

Some species of Cortinariaceae and Russulaceae in the alpine belt of the Belaer Tatras – II

ROSTISLAV FELLNER and JAROSLAV LANDA

Forestry and Game Management Research Institute, Strnady, 156 04 Praha 5 – Zbraslav, Czech Republic

Fellner R. and Landa J. (1993): Some species of Cortinariaceae and Russulaceae in the alpine belt of the Belaer Tatras – II. Czech Mycol. 47: 45–55

Nine agarics are reported from alpine, mostly calcareous habitats in the Belaer Tatras, Slovakia. *Russula norvegica* Reid, *R. saliceticola* (Sing.) Kühn. ex Knudsen & Borgen, *R. pascua* (Moell. & Schaeff.) Kühn. and *R. cupreola* Sarnari are recorded for the first time from Slovakia, *Lactarius nanus* Favre for the first time from the High Tatras. Illustrations and comments on their characters, delimitation and ecology are presented. Additional notes are given to differential characters between *Russula dryadicola* Fellner & Landa and *Russula maculata* Quéf.

Key words: alpine fungi, *Russulaceae*, *Cortinariaceae*, Slovakia

Fellner R. and Landa J. (1993): Některé druhy Cortinariaceae a Russulaceae v alpském pásmu Belánských Tater – II. Czech Mycol. 47: 45–55

Ve druhé části studie je pojednáno o devíti druzích lupenatých hub z alpských, převážně vápencových poloh Belánských Tater na Slovensku. Poprvé jsou tu pro území Slovenska uváděny jako nové tyto druhy: *Russula norvegica* Reid, *R. saliceticola* (Sing.) Kühn. ex Knudsen & Borgen, *R. pascua* (Moell. & Schaeff.) Kühn. a *R. cupreola* Sarnari. Poprvé z Vysokých Tater je rovněž uváděn druh *Lactarius nanus* Favre. Studie obsahuje poznámky k jednotlivým druhům, jejich vymezení a ekologii a vyobrazení většiny diskutovaných taxonů. Současně je zařazen klíč ke všem druhům rodu *Russula* dosud známých z alpských poloh Belánských Tater. V závěru jsou rozvedeny rozdíly mezi nedávno nově vymezeným druhem *Russula dryadicola* Fellner & Landa 1993, význačného svým výskytem pro arкто-alpské oblasti, a teplomilným druhem *Russula maculata* Quéf., charakteristickým pro vápencové oblasti nižších poloh.

The Belaer Tatras are situated in the most eastern calcareous part of the High Tatras Mts., northern Slovakia. In 1990–1991 the authors collected macromycetes growing in close association with dwarf-willow and *Dryas* plant communities in the alpine belt of the mountains (Fellner & Landa 1989, 1990, 1991; Fellner & al. 1990). First results of their study included a full description of two new taxa *Cortinarius tatrensis* Fellner & Landa and *Russula dryadicola* Fellner & Landa (Fellner & Landa 1993). Some other mycorrhizal species of *Inocybe*, *Hebeloma*, *Russula* and *Lactarius* are submitted here. But while all *Russula* and *Lactarius* species known to the authors from the alpine belt of the Belaer Tatras are described here in details, only two examples from genera *Inocybe* and *Hebeloma* are included. A more comprehensive study of cortinarioid fungi from the Tatras is in preparation. Exsiccata of all taxa recorded here are kept in personal herbaria of Fellner and Landa or in PRM.

CORTINARIACEAE

Inocybe geraniodora Favre, Champ. Sup. Zone Alp. Parc Nat. Suisse: 83, 200, 1955

Pileus 1–1.4 cm, convex, sometimes with a small papilla, dark brown, squamulose, fibrillose-squamulose to appressed fibrillose. – Lamellae ascending, ventricose, dark olivaceous brown, edge brown, fimbriate. – Stipe 2.5–3.5 × 0.2–0.25 (–0.35) cm, equal or curved, solid, fibrillose to fibrillose-squamulose, dark brown. – Context brown, sometimes with a pink tinge or even reddening on exposure. – Smell reminding one of *Pelargonium*, sometimes absent. Spores 13–15.7 × 7–8 μm, ellipsoid to subphaseoliform, smooth. – Basidia 40–50 × 9–11 μm, 4-spored. – Cheilocystidia 30–40 × 11.5–12.2 μm, clavate, thin-walled. – Caulocystidia similar to cheilocystidia, present only at apex of stipe.

Material examined:

Košiare, eastern slope – 1960 m, *Dryas octopetala*, 23.8. 1990; Bujačí vrch, northeastern slope – 1860–1940 m, *Dryas octopetala*, 20.8. 1991.

Notes.

The question very often discussed is the absence of smell of *Pelargonium*. Both for Favre (1960) and Nespiak (1990) it was the reason to describe a new taxon. *Inocybe geraniodora* var. *depauperata* Favre differs in being larger and paler, the absence of smell and a reddening context. *Inocybe tatrae* Nespiak differs in being paler, with much longer stipe, earthy smell and pale context with an olivaceous-pink tinge. In the Belaer Tatras we were not able to find any pale specimens but the smell and the colour of context varied a little. While Kuyper (1986) or Nespiak (1990) rejected reddening of the context of stipe by *I. geraniodora*, Schmid-Heckel (1985) confirmed our observation. On the other hand we are not able to confirm any bluish green tinge in the lower half of the stipe as mentioned by Senn-Irlet (1987). *I. geraniodora* was first recorded from the Belaer Tatras by Kubička (1971) on the basis of his collections from August, 1957. Both his collections and ours were made in calcareous sites of a *Caricion firmae* Gams with pH 6.8–7.0, either in connection with *Salix jacquiniana* Willd. (= *S. alpina* Scop. p.p.) or with *Dryas octopetala* L. Our observations – in agreement with Favre's (1955) and Schmid-Heckel's (1985) data – do not confirm an acidophilous character of this species as it was proposed by Senn-Irlet (1987). *I. geraniodora* var. *velifera* (Kühner 1988) is another acidophilous taxon with a well developed white veil from *Salix herbacea* sites in the National Park of Vanoise which is not known yet from the Tatras.

Hebeloma marginatulum (Favre) Bruchet, Bull. Soc. Linn. Lyon, Suppl, 6:43, 1970
– Fig. 1, a–c.

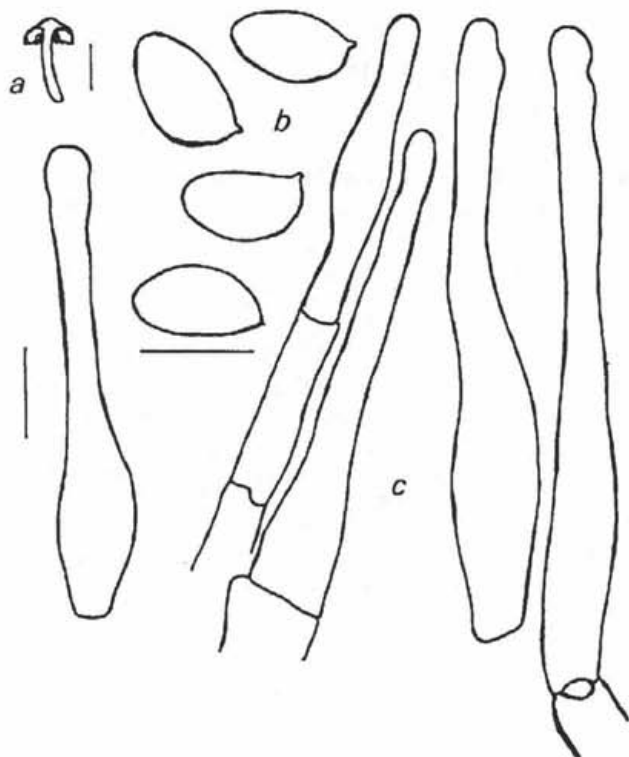


Fig. 1. *Hebeloma marginatum* Favre: a. Fruit body. - b. Spores. - c. Cheilocystidia. Scale bar for illustrations: 1 cm - fruit body, 10 μ m - microscopic characters.

Pileus 1-1.5 cm, convex, with a broad umbo, margin slightly involuted, not viscid, dark brown, without velar remnants near the margin. - Lamellae emarginate, narrowly attached to the stipe, broad, moderately crowded, ochraceous brown, edge white, fimbriate, without droplets. - Stipe 1.5-2 \times 0.2-0.4 cm, cylindric, whitish, discolouring to brown with age from below. - Veil whitish, fugacious. - Context soon pale brownish in the pileus to darker brown in the stipe. - Smell raphanoid. - Taste slightly raphanoid or bitter.

Spores 10-13.8(-15) \times 6-7.7(-8.7) μ m, ellipsoid, only very slightly rugulose, indextrinoid. - Basidia 27-37 \times 9.5-13 μ m, 4-spored, subclavate, sterigmata 4.5-5 \times 1.5-2 μ m. - Cheilocystidia (33-)45-67 \times (4.4-)4.7-6(-6.4) μ m, ventricose, apical part cylindric or slightly capitate, near the base widened to 7.3-9.2 μ m. - Caulocystidia similar. - Pleurocystidia absent. - Pileipellis up to 40 μ m thick, of hyaline, narrow, partly gelatinised hyphae, subpellis of irregular elements with dark brown pigmentation.

Material examined:

Bujačí vrch, northwestern slope - 1920 m, *Salix reticulata*, 23.8. 1990.

Notes.

The species was first recorded for Slovakia by Bruchet (1970). He collected it both in the granite part of the High Tatras (Predné Solisko by Štrbské pleso, 16.8. 1967) and in the calcareous sites in the Belaer Tatras (Hlúpy and Bujačí vrch, 22.8. 1967). In his opinion the species does not prefer calcareous sites to granite ones. Different views of some authors on the ecology of the species could be explained perhaps by this fact. Even the same author characterizes it once as the acidophilous species (Senn-Irlet, 1987), another time as a constant species for calciphilous snow-bed communities (Senn-Irlet, 1988). In addition to *Salix reticulata* particularly *Dryas octopetala* (Debaud, 1987) and *Salix herbacea* (Eynard, 1977) are assumed to be its most important hosts. A similar taxon, *Hebeloma bruchetii* Bon from the same section and subsection *Indusiata* (Fr.) Sacc. was described recently by Fellner & Landa (1989, 1990, 1991) from the western part of the High Tatras (as *Hebeloma repandum* Bruchet). It can be separated from *H. marginatum* by the smaller spores, paler colours, the larger size and the early expanded pileus (cf. Vesterholt, 1989).

RUSSULACEAE

A short survey of alpine species of the genus *Russula* known from the Belaer Tatras:

Lamellae white, taste acrid

- Pileipellis blood red, discolouring to white, context becoming greyish, taste moderately acrid *R. nana* (*Emeticinae*)

Lamellae cream to ochre, taste mild

- Pileipellis violet to purple, context not greying, taste very acrid
..... *R. norvegica* (*Atropurpurinae*)
- Pileipellis violet, not or slightly discolouring, stipe red flushed
..... *R. saliceticola* (*Sphagnophilinae*)
- Pileipellis ochre and pink, context becoming brown, smell of *Russula xerampelina*
..... *R. pascua* (*Viridantinae*)

Lamellae ochre to yellow, taste ± acrid

- Pileipellis vinaceous to purple, context fragile, taste acrid and persistent
..... *R. cupreola* (*Urentinae*)
- Pileipellis copper red-brown to yellow, context firm, taste slightly acrid or even mild
..... *R. dryadicola* (*Maculatinae*)

Russula nana Killermann, Denkschr. Bayer. Bot. Ges. Regensburg 20: 38, 1936

Material examined:

Hlúpy vrch - 2020 m, *Salix reticulata*, 1.9. 1991 - 2000 m, *Salix herbacea*, 1.9. 1991 - 1980 m and 1960 m, *Salix reticulata*, *Polygonum viviparum*, 1.9. 1991; Zadné Jatky, saddle - 1950 m, *Dryas octopetala*, *Salix reticulata*, 1.9. 1991 - 1940 m, *Salix herbacea*, 1.9. 1991; Predné Jatky - 2000 m, *Dryas octopetala*, *Salix reticulata*, 1.9. 1991; Košiare - 2000 m, *Salix reticulata*, 20.8. 1991; Košiare, eastern slope - 1960 m, *Salix reticulata*, 23.8. 1990 - 1940 m, *Salix reticulata*, 6.9. 1990; Bujačí vrch, northeastern slope - 1880 m, *Salix reticulata*, 30.8. 1991 - 1860 m, *Dryas octopetala*, *Salix reticulata*, 30.8. 1991.

Notes.

Russula nana is a common arctic-alpine species. Its distribution and ecology is treated by Gulden & al. (1985) and Skifte (1989). From Slovakia it is recorded from the West Tatras - Roháče (Tondl, 1988) and from the High Tatras - Červené vrchy (Fellner & Landa, 1989, 1990, 1991) and Furkota valley (Fellner & al. 1990). In the Belaer Tatras it is found frequently in different alpine stands with dwarf-willows, *Dryas octopetala* or *Polygonum viviparum*.

Russula norvegica Reid, Fung. Rar. Icon. Color. VI: 36, 1972 - Fig. 2, a-d.

Pileus 2-4.5 cm, convex, then plane or somewhat depressed, margin thin, on occasion slightly tuberculate striate; pileipellis dark violet to purple, discolouring along the margin to paler purplish red, old specimens finally discolouring to very pale purple overall or in spots, glabrous, slightly viscid when young, cuticle removable up to the middle of the cap. - Lamellae free to adnexed, moderately close, 3-5 mm broad, white, edge smooth, concolorous. - Spore print whitish. - Stipe 2.5-4.5 x 0.5-1.1 cm, subclavate, at apex narrower, fragile, stuffed, glabrous, slightly pruinose at apex, faintly veined, white, not becoming greyish but slightly wax yellowish. - Context fragile, white, with a narrow purple zone beneath the pileipellis, not greying, rapidly becoming pink with FeSO₄. - Taste very acrid. - Smell faintly fruity, distinctly fruity if the flesh is desiccated.

Spores 6.5-9 x 5.5-7 μm, medium size 8 x 6.3 μm, Q = 1.25, ellipsoid, coarsely verrucose and finely reticulated, warts 0.4-0.6 μm high, plage amyloid. - Basidia 34-42 x 10-12 μm, 4-spored. - Cystidia 60-95 x 10-12 μm.

Material examined:

Zadné Jatky, saddle - 1940 m, *Salix herbacea*, *S. reticulata*, 1.9. 1991; Košiare - 2000 m, *Salix reticulata*, 20.8. 1991; Košiare, eastern slope - 1940 m, *Salix reticulata*, 6.9. 1990; Bujačí vrch, northeastern slope - 1880 m, *Salix reticulata*, 30.8. 1991.

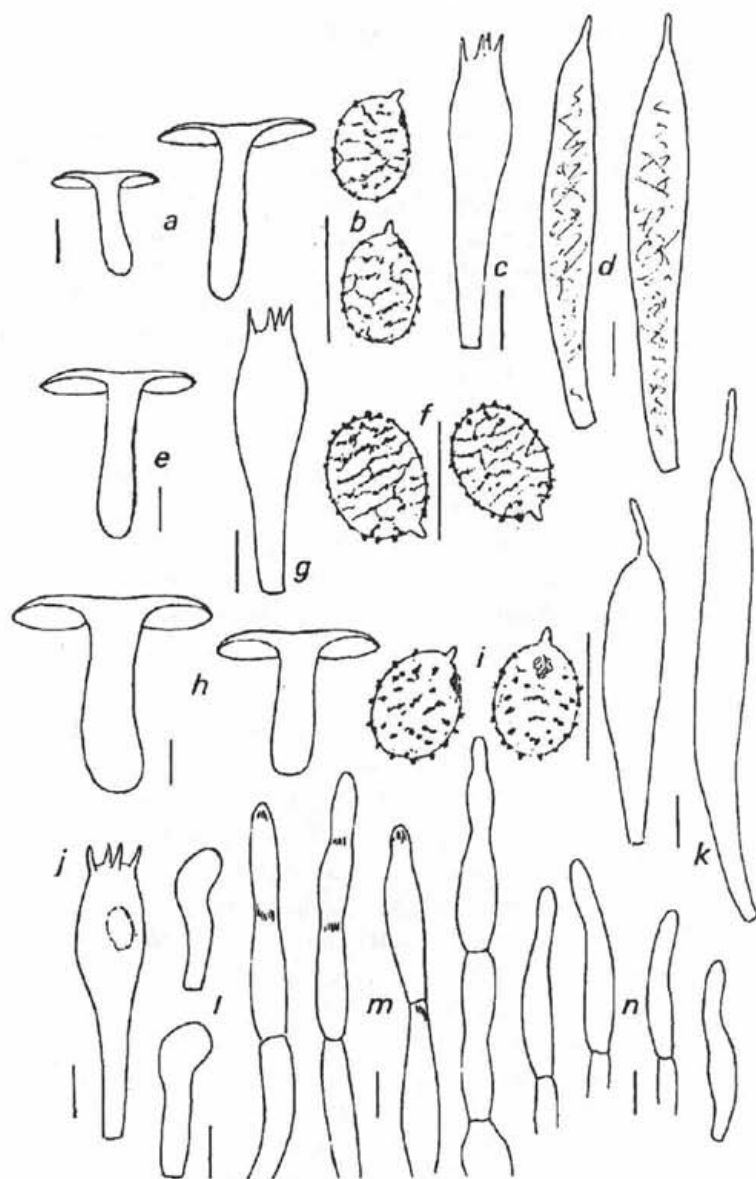


Fig. 2. *Russula norvegica* Reid: a. Fruit body. - b. Spores. - c. Basidia. - d. Cystidia. *Russula saliceticola* (Sing.) Kühn. ex Knudsen & Borgen: e. Fruit body - f. Spores. - g. Basidia. *Russula pascua* (Moell. & Schaeff.) Kühn.: h. Fruit body. - i. Spores. - j. Basidia. - k. Cystidia. - l. Extremities of hymenial hyphae. - m. Pileocystidia. - n. Hairs of pileipellis. Scale bar for illustrations: 1 cm - fruit bodies, 10 μ m - microscopic characters.

Notes.

This is the first record of *Russula norvegica* from Slovakia. Its arctic-alpine distribution and ecology have been discussed by Gulden & al. (1985) and Skifte (1989). In the Belaer Tatras it is found mostly in mountain saddles (Zadné Jatky, Košiare - Bujačí vrch) in association with *Salix herbacea* and *S. reticulata*.

Russula saliceticola (Singer) Kühner ex Knudsen & Borgen in Laursen & Ammirati, Arctic and Alpine Mycology: 224, 1982 - Fig. 2, e-g.

Pileus 3-4 cm, plano-convex, margin thin, slightly striate; pileipellis dark violet, deep vinaceous purple, with a slight brownish tinge, not discolouring, glabrous, dry, almost mat, easily removable. - Lamellae free to adnexed, moderately close to subdistant, narrow, anastomosing, ca. 5 mm broad, deep cream to ochre, edge concolorous, pale. - Spore print cream or pale ochre. - Stipe 3.5 x 0.8-1.1 cm, equal, solid, mat, slightly pruinose at apex, white, slightly red flushed. - Context white, becoming brownish towards the base, with a purple zone beneath the pileipellis, rapidly becoming deep pink with FeSO₄. - Taste mild. - Smell reminding of *Clitocybe gibba* when the flesh is desiccated.

Spores 8.7-12 x 7-9.5 μm, medium size 10.4 x 8.4 μm, Q = 1.23, ellipsoid, densely verrucose, warts 0.5-0.8 μm high, more prominent towards the apices of the spores, connected with lines which form a more or less distinct net. - Basidia 43-48 x 11.3-15 μm, 4-spored.

Material examined:

Zadné Jatky, saddle - 1940 m, *Salix herbacea*, *S. reticulata*, 1.9. 1991.

Notes.

Russula saliceticola is recorded for the first time from Slovakia. In the Belaer Tatras it was found only once, in the saddle Zadné Jatky in an acid site mixed with *Salix herbacea* and *S. reticulata*. Though our collection has slightly larger spores its other features agree well with literature data referenced below. The distribution and ecology is discussed by Kühner (1975), Schmid-Heckel (1985) and Skifte (1989).

Russula pascua (Moell. & Schaeff.) Kühner, Bull. Soc. Mycol. France 91: 331, 1975. - Fig. 2, h-n.

Pileus 2.5-5.5 cm, plano-convex, somewhat depressed and more fleshy in the centre, margin slightly striate; pileipellis ochre to ochre-yellow, towards the margin often pink, glabrous, margin mat, removable up to two thirds of the radius of pileus. - Lamellae adnexed, somewhat ventricose, 3-8 mm broad, moderately close to subdistant, cream, then pale ochre; edge smooth, concolorous. - Stipe 2-4.5 x 0.8-

1.5 cm, base 1.6–2 cm thick, subequal to clavate, solid, fleshy, stuffed, whitish to yellowish, slowly becoming brown, glabrous, mat faintly pruinose. – Context solid at first, slowly becoming brown, greyish green with FeSO_4 . – Taste mild. – Smell of *Russula xerampelina*.

Spores $6.7\text{--}9.5 \times 5.7\text{--}7.7 \mu\text{m}$, medium size $7.9 \times 6.6 \mu\text{m}$, $Q = 1.19$ broadly ellipsoid, covered by isolated conical warts, $0.5\text{--}1(-1,3) \mu\text{m}$ high, rarely connected with short lines. – Basidia $34\text{--}45 \times 10.5\text{--}12 \mu\text{m}$, 4-spored. – Cystidia $9.5\text{--}11 \mu\text{m}$ broad. – Pileocystidia thin-walled, without any differentiated contents, not easily recognizable from hairs; terminal or subterminal articles of pileocystidia ventricose, $4\text{--}9 \mu\text{m}$ broad, apex obtuse, often constricted. – Hairs of pileipellis subcylindric, slightly flexuose, subventricose, $2.5\text{--}5(-6) \mu\text{m}$ broad.

Material examined:

Hlúpy vrch – 2020 m, *Salix reticulata*, 1.9. 1991 – 2000 m, *Salix reticulata*, *Polygonum viviparum*, 1.9. 1991 – 1980 m, *Salix reticulata*, 1.9. 1991; Zadné Jatky, saddle – 1950 m, *Salix reticulata*, *Dryas octopetala*, 1.9. 1991; Predné Jatky – 2000 m, *Salix reticulata*, 1.9. 1991; Košiare, eastern slope – 1940 m, *Salix reticulata*, *Dryas octopetala*, 23.8. 1990 – 1940 m, *Salix reticulata*, 23.8. 1990 and 6.9. 1990; Bujačí vrch, northeastern slope – 1860 m, *Salix reticulata*, *Dryas octopetala*, 30.8. 1991; Kopské sedlo – 1750 m, *Salix reticulata*, 1.9. 1991.

Notes.

Russula pascua is recorded for the first time from Slovakia. In the Belaer Tatras it is found in different alpine sites. Mostly it is associated with *Salix reticulata*. Singer (1975) considered his "inodore" *Russula oreina* Singer (1938) from Altai to be a synonym of *Russula pascua* (Moell. & Schaeff.). Knudsen & Borgen (1982) and Gulden & al. (1985) followed his opinion. On the contrary Bon (1988) treated these taxons separately. On the basis of our collections from the Belaer Tatras we are not able to decide upon this problem. At the time we prefer to follow the species concept of Kühner (1975).

Russula cupreola Sarnari, Boll. Ass. Mic. Ecol. Romana 20–21: 64, 1990 – Fig. 3, a–e.

Pileus 2.5–4.5 cm, convex, soon plano-convex, fragile, margin slightly striate, pileipellis deep vinaceous, vinaceous purple, when old somewhat discolouring, glabrous, viscid, removable. – Lamellae adnexed, rather close, thin, fragile, soon cream to ochre, then ochre to yellow, edge smooth, concolorous. – Spore print yellow. – Stipe 2–3.5 \times 0.7–1.2(-1.4) cm, equal, fragile, white, glabrous, slightly veined. – Context very fragile, white colour not changing, pink with FeSO_4 . – Taste slowly

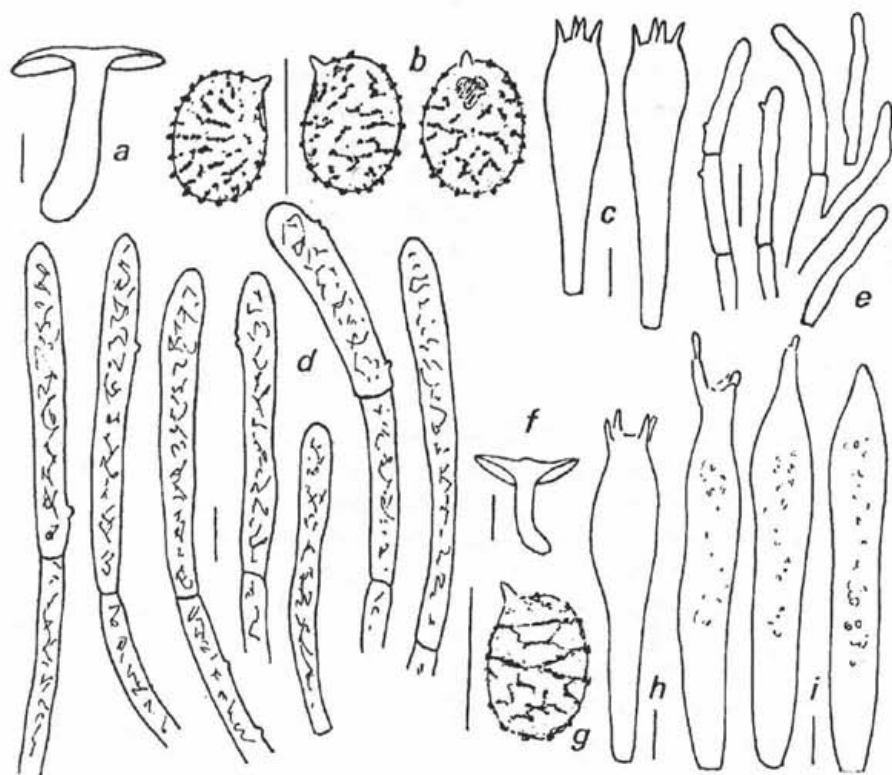


Fig. 3. *Russula cupreola* Sarnari: a. Fruit body - b. Spores. - c. Basidia. - d. Pileocystidia. - e. Hairs of pileipellis. *Lactarius nanus* Favre: f. Fruit body. - g. Spores. - h. Basidia. - i. Cystidia. Scale bar for illustrations: 1 cm - fruit bodies, 10 μ m - microscopic characters.

acid, not extremely but persistent. - Smell faintly fruity, if the flesh is desiccated then distinctly fruity.

Spores $7.7-9.5 \times 6.2-7.8 \mu\text{m}$, medium size $8.9 \times 7 \mu\text{m}$, $Q = 1.25$, with the exception of giant spores (5-20%) ca. $11.5 \times 9 \mu\text{m}$, ellipsoid, densely covered by small obtuse warts, $0.4-1 \mu\text{m}$ high, arranged often in chains or connected with short lines, plage small, amyloid. - Basidia $40-53 \times 11-16 \mu\text{m}$, 4-spored. - Cystidia $10.5-13 \mu\text{m}$ broad. - Pileocystidia up to $150 \times 4.2-9.3 \mu\text{m}$, numerous, septate, occasionally diverticulate. - Hairs of pileipellis $1.8-4(-4.7) \mu\text{m}$, often septate, occasionally diverticulate.

Material examined:

Zadné Jatky, saddle - 1950 m, *Dryas octopetala*, *Salix reticulata*, 1.9. 1991; Predné Jatky - 2000 m, *Dryas octopetala*, *Salix reticulata*, 1.9. 1991; Košiare - 2000 m, *Salix reticulata*, 1.9. 1991.

Notes.

This is the first record of *Russula cupreola* from Slovakia. In the Belaer Tatras it is found rarely on calcareous soil with *Dryas octopetala* and *Salix reticulata*. The species is known (Sarnari 1990, 1991) only from the Swiss Alps, (Val Corno) and from Italy (Conca delle Pisse near Monte Rosa). Our collections differ from the original description (Sarnari 1990) by the absent olive tinge of the pileipellis, and spores with a little higher ornamentation. We assume that these differences are within the range of variability for this species.

Lactarius nanus Favre, Champ. Sup. Zone Alp. Parc Nat. Suisse: 205, 1955 – Fig. 3, f-i.

Pileus small 1.8–3 cm, then plane, depressed, in the centre subpapillate, pale brown to slightly vinaceous brown, glabrous, not zonate, margin plane when old. – Lamellae cinnamomeous to cinnamomeous brownish, adnexed or shortly decurrent, dense, narrow, with numerous lamellules, with drops of unchangeable watery white milk when damaged, milk slightly acid. – Stipe 2–2.5 × 0.5–0.6 cm, pale ochre to cinnamomeous, frequently fistulose, fragile. – Context pale cream to cinnamomeous, ± mild, only milk acid.

Spores 7.5–9.5 × 6–7.7 μm, medium size 8.5 × 6.7 μm, Q = 1.28, ellipsoid, crested, crests 0.4–1 μm high. – Basidia 36–46 × 9.2–12.3 μm, 4-spored. – Cystidia 48–65 × 7.5–9.5 μm, fusoid-mucronate.

Material examined:

Košiare – 1980 m, *Polygonum viviparum*, 20.8. 1991 and 1.9. 1991.

Notes.

In the Belaer Tatras this species is found on acid soil in association with *Polygonum viviparum*. In Slovakia it is also reported from the Ďumbier Nature Reserve in the Low Tatras (Fellner & Landa 1989, 1990, 1991).

Lactarius salicis-reticulatae Kühner, Bull. Soc. Mycol. France 91: 389, 1975.

Material examined:

Zadné Jatky, saddle – 1950 m, *Salix reticulata*, *Dryas octopetala*, 1.9. 1991; Košiare – 2000 m, *Salix reticulata*, 20.8. 1991; Bujačí vrch, northeastern slope – 1880 m, *Dryas octopetala*, *Salix reticulata*, 20.8. 1991.

Notes.

In the Belaer Tatras it is found on calcareous soil, mostly in association with *Salix*

reticulata. In Slovakia it is also reported from Červené Vrchy Mts. in the western part of the High Tatras (Fellner & Landa 1989, 1990, 1991).

ADDITIONAL NOTES TO RUSSULA DRYADICOLA

In the first part of this study (Fellner & Landa 1993) a full description of *Russula dryadicola* Fellner & Landa was given. We decided to describe it as a new taxon on the basis of our comparison between the collection from the Belaer Tatras in alpine *Dryas* sites and collections of typical specimens of *Russula maculata* Qué. from the Czech Karst in planar oak sites (Central Bohemia: Prostřední vrch by Karlštejn, 310 m, in association with *Quercus pubescens*, 16.7. 1992).

In comparison to *Russula dryadicola* the main characters of *Russula maculata* are size of pileus 8–10 cm, bright orange colours of pileipellis, taste very acrid, fluorescence in UV light more intensive, spores (medium size $9.1 \times 8.0 \mu\text{m}$) covered with warts, $0.4\text{--}1.5 \mu\text{m}$ high, connected with occasional short lines, cystidia 8–13 μm broad, pileocystidia very variable in their breadth: $2.4\text{--}14.4 \mu\text{m}$, caulocystidia $2.6\text{--}16.0 \mu\text{m}$ broad, very numerous, in fascicles, hairs of pileipellis and stipitipellis very narrow, cylindric to filiform, flexuose, obtuse, in pileipellis $1.5\text{--}4 \mu\text{m}$ broad, in stipitipellis $1.7\text{--}3.4 \mu\text{m}$ broad and scattered. – Fig. 4, a–h.

REFERENCES

- BON M. (1988): Clé monographique des russules d'Europe. – Doc. Mycol. (71–72): 1–125.
- BRUCHET G. (1970): Contribution à l'étude du genre *Hebeloma* (Fr.) Kummer. – Bull. Soc. Linn. Lyon 39 (6, suppl.): 1–132.
- DEBAUD J.C. (1987): Ecological studies on alpine macromycetes: saprophytic *Clitocybe* and mycorrhizal *Hebeloma* associated with *Dryas octopetala*. – In: Laursen G.A., Ammirati J.F., Redhead S.A. (eds.), Arctic and Alpine Mycology 2 – Plenum Publishing Corporation: 47–60.
- EINHELLINGER A. (1985): Die Gattung *Russula* in Bayern. – Hoppea 43: 5–286.
- EYNARD M. (1977): Contribution à l'étude écologique des Agaricales des groupements à *Salix herbacea*. – Thèse d'Etat, Lyon.
- FAVRE J. (1955): Les champignons supérieurs de la zone alpine du Parc National Suisse. – *Ergebn. Wiss. Untersuch. Schweiz. Nationalpark* 5: 1–212.
- FAVRE J. (1960): Catalogue descriptif des champignons supérieurs de la zone subalpine du Parc National Suisse. – *Ergebn. Wiss. Untersuch. Schweiz. Nationalpark* 6: 323–610.
- FELLNER R., LANDA J. (1989): Nález arktických a alpínských hub v Československu. – In: Sborník referátů a souhrnů referátů z VIII. celostátní vědecké mykologické konference, Vysoká škola zemědělská, Brno: 43.
- FELLNER R., LANDA J. (1990): Giant Mountains and the High Tatras – two prominent Central European localities of arcto-alpine fungi. – In: Reisinger A., Bresinsky A. (eds.), Fourth International Mycological Congress, Abstracts, University of Regensburg, Regensburg: 119/2.
- FELLNER R., LANDA J. (1991): Arctic and alpine fungi in Czechoslovakia. – *Čes. Mykol.* 45: 35.
- FELLNER R., LANDA J. (1993): Some species of Cortinariaceae and Russulaceae in the alpine belt of the Belaer Tatras – I. – In: Petrini O., Laursen G.A. (eds.), Arctic and Alpine Mycology 3–4, *Bibl. Mycol.* 150: 33–37.
- FELLNER R., LANDA J., SOUKUP F. (1990): Mykologický monitoring na trvalých plochách v oblasti Furkoty a Doliny Siedmich prameňov (TANAP) a mykologický inventarizační výzkum těchto území. – Intern. field res. report, ZO ČSOP při VÚLHM, Strnady, 36 pp.

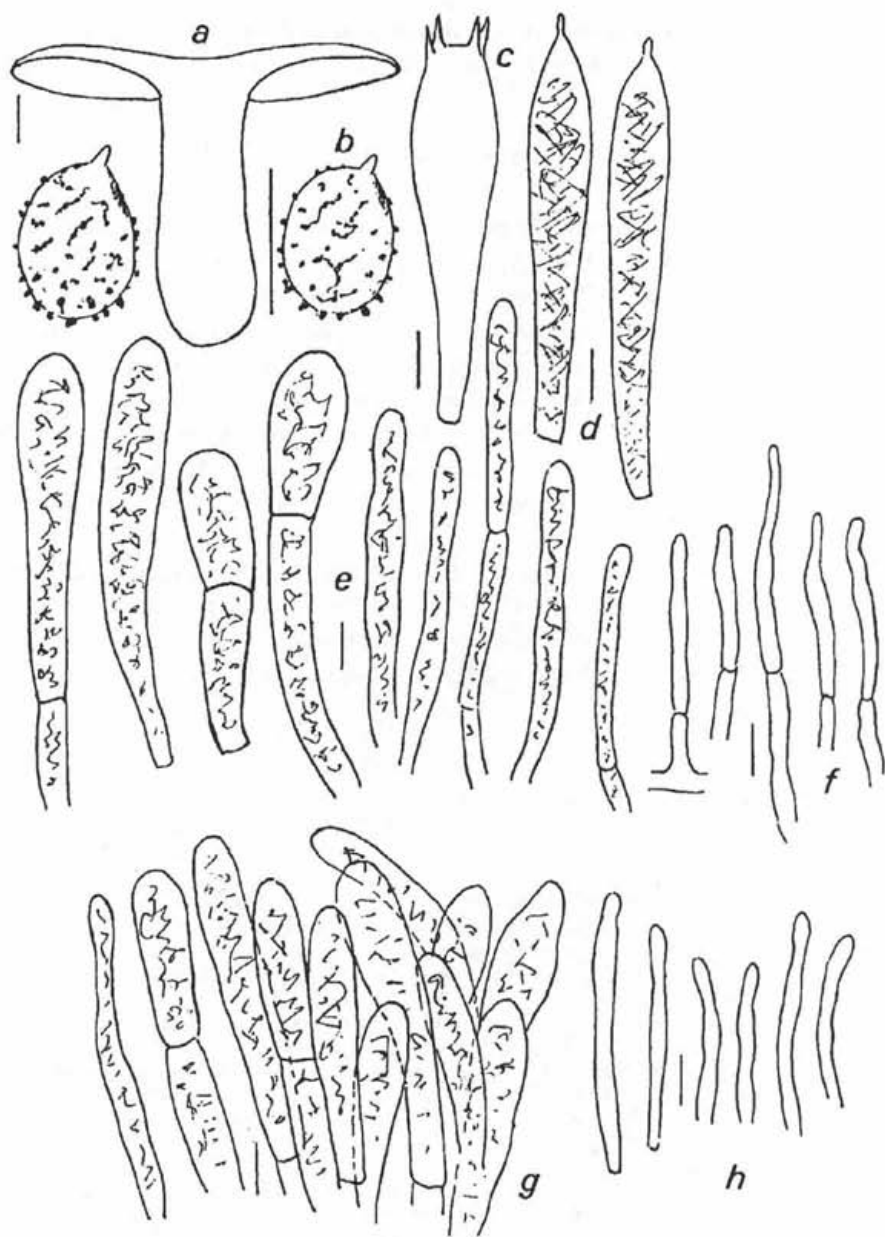


Fig. 4. *Russula maculata* Qué!.: a. Fruit body. - b. Spores. - c. Basidia. - d. Cystidia. - e. Pileocystidia. - f. Hairs of pileipellis. - g. Caulocystidia. - h. Hairs of stipitipellis. Scale bar for illustrations: 1 cm - fruit body, 1 μ m - microscopic characters.

- GULDEN G., JENSSEN K.M., STORDAL J. (1985): Arctic and alpine fungi. 1. – Soppkonsulentent, Oslo, 62 pp.
- HORAK E. (1987): Revision der von J. Favre (1955) aus der Region des Schweizer Nationalparks beschriebenen alpinen Arten von *Cortinarius* subgen. *Telamonia* (Agaricales). – *Candollea* 42: 771–803.
- KNUDSEN H., BORGEN T. (1992): Russulaceae in Greenland. In: Laursen G.A., Ammirati J.F. (eds.), *Arctic and Alpine Mycology 1*, University of Washington Press, Seattle and London: 216–244.
- KUBIČKA J. (1971): *Inocybe geranioidora* Favre – vláknice muškátová, nový druh pro Československo. – *Čes. Mykol.* 25: 239–241.
- KÜHNER R. (1975): Agaricales de la zone alpine. Genre *Russula* Pers. ex S.F. Gray. – *Bull. Soc. Mycol. France* 91: 313–390.
- KÜHNER R. (1988): Diagnoses de quelques nouveaux *Inocybes* récoltés en zone alpine de la Vanoise (Alpes françaises). – *Doc. Mycol.* 74: 1–27.
- KUYPER T.W. (1986): A revision of the genus *Inocybe* in Europe. I. Subgenus *Inosperma* and the smooth-spored species of subgenus *Inocybe*. – *Persoonia*, Suppl. 3: 1–247.
- LAMOURE D. (1977): Agaricales de la zone alpine. *Cortinarius* Fr., subgenus *Telamonia* (Fr.) Loud. I. – *Trav. Sci. Parc Nat. Vanoise* 8: 115–146.
- LAMOURE D. (1978): Agaricales de la zone alpine. *Cortinarius* Fr., subgen. *Telamonia* (Fr.) Loud. II. – *Trav. Sci. Parc Nat. Vanoise* 9: 77–101.
- LAMOURE D. (1987): Agaricales de la zone alpine. Genus *Cortinarius* Fr., subgenus *Telamonia* (Fr.) Loud. Part III. – In: Laursen G.A., Ammirati J.F. (eds.), *Arctic and Alpine Mycology 2*, Plenum Publishing Corporation: 255–259.
- NESPIAK A. (1990): *Grzyby (Mycota)*. Tom XIX. – In: *Flora Polska*, Polska Akademia Nauk, Warszawa – Kraków, 175 pp.
- ROMAGNESI H. (1967): *Les Russules d'Europe et d'Afrique du Nord*. – Bordas, Paris, 998 pp.
- SARNARI M. (1990): Una nuova specie di *Russula* propria delle microsilve alpine. – *Boll. Ass. Mic. Ecol. Romana* 20–21: 60–65.
- SARNARI M. (1991): Precisazioni in merito a *Russula cupreola* e *Russula monspeliensis*. – *Boll. Ass. Mic. Ecol. Romana* 24: 7–8.
- SCHMID-HECKEL H. (1985): Zur Kenntnis der Pilze in den Nördlichen Kalkalpen. – *Nationalparkverwaltung Berchtesgaden, Forschungsberichte* 8: 1–201.
- SCHMID-HECKEL H. (1988): Pilze in der Berchtesgadener Alpen. – *Nationalparkverwaltung Berchtesgaden, Forschungsberichte* 15: 1–136.
- SENN-IRLET B. (1987): Ökologie, Soziologie und Taxonomie alpiner Makromyceten (Agaricales, Basidiomycetes) der Schweizer Zentralalpen. – *Diss. Universität Bern*, 252 pp.
- SENN-IRLET B. (1988): Macromycetes in alpine snow-bed communities – mycocoenological investigations. – *Acta Bot. Neerl.* 37: 251–263.
- SINGER R. (1925): Zur *Russula*-Forschung. – *Z. Pilzk.* 5: 73–80.
- SINGER R. (1926): Monographie der Gattung *Russula*. – *Hedwigia* 66: 153–260.
- SINGER R. (1932): Monographie der Gattung *Russula*. *Beih. Bot. Cbl.* 49: 205–380.
- SINGER R. (1938): Contribution à l'étude des Russules. – *Bull. Soc. Mycol. France* 54: 132–177.
- SINGER R. (1975): The Agaricales in modern taxonomy. – *Cramer, Vaduz*, 912 pp.
- SKIFTE O. (1989): *Russula* of the island Bjørnøya (Bear Island), Svalbard. – *Opera Bot.* 100: 233–239.
- TONDL F. (1988): *Russula nana* v Západních Tatrách. – *Mykol. Listy* (32): 4–8.
- VESTERHOLT J. (1989): A revision of *Hebeloma* sect. *Indusiata* in the Nordic countries. – *Nord. J. Bot.* 9: 289–319.