

STUDIES IN TROPICAL AFRICAN LACTARIUS SPECIES

8. A synopsis of the subgenus *Plinthogali*

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A review is given of the tropical African representatives of the genus *Lactarius* subgenus *Plinthogali* (Burl.) Hesler & Smith. In this subgenus the new section *Nigrescentes* Verbeken (incl. *L. orientalis* stat. nov.) is defined for species with a blackening context. For the species with a rather smooth, sometimes shiny cap and latex changing to greyish-brownish when drying, the section *Pseudofuliginosi* Verbeken sect. nov. is proposed (incl. *Lactarius atroolivinus* Verbeken & Walley spec. nov.). All other representatives are provisionally classified in the section *Plinthogali* (incl. *Lactarius sulcatus* Verbeken & Walley spec. nov., *L. tenellus* Verbeken & Walley nom. nov.) before a more worldwide revision permits a further split of this diverse group. A checklist of the species is given, supplemented with illustrated descriptions of some species.

The taxonomic position of *Arcangeliella dolichocaulis* Pegl., showing affinities with *Lactarius* subgenus *Plinthogali*, is discussed.

In an account of North American *Lactarius* species Burlingham (1908) defines the group *Plinthogalae* as medium-sized milkcaps with a dry, pruinose to velvety, dark brown, smoky brown or putty-coloured to paler pileus, a rather firm context, pruinose gills which become darker with age, mild or acrid, and salmon-coloured or white latex which is either unchanging or changing to salmon-pink, at least where in contact with the broken flesh, or in some species becoming yellow. Seven species are included in this group, which is accepted as a section by Singer (1942).

Hesler & Smith (1979) emend the section *Plinthogali* (Burl.) Sing. to subgenus level as follows: cap a typical velvety to unpolished and dry pileus, with blackish, fuscous, date-brown, alutaceous, dingy buff or dull white colours; latex white, cream or rarely brown, usually changing to reddish, vinaceous, lilac or violet or staining injured surfaces with these colours; true cystidia mostly absent; pileipellis a trichoderm (a palisade ss. auct.), less frequently a cellular layer with a turf above it; spore-ornamentation often prominent. They distinguish two sections: section *Plinthogali*, including species with a blackish, dark to medium brown pileus, a brown intracellular pigment in the pileipellis and mostly a well developed pilear trichoderm, and the section *Fumosi* Hesler & Smith for species with a paler pileus and a reduced or not evident trichodermal structure of the pileipellis.

Bon (1980) splits the section *Plinthogali* into a subsection *Ruginosi* M. Bon for species with winged spores [ornamentation up to 2–3(–4) μm high] and a subsection *Fuliginosi* (Konr.) Bon (invalid), for species with more or less completely reticulate spores [ornamentation up to 1–1.5(–2) μm high].

In tropical Africa, the subgenus *Plinthogali* seems well represented and more diverse than in North America or Europe. Some members are well characterized by a remarkable colour-change of the latex and a strong staining of the context. Their latex appears at first

watery and transparent, then turns to blood-red, grey and finally black. The context is cream and becomes first greyish pink or greyish red, finally black. In dried condition, those species are easily recognized by the black colour of the context. Owing to this striking character which is not known outside Africa, these species are placed here in a new section, *Nigrescentes*. As to the other species, both the classifications of Hesler & Smith (1979) and Bon (1980) are considered highly artificial and not applicable on a worldwide scale. Hesler & Smith (1979) themselves admit that their proposed sections were very difficult to separate within the format of a key. This is not surprising as they put such obviously closely related species as *Lactarius ruginosus* Romagn. and *L. subplinthogalus* Coker in different sections. We do not consider the absolute height of the spore-ornamentation as a taxonomically valuable character for distinguishing subsections, especially not when taking into account that it is partly related to the size of the spores, which is very variable in this group, and that it would necessitate separating such closely related taxa as *Lactarius pterosporus* Romagn. and *L. acris* (Bolt.: Fr.) S.F. Gray. A further detailed revision of this subgenus on a worldwide basis (esp. including more tropical members) should result in a global and natural classification of this group; we therefore prefer to limit the proposal of new sections and subsections, but indicate some groups that might form natural stirps.

MATERIAL AND METHODS

Microscopic features are studied in congo-red in ammonia. Spore-ornamentation is described and illustrated as observed in Melzer's reagent. For details on terminology we refer to Verbeke (1995, 1998). Line-drawings are made with the aid of a drawing tube at magnifications 6700× for spores, 3200× for individual elements and 1100× for sections and surface views. Stippling indicates refractive contents in cystidia and lactifers, intracellular pigmentation in the elements of pilei- and stiptipellis. Basidia length excludes sterigmata length.

Spores are measured in side view in Melzer's reagent, excluding the ornamentation, and measurements are given as (MINa) [AVa-2*SD]-AVa-AVb-[AVb + 2*SD] (MAXb) in which AVa = lowest mean value for the measured collections, AVb = greatest mean value, and SD = standard deviation. Q stands for 'quotient length/width' and is given as (MINQa) Qa-Qb (MAXQb) in which Qa and Qb, stand respectively for the lowest and highest mean quotient for the measured specimens.

Colour-codes are from Kornerup & Wanscher (1978). L+1/cm means number of lamellae (L) and lamellulae (l) per cm at pileus mid-radius.

RESULTS

1. *Lactarius* subgenus *Plinthogali* (Burl.) Hesler & Smith, emend. Verbeke

Lactarius subgenus *Plinthogali* (Burl.) Hesler & Smith, N. Amer. Species *Lactarius*: (1979) 99 (ut '*Plinthogalus*').

Basionym: *Lactaria* group *Plinthogalae* Burl., Mem. Torrey Club 14 (1908) 83.

Lactarius sect. *Plinthogali* (Burl.) Sing., Anns mycol. 40 (1942) 123. — *Lactarius* sect. *Pterospori* R. Heim, Bull. Jard. bot. État 25 (1955b) 45 (invalid, descr. gall.). — *Lactarius* subg. *Venolactarius* R. Heim, Prodr. Fl. Mycol. Madagascar 1 (1938) 31 (nom. nud.). — *Lactariella* Schroet., Fl. Schles. 3 (1) (1889) 544.

Pileus small to moderately large, plano-convex, applanate to slightly depressed, sometimes infundibuliform; pellis dry, velvety, finely tomentose, sometimes wrinkled, sometimes veined, rarely viscid or shiny, dull coloured: blackish, dark brown, leather brown, greyish brown to pale brown, ochraceous or greyish yellow. Stipe cylindrical, slender, mostly concolorous. Lamellae adnexed, adnate to decurrent, rather dense, whitish, greyish, cream, in some species yellowish orange; edge concolorous, in some species dark brown. Context whitish, unchanging or changing to greyish pink, red, reddish, brownish or black. Latex white or transparent, unchanging or changing to grey, reddish or even black (vinaceous, lilac or violet; not seen in African species). Spore-deposit white, cream, dark cream to pale brown.

Spores often globose to subglobose; ornamentation up to 2 μm and more, winged, or composed of irregularly conical warts and then with abundant lower connections or ridges, sometimes zebroid, never composed of isolated elements; plage often distally amyloid. Hymenophoral trama subregular to irregular, composed of hyaline hyphae and lactifers. Pileipellis a hymeniderm, a palisade, sometimes a trichoderm, always with an upper layer of regular, thin-walled elements, often with dark intracellular pigmentation.

Type: *Lactarius lignyotus* Fr.

KEY TO THE SECTIONS

- 1a. Latex first watery and transparent, changing to grey or even black; context cream, changing to greyish pink or greyish red, finally black (exsiccata mostly partly black); pleurocystidia present, hyaline, thin-walled sect. *Nigrescentes*
- b. Latex first white (seldom pink), unchanging or changing to vinaceous, pink, lilac or violet; context not blackening; pleurocystidia absent (rarely present, and then with granular or needle-like content) 2
- 2a. Pileus rather smooth, sometimes shiny; pileipellis an ixotrichoderm; latex changing to greyish-brownish when drying sect. *Pseudofuliginosi*
- b. Not with this combination of characters sect. *Plinthogali*, s.l.

2. *Lactarius* sect. *Nigrescentes* Verbeken, *sect. nov.*

Pileus parvus ad moderate grandis, plano-convexus, applanatus ad leviter depressus; pileipellis sicca, velutina, leviter tomentosa, interdum venosa, non glutinosa, atra, atrabrunnea vel griseoflavida. Stipes cylindricus, gracilis, concolorus. Contextus primo rosescens vel rubescens, deinde nigrescens. Lamellae adnatae ad decurrentes, confertae, albidae, griseae, cremeae. Latex hyalinus, grisescens, rubescens vel nigrescens.

Sporae globosae ad subglobosae vel ellipsoideae, alatae vel subalatae, cristis usque ad 2 μm altis ornatae. Pleuromacrocystidia presentia. Pileipellis hymeniderma, saepe pigmento brunneo intracellulare.

Typus: *Lactarius melanogalus* R. Heim ex R. Heim, Bull. Jard. bot. État 25 (1955) 46.

Pileus small to moderately large, plano-convex, applanate to slightly depressed; pellis dry, velvety, finely tomentose, sometimes wrinkled, sometimes veined, never viscid or shiny, blackish, dark brown, leather brown, greyish brown to pale brown or greyish yellow, never brightly coloured. Stipe cylindrical, slender, mostly concolorous. Lamellae adnexed, adnate to decurrent, rather dense, whitish, greyish, cream. Context changing to greyish pink, red, reddish and finally black. Latex transparent, changing immediately to grey or reddish or even black.

Spores globose to subglobose or ellipsoid; ornamentation up to 2 µm and more, winged, or with irregularly conical warts and then with abundant lower connections. True pleurocystidia present, hyaline, thin-walled. Pileipellis a hymeniderm, always with an upper layer of regular, thin-walled elements, often with dark intracellular pigmentation.

Type: *Lactarius melanogalus* R. Heim ex R. Heim, Bull. Jard. bot. État 25 (1955) 46.

KEY TO THE SPECIES

- 1a. Spores ellipsoid; $Q = 1.24-1.64$ 2
- b. Spores globose to subglobose, rarely ellipsoid; $Q = 1.01-1.20$ 3
- 2a. Spores entirely winged; pileus and stipe greyish yellow to yellowish brown; pileus without papilla, not veined *L. orientalis*
- b. Spores partially winged, with conical warts and lower ridges present; pileus and stipe dark brown; pileus with a distinct papilla *L. griseogalus*
- 3a. Ornamentation of the spores 1–2 µm high; spores $7.3-7.5 \times 6.5-6.7$ µm; latex finally bluish black *L. melanogalus*
- b. Ornamentation of the spores up to 1(1.3) µm high; spores $7.9-8.3 \times 7.3-7.6$ µm; latex finally beige to cream *L. baliophaeus*

The representatives of this section are described and illustrated by Verbeken (1996). The microscopic description of *L. griseogalus* R. Heim, which was made from typematerial in bad condition, was extended later with some illustrations made from the specimen *Nicholson 179* (K) (Fig. 1), which is in much better condition but unfortunately lacks fieldnotes. This specimen has spores measuring $7.5-8.8-10.0(10.4) \times 6.7-7.3-7.8$ µm ($Q = 1.07-1.21-1.35$; $n = 20$), thus somewhat broader than those of the type.

Since our first observations on these species, many more collections of *L. baliophaeus* var. *orientalis* have come to our attention, all of them easily separable from the 'type variety' by the differently shaped spores. In fact, no intermediate cases have been observed. It is difficult to discriminate between these two taxa unambiguously in the field, but *L. baliophaeus* var. *orientalis* seems to lack the ochraceous/beige cap colours and the crenulate margin characteristic for *L. baliophaeus* var. *baliophaeus* (Plate 1). These observations have convinced us that this variety deserves species rank:

Lactarius orientalis (Verbeken) Verbeken, *stat. & comb. nov.* — Plate 2

Basionym: *Lactarius baliophaeus* var. *orientalis* Verbeken, *Persoonia* 16 (1996) 219.

3. ***Lactarius*** sect. ***Plinthogali*** s.l.

Lactarius sect. *Plinthogali* (Bull.) Sing., *Ann. Mycol.* 40 (1942) 123.

Lactarius group *Fuliginosi* Konr., *Bull. trimest. Soc. mycol. Fr.* 51 (1935) 185 (invalid). — *Lactarius* sect. *Fumosi* Hesler & Smith, *N. Amer. Species Lactarius* (1979) 103. — *Lactarius* sect. *Ruginosi* M. Bon, *Doc. mycol.* 10 (37–38) ('1979' 1980) 92.

Pileus small to moderately large, plano-convex, appanate to slightly depressed, sometimes infundibuliform; pellis dry, velvety, finely tomentose, sometimes wrinkled, sometimes veined, never viscid or shiny, blackish, dark brown, leatherbrown, greyish brown to pale

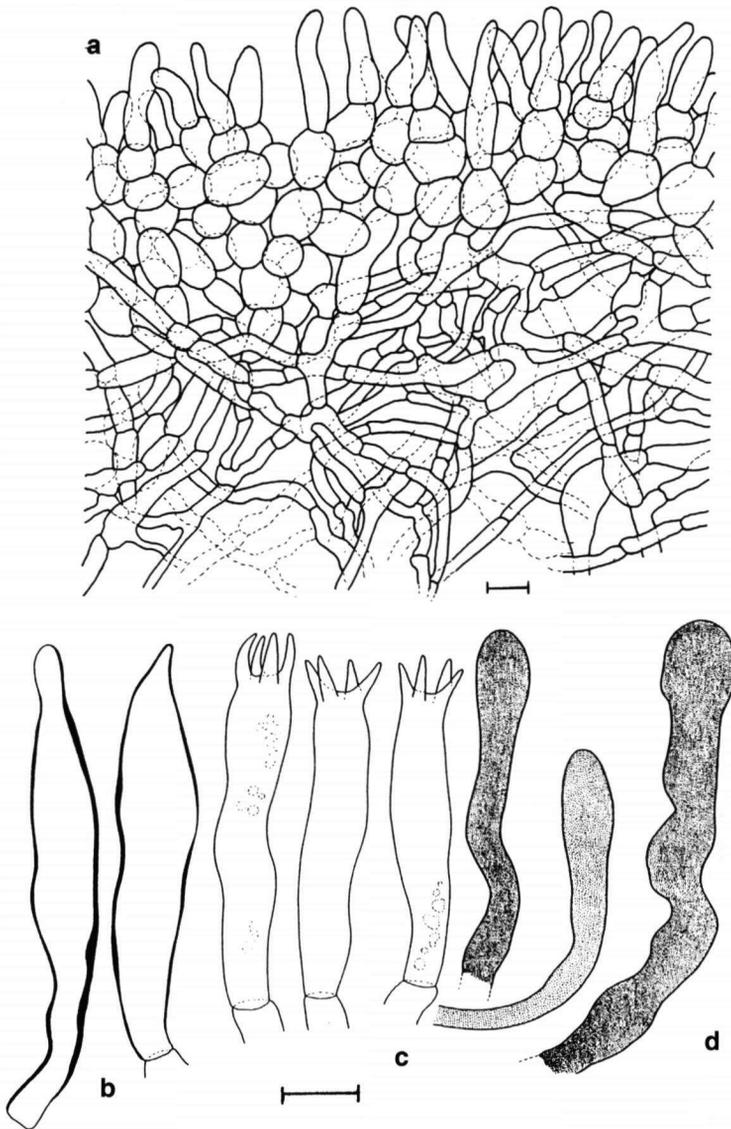


Fig. 1. *Lactarius griseogalus*. a. Section of pileipellis (type); b. pleurocystidia; c. basidia; d. pleuropseudo-cystidia (b–d: *Nicholson 179*; bar = 10 μ m).

brown or greyish yellow, never brightly coloured. Stipe cylindrical, slender, mostly concolorous. Lamellae adnexed, adnate to decurrent, rather dense, whitish, cream, in some species yellowish orange; edge concolorous, in some species dark brown. Context whitish, unchanging or changing to greyish pink, reddish or brownish. Latex white, unchanging or changing (to vinaceous, pink, lilac or violet: not seen in African species). Spore-deposit white, cream, dark cream to pale brown.

- orange; context in stipe base distinctly orange; terminal elements of the pileipellis obovoid to broadly clavate, $10-20 \times 8-15 \mu\text{m}$ *L. kabansus*
- b. Pileus up to 4 cm diam., young dark brown, soon paler greyish, margin more or less crenulate; young lamellae contrastingly white with cap and stipe (as in *L. lignyotus*); context in stipe base never orange; terminal elements of the pileipellis cylindrical, long and slender, $10-40 \times 6-10 \mu\text{m}$ *L. tenellus*
- 8a. Spore-ornamentation winged, composed of regular ridges, having everywhere the same height; context whitish, not changing, sometimes pale orange; lamellae yellowish or brownish orange 9
- b. Spore-ornamentation not regularly winged, composed of ridges which are locally higher and acute, sometimes giving the impression of being rather spiny; context changing to pink or reddish to brownish; lamellae white or greyish 2
- 9a. True pleurocystidia present; pileus olivaceous brown *L. nudus*
- b. True pleurocystidia absent 10
- 10a. Lamella-edge brown *L. congolensis*
- b. Lamella-edge concolorous with lamella 11
- 11a. Pileus dark fuliginous brown; context changing pinkish; spores very highly ornamented with wings up to $2 \mu\text{m}$ high *L. melanodermus*
- b. Pileus pale brown; context unchanging; spore-ornamentation up to $1.5 \mu\text{m}$ high
L. sulcatus
- 12a. Pileus covered with thick radial veins; smell not fish-like; stipe with a large collar of orange hairs around the base *L. adhaerens*
- b. Pileus at most slightly wrinkled; smell fish-like; no such subiculum 13
- 13a. Pellis cream with dark ochraceous brown squamules; pileus never with a papilla
L. pseudolignyotus
- b. Pellis dark brown, finely tomentose; pileus sometimes with a papilla *L. acutus*

Lactarius pusillisorus Verbeken — Fig. 2

Lactarius pusillisorus Verbeken, Bull. Jard. bot. Belg. 65 (1996) 206.

Pileus 30–75 mm diam., plano-convex when young, applanate to plano-concave, sometimes subumbilicate or subumbonate, mostly regular; margin regular, incurved then straight, faintly striate, paler; pellis not dehiscent, dry, velvet-like, felty in the centre, smoother and wrinkling towards the margin, brownish orange, reddish blond to light brown and yellowish brown (5C3–4–5DE5); centre dark brown to brownish beige (6F5–6F3); margin pale yellow (4A3). Stipe 35–60 × 5–10 mm, slightly eccentric to central, cylindrical, long and slender, slightly tapering downwards, concolorous with pileus, paler towards the apex and the base, dry, felty. Lamellae adnexed, narrowly adnate to adnate, unequal with lamellulae of different lengths, moderately spaced (3+6 to 8+11/cm), paper-like, thin, white to cream, pale brown when older; edge entire, dark grey to dark brown. Context firm, elastic, white to cream, sometimes changing pale greyish, unchanging with FeSO_4 (but pale greyish green in Verbeken 94.427), unchanging with NH_4OH , KOH or HCl ; taste not remarkable (very sweet in Verbeken 94.427); smell sweet, agreeable. Latex quite abundant to very abundant, white, unchanging; taste mild to a little astringent. Spore-deposit pale brown.

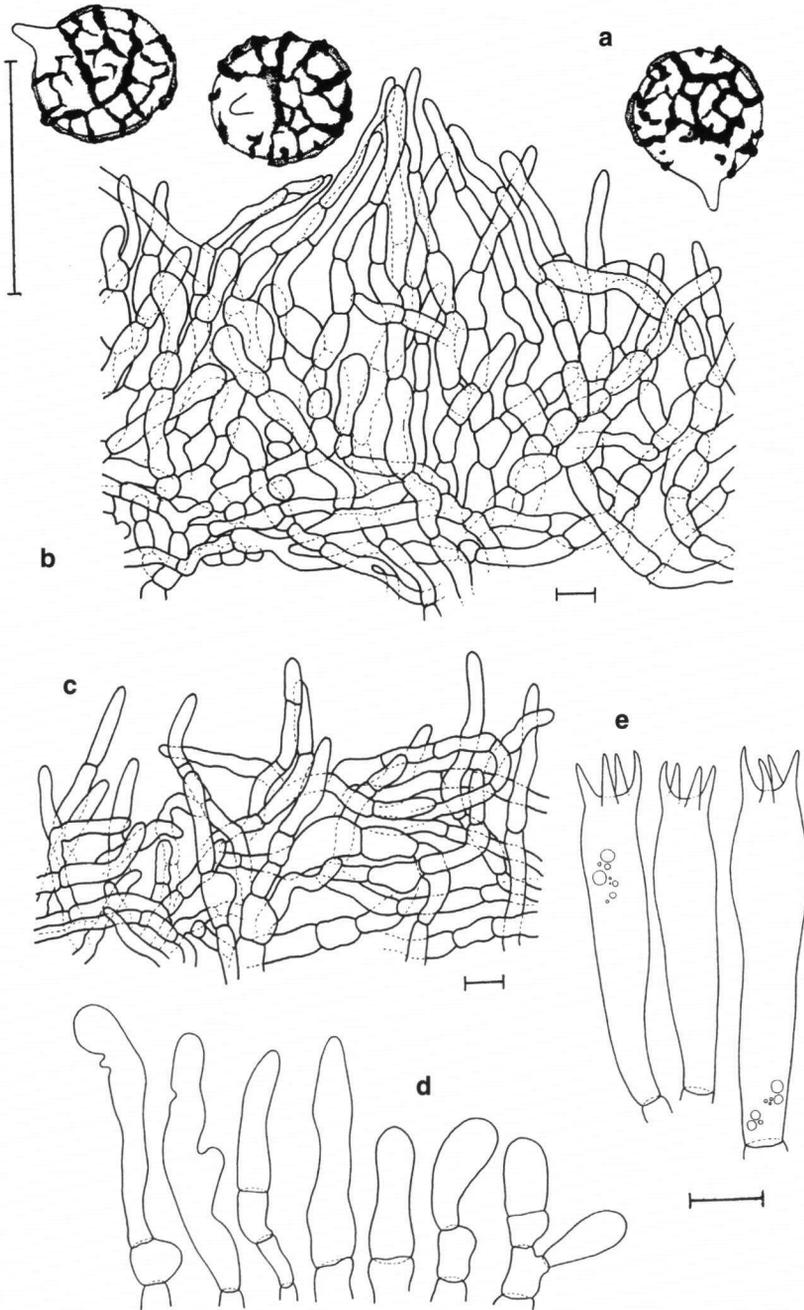


Fig. 2. *Lactarius pusillissporus* (type). a. Spores; b. section of pileipellis; c. section of stiptipellis; d. marginal cells; e. basidia (bar = 10 μ m).

Spores subglobose to ellipsoid, $5.3\text{--}5.8\text{--}6.5\text{--}7.1 \times 4.5\text{--}5.1\text{--}5.9\text{--}6.5 \mu\text{m}$ ($Q = 1.01\text{--}1.10\text{--}1.16\text{--}1.25$; $n = 100$); ornamentation amyloid, composed of ridges up to $0.75 \mu\text{m}$ high, forming an almost complete reticulum with some isolated warts; plage inamyloid. Basidia $35\text{--}45 \times 7\text{--}11 \mu\text{m}$, cylindrical to slightly clavate, 4-spored. True pleurocystidia absent. Pleuro-pseudocystidia not abundant, $3\text{--}6 \mu\text{m}$ diam., emergent, cylindrical, with rounded apex; content oleiferic. Lamella-edge sterile; marginal cells $15\text{--}35 \times 3\text{--}5 \mu\text{m}$, irregularly cylindrical to fusiform, sometimes clavate, content pale brown. Hymenophoral trama irregular, composed of hyaline hyphae; lactifers not abundant, sphaerocytes absent. Pileipellis a trichoderm to trichopalysade, $70\text{--}100 \mu\text{m}$ thick; terminal elements cylindrical, long, slender, $20\text{--}60 \times 3\text{--}5 \mu\text{m}$, arising from broadly cylindrical to almost spherical basal elements. Stipitipellis a trichoderm; terminal elements $25\text{--}45 \times 3\text{--}5 \mu\text{m}$, septate. Clamp-connections absent.

Examined material. BURUNDI: Bururi Prov., Nyamirambo, Rumonge Forest Reserve, 850–950 m alt., miombo woodland dominated by *Brachystegia utilis*, March 1994, *Verbeken 94.285* (holotypus BR, isotypus GENT), idem, *Verbeken 94.011, 94.022, 94.044 & 94.427* (all at BR).

Lactarius rumongensis Verbeken — Fig. 3

Lactarius rumongensis Verbeken, Bull. Jard. bot. Belg. 65 (1996) 208.

Pileus $25\text{--}75 \text{ mm}$ diam., thin, plano-convex to applanate; margin first regular, then irregular and strongly crenulate, sometimes grooved and striate; pellis not dehiscent, smooth in the centre, concentrically wrinkling towards the margin, with remarkable veins forming a reticulum at the margin, yellowish white, greyish yellow to brownish grey (4A2, 4B3, 5CD2–3), paler towards the margin, hygrophanous. Stipe $15\text{--}50 \times 5\text{--}10 \text{ mm}$, cylindrical, subbulbous at the base, sometimes tapering downwards, long and slender, dry, smooth, slightly darker than pileus, brownish grey, paler towards the base, solid, firm. Lamellae adnate, unequal with lamellulae (1 to 3 between 2 lamellae, regular pattern), very distant ($3+5$ to $3+6/\text{cm}$), $4\text{--}10 \text{ mm}$ broad, elastic, paper-like, with remarkable venation when older, white to creamy; edge entire, concolorous. Context thin, firm, whitish, unchanging with FeSO_4 ; taste mild, smell pleasant. Latex not abundant to quite abundant, white to water-like; taste mild. Spore-deposit dark cream to light brown.

Spores subglobose, $7.4\text{--}8.4\text{--}8.8\text{--}9.8(10.0) \times 6.8\text{--}7.8\text{--}8.0\text{--}8.8(8.9) \mu\text{m}$ ($Q = 1.01\text{--}1.08\text{--}1.09\text{--}1.17$; $n = 60$); ornamentation amyloid, forming a complete reticulum, ridges $0.5\text{--}1 \mu\text{m}$ high; plage sometimes distally amyloid. Basidia $40\text{--}60 \times 10\text{--}12 \mu\text{m}$, cylindrical to clavate, 4-spored, exceptionally 2-spored. True pleurocystidia absent. Pleuro-pseudocystidia abundant, $4\text{--}6 \mu\text{m}$ diam., cylindrical to tortuous, with rounded apex. Lamella-edge sterile; marginal cells $25\text{--}40 \times 4\text{--}5(6) \mu\text{m}$, cylindrical to fusiform, septate, sometimes branched. Hymenophoral trama subregular to irregular, with hyaline hyphae and laticiferous hyphae. Pileipellis a hymeniderm; elements $10\text{--}20 \times 3\text{--}5 \mu\text{m}$, fusiform, sometimes clavate, sometimes thick-walled; terminal elements of laticiferous hyphae present, not abundant. Stipitipellis a regular hymeniderm; elements $13\text{--}25 \times 3\text{--}6 \mu\text{m}$, cylindrical to clavate, sometimes slightly thick-walled. Clamp-connections absent.

Examined material. BURUNDI: Bururi Prov., Nyamirambo, Rumonge Forest Reserve, 850–950 m alt., miombo woodland dominated by *Brachystegia utilis*, March 1994, *Verbeken 94.006* (holotypus BR, isotypus GENT) & *94.018* (BR). — ZAIRE: Equateur Prov., Binga, 380 m alt., drier Guineo-Congolian rain-forest with *Gilbertiodendron dewevrei*, Nov. 1928, *Goossens-Fontana 808* (BR).

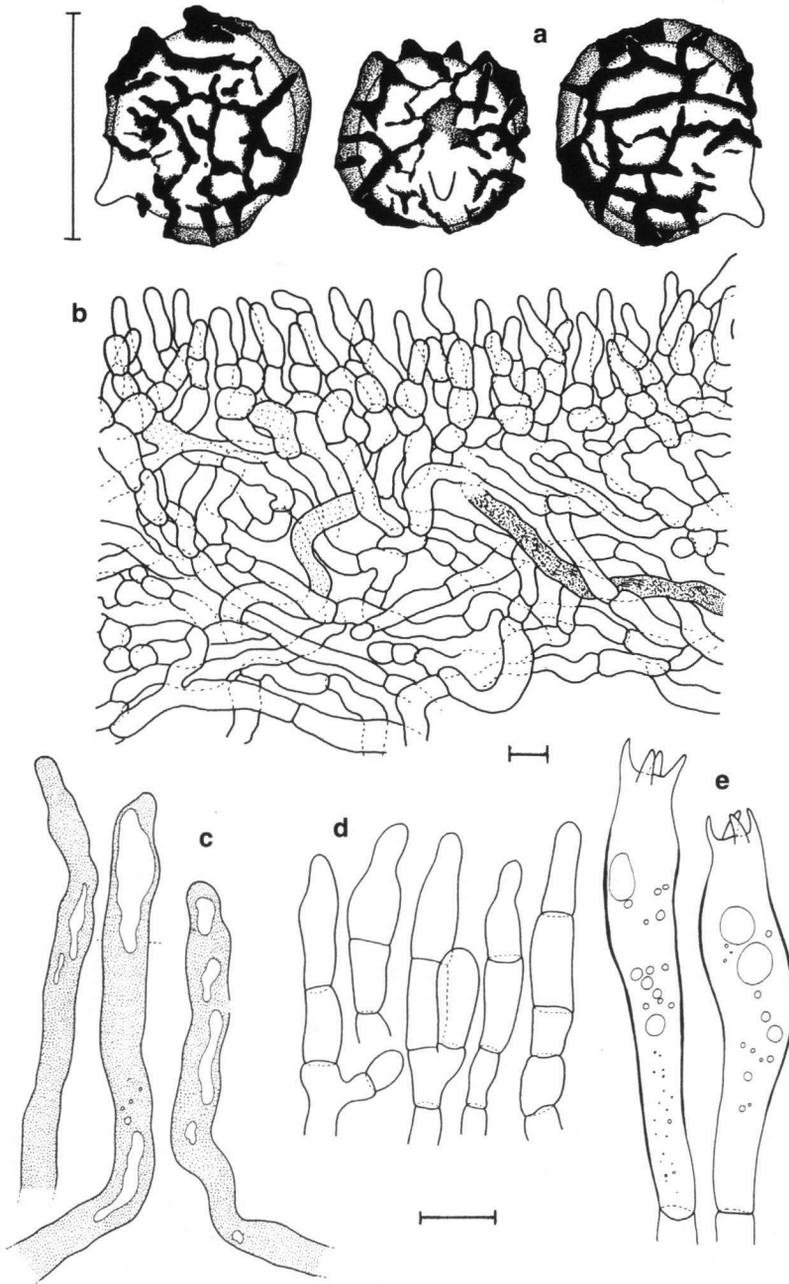


Fig. 3. *Lactarius rumongensis* (type). a. Spores; b. section of pileipellis; c. pleuropseudocystidia; d. marginal cells; e. basidia (bar = 10 μ m).

Lactarius saponaceus Verbeken — Fig. 4, Plate 3

Lactarius saponaceus Verbeken, Bull. Jard. bot. Belg. 65 (1996) 209.

Pileus 50–65 mm diam., applanate and slightly depressed in the centre; margin regular, straight, faintly striate, paler; pellis not dehiscent, dry, felty, greyish yellow to orange grey (4AB3, 5B2), brown in the centre, pale yellow at the margin (4A3). Stipe 15–40 × 5–13 mm, eccentric to central, cylindrical, tapering downwards, pale brown to greyish brown, white at the base, dry, felty. Lamellae adnate to decurrent, quite dense (8+7 to 8+24/cm), unequal with 1–3 lamellulae between 2 lamellae, paper-like, elastic, thin, pale yellow (4A3); edge entire, dark grey to dark brown (very conspicuous in young specimens). Context firm, thick in pileus (4–5 mm), solid in stipe, white, unchanging, unchanging with FeSO₄, NH₄OH, HCl; taste astringent in *Verbeken* 94.353, strongly soap-like and disgusting in *Verbeken* 94.302. Latex not abundant, although very abundant when pileus and stipe are separated, white, unchanging; taste soap-like and disgusting in *Verbeken* 94.302. Spore-deposit pale brown to dark cream.

Spores globose to subglobose, sometimes ellipsoid, 7.0–7.7–8.1–9.3 × 6.8–7.0–7.5–8.2 μm (Q = 1.00–1.08–1.11–1.22; n = 80); ornamentation amyloid, composed of ridges up to 1 μm high, forming an incomplete reticulum with isolated warts and ridges; plage inamyloid. Basidia 50–65 × 9–11 μm, cylindrical to slightly fusiform, 4-spored. True pleurocystidia absent. Pleurospseudocystidia very abundant, 4–6 μm diam., emergent, irregularly cylindrical, mucronate to tortuous; content oleiferic, sometimes guttulate. Lamella-edge sterile; marginal cells 15–35 × 4–6 μm, cylindrical to fusiform, with pale brown content. Hymenophoral trama irregular, composed of hyaline hyphae; lactifers abundant. Pileipellis a hymeniderm, 40–50 μm thick; terminal elements of suprapellis cylindrical to clavate, 15–25(35) × 5–12 μm, without brown pigment; subpellis composed of short to cylindrical cells. Stipitipellis a hymeniderm; terminal elements longer and narrower, 10–30 × 5–7 μm. Clamp-connections absent.

Examined material. BURUNDI: Bururi Prov., Nyamirambo, Rumonge Forest Reserve, 850–950 m alt., miombo woodland dominated by *Brachystegia utilis*, March 1994, *Verbeken* 94.302 (BR) & 94.353 (holotypus BR, isotypus GENT).

Lactarius sulcatulus Verbeken — Fig. 5, Plate 4

Lactarius sulcatulus Verbeken, Bull. Jard. bot. Belg. 65 (1996) 210.

Pileus 10–45 mm diam., very thin, plano-convex, applanate to broadly infundibuliform, with very distinct and acute papilla in the centre; margin thin, crenulate, undulate, slightly grooved, fimbriate to serrate in older specimens; pellis not dehiscent, dry, mat, wrinkled, with very fine radial venation superposed on the radial grooves which start in the centre, greyish yellow (4BC4) to yellowish brown (5EF5), light brown to yellowish brown (5DE4) in the centre; papilla and extreme margin darker brown (5F6–8). Stipe 15–23 × 4–6 mm, cylindrical to very flattened and with a longitudinal fold, slightly tapering downwards, slender, mat, slightly felty, yellowish white to pale yellow (3–4A23), firm, solid. Lamellae broadly adnate to subdecurrent, unequal with abundant lamellulae of different lengths, distant (6/cm), rather broad [2–4(5) mm], thin, rarely anastomosing, yellowish white (3A2) when young, cream when older (3–4A2); edge entire, concolorous. Context thin, whitish, usually regularly fistulose, slightly changing to reddish brown in the stipe, in older specimens reddish

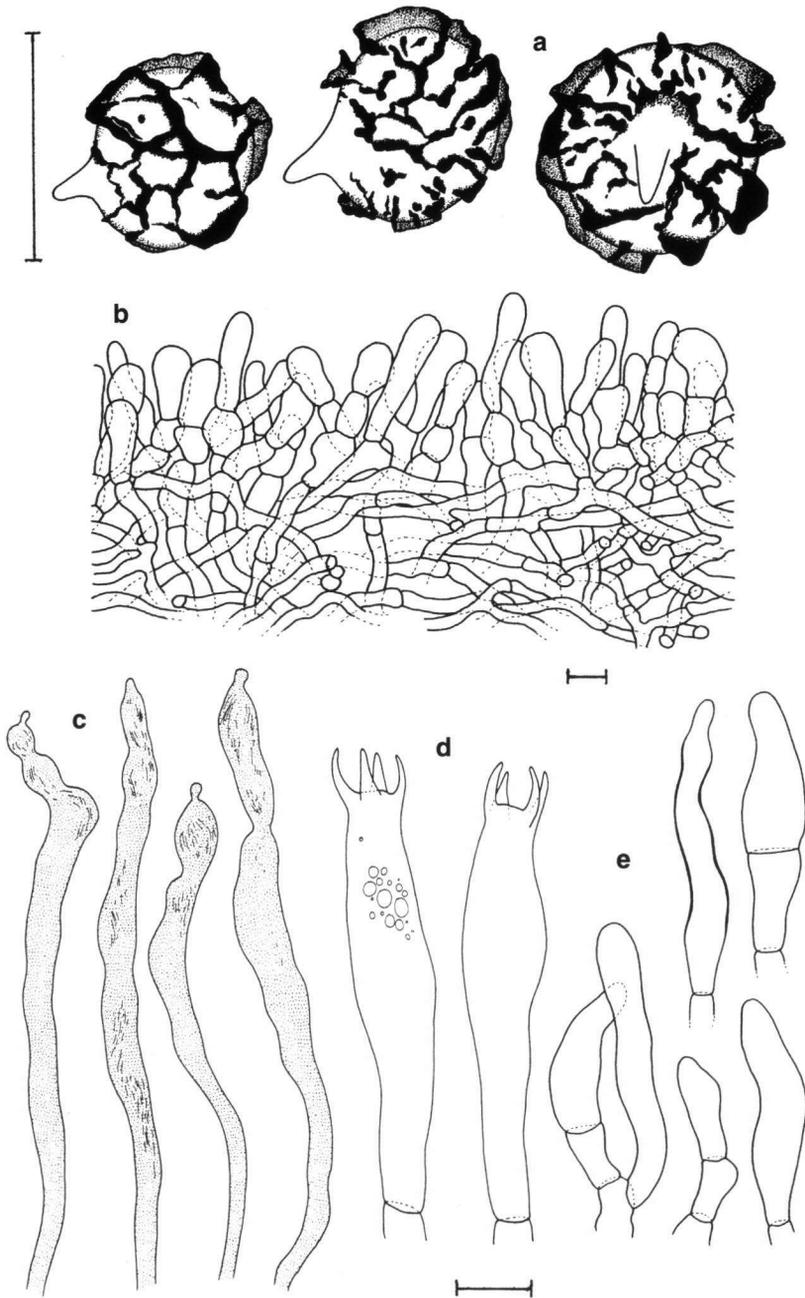


Fig. 4. *Lactarius saponaceus* (type). a. Spores; b. section of pileipellis; c. pleuropseudocystidia; d. basidia; e. marginal cells (bar = 10 μ m).

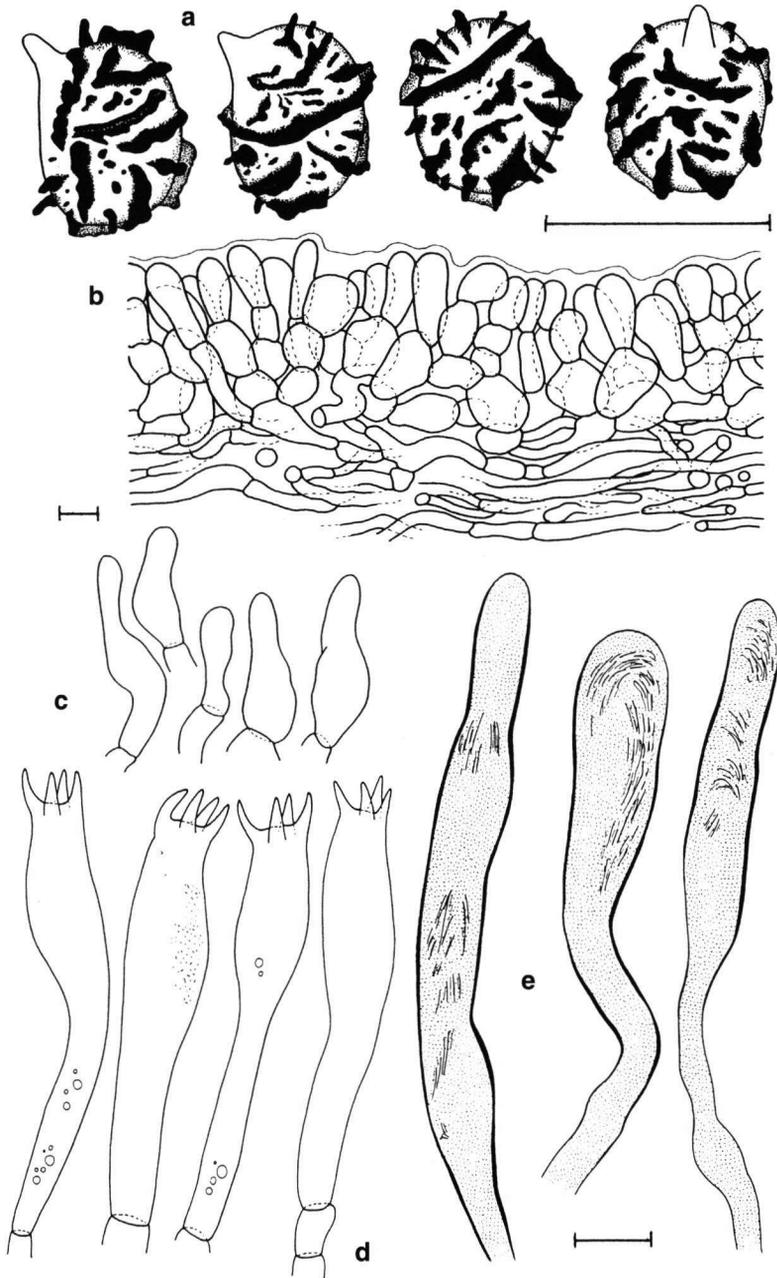


Fig. 5. *Lactarius sulcatulus* (type). a. Spores; b. section of pileipellis; c. marginal cells; d. basidia; e. pleuropseudocystidia (bar = 10 μ m).

in the centre of the stipe, unchanging with NH_4OH , NaOH , anilined H_2O , phenol, FeSO_4 ; reddish brown after a while with phenolaniline; smell papaya-like; taste agreeable, mild, a bit spicy. Latex present, scarce, watery, whitish to transparent, unchanging or changing slightly brownish (?); taste papaya-like. Spore-deposit pale-coloured, not white.

Spores ellipsoid, $7.5\text{--}8.1\text{--}8.6 \times 6.0\text{--}6.6\text{--}7.0(7.2) \mu\text{m}$ ($Q = 1.16\text{--}1.22\text{--}1.31$; $n = 20$); ornamentation amyloid, zebroid, composed of ridges, mostly parallel, seldom branched; some isolated elongated warts present, ridges up to $1 \mu\text{m}$ high; plage inamyloid or with distal amyloid spot. Basidia $50\text{--}55(60) \times 9\text{--}11 \mu\text{m}$, subcylindrical to subclavate, 4-spored. True pleurocystidia absent. Pleuropseudocystidia abundant, mostly emergent, $10\text{--}13(15) \mu\text{m}$ diam. in the upper part, cylindrical to clavate, with rounded apex, thin-walled or slightly thick-walled; content needle-like and oleiferic. Lamella-edge sterile; marginal cells $15\text{--}25 \times 4\text{--}7 \mu\text{m}$, cylindrical to irregularly fusiform, thin-walled, hyaline. Hymenophoral trama irregular, composed of lactifers and hyaline, thin-walled hyphae. Pileipellis hymeniderm-like, two-layered, covered by a slime-layer; terminal elements of suprapellis clavate to broadly clavate, $10\text{--}20 \times 5\text{--}12 \mu\text{m}$, thin-walled; subpellis thin, composed of isodiametric cells, $10\text{--}15(20) \mu\text{m}$ diam. Stipitipellis between a trichoderm and a hymeniderm; elements of the suprapellis $10\text{--}50 \times 5\text{--}8 \mu\text{m}$, cylindrical, with rounded apex, sometimes septate; subpellis rudimentary, composed of a few, small, isodiametric cells, $5\text{--}10(20) \mu\text{m}$ diam., mixed with long and slender hyaline hyphae. Clamp-connections absent.

Examined material. ZAIRE: Kivu Prov., Irangi, rain forest, April 1972, *Rammeloo Z414* (holotypus GENT).

Lactarius sulcatus Verbeken & Walley, *spec. nov.* — Fig. 6, Plate 5

Pileus $45\text{--}55 \text{ mm}$ diam., leviter plano-concavus, margine valde striato ad sulcato crenulato, pileipellis leviter velutina, brunnea. Stipes $20\text{--}40 \text{ mm}$ longus, $7\text{--}11 \text{ mm}$ crassus, subcylindratus, basin versus attenuatus, laevis, pallide brunneus. Lamellae adnatae, distantes, albae. Contextus albidus, gustu mitis. Latex non abundans, albus.

Spores globosae ad subglobosae, $7.2\text{--}8.1\text{--}8.9 \times 7.0\text{--}7.4\text{--}8.0 \mu\text{m}$, subreticulatae, alatae, cristis usque ad $1.5 \mu\text{m}$ altis ornatae, macula suprahilaris interdum distale amyloidea. Basidia $55\text{--}65 \times 10\text{--}12 \mu\text{m}$, cylindrata vel subclavata, tetraspora. Macropleurocystidia absentia. Pseudopleurocystidia rara, non emergentia, $4\text{--}6(9) \mu\text{m}$ diam. Pileipellis trichopalliformis, gelatinosa, elementa suprapellis $15\text{--}40 \times 3\text{--}6 \mu\text{m}$, irregulare cylindrata vel subtortuosa, subpellis ex cellulis sphaeris vel irregularis.

Holotypus: Zimbabwe, road from Mutare to Bvumba at peg 15.5 km, grid 1932B2, *Brachystegia spiciformis*-dominated miombo woodland, 11 Feb. 1999, *Verbeken 99-176* (GENT).

Pileus $45\text{--}55 \text{ mm}$ diam., slightly plano-concave; margin directed slightly upwards in mature specimens, strongly crenulate, deeply and densely grooved (up to 1 cm long); surface velvety, chamois-leather-like, yellowish brown to brown (SE5–6E4), slightly darker in the centre and in the grooves. Stipe $20\text{--}40 \times 7\text{--}11 \text{ mm}$, almost regularly cylindrical, tapering at the base, smooth, soft, concolorous but paler, paler to whitish at the top and at the base. Lamellae broadly adnate, distant ($4\text{--}5/\text{cm}$ halfway the radius), with abundant lamellulae (often in a regular pattern), whitish (4A2), papery thin, not very brittle; edge even, concolorous. Context thin-fleshed near margin, moderately thick in pileus centre, solid in stipe, whitish, slightly greyish brown in older specimens, unchanging with gaic and FeSO_4 ; taste mild; smell not particular. Latex not abundant, white, unchanging; taste mild.

Spores globose to subglobose, $7.2\text{--}8.1\text{--}8.9 \times 7.0\text{--}7.4\text{--}8.0 \mu\text{m}$ ($Q = 1.01\text{--}1.07\text{--}1.12$; $n = 20$); ornamentation composed of rounded ridges up to $1.5 \mu\text{m}$ high, forming a subcomplete and rather dense reticulum; plage distally amyloid. Basidia $55\text{--}65 \times 10\text{--}12(15) \mu\text{m}$,

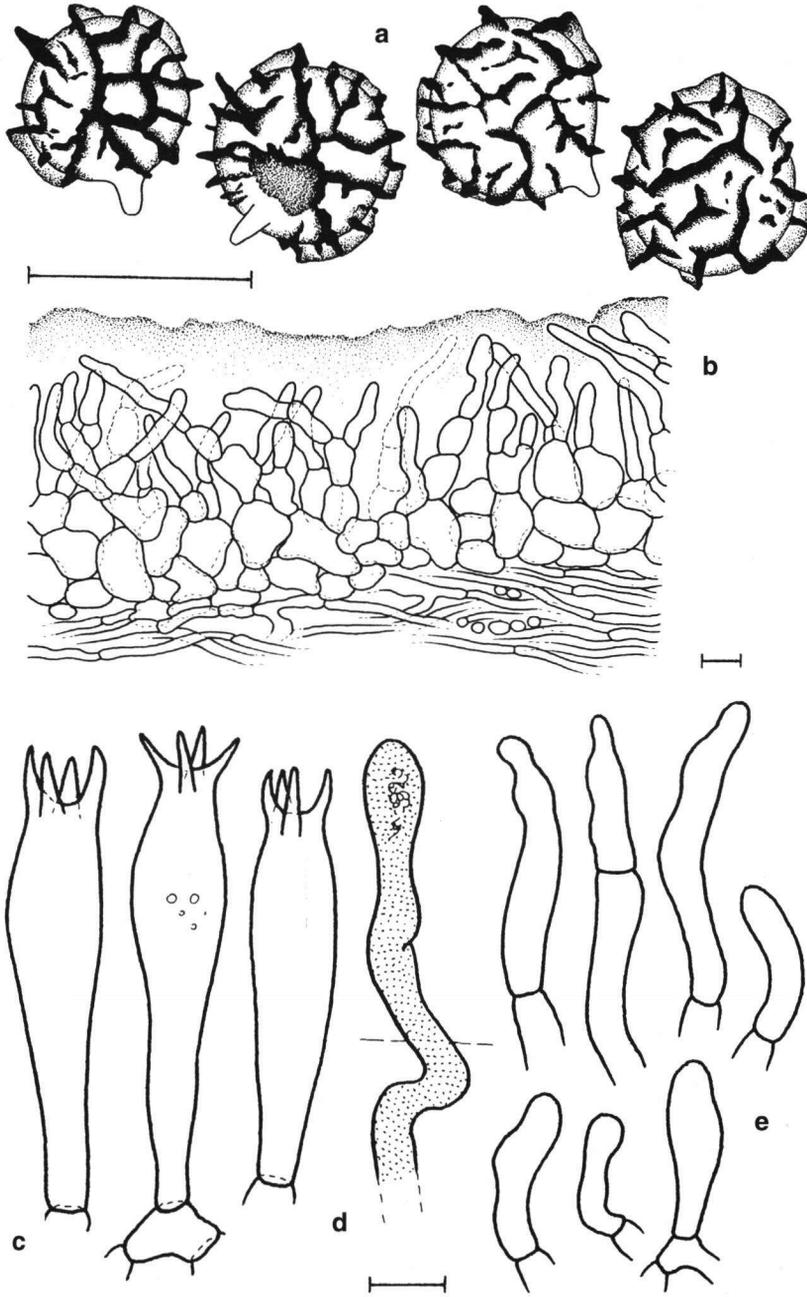


Fig. 6. *Lactarius sulcatus* (type). a. Spores; b. section of pileipellis; c. basidia; d. pseudocystidium; e. marginal cells (bar = 10 μ m).

cylindrical to subclavate, 4-spored; sterigmata $6-10 \times 1-2 \mu\text{m}$. True pleurocystidia absent. Pseudopleurocystidia scarce, never emergent, $4-6(9) \mu\text{m}$ diam., irregularly cylidric, with a very dense granular content. Lamella-edge sterile, composed of marginal cells; marginal cells irregularly cylindrical to subfusiform, $15-40 \times 4-8 \mu\text{m}$, hyaline, thin-walled. Hymenophoral trama mainly composed of hyphae, some swollen compartments present, but no distinct nests of sphaerocytes. Pileipellis $60-80 \mu\text{m}$ thick, a palisade embedded in a slime layer; terminal elements subcylindrical to irregular, $20-40 \times 3-6 \mu\text{m}$, thin-walled (walls not gelatinizing), hyaline; cellular layer $30-40 \mu\text{m}$ thick, composed of rather small ($10-20 \mu\text{m}$ diam.) globose cells. Pileipellis $80-120 \mu\text{m}$ thick, a trichopalisade embedded in a slime layer composed of chains of elements; terminal elements $15-40 \times 3-6 \mu\text{m}$, irregularly cylindrical to subtortuous; lower elements globose up to $20 \mu\text{m}$ diam. or irregular, with pale brown intracellular pigmentation. Stipitipellis a trichoderm.

Examined material. ZIMBABWE: road from Mutare to Bvumba at peg 15.5 km, grid 1932B2, *Brachyostegia spiciformis*-dominated miombo woodland, 11 Feb. 1999, Verbeken 99-176 (GENT, holotypus).

Lactarius tenellus Verbeken & Walley, *nom. nov.* — Plate 8

Basionym: *Lactarius kabansus* var. *pallidus* Verbeken, Bull. Jard. bot. Belg. 65 (1996) 202, *Lactarius pallidus* Pers., Tent. Disp. meth. Fung. 64 (1797).

New field observations have convinced us to upgrade this relative of *L. kabansus* Pegler & Pearce to species level. As well as the clear microscopical distinction with *L. kabansus* (terminal elements of the pileipellis obovoid to broadly clavate, $10-20 \times 8-15 \mu\text{m}$ in *L. kabansus*; terminal elements of the pileipellis cylindrical, long and slender, $10-40 \times 6-10 \mu\text{m}$ in *L. tenellus*, Fig. 7), additional macroscopical differences were established during recent fieldwork. *Lactarius tenellus* has a rather dark brown cap when very young which, together with its contrasting white lamellae, makes it reminiscent of *L. lignyotus*. The cap colour typically fades to grey, almost without brownish components, while *L. kabansus* has brown to dark brown colours, eventually also becoming very pale when specimens are exposed to the sun (Plate 7). *Lactarius kabansus* is usually a more robust species, with an irregular, deflexed margin, while *L. tenellus* is a slender species with a crenulate margin. The initially pure white lamellae of *L. tenellus* become more yellowish, but not as soon and as ochraceous orange as in *L. kabansus*. In case of doubt, cutting the stipe base seems to be an unambiguous test: the context in the base of the stipe is white and stays white in *L. tenellus*, while in all encountered specimens of *L. kabansus*, even in old and insect-infected ones, the stipe base is orange when cut. As to the spores, no conspicuous differences have been observed.

4. Lactarius sect. Pseudofuliginosi Verbeken, *sect. nov.*

Pileus infundibuliformis, umbilicatus vel papillatus, margine valde undulato vel crenulato saepe striato, pileipellis laevis, interdum leviter glutinosa ex ochraceo vel olivaceo brunnea. Stipes cylindratus, laevis, impositus interdum leviter velutinus interdum pruinosis. Lamellae adnatae ad leviter decurrentes, distantes, pallide flavae ad pallide brunneae. Contextus firmus, ex griseo albidus, gustu acerrimus. Latex abundans, albus, griseus vel brunnescens.

Spores globosae ad ellipsoideae, reticulatae, alatae, macula suprahilaris interdum distale amyloidea. Pleuromacrocystidia presentia vel absentia. Pileipellis ixotrichoderma, pigmento brunneo intracellulare.

Typus: *Lactarius atroolivinus* Verbeken & Walley.

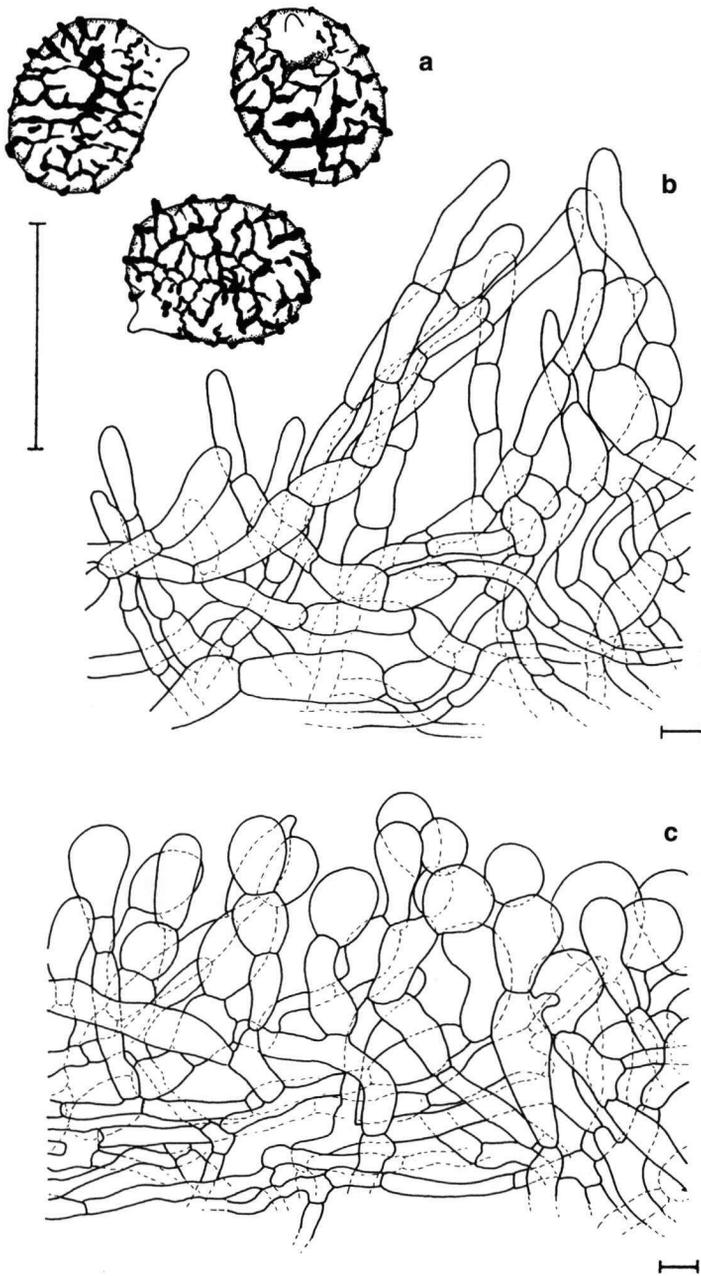


Fig. 7. *Lactarius kabansus*. a. Spores (type); c. section of pileipellis (Buyck 3369). — *Lactarius tenellus*. b. Section of pileipellis (Buyck 3410; bar = 10 µm).

Pileus infundibuliform, umbilicate or papillate; margin strongly undulate or crenulate, often striate; pellis, smooth, sometimes shiny and slightly sticky, with brownish, ochraceous or olivaceous tinges. Stipe cylindrical, smooth, mat, sometimes finely felty, sometimes pruinose. Lamellae broadly adnate to slightly decurrent, unequal with abundant lamellulae of different lengths, distant, pale yellow to pale brown. Context rather firm, with greyish tinge and burning acid taste. Latex abundant, white, drying greyish or brownish; taste very acrid.

Spores globose to ellipsoid; ornamentation amyloid, composed of ridges up to 2(2.5) µm high, forming a reticulum with a strongly winged aspect; plage strongly distally amyloid. True pleurocystidia absent or present and then with distinct needle-like content. Lamella-edge sterile. Pileipellis ixotrichoderm-like, locally with brownish intracellular pigmentation.

Type: *Lactarius atroolivinus* Verbeken & Walley. n.

OBSERVATIONS

Three taxa have a rather distinct position within the subgenus because of their pileipellis-structure: they lack globose or swollen elements and the elements are embedded in a distinct slime-layer. A trichoderm-like structure is unusual within the subgenus, but other characters such as spore-ornamentation, the dark intracellular pigmentation in the pileipellis, and macroscopic habit strongly argue for a position in the subgenus *Plinthogali*. Macroscopically the taxa are recognized by the dull brownish, often olivaceous or ochraceous colours and a smooth, even shiny, pileus.

Because of its olivaceous colours and macrocystidia with needle-like content, *L. atroolivinus* could be a link to certain species in the subgenus *Piperites* (Fr.) C.H. Kauffm.

KEY TO THE TAXA

- 1a. Pleuromacrocystidia abundant; pileus with blackish olivaceous tinges; spores ornamented with narrow, fine ridges *L. atroolivinus*
- b. Pleuromacrocystidia absent; pileus rather brownish; spores more heavily ornamented 2
- 2a. Ascending elements in the pileipellis 5–9 µm broad, subclavate or subfusiform; pileus mat and very finely felty *L. undulatus* var. *undulatus*
- b. Ascending elements in the pileipellis very narrow (2–4 µm), cylindrical, more poorly represented; pileus smooth and shiny, slightly viscid *L. undulatus* var. *rasilis*

***Lactarius atroolivinus* Verbeken & Walley, nov. spec. — Fig. 8, Plate 6**

Pileus 30–100 mm diam., infundibuliformis, distincto umbilico, margine undulato ad crenulato, pileipellis laevis, leviter glutinosa, ex olivaceo atrobrunnea. Stipes 30–60 mm longus, 10–16 mm crassus, subcylindratus, laevis, pruinosis, griseobrunnescens. Lamellae adnatae, moderate distantes ad distantes, atroflavidae. Contextus brunneogriseus, gustu mitis deinde acerrimus. Latex moderate abundans, albus tum cremeus, olivaceobrunnescens.

Spores globosae ad subglobosae, 8.7–9.3–9.8 × 7.7–8.5–9.2 µm, subreticulatae, alatae, cristis usque ad 2.5 µm altis ornaetae, macula suprahilaris interdum distale amyloidea. Basidia 50–65 × 12–15 µm, subclavata, tetraspora. Pleuromacrocystidia abundantia, 50–70 × 6–8 µm, fusiformia. Pleuropseudo-cystidia moderate abundantia, non emergentia, 3–4 µm diam. Pileipellis ixotrichoderma.

Holotypus: Zimbabwe, Penhalonga, hill behind Harris' garden, grid 1832B3, young *Brachystegia spiciformis*-dominated miombo woodland with *Uapaca kirkiana* on hill ridge, 9 Feb. 1999, Verbeken 99-143 (GENT, holotypus).

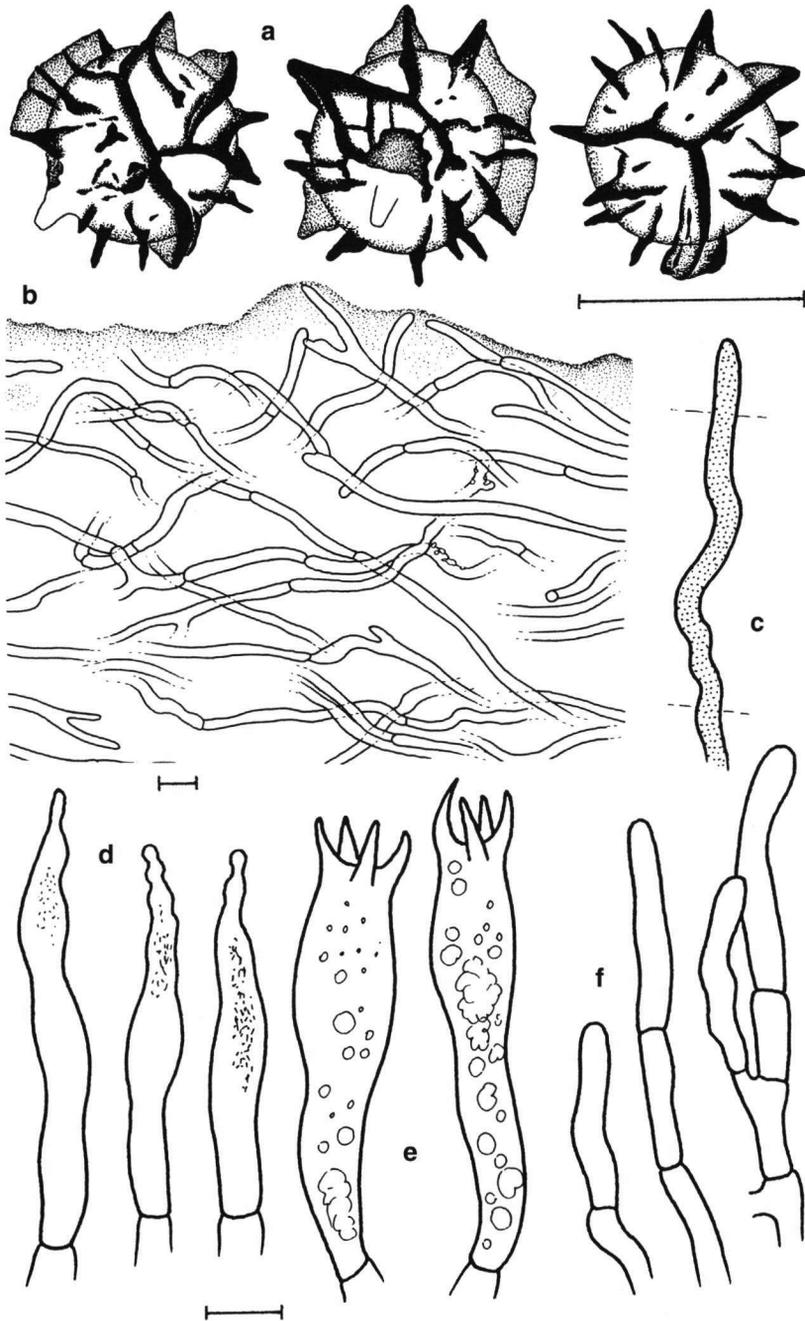


Fig. 8. *Lactarius atroolivinus* (type). a. Spores; b. section of pileipellis; c. pseudocystidium; d. pleuro-macrocytidia; e. basidia; f. marginal cells (bar = 10 μ m).

Pileus 30–100 mm diam., regularly infundibuliform, with a typical *Clitocybe*-shape, with a distinct, sometimes suddenly deep and narrow umbilicus; margin incurved and staying slightly incurved, broadly wavy, crenulate in older specimens; surface smooth, shiny, with very small, almost indistinct radially wrinkles, very slightly sticky, very dark brown, almost blackish at margin, greyish brown (7F3–4) but more intense towards the centre (6F4–6E3), overall tinged dark brown to blackish brown with an olivaceous shade. Stipe 30–60 × 10–16 mm, subcylindrical, slightly tapering at the base, smooth, dryer than the pileus, with a somewhat pale, almost pruinose aspect which makes it look like plaster, greyish brown (6E3), not unicolorous, locally grey (6C1) in young specimens, with plastery greyish tinge, with a very dark narrow zone just beneath the lamellae, and right underneath this darker zone slightly paler than in the rest of the stipe. Lamellae broadly adnate, moderately distant to distant (4 to 7/cm halfway the radius), papery thin, not very brittle, with very abundant lamellulae of many different lengths (no regular pattern), dark blonde (5D4), staining dark in old specimens. Context rather thick and firm, brownish-grey (same tinge as pileus, but paler), immediately blue with gaiac; smell a bit fatty, faintly of *L. quietus*; taste first mild, but soon very acrid, burning. Latex moderately abundant, white, slightly cream, drying dark olivaceous brown (5E4) after more than 30 minutes, unchanging with KOH, slightly cream on paper.

Spores globose to subglobose, 8.3–9.2–9.3–10.0 × 7.7–8.3–8.5–9.2 μm (Q = 1.00–1.08–1.10–1.17; n = 40); ornamentation amyloid, composed of narrow and acute ridges, up to 2.5 μm high, forming a very incomplete reticulum; plage distally amyloid. Basidia 50–65 × 12–15 μm, 4-spored, subclavate, with guttulate or densely granular content; sterigmata 9–11 × 1–3 μm. Pleuromacrocystidia abundant, sometimes slightly emergent, 50–70 × 6–8 μm, narrowly fusiform, with tapering or mucronate apex; content needle-like. Pleuropseudocystidia rather abundant, never emergent, 3–4 μm diam., narrow, cylindrical, with rounded apex. Lamella-edge sterile; composed of marginal cells which are narrowly cylindrical, 30–45 × 4–6 μm, hyaline, thin-walled. Hymenophoral trama mixed; filamentose with some sphaerocytes present; lactifers abundant. Pileipellis an ixotrichoderm, 100–120 μm thick, composed of very loosely interwoven repent and ascending hyphae; hyphae 2–4 μm diam., thin-walled, some with a brown intracellular pigmentation; some incrustations also present; embedded in a slime-layer but never with gelatinized walls. Stipitipellis a trichoderm, locally a cutis, not embedded in a slime-layer, but composed of hyphae of 4–6 μm diam. and with a rather rigid wall; no pigmentation present.

Examined material. ZAMBIA: Kitwe, Dec. 1978, *Pearce 593/2* (K, previously identified by myself as *L. undulatus* var. *rasilis*). — ZIMBABWE: road from Mutare to Bvumba at peg 15.5 km, grid 1932B2, *Brachystegia spiciformis*-dominated miombo woodland, 11 Feb. 1999, *Verbeken 99-175* (GENT); Penhalonga, hill behind Harris' garden, grid 1832B3, young *Brachystegia spiciformis*-dominated miombo woodland with *Uapaca kirkiana* on hill ridge, 9 Feb. 1999, *Verbeken 99-143* (GENT, holotypus).

Lactarius undulatus var. **undulatus** — Fig. 9

Lactarius undulatus Verbeken, Bull. Jard. bot. Belg. 65 (1996) 210.

Pileus 75 mm diam., broadly infundibuliform with an umbilicate centre; margin straight, strongly undulate, strongly striate to grooved; pellis not dehiscent, mat, very finely felty, sepia to horn, ochraceous towards the centre. Stipe 42 × 11 mm, long, slender, cylindrical, mat, very finely felty, clay-buff to hazel-buff, cream at the apex. Lamellae adnate to slightly

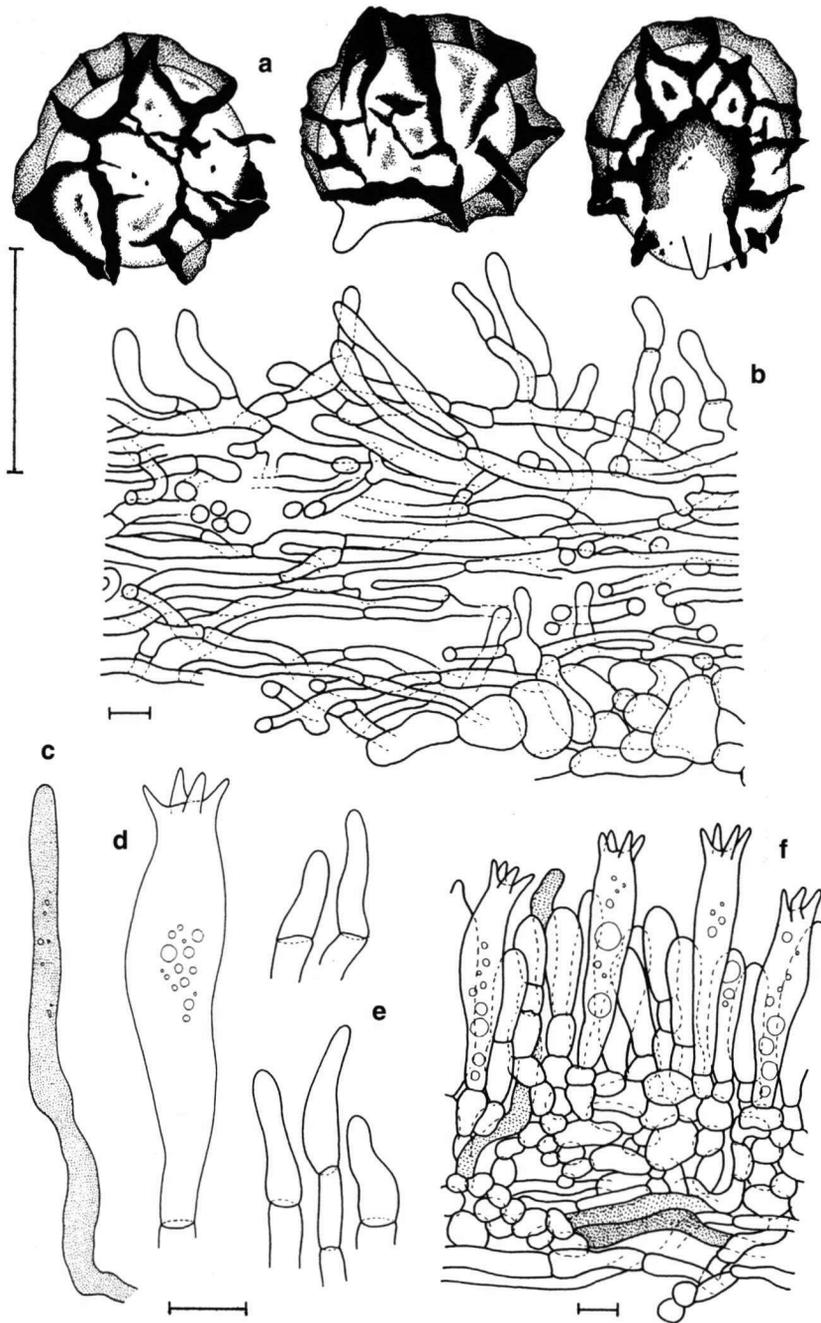


Fig. 9. *Lactarius undulatus* (type). a. Spores; b. section of pileipellis; c. pseudocystidium; d. basidium; e. marginal cells; f. hymenium (bar = 10 μ m).

decurrent, unequal with lamellulae of different lengths, very distant (5/cm), cream to pale milky coffee-colour. Context with very acrid taste; smell unpleasant to mealy. Latex very abundant, white, becoming grey and then slightly brown; taste very acrid. Spore-deposit not observed.

Spores ellipsoid, $8.2-10.0-11.8(-12.4) \times (6.1-6.7-7.9-9.2 \mu\text{m})$ ($Q = 1.16-1.26-1.36$; $n = 20$); ornamentation amyloid, composed of ridges up to $2(2.5) \mu\text{m}$ high, forming a reticulum with strongly winged aspect; some low isolated warts present; wall sometimes rugose; plage strongly distally amyloid. Basidia $45-55 \times 11-14 \mu\text{m}$, subfusiform to fusiform, 4-spored; content guttulate. True pleurocystidia absent. Pseudopleurocystidia rather scarce, narrowly cylindrical, with rounded apex, $3-4 \mu\text{m}$ diam.; content oleiferic. Lamella-edge sterile; marginal cells not abundant because of the presence of narrow, parallel hyphae which border the lamella; some marginal cells narrowly cylindrical, with rounded apex, $10-30 \times 3-5 \mu\text{m}$, hyaline, thin-walled. Hymenophoral trama subregular, composed of hyaline, narrow hyphae; lactifers abundant. Pileipellis ixotrichoderm-like, two-layered; suprapellis composed of ascending elements, $20-60 \times 5-9 \mu\text{m}$, subclavate or subfusiform, sometimes septate, thin-walled, often with brownish content; subpellis composed of narrow, hyaline hyphae, locally with brownish content. Stipitipellis two-layered; suprapellis composed of ascending elements, $20-50 \times 5-8 \mu\text{m}$, cylindrical, subclavate or subfusiform, sometimes septate, thin-walled, often with brownish content; subpellis ixocutis-like, composed of narrow, hyaline hyphae, locally with brownish content. Clamp-connections absent.

Examined material. CAMEROON: South Western Prov., Korup NP, near Mundema, 100–150 ft., transect P'-P24, Jan. 1989, *Watling 21468* (holotypus, E).

Lactarius undulatus var. **rasilis** Verbeken — Fig. 10

Lactarius undulatus var. *rasilis* Verbeken, Bull. Jard. bot. Belg. 65 (1996) 210.

Pileus 70 mm diam., thin, elastic, broadly infundibuliform, with small, broad papilla in the centre; margin slightly deflexed, strongly undulate and crenulate, strongly striate to grooved; pellis not dehiscent, smooth, shiny, humid and slightly sticky, dark brown (5EF6), paler in the centre, ochraceous brown in the centre. Stipe 55×8 mm, long, slender, cylindrical, slightly curved, smooth, mat, slightly striate in the upper part, brown (5E4), pale greyish in the upper part, fragile, fistulose, with ochraceous rhizomorphs at the base. Lamellae adnate to slightly decurrent, unequal with abundant lamellulae of different lengths, very distant (5/cm), rather broad (5–7 mm), moderately thick, elastic, not fragile, pale yellow to greyish yellow (4AB3); edge entire, concolorous. Context rather firm, thin, fragile in stipe, dirty white (6B2), changing pale greyish brown in pileus, changing brownish orange (6C3) in stipe, unchanging with anilined H_2O , NH_4OH , phenolaniline, brownish with NaOH , pale pinkish with phenol; taste very acrid; smell not remarkable. Latex very abundant, watery, white, changing to yellowish when drying, later greyish; taste very acrid. Spore-deposit pale cream.

Spores subglobose to ellipsoid, $8.2-9.2-10.3 \times 7.3-8.1-8.8 \mu\text{m}$ ($Q = 1.05-1.14-1.24$; $n = 20$); ornamentation amyloid, composed of ridges up to $2(2.5) \mu\text{m}$ high, forming a reticulum with strongly winged aspect; some low isolated warts present; wall sometimes rugose; plage strongly distally amyloid. Basidia $50-65 \times 9-11 \mu\text{m}$, cylindrical to subfusiform, 4-spored. True pleurocystidia absent. Pseudopleurocystidia scarce, narrowly cylindrical, with rounded apex, $3-4 \mu\text{m}$ diam.; content oleiferic. Lamella-edge sterile; marginal cells

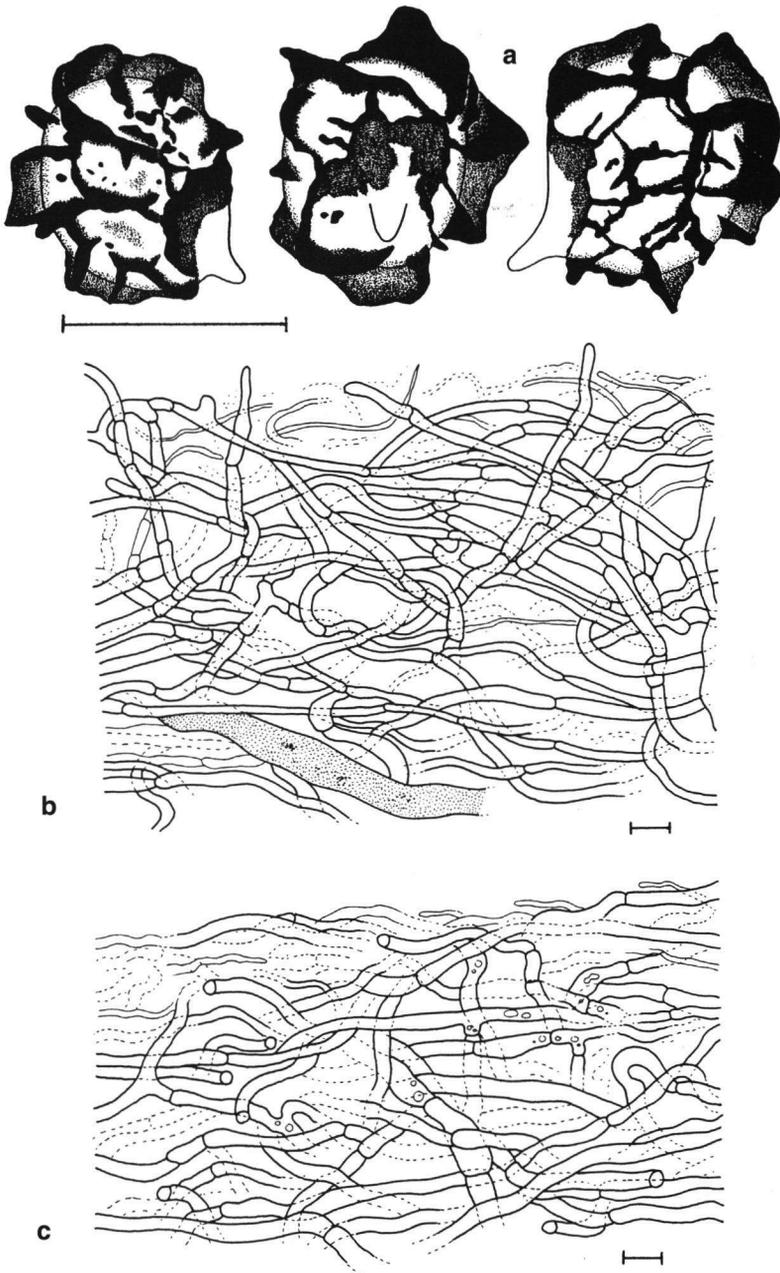


Fig. 10. *Lactarius undulatus* var. *rasilis* (type). a. Spores; b. section of pileipellis; c. section of stipitipellis (bar = 10 μ m).

not abundant because of the presence of narrow, parallel hyphae which border the lamella; some marginal cells narrowly cylindrical, with rounded apex, $13\text{--}25 \times 3\text{--}5 \mu\text{m}$, hyaline, thin-walled. Hymenophoral trama subregular, composed of hyaline, narrow hyphae; lactifers abundant. Pileipellis one-layered, ixotrichoderm-like, composed of recumbent, narrow hyphae, more or less parallel; some terminal, very narrow ($2\text{--}4 \mu\text{m}$), ascending elements present, embedded in a slime-layer; locally brownish intracellular pigmentation. Stipitipellis ixocutis-like, composed of narrow, recumbent, parallel hyphae; locally brownish intracellular pigmentation. Clamp-connections absent.

Examined material. ZAIRE: Kivu Prov., Irangi, rain forest, April 1972, *Rammeloo Z415* (holotypus GENT).

5. Checklist of the subgenus *Plinthogali* in tropical Africa

Extended descriptions other than the original descriptions are cited under 'Select. descr.' Countries where the species has been collected are listed alphabetically under 'Distribution'; for each country, herbaria are listed where material of the species is kept.

acutus – *Lactarius acutus* R. Heim, Bull. Jard. bot. Etat 25 (1955) 73.

Holotypus: *Heim D74* (PC).

Type locality: Guinea, near Macenta, $\pm N 08^{\circ}35'$, $W 09^{\circ}27'$.

Known distribution: Cameroon (E), Guinea-Conakry (PC), Congo-Kinshasa (BR).

adhaerens – *Lactarius adhaerens* R. Heim, Candollea 7 (1938) 375.

Holotypus: *Heim J18* (PC).

Type locality: Madagascar, South of Antanambé, $\pm S 16^{\circ}26'$, $E 49^{\circ}50'$.

Select. descr.: R. Heim, Prodr. Fl. Mycol. Madagascar 1 (1938) 32.

Icon.: R. Heim, Prodr. Fl. Mycol. Madagascar 1 (1938) pl. 1b.

Known distribution: only known from type locality.

atroolivinus – *Lactarius atroolivinus* Verbeken & Walley, this paper.

Holotypus: *Verbeken 99-143* (GENT).

Type locality: Zimbabwe, hill north of Penhalonga, $S 18^{\circ}53'$, $E 32^{\circ}42'$.

Known distribution: Zambia (K), Zimbabwe (GENT).

baliophaeus – *Lactarius baliophaeus* Pegl., Kew Bull. 23 (1969) 237.

Holotypus: *Holden GC66* (K).

Type locality: Ghana, Tafo, $N 06^{\circ}44'$, $W 01^{\circ}37'$.

Select. descr.: Verbeken, Persoonia 16 (1996) 215.

Known distribution: Burundi (BR, PC), Ghana (K), Senegal (BR), Zambia (PC).

congolensis – *Lactarius congolensis* Beeli, Bull. Soc. r. Bot. Belg. 60 (1928) 164.

Syn.: *Lactarius craterelloides* Heim & Gooss.-Font. ap. R. Heim, Bull. Jard. bot. Etat 25 (1955) 52; *Lactarius unicolor* Gooss.-Font. & Heim ap. R. Heim, Bull. Jard. bot. Etat 25 (1955) 77.

Holotypus: *Goossens-Fontana 528* (BR).

Type locality: Congo, Diobo Akuba, $N 02^{\circ}37'$, $E 20^{\circ}50'$.

Select. descr.: Verbeken, Edinburgh J. Bot. 52 (1996) 63.

Icon.: R. Heim, Fl. Iconogr. Champignons Congo 4 (1955) pl. 14, fig. 9 & pl. 15, fig. 4;

R. Heim, Bull. Jard. bot. Etat 25 (1955) pl. 3, fig. 4 & pl. 5, fig. 4ab.

Known distribution: Congo (BR).

griseogalus – *Lactarius griseogalus* R. Heim, Rev. Mycol. (Paris) 32 (1967) 204.

Holotypus: Heim LM2189 (PC).

Type locality: Central African Republic, Bébé savanna, close to Filifi river, (?) N 05°50', E 15°22'.

Select. descr.: R. Heim, Israel J. Bot. 15 (1966) 158.

Known distribution: Central African Republic (PC), Nigeria (K).

kabansus – *Lactarius kabansus* Pegler & Pearce, Kew Bull. 35 (1980) 487.

Holotypus: Pearce 600.3 (K).

Type locality: Zambia, Kitwe, Chimwemwe market, S 12°49', E 28°13'.

Select. descr.: Buyck, Brussels Admin. Gén. Coop. Dévelopm., Publ. Agricoles 34 (1994) 106.

Icon.: Buyck, Brussels Admin. Gén. Coop. Dévelopm., Publ. Agricoles 34 (1994) fig. 80; Karhula et al., Karstenia 38 (1998) fig. 22; Ryvarden et al., Introduction larger fungi South Central Africa (1994).

Known distribution: Benin (BR), Burundi (BR, PC), Congo (BR), Kenya (K), Malawi (K), Tanzania (H), Zambia (E, K, PC), Zimbabwe (BR, GENT).

kalospermus – *Lactarius kalospermus* (Beeli) Verbeken & Walley, Edinburgh J. Bot. 53 (1996) 69.

Basionym: *Laccaria kalosperma* Beeli, Bull. Soc. r. Bot. Belg. 66 (1933) 22.

Holotypus: Goossens-Fontana 859 (BR).

Type locality: Congo, Binga, N 02°28', E 20°31'.

Select. descr.: Verbeken, Edinburgh J. Bot. 52 (1996) 69.

Known distribution: only known from type locality.

melanodermus – *Lactarius melanodermus* Heim & Gooss.-Font., Bull. Jard. bot. Etat 25 (1955) 50.

Holotypus: Goossens-Fontana 4039 (BR).

Type locality: Congo, Binga, N 02°28', E 20°31'.

Icon.: R. Heim, Fl. Iconogr. Champignons Congo 4 (1955) pl. 14, fig. 7; R. Heim, Bull. Jard. bot. État 25 (1955) pl. 5, fig. 3a–b.

Known distribution: Cameroon (E), Congo (BR).

melanogalus – *Lactarius melanogalus* R. Heim ex R. Heim, Bull. Jard. bot. Etat 25 (1955) 46.

Based on *Lactarius melanogalus* R. Heim, Boissiera 7 (1943) 268, nom. nud., descr. gall.

Lectotypus: Goossens-Fontana 979 (BR).

Type locality: Zaire, Binga, N 02°28', E 20°31'.

Select. descr. & lectotypification: Verbeken, Persoonia 16 (1996) 211.

Icon.: R. Heim, Fl. Iconogr. Champignons Congo 4 (1955) pl. 14, fig. 6; R. Heim, Bull. Jard. bot. État 25 (1955) pl. 5, fig. 1–2.

Known distribution: Benin (BR), Congo (BR), Ghana (K), Ivory Coast [R. Heim, Fl.

Iconogr. Champignons Congo 4 (1955)], Cameroon [E; R. Heim, Bull. Jard. bot. Etat 25 (1955)], Gabon [R. Heim, Fl. Iconogr. Champignons Congo 4 (1955)], Zambia (PC).

nudus – *Lactarius nudus* R. Heim, Bull. Jard. Bot. Etat 25 (1955) 53.

Holotypus: *Goossens-Fontana 1006* (BR).

Type locality: Congo, Binga, N 02°28', E 20°31'.

Icon.: R. Heim, Fl. Iconogr. Champignons Congo 4 (1955) pl. 14, fig. 8; R. Heim, Bull. Jard. bot. État 25 (1955) pl. 5, fig. 5a–c.

Known distribution: only known from type locality.

orientalis – *Lactarius orientalis* (Verbeken) Verbeken, this paper.

Basionym: *Lactarius baliophaeus* var. *orientalis* Verbeken, Persoonia 16 (1996) 219.

Holotypus: *Verbeken 94.472* (BR, isotypus GENT).

Type locality: Burundi, Rumonge Forest Reserve, Nyamirambo hill, S 04°07', E 29°37'.

Select. descr.: Verbeken, Persoonia 16 (1996) 219.

Known distribution: Burundi (BR, GENT, PC), Zambia (PC), Zimbabwe (GENT).

pusillisporus – *Lactarius pusillisporus* Verbeken, Bull. Jard. bot. Belg. 65 (1996) 206.

Holotypus: *Verbeken 94.285* (BR, isotypus GENT).

Type locality: Burundi, Rumonge Forest Reserve, Nyamirambo hill, S 04°07', E 29°37'.

Known distribution: Burundi (BR).

rumongensis – *Lactarius rumongensis* Verbeken, Bull. Jard. bot. Belg. 65 (1996) 208.

Holotypus: *Verbeken 94.006* (BR, isotypus GENT).

Type locality: Burundi, Rumonge Forest Reserve, Nyamirambo hill, S 04°07', E 29°37'.

Known distribution: Burundi (BR, PC), Congo (BR).

saponaceus – *Lactarius saponaceus* Verbeken, Bull. Jard. bot. Belg. 65 (1996) 209.

Holotypus: *Verbeken 94.353* (BR, isotypus GENT).

Type locality: Burundi, Rumonge Forest Reserve, Nyamirambo hill, S 04°07', E 29°37'.

Known distribution: Burundi (BR, PC), Zambia (PC), Zimbabwe (GENT).

sulcatulus – *Lactarius sulcatulus* Verbeken, Bull. Jard. bot. Belg. 65 (1996) 210.

Holotypus: *Rammeloo Z414* (GENT).

Type locality: Congo, Kivu, Irangi, S 01°53', E 28°27'.

Known distribution: Congo (GENT), Zimbabwe (GENT).

sulcatus – *Lactarius sulcatus* Verbeken & Walleyn, this paper.

Holotypus: *Verbeken 99.176* (GENT).

Type locality: Zimbabwe, road from Mutare to Bvumba at peg 15.5 km.

Known distribution: only known from type locality.

tenellus – *Lactarius tenellus* Verbeken & Walleyn, this paper.

Basionym: *Lactarius kabansus* var. *pallidus* Verbeken, Bull. Jard. bot. Belg. 65 (1996) 202.

Holotypus: *Verbeken 94.157* (BR, isotypus GENT).

Type locality: Burundi, Rumonge Forest Reserve, Nyamirambo hill, S 04°07', E 29°37'.

Known distribution: Burundi (BR, PC), Congo (BR), Malawi (K), Tanzania (K, WAG), Zambia (K, PC).

undulatus – *Lactarius undulatus* Verbeken, Bull. Jard. bot. Belg. 65 (1996) 210.

Holotypus: *Watling 21468* (E).

Type locality: Cameroon, Korup NP, N 04°55', E 08°52'.

Select. descr.: this paper.

Known distribution: only known from type locality.

undulatus var. **rasilis** – *Lactarius undulatus* var. *rasilis* Verbeken, Bull. Jard. bot. Belg. 65 (1996) 210.

Holotypus: *Rammeloo Z415* (GENT).

Type locality: Congo, Kivu, Irangi, S 01°53', E 28°27'.

Select. descr.: this paper.

Known distribution: Congo (GENT).

INSUFFICIENTLY KNOWN TAXA

fulgens – *Lactarius fulgens* R. Heim, Candollea 7 (1938) 377.

Holotypus: *Heim 140* (PC).

Type locality: Madagascar, N of the Isle of St.-Marie, ± S 16°50', E 49°56'.

Select. descr.: R. Heim, Prodr. Fl. Mycol. Madagascar 1 (1938) 44.

Icon.: R. Heim, Prodr. Fl. Mycol. Madagascar 1 (1938) pl. 1d.

Known distribution: only known from type locality.

Observations

The type material of this species consists of one basidiome which had been preserved in alcohol. As the alcohol has evaporated in the course of time, the specimen is in very bad condition. The spore-ornamentation can hardly be observed in Melzer's reagent; nor can the structure of the pileipellis and stiptipellis be identified. The former consists of small and short cylindrical elements, 10–30 × 3–6 µm, thin-walled and with granular content. These were only observed in surface view.

fulgens var. **africanus** – *Lactarius fulgens* var. *africanus* R. Heim, Bull. Jard. Bot. Etat 25 (1955) 70.

Holotypus: *Heim B21* (PC).

Type locality: Ivory Coast, Toulépleu forest, near Danané, N 06°37', W 08°27'.

Known distribution: only known from type locality.

Observations

Spores globose to subglobose, sometimes ellipsoid, 5.2–6.0–6.8 × 4.7–5.4–6.1 µm (Q = 1.01–1.11–1.17; n = 30); ornamentation amyloid, composed of irregular ridges and warts, forming an almost complete reticulum; ridges up to 0.8 µm high; plage inamyloid. Basidia 35–45 × 8–10 µm, cylindrical to subclavate, 4-spored. True pleurocystidia not observed. Pseudopleurocystidia fairly abundant, 2–5 µm diam., cylindrical to tortuous, with rounded apex; content oleiferic. Hymenophoral trama irregular, composed of narrow, hyaline hyphae and abundant lactifers.

The type material of this taxon consists of a small piece of a basidiome in very bad condition. The spore-ornamentation is hardly visible in Melzer's reagent; most probably the specimen has been preserved in alcohol before drying completely. Given the bad condition of the specimen, it has been impossible to identify the structure of stiptipellis and pileipellis. A surface view of the pileipellis could be observed. It probably consists of pseudoparen-

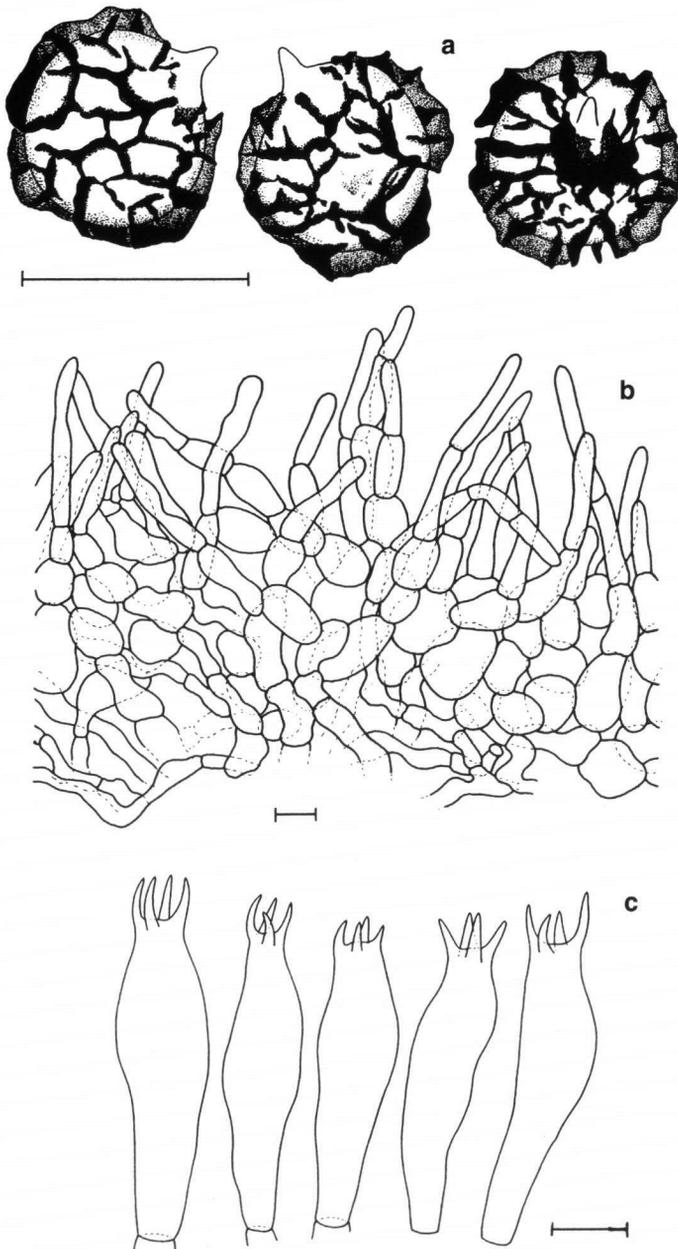


Fig. 11. *Arcangeliella dolichocaulis* (type). a. Spores; b. section of pileipellis; c. basidia (bar = 10 μ m).

chymatous subpellis with a suprapellis composed of slender cylindrical elements, 20–35 × 4–8 µm. *Lactarius fulgens* var. *africanus* most probably represents a good species on its own but new collections and observations are needed to clarify its identity.

6. Observations on *Arcangeliella dolichocaulis* Pegl.

Arcangeliella dolichocaulis is described by Pegler (1982) from Zambian miombo woodland as an epigeal, agaricoid mushroom with a smooth, glabrous and dry pileipellis, a well-developed stipe and an exposed, sinuate, globulose, somewhat radiating to alveolate labyrinthoid hymenophore, forming numerous, small irregular locules without any geotropical orientation. It contains copious latex, which is white, unchanging and tastes like cedarwood with a bitter after-taste. We examined the type (*Rose 7701*, K) and observed the following microscopic characters (Fig. 11):

Spores 7.8–8.5–9.7 × 6.7–7.7–9.0 µm, subglobose ($Q = 1.05–1.10–1.21$); ornamentation amyloid, consisting of an almost complete reticulum with ridges up to 1.5 µm high; plage distally amyloid; basidia 4-spored, clavate to subfusiform, 35–45 × 9–12 µm; true cystidia and pseudocystidia lacking; hymenophoral trama consisting of thin-walled hyaline hyphae which are more or less parallel and embedded in some slimy consistence; lactifers scarcely present; pileipellis and stiptipellis a palisade with a well developed layer of isodiametric cells and a suprapellis of thin-walled, 1–3-septate cylindrical elements.

Pegler (1982) has already stated that the basidiomes of *Arcangeliella dolichocaulis* are completely agaricoid apart from the glebulate hymenophore and are closer to *Lactarius* than to *Arcangeliella* as defined by Pegler & Young (1979). Indeed, if this species had a normal hymenophore and pseudocystidia, it would fit perfectly in *Lactarius* subgenus *Plinthogalus* because of the winged spore-ornamentation with distally amyloid plage and the structure of the pileipellis. The particular shape and structure of the hymenophore could be interpreted as aberrant, but the lack of pseudocystidia makes a position in *Lactarius* unacceptable.

A more recent definition of *Arcangeliella* is given by Thiers (1984). The main differences with the type specimen of *A. dolichocaulis* are: pileus rarely becoming fully expanded; margin typically attached to the stipe, breaking free at maturity (hard to observe in *A. dolichocaulis* as there are no young specimens, but the pileus is perfectly expanded and no trace of an attachment is visible); gleba lamelliform with highly branched, intervenose lamellae (and thus not without any geotropical orientation); cystidia usually present, often rare and inconspicuous or differentiated as pseudocystidia or macrocystidia; pileipellis a differentiated layer of more or less repent hyphae, a trichodermium, ixotrichodermium or a turf of free hyphal tips.

Arcangeliella dolichocaulis thus differs from other representatives of *Arcangeliella* by its agaricoid and fully expanded basidiome, the shape of the hymenophore and the lack of cystidia. We therefore feel like placing it in a new genus (*Porolactarius* ad int.), but have decided to wait for more records of this species, as thus far only a single carpophore is known.

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