



ORIGINAL RESEARCH PAPER

***Lepiota oreadiformis* VELEN. AND *Lactarius rubrocinctus* FR.
(BASIDIOMYCOTA), TWO MACROFUNGAL SPECIES NEW TO
MONTENEGRO**

Ilinka ČETKOVIĆ¹, Suzana MALIDŽAN¹ and Marija KOJIC^{2*}

¹ Natural History Museum of Montenegro, Trg vojvode Bećir bega Osmanagića 16, 81000 Podgorica, Montenegro.

² Gymnasium „Slobodan Škerović”, Vaka Đurovića 25, 81000 Podgorica,

E-mails: ilinka.cetkovic@gmail.com, suzana.maldzan@gmail.com, marija.kojic@gim-pg.edu.me

* Corresponding author: marija.kojic@gim-pg.edu.me

Key words:

Agaricales,
biodiversity,
biogeography,
Russulales.

Ključne riječi:

Agaricales,
biološka raznovrsnost,
biogeografija,
Russulales.

SYNOPSIS

As a result of the first mycological research at several localities in the municipality of Nikšić, Montenegro, two macrofungal species new to Montenegrin mycobiota were recorded and described: *Lepiota oreadiformis* Velen. and *Lactarius rubrocinctus* Fr.. The descriptions are accompanied by photographs of the basidiomata on the site and some microscopic characters.

SINOPSIS

LEPIOTA OREADIFORMIS VELEN. I *LACTARIUS RUBROCINCTUS* FR. (BASIDIOMYCOTA), DVIJE NOVE VRSTE MAKROGLJIVA ZA CRNU GORU

Kao rezultat prvih mikoloških istraživanja na nekoliko lokaliteta u opštini Nikšić, Crna Gora, zabilježene su i opisane dvije vrste makro gljiva, nove za crnogorsku mikobiotu: *Lepiota oreadiformis* Velen. i *Lactarius rubrocinctus* Fr.. Opisi su praćeni fotografijama plodišta na lokalitetu i nekim mikroskopskim karakteristikama.

INTRODUCTION

Due to the small number of researchers and the large number of different types of habitats, fungi are still one of the least studied groups of organisms in Montenegro. Although there are areas from which we have a significant amount of mycological data, unfortunately, there are also a large number of areas from

which such data are lacking. According to Kasom (2013), 839 macro-basidiomycetes have been recorded in Montenegro until then, of which 444 belong to the order Agaricales, and 112 to the order Russulales. In autumn 2018 and 2019, we researched fungi in the municipality of Nikšić (vicinity of Morakovo village and Vojnik Mountain) and collected about 50 species of macro-basidiomycetes. During

identification, we discovered two species new to Montenegrin mycobiota, *Lepiota oreadiformis* (Agaricales) and *Lactarius rubrocinctus* (Russulales), which we report and describe in this paper.

MATERIAL AND METHODS

The collected specimens were deposited in the mycological collection of Natural History Museum of Montenegro (Podgorica). The fruiting bodies were photographed in situ, carefully detached from the substrate, wrapped in aluminum foil, and placed in the wooden basket. The collection date, locality, plant community and number of fruiting bodies were noted in the field. Laboratory work comprised description of the macroscopic characters of the fruiting bodies, their preservation by drying (in exicator at 40–60°C) and storage in plastic bags, and subsequent identification. Microscopic characters were observed and described from dried material mounted in 2.5% potassium hydroxide (KOH) and observed with an Olympus CX41 light microscope. Amyloidity of basidiospores were tested in Melzer's reagent. Basidiospore measurements were made on 30 randomly selected mature basidiospores from calibrated digital images, using Motic Images Plus 2.0 software.

RESULTS AND DISCUSSION

Taxonomy

Lepiota oreadiformis Velen., České Houby 1: 215 (1920)

= *Lepiota clypeolaria* var. *pratensis* (Bull.) Gillet, Hyménomycètes (Alençon): 62 (1876) [1878]

= *Lepiota gracilis* var. *laevigata* J.E. Lange, Dansk bot. Ark. 2: 52 (1915)

= *Lepiota laevigata* (J.E. Lange) J.E. Lange, Dansk bot. Ark. 4: 47 (1923)

= *Lepiota oreadiformis* var. *laevigata* (J.E. Lange) Bon, Docums Mycol. 22(no. 88): 28 (1993)

= *Lepiota pratensis* (Bull.) Bigeard & H. Guill., Fl. Champ. Supér. France 1: 58 (1909)

= *Lepiota rocabrunae* Consiglio & Migl., Revta Catal. Micol. 24: 229 (2002)

Pileus 33–35 mm broad, ± hemispherical with inflexed margin at first, then campanulate, convex or plano-convex with a low, broad umbo, light red-brown at first, later very pale pinkish-brownish with light reddish-brown centre, dry, almost glabrous at first, later finely plush-like near the centre and minutely, adpressed flocculose-squamulose towards margin, often shallowly cracked, margin with small, white, floccose velar remnants. **Lamellae** free, moderately crowded, cream, edge entire and concolorous. **Stipe** 71–78 × 6.5 mm, cylindrical, base slightly broadened, white fibrillose to floccose on cream to pale brown ground, at annular zone with tufts of loose, white fibrils, hollow, dry. **Context** in pileus whitish to cream, in stipe cream and pinkish in lower part. **Taste** mild or insipid. **Smell** unpleasant of rubber. **Spore-print** white. **Basidiospores** 11.6–12.8–15 × 4.1–4.8–5.5 µm, Q = 2.3–2.7–3.3, in frontal view elongated ellipsoid, shortly clavate or subfusiform, in side view mostly fusiform-amygdaliform with both spore sides convex, with acute base and obtuse apex, often with suprahilal depression, smooth, dextrinoid. **Basidia** 4-spored, narrowly clavate. **Cheilocystidia** narrowly clavate, narrowly utriiform or subcylindrical, hyaline, slightly thick-walled. **Pleurocystidia** absent. **Pileipellis** a trichoderm, composed of

non-septate, prostrate hyphae, partially with erect ends, hyaline to pale brown. **Clamp-connections** present.

Specimen examined: MONTENEGRO, Nikšić Municipality, vicinity of Morakovo village, 42°42'9.87"N, 19°11'42.00"E, 898 m a.s.l., meadow, 8 October 2019,

leg. S. Malidžan & al., NHMP 782/10688.

Ecology & distribution - Fruiting bodies of *Lepiota oreadiformis* occurs solitary or in small groups in grasslands, at roadsides, rarely in deciduous forests, terrestrial, in summer and autumn; it

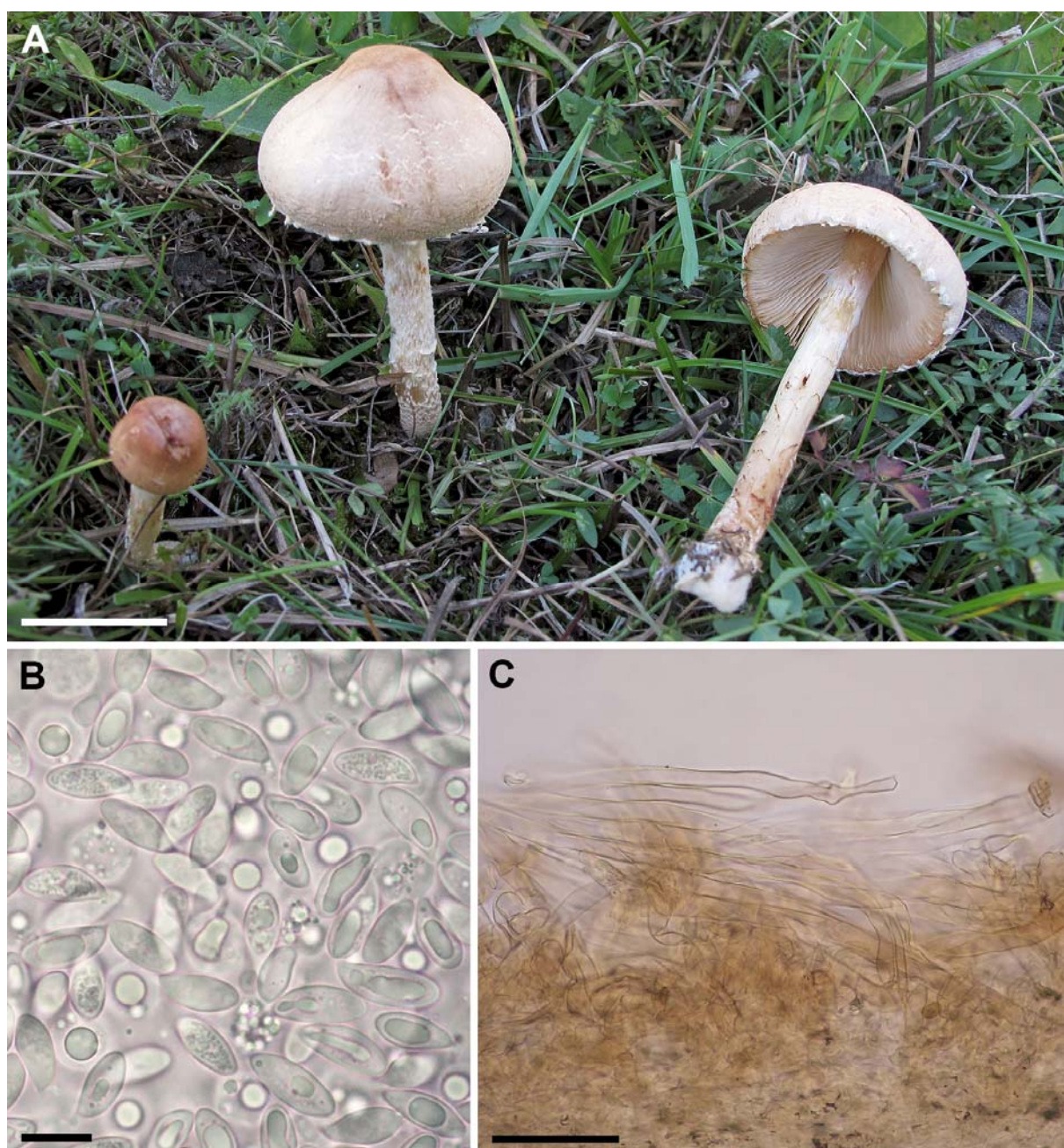


Figure 1: *Lepiota oreadiformis*. A. basidiomata; B. basidiospores; C. pileipellis.

Scale bars: A = 20 mm; B = 10 μm ; C = 50 μm .

lives as a saprotroph; widespread but rare in Europe (Vellinga, 2001; Lange, 2012). In surrounding countries, *L. oreadiformis* is recorded in Croatia (Mešić, 2008). New to the Montenegrin mycobiota.

Comments - Like most modern authors, we take *Lepiota oreadiformis* in a broader sense. It is characterised by a pale pileal surface without distinct and contrasting squamules, fusiform-amygdaliform basidiospores in side view, with both spore sides convex and average spore width up to 5.5 µm, and non-septate pileipellis hyphae (Vellinga, 2001). Only a few *Lepiota* species have no distinct and contrasting squamules on the pileus. *L. erminea* (Fr.) P. Kumm. differs by more whitish and/or yellowish colours in the pileus and broader basidiospores (averages 5.5–6.1). *L. pallida* Locq. ex Bon & Candusso differs by septate hyphae in the pileipellis. *L. oreadiformis* is not edible.

Lactarius rubrocinctus Fr., Monographia Hymenomycetum Sueciae 2: 176 (1863)

Pileus 37–111 mm broad, plano-convex with a decurved margin at first, later plane with ± depressed centre to funnel-shaped, pale orange - to ochre-brown at first, then often more brown to reddish at centre and palescent towards the margin, in maturity with many small orange-brown spots, dry to slightly greasy, in maturity radially wrinkled, at least around centre. **Lamellae** decurrent, narrow, medium crowded, cream when young, pinkish buff at maturity, with orange-brown spots, turning lilac-red when bruised. **Stipe** 49–73 × 11–17 mm, cylin-

dric, at first light orange-brown, later red brown to dark red-brown, with narrow darker (wine-brown) zone at the top, smooth. **Context** white to pale pinkish buff, unchanging. **Milk** white. **Taste** mild to slightly acrid. **Smell** faint. **Spore-print** whitish to cream. **Basidiospores** 6.6–7.8–9.6 × 5.7–6.3–7.3 µm, Q = 1.1–1.2–1.4, subglobose to broadly ellipsoid; ornamentation up to 1 µm high, made up of warts and short ridges connected by finer lines to form a very incomplete reticulum, strongly amyloid. **Basidia** 4-spored, clavate. **Pleuromacrocystidia** and **cheilomacrocystidia** conical to fusiform. **Pileipellis** a hyphoepithelium to hymenopithelium.

Specimens examined: MONTE-NEGRO, Nikšić Municipality, vicinity of Morakovo village, 42°42'10.37"N 19°12'53.73"E, 1101 m a.s.l., beech forest, 8 October 2019, leg. M. Kojić & al., NHMP 783/10 689

Ecology & distribution - *Lactarius rubrocinctus* is associated with beech (*Fagus*) on rich soil, forming mycorrhiza. Fruiting bodies can be found from July to October. Rather rare European species, distributed in most parts of Europe, following the distribution of beech (Gminder et al., 2000). Extending north to southern Sweden (Heilmann-Clausen et al., 1998) and south to southern Italy (Onofri, 2005). In surrounding countries, *Lactarius rubrocinctus* is recorded in Croatia (Z. Tkalčec pers. com.) and Serbia (Katanić et al., 2011). New to the Montenegrin mycobiota.

Comments - *Lactarius rubrocinctus* is characterised by dominantly orange-

brown pileus which is wrinkled and has small orange-brown spots in maturity, lamellae which turning lilac-red when bruised, and a stipe with a darker, wine-brown apical zone. Microscopically, it

can be distinguished from all other European *Lactarius* species by very large macrocystidia and the type of pileipellis (Heilmann-Clausen et al., 1998). It is not edible.

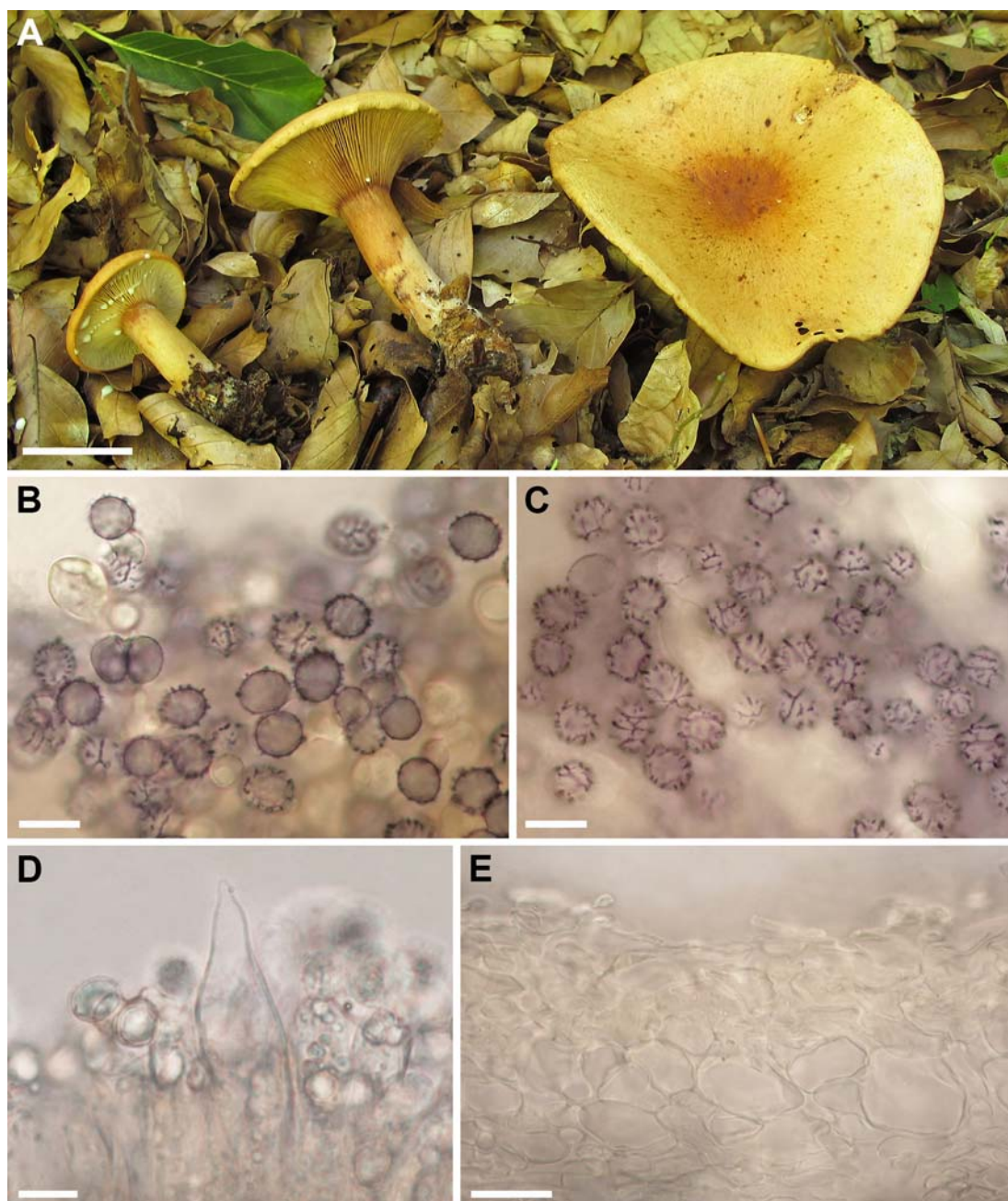


Figure 2: *Lactarius rubrocinctus*. A. basidiomata; B, C. basidiospores (in Melzer's reagent); D. macrocheilocystidium; E. pileipellis. Scale bars: A = 30 mm; B–D = 10 μm ; E = 20 μm .

Acknowledgements

We are very grateful to our colleagues from the Institute “Ruđer Bošković” (Zagreb), Dr Zdenko Tkalčec and Dr Armin Mešić for a critical review of the manuscript, useful suggestions and corrections.

REFERENCES

- GMINDER, A., KRIEGLSTEINER, G. J., WINTERHOFF, W. & KAISER, A. 2000: Die Großpilze Baden-Württembergs. 2. Ständerpilze: Leisten-, Keulen-, Korallen- und Stoppelpilze, Bauchpilze, Röhrlings- und Täublingsartige. - Verlag Eugen Ulmer, Stuttgart, 620 pp.
- HEILMANN-CLAUSEN, J., VERBEKEN, A. & VESTERHOLT, J. 1998: The genus *Lactarius*. Fungi of Northern Europe - vol. 2. - Svampetryk, Copenhagen, 287 pp.
- KATANIĆ, M., ORLOVIĆ, S., GREBENC, T., GALIĆ, Z., STOJNIĆ, S., KRAIGHER, H. 2011: Ectomycorrhizal types on beech from Stara planina. - Institut za nizijsko šumarstvo i životnu sredinu, Topola, Poplar, 187-188: 85-98.
- KASOM, G. 2013: Makromicete razdjela Basidiomycota Crne Gore. Doktorska disertacija. - Univerzitet Crne Gore, Prirodno-matematički fakultet, Podgorica, 251 pp.
- LANGE, C. 2012: Lepiota (Pers.: Fr.) Gray. In: KNUDSEN, H. & VESTERHOL, T.J., (Eds), Funga Nordica. - Nordsvamp, Copenhagen. pp: 627–637.
- MEŠIĆ, A. 2006: Gljive reda Agaricales (Basidiomycota) s bijelim sporama u Hrvatskoj. Doktorska disertacija. - Sveučilište u Zagrebu, Prirodoslovno-matematički fakultet, Zagreb, 173 pp.
- ONOFRI, S. (Ed.) 2005: Checklist dei funghi italiani. - Carlo Delfino editore, Sassari, 380 pp.
- VELLINGA, E.C. 2001: Lepiota (Pers.: Fr.) S.F. Gray. - In: NOORDELOOS, M.E., KUYPER, T.W. & VELLINGA, E.C. (Eds), Flora Agaricina Neerlandica, Critical monographs on families of agarics and boleti occurring in the Netherlands, Vol. 5. - A.A. Balkema Publishers, Lisse/Abingdon/Exton (PA)/Tokyo, pp. 109–154.

Received: 19. July 2021.