

SOME LIGNICOLUS MACROMYCETES FROM
KRAKOVSKI GOZD, NEW OR RARE
IN YUGOSLAVIA

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Krakovski gozd (the forest of Krakovo) is situated in Slovenia (NW part of Yugoslavia) on the northern bank of the river Krka, near the small town Kostanjevica and covers somewhat more than 2600 ha. It is the westernmost offshoot of the Slavonian lowland oak forests in the river Sava valley and lies at an altitude of cca 150—220 m. An area of 40.5 ha, with some characters of a virgin forest, is set aside as a nature reserve. The main tree species is *Quercus robur*, with a larger or smaller admixture of *Carpinus betulus*, *Alnus glutinosa*, *Quercus petraea*, *Populus* spp., *Ulmus* spp., *Fraxinus* spp. and other hardwoods, most of them autochthonous, but a few cultivated. Coniferous species also grow in some places, of which *Pinus sylvestris* is autochthonous, whilst *Picea abies* and *Abies alba* are cultivated.

Plenty of dead wood (stumps, logs, fallen branches etc.) is present, not only in the preserved part but also elsewhere, which offers a favourable substrate for many lignicolous fungi. In our first paper (Hočevari Tortić 1975) we gave a list of 101 species growing on wood, observed in various parts of the forest, some of them rare and not previously noted for Yugoslavia. Here we present additional five lignicolous species, four of them new for this country and the fifth with only one locality known earlier. They were collected in districts 35—38, the last being the nature reserve. Notes on two species, mentioned briefly in the first paper cited above, are added. The specimens of each species discussed are preserved at the Institute of Botany, Faculty of Science (ZA); duplicates of two were sent to National Museum, Prague (PRM).

In two of the species presented, the reactions of the hyphae in cresyl blue were studied. As was shown by the first author (Tortić, 1976), the hyphae, particularly skeletal, in polypores and other fungi

give various colour reactions in this dye, which can often be very useful in assisting determination and perhaps, in some cases, also giving a clue to the taxonomic relationships. Since different products give somewhat different shades of colour, we used three: 1) Dr. G. Grübler et Co, Leipzig, 2) British Drug Houses CI 51010, product 34013, 3) Lachema, Brno, no. 7133.

Spongipellis fractipes (Berk. et Curt.) Kotl. et Pouz. In the Krakovo nature reserve (distr. 38), on fallen twigs of *Alnus glutinosa*, 10 VII 1974 and 26 VI 1975, leg. S. Hočevár and M. Tortić. The material was later examined by F. Kotlaba and Z. Pouzar. The substrate was kindly identified by Dr. V. Šeukanec, Department of Wood Anatomy, Forestry Faculty, Zagreb. Only 2—3 very small specimens were found each time, no more than 2 cm high, with an irregularly fanlike cap, only up to 1.5 cm wide, decurrent on a short excentric stipe. Very short decurrent tubes with minute pores and two-layered context, which characterize this species, were clearly noticeable. The specimens were at first white, later turning somewhat cream-coloured. Microscopic examination showed that both layers of the context consisted of similar generative hyphae, with thin to somewhat thickened walls, septate and clamped, irregularly interwoven in the upper layer and densely parallel in the lower. Because our material was very scanty, we did not find the thickwalled pseudo-skeletal mentioned by Kotlaba and Pouzar (1976a, b). The hyphae were cyanophilous, as were also the broadly ovate to globose spores, which, in our specimens, were $(3.5) 4.9-5.6 \times (2.8) 3.5-4.2 \mu\text{m}$; most frequently cca $5 \times 4 \mu\text{m}$.

In cresyl blue, the colour reaction of the hyphae in the two layers of the context was somewhat different. This difference was most clearly visible in product no 1, which gave the broadest range of colours, with the lower layer turning violet red and the upper blue or blue violet. In other products the upper layer also turned blue violet, but the lower was violet, and the difference in colour was only slight.

This species, considered for a long time to occur only in North America, was published for Europe (SSSR) first by Komarova in 1956 as *Abortiporus* and in 1964 as *Spongipellis* (cited after Jahn 1974). Recently it was found also in Germany (Jahn 1973, 1974), France (David et Candoussau 1974) and Czechoslovakia (Kotlaba and Pouzar 1976a, b). In all localities it grew in wet, broad-leaved forests, on fallen branches, stumps and logs, mostly of *Alnus*, but also of *Carpinus* and *Fraxinus*.

The taxonomic position of the species was discussed by David et Candoussau (1974) and Jahn (1974), who maintained that its similarities to the genera *Abortiporus* and *Spongipellis* were only macroscopic, and as they could not decide where to place it, they designated it temporarily by the basionym *Polyporus fractipes*. Kotlaba and Pouzar (1976a) however, after comparing the macro- and microscopic characters of *P. fractipes* with those of both *Abortiporus* and *Spongipellis* species, reached the opinion that the species properly belongs to the genus *Spongipellis*, as there are more fundamental similarities with this genus than with *Abortiporus*. Because of some particular features not shared by other species of *Spongipellis*, they propose for this species a new subgenus, *Loweomyces*, with the remark that some other author might perhaps raise it to generic rank.

Since it was necessary to place the species somewhere, this seems to be the best temporary solution, and we have therefore used the name *Spongipellis fractipes* in this paper.

On comparing the reactions with cresyl blue in other *Spongipellis* spp. with those described above in *S. fractipes*, we found that the hyphae and the spore wall turned intensively red violet to violet, according to the species and the cresyl blue used, but the two layers of the context showed no difference in colour.

Krakovski gozd is the first known locality in Yugoslavia for *S. fractipes* and probably more specimens will be found there although it does not seem to fruit abundantly. As there also exist further large tracts of wet forests with alder, for instance along the river Sava, it is to be expected that it will be found in other localities.

Tremella globospora Reid (*T. tubercularia* Berk.) On fallen branches of *Quercus robur* 15 III and 15—17 IV 1975, in all districts 35—38, leg. M. and S. Tortić and S. Hočevar. This species grows as small, milk-white gelatinous knobs on the stromata of several pyrenomycetes which infect oak (and chestnut) branches, mostly *Eutypella* and *Diaporthe*. In this case, the pyrenomycetes were in a very bad condition and we did not attempt their determination. Unfortunately, the collected specimens of *T. globospora* proved to have immature basidia and were without spores, but the macroscopical description and mode of living agree with this species.

This fungus is known from North America and in Europe from Czechoslovakia, Denmark, England, France, Germany (Pilát 1957) and has also been found in Poland (Wojewoda 1975). It is considered rare. However, we found it in enormous quantities during rain, but, several hours after the rain had stopped, the dried fruitbodies on the same branches could be noticed only by means of a lens and that with difficulty. At the same time the following year (18 IV 1976), but in dry weather, not a single fruitbody could be found in the same places. Therefore, although this is the first and, for the moment, the only known locality of *T. globospora* in Yugoslavia, it is very probable that it is distributed in other similar forests, but must be looked for only in very wet weather.

Hymenochaete corrugata (Fr.) Fr. On several *Corylus* stems in district 37, on 30 XI 1975 and 17 IV 1976, leg. M. and S. Tortić. It develops as a thin, rusty brown crust on dead, standing stems of *Corylus*, covering large parts. The crusts are cracked into many small areas. It is characterized microscopically, as are other *Hymenochaete* spp. by numerous brown setae. Spores rather rare, mostly still attached to the sterigmata, cylindrical, somewhat allantoid, hyaline, inamyloid, about $3.5\text{--}4.2 \times 1.4 \mu\text{m}$, which agrees quite with dimensions found on our material by Kotlaba and Pouzar ($4\text{--}4.5 \times 1.2\text{--}1.5 \mu\text{m}$). Jahn (1971) states that its distribution in Europe is only imperfectly known, but suggests that it is probably not rare in warmer districts. The most important host is apparently *Corylus*, others known are *Calluna*, *Crataegus*, *Fagus*, *Betula*, *Populus tremula*. The collection from Krakovski gozd is the first record of this species in Yugoslavia, probably mainly because few mycologists pay attention to such rather inconspicuous species.

Guepiniopsis buccina (Pers. ex Fr.) Kennedy. Two localities are now known in Yugoslavia: 1) Preslo in the Komovi mountains (Crna Gora, near the Albanian border), cca 1500 m alt., beech forest, very abundant on fallen *Fagus* trunks 13 VII 1973, leg. M. and S. Tortić, det. D. A. Reid, 2) Krakovski gozd, distr. 37, on standing dead *Corylus* branch, 14 IV 1975, leg. S. Hočevar and M. Tortić. The fruitbodies are in the form of small

orange yellow cups on stipes of variable length. In the collection from Komovi, the cups were larger, up to about 1 cm in diameter, fully expanded and completely covering the very short stipe, while the fruitbodies from Krakovski gozd had narrow, deep cups attached to the substrate by stipes about as long as the cup was deep (a few mm each). The spores in the first collection were mostly 3-septate, although some had only one septum, elliptical, $13.5\text{--}16.5 \times (5.5) 6\text{--}7 \mu\text{m}$. In the collection from the second locality they were somewhat smaller, $11\text{--}12 (15) \times 4.5\text{--}6 \mu\text{m}$, rarely septate, elliptic to subcylindric, but were probably not quite mature. The hymenial layer is developed only within the cup, whilst the outer surface is covered by a palisade of hyphae with very broad, clavate (or even globose) tips, and thick walls.

Reid (1974) states that this species is wide-spread in all the continents except Africa on broad-leaved trees (in addition to *Corylus* and *Fagus*, he also mentions *Alnus*, *Carpinus*, *Quercus*, *Salix* and *Ulex*). It is therefore very probable that this species will also be found in other localities in Yugoslavia.

***Pleurotus calyptratus* (Paul. ex Pers.) Rolland.** On two standing dead trees of *Populus canescens* (*P. tremula* x *P. alba*) in a meadow with stagnating water in distr. 35, 18 IV 1975, leg. S. Hočevar and M. Tortić (Fig. 1). This species is bound to the genus *Populus*, particularly *P. tremula* and *P. alba*. The fruitbodies, characterized by the white velum

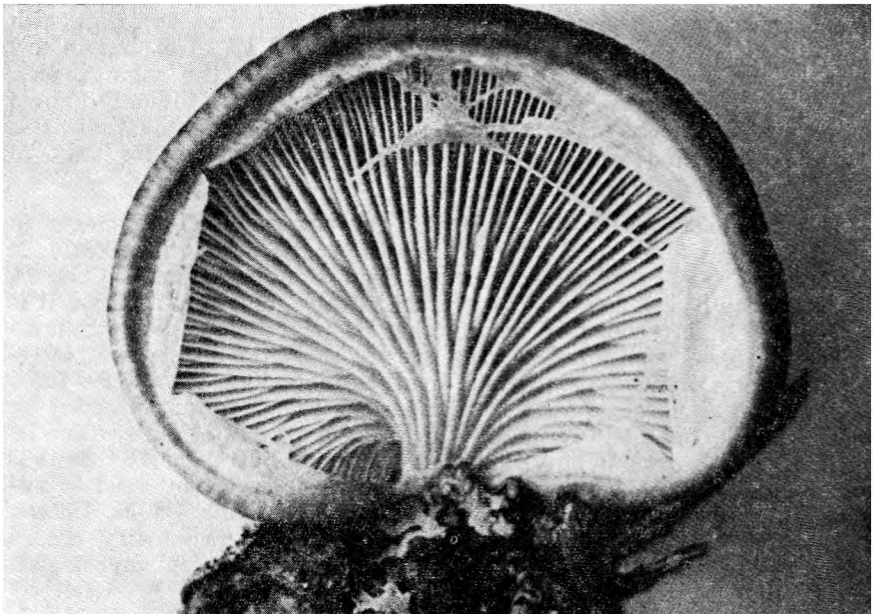


Fig. 1. *Pleurotus calyptratus* (Paul. ex Pers.) Rolland. View from below with lamellae and the rests of velum. Krakovski gozd, 18 IV 1975. (Photo S. Tortić).

Sl. 1. *Pleurotus calyptratus* (Paul. ex Pers.) Rolland. Donja strana s lamelama i ostacima veluma. Krakovski gozd 18. IV 1975. (Foto S. Tortić).

covering the lamellae in youth, develop mostly in spring and summer, but can sometimes be found also in autumn, since we noted two older specimens, already without velum, on 18 X 1975.

As pointed out by Kotlaba and Pouzar (1965), this species is dimittic, the fruitbody consisting of generative and skeletal hyphae. According to our measurements, the width of these hyphae is: generative (3) 4—7 μm in the context and 3—5 μm in the lamellae, skeletal 2—5 (6) μm in the context and 2—4 μm in the lamellae. The hyphal walls are very thick in the skeletal and, in some cases, the lumen is almost lacking. At the point of attachment of the fruitbody, the context and lamellae consist almost solely of skeletal; towards the margin the quantity of skeletal decreases and that of generative hyphae increases. Skeletal are not cyanophilous nor did they react with Melzer's reagent. They did, however, turn intensively violet to blue in cresyl blue. In products nos. 2 and 3, the shade was more bluish than in no. 1, where the colour was sometimes red violet. Often one has the impression that the individual layers of the hyphal wall reacted with somewhat different shades of colour, which could be observed by raising or lowering the microscope tube; sometimes it looked as if the blue ground colour was overlaid by red. Generative hyphae turned light violet in cresyl blue.

The reactions of hyphae with cresyl blue in four other species of the genus *Pleurotus*, as presently delimited, were briefly compared. The first three are monomittic, with generative hyphae partly sclerified, and the fourth is dimittic (Singer 1975). Thin-walled generative hyphae in all these species turned lighter or darker reddish violet in various shades. Only such hyphae were noted in *P. eryngii* (DC ex Fr.) Quél., whilst in *P. ostreatus* (Jacq. ex Fr.) Quél. some sclerified hyphae with septa and clamps were found at the base of the stipe, turning light red-violet. In *P. cornucopiae* (Paul. ex Fr.) Roll., sclerified hyphae were rather abundant in the stipe and turned red violet in product no. 1, but violet in the others. The width of these hyphae varied greatly, as did that of the thin-walled hyphae with which they were interwoven (inflating hyphae). Thickwalled hyphae, presumably skeletal, were observed in relatively small numbers in *P. dryinus* (Pers. ex Fr.) Kummer; they and the generative hyphae reacted particularly intensively violet red in cresyl blue no. 1 and red violet or violet in others.

Accordingly, the hyphal structure of *P. calyptratus* is clearly different from that occurring in other members of this genus and allows easy identification of even old specimens which have lost the characteristic velum and which, macroscopically, can be very similar to sessile specimens of *P. ostreatus*. Of course, these two species also have different spore size, which is 10—13.5 \times 4—5 μm in *P. calyptratus*, whilst those in *P. ostreatus* are not so much shorter as clearly narrower, 9—12 \times 3—3.5 μm .

P. calyptratus is generally a rare species, known from Austria, Czechoslovakia and Sweden (Kotlaba and Pouzar 1965) and was found recently in the Ukrainian SSR (Wasser 1974). In Yugoslavia, it was collected earlier only once (Jelić i Torić 1973) and the locality in Krakovski gozd is therefore the second. We suppose that it will be refound in this country in wet lowland forests.

Tyromyces subcaesius David was only briefly mentioned among the rare species in Krakovski gozd in a previous paper (Hočevari Torić 1975), but it deserves a more detailed treatment. This species has been described only very recently (David 1974) as distinct from *T.*

caesius, with which it was earlier confused, and its distribution is still poorly known. In Yugoslavia, it is known with certainty from only two localities in Slovenia: 1) Krakovski gozd, on a fallen branch of *Quercus* sp., 8 VIII 1972, on a dead, standing specimen of a young *Carpinus betulus*, 26 VI 1975, and a dead, standing *Corylus avellana* 18 X 1975, leg. M. and S. Tortić and S. Hočevar, with only very few specimens being found on each occasion. 2) Trzin near Mengeš (in the vicinity of Ljubljana) on a fallen *Quercus* branch, 19 IX 1971, leg. V. Hudoklin. The specimens were white or whitish, or a little brownish-greenish, finely pubescent, the pores were mostly somewhat greenish, but not as intensively as in the closely related *T. caesius*. Microscopically they differ from the last-named species particularly by the narrower spores (1—1.25 μm in *T. subcaesius* and 1.5—1.75 μm in *T. caesius*), which are of approximately the same length (4—5 μm) in both species.

However, as pointed out by Jahn (1974), there exist intermediary forms between *T. caesius* and *T. subcaesius* which cannot be interpreted as yet. The upper surface in those forms is glabrous and of a greenish brown colour like *T. caesius*, whilst the spores are narrow as in *T. subcaesius*. Such forms were found, both times on beech (on which substrate *T. caesius* grows occasionally in addition to its usual coniferous hosts) in the Plitvice National Park in Croatia and on Donačka gora (mountain) in Slovenia. The first collection from Krakovski gozd is also somewhat similar. This problem needs further investigation.

Here we want to add also a note on *Stereum subtomentosum* Pouz. It was published for the first time for Yugoslavia from only two localities (Tortić and Jelić 1972) and, as only a few specimens were found in each, it was considered to be rare in this country. However, it not only proved to be rather frequent in Krakovski gozd (Hočevari Tortić 1975) but we find that it is abundant in the area we recently started investigating (districts 35—38), particularly on *Alnus* wood. Also, it was refound on one of the published localities, Fruška gora, in a rather large number of specimens (Jelić, personal communication). Therefore it is likely to be widely distributed in other moist lowland forests in Yugoslavia, and perhaps in some other habitats.

Summary

Several rare lignicolous higher fungi are reported from the lowland oak forest of Krakovski gozd in Slovenia. *Spongipellis fractipes* (Berk. et Curt.) Kotl. et Pouz., *Tremella globospora* Reid, *Hymenochaete corrugata* (Fr.) Fr. and *Guepiniopsis buccina* (Pers. ex Fr.) Kennedy are here published for the first time for Yugoslavia. The first three were found only in this locality, whilst *G. buccina* was collected also in Crna Gora. For *Pleurotus calyptratus* (Paul. ex Pers.) Rolland, this is the second published locality in Yugoslavia. *Tyromyces subcaesius* David, which was briefly mentioned in our first paper (Hočevari Tortić 1975), and which was not known up to then for this country, is here treated more in detail and its to known localities presented. A note about *Stereum subtomentosum* Pouz. is added. The reactions of hyphae in cresyl blue in *S. fractipes* and *P. calyptratus*, as well as in other species of the genus *Pleurotus*, are discussed.

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SADRŽAJ

NEKI LIGNIKOLNI MAKROMICETI IZ KRAKOVSKOG GOZDA (SLOVENIJA), NOVI ILI RIJETKI U JUGOSLAVIJI

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Prikazano je nekoliko rijetkih vrsta viših lignikolnih gljiva iz nizin-
ske šume lužnjaka Krakovski gozd (kod Kostanjevice na Krki), od kojih
su *Spongipellis fractipes* (Berk. et Curt.) Kotl. et Pouz., *Tremella globospora*
Reid, *Hymenochaete corrugata* (Fr.) Fr. i *Guepiniopsis buccina*
(Pers. ex Fr.) Kennedy ovdje prvi put objavljene za Jugoslaviju. Prve tri
su zasad nađene samo na ovom lokalitetu, dok je *G. buccina* ustanovljena
i u Crnoj Gori, na Komovima. Za *Pleurotus calyptratus* (Paul. ex Pers.)
Rolland je ovo drugi poznati lokalitet u Jugoslaviji, a za *Stereum sub-
tomentosum* Pouz. treći. Ta posljednja vrsta je ovdje vrlo obilato raši-
rena. Poblize se govori o građi i reakcijama s krezil plavilom vrsta
Spongipellis fractipes i *Pleurotus calyptratus*.

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