

Agaricales of Indonesia. 3. New records of the genus *Lactarius* (Basidiomycota, Russulales) from Java.

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Verbeken, A., E. Horak & D. E. Desjardin (2001). Agaricales of Indonesia. 3. New records of the genus *Lactarius* (Basidiomycota, Russulales) from Java. – Sydowia 53(2): 261–289.

Based upon fresh material evaluated and annotated by E. Horak and D. E. Desjardin in Java (Indonesia), seven new species of *Lactarius* Pers. are described and illustrated. Three species, recently recorded from Papua New Guinea, are reported for the first time from Java. According to field data, all species of *Lactarius* described in this contribution have fagaceous trees (*Castanopsis*, *Lithocarpus*, *Quercus*) as their putative ectomycorrhizal hostpartners. A key to eleven species (including the enigmatic *L. sublignyotus* Henn. & E. Nyman) is provided to aid in identifying Javanese *Lactarius*.

Keywords: Russulales, taxonomy, ectomycorrhizal fungi, *Castanopsis*, *Lithocarpus*, *Quercus*.

Based upon mycoecological observations in various habitats world-wide, all species of *Lactarius* are obligate ectomycorrhiza formers both with broadleaf, evergreen and deciduous trees and with conifers (in particular members of the Pinaceae). Despite the fact that the basidiomes of the majority of *Lactarius* species are large and conspicuous, the diversity and ecology of the numerous taxa this genus of the Russulales are still poorly known. The most comprehensive contributions on *Lactarius* in temperate biomes of the northern hemisphere relate to taxa occurring in Europe (Neuhoff 1956, Heilmann–Clausen & al. 1998, Basso 1999), North America (Hesler & Smith 1979), and Japan (Hongo 1960). In the temperate zone of the southern hemisphere only the *Lactarii* of New Zealand have been recorded and critically monographed by McNabb (1971).

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Within the tropical-subtropical region of Africa and SE-Asia, representatives of *Lactarius* have been reported from Central Africa (Heim 1955a, 1955b; Verbeken 2000, 2001), Madagascar (Heim 1938), Sri Lanka (Pegler 1986), and Papua New Guinea (Verbeken & Horak 1999, 2000).

Except for a few taxa of *Lactarius* recorded from Thailand (Heim 1962) no significant contribution on *Lactarius* has ever been published within the Malaysian region in the strict sense. These mycorrhizal fungi play an active ecophysiological role in the symbiosis between fungus and its obligate tree partners. In order to enhance the success in reforestation projects (urgently needed all over SE-Asia), most species of Malaysian Lactarii could probably be used as inoculum in tree nurseries rearing vigorous and site-adjusted seedlings of local dipterocarp and fagaceous trees.

Lactarius sublignytus Henn. & E. Nyman (Hennings 1900) is the only known *Lactarius* from Java (Indonesia).

In this contribution, seven new species of *Lactarius* and three first Javanese reports of species previously recorded from Papua New Guinea are presented.

Considering the actual distribution and ecology of the ectomycorrhizal dipterocarps and fagaceous trees in the Indonesian forest biomes (Johns 1995a, Whitten & al. 1997), then the 11 recorded taxa of *Lactarius* may represent just a fraction of their actual diversity. This assumption is supported by the fact that recently in ecologically comparable forest associations 5 species of *Lactarius* have been described from lowland dipterocarp forests in Papua New Guinea (versus no record in Indonesian territory) and 22 species were found to be associated with fagaceous trees in montane rain forests (Heim & Perreau-Bertrand 1973, Hongo 1973, Verbeken & Horak 1999, 2000).

From a mycogeographical point of view only 3 out of the 27 Papuan species of *Lactarius* (viz. *L. corrugatus*, *L. liliputianus*, *L. leucophaeus*) have been discovered in Javanese forests. In the past, dipterocarp and fagaceous (except *Nothofagus*) forest belts migrated eastward (with Java being one of the stepping stones) from the Indomalayan tropics to the island of New Guinea and reached there the easternmost outposts of its natural distribution (Johns 1995b). Simultaneously, the strictly symbiotic species of *Lactarius* closely followed their tree hosts on the eastbound migration. The present, seemingly disjunct (a mere consequence of still missing data) distribution pattern of Malaysian Lactarii indicates that in the past both partners obviously succeeded to cross together the biogeographically significant barrier "Wallace Line", running South to North between Bali and Lombok. Both islands have been visited at several occasions but surprisingly no representatives of *Lactarius* have been found yet in their ecologically adequate forests. Future

field work and research may prove the hypothesis that all Papuan *Lactarii* (except those in ectomycorrhizal symbiosis with *Nothofagus*) will, sooner or later, also be recorded within Indonesian territory.

Regarding the actual diversity and history of the Malaysian mycota in general, our limited data on Javanese and Papuan taxa illustrate once again the fragmentary knowledge about the occurrence and distribution of agarics and boletes in the unique biomes of Indonesia and its adjacent regions.

Material and methods

During the last few years fresh specimens have been gathered in montane rain forests of Java which are dominated by several genera of oaks (Soepadmo, 1972). These host trees are suspected to be the ectomycorrhizal host plants of the *Lactarii* mentioned in this contribution.

Fresh material of Javanese *Lactarius* has been annotated and processed by E. Horak and/or D. E. Desjardin (1977, 1998–2001). Holotype material is kept in Herbarium BO (Bogor, Indonesia) and duplicates are lodged both in GENT (Gent, Belgium) and ZT (Zurich, Switzerland). The description and terminology of microscopic features follow Verbeken (1998). Color codes relate to Kornerup & Wanscher (1978).

Results and discussion

This paper refers to eleven Javanese representatives of *Lactarius* (Russulales, Basidiomycota) and encompasses seven new taxa, and three already known species recently recorded by Verbeken & Horak (1999, 2000) from fagaceous forests in Papua New Guinea. SEM photograms of the basidiospores are presented for all taxa. Prior to this report, only one species of *Lactarius* has been published from Java, viz. *L. sublignytus* Henn. & E. Nyman (1900). Unfortunately, we have not encountered yet this conspicuous species of *Lactarius*.

Key to the known Javanese species of *Lactarius*

- 1. Latex bright yellow from the beginning or changing to yellow when in contact with the context or when isolated. Context (and latex) sooner or later turning to yellow 2
- 1*. Latex watery or white, eventually changing to greenish or brownish but never changing to yellow 4
- 2. Pileus surface glabrous and viscid to glutinous. Ornamentation of basidiospores forming zebroid pattern 1. *L. zebrisporus*
- 2*. Pileus surface minutely or densely fibrillose, viscid when moist. Ornamentation of basidiospores forming reticulate pattern . . . 3

- 3.. Stipe smooth, not scrobiculate. Pileus deep liver brown or red-
dish brown. Basidiospores on average $7.2 \times 6.5 \mu\text{m}$ 2. *L. sulphurescens*
- 3*. Stipe distinctly scrobiculate. Pileus pale hazel brown or flesh-
colored. Basidiospores on average $10.2 \times 9.3 \mu\text{m}$ 3. *L. austroscrobiculatus*
- 4. Context and latex changing to reddish brown 4. *L. rubrobrunnescens*
- 4*. Context and latex not changing to reddish brown 5
- 5. Mature basidiomes small and slender, pileus up to 15 mm diam.
Ornamentation of basidiospores formed by (almost completely)
isolated, obtuse warts 5. *L. liliputianus*
- 5*. Mature basidiomes larger. Ornamentation of basidiospores
formed by connected warts or reticulate 6
- 6. Latex turning pale greenish upon drying. Lamellae very crow-
ded. Pileus pale brown to greyish beige 6. *L. leucophaeus*
- 6*. Latex unchanging 7
- 7. Pileus smooth, dry, with distinct, acute papilla. Stipitipellis with
prominent caulocystidia 7. *L. caulocystidiatus*
- 7*. Pileus distinctly venose or wrinkled to net-like, papilla absent.
Stipitipellis without caulocystidia 8
- 8. Basidiomes up to 190 mm diam. Pileus caramel-brown. Lamellae
distant. Ornamentation of basidiospores forming reticulate rid-
ges and isolated warts 8. *L. javanicus*
- 8*. Basidiomes smaller, up to 50 mm diam. Pileus ochre-brown, red-
brown or fuliginous. Lamellae moderately crowded 9
- 9. Pileus ochre-brown to red-brown. Ornamentation of basidio-
spores forming zebroid pattern if reminding *L. lignyotus* and if
with greyish lamellar edge, cf. 11. *L. sublignyotus* 9. *L. corrugatus*
- 9*. Pileus fuliginous, wrinkled to net-like. Ornamentation of basi-
diospores forming reticulate pattern (without parallel ridges) ...
..... 10. *L. reticulatovenosus*

Description of the Javanese species of *Lactarius*

1. *Lactarius zebrisporus* Verbeken & E. Horak **sp. nov.** – Pl. 1: 1;
Fig. 1: 1–4, Fig. 2: 1–3.

Pileus –80 mm diam., subumbilicatus, ad marginem incurvatus, glabrus, pal-
lide aurantiacus vel ochraceus, subzonatus, viscidus. Lamellae decurrentes, pallide

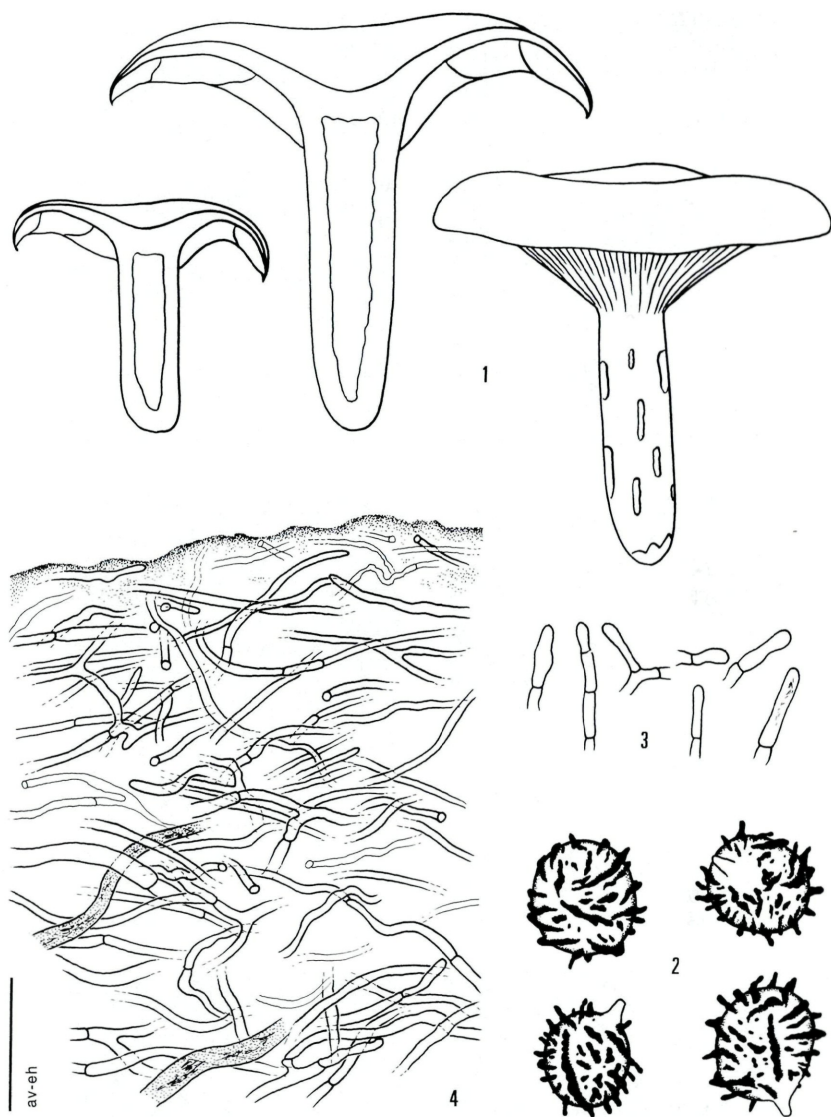
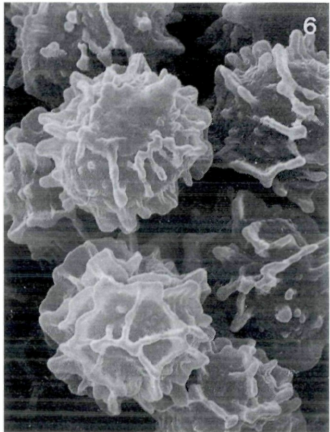
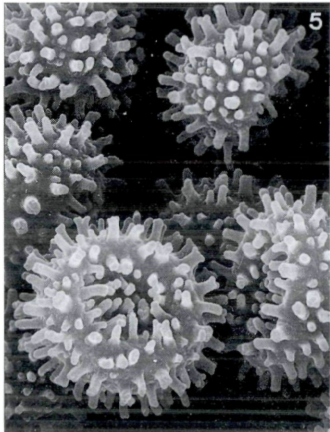
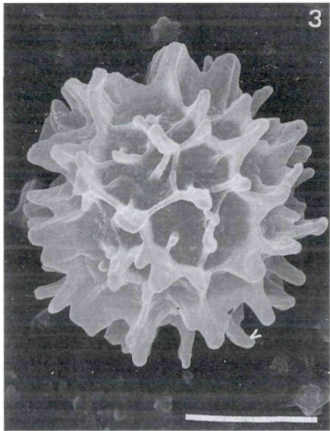
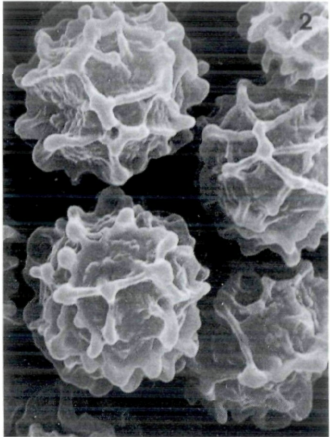
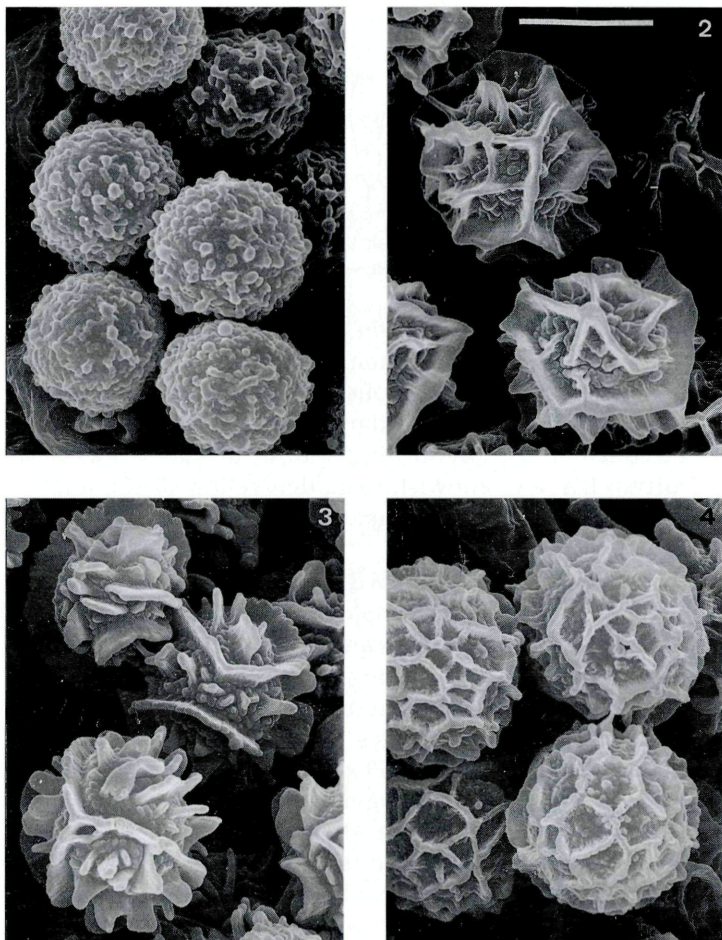


Fig. 1. – *Lactarius zebrisporus* (holotype): 1. Basidiomes. – 2. Basidiospores. – 3. Marginal cells. – 4. Cross-section of pileipellis. – Scale bar: 1 = 20 mm, 2 = 10 μ m, 3 = 40 μ m, 4 = 80 μ m.

ochraceae, ad marginem concolores, lamellis instructae. Stipes 40 mm \times 14 mm, cylindricus, viscidus, pileo concolor, glabrus vel scrobiculis aurantiacis instructus, cavus. Caro concolor, immutabilis. Sapor nullus. Odor gratus. Latex stramineus vel aureus, immutabilis. Basidiosporae in cumulo albae, (8–)9.1(–10.2) \times (7–)7.9(–8.8) μ m, subgloboae vel late ellipsoideae, amyloideae, alis et crestis conspicuis obtectae. Basidia 50–60 \times 13–15 μ m, tetraspora. Pleuromacrocystidia 40–55 \times 10–11 μ m, abundantia, inconspicua. Pileipellis ex hyphis cylindricis gelatinosisque ixocutem





Pl. 2: 1. – *Lactarius leucophaeus* (ZT 7330). – 2. *Lactarius javanicus* (holotype). – 3. *Lactarius corrugatus* (ZT 77–186). – 4. *Lactarius reticulatovenosus* (holotype). – Scale bar = 5 μ m.

formantibus. Fibulae nullae. Ad terram in silvis fagineis montanisque (*Castanopsis*, *Quercus*). Indonesia: Java, Cibodas, 30 Dec. 1998, Horak ZT 6460 (holotypus BO; isotypi GENT, ZT).

Pileus –80 mm diam., already in young specimens depressed-umbilicate, margin strongly inrolled, smooth, weakly striate, surface pale ochraceous orange, with paler concentric zonation, viscid to glutinous. Lamellae decurrent, 48–60 reaching stipe, 3–7 lamel-

Pl. 1: 1. – *Lactarius zebrispurus* (holotype). – 2. *Lactarius sulphureus* (holotype). – 3. *Lactarius austroscrobiculatus* (holotype). – 4. *Lactarius rubrobrunnescens* (holotype). – 5. *Lactarius liliputianus* (ZT 77–103). – 6. *Lactarius caulocystidiatus* (holotype). – Scale bar = 5 μ m.

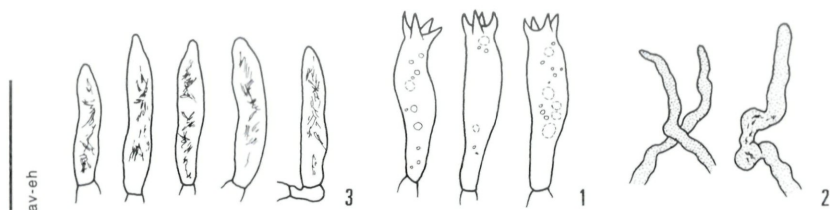


Fig. 2. – *Lactarius zebrisporus* (holotype): 1. Basidia. – 2. Pleuopseudocystidia. – 3. Pleuromacrocytidia. – Scale bar = 40 μ m.

lulae, crowded, up to 3 mm wide, pale ochre-apricot, edge entire, concolorous. – Stipe 40 \times 14 mm, solitary, cylindric, hollow, viscid, smooth, concolorous with pileus, often with distinct apricot-orange tinge, scrobiculate with darker, carrot-orange scrobicules. – Context concolorous, not turning yellow, brittle. – Taste mild. – Odor fruity. – Latex yellowish to golden yellow (3A6), unchanging, watery, no stained spots on lamellae. – Chemical reactions unknown.

Spore print white. – Basidiospores (8–)9.1(–10.2) \times (7–)7.9 (–8.8) μ m ($Q = 1.15$, $n = 20$), subglobose to broadly ellipsoid, ornamentation amyloid, composed of rather acute and narrow ridges up to 1(–1.5) μ m high, forming a zebroid pattern, but with incomplete and interrupted lines which are composed of ridges and abundant isolated and elongated warts, ridges often knotty and uneven, plage non-amyloid. – Basidia 50–60 \times 13–15 μ m, broadly clavate to almost cylindric, 4-spored, sterigmata 5–10 \times 2–3 μ m, content guttate. – Pleuromacrocytidia 40–55 \times 10–11 μ m, very abundant, not or hardly emergent, cylindric to broadly fusiform with rounded to slightly tapering apex, thin-walled, with needle-like content. – Pleuopseudocystidia not abundant, not emergent, cylindric, tortuous, with refringent content, 3–4 μ m diam. – Hymenophoral trama filamentose, with abundant lactifers. – Lamellar edge sterile, composed of marginal cells which are slightly embedded in a viscous matrix, marginal cells cylindric, with rounded apex, thin-walled, hyaline, 10–30 \times 3–5 μ m. – Pileipellis a cutis, 150–180 μ m thick, composed of loosely interwoven hyphae, embedded in a viscous matrix, layer of gluten composed of cylindric, narrow, 2–3 μ m diam. broad, thin-walled but hardly shrivelled, hyaline hyphae. – Stipitipellis an ixocutis. – Clamp connections absent.

Material examined. – INDONESIA: Java, Cibodas, 1700 m alt., on soil, in montane rain forest dominated by *Castanopsis* and *Quercus*, 30 Dec. 1998, leg. Horak ZT 6460 (holotype BO; isotypes GENT, ZT).

Lactarius zebrisporus is very closely related to *L. virgatisporus*, described from montane broad-leaved forests dominated by *Casta-*

nopsis and *Lithocarpus* in Papua New Guinea (Verbeken & Horak, 2000). In fact, both species agree in almost all essential characters except that the latex of *L. virgatisporus* is white as opposed to yellow in *L. zebrisporus*. Furthermore, the basidiospores, zebroid in both species, have in *L. virgatisporus* a more conspicuous ornamentation, i.e. the wing-like crests are by comparison more irregular and less densely arranged than in *L. zebrisporus*.

Lactarius zebrisporus belongs to subgen. *Piperites* (Fr. ex J. Kickx f.) Kauffman, subsect. *Zonarii* (Quél.) Basso.

2. *Lactarius sulphureus* Verbeken & E. Horak sp. nov. – Pl. 1: 2; Fig. 3: 1–7.

Pileus –50 mm diam., depresso-convexus, hepaticus vel castaneus, squamulis fibrillosis concoloribus vel obscurioribus dense obtectus, subsquamulosis marginem incurvatus versus, siccus. Lamellae adnatae vel decurrentes, cinnamomeo-ochraceae, ad marginem concolores. Stipes –35 × –10 mm, cylindricus, pruinoso-velutinus, lamellis concolor; siccus, cavus. Caro perlutea, fragilis. Sapor amarus. Odor gratus. Latex perluteus. Basidiosporae (6.5–)7.2(–8.0) × (6.0–) 6.5 (–7.1) µm, subglobose vel late ellipsoideae, amyloideae, subreticulatae. Basidia 40–60 × 10–12 µm, tetraspora. Pleuromacrocystidia 50–75 × 6–8 µm, abundantia. Pileipellis ex hyphis et cellulis haud gelatinosis cutem vel trichodermium formantibus. Fibulae nullae. Indonesia: Java, Mt. Halimun N.P., Cikaniki, ca. 950 m alt. Ad terram in silvis fagineis montanisque (*Castanopsis*, *Quercus*), 13 Jan. 1998, leg. Horak ZT 7044 (holotypus BO; isotypi GENT, ZT).

Pileus –50 mm diam., already in young specimens depressed-convex with inrolled margin, especially in center covered with darker or concolorous, appressed, more or less fibrillose squamules, becoming scurfy to minutely fibrillose-squamulose towards the weakly striate margin, opaque, dry, deep liver brown, red brown. – Lamellae 36–44 reaching stipe, rather distant, one lamellula or none, adnate to decurrent, cinnamon ochre, edge entire, concolorous. – Stipe –35 × –10 mm, solitary, cylindric, tapering downwards, minutely pruinose or velutinous, dry, concolorous with lamellae, sometimes with darker scrobicules, hollow with fibrillose pith. – Context immediately chrome yellow upon exposure, brittle. – Taste bitter. – Odor aromatic. – Latex chrome yellow, abundant. – Chemical reactions unknown.

Spore print unknown. – Basidiospores (6.5–)7.2(–8.0) × (6.0–) 6.5(–7.1) µm (n = 20, Q = 1.11), subglobose to broadly ellipsoid, ornamentation amyloid, composed of irregular ridges, locally up to 1(1.5) µm high and acute, forming an incomplete reticulum, some isolated irregular warts present, plage distally and incompletely amyloid. – Basidia 40–60 × 10–12 µm, subcylindric to narrowly clavate, 4-spored, sterigmata 5–7 × 1–2 µm. – Pleuromacrocystidia 50–75 × 6–8 µm, abundant, not or slightly emergent, subcylindric

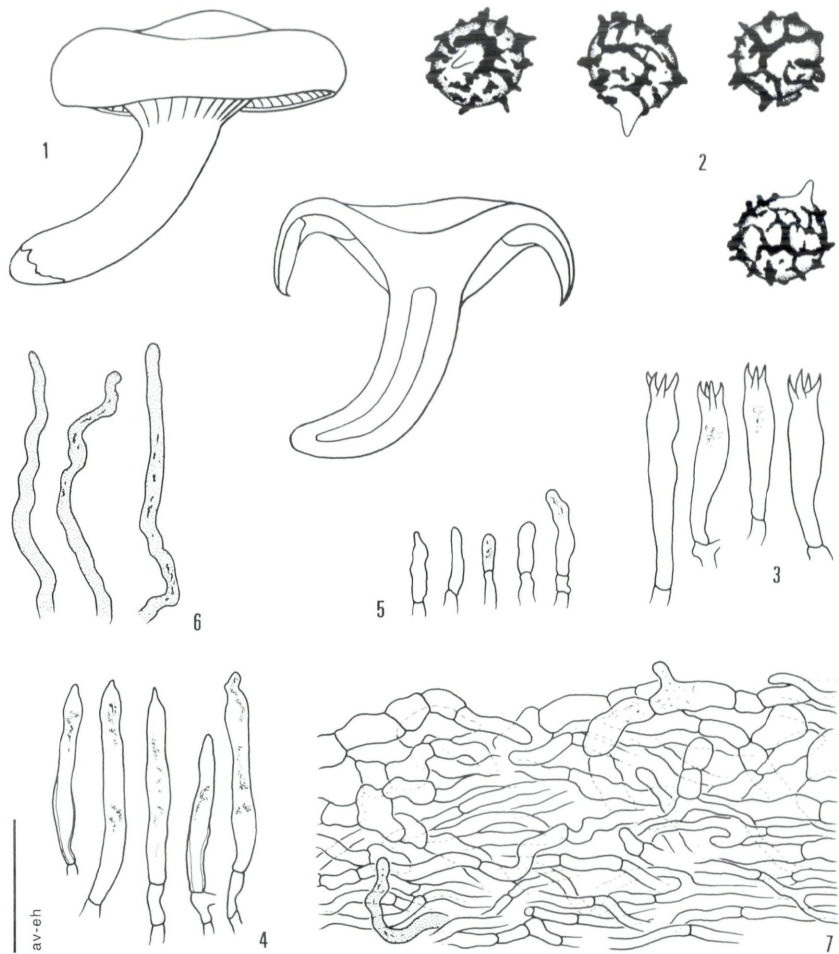


Fig. 3. – *Lactarius sulphurescens* (holotype): 1. Basidiomes. – 2. Basidiospores. 3. Basidia. – 4. Pleuromacrocystidia. – 5. Cheilopseudocystidia. – 6. Pleuropseudocystidia. – 7. Cross-section of pileipellis. – Scale bar: 1 = 20 mm, 2 = 10 μ m, 3–6 = 40 μ m, 7 = 80 μ m.

with tapering, sometimes mucronate apex, with slightly needle-like content. – Pleuropseudocystidia abundant, not or slightly emergent, 3–5 μ m diam., narrowly cylindric, with oil-like or slightly granular content. – Lamellar edge sterile, composed of marginal cells, marginal cells narrowly cylindric, some with a tapering apex, 15–30 \times 4–7 μ m, thin-walled, hyaline or with slightly granular content. – Hymenophoral trama mixed, composed of hyaline hyphae, abundant lactifers and some sphaerocysts. – Pileipellis cutis-like to trichoderm-like, 50–100 μ m thick, but with abundant short and swollen hyphae, thin-walled, with pale brown intracel-

lular pigmentation in the upper layer. – *Stipitipellis* a cutis. – Clamp connections absent.

Specimens examined. – INDONESIA: Java, Mt. Halimun National Park, Research Station Cikaniki, Loop trail, ca. 950 m alt., on soil, in montane rain forest dominated by *Castanopsis* and *Quercus*, 13 Jan. 1998, leg. Horak ZT 7044 (holotype BO; isotypes GENT, ZT).

Macroscopically, *Lactarius sulphurescens* is remarkable because of its conspicuous chrome yellow latex. The structure of the pileipellis is difficult to define. It can be described as a cutis intermixed with cellular elements. This type of pileipellis is occasionally encountered in subgen. *Russularia* for which several representatives exuding a yellow latex are already described in the pertinent literature. It is noteworthy that basidiomes with scrobiculate stipes and yellow latex are also reported for species belonging to subgen. *Piperites*. In this taxonomic group, however, the pileipellis of all recorded representatives does have an ixocutis. Therefore, we place *Lactarius sulphurescens* tentatively in subgen. *Russularia* (Fr. ex Burl.) Kauffman.

3. *Lactarius austroscrobiculatus* Verbeken & E. Horak sp. nov. –

Pl. 1: 3; Fig. 4: 1–2, Fig. 5: 1–6.

Pileus –100 mm diam., umbilicatus vel infundibuliformis, conspicue incurvatus ad marginem, avellaneus, coloribus pallide carneo-lilaceis tinctu, viscidus, siccitate dense fibrilloso-tomentosus. Lamellae adnatae vel decurrentes, densae, lamellulis nonnullis instructae, cremeae dein pallide aurantiacae, aureae tactu, ad marginem concolores. Stipes –80 × –16 mm, cylindricus, saepe attenuatae basim versus, pileo concolor vel pallidior, distincte scrobiculatus, cavus. Caro pallide avellanea, aurantio-lutescens. Sapor nullus. Odor gratus. Latex aquosus. Basidiosporae in cumulo albae vel pallide luteae, (8.9–)10.2(–11.6) × (8.1–)9.3(–10.5) µm, subglobosae vel late ellipsoideae, amyloideae, cretistis conspicuis (sub-)reticulatis instructae. Basidia 55–65 × 13–15 µm, tetraspora. Pleuromacrocyttidia 75–130 × 16–20 µm, abundantia, conspicua, fusiformes. Pleuropseudocystidia rara. Pileipellis ex hyphis hyalinis gelatinosisque ixocutem formantibus. Fibulae nullae. Ad terram in silvis fagineis montanisque (*Castanopsis*, *Quercus*). Indonesia: Java, Halimun N.P., 1000 m alt., 09 Jan. 1999, leg. Horak ZT 7314 (holotypus BO; isotypi GENT, ZT).

Pileus –100 mm diam., umbilicate to deeply infundibuliform, margin non-translucent striate, at first strongly inrolled-incurved, later straight, (pale) hazel brown with pale flesh color and pale lilac tinge, surface viscid if moist, soon dry, densely fibrillose-felty (with white shade), azonate. – Lamellae 40–60 reaching stipe, 1–3(7) lamellulae, crowded, adnate to decurrent, at first cream color, later changing to pale apricot-cream, golden yellow at bruising, edge entire, concolorous. – Stipe –80 × –16 mm, solitary, cylindric, often tapering at the base, paler than or concolorous with pileus, base

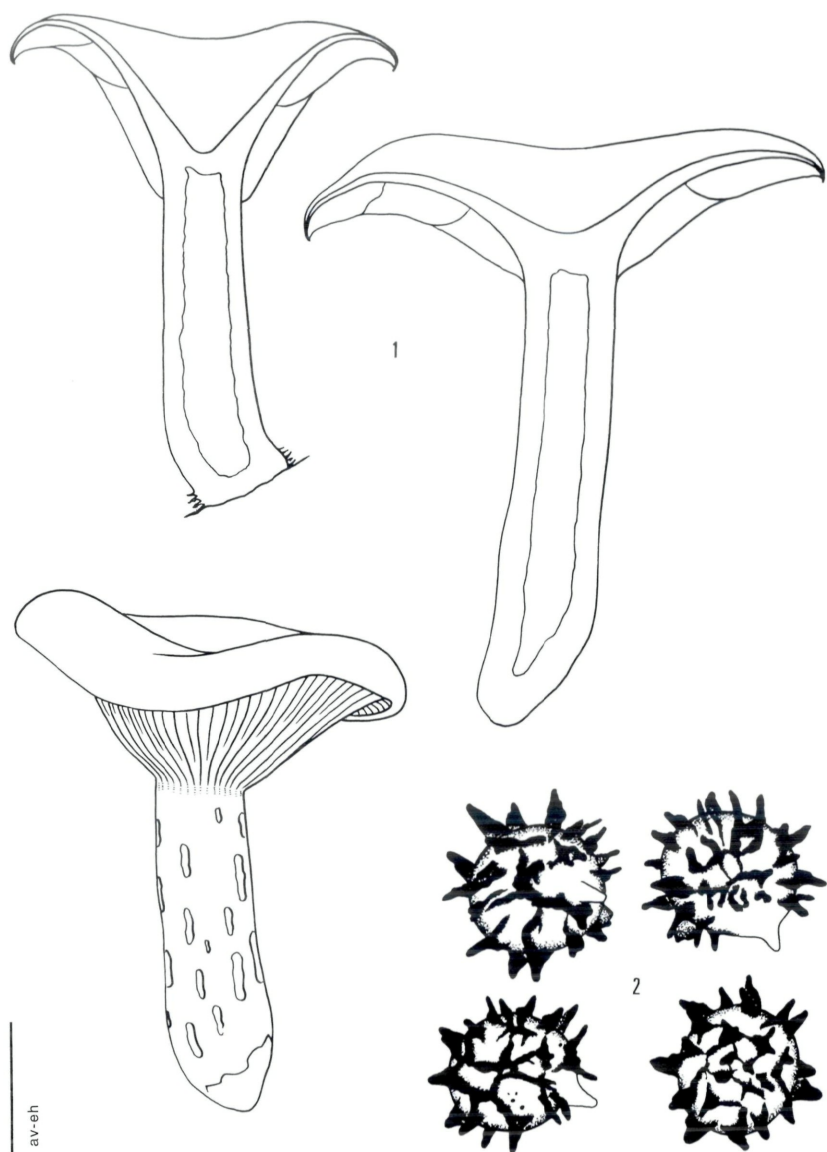


Fig. 4. – *Lactarius austroscrobiculatus* (holotype): 1. Basidiomes. – 2. Basidiospores. – Scale bar: 1 = 20 mm, 2 = 10 μ m.

often with bristles, over whole length distinctly scrobiculate, hollow, brittle. – Context pale concolorous, in base of stipe turning yellow-orange after exposure, cottony, brittle. – Taste mild. – Odor fruity. – Latex watery, becoming distinctly yellow when mounted in KOH 3%. – Chemical reactions unknown.

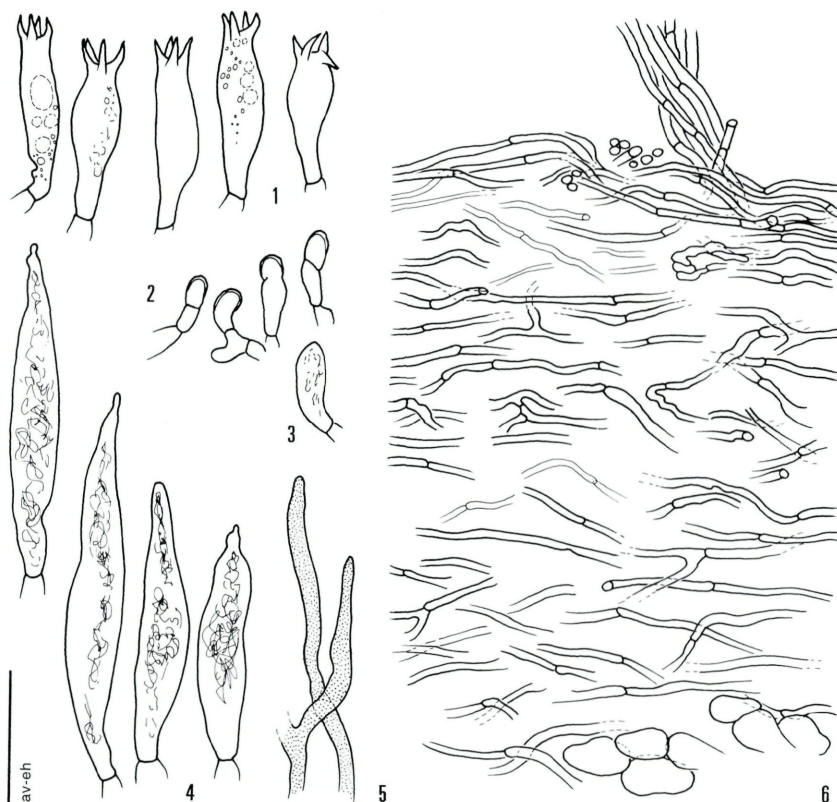


Fig. 5. – *Lactarius austroscrobiculatus* (holotype): 1. Basidia. – 2. Marginal cells. – 3. Cheilomacrocytidium. – 4. Pleuromacrocytidia. – 5. Pleuropseudocystidia. – 6. Cross-section of pileipellis. – Scale bar: 1–5 = 40 μm , 6 = 80 μm .

Spore print off-white to very pale yellow. – Basidiospores $(8.9\text{--}10.2\text{--}(11.6) \times (8.1\text{--}9.3\text{--}(10.5)) \mu\text{m}$ ($Q = 1.09$, $n = 20$), subglobose to broadly ellipsoid, ornamentation amyloid, composed of acute and locally very high ridges (up to $2.5 \mu\text{m}$ high) which are connected by lower and finer lines, forming a rather dense but very irregular reticulum, ridges less distinctly amyloid in central part, plage not amyloid. – Basidia $55\text{--}65 \times 13\text{--}15 \mu\text{m}$, broadly clavate, 4-spored, content guttate, sterigmata $7\text{--}11 \times 1\text{--}2 \mu\text{m}$. – Pleuromacrocytidia $75\text{--}130 \times 16\text{--}20 \mu\text{m}$, content very abundant, very emergent, fusiform, with tapering, sometimes moniliform, sometimes rather rounded apex, thin-walled, content needle-like to granular. – Pleuropseudocystidia scarce, thin-walled, cylindric, rarely emergent, $4\text{--}5 \mu\text{m}$ diam., with refringent content. – Hymenophoral trama filamentose, with abundant lactifers. – Lamellar edge sterile, composed of marginal cells and scarce cheilocystidia, marginal cells

shortly clavate, $10\text{--}25 \times 8\text{--}12\text{ }\mu\text{m}$, irregularly cylindric to fusiform, with needle-like content, thin-walled. – Pileipellis an ixocutis composed of thin-walled, hyaline, $2\text{--}3\text{ }\mu\text{m}$ diam., cylindric, shrivelled hyphae embedded in a layer of slime, viscid matrix $200\text{--}300\text{ }\mu\text{m}$ thick, locally with ascending bundles of hyphae which are firmer and more rigid, $3.5\text{ }\mu\text{m}$ diam. – Stipitipellis a cutis. – Clamp connections absent.

Specimens examined. – INDONESIA: Java, Halimun National Park, 1000 m alt., on soil, in montane rain forest dominated by *Castanopsis-Quercus*, 09 Jan. 1999, leg. Horak ZT 7314 (holotype BO; isotypes GENT, ZT).

Lactarius austroscrobiculatus is characterized by its hazel brown basidiomes with pale lilac to flesh-colored tinges, its scrobiculate stipe and yellowing latex. Microscopically, the very large basidiospores with conspicuous irregular-reticulated ornamentation are typical features for this species. This is the first record for Indonesia.

Lactarius austroscrobiculatus belongs in subgen. *Piperites* (Fr. ex J. Kickx f.) Kauffman, most probably to sect. *Zonarii* (Qué.) Bon, subsect. *Scrobiculati* Hesler & A.H. Sm.

4. *Lactarius rubrobrunescens* Verbeken, E. Horak & Desjardin
sp. nov. – Pl. 1: 4; Fig. 6: 1–2, Fig. 7: 1–4.

Pileus $40\text{--}55\text{ mm}$ diam., convexus dein planoconvexus vel depressus, primo pallide luteus vel cremeus dein subcastaneus vel griseo-ruber, rugulosus, viscidus. Lamellae subdecurrentes, densis, lamellis nonnullis instructae, cremeis. Stipes $35\text{--}50 \times 10\text{--}13\text{ mm}$, centralis vel excentricus, cylindricus, albus vel cremeus, castaneus tactu, tomentosus, viscidus, cavus. Caro pallide lutea dein pallide castanea. Sapor nullus. Odor gratus dein foetidus. Latex albus, lente brunescens. Basidiosporae $(7.3\text{--})8.3\text{--}(9.3) \times (6.4\text{--})7.2\text{--}(7.9)\text{ }\mu\text{m}$, subgloboasae vel ellipsoideae, amyloideae, verrucis cylindricis isolatis instructae. Basidia $65\text{--}80 \times 10\text{--}12\text{ }\mu\text{m}$, tetraspora. Pleurocystidia nulla. Pleuropseudocystidia frequens vel inconspicua. Cheilocystidia $30\text{--}100 \times 4\text{--}6\text{ }\mu\text{m}$, cylindrico-capitata. Pileipellis ex cellulis ovato-globosis lampropalisadam formantibus. Fibulae nullae. Ad terram in silvis fagineis montanis (*Castanopsis*, *Quercus*). Indonesia: Java, Cibodas, 1780 m alt., 23 Jan. 1999, leg. Desjardin in Horak ZT 7194 (holotypus BO; isotypi in GENT, ZT).

Pileus $40\text{--}55\text{ mm}$ diam., convex to plano-convex and depressed, margin incurved, wavy in age, pale yellow-white (4A2) to cream color (4A3) when young and fresh, changing to reddish brown (8D4–5) or greyish red (8C3–5) with age, surface rugulose overall, viscid, felty. – Lamellae $32\text{--}40$ reaching stipe, $1\text{--}3$ lamellulae, close to crowded, subdecurrent, narrow (up to 3 mm wide), cream color (4A3). – Stipe $35\text{--}50 \times 10\text{--}13\text{ mm}$, solitary, central to eccentric, terete, sometimes tapering downwards, appressed-felty overall, viscid, not scrobiculate, pale yellow-white to cream color when fresh, discoloring to reddish brown when bruised, hollow. – Context thick ($2\text{--}4\text{ mm}$), brittle, yellow-white, changing reddish brown where cut. –

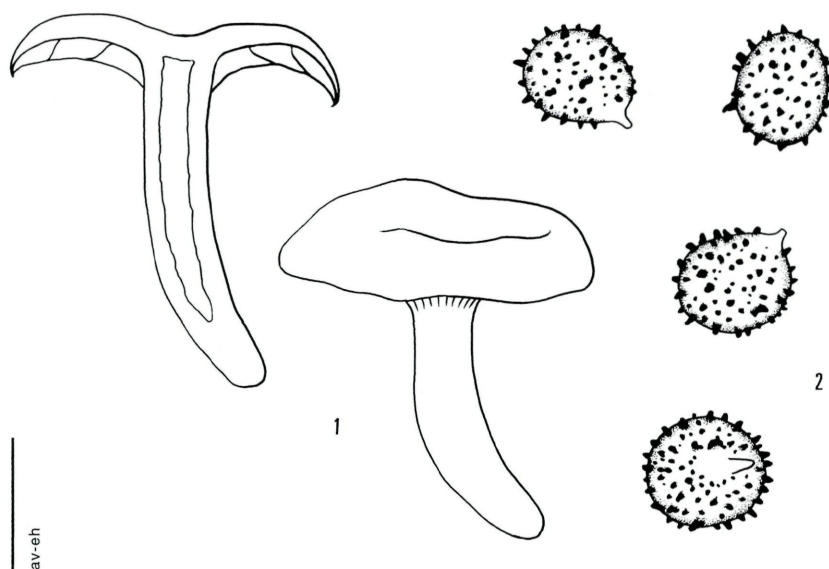


Fig. 6. – *Lactarius rubrobrunnescens* (holotype): 1. Basidiomes. – 2. Basidiospores. – Scale bar: 1 = 20 mm, 2 = 10 μ m.

Taste mild. – Odor sweet at first, then like rotten fish (even in good quality specimens). – Latex white, unchanging but slowly becoming reddish brown on lamellae, on white paper turning reddish brown. – Chemical reactions unknown.

Spore print unknown. – Basidiospores $(7.3\text{--}8.3\text{--}(9.3) \times (6.4\text{--}7.2\text{--}(7.9))\text{ }\mu\text{m}$ ($n = 20$, $Q = 1.16$), subglobose to ellipsoid, ornamentation amyloid, composed of isolated warts, up to 1 μ m high, mostly regular and rounded at the base, rarely elongated and forming a very short ridge, top of the warts rounded, not acute, plage not amyloid. – Basidia $65\text{--}80 \times 10\text{--}12\text{ }\mu\text{m}$, subcylindric to narrowly clavate, with guttate content, 4-spored, sterigmata $8\text{--}12 \times 1\text{--}2\text{ }\mu\text{m}$. – True pleurocystidia absent. – Pleuropseudocystidia common but inconspicuous, sometimes slightly emerging, hyaline, not distinctly oleiferic, cylindric, slightly tortuous, mostly tapering at apex, 3–5 μ m diam. – Lamellar edge sterile, composed of cheilocystidia embedded in a dark brown layer of gluten, cheilocystidia $30\text{--}100 \times 4\text{--}6\text{ }\mu\text{m}$, cylindric but with distinctly capitate apex, up to 12 μ m diam., 1- to 3-septate, terminal elements 20–70 μ m. – Hymenophoral trama cellular, with some filamentous hyphae present. – Pileipellis a lampropalisade, subpellis 150–180 μ m thick, a dense layer of rounded cells which are 17–40 μ m diam., suprapellis composed of erected „hairs“ which are slightly thick-walled, $55\text{--}120 \times 5\text{--}7\text{ }\mu\text{m}$, cylindric, but with distinctly capitate apex up to 12 μ m diam., 1- or 2-septate. – Stipitipellis a trichoderm composed of long, erect

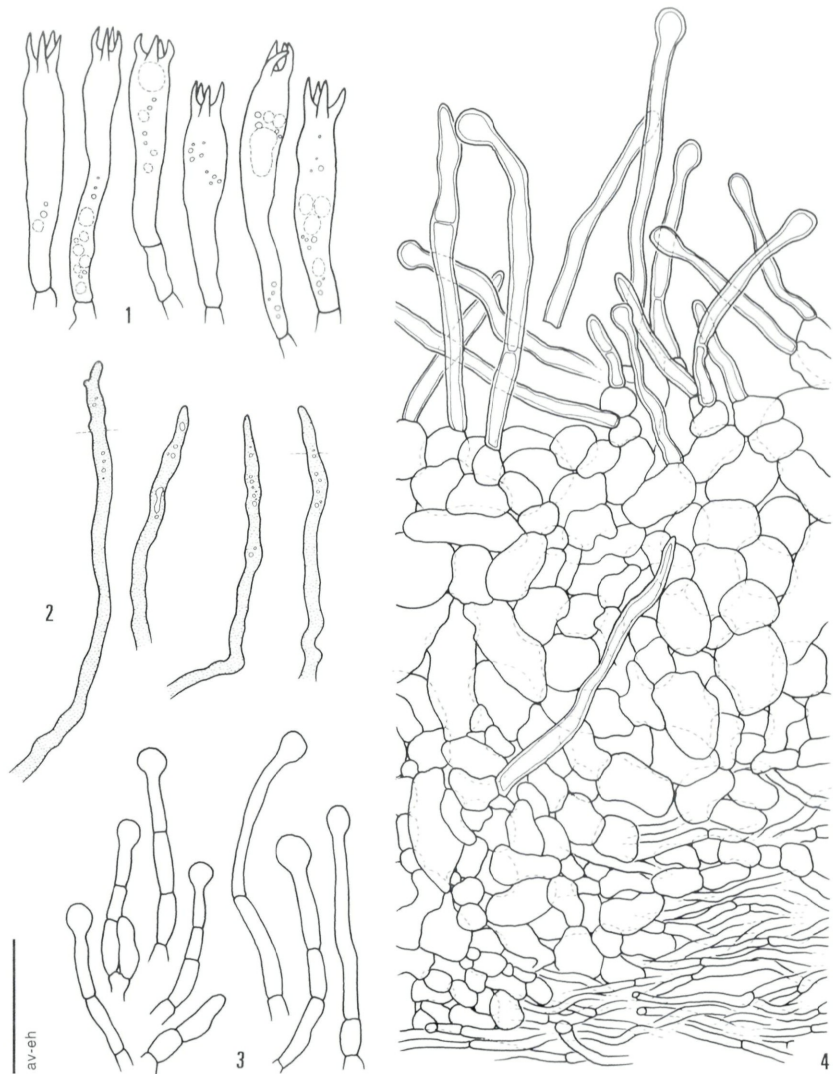


Fig. 7. – *Lactarius rubrobrunnescens* (holotype): 1. Basidia. – 2. Pleuropseudocystidia. – 3. Cheilocystidia. – 4. Cross-section of pileipellis. – Scale bar: 1–3 = 40 µm, 4 = 80 µm.

elements which are thick-walled and have a distinctly capitate apex, up to 120 µm long, parallel, forming a very dense layer. – Clamp connections absent.

Specimens examined. – INDONESIA: Java, Cibodas, trail to Mt. Gedeh, 1780 m alt., on soil, in montane rain forest dominated by *Quercus–Castanopsis*, 23 Jan. 1999, leg. Desjardin 6984 in Horak ZT 7194 (holotype BO; isotypes in GENT, ZT).

Macroscopically, *Lactarius rubrobrunnescens* is well characterized by the reddish brown staining on pileus, stipe and context and by the fetid, fish-like smell. Microscopically, the thick-walled, capitate elements in the pileipellis and stipitipellis are distinctive features. The lamellar edge covered with capitate elements embedded in a dark brown glue-like, slimy substance is unique in genus *Lactarius*.

This Javanese species is closely related to *Lactarius luteolus* Peck, described from North America. *Lactarius rubrobrunnescens* differs, however, by the larger and more globose basidiospores ($7.1\text{--}7.8\text{--}(8.6) \times (5.3\text{--})5.7\text{--}(6.1) \mu\text{m}$, $Q = 1.38$, in *L. luteolus*).

In *Lactarius luteolus* the marginal cells are sometimes capitate but never as distinctive and as frequent as in its Javanese relative. Another distinguishing character is found in the pileipellis: in *L. rubrobrunnescens* all elements are capitate, but in *L. luteolus* only few (if any) of those cells can be observed. Furthermore, cheilocystidia embedded in dark brown gluten are not reported for *L. luteolus* (Hesler & Smith, 1979 and personal observations). Finally, the two related taxa can be distinguished by the size of the basidia.

According to Hongo (1960), *Lactarius luteolus* Peck is recorded for Japan. In order to prove its identity authentic specimens from Japan have to be re-examined and compared with the type material from eastern North America and with the Javanese *L. rubrobrunnescens*.

Similar species of *Lactarius* characterized by the brown-staining latex and the fish-like smell occur also in tropical Africa (Verbeke, 1998).

Taxonomically, *Lactarius rubrobrunnescens* belongs to subgen. *Lactifluus* (Burl.) Hesler & A.H. Sm., sect. *Phlebonemi* R. Heim ex Verbeke.

5. *Lactarius liliputianus* Verbeke & E. Horak. Austr. Syst. Bot. 13: 694 (2000). – Pl. 1: 5; Fig. 8: 1.

This very distinctive *Lactarius* is characterized by very small and fragile basidiomes and basidiospores ornamented by isolated, apically obtuse warts, up to $1 \mu\text{m}$ high. The type collection was found under *Castanopsis* in the montane rainforests of Papua New Guinea.

The smell of the Papuan collection is reported as absent while a fruity to *Pelargonium*-like odor has been noticed in the Javanese specimens.

In the protologue to *Lactarius liliputianus* lamellulae are erroneously reported to be absent. They are, however, present both in type specimens from Papua New Guinea and in the Javanese collection.

All relevant features observed on *Lactarius liliputianus* indicate that this species belongs to sect. *Russuliformes* Verbeke (Verbeke 2001). This is the first record for Indonesia.

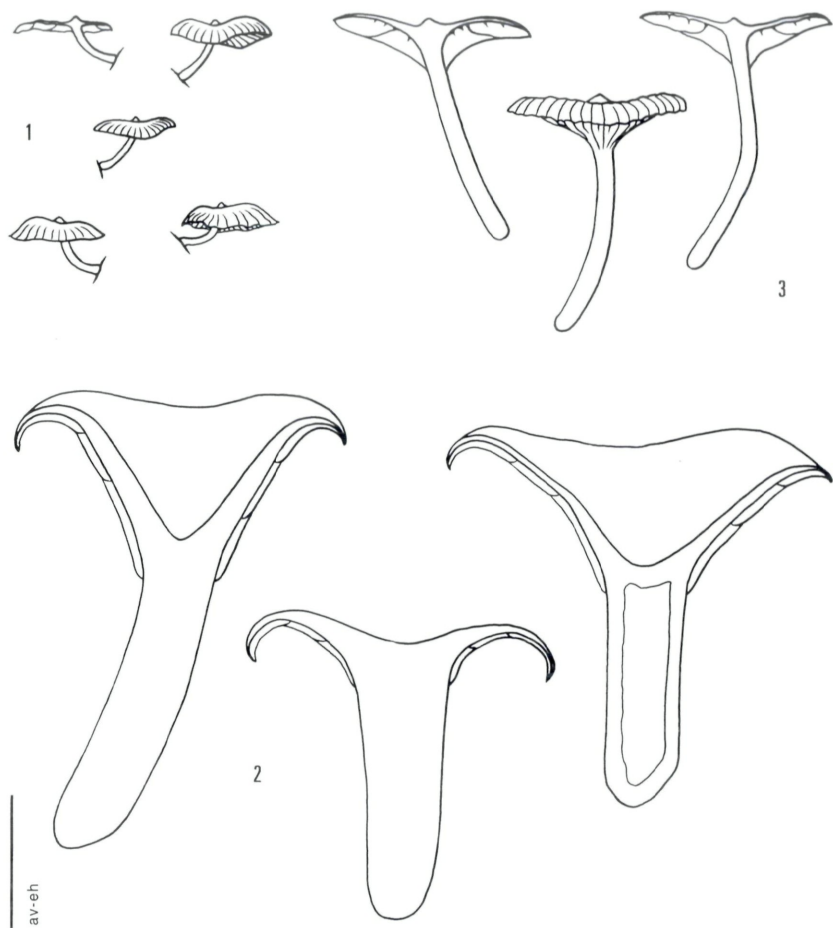


Fig. 8: 1. – *Lactarius liliputianus* Verbeken & E. Horak (ZT 77–103): Basidiomes. – 2. *Lactarius leucophaeus* Verbeken & E. Horak (BO 99–207, ZT 7330): Basidiomes. – 3. *Lactarius corrugatus* Verbeken & E. Horak (ZT 77–186): Basidiomes. – Scale bar = 20 mm.

Specimens examined. – INDONESIA: Java, Cibodas, on mossy stem of standing tree, in montane rain forest dominated by *Lithocarpus–Castanopsis*, 14 Mar. 1977, leg. Horak ZT 77–103 (BO, ZT, GENT).

6. *Lactarius caulocystidiatus* Verbeken & E. Horak sp. nov. – Pl. 1: 6; Fig. 9: 1–5, Fig. 10: 1–4.

Pileus –40 mm diam., convexus dein applanatus vel umbilicatus saepe papilla distincta instructus, fuscus vel hepaticus, pallidior vel cremeus marginem subsulcatum versus, siccus. Lamellae adnatae vel decurrentes, lamellulis nonnullis instructae, primo albidulae dein pallide cremeae coloribus pallide ochraceis vel aurantiacis tinctu, ad marginem concolores. Stipes 20–40 × 2.5–5 mm, cylindricus

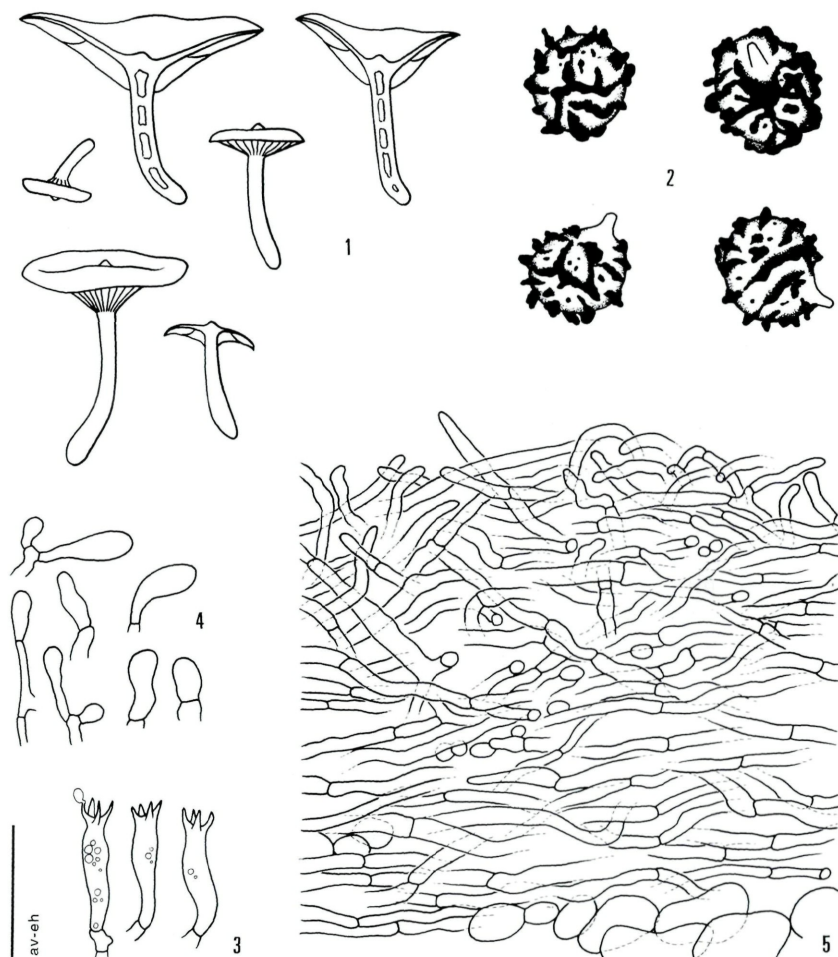


Fig. 9. – *Lactarius caulocystidiatus* (holotype): 1. Basidiomes. – 2. Basidiospores. – 3. Basidia. – 4. Cheilomacrocystidia. – 5. Cross-section of pileipellis. – Scale bar: 1 = 20 mm, 2 = 10 μ m, 3, 4 = 40 μ m, 5 = 50 μ m.

vel subclavatus, pallide hepaticus, glabrus, siccus. Caro concolor. Sapor nullus vel acris. Odor gratus. Basidiosporae in cumulo albae, $(6.7-7.4(-8.1) \times (5.6-6.4(-6.9) \mu$ m, subgloboae vel late ellipsoideae, amyloideae, cretis reticulatis conspicisque et verrucis isolatis obtectae. Basidia $40-50 \times 7-9 \mu$ m, tetraspora. Pleuromacrocystidia $45-100 \times 10 \mu$ m, abundantia, fusiformia. Pleuropseudocystidia rara. Caulocystidia abundantia. Pileipellis ex hyphis cylindraceis haud gelatinosis cutem vel trichodermium formantibus. Fibulae nullae. Ad terram in silvis fagineis montanisque (*Castanopsis*, *Quercus*, *Lithocarpus*). Indonesia: Java, Cibodas, 1720 m, 30 Dec. 1998, leg. Horak ZT 6463 (holotypus BO; isotypi in GENT, ZT).

Pileus –40 mm diam., convex to applanate or with small, persisting conical papilla when young, slightly depressed in the center,

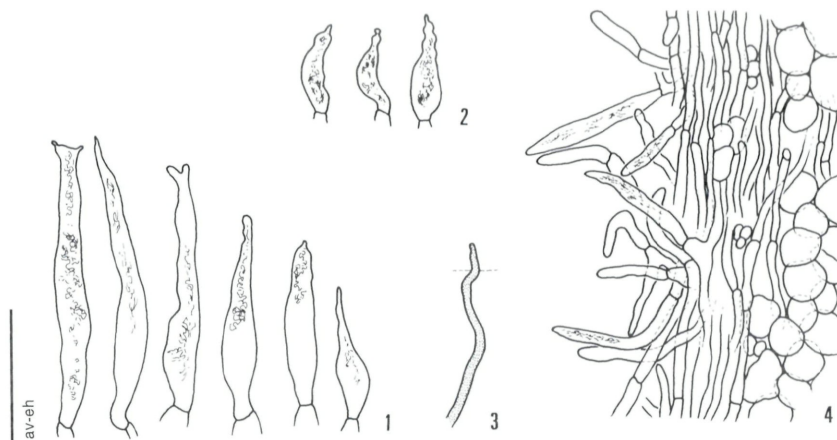


Fig. 10. – *Lactarius caulocystidiatus* (holotype): 1. Pleuromacrocytidia. – 2. Cheilomacrocytidia. – 3. Pleuropseudocystidia. – 4. Cross-section of pileipellis. – Scale bar: 1–3 = 40 μ m, 4 = 80 μ m.

later becoming depressed-umbilicate, obtuse papilla more or less distinctive, centre at first dark brown but paler to cream color towards the more or less striate, translucent, subsulcate margin, also pale brown to dark liver brown, date brown, without olive tinges, thin-fleshy but cartilaginous, surface dry. – Lamellae 38–48 reaching stipe, 1–3 lamellulae, rather crowded, broadly adnate to decurrent, up to 3 mm wide, at first off-white or pale cream color becoming cream with pale ochre tinge or pale orange, narrow, edges entire, concolorous. – Stipe 20–40 mm long, up to 2.5–5 mm broad, cylindric to subclavate (also gradually swollen or attenuated at the base), pale liver brown to pinkish brown, smooth, chambered-hollow, dry, solitary, basal tomentum absent. – Context concolorous, brittle. – Taste none or acrid. – Odor fragrant, fruity. – Latex scarce, watery, unchanging. – Chemical reactions unknown.

Spore print white. – Basidiospores $(6.7\text{--}7.4\text{--}(8.1) \times (5.6\text{--}6.4\text{--}(6.9) \mu\text{m}$ ($Q = 1.18$, $n = 40$), subglobose to broadly ellipsoid, ornamentation amyloid, composed of broad rounded ridges forming an incomplete reticulum, abundant isolated warts, elongated warts and short ridges present, plage distally amyloid. – Basidia $40\text{--}50 \times 7\text{--}9 \mu\text{m}$, 4-spored, narrowly clavate, content guttate, sterigmata $5\text{--}6 \times 1\text{--}2 \mu\text{m}$. – Pleuromacrocytidia $45\text{--}100 \times 10 \mu\text{m}$, abundant, emergent, variable in shape, mostly narrowly fusiform, but narrowing or diverticulate near top, with needle-like content. – Pleuropseudocystidia scarce, cylindric, sometimes slightly emergent, mostly not, $2\text{--}4 \mu\text{m}$ diam., rounded on top, with refringent content. – Lamellar edge sterile, marginal cells and cheilocystidia present, marginal cells clavate to narrowly clavate, thin-walled and with

some brown intracellular pigment, $10\text{--}30 \times 5\text{--}10\text{ }\mu\text{m}$, recumbent, often parallel with the direction of the edge, cheilocystidia scattered between the marginal cells, shortly fusiform, $27\text{--}40 \times 7\text{--}9\text{ }\mu\text{m}$, with granular to needle-like content, apex moniliform or mucronate. – Pileipellis a cutis to a trichoderm, $200\text{ }\mu\text{m}$ thick, dry, composed of cylindric hyphae, $5\text{--}7\text{ }\mu\text{m}$ diam., interwoven and recumbent to ascending, terminal elements regularly cylindric, not widening, with rounded top, $20\text{--}50 \times 5\text{--}7\text{ }\mu\text{m}$. – Stipitipellis a trichoderm with abundant caulocystidia, caulocystidia narrowly cylindric to fusiform, $25\text{--}50 \times 5\text{--}7\text{ }\mu\text{m}$, with needle-like content. – Clamp connections absent.

Specimens examined. – INDONESIA: Java, Cibodas, trail to Mt. Gedeh, 1720 m alt., on soil, in montane rain forest dominated by *Castanopsis*, *Quercus*, *Lithocarpus*, 30 Dec. 1998, leg. Horak ZT 6463 (holotype BO; isotypes in GENT, ZT). – INDONESIA: Java, Cibodas, trail to Mt. Gedeh, 1700 m alt., on soil, in montane rain forest dominated by *Castanopsis*, *Quercus*, *Lithocarpus*, 16 Mar. 1977, leg. Horak ZT 77–194 (BO, GENT, ZT).

Concerning habit and colors as observed on fresh basidiomes, *Lactarius caulocystidiatus* can be mistaken for the European *Lactarius obscuratus* (without its often distinctive olive tinge over the pileus). Microscopically, the present new Javanese species is readily recognized by the abundant caulocystidia found on the surface of the stipe.

Regarding the taxonomic position of *Lactarius caulocystidiatus*, this species most probably belongs to the subgen. *Russularia* (Fr. ex Burl.) Kauffman, sect. *Russularia* Fr. ex Burl. Taxa allocated in this distinctive group usually have a pileipellis-structure composed of isodiametric, globose cells. Several European representatives in sect. *Russularia*, however, have a trichoderm-like pileipellis.

7. *Lactarius leucophaeus* Verbeken & E. Horak. Austr. Syst. Bot. 12: 768 (1999). – Pl. 2: 1; Fig. 8: 2.

Both macroscopic and microscopic characters of this species correspond in most relevant details with the type material of *Lactarius leucophaeus*, originally described from lowland dipterocarp rainforest in Papua New Guinea. The Javanese material, however, differs in that the centre of the pileus is already depressed and umbilicate in young specimens and the margin of the pileus is weakly translucent-striate.

All microscopic features are identical with the Papuan type collection: the pileipellis composed by a pseudoparenchymatous layer covered by a layer of periclinally arranged thin-walled and slender

hyphae, without dermatocystidia, the low ornamented basidiospores and the presence of cheilo- and pleuro-macrocytidia.

Lactarius leucophaeus, reminescent of *Leucopaxillus gentianeus* in the field, has its taxonomic position in subgen. *Lactarius*, sect. *Lactarius*. This is the first record for Indonesia.

Specimens examined. – INDONESIA: Java, Cibodas, 1750 m, on soil, in montane rain forest dominated by *Castanopsis-Quercus*, 11 Jan. 1999, Horak ZT 7330 (BO, GENT, ZT).

8. *Lactarius javanicus* Verbeken & E. Horak sp. nov. – Pl. 2: 2; Fig. 11: 1–6, Fig. 12: 1–2.

Pileus –190 mm diam., semper depresso-umbilicatus, ad marginem versus pectinatus, cinnamomeo-umbrinus, distincte radialiter venosus, siccus. Lamellae late adnatae vel decurrentes, pileo concolores. Stipes –80 mm × –12 mm, cylindricus vel attenuatus basim versus, pileo concolor, glaber, apicaliter dentatus, siccus. Caro aurantiaca in stipite, ferruginea vel rufa in pileo. Odor gratus. Sapor acris. Latex albus, aquosus, immutabilis. Basidiosporae in cumulo pallide ochraceae, $(7.4)8.3(-9.2) \times (6.7)7.6(-8.4) \mu\text{m}$, subglobosae, amyloideae, incomplete reticulatae et verrucosae. Basidia $60\text{--}75 \times 11\text{--}15 \mu\text{m}$, tetraspora. Pleuromacrocytidia $75\text{--}90 \times 10\text{--}12 \mu\text{m}$, abundantia, longe clavata. Pleuropseudocystidia abundantia, cylindrica vel contorta. Cheilocystidia $23\text{--}32 \times 5\text{--}6 \mu\text{m}$, cylindrica vel subfusiformia. Pileipellis ex hyphis cylindraceis sugelatinosisque palisadam formantibus. Fibulae nullae. Ad terram in silvis fagineis montanisque (*Castanopsis*, *Quercus*). Indonesia: Java, Cibodas, 1720 m, 27 Oct. 2000, leg. Horak & Retnovati ZT 8827 (holotypus BO; isotypi in GENT, ZT).

Pileus –190 mm diam., already when young with depressed center, later umbilicate, strongly pectinate towards margin, scalloped, not incurved, center distinctly radially venose or wrinkled, dry, equally caramel colored, weakly hygrophanous in center. – Lamellae 32–42 reaching stipe, 1–3 lamellulae, rather crowded, broadly attached to decurrent with tooth, caramel colored like pileus, up to 8 mm wide, edge entire, concolorous. – Stipe –80 × 12 mm, cylindric to attenuated towards the base, concolorous with pileus, smooth to very minutely ridged, dry, solid, solitary. – Context orange in the rind of the stipe, paler in the center, later distinctly reddish orange to rusty red–orange. – Taste acrid. – Odor pleasant. – Latex white, unchanging, strongly milky–watery, forming white crusts on bruised lamellae. – Chemical reactions unknown.

Spore print pale ochre. – Basidiospores $(7.4)8.3(-9.2) \times (6.7)7.6(-8.4) \mu\text{m}$ ($Q = 1.09$, $n = 20$), subglobose, ornamentation amyloid, composed of broad rounded ridges, up to $1.5(-2) \mu\text{m}$ high, forming an incomplete reticulum, ridges often split, abundant isolated small warts present, plage amyloid. – Basidia $60\text{--}75 \times 11\text{--}15 \mu\text{m}$, narrowly clavate, 4-spored, content guttate, sterigmata $10 \times 1\text{--}2 \mu\text{m}$. – Pleuro-

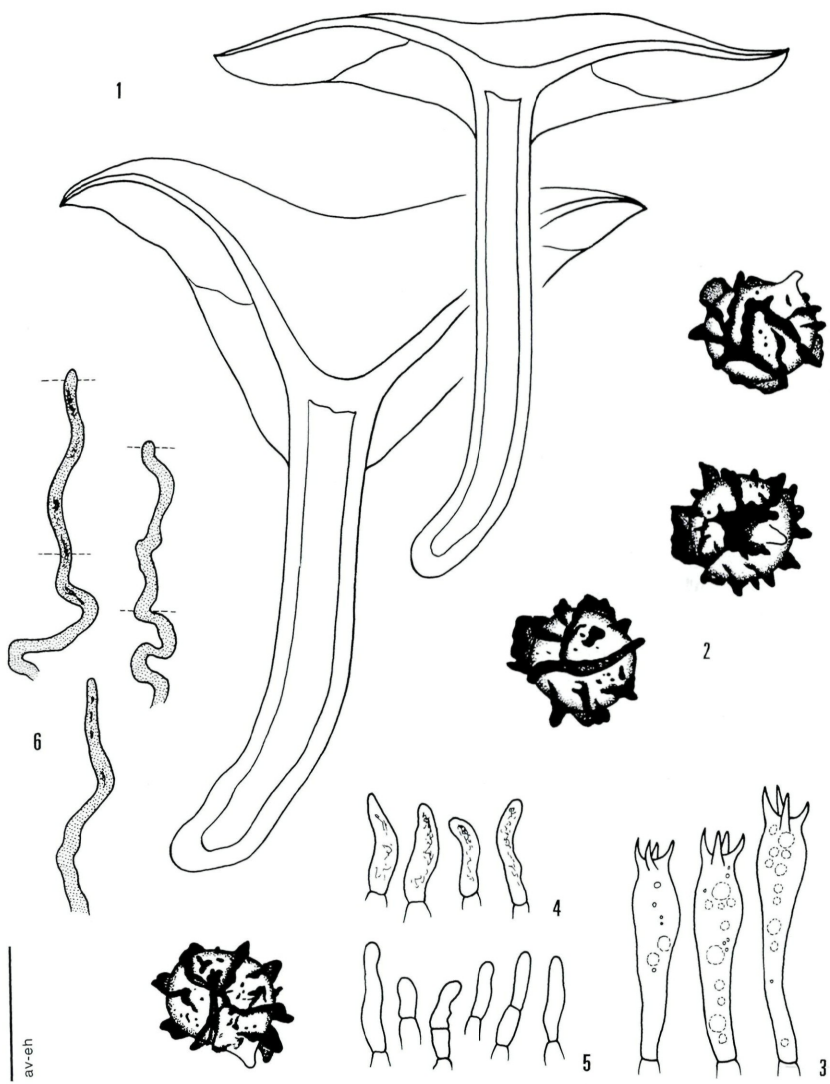


Fig. 11. – *Lactarius javanicus* (holotype): 1. Basidiomes. – 2. Basidiospores. – 3. Basidia. – 4. Cheilomacrocystidia. – 5. Marginal cells. – 6. Pleuropseudocystidia. – Scale bar: 1 = 20 mm, 2 = 10 μ m, 3–6 = 40 μ m.

macrocystidia 75–90 \times 10–12 μ m, abundant, slightly emergent, arising deep in the hymenophoral trama, slender clavate, always with rounded top, thin-walled, with needle-like content. – Pleuropseudocystidia abundant, only very slightly emergent, cylindric, tortuous, 2–4 μ m diam., rounded on top, with refringent content. – Lamellar edge sterile, marginal cells and cheilocystidia present,

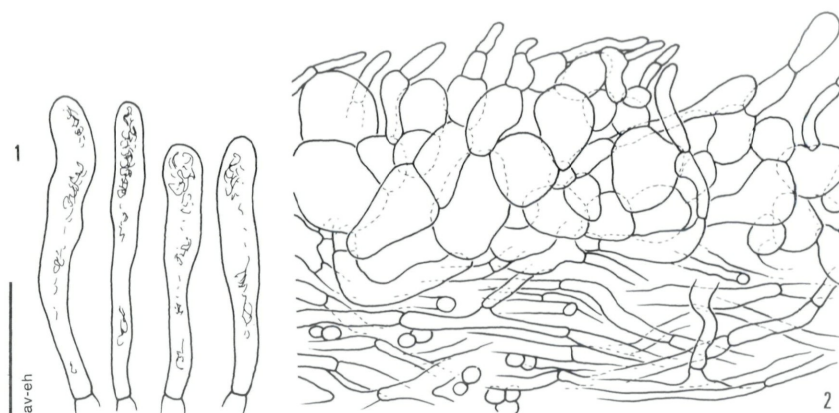


Fig. 12. – *Lactarius javanicus* (holotype): 1. Pleuromacrocystidia. – 2. Cross-section of pileipellis. – Scale bar: 1 = 40 μm , 2 = 80 μm .

marginal cells $15\text{--}35 \times 5\text{--}7 \mu\text{m}$, cylindric to slightly irregular, thin-walled and hyaline, cheilocystidia scattered between the marginal cells, $23\text{--}32 \times 5\text{--}6 \mu\text{m}$, cylindric to subfusiform with granular to needle-like content, apex slightly tapering or rounded. – Pileipellis a palisade, 70–100 μm thick, suprapellis rather thin, composed of cylindric elements, thin-walled, hyaline, $5\text{--}25 \times 3\text{--}7\text{--}6(10)$, rarely clavate, slightly embedded in a rudimentary layer of slime, subpellis thick, composed of globose to subglobose, thin-walled cells, 12–30 μm diam. – Stipitipellis a trichoderm, with short, cylindrical, thin-walled, hyaline terminal elements which are $10\text{--}20 \times 3\text{--}4 \mu\text{m}$. – Clamp connections absent.

Specimens examined. – INDONESIA: Java, Cibodas, montane rain-forest dominated by *Quercus-Castanopsis*, 1650 m, on soil, 27 Oct. 2000, leg. Horak ZT 8827 (holotype BO; isotypes GENT, ZT).

All characters observed in *Lactarius javanicus* indicate that it belongs to subgen. *Russularia* (Fr. ex Burl.) Kauffman. Macroscopically, it is recognized by the large, robust habit, the venose or wrinkled, caramel-colored pileus and distant lamellae. At first sight (at least in dry condition), the species reminds *L. volemus* and *L. austrovolemus* (except for the unchanging latex) and it can be mistaken for a representative of subgen. *Lactifluus*. The pileus is a palisade which occurs both in the subgen. *Lactifluus* and subgen. *Russularia*. But the presence of abundant pleuromacrocystidia strongly indicate that this species belongs to *Russularia*, where by comparison it represents a rather large-sized species. Microscopically, the subglobose, rather highly reticulate basidiospores, the palisade embedded in a very thin layer of gluten and the abundant

pleuromacrocystidia as well as pleuropseudocystidia, are characteristic for the species.

9. *Lactarius corrugatus* Verbeke & E. Horak. Austr. Syst. Bot. 13: 696 (2000). – Pl. 2: 3; Fig. 8: 3.

The type material of *Lactarius corrugatus* has been gathered in Papua New Guinean montane rainforest where this species is also associated with *Lithocarpus* and *Castanopsis*. Macroscopic and microscopic characters observed in the present Javanese material closely agree with the original description. The species has its taxonomic position in subgen. *Russularia* (Fr. ex Burl.) Kauffman, sect. *Olentes* (Bataille) Basso. This is the first record for Indonesia.

Specimens examined. – INDONESIA: Java, Cibodas, 1750 m, in montane rainforest dominated by *Lithocarpus*–*Castanopsis*, 14 Mar. 1977, leg. Horak 77–186 (BO, ZT, GENT).

10. *Lactarius reticulatovenosus* Verbeke & E. Horak sp. nov. – Pl. 2: 4; Fig. 13: 1–5.

Pileus –30 mm diam., convexus dein applanatus, papilla distincta obtectus, fuliginosus, pallidior aetate, radialiter pervenosus, siccus. Lamellae late adnatae vel subdecurrentes, lamellis nonnullis instructae, semper albae, ad marginem concolores. Stipes –15 (20) × –3 mm, cylindricus, pileo concolor, tomentosus, siccus. Caro brunnea, immutabilis. Sapor odorque nulli. Latex aquosus vel lactosus. Basidiosporae in cumulo albae, (8.1–)9.3(–10.5) × (7.3–)8.1(–9.0) µm, subglobosae vel late ellipsoideae, amyloideae, cretis inconspicuis reticulatifimbriatis et verrucis sparsis obtectae. Basidia 35–60 × 12–14 µm, tetraspora. Pleurocystidia nulla. Pleuropseudocystidia rarissima. Pileipellis ex cellulis subcylindricis et globosis, haud gelatinosis, palisadiformibus, cellulis elongatis (40–90 × 4–9 µm) intermixtis. Fibulae nullae. Ad terram in silvis fagineis montanisque (*Castanopsis*, *Quercus*). Indonesia: Java, Cibodas, 02 Jan 1999, leg. Horak ZT 6472 (holotypus BO, isotypi GENT, ZT).

Pileus –30 mm diam., thin-fleshy, convex, soon irregularly applanate and expanded, with more or less distinct conical papilla, evenly fuliginous, with age becoming paler to pale brown, surface densely covered with irregular, reticulate ridges or coarse, conspicuous wrinkles, dry. – Lamellae 20–38 reaching stipe, 1–3 lamellulae, moderately crowded, broadly adnate to shortly decurrent, up to 3 mm wide, white in young and old specimens, unchanging, edge entire, concolorous. – Stipe –15(20) × –3 mm, solitary, cylindric, concolorous with pileus, white at apex, minutely felty, dry. – Context unchanging, brittle, brown beneath cuticle and in the rind of the stipe. – Taste mild. – Odor not distinctive. – Latex watery to milky. – Chemical reactions unknown.

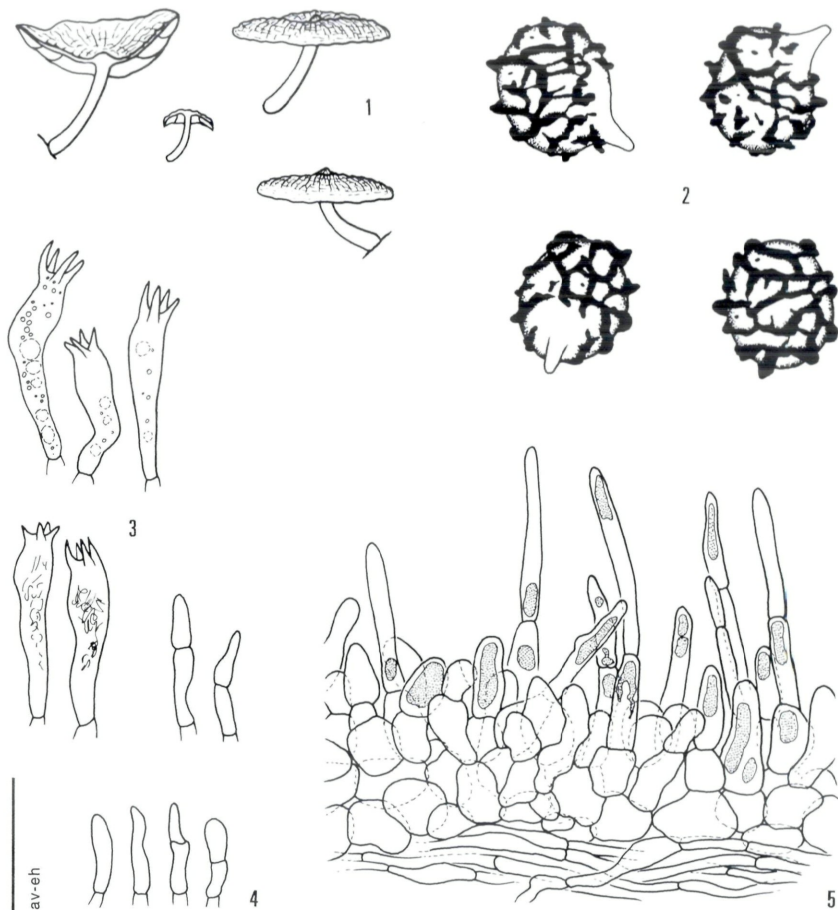


Fig. 13. – *Lactarius reticulatovenosus* (holotype): 1. Basidiomes. – 2. Basidiospores. – 3. Basidia. – 4. Marginal cells. – 5. Cross-section of pileipellis. – Scale bar: 1 = 20 mm, 2 = 5 μ m, 3, 4 = 20 μ m, 5 = 80 μ m.

Spore print white. – Basidiospores $(8.1\text{--}9.3\text{--}(10.5) \times (7.3\text{--}8.1\text{--}(9.0) \mu\text{m}$ ($n = 20$, $Q = 1.15$), subglobose to broadly ellipsoid, ornamentation amyloid, composed of rounded ridges up to 0.5 (1) μm high, forming a rather compact and complete reticulum, some isolated warts present, plage faintly amyloid. – Basidia $35\text{--}60 \times 12\text{--}14 \mu\text{m}$, narrowly to distinctly clavate, 4-spored, content needle-like or guttate, sterigmata up to $12 \times 2\text{--}3 \mu\text{m}$. True pleurocystidia absent. – Pleuopseudocystidia very scarce, not emergent. Hymenophoral trama cellular, with distinct clusters of sphaerocysts. – Lamellar edge sterile, composed of marginal cells, marginal cells $15\text{--}30 \times 3\text{--}6 \mu\text{m}$, hyaline, thin-walled, narrowly fusiform to cylindric with rounded or tapering apex. – Pileipellis a palisade, composed

of subcylindric, subclavate, short cells ($15\text{--}35 \times 10\text{--}15\ \mu\text{m}$) and long, narrow, cylindric, hair-shaped cells ($40\text{--}90 \times 4\text{--}9\ \mu\text{m}$), all thin-walled and with brown intracellular pigmentation which is more localized in the long, hair-shaped elements, subpellis $20\text{--}40\ \mu\text{m}$ thick, a thin layer of rounded cells which are $10\text{--}20\ \mu\text{m}$ diam., thin-walled. – Stipitipellis a trichoderm, composed of recumbent to ascending hyphae, with dark brown intracellular pigmentation. – Clamp connections absent.

Specimens examined. – INDONESIA: Java, Cibodas, 1700 m, on rotten wood and soil, in montane rain forest dominated by *Castanopsis-Quercus*, 02 Jan 1999, leg. Horak ZT 6472 (holotype BO, isotypes GENT, ZT).

Lactarius reticulatovenosus is closely related to *Lactarius venosus* described from montane rain forests (dominated by *Castanopsis* and *Lithocarpus*) in Papua New Guinea (Verbeken & Horak, 2000). Macroscopically, the striking new Javanese *Lactarius reticulatovenosus* can be distinguished by its less crowded lamellae with brown colored edges in *L. venosus*. Furthermore, the two taxa can also be distinguished by the distinctly larger basidiospores of *L. reticulatovenosus* (vs. $7.6 \times 7.0\ \mu\text{m}$ in *L. venosus*).

Taxonomically, *Lactarius reticulatovenosus* belongs in subgen. *Plinthogalus* (Burl.) Hesler & A.H. Sm.

11. *Lactarius sublignyotus* Henn. & E. Nyman in Henn. Monsunia 1: 14 (1900, as „*Lactaria sublignyota*“).

Unfortunately, the type material of this species is lost. Despite the fact that the type locality in Cibodas has been visited on several occasions, no fresh material of this distinctive taxon, reportedly closely resembling the European *Lactarius lignyotus* Fr., has been gathered.

For completeness, the translation of the original description is repeated herewith:

“Pileus 35 mm diam., slightly fleshy, from convex to applanate, not umbilicate, rugose to wrinkled, glabrous, black-brown, margin thin. – Lamellae adnate, not decurrent, rather crowded, broad, pale yellow, edge greyish. – Stipe hollow, terete, equal, smooth, glabrous, black-brown, $30 \times 5\ \text{mm}$. – Basidia clavate, $30\text{--}40 \times 11\text{--}13\ \mu\text{m}$, subulate sterigmata about $6\ \mu\text{m}$ long. – Basidiospores $8\text{--}9\ \mu\text{m}$, hyaline to pale yellow, globose, ornamented with spines. – Java, Tjibodas, on soil, 10 July 1898 (M. Fleischer).

Shape and color of this species is very similar to *Lactaria lignyota* Fr. but it is clearly separated by the plane pileus lacking a papilla, the verrucose-venose, glabrous pileus, and by the paler colored lamellae. In the original notes nothing is mentioned about the color and property of the latex, the smell or the taste.“

Acknowledgments

This research was funded by NSF Grant #DEB-9705083 to D. Desjardin and E. Horak. The authors are most grateful to our Indonesian sponsor Dr. Mien Rifai, and to Lembaga Ilmu Pengetahuan Indonesia (LIPI – Indonesian Institute of Sciences) and Pusat Penelitian Dan Pengembangan Biologi (PPPB) for facilitating acquisition of research and collecting permits for Indonesia. The Herbarium Bogoriense (BO) is thanked for the free use of all facilities. During field work in Java we have been actively supported by Almut Horak (Zurich, Switzerland), Dr. Roy Halling (New York, USA), Atik Retnovati (Bogor, Indonesia) and Andy Wilson (San Francisco, USA). Mrs. A. Tanner (Herbaria Zurich, Switzerland) has been a great help for editorial assistance and processing herbarium specimens. Mr. U. Jauch (Electron Microscopy Laboratory, University of Zurich) is thanked for the careful preparation and handling of the SEM photograms.

References

- Basso, M. T. (1999). *Lactarius* Pers. Fungi Europaei 7. – Mykoflora, 845 pp.
- Heilmann-Clausen, J., A. Verbeken & J. Vesterholt (1998). Fungi of Northern Europe.2. The genus *Lactarius*. – Svampetryk, Danish Mycological Society. Denmark. 287 pp.
- Heim, R. (1938). Les lactario-russulés du domaine orientale de Madagascar. – Prodr. Fl. Mycol. Madagascar 1: 1–196.
- (1962). Contribution à la flora mycologique du Thaïlande. 1ère partie. – Rev. Mycologie (Paris) 27: 123–159.
- (1955a). *Lactarius*. – Fl. Iconogr. Champignons Congo 4: 81–97.
- (1955b). Les lactaires d'Afrique intertropicale (Congo belge et Afrique noire française). – Bull. Jard. Bot. Etat 25: 1–91.
- & J. Perreau-Bertrand (1973). Sur quelques lactaires de Nouvelle-Guinée. 1. Description et ornementation sporale du *Lactarius arachnisporus* Heim & Perreau, sp. n. Rev. – Mycologie (Paris) 37: 117–124.
- Hennings, P. (1900). Fungi monsunenses. – Monsunia 1: 1–38.
- Hesler, L. R. & A. H. Smith (1979). North American species of *Lactarius*. – Ann Arbor, Univ. Michigan Press. 841 pp.
- Hongo, T. (1960). The Agaricales of Japan 1–3. – Acta Phytotax. Geobot. 18: 129–146.
- (1973). On some interesting larger fungi from New Guinea. Mycological reports from New Guinea and the Solomon Islands. 15. – Rep. Tottori Mycol. Inst. 10: 357–364.
- Johns, R. J. (1995a). Malaysia – an introduction. – Curtis's Botanical Magazine 12: 52–62.
- (1995b). Endemism in the Malaysian flora. – Curtis's Botanical Magazine 12: 95–110.
- Kornerup, A. & J. H. Wanscher (1978). Methuen Handbook of Colour. – London, Eyre Methuen. 252 p.
- McNabb, R. F. R. (1971). The Russulaceae of New Zealand. 1. *Lactarius* DC ex S.F. Gray. – New Zealand J. Bot. 9: 46–66.
- Neuhoff, W. (1956). Die Milchlinge (Lactarii). Pilze Mitteleuropas, 2b. – J. Klinkhardt, Bad Heilbrunn.
- Pegler, D. N. (1986). Agarics flora of Sri Lanka. – Kew Bull. Add. Ser. 12: 1–519.
- Soepadmo, E. (1972). Fagaceae. – Flora Malesiana 7: 265–403.
- Verbeken, A. (1998). Studies in tropical African *Lactarius* species. 5. A synopsis of the subgenus *Lactifluus* (Burl.) Hesler & A. H. Sm. emend. – Mycotaxon 66: 363–386.

- (2000). Studies in tropical African *Lactarius* species. 8. A synopsis of the subgenus *Plinthogali*. – *Persoonia* 17: 377–406.
 - (2001). Studies in tropical African *Lactarius* species. 10. Infrageneric classification. – *Mycotaxon* 77: 435–444.
 - & E. Horak (1999). *Lactarius* (Basidiomycota) in Papua New Guinea. 1. Species of tropical lowland habitats. – *Australian Syst. Bot.* 12: 767–779.
 - & — (2000). *Lactarius* (Basidiomycota) in Papua New Guinea. 2. Species of tropical montane rainforests. – *Australian Syst. Bot.* 13: 649–707.
- Whitten, T., R.E. Soeripatmadja & S.A. Afiffiff (1997). *The Ecology of Java and Bali. – The Ecology of Indonesia Series. 2.* Oxford Univ. Press. 969 pp.

(Manuscript accepted 12th July 2001)

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Band/Volume: [53](#)

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Artikel/Article: [Agaricales of Indonesia. 3. New records of the genus Lactarius \(Basidiomycota, Russulales\) from Java. 261-289](#)