fallen trunks. However, Keller et Moser (2001) and Beran (personal communication) report that *G. josserandii* grows on decayed fallen trunks of conifers in Austria.

Distribution: *Gymnopilus josserandii* is relatively rare in the Czech Republic as it is known only from three regions – the Šumava Mts. and Novohradské hory Mts. in Bohemia and the Beskydy Mts. in Moravia (see Antonín et Škubla 2000, Holec 2001b and the collections studied). In all these regions the species is rare but regularly occurs in suitable habitats – natural, seminatural to man-made mixed or coniferous forests with presence of old and strongly decayed stumps (or trunks) of *Picea* or *Abies*.

In Europe, *G. josserandii* is well documented from France (Josserand 1948, as *Naucoria subsphaerospora*), Switzerland (Breitenbach et Kränzlin 2000: 140, as *G. subbellulus*), the Netherlands (Arnolds et al. 1995, as *G. subsphaerosporus*), Germany (Krieglsteiner 1991; Luschka 1993: 197; Ludwig 2001: 152; in all cases as *G. subsphaerosporus*) and Austria (Keller et Moser 2001, as *G. subsphaerosporus*), mostly from mountains. The species is not reported from Great Britain (Orton 1993) and Nordic countries (Høiland 1990, Ryman 1992). Generally, *G. josserandii* can be characterised as a rare mountainous species (but rarely growing also in lowlands, e.g. in the Netherlands) known above all from mountains of Central Europe (the Alps, Bayerischer Wald + the Šumava Mts., Beskydy Mts.). Its occurrence in suitable habitats of the Carpathians and Balkan mountains is expected. The find from Corsica published by Bon et Roux (2002) as *G. josserandii* represents *G. bellulus* (results of a microscopic revision of the depicted specimen: coll. no. 3582 from the private herbarium of P. Roux) as it has a moist and lustrous pileus surface whereas the true *G. josserandii* typically has dry and fibrillose-tomentose surface of the whole fruitbody (compare also plate 4-A by Bon and Roux with my photographs). Moreover, the shape of cheilocystidia depicted by Bon and Roux (2002: p. 31, fig. G) is atypical of *G. josserandii*, which has cystidia with more prominent globose head and narrow neck.

Discussion: *Gymnopilus josserandii* is well recog-

nisable by its small fruitbodies with fibrillose-tomentose surface, dark brown colour of mature lamellae, mild taste, small and almost globose spores having no suprahilar depression, cheilocystidia of a distinct shape (tibiiform with a narrowly lageniform or cylindrical basal part, long narrow neck and globose head, often with slightly thickened and rusty brown wall) and growth on strongly decayed wood of conifers (*Picea, Abies*), typically on old decayed stumps. *Gymnopilus bellulus* also has small fruitbodies and small spores but differs in spore shape (more ellipsoid with distinct suprahilar depression), brighter colour of fruitbodies (pileus rusty orange to rusty brown with orange tinge, lamellae deep yellow, then yellow-rusty), slightly lustrous pileus surface and different appearance of cheilocystidia (thin-walled, head not so prominent).

In European literature, *G. josserandii* has been known as *Gymnopilus subsphaerosporus* (Joss.) Kühner et Romagn. for a long time. Unfortunately, this name is invalid because of a lacking Latin diagnosis. Consequently, Antonín (in Antonín et Škubla 2000) described the species validly as *Gymnopilus josserandii* in honour of Marcel Josserand who recognised it for the first time and published a perfect description with exact line drawings.

My records well agree with the description by Josserand (1948: 21–23) and the later description and colour photograph by Antonín (in Antonín et Škubla 2000: 13–16). However, I did not observe so many types of caulocystidia as Antonín did, but only those resembling the cheilocystidia. The fruitbodies found by Josserand and Antonín have longer stems (up to 5 cm).

The record described and photographed by Breitenbach et Kränzlin (2000: p. 140–141) and identified as *Gymnopilus subbellulus* Hesler certainly represents *Gymnopilus josserandii*. Almost all characters well agree with the descriptions mentioned above. The only exceptions represent the bitterish taste and presence of pileocystidia given by Breitenbach and Kränzlin. The authors obviously knew the invalid status of the name *G. subsphaerosporus* (which is cited by them as a synonym of *G. subbellulus*) and decided to use the valid name by Hesler. The correctness of this conclusion is discussed below.

Gymnopilus subbellulus Hesler, North American species of Gymnopilus: 46, 1969 (in Mycologia Memoir no. 3) was described from Michigan and California as a species of *Gymnopilus* sect. *Microspori*. According to Hesler (1969), it is distinguished by the following characters: non-dextrinoid, ellipsoid, ovoid to subglobose spores reaching 3.5–5.0 × 2.4–3.8 µm, pleuro- and cheilocystidia both present, furfuraceous pileus and mild taste. If only the data from the book by Hesler (1969) are considered, many characters of *G. subbellulus* are really very close to *G. josserandii*. However, the presence of pleurocystidia is in conflict with all European descriptions of this species as well as with the records presented here, where no pleurocystidia were observed in spite of long and careful search. For these reasons I considered *Gymnopilus subbellulus* Hesler a species different from *Gymnopilus josserandii* Antonín (see Holec 2001b).

Later I studied the original material of *G. subbellulus* from Michigan herbarium (MICH). Surprisingly, the holotype (coll. Smith 49838) is different from the paratype (coll. Smith 56336), which represents a species close or identical with *G. bellulus* (it has quite different spores: ellipsoid with a distinct suprahilar depression). This means that Hesler (1969) did not have a clear concept of his new species. However, the use of the name *G. subbellulus* is fixed by the holotype which is microscopically very similar to the European *G. josserandii* except for a rare presence of pleurocystidia and more ellipsoid (E = 1.15–1.62, Q = 1.31) and more distinctly verrucose spores. In contrast with my previous opinion (Holec 2001b), *G. subbellulus* could eventually be conspecific with *G. josserandii*. However, more American collections must be compared with the European ones to judge the variability of the American population and confirm or refuse conspecifity. At this moment, I prefer to use the European name *G. josserandii* for European collections.

Collections studied:

Czech Republic – Šumava Mts., České Žleby, Spáleniště mountain, on decayed stump of a conifer (*Picea*?, *Abies*?) covered with mosses, 26 Oct 2002, leg. J. Holec (PRM 900961). – Ditto, *Abies alba*, on decayed stump, 13 Oct 1997, leg. J. Holec, JH 755/97 (PRM 891945). – Ditto, decayed stump covered with mosses (*Abies*?, *Picea*?), 26 Oct 2002, leg. J. Holec, JH 521/02 (PRM). – Šumava Mts., Jelení Vrchy near Nová Pec, Pod kanálem protected area, *Picea abies*, on decayed stump, 30 Sep 2000, leg. J. Holec, JH 173/00 (PRM 897842). – Šumava Mts., Prášily, Ždanidla mountain, *Picea abies*, on decayed stump among mosses, 16 July 2002, leg. J. Holec, JH 52/02 (PRM 898682). – Šumava Mts., Strážný, Strážný mountain, *Picea abies*, on decaying stump among mosses, 28 Aug 2001, leg. J. Holec, JH 187/01 (PRM). – Šumava Mts., Zátoň near Lenora, Pažení mountain (Boubín mountain group), *Picea abies*, on decayed stump among mosses, 30 Aug 2001, leg. J. Holec, JH 216/01 (PRM). – Šumava Mts., Zátoň near Lenora, Boubínský prales virgin forest, *Picea abies*, on decayed stump among mosses, 2 Oct 2001, leg. J. Holec, JH 580/01 (PRM). – Novohradské hory Mts., Žofínský prales virgin forest, 19 Sep 2004, leg. M. Beran (CB). – Ditto, *Picea abies*?, in cavity of a strongly decayed stump, 27 Aug 2004, leg. M. Beran (CB).

Gymnopilus flavus (Bres.) Singer

(Text-fig. 5, Pl. 12)

Bas.: *Naucoria flava* Bresadola, Ann. Mycol. 3: 162, 1905.

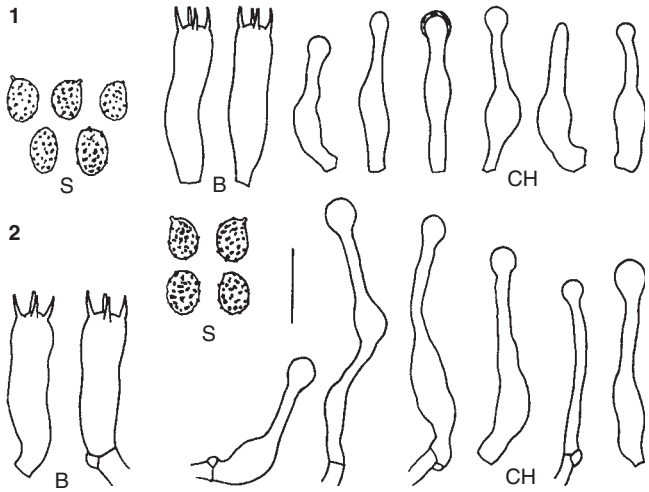
≡ *Gymnopilus flavus* (Bresadola) Singer, Lilloa 22: 561, 1951 ("1949").

≡ *Flammula flava* (Bres.) J. E. Lange, Fl. agaric. danic., vol. 4: 12, 1939.

= *Flammula dactylidicola* J. E. Lange, Meddelelser fra foreningen til svampekundskabens fremme 3(1): 2, 1926 (published in grammatically incorrect form "*dactylicola*"; a correction was made by J. E. Lange already in Dansk. Bot. Arkiv 5(7): 6, 1928 and later also in Fl. agaric. danic., vol. 4: 12, 1939).

Selected illustrations: Bresadola: tab. 795. – Lange: fig. 123G. – Breitenbach et Kränzlin, vol. 5: fig. 142. – Ludwig: fig. 31.7.

Characteristics in brief: Fruitbodies small to medium-sized, rather fleshy, yellow, ochre to rusty ochre,



Text-fig. 5. ***Gymnopilus flavus*****: 1 – Brno, between Kuřim and Lipůvka (BRNM 313641); 2 – Praha-Veleslavín (PRM 677110). For explanations see Material and Methods. Scale bar = 10 µm.**

without veil, stipe with bulbous or fusiform lower part and fusiform to rooting base, spores small, mostly 5.0–6.0 × 3.5–4.5 µm, coarsely verrucose to verrucose-rugulose, cheilocystidia tiny, narrowly cylindrical to narrowly lageniform with obtuse to capitate apex. Growing outside forests in grassy places (meadows, pastures, road margins, etc.) as a saprophyte in tufts of grasses, typically among *Dactylis glomerata*.

Description: I have not found the species in the field as it is extremely rare in the Czech Republic. Consequently, the short description of macrocharacters is compiled from Bresadola (1927–1960: tab. 795), Lange (1935–1940; as *Flammula flava*), Breitenbach et Kränzlin (2000: p. 136) and Ludwig (2001: 155). For detailed descriptions see Bresadola (1905: original description) and the cited authors.

Fruitbodies growing singly or in small groups. Pileus 15–60 mm, fleshy, convex to slightly campanulate, edge incurved to inflexed, later plano-convex, sometimes with a low broad umbo, surface dry, mat, fibrillose-tomentose, yellow to pale ochre when young, later rusty yellow to rusty ochre, with brown spots. Lamellae rather crowded, L = 35–40, l = 5–9, emarginate-adnate with a decurrent tooth, at first pale yellow, then bright rusty yellow with an orange tinge, edge whitish floccose. Stipe 20–50(–70) × 3–10 (upper part) to 10–15 mm (base), cylindrical with fusiform to bulbously thickened lower part and fusiform to rooting base, without veil, surface yellow-ochre, then darkening to rusty brown in lower part, fibrillose with pruinate apex, at first solid but hollow at base when old. Context soft, yellowish to yellow-ochre. Taste mild to slightly bitterish. Smell indistinct to pleasantly spicy (like *Cantharellus cibarius*). Spore print rusty yellow to ferrugineous.

The description of the microcharacters is based on a personal study of the collections cited below. Spores (4.5–)5.0–6.0(–6.5) × 3.5–4.6(–4.8) µm, broadly ellipsoid to broadly amygdaliform-ellipsoid in side view, with slight suprahilar depression, in front view broadly ellipsoid to ovoid-ellipsoid, exceptionally subglobose, wall rusty brown, coarsely verrucose to rugulose-verrucose, without suprahilar disc, not dextrinoid or only slightly dextrinoid, with almost indistinct pinkish-brown tinge in Melzer's reagent. Basidia 20–24 × 5.5–6.5 µm, cylindrical to narrowly clavate, with slight median constriction, 4-spored. Basidioles 16–20 × 5.5 µm, narrowly clavate. Cheilocystidia intermixed with basidioles at edge, 18–32 × 1.5–5 µm, narrowly cylindrical to narrowly lageniform in basal part and obtuse, subcapitate to capitate at apex, neck 1.5–2.5 µm broad, head 2.5–5 µm broad, hyaline or filled with homogeneous yellow pigment, some of them covered with yellow deposit. Pleurocystidia absent. Lamellar trama regular, of hyaline thin-walled hyphae 2.5–12 µm broad, cells cylindrical to slightly fusiformly inflated, wall yellow coloured, with frequent gloeoplerous hyphae filled with yellow content. Pileus cuticle (section) a cutis with a transition to trichoderm, 2-layered, upper layer thin, of densely arranged, parallel hyphae 1–2 µm broad, little incrusted to smooth, in scalp visible as a loose net of hyphal cords of thin parallel hyphae, lower layer thick, reddish brown, of loosely arranged parallel hyphae 4–12(–15) µm broad, cells cylindrical to slightly inflated, terminal elements narrowly clavate, all cells with coarse rusty brown incrustations arranged in a "zebra" to "tiger" pattern, pileocystidia not observed. Stipe cuticle a cutis with transition to a trichoderm, of cylindrical hyphae 2.5–6(–10) µm broad, with pale yellow membranal pigmentation, covered with nests of interwoven hyphae forming granules on stipe surface, caulocystidia present, of similar shape as cheilocystidia, 25–30 µm long, mostly narrowly cylindrical with capitate apex, neck 1.5–2.5 µm, head about 4 µm. Clamp connections present in all tissues.

Fructification: September – October (CR), there are also records from spring in Europe.

Ecology: In the Czech Republic, *Gymnopilus flavus* was found in open places outside forests (at margin of a grassland, in a meadow, on a ruderal place), although one find is from a forest meadow. Unfortunately, the exact substrate (grass species) is not indicated in any of the specimens. All finds are from the warmest regions of the CR (thermophyticum, see Hejný et Slavík 1988). In European literature (see Material and Methods), the species is characterised as a saprophyte growing typically in tufts of the grass *Dactylis glomerata* but also in stands of other grass species (without specification). It grows singly or in small groups but not caespitose. Ludwig (2001) characterises it as a species of pastures, meadows, dunes and of grassy road margins. Regarding altitude, there are also finds from the alpine zone (1900 m, see Bon et Roux 2002: 34).

Distribution: *Gymnopilus flavus* is extremely rare in the Czech Republic as only three finds are known. One find originates from the vicinity of the city of Brno and two finds are from the capital city of Praha. In Europe, the species is distributed in most countries except for the boreal, subarctic and arctic zones of Scandinavia. However, it is rare to scattered everywhere.

Discussion: The species is well recognisable by its small to medium fruitbodies growing in grass tufts, uniform-

ly yellow, ochre to rusty ochre colour, small spores with coarse ornamentation and narrowly cylindrical or lageniform-cylindrical cheilocystidia with subcapitate to capitate apex. It seems to be a taxonomically unproblematic species, although some discrepancies concerning its taste (mild to bitterish) and smell (fruity or even like *Hebeloma sacchariolens* in some collections) are mentioned by Bon et Roux (2002).

Collections studied:

Austria – Niederösterreich, Klosterneuburg, Buchberg, in meadow, 22 Oct 1989, leg. Pissenberger (WU 7976). – Niederösterreich, Laa/Thaya, Zwingendorf, roots of a grass, 13 Oct 1995, leg. A. Hausknecht (WU 14724). – Niederösterreich, Pottenbrunn, Wasserburg, among grasses in a meadow, 30 Oct 1988, leg. W. Klofac (WU 7196).

Czech Republic – Praha-Bubeneč, on soil in a ruderal place (not in forest), 25 Oct 1942, leg. J. Herink (PRM 677109). – Praha-Veleslavín, at margin of a grassland (not in forest), 3 Oct 1943, leg. J. Herink (PRM 677110). – Moravia, Brno, between Kuřim and Lipůvka, in a meadow at forest margin, 13 Sep 1975, leg. A. Vágner (BRNM 313641).

Gymnopilus fulgens (J. Favre et Maire) Singer

(Text-fig. 6, Pl. 13)

Bas.: *Naucoria fulgens* J. Favre et Maire, Bull. Soc. Mycol. France 53: 267, 1937.

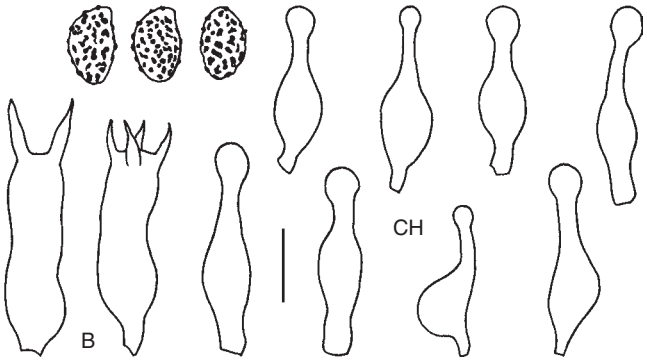
≡ *Gymnopilus fulgens* (J. Favre et Maire) Singer, Lilloa 22: 561, 1951 ("1949").

= *Naucoria cerodes* (Fr.) P. Kumm. sensu J. E. Lange, Fl. agaric. danic., vol. 4: 16, 1939.

Selected illustrations: Lange: fig. 123E. – Breitenbach et Kränzlin, vol. 5: fig. 143. – Moser et Jülich: III *Gymnopilus* 3, top figure. – Bon et Roux: pl. 7-B.

Characteristics in brief: Fruitbodies small, pileus bright coloured, orange-yellow, orange-rusty to red-brown, stipe with dark red-brown lower part, spores large, mostly 8–11 × 5–7 µm (data from literature), coarsely verrucose-rugulose, without suprahilar disc. It occurs in various types of peat-bogs or in sand-dune heaths on peaty soil, where it grows on peat or peaty soil or among *Sphagnum* and other mosses or among lichens.

Description: The following text is an English translation of a Czech description kindly provided by M. Svrček (published in Svrček 1965: 46–47), the only collector of *G. fulgens* in the Czech Republic. Pileus 12–22 mm, medium fleshy, plano-convex with a small umbo, then shallowly and broadly concave and without umbo, not hygrophanous, not translucently striate, smooth and glabrous, either vividly and deeply orange-yellow or (in older fruitbodies) deeply orange-rusty, pileus cuticle mat, dry, slightly fibrillose under lens, without cortina. Lamellae scarce, at first pale cinnamon-yellow, rusty yellow to croceate rusty, then deeply cinnamon-rusty, edge uneven and pale yellow, emarginate and shortly adnate, up to 4 mm high. Stipe 20–25 ×1.5–2.5 mm, rather thin, cylindrical, growing from peaty soil mixed with small roots (not on wood), pale orange-yellow, soon dark brown to blackish brown from base (also after bruising), pale whitish fibrillose, upper part finely granulose, without veil, with traces of pure white mycelium at base. Context pale yellowish in pileus and stipe, taste mild (neither bitterish nor farinaceous) but with a slightly bitterish or resinous smell (like some species of *Dermocybe*).



Text-fig. 6. *Gymnopilus fulgens* – Klánovice near Praha, Vidrholec forest (PRM 611916). For explanations see Material and Methods. Scale bar = 10 µm.

The description of the microcharacters is based on a personal study of the collection cited above. Spores rather large, (8.8–)9.5–10.5 × (6.0–)6.5–7.2 µm, rusty yellow in KOH, amygdaliform-ellipsoid, in side view with suprahilar depression, with small hyaline hilar appendix, without suprahilar disc, wall medium thick, rusty brown, with coarse verrucose-rugulose ornamentation up to 0.8 µm high, not or indistinctly dextrinoid (in some spores only). Basidia 4(2)-spored, 22–30 × 6–8 µm, cylindrical with median constriction, often filled with yellow-rusty pigment. Basidioles clavate, variable in size. Cheilocystidia intermixed with basidioles at edge, 24–28 × 5–7 µm, lageniform to narrowly lageniform with capitate apex, head more or less prominent, 3–5 µm broad, neck 1.5–3.5 µm broad, hyaline, thin-walled. Pleurocystidia not observed. Lamellar trama regular to subregular, of cylindrical or slightly inflated cells (6–)12–22(–30) µm broad, hyaline, with yellow membranal pigment (wall entirely yellow). The pileus cuticle was studied only in a scalp in order not to damage the scanty material. It is made up of scattered cylindrical hyphae 4–8 µm broad, with coarse yellow-brown to rusty brown incrustations, pileocystidia not observed. Stipe made up of parallel cylindrical to slightly inflated cells 4–20 µm broad, hyaline, wall yellow-brown, stipe cuticle a cutis of parallel cylindrical hyphae 1.5–4 µm broad, terminal elements sometimes with capitate end, at places with short cylindrical outgrowths terminated with infrequent caulocystidia which are lageniform to narrowly lageniform with distinctly capitate head. Clamp connections present in all tissues.

Fructification: Juni (CR); July, September, October (Europe).

Ecology: In the Czech Republic, *Gymnopilus fulgens* was found on a side wall of a forest drainage ditch grown by *Molinia caerulea*, *Populus tremula* and *Betula pubescens* and in a small clearing covered with *Alnus glutinosa* and *Calluna vulgaris* (both sites are at the same locality, see Svrček 1965). The fruitbodies grew in peaty soil mixed with small roots (not on wood) and one of them also in a moist

depression close to the first site (Svrček 1965). The whole locality represents a complex of various wetland communities (especially small peat-bogs) along a railway track from Praha to Kolín in the Klánovický les ("Vidrholec") forest. In Europe, the species is known from various types of peat-bogs but also from sand-dune heaths on peaty soil (Orton 1993). It grows there as a saprophyte on peat or peaty soil or among *Sphagnum* and other mosses or among lichens. Orton (1993) mentions its occurrence on burnt soil which seems unlikely (identification error?), as the species is reported to be strictly sphagnicolous or turficolous. Breitenbach et Kränzlin (2000) characterise it as a montane to subalpine species (in Switzerland) which agrees with its occurrence in the Jura Mountains, where it was described from (Favre et Maire 1937). However, other European finds and the Czech one show that the species can grow in lowlands, too.

Distribution: *Gymnopilus fulgens* is extremely rare in the Czech Republic as only one find is known (Svrček 1965: Klánovický les forest) in spite of the fact that the country is rich in various types of peat-bogs which have been studied intensively in the last decades. The locality (see collections studied) was checked for its occurrence in 2003 (two times: in June and July) together with M. Svrček, who showed me his collecting site. The species was not found, however, it does not automatically mean that it is not present anymore as the weather was extremely unfavourable for fructification of agarics that year (hot and dry).

In Europe, the species is known in most regions and countries. In Scandinavia, it is only known from the temperate and hemiboreal zone of Sweden (Ryman 1992), which shows that it is not an arctic-alpine fungus. However, it is rare to scattered everywhere.

Discussion: *G. fulgens* is easily recognisable by its small fruitbodies [pileus 5–30(–50) mm, stipe 10–30(–40) × 1.5–2.5 mm] having bright colours, rather large and coarsely verrucose-rugulose spores, and its habitat which is unique for a *Gymnopilus* species.

Collections studied:

Czech Republic – Central Bohemia, Klánovice near Praha, Vidrholec forest (= Klánovický les), on peaty soil, 28 June 1964, leg. M. Svrček (PRM 611916).

Gymnopilus decipiens (W.G. Smith) P.D. Orton

(Text-fig. 7, Pl. 14)

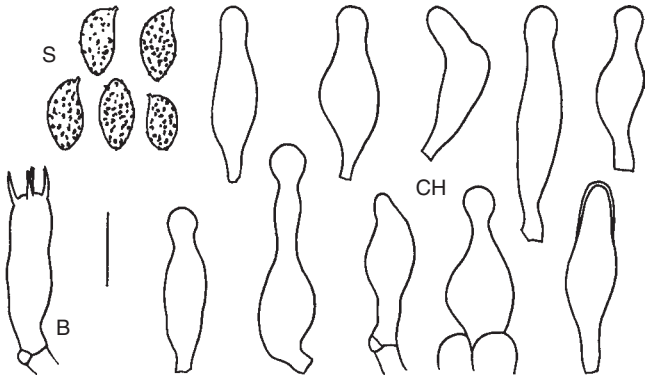
Bas.: *Agaricus (Flammula) decipiens* W.G. Smith, J. Bot., London 7: 249, 1869.

≡ *Gymnopilus decipiens* (W.G. Smith) P.D. Orton, Trans. Brit. Mycol. Soc. 43: 176, 1960.

≡ *Flammula decipiens* (W.G. Smith) Sacc., Syll. Fung. 5: 811, 1887.

Selected illustration: Ludwig: fig. 31.11.

Characteristics in brief (macrocharacters and ecology are compiled from Høiland 1990, Orton 1993, Ludwig 2001; microcharacters are based on a personal study of 2 collections from the Czech Republic): Fruitbodies small, pileus up to 30 mm, dirty yellow-brown, rusty brown to greyish brown, surface fibrillose-tomentose to tomentose-scaly, stipe finely floccose, fibrillose to fibrillose-scaly, taste completely mild, spores 7.2–9.2(–10.4) × 4.0–5.2 µm, narrow, amygdaliform to narrowly amygdaliform with prominent suprahilar depression in side view, moderately to coarsely verrucose, without suprahilar disc. Growing as a saprophyte on dry sandy soil, peaty soil, burnt soil, ash and charcoal in *Picea* or *Pinus* forests, very rare.



Text-fig. 7. ***Gymnopilus decipiens*** **– Kaplice, Malonty, Hodonický potok valley (CB 13057). For explanations see Material and Methods. Scale bar = 10 µm.**

Description: I have not seen fresh fruitbodies in the field (the species is extremely rare in the Czech Republic). For recent descriptions see Høiland (1990: 276), Ludwig (2001: 158–159) and Orton (1960: 243–244, 1993: 69–70). The description of the macrocharacters published here is adopted from Høiland (1990).

Pileus 7–27 mm, convex, fibrillose felty or scaly with felty squamules, dirty yellow-brown, dirty red-brown, or greyish brown. Lamellae adnexed to adnate, bright yellow to orange yellow. Stipe 10–20 × 2–4 mm, fibrillose, brown, but more yellow towards the apex, with weak veil remnants. Flesh yellow, with mild taste. Superficially reminiscent of *Cortinarius* (*Dermocybe*) *croceus*.

The description of the microcharacters is based on a personal study of the collections cited below. Spores 7.2–9.2(–10.4) × 4.0–5.2 µm, shape and size variable, amygdaliform to narrowly amygdaliform with prominent suprahilar depression in side view, in front view ellipsoid-amygdaliform to narrowly amygdaliform with acute ends, wall rusty brown, medium to roughly verrucose, without suprahilar disc, mature spores dextrinoid, immature ones not dextrinoid. Basidia 20–24 × 5.5–6.5 µm, cylindrical to narrowly clavate, with slight median constriction, 4(2)–spored. Cheilocystidia 20–32 × 6–8 µm, variable in shape: narrowly lageniform-fusiform, brodly lageniform, utriform, fusiform-cylindrical, apex obtuse to capitate, neck 2–3 µm broad, head about 5 µm broad, some of them with slightly thickened wall (up to 0.8 µm), hyaline or filled with yellow-rusty pigment. Pleurocystidia rare, narrowly utriform. Lamellar trama regular, hyphae (4–)5.5–12 µm broad, with rusty brown content or incrustations. Pileus cuticle (section) a cutis, 1-layered, thin, of densely arranged parallel to slightly interwoven hyphae (4–)6–10 µm broad,

strongly yellow-brown incrusted, in scalp covered with nests or cords of veil hyphae, 5.5–13.5 µm broad, cells cylindrical, with rusty brown incrustations arranged in a "zebra" to "tiger" pattern, terminal elements narrowly clavate, pileocystidia not observed. Stipe cuticle a cutis of cylindrical hyphae 5–7 µm broad, slightly pigmented, caulocystidia absent. Clamp connections present in all tissues.

Fructification: The only two collections from the Czech Republic are from the end of September and beginning of October. However, the species is found from June to October (Høiland 1990, Ludwig 2001).

Ecology: In the CR, one find is from a sparse young stand of *Pinus sylvestris* on dry sandy soil covered with lichens and the other from a clearing where a *Pinus* forest was before, on naked soil in the vicinity of a burnt place. The following substrates and habitats are given by various European authors (e.g. Høiland 1990, Orton 1993, Ludwig 2001): naked soil (usually dry sandy soil), peaty soil, burnt soil, ash and charcoal, sawdust and ash; in *Picea* or *Pinus* forests.

Distribution: *Gymnopilus decipiens* is known from most European countries but it is extremely rare elsewhere. In the Czech Republic, only two localities are known in southern Bohemia.

Discussion: *Gymnopilus decipiens* is typical by its growth on soil or on burnt substrates and by other characters summarised in the paragraph "Characteristics in brief". *Gymnopilus odini* has a similar ecology but differs by a more vividly coloured pileus (orange red-brown) with an almost smooth surface (at most finely fibrillose-scaly), bitterish taste and slightly shorter spores measuring (6–)6.5–7.5(–8.5) × (3.5–)4.0–4.8(–5.5) µm (Høiland 1990, Orton 1993).

Bon et Roux (2002) mention another *Gymnopilus* species growing on soil or burnt substrates in Europe (based on material especially from France): *Gymnopilus pseudofulgens* Romagn. (Romagnesi 1979), a carbonicolous species distinguished by a farinaceous to bitterish taste, rather large spores with a distinctly delimited suprahilar disc and "subpore" at apex, and *Gymnopilus humicola* Hard. ex Singer (on humus, bitter taste, pileus 3–5 cm, rusty dotted on ochraceous ground, yellow stipe, spores 7–8.5(–9) × 4–5 µm). These species are not known from Central Europe.

Finally, Ludwig (2000: fig. 31.12., 2001: p. 159–160) describes a "small, undeterminable species found on fire place, coming near *G. decipiens*, but differing by bitter taste (not farinaceous) and clearly smaller and broader spores". However, he had only one fruitbody at hand so this find is waiting for evaluation until more material is available.

Collections studied:

Czech Republic – Southern Bohemia, Chlum u Třeboně, Hajnice station near Mirochov, dry sandy soil covered with lichens, young *Pinus* stand, 10 Oct 1999, leg. M. Beran (CB 11990). – Southern Bohemia, Kaplice, Malonty, Hodonický potok valley, naked soil in the vicinity of a burnt place, clearing where a *Pinus* forest was before, 29 Sep 2002, leg. M. Beran (CB 13057).

Gymnopilus penetrans (Fr.) Murrill

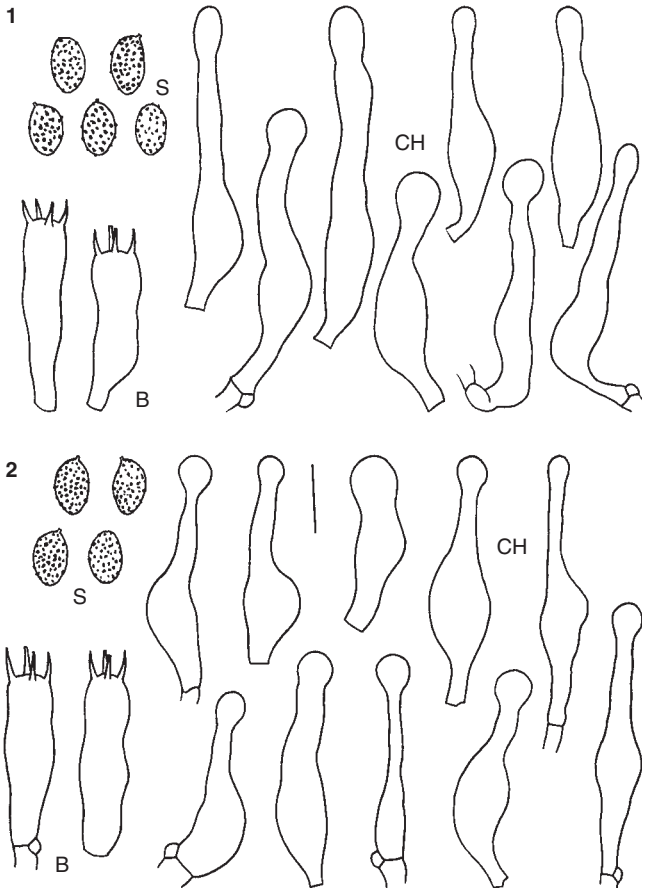
(Text-fig. 8, Pl. 6, Pl. 7, Pl. 15)

Bas.: *Agaricus penetrans* Fr., Observ. mycol. 1: 23, 1815.
≡ *Gymnopilus penetrans* (Fr.) Murrill, Mycologia 4: 254, 1912.
≡ *Flammula penetrans* (Fr.) Quél., Mém Soc. Emul. Montbéliard, ser. 2, 5: 252, 1872 (in Champ. Jura Vosges 1).
≡ *Dryophila penetrans* (Fr.) Quél., Enchir. fung.: 71, 1886.
= *Agaricus sapineus* Fr.: Fr., Syst. mycol. 1: 239, 1821.
≡ *Gymnopilus sapineus* (Fr.: Fr.) Maire sensu Høiland (1990).
= *Agaricus hybridus* Sowerby sensu Fries (1818: 30; 1821: 239, as *Agaricus sapineus* β *hybridus*; 1838: 189; 1874: 250) non Sowerby, Col. fig. Engl. fung. 2: text to tab. 221, 1799 (*A. hybridus* Sowerby certainly is no *Gymnopilus;* moreover, the name is a later homonym of *A. hybridus* Scop.).
≡ *Gymnopilus hybridus* (Sowerby) Maire, Treballs del Museu de Ciències Naturals de Barcelona 15(2): 96, 1933.

Selected illustrations: Lange: fig. 121G (as *Flammula penetrans*). – Phillips: p. 142 (as *G. hybridus*), p. 143 (as *G. penetrans*). – Ryman et Holmåsen: p. 484 (as *G. penetrans*). – Dähncke: p. 702 (as *G. hybridus*), p. 703 (as *G. penetrans*). – Moser et Jülich: III *Gymnopilus* 3, bottom figure (as *G. hybridus*). – Breitenbach et Kränzlin, vol. 5: fig. 146 (as *G. penetrans*). – Ludwig: pl. 44, perfectly shown variability (as *G. penetrans*). – Hagara et al.: p. 291, fig. 426 (as *G. hybridus*), fig. 427 (as *G. penetrans*). – Cetto: fig. 918 (as *G. penetrans*). – Robich, Riv. Micol. 32(5–6): p. 261 (as *G. penetrans*), p. 262 (as *G. hybridus*).

Characteristics in brief: Fruitbodies medium-sized, pileus covered with white to greyish-white velum when young, the velum disappears soon, colour yellow at margin, towards centre yellow-ochre, ochre-brown, orange-brown to rusty brown, surface smooth but finely innately rusty ochre to rusty brown fibrillose-striped, in some fruitbodies with disrupted covering forming fine, appressed, fibrillose scales, lamellae rather pale yellow when young, stipe pale ochre, brownish to rusty brown, covered with remnants of velum which are white and tomentose-fibrillose, base white tomentose with white mycelial cords, context pale yellow in pileus, taste distinctly bitter; spores medium-sized, mostly 7.2–8.8 × 4.4–5.2 µm, ellipsoid to amygdaliform-ellipsoid with slight suprahilar depression, ornamentation moderately developed, verrucose to rugulose-verrucose, cheilocystidia variable: cylindrical, narrowly fusiform-cylindrical, narrowly lageniform-fusiform to lageniform, apex mostly with globose head 4–7 µm in diam., upper layer of pileus cuticle visible (scalp) as a loose net of hyphae or hyphal cords forming the fibrillose to scaly pileus covering, cells cylindrical, narrow: 3–10(–12) µm in diam. Growing as a saprophyte on dead wood of conifers and deciduous trees, from the lowlands to the mountains, common.

Description: Fruitbodies growing singly, in groups or fascicles. Pileus (10–)20–80(–100) mm, surface strongly variable in colour and appearance depending on age and weather conditions, when young hemisphaerical to hemisphaerical-conical with inflexed to involute margin, then convex to convex-conical, sometimes with low broad umbo, finally plano-convex to slightly concave, dry, mat, not hygrophanous, not translucently striate, in very young fruit-



Text-fig. 8. ***Gymnopilus penetrans*****: 1 – Volary, Chornice protected area near Nová Pec, JH 132/00 (PRM); 2 – Volary, Hučinka protected area near Černý Kříž, JH 139/00 (PRM). For explanations see Material and Methods. Scale bar = 10 µm.**

bodies rather dark, brown (6D7), grey-brown, whole surface covered with white to greyish-white tomentose-arachnoid velum which connects pileus margin and stipe, later present at pileus margin only, soon completely disappearing, pileus at maturity pale yellow (4A6) to yellow, towards centre darker, yellow-ochre, ochre-brown, orange-brown to rusty brown, often with rusty spots, in old fruitbodies sometimes homogeneously rusty to ochre-brown, surface smooth but almost always finely innately rusty ochre to rusty brown fibrillose-striped, in some fruitbodies with disrupted covering forming fine, appressed, fibrillose scales (fibrillose and scaly pilei often present in various fruitbodies of the same fascicle). Lamellae crowded, L = 40–60, l = 1–7, 3–8 mm high, segmentiform to slightly ventricose but sometimes also triangular, near stipe emarginate and decurrent with a small tooth or broadly adnate to slightly decurrent, at first pale yellow (even in this state sometimes rusty spotted – under dry conditions), then yellow-ochre, yellow-rusty, orange ochre-rusty, finally to deep rusty brown, often rusty spotted, edge concolorous or somewhat paler, even or slightly irregularly serrulate, surface changing rusty brown when bruised. Stipe 20–80(–100) × 3–10(–12) mm, cylindrical or slightly gradually thickened towards base, being slightly bulbous in some cases, sometimes eccentric, connected with stipe with a whitish velum leaving a disrupted, whitish, tomentose annular zone, soon disappearing, upper part pale yellow, finely pruinose, towards base pale ochre, brownish to rusty brown but covered with remnants of velum which are white and tomentose-fibrillose, base white tomentose with white mycelial cords. Context pale yellow in pileus, sordid ochre when moist, in stipe yellow, pale yellow-rusty to pale rusty brown. Taste immediately distinctly bitter. Smell acidulous-fungoid (like *Suillus bovinus*) or fruity-spicy.

Spores (6.8–)7.2–8.8(–9.5) × (4.2–)4.4–5.2(–5.6) µm, E = 1.45–1.82, Q = 1.65, ellipsoid to amygdaliform-ellipsoid both in side and face view, in side view with slight suprahilar depression, rusty yellow in KOH, wall darker, rusty brown, ornamentation moderately developed, verrucose to rugulose-verrucose, without suprahilar disc, protoplasm of mature spores distinctly red-brown in Melzer's reagent (dextrinoid), wall remaining bright yellow to yellow-rusty, young or immature spores without this reaction. Basidia 24–28 × 6–7 µm, 4(2)-spored, broadly cylindrical with median constriction and attenuated basal part. Basidiolae resembling basidia, smaller. Cheilocystidia rarely intermixed with basidia at edge, 24–48 × 5.5–9 µm, variable in shape: cylindrical, narrowly fusiform-cylindrical, narrowly lageniform-fusiform to lageniform, apex with more or less pronounced globose head 4–7 µm in diam. but sometimes not capitate, rarely with slightly thickened and rusty yellow wall of the head, mostly thin-walled, hyaline, at places filled with homogeneous rusty brown content. Pleurocystidia rarely present, lageniform with globose head or utriform, mostly absent. Lamellar trama regular, hyphae 3–14 µm broad, cells cylindrical or slightly fusiform inflated, hyaline. Velum (from cortina between pileus margin and stipe) made up of cords of parallel to slightly interwoven hyphae which are hyaline, thin-walled, not incrusted, cells cylindrical, 2.5–6.5 µm broad, with clamps at all septa. Pileus cuticle (section) a thin cutis of densely arranged hyphae 3–7 µm broad, cells cylindrical, rusty brown incrusted, covered with nests of parallel to interwoven hyphae forming the scales which are more intensely coloured, rusty brown, of cylindrical to narrowly fusiform cells 4–10 µm broad, whole cuticle sometimes covered with a thin layer of less coarsely incrusted hyphae of velum (only slightly dotted), scalp surface covered by a loose net of hyphae or hyphal cords forming the fibrillose to scaly pileus covering, cells cylindrical, 3–10(–12) µm broad, medium to coarsely rusty brown incrusted ("zebra" to "panther" pattern), special terminal elements or pileocystidia not present. Stipe cuticle a cutis of parallel cylindrical hyphae 2–6 µm broad, with yellow-brown wall and scarce incrustations or with cellular pigment, covered with a thin layer of parallel to interwoven, hyaline velum hyphae 2–5 µm broad, loosely arranged, rarely with yellow-brown incrustations, caulocystidia and special terminal elements not observed.

Fructification: Rarely – in second half of June, whole July, August, first half of December; commonly –

September-November, most frequently – September-October (CR).

Ecology: In the Czech Republic, *Gymnopilus penetrans* is found as a saprophyte on dead wood of conifers but also deciduous trees, especially on fallen trunks, stumps, twigs, wood debris, wood chips etc., rarely also on wood used by man, e.g. in hot-beds. The species grows on wood in all stages of decay except for soft, almost completely decayed wood. Most finds are from *Abies alba, Picea abies, Pinus sylvestris* and *Fagus sylvatica*; one from *Betula*. *Gymnopilus penetrans* grows in almost all types of forests, both natural and man-made, in purely coniferous stands as well as in mixed forests, but also in clearings (on heaps of wood chips or on roots), parks and places with wood debris. It often occurs in groups or fascicles of tens or hundreds of fruitbodies. The species can be found from the lowlands up to the highest parts of mountains in the CR.

Concerning the spectrum of host trees, I know also finds from *Salix* and *Pinus nigra* (see Collections studied). Høiland (1990, under name *G. sapineus*) mentions also *Juniperus, Alnus, Quercus, Populus tremula* and *Fraxinus* from Norway (in all cases only 1–3 finds). One find is from *Empetrum*. He writes that the species prefers the most frequent substrate at hand, which is *Pinus* and *Picea* in regions with coniferous forests and *Betula* in regions with deciduous forests. This agrees with my observations from the Czech Republic except for *Quercus* and *Carpinus* forests in the warmest regions where the species does not grow on wood of these hosts but on introduced *Picea* or *Pinus*. However, *G. penetrans* is common on *Fagus* in *Fagus* forests or mixed forests with *Fagus*. Krisai-Greilhuber (1992: 139, under the name *G. hybridus*) mentions finds on *Fagus, Quercus* and *Carpinus* from deciduous forests in the vicinity of Wien (Austria). Orton (1993: 64) writes that the species (under name *G. hybridus*) is one of the few agarics found commonly on decaying *Quercus* wood in some oakwood areas of Great Britain. Generally, *G. penetrans* is a species with a broad spectrum of hosts but clearly preferring conifers. From deciduous trees, the species prefers dominant forest-forming species like *Fagus*, *Betula* and *Quercus* (data from Central and Western Europe and Scandinavia).

Distribution: *Gymnopilus penetrans* is a common species in all parts of the Czech Republic, especially in regions with a high percentage of coniferous or mixed forests. The species is common in most European countries. In Scandinavia, it is found up to the subarctic/subalpine zone (Ryman 1992).

Discussion: *Gymnopilus penetrans* is a common but very variable species. It is typical by its medium sized fruitbodies growing often in large groups or fascicles, yellow, yellow-ochre, yellow-orange to rusty brown colours, pale yellow colour of young lamellae, white to greyish-white velum on young pilei which disappears soon, stipe covered with white tomentose-fibrillose velum remnants, pale yellow context of pileus, distinctly bitter taste, medium sized spores with moderately developed ornamentation and above all by narrow hyphae in the upper layer of the pileus cuticle (3–10(–12) µm in diam.). In Europe, *G. penetrans* is treated either as one species with *G. hybridus* as a synonym (Ryman 1992; Ludwig 2000, 2001; Keller et Moser 2001) or form (Kühner et Romagnesi 1953) or as two separate species (*G. penetrans* and *G. hybridus*) differing in colours, development of veil, presence of rusty spots on lamellae and shape of cystidia (for a discussion on the reliability of these characters see below). In works recognising 2 species (e.g. Moser 1983, Orton 1993, Bon et Roux 2002,), *G. hybridus* is characterised as a fungus having a richer velum on the stipe (leaving a submembranaceous annulus or annular zone) and lacking rusty spots on mature lamellae.

The differences between *Gymnopilus penetrans* and *G. sapineus* sensu Kühner et Romagnesi (1953) etc. are thoroughly discussed under *G. sapineus*. In brief, *G. penetrans* has a paler pileus without a tomentose surface, narrower hyphae of the pileus cuticle and produces fruitbodies mostly in autumn (September – November: situation in the CR). See also the papers by Clémençon (2002, 2003).

Høiland (1990) synonymised *G. penetrans* and *G. hybridus* with *G. sapineus* and suggested to use *G. sapineus* as the correct name for this taxon. I agree with him that the names *Agaricus penetrans* Fr. (Fries 1815: 23), *A. hybridus* Sowerby sensu Fries (1818: 30–32) and *A. sapineus* (Fries 1821: 239) represent in fact one extremely variable species which should have *Agaricus sapineus* as its basionym – the only sanctioned name of the three (*A. penetrans* and *A. hybridus* are considered infraspecific taxa of *A. sapineus* by Fries in his sanctioning works, see e.g. Fries 1821: 239). Later, Fries (1838, 1874) treated these taxa as 3 separate species. However, figures 118/2 and 118/3 in Icones (Fries 1867–1884) labelled as *A. penetrans* and *A. sapineus* well show the variability of the one – in my opinion – really existing species (the whole variability is perfectly shown by Ludwig 2000: tab. 44). I think that Fries overestimated the differences in appearance of the pileus surface, development of the veil and colours of the fruitbody including the presence of spots on the lamellae surface. All these characters are extremely variable depending on age of fruitbodies and weather conditions. According to my observations, when one fascicle in one location is observed several days under different climatic conditions, almost all ”forms” can be seen – young fruitbodies with abundant velum which disappears at maturity, colours dull and dark at first, later more yellow but finally again darker (rusty brown). The pileus surface changes from glabrous to innately fibrillose to finely fibrillose-scaly (the scales are appressed and formed by disruption of the pileus cuticle). The rusty brown spotted lamellae are present especially in dry conditions (do the spores ripe only in some parts of the lamellae?). Such variable characters cannot be used for species delimitation. The same fact concerns the shape of the cheilocystidia (capitate or not), which is used e.g. by Moser (1983) or Bon et Roux (2002) for separation of *G. penetrans* and *G. hybridus*.

To be certain, I used one collection with rich veil and non-spotted lamellae (PRM 901885: "*hybridus*") and one with no veil and spotted lamellae (PRM 900954: ”*penetrans*") for DNA analysis (ITS), carried out by my colleague

M. Tomšovský (Prague). The collections proved to be practically identical (difference in 1 base). Simultaneously, they were almost identical (difference in 1, resp. 2 bases) with *G. penetrans* from Scotland used by Rees et al (2002) for their DNA study. Rees et al. (2002) also found that the sample from a specimen collected by M. Moser in Sweden (herb. IB) and identified as *G. hybridus* was quite different from Scotland's *G. penetrans* (32 bases different, pers. communication by B. Rees based on data added to GenBank). This means that my collections from PRM analysed by Tomšovský are also different from *G. hybridus* sensu Moser from Sweden. Such a fungus probably does not grow in the CR. Unfortunately, the collection by Moser was on loan and could not be provided for revision.

Concerning *G. hybridus*, the name is problematic both for taxonomical and nomenclatural reasons. Its basionym *Agaricus hybridus* Sowerby 1799 is a later homonym of *A. hybridus* Scop. and thus illegitimate. It escaped from homonymy by transfer to *Flammula* by Gillet in 1876 (later to *Gymnopilus* in 1933). However, the original *A. hybridus* Sowerby certainly is no *Gymnopilus*, as the pileus surface is described as "glutinous" when moist whereas all *Gymnopilus* species have a pileus surface without any glutinous layer. Even if Fries (1818, 1838, 1874) shifted its concept towards the present-day interpretation, the use of the name must follow the protologue by Sowerby. It is also erroneous to cite it as *Gymnopilus hybridus* (Fr.) Maire (which is common in contemporary literature), because the basionym was not created by Fries and the name is not sanctioned by Fries. In my opinion, the name should not be used within the genus *Gymnopilus*.

If all these facts are considered, the best solution would be the reintroduction of the original Friesian concept of the name *G. sapineus* (Fries 1821) for the fungus which is currently known as *G. penetrans* and/or *G. hybridus*. This was recently done by Høiland (1990) but not accepted by most authors. However, Høiland (1990) did not treat the similar species with broader hyphae in the pileus cuticle for which the name *G. sapineus* is used by most European authors at least during the second half of the 20th century and in the beginning of 21th century. Its delimitation is well explained by Kühner et Romagnesi (1953: 322) for the first time.

To solve the problems with interpretation and current use of the names *G. sapineus, G. penetrans* and *G. hybridus*, two ways are available.

1. Conservation of the current use of the names *G. penetrans* (with *G. hybridus* as a synonym) and *G. sapineus*. Designation of neotypes supporting this concept would be necessary.
2. Return to the original concept of *G. sapineus* (Fries 1821), which is the correct name for the species with narrow hyphae in the pileus cuticle currently known as *G. penetrans* and/or *G. hybridus*. This was recently proposed by Høiland (1990). Consequent search for a name for *G. sapineus* sensu Kühner et Romagnesi etc. (species with broader hyphae in pileus cuticle) or its description as a new species. Designation of a neotype for *G. sapineus* or a holotype for the new species would be necessary.

At the moment, I am not able to decide which solution is better. Broader discussion with some specialists is desirable. Consequently, I am using the names *G. penetrans* and *G. sapineus* in the sense of most European authors (their concept is best presented by Kühner et Romagnesi 1953; Ludwig 2000, 2001; Breitenbach et Kränzlin 2000), which taxonomically corresponds to my observations. This is a solution resulting from the concept of nomenclatural stability of names in current use. However, if the truth and the rules are to be followed, than the use of the name *G. sapineus* as proposed by Høiland (1990) is correct.

Just recently, Rees et Strid (2001) tried to clear up the concepts of *G. penetrans, G. hybridus* and *G. sapineus* using a detailed study of microcharacters of collections by M. Moser from the Femsjö area in Sweden, where Fries collected fungi for his publications. They found that *G. hybridus* has "more broadly lecythiform cheilocystidia with strongly thickened more broadly capitate apices" and "more broadly clavate" basidia (a conclusion based on the study of only 1 collection: IB 78/226). Molecular evidence (Rees et al. 2002: ITS region of ribosomal DNA) also showed that *G. hybridus* (represented by IB 78/226 again) and *G. penetrans* (BRGB 98/5 from Scotland) as distinguished by Orton (1993) are sufficiently different. This is a strong evidence but to fully accept it, I would like to revise in future all collections which Rees et Strid (2001) and Rees et al. (2002) used for their studies.

Other taxa from this group are *Gymnopilus stabilis* (Weinm.) Kühner et Romagn. ex Bon and *Gymnopilus liquiritiae* (Pers.: Fr.) P. Karst. sensu Kühner et Romagnesi (1953: 322). They are discussed in the chapter "Comments on some taxa not reported from the Czech Republic".

Collections studied:

Austria – Niederösterreich, Bad Fischau, wood of a conifer (*Pinus nigra*?), 12 Oct 1980, leg. R. Schütz (WU 0337). – Niederösterreich, Bad Fischau, *Pinus nigra*, 11 Oct 1981, leg. I. Krisai (herb. I. Krisai 1981/194). – Niederösterreich, Fuglau, Steinegg, *Alnus glutinosa*, on stump, 31 Oct 1987, leg. A. Hausknecht (WU 6535). – Niederösterreich, Hohenberg, Lahnsattel, on wood, 19 Sep 1992, leg. W. Klofac (WU 11043). – Niederösterreich, Irnfritz, Steinplatte, *Picea* forest, 17 Sep 1981, leg. R. Schütz (WU 1527). – Niederösterreich, Maissau, Kühberg, decayed wood of a conifer (*Picea*?, *Pinus*?), 4 Oct 1980, leg. A. Hausknecht (WU 0335). – Niederösterreich, Weidlingbach, *Alnus*, 12 Oct 1991, leg. W. Jaklitsch (WU 15812). – Niederösterreich, Wienerwald, *Betula*, 11 Oct 1980, leg. Ing. Wanek (WU 0336). – Steiermark, Gleidorf, Lassnitzthal, Arboretum Gurgl, *Picea abies*, on decorticated log, 11 Sep 2002, leg. J. Holec, JH 167/02 (PRM). – Steiermark, Graz, near Stattegg, Alpengarten Rannach, decayed wood of a conifer, 13 Sep 2002, leg. J. Holec, JH 182/02 (PRM).

Croatia – Vrhovine (Lika), Bieli Vrh mountain, *Abies*, on trunk, 24 Oct 1965, leg. M. Tortić (PRM 624968).

Czech Republic – Rozvadov near Tachov, Diana virgin forest, *Picea abies*, on wood, 8 Oct 1966, leg. A. Pilát and J. Nordin (PRM 624218). – Konstantinovy Lázně, *Pinus sylvestris*, on stump, July 1965, leg. A. Pilát (PRM 624444). – Krkonoše Mts., Špindlerův Mlýn, *Picea abies*, on decayed trunk, 8 Sep 1946, leg. J. Kubička (PRM 520906). – Northern Bohemia,

Studený vrch nature reserve ("Kaltenberger Urwald") near Chřibská, *Fagus sylvatica*, on dead trunk, 2 Oct 1965, leg. Pieschel and H. Marschner (PRM 725626) – Liberec, Rudolfov, Houbový vrch hill, *Picea abies*, on stump, 18 July 1950, leg. J. Herink (PRM 608794). – Turnov, Prachovské skály rocks, on soil in *Pinus* forest, 25 June 1946, leg. M. Svrček (PRM 677032). – Central Bohemia, Dobřichovice, Hlavatý kámen, *Pinus sylvestris*, on stump, 4 Nov 1996, leg. M. Svrček (PRM 889961). – Černolice near Praha, *Pinus sylvestris*, 20 Aug 1944, leg. A. Pilát (PRM 676982). – near Praha, Aug 1941, leg. I. Charvát (PRM 118250). – Nový Bydžov, Pamětník, *Pinus sylvestris*, on logs, 5 Nov 1989, leg. L. Drahokoupil (PRM 873972). – Šumava Mts., Boubín mountain, virgin forest, Aug 1936, leg. J. Herink (PRM 27811). – Šumava Mts., Březník near Modrava, Studená hora mountain, *Picea abies*, on decayed wood, 11 Oct 2001, leg. J. Holec, JH 638/01 (PRM 898679). – Ditto, *Picea abies*, on wood chips on soil, 11 Oct 2001, leg. J. Holec, JH 639/01 (PRM 898680). – Šumava Mts., Březník near Modrava, site called Pytlácký roh, *Picea abies*, on decaying trunk, 11 Oct 2001, leg. J. Holec, JH 633/01 (PRM 898678). – Šumava Mts., Čeňkova Pila near Srní, Povydří protected area, *Abies alba*, fallen trunk without bark, 28 Oct 2002, leg. J. Holec, JH 535/02 (PRM). – Ditto, *Pinus sylvestris*, on fallen decaying trunk, 28 Oct 2002, leg. J. Holec, JH 526/02 (PRM). – Šumava Mts., Černý Kříž, Aug 1931, leg. A. Pilátová (PRM 676997). – Šumava Mts., Černý Kříž near Volary, Hučinka protected area, *Picea abies*, on decaying trunk, 27 Sep 2000, leg. J. Holec, JH 134/00 (PRM 897809). – Šumava Mts., České Žleby, Spáleniště mountain, *Abies alba*, on stump, 15 Oct 1997, leg. J. Holec, JH 795/97 (PRM 898593). – Ditto, *Abies alba*, on fallen trunk, 22 Sep 1998, leg. J. Holec, JH 653/98 (PRM 897365). – Ditto, *Fagus sylvatica*, on fallen trunk, 22 Sep 1998, leg. J. Holec, JH 654/98 (PRM 897366). – Šumava Mts., České Žleby, Žlebský kopec hill, *Abies alba*, on fallen trunk, 13 Sep 1999, leg. J. Holec, JH 178/99 (PRM 897998). – Ditto, *Abies alba*, on decayed trunk, 13 Sep 1999, leg. J. Holec, JH 175/99 (PRM 897995). – Šumava Mts., Kubova Huť, Boubín mountain, *Picea abies*, on decayed wood, 30 Aug 2001, leg. J. Holec, JH 209/01 (PRM). – Šumava Mts., near Horní Vltavice, *Pinus sylvestris*, on stump, 31 Aug 2001, leg. J. Holec, JH 227/01 (PRM). – Šumava Mts., Nová Pec near Volary, Koňský vrch hill, *Fagus sylvatica*, on strongly decayed trunk, 29 Sep 2000, leg. J. Holec, JH 159/00 (PRM 897829). – Šumava Mts., Nová Pec near Volary, Koňský vrch hill, *Picea abies*, on decaying stump, 29 Sep 2000, leg. J. Holec, JH 161/00 (PRM 897831). – Šumava Mts., Nové Údolí, Kamenná mountain, *Fagus sylvatica*, on decaying wood, 28 Aug 1996, leg. J. Holec, JH 360/96 (PRM 889159). – Šumava Mts., Prášily, Ždanidla, *Picea abies*, on decaying trunk, 8 Oct 2000, leg. J. Holec, JH 194/00 (PRM 897862). – Šumava Mts., Prášily, near Laka lake, *Picea abies*, on wood, 30 Sep 1994, leg. J. Holec, JH 280/94 (PRM 885992). – Šumava Mts., Srní, Dračí skály protected area, *Abies alba*, on fallen log, 29 Sep 2001, leg. J. Holec, JH 535/01 (PRM). – Ditto, *Abies alba*, on decaying trunk, 29 Sep 2001, leg. J. Holec, JH 533/01 (PRM). – Ditto, *Abies alba*, on decaying trunk, 29 Sep 2001, leg. J. Holec, JH 537/01 (PRM). – Ditto, *Abies alba*, on decaying trunk, 10 Oct 2002, leg. J. Holec, JH 462/02 (PRM). – Ditto, *Abies alba*, on decayed stump, 10 Oct 2002, leg. J. Holec, JH 464/02 (PRM). – Šumava Mts., Srní, Vydra river valley, *Pinus sylvestris*, on fallen trunk, 28 Oct 2002, leg. J. Holec (PRM 900952). – Ditto, *Betula pendula*, on fallen trunk, 12 Oct 1998, leg. J. Holec, JH 979/98 (PRM 897640). – Šumava Mts., Srní, Povydří area, site called Černé stráně, *Fagus sylvatica*, on fallen trunk, 6 Oct 1997, leg. J. Holec, JH 585/97 (PRM 898409). – Šumava Mts., Strážný, Strážný mountain, *Picea abies*, on decaying trunk, 28 Sep 2001, leg. J. Holec, JH 511/01 (PRM). – Ditto, *Abies alba*, on decaying trunk, 28 Sep 2001, leg. J. Holec, JH 503/01 (PRM). – Šumava Mts., Volary, Hučinka protected area near Černý Kříž, *Fagus sylvatica*, on decaying trunk, 27 Sep 2000, leg. J. Holec, JH 139/00 (PRM 897813). – Šumava Mts., Volary, Chornice protected area near Nová Pec, *Fagus sylvatica*, on decaying trunk, 26 Sep 2000, leg. J. Holec, JH 132/00 (PRM 897807). – Šumava Mts., Zátoň near Lenora, Boubínský prales virgin forest, *Abies alba*, on dead stump, 29 Oct 2002, leg. J. Holec (PRM 900954). – Ditto, *Abies alba*, on fallen trunk, 29 Oct 2002, leg. J. Holec, JH 553/02 (PRM). – Ditto, *Abies alba*, on strongly decayed trunk, 29 Oct 2002, leg. J. Holec, JH 539/02 (PRM). – Ditto, *Abies alba*, on decaying trunk, 2 Oct 2001, leg. J. Holec, JH 571/01 (PRM). – Ditto, *Picea abies*, on fallen trunk, 2 Oct 2001, leg. J. Holec, JH 599/01 (PRM). – Ditto, *Abies alba*, on decaying trunk, 2 Oct 2001, leg. J. Holec, JH 591/01 (PRM). – Šumava Mts., Železná Ruda, Debrník protected area, *Abies alba*, on fallen trunk, 21 Sep 1998, leg. J. Holec, JH 605/98 (PRM 897323). – Ditto, *Fagus sylvatica*, on decaying trunk, 21 Sep 2002, leg. J. Holec, JH 608/98 (PRM 897326). – Ditto, *Abies alba*, on stump, 16 Oct 1997, leg. J. Holec, JH 834/97 (PRM 898626). – Šumava Mts., Železná Ruda, slope above Čertovo jezero lake, *Abies alba*, on fallen trunk, 29 Sep 1994, leg. J. Holec, JH 260/94 (PRM 885683). – Southern Bohemia, Fabián nature reserve, *Abies alba*, on stump, 19 Oct 2002, leg. M. Beran (CB). – Southern Bohemia, Písek, Těšínov, Fanfíry forest, *Pinus sylvestris*, 4 Sep 1975, leg. J. Staněk (CB 612). – Southern Bohemia, Ševětín, Velechvínské polesí forest, *Picea abies*, on decayed stump, 17 July 1975, leg. J. Kučerová (CB 528). – Southern Bohemia, Vodňany, *Picea abies*, 6 July 1936, leg. J. Herink (PRM 28412). – Hluboká nad Vltavou, Libochovka stream valley, *Fagus sylvatica*, on fallen trunks, 20 Oct 1971, leg. J. Kubička (PRM 842412). – Jindřichův Hradec district, Klikov, *Picea*, on stump, 19 July 1977, leg. J. Kubička (BRA). – Vlastiboř near Soběslav, Bory near Soběslavská blata, *Pinus sylvestris*, on fallen logs, 17 June 1984, leg. F. Kotlaba (PRM 835793). – Eastern Bohemia, Ústí nad Orlicí, Tichá Orlice river valley, *Fagus sylvatica*, on fallen trunk, 20 Oct 1994, leg. J. Holec, JH 381/94 (PRM 886271). – Jihlava, Henčovský les, on decayed wood, 2 Dec 1945, leg. K. Voneš (PRM 677018). – Žďár n. Sázavou, Žákova hora virgin forest, *Abies alba*, on trunk, 23 July 1948, leg. F. Šmarda (BRNM 312406). – Žďár n. Sázavou, Žákova hora virgin forest, *Abies alba*, on trunk, 26 Oct 1952, leg. F. Šmarda (BRNM 312394). – Českomoravská vrchovina highland, Třešť, Velký Špičák nature reserve, *Fagus sylvatica*, fallen trunk, 17 Oct 2002, leg. J. Holec, JH 495/02 (PRM). – Českomoravská vrchovina highland, Třešť, Velký Špičák nature reserve, *Abies alba*, at base of a dead trunk, 17 Oct 2002, leg. J. Holec, JH 498/02 (PRM). – Třebíč, Senorady, Velká skála, *Picea abies*, on stump, 28 Sep 1993, leg. V. Antonín (BRNM 576695). – Brno, Útěchov, Coufavá nature reserve, *Picea abies*, on fallen decaying trunk, 27 July 1986, leg. A. Vágner (BRNM 457489). – Brno-Komárov, on wood of a hot-bed, 8 Sep 1952, leg. J. Zeman (PRM 676852). – Brno-Lesná, Suchá hora, *Picea abies*, fallen trunk, 2 July 1993, leg. A. Vágner (BRNM 590151). – Podyjí national park, Čížov near Vranov nad Dyjí, údolí Klaperova potoka valley, *Pinus sylvestris*, twigs on soil, 18 Oct 2002, leg. J. Holec, JH 505/02 (PRM). – Podyjí National Park, Vranov nad Dyjí, Dyje river valley, *Picea abies*, decaying wood on soil, 19 Oct 2002, leg. J. Holec, JH 513/02 (PRM). – Znojmo, Podyjí National Park, Havraníky, *Pinus*, around wood, 17 Sep 1993, leg. V. Antonín

(BRNM 576660). – Moravia, Braniškov, *Abies alba*, at base of a decayed trunk, 2 Dec 1963, leg. J. Lazebníček (BRNM 312428). – Moravskoslezské Beskydy Mts., Horní Lomná, Mionší nature reserve, *Abies alba*, on stump, 18 Oct 1976, leg. J. Kuthan (BRA). – Beskydy Mts., Bílá, Salajka virgin forest, *Abies alba*, on trunk, 1 Aug 1948, leg. F. Šmarda (BRNM 312400).

Germany – Görlitz, *Abies alba*, Oct 1933, leg. A. Pilát (PRM 676998).

Italy – Trento, Val di Sella, woody debris (a conifer) on a meadow, 4 Oct 1982, leg. I. Krisai (herb. I. Krisai 654).

Poland – Bialowieza virgin forest, *Pinus sylvestris*, at base, 14 Oct 1950, leg. A. Pilát (PRM 676983).

Sweden – Småland, Femsjö parish, Hägnens bokhult (Fungi Exsiccati Suecici no. 2035), *Fagus*, on rotten prostrate trunk, 20 Sep 1945, leg. S. Lundell (PRM 677025). – Småland, Femsjö, Hallawäs skog, murken barrved, 22 Oct 1943, leg. S. Lundell (PRM 676993). – Upland, Upsala, Kronoparken (Fungi Exsiccati Suecici no. 17), on decaying coniferous wood, 2 Oct 1933, leg. S. Lundell (PRM – 676988).

Ukraine – Eastern Carpathians, Dilove (Trebušany), Menchul mountain, *Picea abies*, Aug 1934, leg. A. Pilát (PRM 20733). – Eastern Carpathians, Dilove (Trebušany), Menchul mountain, *Picea abies*, Aug 1934, leg. A. Pilát (PRM 20738). – Eastern Carpathians, near Dilove (Trebušany), Biliyi stream valley (Bílý potok), *Picea abies*, Oct 1935, leg. A. Pilát (PRM 20738). – Eastern Carpathians, near Dilove (Trebušany), Biliyi stream valley (Bílý potok), *Picea abies*, Oct 1935, leg. A. Pilát (PRM 23259).

Gymnopilus sapineus (Fr.: Fr.) Maire

sensu Kühner et Romagnesi (1953), Moser (1983), Ludwig (2000, 2001), Breitenbach et Kränzlin (2000); non *G. sapineus* sensu Fries (1821), Høiland (1990).

(Text-fig. 9, Pl. 8, Pl. 16)

Bas.: *Agaricus sapineus* Fr.: Fr., Syst. mycol. 1: 239, 1821.

≡ *Gymnopilus sapineus* (Fr.: Fr.) Maire, Treballs del Museu de Ciències Naturals de Barcelona 15(2): 96, 1933.

Other combinations based on *A. sapineus* Fr.: Fr.: (in fact, the fungus described in the cited works is probably *G. penetrans*) – *Flammula sapinea* (Fr.: Fr.) P. Kumm., Führ. Pilzk.: 82, 1871. – *Dryophila sapinea* (Fr.: Fr.) Quél., Enchir. fung.: 71, 1886.

Selected illustrations: Dähncke: p. 700. – Moser et Jülich: III *Gymnopilus* 4, bottom figure. – Breitenbach et Kränzlin: fig. 149 (fruitbodies are too pale for *G. sapineus*, but the microcharacters fit this species). – Ludwig: fig. 31.13A–C (best presentation of *G. sapineus* and its variability).

Characteristics in brief: Fruitbodies small to medium-sized, mostly slender but also robust, pileus typically fibrillose-tomentose, tomentose to tomentose-scaly, rather deep coloured: margin deep yellow to yellow-ochre, towards the centre deep ochre-rusty, yellow-brown to rusty brown, lamellae typically deep yellow, then rusty, stipe without traces of velum, yellow-ochre, ochre-rusty to rusty brown with yellow fibrillose-tomentose surface, context mostly deep yellow in pileus, smell rather distinct, spores mostly 7.2–9.2 × 4.5–5.2 µm, ellipsoid-amygdaliform with distinct suprahilar depression, ornamentation medium to coarse, verrucose to rugulose-verrucose, without suprahilar disc, cheilocystidia cylindrical, narrowly fusiform, fusiform-lageniform to narrowly lageniform, with more or less distinct globose head 3–5 µm in diam., pileus cuticle of broad and coarsely incrusted hyphae (4–)6–20 µm in diam., with narrowly clavate, clavate to pyriform terminal cells. Growing as a saprophyte on dead wood of conifers, rarely also deciduous trees, almost exclusively in summer (June–August).

Description: Fruitbodies growing singly, in groups or fascicles. Pileus 1.5–6.5 cm, convex, plano-convex, finally applanate, sometimes with low broad umbo, dry, mat, not hygrophanous, not translucently striate, margin deep yellow to yellow-ochre, towards centre darker, deep ochre-rusty, yellow-brown to rusty brown, sometimes also with slight orange tinge, surface finely fibrillose-tomentose, tomentose to tomentose-scaly, scales fine, appressed to slightly upraised. Lamellae medium crowded, L = 40–60, l = 1–5, 3–6 mm high, ventricose, near stipe emarginate and decurrent with a small tooth, at first mat yellow, then deep yellow, finally rusty, sometimes slightly rusty spotted, edge even, pale yellow. Stipe 30–60 × 3–7(–10) mm, either slender and gradually thickened downwards or rather robust and cylindrical, without traces of velum, upper part yellow, towards base deep yellow-ochre, ochre-rusty to rusty brown, surface finely pale yellow to yellow fibrillose-tomentose. Context typically deep yellow in pileus (like lamellae), but sometimes also pale yellow; yellow-rusty in stipe. Taste moderately bitter to bitter. Smell rather distinct, earthy-raphanoid, musty, like *Cortinarius traganus*, in lamellae sometimes slightly iodoform-like.

Spores 7.2–9.2(–10.4) × 4.5–5.2(–5.6) µm, E = 1.5–1.8(–2.0), Q = 1.63, ellipsoid to ellipsoid-amygdaliform both in side and face view, with distinct suprahilar depression in side view, rusty yellow in KOH, wall rusty brown, ornamentation medium to coarse, verrucose to rugulose-verrucose, without suprahilar disc, dextrinoid, immature spores not dextrinoid. Basidia 18–26 × 6–7 µm, 4(2)-spored, broadly cylindrical or slightly conical with median constriction and attenuated basal part. Basidiolae 17–20 × 6 µm, resembling basidia. Cheilocystidia forming sterile band at edge, 20–40 × 5–8 µm, variable in shape: cylindrical, narrowly fusiform, fusiform-lageniform to narrowly lageniform, with more or less distinct globose head 3–5 µm in diam., sometimes not capitate, thin-walled, hyaline, sometimes partly or completely filled with a homogeneous or finely granular rusty yellow content. Pleurocystidia not observed. Lamellar trama regular, hyphae 4–18 µm broad, cells cylindrical or slightly inflated, hyaline, with yellow wall, yellow coloured gloeoplerous hyphae rarely present. Pileus cuticle a cutis with a transition to a trichoderm, whole layer rusty brown, lower part of densely arranged hyphae, upper part of parallel to slightly ascending hyphae forming the scales on the pileus surface, hyphae densely arranged in scalp, cells (4–)6–20 µm broad, cylindrical, narrowly ellipsoid or almost barrel-shaped, mostly 8–16 µm broad, with coarse rusty brown incrustations forming patches or a tiger-like pattern, with rare to scattered, narrowly clavate, clavate to pyriform terminal

1. – Šumava Mts., Strážný, Strážný mountain, *Picea abies*, on decaying stump among mosses, 28 Aug 2001, leg. J. Holec, JH 187/01 (PRM).

2. – Ditto, typical substrate of *G. josserandii* – old decaying stumps of conifers covered with mosses.

3. – Šumava Mts., Zátoň near Lenora, Pažení mountain (Boubín mountain group), *Picea abies*, on decayed stump among mosses, 30 Aug 2001, leg. J. Holec JH 216/01 (PRM).

1. – Novohradské hory Mts., Žofínský prales virgin forest, 26 Sep 2003, leg. J. Holec, JH 160/03 (PRM).

2. – Ditto, JH 163/03 (PRM).

3. – Ditto, leg. J. Burel, JH 164/03 (PRM).

1. – Šumava Mts., Lenora, Radvanovický hřbet mountain ridge, *Abies alba*, on decaying trunk among mosses, 13 July 1998, leg. J. Holec, JH 261/98 (PRM).

2. – Southern Bohemia, Frahelž near Třeboň, dike between Naděje and Víra fish-ponds, *Quercus*, on stump in soil level, 11 Oct 2002, leg. J. Holec, JH 482/02 (PRM).

3. – Ostrava, Polanka, Přemyšovský mokřad nature reserve, *Salix caprea*, on roots of a fallen trunk, 4 Oct 2002, leg. J. Holec, JH 336/02 (PRM).

1. – České Švýcarsko National Park, Mezní Louka near Hřensko, site called Kozí hřbety, *Quercus robur*, roots at base of a living trunk, 28 Sep 2002, leg. J. Holec, JH 305/02 (PRM).

2. – Třeboň, stump of *Quercus*, not documented.

3. – Novohradské hory Mts., Pohořské rašeliniště peat bog, *Picea abies*, on fallen decaying trunk, 27 Sep 2003, leg. J. Holec, JH 171/03 (PRM).

1. – Novohradské hory Mts., Pohořské rašeliniště peat bog, *Picea abies*, on fallen decaying trunk, 27 Sep 2003, leg. J. Holec, JH 170/03 (PRM).

2. – Šumava Mts., Srní, Povydří protected area, *Picea abies*, on fallen trunk, 16 Sep 1998, leg. J. Holec, JH 494/98 (PRM).

3. – Šumava Mts., Velká Niva peat bog, *Picea abies*, on decaying wood, 25 Sep 2003, leg. J. Holec, JH 146/03 (PRM).

1. – Šumava Mts., Srní, Dračí skály protected area, *Abies alba*, on decaying trunk, 10 Oct 2002, leg. J. Holec, JH 462/02 (PRM). Note the young fruitbodies with velum.

2. – Ditto.

3. – Šumava Mts., Srní, Dračí skály protected area, *Abies alba*, on decayed stump, 10 Oct 2002, leg. J. Holec, JH 464/02 (PRM).

1. – Českomoravská vrchovina highland, Třešť, Velký Špičák nature reserve, *Fagus sylvatica*, fallen trunk, 17 Oct 2002, leg. J. Holec, JH 495/02 (PRM).

2. – Šumava Mts., Zátoň near Lenora, Boubínský prales virgin forest, *Abies alba*, on strongly decayed trunk, 29 Oct 2002, leg. J. Holec, JH 539/02 (PRM). The pileus surface is covered with spores.

3. – České Švýcarsko National Park, Dolský mlýn, *Picea abies*, on fallen decaying trunk, 20 Sep 2003, leg. J. Holec, JH 129/03 (PRM). Fruitbodies with rusty brown spotted lamellae.

1. – České Švýcarsko National Park, valley of the Malý Vlčí potok stream, *Picea abies*, on roots of a decaying stump, 16 July 2003, leg. J. Holec, JH 27/03 (PRM).

2. – Ditto.

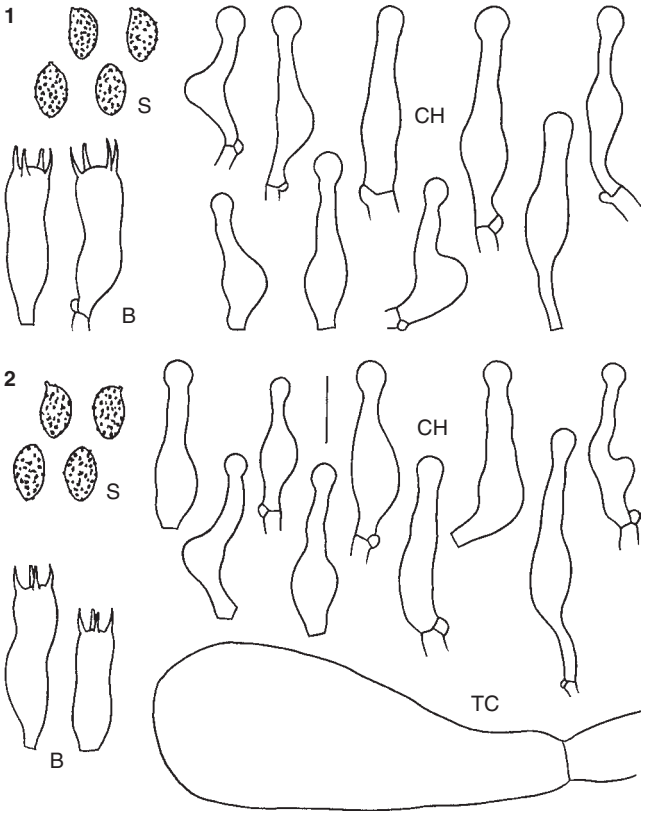
3. – Southern Bohemia, Tábor, Hlinice, Velký Hutecký les forest, *Pinus sylvestris*, at base of a stump, 11 June 2004, leg. and photographed by M. Beran (CB).

cells up to 26 µm broad. Stipe cuticle a cutis of densely arranged hyphae 4–8 µm broad, with fine rusty incrustations, at places with ascending hyphae or nests of such hyphae, caulocystidia or terminal elements of special shape not observed. Lamellae exuding yellow pigment when mounted in a 5 % KOH.

Fructification: Based on 48 specimens I studied from the Czech Republic, the frequency of finds is as follows: May: 1, June: 8, July: 21, August: 15, September: 2, October: 1 (9 Oct.). Fructification thus begins early in the season (May), culminates in the summer months (June–August) and is very rare in September and early October. *Gymnopilus sapineus* is sometimes one of the few fungi producing fruitbodies in periods of dry and hot weather. It seems that the species needs higher temperatures for its fructification and is not able to produce fruitbodies in cold weather with frosts which in the Czech Republic regularly occur from half October. This is a remarkable difference to *G. penetrans*, which rarely appears in summer but frequently in autumn regardless of the first frosts (till December).

Ecology: In the Czech Republic, *G. sapineus* is found as a saprophyte on dead wood of conifers, rarely also of deciduous trees, sometimes seemingly in soil, but obviously on strongly decayed wood buried in the soil. Regarding the 48 specimens studied, the frequency of substrates was as follows: *Picea abies*: 26, *Pinus sylvestris*: 3, *Pinus rotundata*: 1, *Betula*: 2, *Abies alba*: 1, seemingly on soil in coniferous forests: 5, coniferous wood (*Picea* or *Pinus*): 3, not indicated: 7. The fruitbodies mostly appear on more or less decayed stumps, less frequently on decaying trunks, roots in soil and seemingly on soil. The facts based on collections from Sweden, Austria and Finland I have seen in herbaria (see Collections studied) are similar to those from the CR. The finds from the CR are from the lowlands to the mountains (highest find: "Plechý" mountain in the Šumava Mts., 1330 m a.s.l.) without preference for a certain altitude belt. The species seems to prefer larger complexes of coniferous forests (mostly spruce forests but also pine forests or mixed stands) with high amount of decaying wood, especially stumps. Its finds come both from natural as well as man-made forests.

Distribution: *Gymnopilus sapineus* has a scattered occurrence in the Czech Republic and prefers regions with coniferous forests (see Ecology). The species seems to occur scatteredly in most European countries but data on its exact distribution are not reliable due to confusion about its taxonomy and nomenclature (see Discussion). The only reliable source of data are papers describing the microcharacters of the pileus cuticle or data based on detailed revision of herbarium specimens. *Gymnopilus sapineus* is mentioned from Scandinavia (e.g. Fries 1821, 1838, 1874; Høiland 1990; Ryman 1992) but represents in fact species with narrow hyphae in the pileus cuticle (*G. penetrans*). The species with broad hyphae (*G. sapineus* sensu Kühner et Romagnesi etc.) is not reported from Nordic countries by Ryman (1992). Because of its tendendy to produce fruitbodies in warm summer months (see Ecology), it seems that the species does not grow in cold Nordic countries. However, I personally studied 2 collections of it from Sweden and 1



Text-fig. 9. ***Gymnopilus sapineus*****: 1 – České Švýcarsko National Park, valley of the Malý Vlčí potok stream, JH 27/03 (PRM); 2 – Prášily, Nad peřejemi protected area, JH 96/02 (PRM). For explanations see Material and Methods. Scale bar = 10 µm.**

from Finland (see Collections studied). Consequently, *G. sapineus* sensu Kühner et Romagnesi etc. is documented from the Nordic countries but seems to be rare there. Høiland (personal communication) wrote to me that some old and thus badly prepared collections referred by him from Norway (Høiland 1990: p. 273, at bottom) seem to represent *G. sapineus*.

In my opinion, *G. sapineus* sensu Fries (1821) represents the same species as *G. penetrans* (see discussion on *G. penetrans* in this work and publications by Fries 1821, Høiland 1990).

Discussion: The fungus named here *G. sapineus* sensu Kühner et Romagnesi etc. is macroscopically very similar to *G. penetrans*. However, a combination of some characters distinguishes it rather well from *G. penetrans*. Its colours are deeper (especially lamellae, stipe surface and pileus context) and the pileus surface is distinctly tomentose to tomentose-scaly in all stages of development (in *G. penetrans*, some fruitbodies may be fibrillose-scaly by a disrupted pileus surface but the surface in never tomentose). The habit of the fruitbodies is somewhat different, too (slender and slightly smaller, but robust forms are known, too). In some cases it is impossible to distinguish the two species macroscopically; in that case microcharacters of the pileus cuticle are necessary for unambiguous identification. In *G. sapineus*, the hyphae of pileus cuticle are broad [(4–)6–20

µm, mostly 8–16 µm], coarsely rusty brown incrusted and often composed of inflated short cells and clavate to pyriform terminal elements. In *G. penetrans*, the hyphae are slender [3–10(–12) µm], less distinctly incrusted and composed of cylindrical cells. The differences are well seen on the photographs by Clémençon (2002, 2003). Based on data from the CR, *G. sapineus* produces fruitbodies in summer (mostly June–August), whereas *G. penetrans* is predominantly an autumnal species (especially September–November). Moreover, the separate position of *G. sapineus* was confirmed by DNA studies (ITS region) by Rees et al. (2002).

The taxonomic delimitation of the fungus named here *G. sapineus* sensu Kühner et Romagnesi etc. is clear. However, its nomenclature is very problematic. The name *G. sapineus* has been used in different ways (although most recent European authors use it for the species in question). Nice examples of the confusing concept of this species are the works e.g. by Moser (e.g. 1983) or Keller et Moser (2001). The authors certainly deal with the species in question, but refer to several illustrations which do not represent it (Bresadola, fig. 782: fungus with smooth subreniform spores, probably *Pholiota lucifera*; Fries, fig. 118/3: *G. penetrans*). On the other hand, Kühner et Romagnesi (1953, 1957), Ludwig (2000, 2001) or Breitenbach et Kränzlin (2000) present the species quite correctly.

The name *Gymnopilus sapineus* in its original sense (Fries 1821, as *Agaricus sapineus*) is inapplicable for our species as it certainly represents the species with narrow hyphae in the pileus cuticle, hence it is *G. penetrans* (see detailed explanation under *G. penetrans* and conclusions by Høiland 1990). Even the later Friesian concept of *G. sapineus* (Fries 1874, 1867–1884: fig. 118/3) does not represent the species in question but a form of *G. penetrans* with a fibrillose-scaly pileus surface (see discussion on *G. penetrans*).

My current approach to this problem is presented at the end of the discussion on *G. penetrans*. In this work I name the species with broad hyphae in the pileus cuticle *G. sapineus* sensu Kühner et Romagnesi etc.

Gymnopilus spadiceus Romagnesi, Kew Bull. 31(3): 444, 1977 (for illustration see Bon 1988: p. 245) is a similar species. It also possesses a tomentose-scaly pileus cuticle but its pileus is red-brown, the hyphae of the pileus cuticle measure only 5–10(–12) µm and its spore print is brown, not rusty (according to Bon et Roux 2002). It is not known from the CR.

Collections studied:

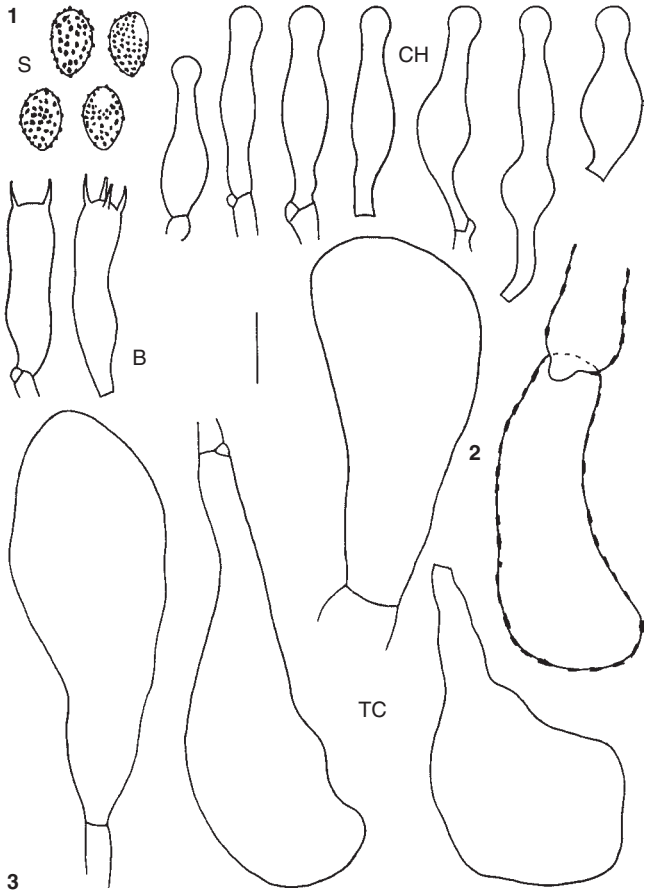
Austria – Niederösterreich, Allentsteig, Sandholz, on the ground and on roots buried in soil, 18 July 1998, leg. A. Hausknecht and ?(illegible) (WU 18157). – Niederösterreich, Dobersberg, Kautzen, on soil (roots in soil?), 15 July 1998, leg. A. Hausknecht and G. Kovacs (WU 18178). – Niederösterreich, Litschau, Eggern, wood buried in soil, 18 July 1987, leg. W. Klofac (WU 6257). – Niederösterreich, Litschau, Schönauer Forst, *Picea abies*, on decayed stump, 10 July 1992, leg. A. Hausknecht (WU 11738). – Niederösterreich, Litschau, Schönauer Forst, *Picea abies*, on wood and roots, 23 June 1993, leg. L. Sandmann and A. Hausknecht (WU 11738). – Niederösterreich, NE of Amaliendorf, Haslauer Moor near Wasserstein, decayed wood of a conifer, 20 June 1993, leg. I. Krisai (herb. I. Krisai 5786).

Czech Republic – Mariánské Lázně, Císařský les, in *Picea* forest with *Sphagnum*, 29 July 1950, leg. M. Svrček (PRM 677016). – Krušné hory Mts., Jelení near Nejdek, Jelení hřbet mountain, *Picea abies*, on stump, 4 Aug 1965, leg. F. Kotlaba (PRM 605888). – Krušné hory Mts., Osek, Loučná mountain, *Picea abies*, on stump, 29 July 1969, leg. F. Kotlaba (PRM 681446). – Hřensko, Mezná Louka, Dětské kameny, *Picea abies*, on fallen trunks, 2 July 1969, leg. M. Svrček (PRM 685264). – Hřensko, Mezná Louka, Větrovec hill, *Picea abies*, on decayed stump, 29 June 1969, leg. M. Svrčková (PRM 685263). – Mezná near Hřensko, *Picea abies*, on roots and stumps, 6 July 1969, leg. M. Svrček (PRM 685262). – Krásná Lípa, Kyjov, on roots and stumps of *Picea*, *Pinus*, 16 July 1961, leg. M. Svrček (PRM 616096). – Krásná Lípa, Kyjov, *Picea abies*, on stump, July 1960, leg. M. Svrček (PRM 620172). – Růžová near Hřensko, between Mezná and Růžák mountain, *Picea abies*, on stump, 1 July 1969, leg. M. Svrček (PRM 685259). – Liberec Distr., Bedřichov: Kristiánov, *Picea abies*, on decayed stump, 18 July 1950, leg. J. Herink (PRM 608785). – Liberec, Baierův potok stream valley, *Picea abies*, on stump, 18 July 1950, leg. J. Herink (PRM 608793). – Liberec, Rudolfov, Žulový vrch hill, on soil near decayed stumps of *Picea abies*, 18 July 1950, leg. J. Herink (PRM 608784). – Jablonec n. Nisou, *Picea abies*, 20 June 1946, leg. Eberle (PRM 677003). – Mašov: Pelešany, distr. Turnov, Valdštejn, *Picea abies*, on decayed stump, 18 Aug 1948, leg. J. Herink (PRM 608799). – Mašov near Turnov, Valdštejn, among *Leucobryum glaucum* (*Picea-Pinus* forest), 15 Aug 1946, leg. J. Kubička (PRM 520586). – Bukovina near Turnov, Zelené údolí valley, on soil (*Picea-Pinus* forest), 14 Aug 1946, leg. J. Kubička (PRM 520529). – Krkonoše Mts., Jilemnice, Vítkovice, Preislerův kopec hill, *Picea abies*, on stump, 4 Aug 1984, leg. F. Kotlaba (PRM 835838). – Hořice v Podkrkonoší, Dachova, stump of a conifer, 22 July 1965, leg. L. Rychtera (PRM 610937). – Náchod, Starkoč, *Picea abies*, on stump, 4 Sep 1948, leg. J. Herink (PRM 608790). – Pomezí near Polička, *Picea abies*, 29 June 1965, leg. F. Šmarda (BRNM 301821). – Central Bohemia, Černolice near Dobřichovice, *Pinus sylvestris*, on decayed trunk, 20 Aug 1944, leg. A. Pilát (PRM 676807). – Central Bohemia, Černolice near Dobřichovice, *Pinus sylvestris*, 27 July 1948, leg. A. Pilát (PRM 619629). – Central Bohemia, Sadská, Kersko, 9 Oct 1967, leg. A. Pilát (PRM 629446). – Central Bohemia, Sadská, Kersko forest, on soil in *Pinus* forest, 1 July 1951, leg. Landkammer (PRM 677029). – Praha, Krčský les forest, *Pinus-Quercus* forest, among *Vaccinium myrtillus*, 29 July 1944, leg. M. Svrček (PRM 677031). – Praha, Hvězda public garden, on strongly decayed trunk, 25 June 1944, leg. J. Herink (PRM 677008). – Praha, Klánovice, Vidrholec forest, May 1949, leg. ? (PRM 676980). – Praha-Krč, on soil and roots in *Pinus* forest, 23 June 1945, leg. V. Vacek (PRM 677041). – Šumava Mts., Černý Kříž, Mrtvý luh protected area, *Pinus rotundata*, on decaying trunk, 8 July 1997, leg. J. Holec, JH 117/97 (PRM 890947). – Šumava Mts., Kvilda, near Jezerní slať peat-bog, *Picea abies*, on stump, 24 Aug 1966, leg. A. Pilát (PRM 627010). – Šumava Mts., near Kvilda, *Picea abies*, on stump, 13 Aug 1965, leg. A. Pilát (PRM 624644). – Šumava Mts., Nová Pec, Houska protected area, *Picea abies*, on dead log lying on soil, 25 Aug 1996, leg. J. Holec, JH 291/96 (PRM 889095). –Ditto, *Betula pendula*, on decaying log, 3 July 1997, leg. J. Holec, JH 67/97 (PRM 890930). – Šumava Mts., Nová Pec, Plechý mountain, *Picea*

abies, on decaying stump, 26 Aug 1996, leg. J. Holec, JH 312/96 (PRM). – Šumava Mts., Prášily, Frauental protected area, on peaty soil (?), 10 July 1996, leg. F. Kotlaba (PRM 889732). – Šumava Mts., Prášily, Nad peřejemi protected area, wood of a conifer in soil (*Picea*?, *Pinus*?), 19 July 2002, leg. J. Holec, JH 96/02 (PRM 898720). – Šumava Mts., Prášily, U Cettlovy Hůrky protected area, *Picea abies*, on stump, 29 Aug 2000, leg. J. Holec, JH 92/00 (PRM). – Šumava Mts., Strážný, Častá protected area, *Betula*, on decayed stump, 27 Aug 2001, leg. J. Holec, JH 154/01 (PRM). – Southern Bohemia, Hlinice, Velký hutecký les forest, *Picea abies*, in *Polytrichum* on stump and around it, 4 July 1987, leg. M. Beran (CB 5928). – Southern Bohemia, Pohorská Ves, Lužnický vrch hill, *Picea abies*, on roots, 10 June 2003, leg. M. Beran (PRM). – Třeboň, Rumburk, *Picea abies*, on roots, 13 Aug 1984, leg. J. Kubička (PRM 871547). – Žďár n. Sázavou, Žákova hora virgin forest, 25 July 1955, leg. F. Šmarda (BRNM 312412). – Žďárské vrchy hills, Budeč, near Matějovský and Babínský fish-ponds, *Picea abies*, on stump, 14 July 1999, leg. A. Vágner (BRNM 648547). – Českomoravská vrchovina highlands Fryšava, near Sykovec fish-pond, *Picea abies*, on decayed stumps, 4 July 1963, leg. K. Kříž (BRNM 313395). – Moravia, Staré Hamry-Huťský revír, site called U Klínu, *Abies alba*, on stump, 16 July 1963, leg. J. Veselský (BRNM 312421). – Moravia, Tišnov, Kuřim, Babí lom forest, *Picea abies*, on trunk, 23 June 1940, leg. F. Šmarda (BRNM 312402). – Jeseníky Mts., between Sobotín and Stará Vess, Skřítek nature reserve, *Picea*, on dead trunk, 28 Sep 1975, leg. J. Kuthan (BRA). – Jeseníky Mts., near Karlova Studánka, Bílá Opava river valley, *Picea*, on decayed stump, 4 July 1971, leg. J. Kuthan (BRA). – Jeseníky Mts., Rejvíz, Rejvízské rašeliniště nature reserve, *Picea abies*, on decayed stump, 27 Aug 1975, leg. J. Kuthan (BRA).

Finland – Keminmaa, Hyypiö, *Pinus sylvestris* forest, 14 Aug 1993, leg. H. Väre (PRM 879864).

Sweden – Dalarna: Rättvik, Vikarbyn, Röjerasvägen, 9 July 1935, leg. B. Cortin (PRM 676809). – Stockholm, Uggleviksskogen, Romell. no. 9775, 4 Aug 1888, leg. L. Romell (PRM 676810).



Text-fig. 10. ***Gymnopilus picreus*****: 1 – Šumava Mts., Plechý mountain, JH 321/96 (PRM); 2 – České Žleby, Radvanovický hřbet mountain ridge, JH 136/97 (PRM); 3 – Lenora, Malá Niva protected area, JH 200/97 (PRM). For explanations see Material and Methods. Scale bar = 10 µm.**

Gymnopilus picreus (Pers.: Fr.) P. Karst.

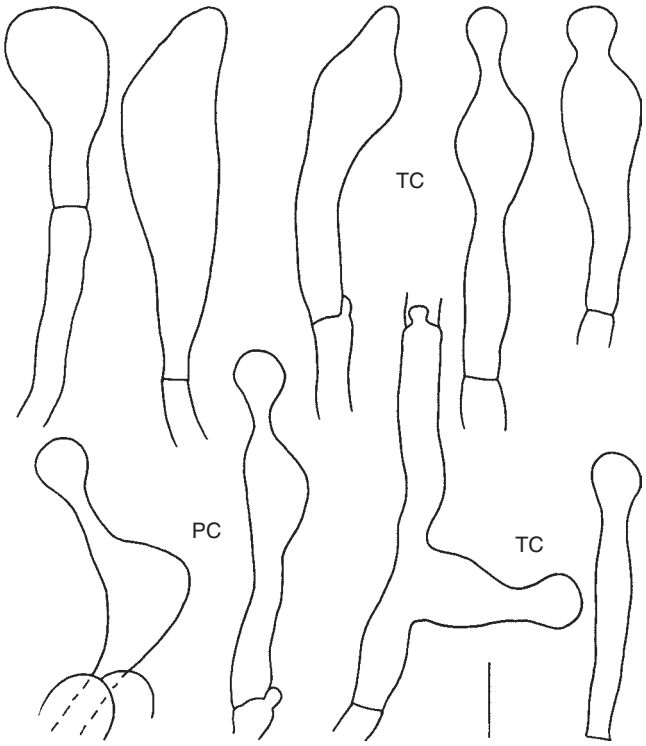
(Text-figs. 10–12, Pl. 4, fig. 3; Pl. 5; Pl. 17; Pl. 18)

Bas.: *Agaricus picreus* Pers., Icon. descr. fung. 1: 14, 1798.
≡ *Agaricus picreus* Pers.: Fr., Syst. mycol. 1: 239, 1821.
≡ *Gymnopilus picreus* (Pers.: Fr.) P. Karst., Bidrag Kännedom Finlands Natur Folk 32: 400, 1879.
≡ *Flammula picrea* (Pers.: Fr.) P. Kumm., Führ. Pilzk.: 82, 1871.
≡ *Dryophila picrea* (Pers.: Fr.) Quél., Enchir. fung.: 71, 1886.

Selected illustrations: Fries: fig. 119/2. – Ludwig: fig. 31.1. – Bon et Roux: pl. 7-A (typical form having a dark stipe with flocculose-fibrillose covering arranged in rows).

Characteristics in brief: Fruitbodies small, rarely medium-sized, pileus typically obtusely conical but also hemisphaerical (when young) or convex (at maturity), at centre typically orange-brown, red-brown to reddish rusty brown (but also yellow-rusty to rusty brown when dry), surface seemingly glabrous but in detailed view or under lens finely verrucose-granular, tomentose-verruculose, tomentose-scaly or fibrillose-rugulose, lamellae vividly deep yellow for a long time, stipe typically dark rusty brown to umber-brown with a red or violet tinge, sometimes almost brown-black at base, apex paler, surface whitish-yellow to yellow flocculose, flocculose-fibrillose to finely fibrillose-tomentose, spores large, mostly 8.5–10.5 × 5.5–6.5 µm, amygdaliform in side view, ovoid to ovoid-amygdaliform in front view, coarsely verrucose, with suprahilar disc, pileus cuticle covered with inflated terminal cells: narrowly clavate, broadly clavate, pyriform to sphaeropedunculate, stipe cuticle covered with nests of cylindrical outgrowths and numerous caulocystidia. Growing on dead wood of conifers, rarely deciduous trees, preferably in mountainous areas or locations with a cold climate.

Description: Fruitbodies growing singly, in small groups or small fascicles. Pileus 5–40(–55) mm, at first hemisphaerical, hemisphaerical-conical to obtusely conical, then broadly conical, convex to plano-convex, slightly hygrophanous, not glossy (mat), typically orange-brown, red-brown (7D8) to reddish rusty brown (7D7) when fresh, especially at centre, sometimes also yellow-rusty to rusty brown, towards margin brown-yellow (6C7–8), ochre-yellow to deep yellow, in dry weather paler, brown-yellow (6CD8), surface seemingly glabrous but in detailed view or under lens finely verrucose-granular, tomentose-verruculose, tomentose-scaly or fibrillose-rugulose, sometimes



Text-fig. 11. ***Gymnopilus picreus*** **– France, Isère, Seiglières (herb. P.-A. Moreau no. 96091701, as** ***G. picreus*****). For explanations see Material and Methods. Scale bar = 10 µm.**

finely disrupted, margin often exceeding lamellae and dentate. Lamellae crowded, L = 30–46, l = 3–7, even to more or less ventricose, near the stipe emarginate or with a small decurrent tooth, vividly deep yellow (4A7–8) even when young, long time so, but yellow-rusty, ochre-rusty (5B7) to yellow-brown (4B8) when old, edge yellow, even or slightly undulate. Stipe 10–45(–60) × 1.5–5 mm, cylindrical or slightly thickened downwards, base sometimes slightly bulbous, colour typically dark rusty brown to umber-brown with a red (7E–D7) or violet tinge, sometimes almost brown-black, especially at base and when fresh, apex paler, yellow-rusty, rusty brown to yellow-brown, surface whitish yellow to yellow flocculose, flocculose-fibrillose to finely fibrillose-tomentose, sometimes in longitudinal rows, without any traces of velum, sometimes with white tomentum at base, hollow when old. Context yellow to yellow-brown in pileus; yellow-rusty to ochre-rusty in stipe, rusty brown in stipe base. Taste immediately distinctly bitter, sometimes with a mealy trace. Smell indistinct.

Spores (8.0–)8.5–10.5(–10.8) × (5.2–)5.5–6.5 µm, E = 1.45–1.82, Q = 1.65, amygdaliform in side view, ovoid to ovoid-amygdaliform in front view, yellow-rusty in KOH, wall rusty brown, with very prominent, coarse, verrucose ornamentation, warts up to 0.4–0.6 µm high and up to 0.8 µm broad, below the hilar appendix with a small smooth area (suprahilar disc) not separated by a line from the surrounding verrucose surface, spore interior only slightly dextrinoid (with reddish brown tinge) in Melzer's reagent. Basidia 23–26 × 6–8 µm, 4(2)-spored, cylindrical with attenuated basal part and median constriction. Cheilocystidia forming a sterile band at the edge, 20–40 × 5.5–8 µm, narrowly lageniform or fusiform-lageniform with a more or less capitate apex, neck 2.5–3.5 µm, head globose, 4–5.5 µm, thin-walled, hyaline, rarely filled with a homogeneous yellow-rusty content. Pleurocystidia absent. Lamellar trama regular, hyphae 4–22 µm broad, cells cylindrical to narrowly ellipsoid, thin-walled, hyaline, wall yellow-brown, subhymenium of densely arranged, short, septate hyphae, not gelatinised. Pileus cuticle a thin cutis, rusty brown, of densely arranged hyphae, cells cylindrical, narrowly fusiform to narrowly ellipsoid, 4–20 µm broad, with coarse rusty brown incrustations ("zebra" to "tiger" pattern), yellow-brown membranal pigment and rather thick wall (up to 1–1.5 µm), at places with clearly inflated cells (terminal elements of slightly protruding hyphae forming the verrucose-granular pileus surface) which are narrowly clavate, broadly clavate, pyriform to sphaeropedunculate, up to 25 µm broad (Figs. 11, 12: 3), with the same type of pigmentation; except for these cells, two other types of elements can be found: a) cylindrical terminal elements with capitate apex on a narrow neck having a thick and strongly pigmented wall, 20–60 × 4–12 µm (Fig. 12: 2) and, b) hyaline pileocystidia of narrowly to broadly lageniform shape with more or less capitate apex, 25–35 × 7–10 µm, neck 2–3 µm, apex 3–5 µm (Figs. 11, 12: 3); however, these were not observed in all collections (sometimes collapsed?). Stipe cuticle principally a cutis of densely arranged parallel hyphae 4–7 µm in diam., with yellow-brown wall and rusty brown incrustations, with numerous cylindrical outgrowths and numerous caulocystidia which are cylindrical, narrowly fusiform, fusiform-lageniform to clavate, mostly with capitate apex, 20–30 × 7–10 µm, forming nests on stipe surface (macroscopically visible as fine granulae).

Fructification: August–October, most frequently in September (CR).

Ecology: In the Czech Republic, *G. picreus* grows as a saprophyte on dead wood of conifers (mostly *Picea abies*, less frequently *Pinus sylvestris*) and rarely deciduous trees (*Betula*, *Fagus sylvatica*). The species mostly occurs on decaying trunks in later stages of decay (often covered with mosses), but also on fallen trunks without bark (with hard wood), on stumps and wood lying on soil. *Gymnopilus picreus* is found especially in natural or near-natural coniferous or mixed forests (*Picea* forests, *Pinus* forests, mixed montane forests with *Fagus, Picea* and *Abies*) with a high amount of fallen trunks and decaying wood. However, finds from man-made stands are known, too (but they are less frequent). The species prefers mountainous areas (altitude 700–1300 m) and locations with a cold inverse climate (gorges, stream valleys etc.)

Distribution: *Gymnopilus picreus* is a typical species of all mountainous areas in the Czech Republic, where it occurs scatteredly. It is rare in the lowlands and in the hills. The species is known from most European countries. In Scandinavia, it is found up to the boreal zone (Ryman 1992).

Discussion: *Gymnopilus picreus* is well recognisable

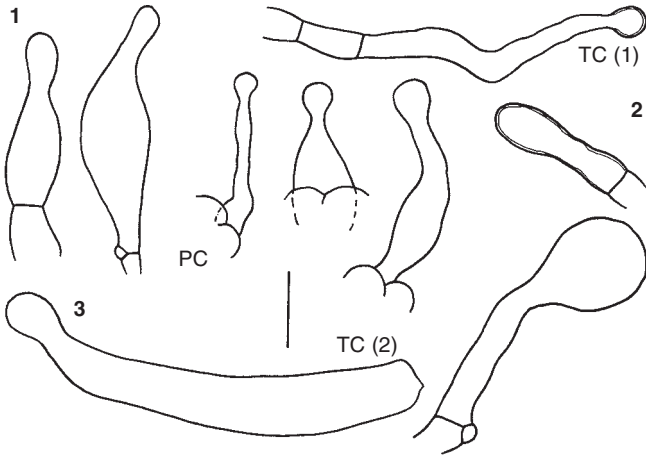
by the characters summarised in the paragraph Characteristics in brief. The most prominent features are the orange to red tinge of the pileus (when fresh), finely verrucose-granular to tomentose-scaly pileus surface (under lens), vividly yellow lamellae, mostly dark stipe with flocculose-fibrillose covering, large spores with suprahilar disc and coarse verrucose ornamentation and inflated terminal cells (clavate, pyriform to sphaeropedunculate) with coarse incrustations in the pileus cuticle. This concept of *G. picreus* is widely accepted by European mycologists and is well presented e.g. by Ludwig (2000, 2001).

Bon et Roux (2002) recognise a similar species for which they use the old and variously interpreted name *Gymnopilus liquiritiae* (Pers.) P. Karst. (a summary of these interpetations is given in the chapter "Comments on some taxa not reported from the Czech Republic"). It should differ by a stipe without blackish tinges (of the same colour as pileus) and being rarely pruinose (only at apex), but with silvery fibrils, a pileus without pruinose covering and with lacking true pileocystidia. Its photographs (Bon et Roux 2002: pl. 5-B, 6-A, 6-B) really look somewhat different than that of *G. picreus* (pl. 7-A). However, even if the authors describe the pileus of *G. liquiritiae* as smooth, their photographs (especially pl. 5-B and 6-B) show something else – a clearly granular-tomentose surface (the same as in *G. picreus*).

I carefully checked if two similar species exist within this group. In the fruitbodies I have seen in the CR the pileus was never smooth, the stipe colour varied from rusty brown through dark rusty brown and red-brown to umber brown with a blackish tinge (especially when young and fresh) and the stipe surface was flocculose, flocculose-fibrillose to finely fibrillose-tomentose in all cases. Concerning the pileocystidia, one must be aware of the fact that 3 distinctive types of cells can be seen in the pileus cuticle (see Description). The pileocystidia are hyaline and sometimes not easy to observe as they can be collapsed and hardly distinguishable from the neighbouring pigmented cells. They were found in most collections but not seen in others. However, there was no correlation between presence or absence of pileocystidia and colour of the stipe. Contrary to Bon et Roux (2002), I have seen collections with a dark brown stipe and no pileocystidia and collections with a paler (brown) stipe and pileocystidia (combinations which are impossible according to Bon et Roux 2002). Generally, there were no correlating characters which could separate the collections studied in two distinct groups. Characters given as typical either of *G. picreus* or *G. liquiritiae* by Bon et Roux (2002) were observed in various combinations in different collections.

For these reasons, I consider the material from the CR conspecific and use the unambiguous and sanctioned name *Gymnopilus picreus* for it. The name *Gymnopilus liquiritiae* is not sanctioned, is hard to interpret, has been used in several ways in the past and should be rejected in my opinion (see discussion in the chapter "Comments on some taxa not reported from the Czech Republic").

I revised 1 collection (kindly provided by P. Roux from his private herbarium) of each of 4 taxa recognised in this



Text-fig. 12. *Gymnopilus picreus*: 1 – hyaline pileocystidia (from JH 564/98, 177/01, 298/02, 200/97, 171/01, all collections kept at PRM); 2 – cylindrical terminal elements of hyphae from pileus cuticle having capitate apex and strongly pigmented wall, Srní, Povydří protected area between Čeňkova Pila and Hrádecký potok, JH 477/02 (PRM); 3 – normal terminal cells of hyphae from pileus cuticle, Kvilda, Mezilesní slať peat bog, JH 257/99 (PRM). For explanations see Material and Methods. Scale bar = 10 µm.

group by Bon et Roux (2002): *Gymnopilus picreus, G. liquiritiae* var. *liquiritiae, G. liquiritiae* var. *satur, G. liquiritiae* var. *satur* f. *velutinus* ad int. There really is a difference in presence of pileocystidia: they are present in the collection identified as *G. picreus* and absent in all collections of *G. liquiritiae*. However, as shown above, my results do not confirm the separation of these taxa based among others on the presence of cystidia. As Bon et Roux cite a very small number of collections studied, it seems that they overestimated some differences clearly correlating in a small number of collections but not correlating when more material is studied. In the future, the correlation between presence or absence of pileocystidia (which is generally an important character) and macrocharacters should be studied on a broader basis and include modern methods (DNA techniques etc.). Moreover, the basionym *Flammula satura* Kühner [Bull. Soc. Nat. Oyonnax 10–11, Suppl. (Mém. hors. série, no. 2): 4, 1957] is invalidly published since two alternative names are given simultaneously (the variants are: *Gymnopilus satur, Fulvidula satura*). The new combination *Gymnopilus liquiritiae* var. *satur* created by Bon et Roux (2002) is therefore also invalid.

Gymnopilus picreus was selected by Høiland (1990: 258) as the new lectotype of the genus *Gymnopilus* instead of *G. liquiritiae*, which was designated mechanically and is a species hard to interpret (see above). I agree with Høiland's opinion. The work by Guzmán-Dávalos et al. (2003) based on sequence data from the ITS region of ribosomal DNA showed that *G. picreus* stands outside the well-supported clade containing *Gymnopilus* species. However, Rees et al. (2002, using the same method) showed that its separation from the remaining species of *Gymnopilus* is only weakly supported.

Collections studied:

Croatia – Gorski Kotar, Delnice, Crni Lug, *Abies*, on trunk, 1 Oct 1965, leg. M. Tortić (PRM 624969).

Czech Republic – České Švýcarsko National Park, Kyjov near Krásná Lípa, Čerstvý důl gorge, *Picea abies*, on fallen trunk, 27 Sep 2002, leg. J. Holec, JH 295/02 (PRM 896815). – Ditto, Kyjovské údolí valley, *Picea abies*, fallen trunk without bark, 27 Sep 2002, leg. J. Holec, JH 298/02 (PRM 896817). – Krkonoše Mts., Harrachov, Alžbětinka, *Picea abies*, fallen decaying trunk, 16 Sep 1999, leg. V. Antonín (BRNM 652635). – Šumava Mts., between Borová Lada and Horní Vltavice, site called Pravětínská lada, *Pinus sylvestris*, on decaying trunk, 28 Sep 2001, leg. J. Holec, JH 517/01 (PRM). – Šumava Mts., České Žleby, Radvanovický hřbet mountain ridge, *Picea abies*, on decaying trunk, 4 Aug 1997, leg. J. Holec, JH 136/97 (PRM 898180). – Šumava Mts., Jelení Vrchy near Nová Pec, Pod kanálem protected area, *Fagus sylvatica*, 30 Sep 2000, leg. J. Holec, JH 171/00 (PRM 897840). – Šumava Mts., Kvilda, Mezilesní slať peat bog, *Betula*, on decayed trunk, 18 Sep 1999, leg. J. Holec, JH 257/99 (PRM 898071). – Šumava Mts., Kvilda, Prameny Vltavy protected area, *Picea abies*, on decaying trunk, 26 Sep 1994, leg. J. Holec, JH 190/94 (PRM 886882). – Šumava Mts., Lenora, Malá Niva peat bog (protected area), *Pinus sylvestris*, on fallen trunk, 4 Aug 1998, leg. J. Holec, JH 383/98 (PRM 897127). – Ditto, *Picea abies*, on decaying trunk, 6 Aug 1997, leg. J. Holec, JH 200/97 (PRM 898226). – Šumava Mts., Nová Pec, Plechý mountain, *Picea abies*, on decaying trunk, 24 Sep 1997, leg. J. Holec, JH 401/97 (PRM 891302). – Ditto, *Picea abies*, on fallen trunk, 26 Aug 1996, leg. J. Holec, JH 304/96 (PRM 889106). – Šumava Mts., Nová Pec, near Plešné jezero lake, *Picea abies*, on decaying trunk, 23 Sep 1997, leg. J. Holec, JH 362/97 (PRM 891315). – Šumava Mts., Prášily, slope above Laka lake, *Picea abies*, on wood, 30 Sep 1994, leg. J. Holec, JH 281/94 (PRM 885988). – Šumava Mts., Srní, Dračí skály protected area, on decaying trunk of a conifer, 3 Oct 2001, leg. J. Holec, JH 612/01 (PRM). – Šumava Mts., Srní, Hrádecký potok stream valley, *Pinus sylvestris*, on decaying trunk, 7 Oct 1998, leg. J. Holec, JH 860/98 (PRM 897535). – Šumava Mts., Srní, Povydří protected area, *Pinus sylvestris*, on strongly decayed trunk, 16 Sep 1998, leg. J. Holec, JH 500/98 (PRM 897219). – Ditto, *Picea abies*, on decayed trunk among mosses, 19 Sep 1998, leg. J. Holec, JH 564/98 (PRM 897281). – Ditto, *Picea abies*, on fallen trunk, 16 Sep 1998, leg. J. Holec, JH 494/98 (PRM 897213). – Ditto, between Čeňkova Pila and Hrádecký potok, *Picea abies*, on fallen trunk, 10 Oct 2002, leg. J. Holec, JH 477/02 (PRM). – Šumava Mts., Stožec near Volary, Spálený luh peat bog, *Betula*, on decaying trunk, 28 Sep 2000, leg. J. Holec, JH 153/00 (PRM 897825). – Šumava Mts., Strážný, Strážný mountain, *Fagus sylvatica*, on decaying trunk, 28 Sep 2001, leg. J. Holec, JH 504/01 (PRM). – Ditto, *Picea abies*, on decaying trunk, 28 Aug 2001, leg. J. Holec, JH 177/01 (PRM). – Šumava Mts., Strážný, Častá protected area, *Picea abies*, on decaying trunk among mosses, 27 Aug 2001, leg. J. Holec, JH 173/01 (PRM). – Ditto, *Picea abies*, on decaying trunk among mosses, 27 Aug 2001, leg. J. Holec, JH 174/01 (PRM). – Šumava Mts., Železná Ruda, near Černé jezero lake, on fallen trunk (*Picea*?, *Abies*?), 28 Sep 1994, leg. J. Holec, JH 229/94 (PRM – 885669). – Tábor, Prudice, Na zátokách forest, *Pinus sylvestris*, on decayed trunk, 1 Sep 1946, leg. M. Svrček (PRM 521021). – Novohradské hory Mts., Žofínský prales virgin forest, *Picea abies*, on trunk, 21 Sep 1991, leg. V. Antonín (BRNM 553291). – Bruntál, Karlov pod Pradědem, at the foot of Klobouk hill, *Picea abies*, on stump, 25 Aug 1991, leg. A. Vágner (BRNM 568555). – Vsetín, Javorníky Mts., Velké Karlovice, Razula virgin forest, *Abies alba*, on fallen trunk, 21 Sep 1994, leg. V. Antonín (BRNM 599105).

Sweden – Småland, Femsjö, Rävabockarna nära Arvaviken, 30 Aug 1940, leg. S. Lundell (PRM 677005). – Uppland, Vada, Langsjön, 26 Sep 1946, leg. G. Haglund (PRM 677014).

Ukraine – Eastern Carpathians, near Dilove (Trebušany), Berlebash stream valley (Berlebaš), *Abies alba*, Aug 1937, leg. A. Pilát (PRM 488062). – Eastern Carpathians, near Dilove (Trebušany), Biliyi stream valley (Bílý potok), *Picea abies*, Aug 1935, leg. A. Pilát (PRM 20477).

Collections published by Bon et Roux (2002): France: Isère, Seiglières, 17 Sep 1996, leg. P.-A. Moreau (herb. P.-A. Moreau no. 96091701, as *G. picreus*). – Hte-Loire, Riotord, 23 Sep 1990, leg. P. Bordes (herb. P. Roux no. 90.9.848, as *G. liquiritiae*). – Hte-Loire, Sembadel, 2 Sep 2001, leg. P. Roux (herb. P. Roux no. 01.09.3606, as *G. liquiritiae* var. *satur*). Slovakia: Starý Smokovec, 23 Aug 1997, leg. F. Cadène (herb. P. Roux no. 97.8.2834, as *G. liquiritiae* var. *satur* f. *velutina* ad int.).

Comments on some taxa not reported from the Czech Republic

Gymnopilus odini (Fr.) Bon et P. Roux

Bas.: *Agaricus (Hebeloma) odini* Fr., Monogr. hymenomyc. Suec. 2: 300, 1863.

≡ *Gymnopilus odini* (Fr.) Kühner et Romagn., Fl. anal. champ. supér.: 323, 1953 (invalid combination: basionym not cited).
≡ *Gymnopilus odini* (Fr.) Bon et P. Roux, Fungi non delineati 17: 10, 2002.
≡ *Hebeloma odini* (Fr.) Sacc., Syll. fung. 5: 808, 1887.

Selected illustration: Fries: fig. 114/3. – Ludwig: fig. 31.15.

Characteristics in brief (based on data by Høiland 1990, Ludwig 2001): Fruitbodies small, pileus up to 25 mm, bright coloured, orange red-brown, with almost smooth surface, at most finely fibrillose-scaly, taste bitterish, spores ovoid-ellipsoid to amygdaliform, (6–)6.5–7.5(–8.5) × (3.5–)4.0–4.8(–5.5) µm, verrucose. Growing on sandy or peaty soil and on burnt places in coniferous forests, heathlands and mires, very rare.

Description: I have not seen fresh fruitbodies in the field. For recent descriptions see Høiland (1990: 275), Ludwig (2001: 162).

Fructification: May–November (Høiland 1990, Ludwig 2001).

Ecology: The following substrates and habitats are given in reliable literature (Høiland 1990, Ludwig 2001): sandy or peaty soil and burnt places in coniferous forests, heathlands and mires.

Distribution: The presence of *Gymnopilus odini* in the Czech Republic is neither reported in reliable literature nor documented by herbarium specimens. I suppose that the species grows here but its occurrence has not been proved to date. The species is known from many European countries but seems to be very rare elsewhere.

Discussion: See discussion on *Gymnopilus decipiens*.

Slightly aberrant finds from *Sphagnum* stands were published by Bon et Roux (2002: pl. 8-B, p. 45) and Cetto (1970–1993: no. 2670). Moser et al. (2001) described a related species, *Gymnopilus turficola* M.M. Moser et H. Ladurner, growing in palsa mires on peat in subarctic areas in Norway and Finland. Its distinguishing characters are the olive-brown pileus (the only European species having greenish colours), bluish to yellow-green lamellae when young, dextrinoid spores, presence of pleurocystidia, strong odour of iodoform and habitat on peat in subarctic to arctic regions.

Gymnopilus stabilis (Weinm.) Kühner et Romagn. ex Bon

Bas.: *Agaricus stabilis* Weinm., Hymen. Gasteromyc.: 210, 1836.
≡ *Gymnopilus stabilis* (Weinm.) Kühner et Romagn., Fl. anal. champ. supér.: 322, 1953 (invalid combination: without citation of the basionym).
≡ *Gymnopilus stabilis* (Weinm.) Kühner et Romagn. ex Bon, Doc. Mycol. 61: 16, 1985.

Discussion: *Gymnopilus stabilis* is characterised (Kühner et Romagnesi 1953, 1957; Moser 1983; Orton 1993; Ludwig 2000, 2001) as a robust species with firm fruitbodies, veil forming a whitish coating on pileus and rather distinct, but soon missing annulus on stipe. The species is close to *G. penetrans*. Ludwig (2000, 2001) also mentions roughly verrucose spores, however, his conclusions are based on one find only. Similarly, *G. stabilis* is referred to as a rare species by Orton (1993) and Keller et Moser (2001). I have never seen such fruitbodies in the field.

In my opinion, the given delimiting characters are so variable in *Gymnopilus* that they cannot be used for species delimitation. When the great variability of *G. penetrans* (see discussion on that species) is considered, I think that *G. stabilis* represents only a robust form of *G. penetrans* with more prominent velum (see e.g. the photo by Dähncke 1993: 701). I personally saw fruitbodies of *G. penetrans* the young pilei of which were covered with a thick layer of greyish white tomentose-arachnoid veil.

Gymnopilus liquiritiae (Pers.) P. Karst.

Bas.: *Agaricus liquiritiae* Pers., Syn. meth. fung.: 306, 1801.
≡ *Gymnopilus liquiritiae* (Pers.) P. Karst., Bidrag Kännedom Finlands Natur Folk 32: 400, 1879. (the name is not sanctioned by Fries – the inclusion of Fries into the author's abbreviations by some recent mycologists is erroneous).
≡ *Flammula liquiritiae* (Pers.) P. Kumm., Führ. Pilzk.: 82, 1871.
≡ *Dryophila liquiritiae* (Pers.) Quél., Enchir. fung.: 71, 1886.

Discussion: The species is a lectotype of the genus *Gymnopilus* selected by Earle (1909). The history of the typification is described by Donk (1962). Høiland (1990) impeached this selection showing that the choice was mechanical, the name *G. liquiritiae* is hard to interpret and has been variously interpreted during the years. He proposed a new lectotype, *Gymnopilus picreus* (Pers.: Fr.) P. Karst. His proposal has not been accepted by recent authors dealing with *Gymnopilus* (e.g. Bon et Roux 2002). However, for the reasons discussed below, I fully agree with him.

The name *Gymnopilus liquiritiae* really is hard to interpret as the original description by Persoon (1801) is too short for a reliable interpretation (see also Høiland 1990). It has been used at least in three different ways during history:

1. I agree with Høiland (1990: 257) that Fries (1838, 1867–1884: fig. 119/1) and Karsten (1879) interpreted the name as a fungus similar to *G. picreus* but having a paler and striate (not pruinose) stipe. Such an interpretation is also presented by Horak (1968). Bon et Roux (2002) add that *G. liquiritiae* has a non-pruinose pileus and no true pileocystidia, whereas *G. picreus* has capitate pileocystidia, a pruinose stipe and pruinose pileus. *Gymnopilus liquiritiae* sensu Moser (1983) is a relatively large fungus (pileus 3–8 cm) which differs from the other interpretations.
2. Kühner et Romagnesi (1953: 322) used the name for a fungus from the *G. penetrans* group differing from it by a smaller pileus with a margin becoming grooved, and a hollow stipe. This concept is not followed by any modern author.
3. Bresadola (1927–1960: tab. 783, as *Flammula liquiritiae*) used the name for a small-spored fungus, later described as *Gymnopilus microsporus* (Singer) ex Singer. For detailed discussion see under *G. bellulus*.

It is interesting that most modern authors who worked with real fresh material of *Gymnopilus* did not include *Gymnopilus liquiritiae* in their publications (Høiland 1990; Ludwig 2000, 2001, Breitenbach et Kränzlin 2000). Orton (1993) has no recent record from Britain. It shows convincingly that it is unclear whether such a fungus really exists. The only work where *G. liquiritiae* is well documented is the publication by Bon et Roux (2002) where descriptions, photographs and studied specimens are given. In my opinion, their *G. liquiritiae* is conspecific with *G. picreus*. In my material from the Czech and Slovak Republics, I was not able to distinguish two distinct groups (*G. picreus* vs. *G. liquiritiae*) using the characters given in paragraph 1 of this discussion (see also thorough discussion under *G. picreus*).

As the name *Gymnopilus liquiritiae* (Pers.) P. Karst. is hard to interpret and has been used in different ways in history, it should be rejected in my opinion. If it is considered a synonym of *Gymnopilus picreus* (Pers.: Fr.) P. Karst., then *G. picreus* must be preferred, as it is a sanctioned name. If this proves to be correct, then there is no problem with the lectotype of the generic name *Gymnopilus – G. picreus* proposed by Høiland (1990) will include *G. liquiritiae*, too.

Gymnopilus junonius (Fr.: Fr.) P.D. Orton

Bas.: *Agaricus junonius* Fr.: Fr., Syst. mycol. 1: 244, 1821.
≡ *Gymnopilus junonius* (Fr.: Fr.) P.D. Orton, Trans. Brit. Mycol. Soc. 43: 176, 1960.
≡ *Pholiota junonia* (Fr.: Fr.) P. Karst., Bidrag Kännedom Finlands Natur Folk 32: 301, 1879.
≡ *Pholiota spectabilis* var. *junonia* (Fr.: Fr.) J. E. Lange, Fl. agaric. danic. 5: 100, 1940.
= *Pholiota citrinofolia* Métrod, Bull. Soc. Nat. Oyonnax 14+15: 141, 1962; invalid name: published without Latin diagnosis (for taxonomic evaluation see Holec 2001a).

Discussion: Taxonomy and nomenclature of this fungus are discussed under *Gymnopilus spectabilis*. In brief, the name in its original sense represents a small fungus (pileus up to 5 cm) with glabrous pileus surface and cylindrical stipe growing solitary. I do not know such collections from the CR. However, a fungus having these characters and named *G. junonius* is presented by several recent authors (e.g. Bon et Roux 2002, Robich 1989). In most recent publications, the name *G. junonius* is used for robust fungus traditionally known as *G. spectabilis* or includes both robust and slender forms.

Acknowledgements

I thank Zdeněk Pouzar (Praha, Czech Republic) and Klaus Høiland (Oslo, Norway) for valuable advice and comments on the manuscript, Bettye J. Rees (Sydney, Australia) for many fruitful discussions and sending reprints, Laura Guzmán-Dávalos (Guadalajara, Mexico) for discussions and reprints and Michal Tomšovský (Praha, Czech Republic) for performing the DNA sequencing. The following people kindly provided fresh as well as dried collections or photographs for this study (listed in alphabetic order): Vladimír Antonín (Brno, Czech Republic), Miroslav Beran (České Budějovice, Czech Republic), Helena Deckerová (Ostrava, Czech Republic), Michal Graca (Ostrava, Czech Republic), Irmgard Krisai-Greilhuber (Wien, Austria), Pierre-Arthur Moreau (Lille, France), Pierre Roux (Ste. Sigolène, France) and Martina Vašutová (Olomouc, Czech Republic). Curators of the following herbaria are kindly acknowledged for arranging visits to or loans from their institutions: AH, BRNM, BRA, CB, LE, NYS, MICH, PR, PRM, TR, W, WU; or providing information: BUF, NY, M, S. The technical assistance of Ladislav Šafránek and Lenka Edrová from my department was invaluable during the whole study. The work was financially supported by the Grant Agency of the Czech Republic (project no. 206/01/P05) and the Ministry of Culture of the Czech Republic (MK0CEZ99F0201, MK00002327201).

References

Antonín, V., Škubla, P. (2000): Interesting macromycetes found in the Czech and Slovak Republics. – In: Fungi non delineati, vol. 11, 46 p., Alassio.

Antonín, V., Vágner, A. (2000): Makromycety (Makromyceten). – In: Antonín, V., Gruna, B., Hradílek, Z., Vágner, A., Vězda, A., Houby, lišejníky a mechorosty Národního parku Podyjí, p. 29–95, Brno (in Czech and German).

Antonín, V., Vágner, A., Vampola, P. (2000): Flóra makromycetů (Macroscopic fungi). – In: Vicherek, J. et al., Flóra a vegetace na soutoku Moravy a Dyje, p. 25–82, Brno (in Czech with English summary).

Arnolds, E., Kuyper, T. W., Noordeloos, M. E. (1995): Overzicht van de paddestoelen in Nederland. – 871 p., Wijster.

Bas, C., Kuyper, T. W., Noordeloos, M. E., Vellinga, E.C. (1988): Flora agaricina neerlandica. Vol. 1. – 182 p., Rotterdam.

Bon, M. (1988): Pareys Buch der Pilze. – 362 p., Hamburg.

Bon, M., Roux, P. (2002): Le genre Gymnopilus P. Karst. en Europe. – In: Fungi non delineati, vol. 17: 1–52, Alassio.

Breitenbach, J., Kränzlin, F. (2000): Pilze der Schweiz. Band 5, Blätterpilze 3. Teil, Cortinariaceae. – 340 p., Luzern.

Bresadola, J. (1905): Hymenomycetes novi vel minus cogniti. – Ann. Mycol. 3: 159–164.

Bresadola, J. (1927–1960): Iconographia mycologica. Vol. 1–28. – Milano.

Brummitt, R. K., Powell, C.E. (1992): Authors of plant names. – 732 p., Kew.

Cetto, B. (1970–1993): I funghi dal vero. Vol. 1–7. – 3042 figs., Trento.

Cooke, M. C. (1881–1891): Illustrations of British fungi. – 1198 plates, London.

Cooke, M. C. (1883): Handbook of British fungi. Ed. 2. – 398 p., London.

Clémençon, H. (1974): Die Wandstrukturen der Basidiosporen. V. Pholiota und Kuehneromyces, verglichen mit Galerina und Gymnopilus. – Z. Pilzk. 40: 105–126.

Clémençon, H. (1979): Biometrische Untersuchungen zur Variabilität der Basidiosporen. – Beih. Sydowia 8: 110–138.

Clémençon, H. (2002): Mycelial morphology, rhizomorph anatomy and primordium formation of Gymnopilus penetrans. – Feddes Repert. 113: 63–79.

Clémençon, H. (2003): Der Gefleckte Flämmling und der Tannen-Flämmling/Gymnopilus penetrans, Gymnopilus sapineus. – Schw. Z. Pilzk. 81(6): 246–248.

Černý, A., Kříž, K. (1972): Druhé mykologické dny na Moravě (2. Mykologische Studientage in Mähren). – Čes. Mykol. 26: 121–125 (in Czech with German summary).

Dangy-Caye, M.-P., Arpin, N. (1974): Présence de styryl-6á pyrones, notamment de bis-noryangonine, d'hispidine, chez Gymnopilus penetrans (Fr. ex Fr.) Murr. – Bull. Soc. Linn. Lyon, Trav. Mycol. dédiés R. Kühner: 109–118.

Deneyer, Y., Moreau, P.-A. and Wuilbaut, J.-J. (2002): Gymnopilus igniculus sp. nov., nouvelle espèce muscicole des terrils de charbonnage. – Doc. Mycol. 32(125): 11–16.

Dennis, R. W. G., Orton, P. D., Hora, F. B. (1960): New check list of British Agarics and Boleti. – Trans. Brit. Mycol. Soc., suppl.: 1–225.

Donk, M. A. (1962): The generic names proposed for Agaricaceae. – Beih. Nova Hedwigia 5: 1–320.

Earle, F. S. (1909): The genera of North American gill fungi. – Bull. New York Bot. Gard. 5: 373–451.

Enderle, M. (2004): Die Pilzflora des Ulmer Raumes. – 521 p., Ulm.

Favre, J., Maire R. (1937): Sur un Naucoria des tourbières jurassiennes. – Bull. Soc. Mycol. France 53: 267–270.

Fausto-Guerra, S., Guzmán-Dávalos, L., Velázquez-Hueso, J. C. (2002): Cultural studies of Gymnopilus species (Cortinariaceae, Agaricales). – Mycotaxon 84: 429–444.

Fries, E. (1818): Observationes mycologicae praecipue ad illustrandam Floram Suecicam, vol. 2. – 372 p., Copenhagen.

Fries, E. (1821): Systema mycologicum, vol. 1. – 520 p., Lund.

Fries, E. (1828): Elenchus fungorum, vol. 1. – 238 p., Greifswald.

Fries, E. (1832): Systema mycologicum, Index alphabeticus. – 202 p., Greifswald.

Fries, E. (1838): Epicrisis systematis mycologici, seu synopsis Hymenomycetum. – 610 p., Uppsala.

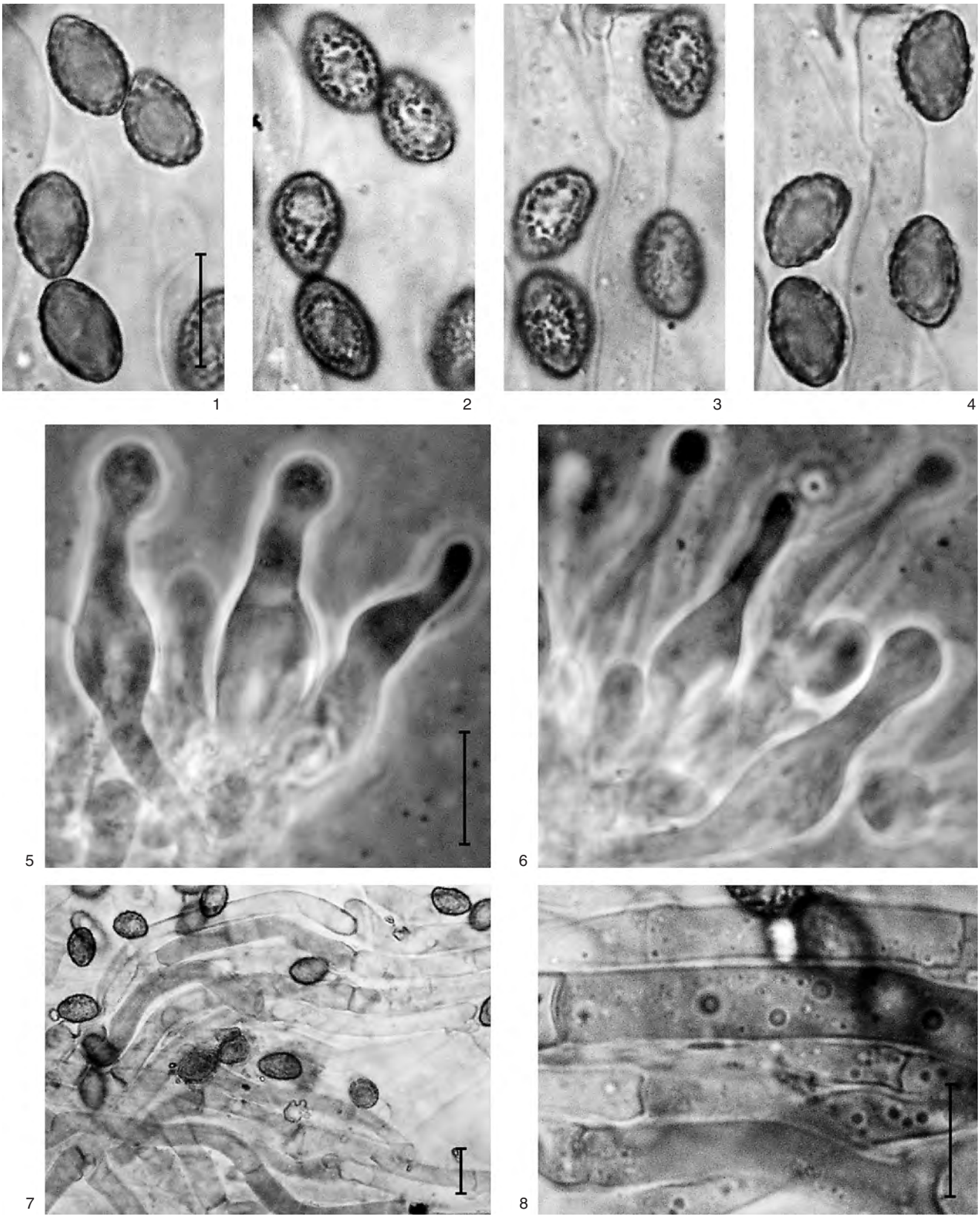
Fries, E. (1874): Hymenomycetes europaei sive epicriseos systematis mycologici editio altera. – 756 p., Uppsala.

Fries, E. (1867–1884): Icones selectae Hymenomycetum nondum delineatorum, vol. 1–2. – Stockholm.

Gartz, J. (1989): Occurrence of psilocybin, psilocyn and baeocystin in Gymnopilus purpuratus. – Persoonia 14: 19–22.

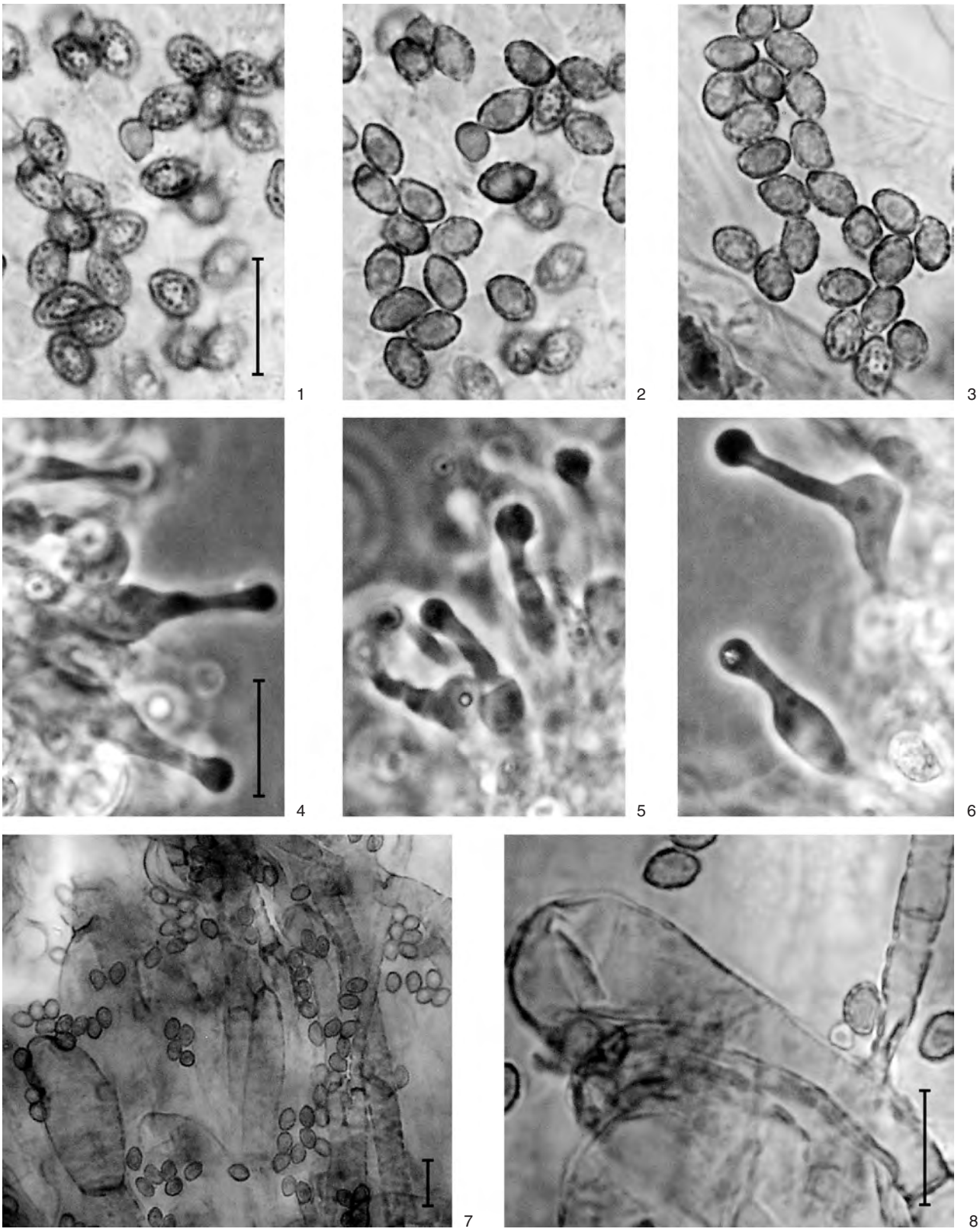
Giacomoni, L. (1997): Les poisons neurotropes de Gymnopilus spectabilis: une revision Syndromes Psycholeptiques. – Bull. Fed. Ass. Mycol. Mediterr. 12: 21–32.
Greuter, W., et al. (2000): International code of botanical nomenclature (Saint Luis Code) adopted by the sixteenth international botanical congress St. Louis, Missouri, July – August 1999. – 474 p., Königstein.
Guzmán-Dávalos, L. (1994): New species of Gymnopilus (Agaricales, Cortinariaceae) from Mexico. – Mycotaxon 50: 333–348.
Guzmán-Dávalos, L. (1995): Further investigations on Gymnopilus (Agaricales, Cortinariaceae). A new section and a new species from Mexico. – Mycotaxon 54: 117–124.
Guzmán-Dávalos, L. (1996a): Primer registro de Gymnopilus (Agaricales, Cortinariaceae) de Guatemala y un análisis de las especies centroamericanas y del Caribe. – Rev. Mex. Mic. 12: 89–96.
Guzmán-Dávalos, L. (1996b): New records of the genus Gymnopilus (Agaricales, Cortinariaceae) from Mexico. – Mycotaxon 59: 61–78.
Guzmán-Dávalos, L. (1997): First record of Gymnopilus (Agaricales, Cortinariaceae) from Guatemala and an analysis of Caribbean and centroamerican species. – Rev. Mexic. Micol. 12: 89–96.
Guzmán-Dávalos, L. (2003): Type studies of Gymnopilus (Agaricales) I. – Mycotaxon 86: 395–423.
Guzmán-Dávalos, L., Guzmán, G. (1986): Hongos del estado de Jalisco, VII. El genere Gymnopilus (Cortinariaceae). – Rev. Mexic. Micol. 2: 157–185.
Guzmán-Dávalos, L., Guzmán, G. (1995): Toward a monograph of the genus Gymnopilus (Cortinariaceae) in Mexico. – Doc. Mycol. 98–100: 197–212.
Guzmán-Dávalos, L., Ovrebo, C.L. (2001): Some species of Gymnopilus from Costa Rica and Panama. – Mycologia 93: 398–404.
Guzmán-Dávalos, L., Mueller, M. A., Cifuentes, J., Miller, A.N., Santerre, A. (2003): Traditional infrageneric classification of Gymnopilus is not supported by ribosomal DNA sequence data. – Mycologia 95: 1204–1214.
Hansen, L., Knudsen, H. (eds.) (1992): Nordic macromycetes. Vol. 2. – 474 p., Helsinki.
Hatfield, M. A., Valdes, I.J., Smith, A.H. (1978): The occurrence of psilocybin in Gymnopilus species. – Lloydia 44: 140–144.
Hejný, S., Slavík, B. [eds.] (1988): Květena České socialistické republiky. Vol. 1 [Flora of the Czech Socialist Republic. Vol. 1]. – 557 p., Praha [in Czech].
Henrici, A. (2002): Notes and records. – Field Mycol. 3(1): p. 28–30; colour photographs by T. Leech: back cover.
Hesler, L.R. (1969): North American Species of Gymnopilus. – Mycologia Memoir 3: 1–117.
Høiland, K. (1990): The genus Gymnopilus in Norway. – Mycotaxon 39: 257–279.
Holec, J. (1999): A revision of new species of Pholiota and Flammula (Fungi, Agaricales) described by Josef Velenovský. – Czech Mycol. 52(1): 17–39.
Holec, J. (2001a): The genus Pholiota in central and western Europe. – In: Libri Botanici, vol. 20: 1–220, Eching.
Holec, J. (2001b): Remarks to the taxonomy of Gymnopilus josserandii based on records from the Bohemian Forest (Czech Republic). – Czech Mycol. 53(2): 131–137.
Holec, J. (2002): The genus Gymnopilus (Basidiomycetes, Agaricales) in the Czech Republic. – In: IMC7, Book of abstracts, p. 207 (abstract of poster presented at The 7th International Mycological Congress, Oslo 11–17 August 2002).
Holec, J., Antonín, V., Graca, M., Moreau, P.-A. (2003): Gymnopilus igniculus – find from the Czech Republic and notes on its variability. – Czech Mycol. 55(3–4): 161–172.
Holmgren, P.K., Holmgren, N.H., Barnett, L.C. (1990): Index herbariorum. Part I: The herbaria of the world. Ed. 8. – 693 p., New York.
Horak, E. (1968): Synopsis generum Agaricalium. – In: Beiträge zur Kryptogamenflora der Schweiz, vol. 13: 1–741, Wabern-Bern.
Josserand, M. (1948): Notes critiques sur quelques champignons de la région Lyonnaise. – Bull. Soc. Mycol. France 64: 5–32.
Karsten, P. A. (1879): Rysslands, Finlands och den Skandinaviska halföns Hattsvampar. Vol. 1. Skifsvampar. – Bidrag Kännedom Finlands Natur Folk 32: p. i-xxviii, 1–571.
Keller, J. (1997): Atlas des basidiomycetes vus aux microscopes electroniques. – 173 p., 324 plates, Switzerland.
Keller, G., Moser, M.M. (2001): Die Cortinariaceae Österreichs. Catalogus Florae Austriae, III. Teil, Pilze, Heft 2, Agaricales: Cortinariaceae. – In: Biosystematics and ecology series, no. 19: 1–220, Wien.
Klán, J. (1990): Význam ligninového testu v mykotoxikologii a chemotaxonomii hub (Lignin test – its mycotoxicological and chemotaxonomical significance). – Čes. Mykol. 44: 220–224 (in Czech with English summary).
Klán, J., Baudišová, D. (1990): Enzyme activity of mycelial cultures of saprotrophic macromycetes (Basidiomycotina). I. Methods of hydrolases estimation. – Čes. Mykol. 44: 203–211.
Kornerup, A., Wanscher, J.H. (1981): Taschenlexikon der Farben. Ed. 3. – Muster-Schmidt Verlag, Zürich (German edition of the Methuen handbook of colours).
Kotlaba, F., Pouzar, Z. (1964): Preliminary results of the staining of spores and other structures of Homobasidiomycetes in cotton blue and its importance for taxonomy. – Feddes Repertorium 69: 131–142.
Kreisel, H. and Lindequist, U. (1988): Gymnopilus purpuratus, ein psilocybinhaltiger Pilz adventiv im Bezirk Rostock. – Z. Mykol. 54: 73–76.
Kreisel, H. et al. (1987): Pilzflora der Deutschen Demokratischen Republik. – 281 p., Jena.
Krieglsteiner, G.J. (1991): Verbreitungsatlas der Großpilze Deutschlands (West). Band 1: Ständerpilze. Teil B: Blätterpilze. – 1016 p., Stuttgart.
Krisai-Greilhuber, I. (1992): Die Makromyceten im Raum von Wien. Ökologie und Floristik. – In: Libri Botanici, vol. 6, 192 p., Eching.
Kuyper, T. W. (1995): Gymnopilus P. Karst. – In: Arnolds, E., Kuyper, T. W., Noordeloos, M. E. (eds.), Overzicht van de paddestoelen in Nederland, p. 215–217, Wijster.
Kühner, R. (1980): Les Hyménomycètes agaricoides. – In: Bull. Soc. Linn. Lyon, vol. 49, no. spec.: 1–1025.
Kühner, R., Romagnesi, H. (1953): Flore analytique des champignons supérieurs. – 557 p., Paris.
Kühner, R., Romagnesi, H. (1957): Compléments à la "Flore Analytique" VII. – Espèces nouvelles, critiques ou rares de Naucoriacées, Coprinacées, Lépiotacées. – Bull. Soc. Nat. Oyonnax 10–11, Suppl. (Mém. hors. série, no. 2): 1–94.
Lange, J. E. (1935–1940): Flora agaricina danica. Vol. 1–5. – Copenhagen.
Lawrence, G. H. M., Buchheim, A. F. G., Daniels, G.S., Dolezal, H. (1968): B-P-H. Botanico-Periodicum-Huntianum. – 1063 p., Pittsburgh.
Ludwig, E. (2000): Pilzkompendium. Band 1. Abbildungen. – 192 p., Eching.
Ludwig, E. (2001): Pilzkompendium. Band 1. Beschreibungen. – 758 p., Eching.

Luschka, N. (1993): Die Pilze des Nationalparks Bayerischer Wald. – Hoppea 53: 5–363.
Maurice, J.-P. (2001): Gymnopilus corsicus Romagnesi. – Bull. Fed. Ass. Mycol. Mediterr., N. S., no. 19: 27–32.
Moncalvo, J.-M., Vilgalys, R., Redhead, S. A., Johnson, J. E., James, T. Y., Aime, M. C., Hofstetter, V., Verduin, S. J. W., Larsson, E., Baroni, T. J., Thorn, R. G., Jacobsson, S., Clémençon, H., Miller, O. K. Jr. (2002): One hundred and seventeen clades of euagarics. – Mol. Phylogenet. Evol. 23: 357–400.
Moreno, G., Esteve-Raventós, F. (1990): Gymnopilus microsporus (Sing.) Sing. y Simocybe iberica sp. nov. en España peninsular. – Riv. Micol. 33: 287–292.
Moser, M. (1983): Die Röhrlinge und Blätterpilze. – In: Kleine Kryptogamenflora, ed. 5, vol. 2b/2: 1–533, Stuttgart.
Moser, M., Ladurner, H., Peintner, U., Kirchmair, M. (2001): Gymnopilus turficola (Agaricales), a new species from subarctic palsa mires and its phylogenetic relationship based on ITS sequences. – Nord. J. Bot. 21: 321–327.
Orton, P. D. (1960): New check list of British Agarics and Boleti. Part III. Notes on genera and species in the list. – Trans. Brit. Mycol. Soc. 43: 159–439.
Orton, P. D. (1993): Gymnopilus. – In: Watling, R., Gregory, N.M., British fungus flora. Agarics and Boleti, vol. 6: 58–72, Edinburgh.
Pegler, D. N. (1969): British records 97. Gymnopilus bellulus (Peck) Murr. – Trans. Brit. Myc. Soc. 52: 323–329.
Pegler, D. N., Young, T. W. K. (1971): Basidiospore morphology in the Agaricales. – Beih. Nova Hedwigia 35: 1–210.
Persoon, C. H. (1801): Synopsis methodica fungorum. – 706 p., Göttingen.
Peintner, U., Bougher, N. L., Castellano, M. A., Moncalvo, J.-M., Moser, M. M., Trappe, J. M., Vilgalys, R. (2001): Multiple origins of sequestrate fungi related to Cortinarius (Cortinariaceae). – Amer. J. Bot. 88: 2168–2179.
Phillips, R. (1981): Mushrooms and other fungi of Great Britain & Europe. – 288 p., London.
Rees, B. J. (2003): Gymnopilus perplexus, a new name for G. anomalus B. J. Rees. – Mycotaxon 87: 411–412.
Rees, B. J., Lepp, H. (2000): A new species of Gymnopilus from Norfolk Island. – Australasian Mycologist 19: 36–40.
Rees, B. J., Strid, Å. (2001): Relationships between Australian and Northern Hemisphere Gymnopilus species I. New species and common misconceptions regarding earlier names. – Australasian Mycologist 20: 29–48.
Rees, B. J., Ye, J. L. (1999): Pyrrhoglossum and the small-spored species of Gymnopilus (Cortinariaceae) in eastern Australia. – Austral. Syst. Bot. 12: 255–270.
Rees, B. J., Orlovich, D. A., Marks, P. B. D. (1999): Treading the fine line between small-statured Gymnopilus and excentrically stipitate Galerina species in Australia. – Mycol. Res. 103: 427–442.
Rees, B. J., Zuccarello, G. C., Orlovich, D. A. (2002): Relationships between Australian and Northern Hemisphere Gymnopilus species II. A preliminary phylogeny of species of Gymnopilus and related genera based on internal transcribed spacer (ITS) region of ribosomal DNA. – Mycotaxon 84: 93–110.
Rees, B. J., Marchant, A., Zuccarello, G. C. (2004): A tale of two species – possible origins of red to purple-coloured Gymnopilus species in Europe. – Australasian Mycologist 22: 57–72.
Rees, B. J., Marchant, A. D., Zuccarello, G. C., Heslewood, M. M., Bartlett, J. (2003): A Southern Hemisphere contribution to the phylogenetic study of the agarics. – Australasian Mycologist 21(3): 102–110 (“2002”).
Robich, G. (1989): Alcuni interessanti Gymnopilus. – Riv. Micol. 32: 251–263.
Romagnesi, H. (1943): Quelques points de taxonomie. – Bull. Soc. Mycol. France 48: 81–89 (“1942”).
Romagnesi, H. (1976): Sur deux espèces nouvelles de Gymnopilus. – Kew Bull. 31: 443–447.
Romagnesi, H. (1979): Un Mycena, deux Gymnopilus carbonicoles. – Bull. Soc. Mycol. France 95: 139–147.
Röllin, O. (1998): Sur un Gymnopilus annelé, inconnu en Europe. – Bull. Féd. Myc. Dauphiné-Savoie 150: 38–40.
Ryman, S. (1992): Gymnopilus Karst. – In: Hansen L., Knudsen H., Nordic macromycetes. Vol. 2: 314–315, Copenhagen.
Ryman, S., Holmåsen, I. (1992): Pilze. – 718 p., Braunschweig (German edition of Svampar).
Singer, R. (1937): Notes sur quelques Basidiomycètes. III^{e} série. – Rev. Mycol. 2: 226–242.
Singer, R. (1951): The “Agaricales” (mushrooms) in modern taxonomy. – Lilloa 22: 1–832 (“1949”).
Singer, R. (1986): Agaricales in modern taxonomy. – 981 p., Koenigstein.
Stafleu, F. A., Cowan, R. S. (1976–1988): Taxonomic literature, vol. 1–7. – Utrecht.
Stearn, W. T. (1986): Botanical Latin. 3rd revised edition. – 566 p., Newton Abbot.
Stijve, T. (1995): Worldwide occurrence of psychoactive mushrooms – an update. – Czech Mycol. 48: 11–19.
Stijve, T., Kuyper, T. W. (1988): Absence of psilocybin in species of fungi previously reported to contain psilocybin and related tryptamine derivates. – Persoonia 13: 463–465.
Svrček, M. (1965): Lupenaté houby z Čech. I. [Agaricales from Bohemia. I.]. – Čes. Mykol. 19: 43–51. (in Czech).
Svrček, M. (1990): A report on mycological trips to Krkonoše Mts. (Giant Mts.), Bohemia, in the years 1986–1989. – Čes. Mykol. 44: 77–91.
Svrček, M., Kubička, J. (1971): Druhý příspěvek k poznání mykoflory Žofínského pralesa v Novohradských horách [Zweiter Beitrag zur Kenntnis der Mykoflora des Urwaldes „Žofínský prales“ im Gebirge Novohradské hory (Südböhmen)]. – Čes. Mykol. 25: 103–111 (in Czech with German summary).
Škubla, P. (2003): Mycoflora Slovaca. – 1103 p., Šaľa.
Tanaka, M., Hashimoto, K., Okuno, T., Shirahama, H. (1993): Neurotoxic oligoisoprenoids of the hallucinogenic mushroom Gymnopilus spectabilis. – Phytochemistry 34: 661–664.
Thomas, A. K., Guzmán-Dávalos, L., Manimohan, P. (2003): A new species and new records of Gymnopilus from India. – Mycotaxon 85: 297–305.
Velenovský, J. (1920–1922): České houby. Part 1–5. – 950 p., Praha.
Watling, R. (1998): Profiles of fungi. 94. Gymnopilus dilepis. – Mycologist 12(2): 61.
Weinmann, J. A (1824): Elenchus plantarum horti imperialis pawlowskiensis, agri Petropolitani; conscriptus a I.A. Weinmann, horti imperialis cultore. – 472 p., St. Petersburg.
Weinmann, J. A. (1836): Hymeno-, Gasteromycetes hucusque in imperio rossico observatos recensuit C. A. Weinmann. – 676 p., St. Petersburg.

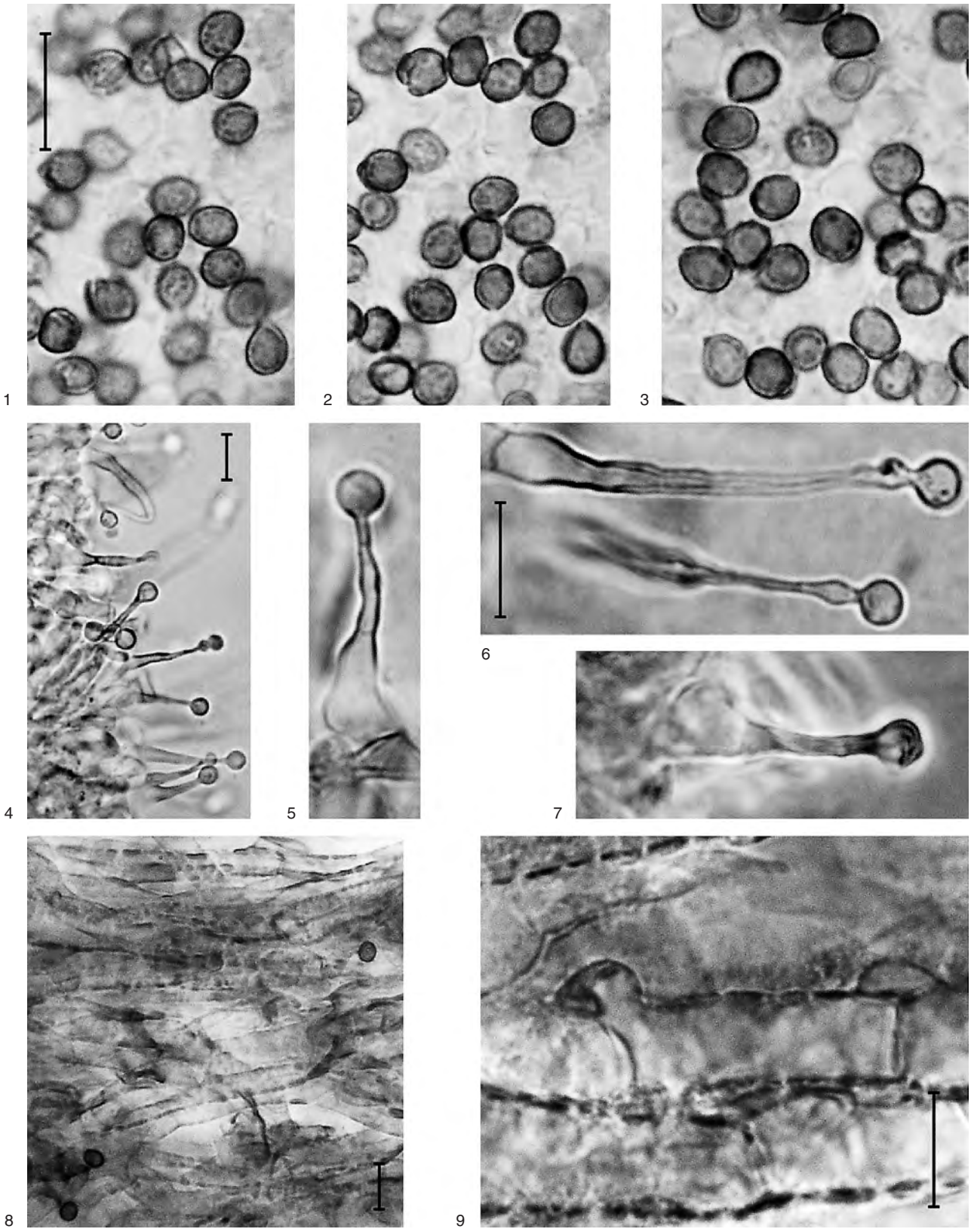


1., 4. – basidiospores (outline); 2.–3. – basidiospores (ornamentation); 5.–6. – cheilocystidia (in phase contrast); 7.–8. – pileus cuticle (surface of the scalp)
Scale bar = 10 µm. For details on collection see Collections studied.

PLATE 10 ***Gymnopilus bellulus*** (PRM 901943 = JH 171/02)

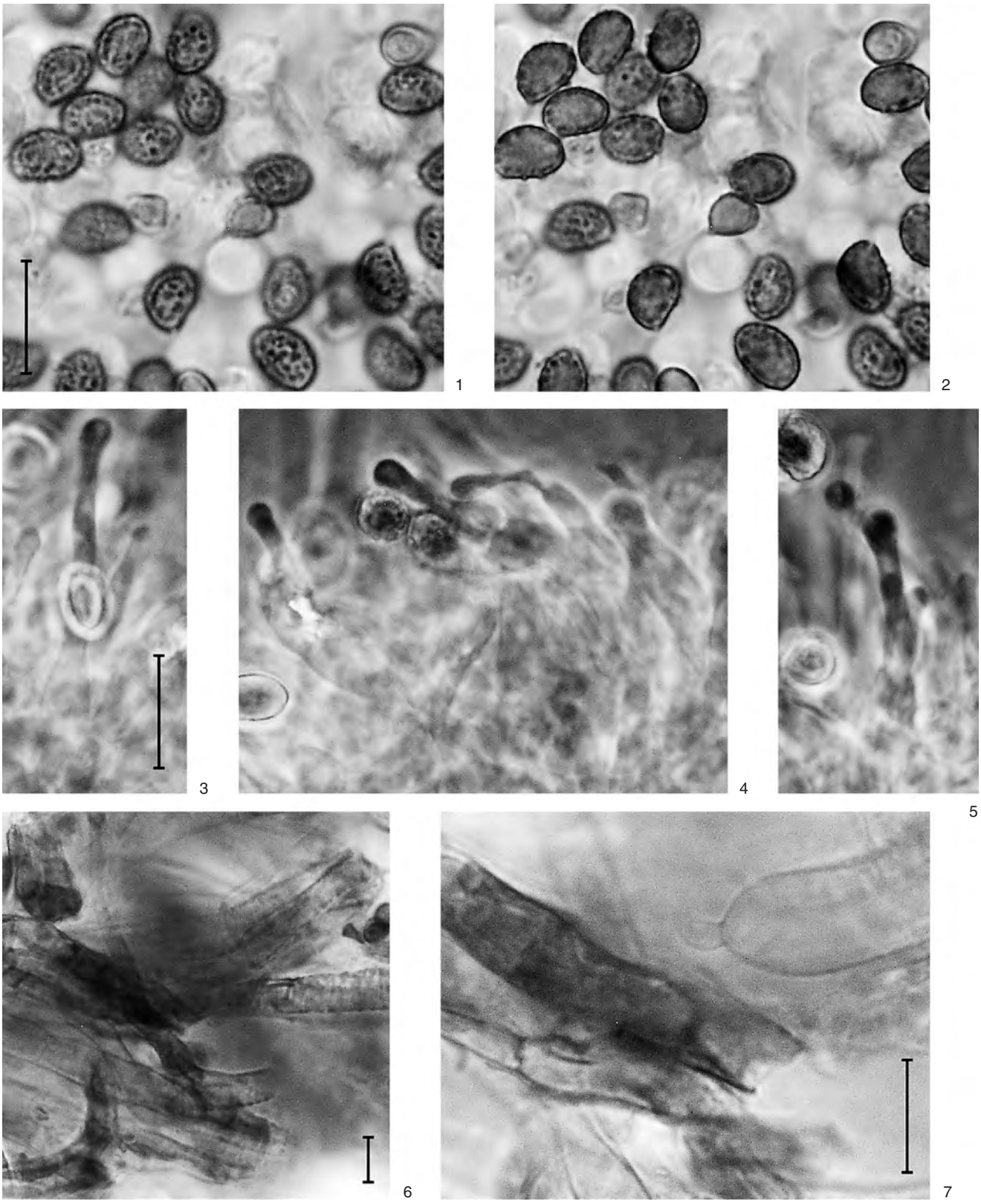


1. – basidiospores (ornamentation); 2.–3. – basidiospores (outline); 4.–6. – cheilocystidia (in phase contrast); 7.–8. – pileus cuticle (surface of the scalp)
Scale bar = 10 µm. For details on collection see Collections studied.

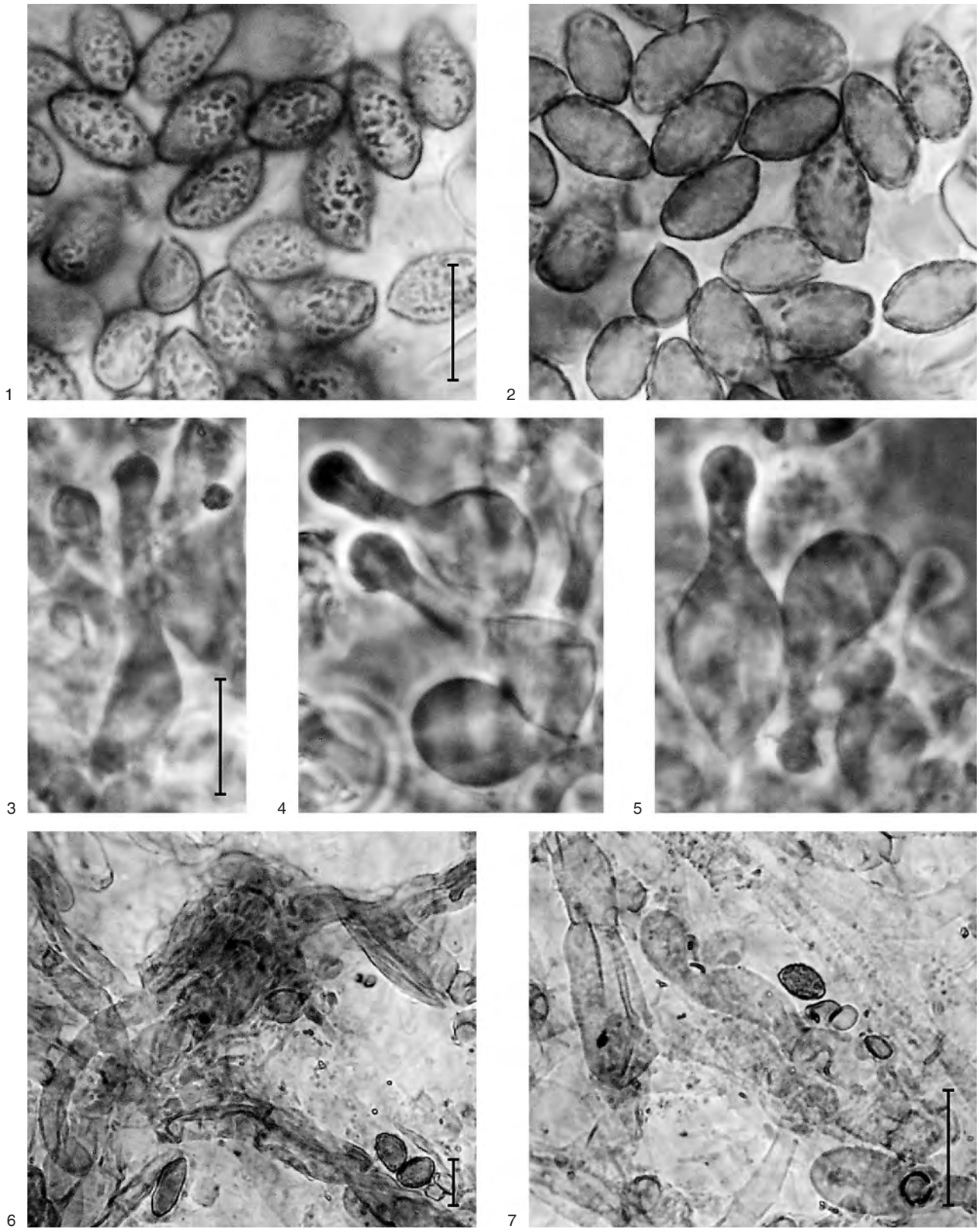


1. – basidiospores (ornamentation); 2.–3. – basidiospores (outline); 4.–7. – cheilocystidia (in phase contrast); 8.–9. – pileus cuticle (surface of the scalp)
Scale bar = 10 µm. For details on collection see Collections studied.

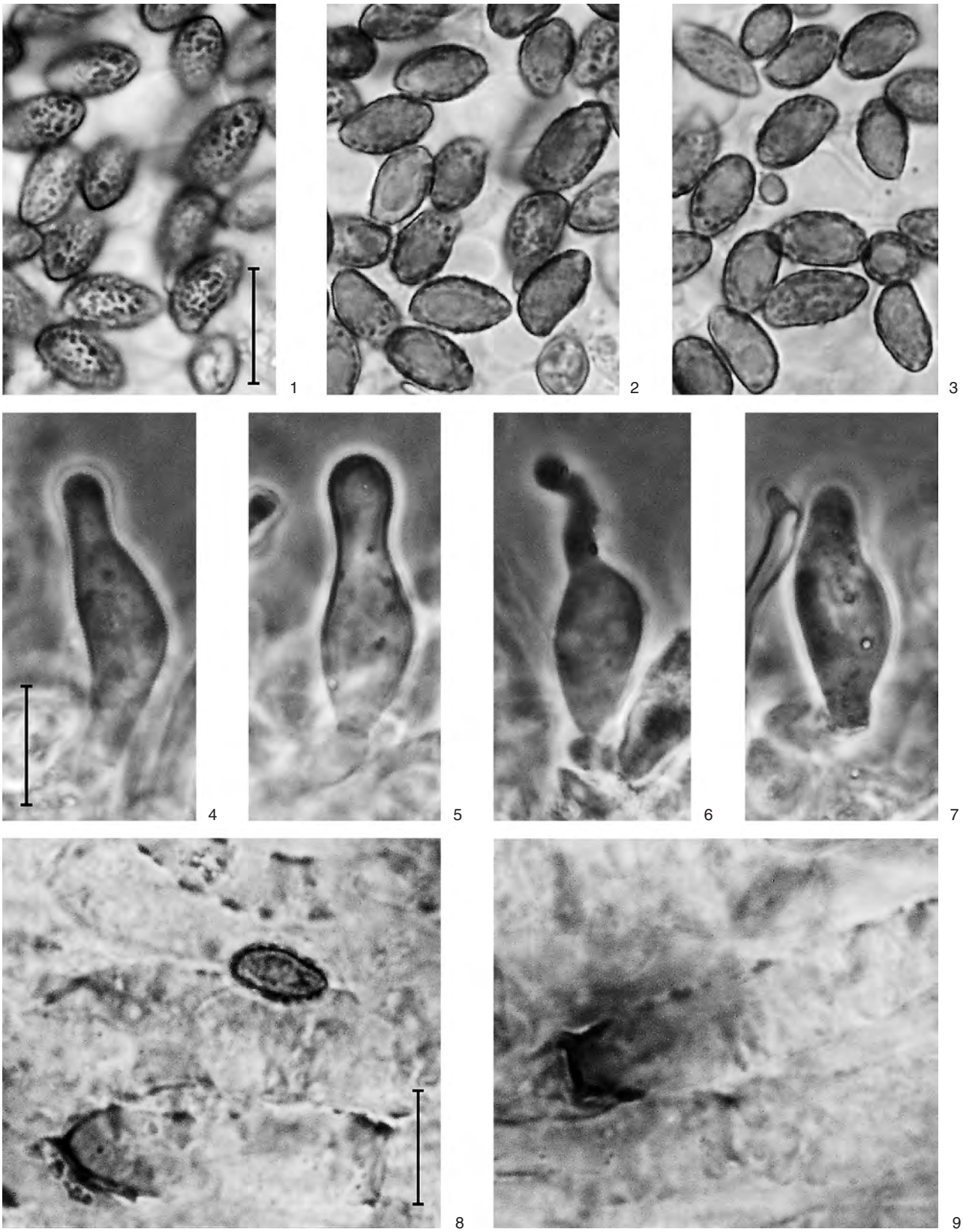
PLATE 12 *Gymnopilus flavus* (PRM 677110)



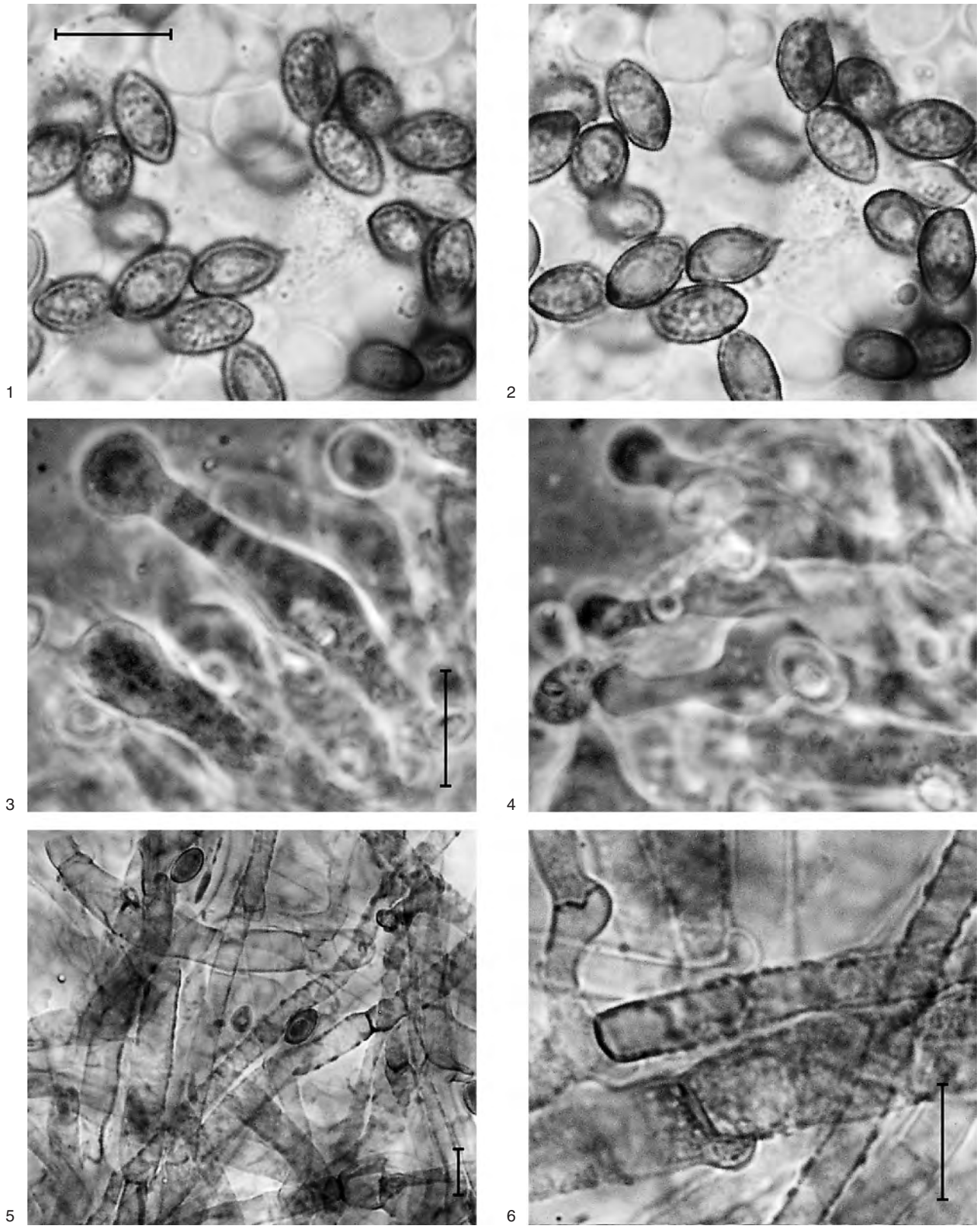
1. – basidiospores (ornamentation); 2. – basidiospores (outline); 3.–5. – cheilocystidia (in phase contrast); 6.–7. – pileus cuticle (surface of the scalp)
Scale bar = 10 µm. For details on collections see Collection studied.



1. – basidiospores (ornamentation); 2. – basidiospores (outline); 3.–5. – cheilocystidia (in phase contrast); 6.–7. – pileus cuticle (surface of the scalp)
Scale bar = 10 µm. For details on collection see Collections studied.

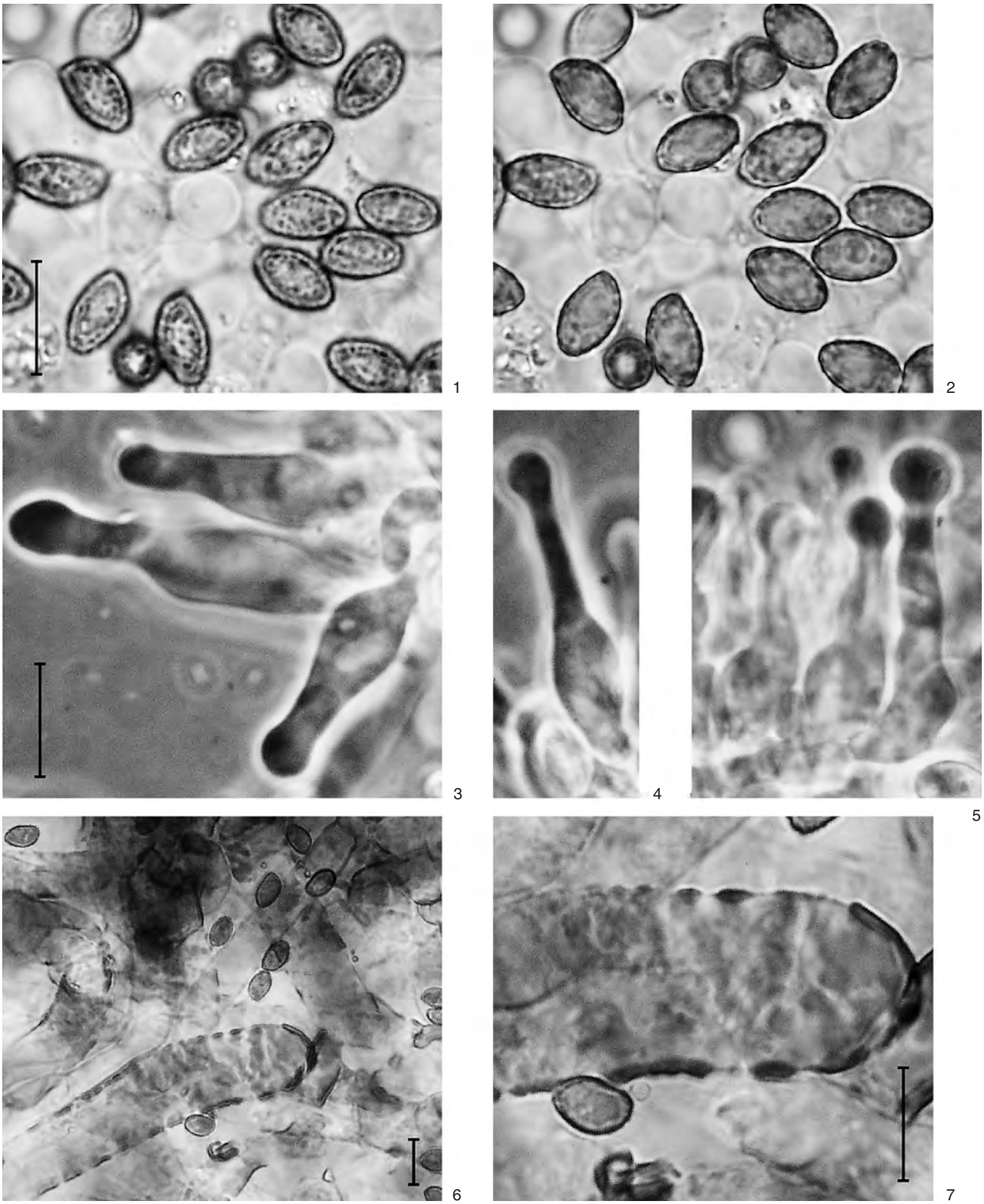


1. – basidiospores (ornamentation); 2.–3. – basidiospores (outline); 4.–7. – cheilocystidia (in phase contrast); 8.–9. – pileus cuticle (surface of the scalp)
Scale bar = 10 µm. For details on collection see Collections studied.

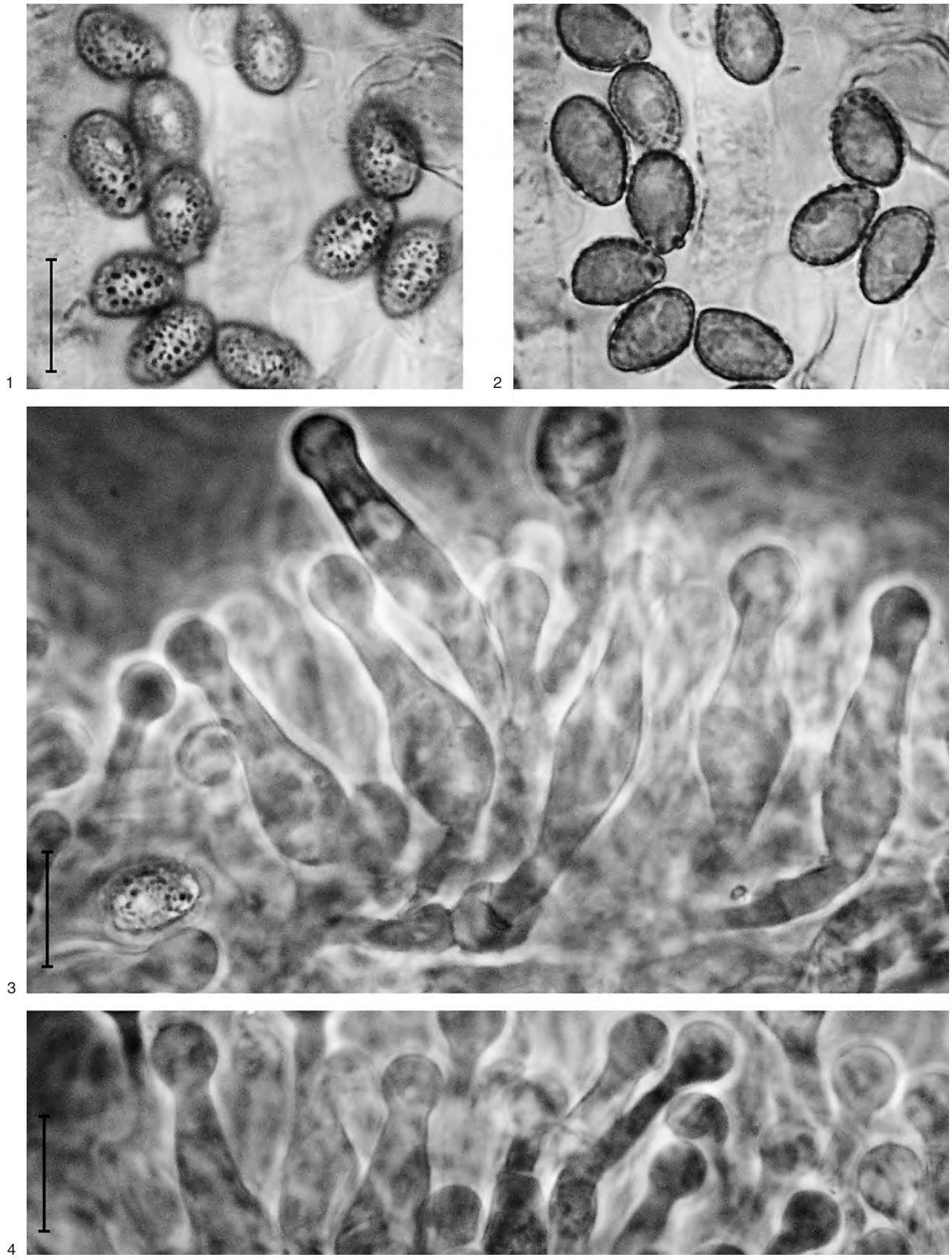


1. – basidiospores (ornamentation); 2. – basidiospores (outline); 3.–4. – cheilocystidia (in phase contrast); 5.–6. – pileus cuticle (surface of the scalp)
Scale bar = 10 µm. For details on collection see Collections studied.

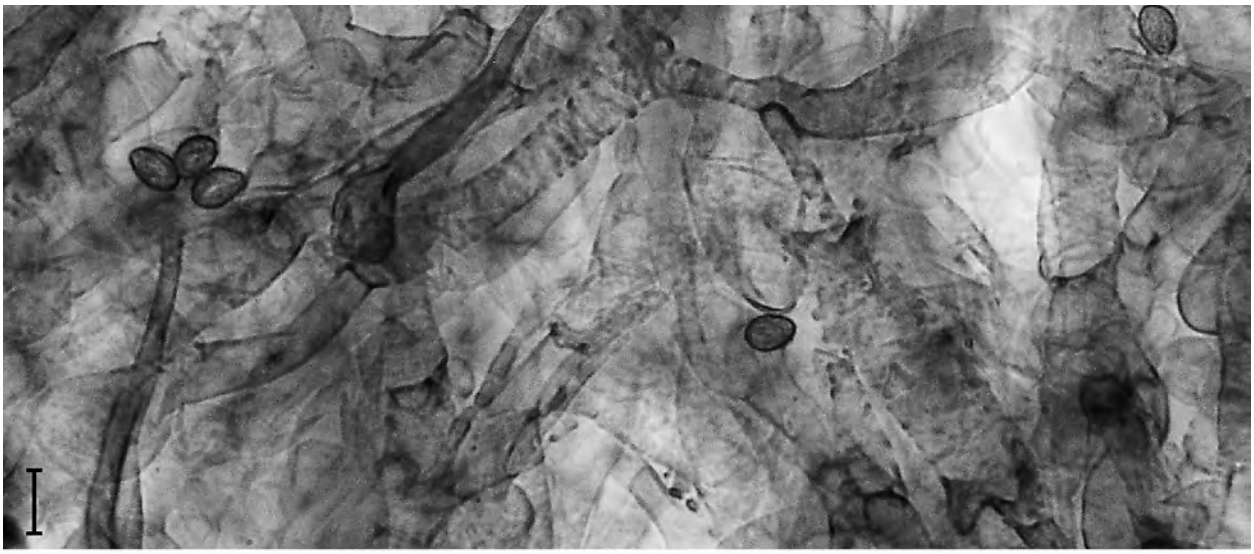
PLATE 16 ***Gymnopilus sapineus*** (PRM 889105 = JH 312/96)



1. – basidiospores (ornamentation); 2. – basidiospores (outline); 3.–5. – cheilocystidia (in phase contrast); 6.–7. – pileus cuticle (surface of the scalp)
Scale bar = 10 µm. For details on collection see Collections studied.

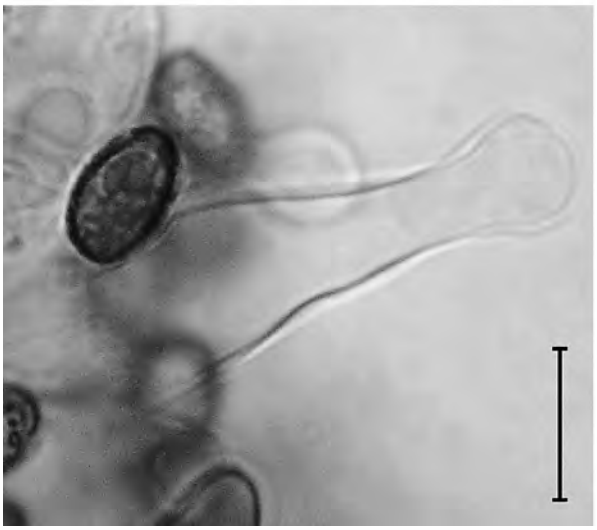


1. – basidiospores (ornamentation); 2. – basidiospores (outline); 3.–4. – cheilocystidia (in phase contrast)
Scale bar = 10 µm. For details on collection see Collections studied.

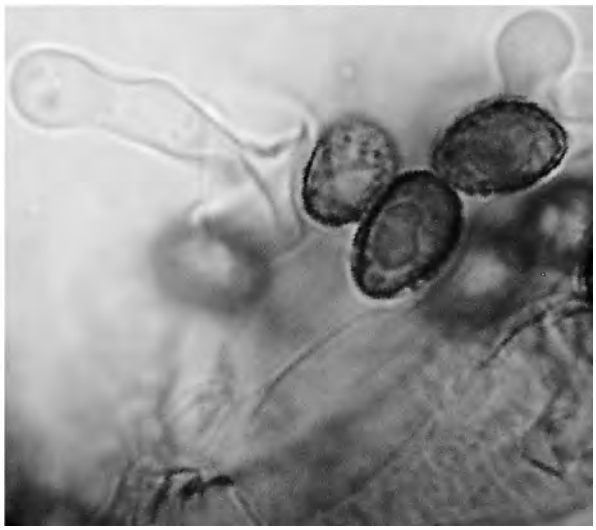


1

2



3



4

1.–2. – pileus cuticle (surface of the scalp) with typical inflated terminal cells; 3.–4. – pileocystidia
Scale bar = 10 µm. For details on collections see Collection studied.