

## Three new species of *Lactarius* (Russulaceae) from Sikkim, India

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**Abstract** – Since 2008, fungal explorations have been undertaken in a mycologically unexplored area: West district of Sikkim (India), located in the Esatern Himalaya. Three *Lactarius* species are proposed here as new taxa: *Lactarius elaioviscidus*, *L. ermineus* and *L. byssaceus*. Extended descriptions and illustrations are given; the taxonomic position and relation to allied species is discussed.

**Macrofungi / India / Russulales / *Lactarius* / taxonomy**

### INTRODUCTION

Sikkim is a small (0.22% of geographical area of this country) hilly state located in the Eastern Himalaya in India. Keeping in view the enormous altitudinal (300-8585 m) and climatic variations supported by plenty of ectomycorrhizal hosts, the expected diversity of macrofungi in this mycologically almost unexplored area is high. Being a part of one (Himalaya Hotspot) of the 34 Global Biodiversity Hotspots ([www.biodiversityhotspots.org](http://www.biodiversityhotspots.org)), Sikkim is substantially diverse in plants and animals, and undoubtedly also in fungi, although, their diversity is seriously understudied. The West District, locating in the West of this state is stretched between N 27°07' to N 27°37' and E 88°01' to E88°22' and covers an area of 1166 sq. km. The elevation in the district ranges from 350 m to 7000 m. This district experiences a wide range of climatic zones: tropical (up to 500 m), subtropical (500-1500 m), temperate (1500-2700 m), sub-alpine (2700-5000 m) and alpine (above 5000 m) and is rich in the ectomycorrhizal host trees like, *Lithocarpus pachyphyllus* Rehder, *Castanopsis tribuloides* A. DC., *C. hystrix* A. DC., *Quercus lamellosa* Sm., *Alnus nepalensis* D. Don, *Betula utilis* D. Don, *Schima wallichii* Choisy, *Abies densa* Griff., *A. spectabilis* Spach, *Tsuga dumosa* Eichl., *Pinus wallichiana* A.B. Jacks. etc, that supports enormous growth and development of ectomycorrhizal mushrooms.

While concentrating on the West district of Sikkim, explorations have been undertaken regularly since 2008 to reveal the diversity of macrofungal flora (Das & Mishra 2009, Das & Sharma 2009-10, Das et al. 2010, Das et al. in press) with special reference to Russulales, one of the most important ectomycorrhizal groups. *Lactarius* is one of the common genera in the Himalayan forests and

13 new taxa namely, *Lactarius princeps* Berk., *L. himalayanus* Rawla & Sarwal, *L. abbotanus* K. Das & J.R. Sharma, *L. mayawatianus* K. Das & J.R. Sharma, *L. dwaliensis* K. Das, J.R. Sharma & Verbeken, *L. maitlyensis* K. Das, J.R. Sharma & Verbeken, *L. dafricanus* K. Das, J.R. Sharma & Verbeken, *L. sanjappae* K. Das, J.R. Sharma & Montoya, *L. mukteswaricus* K. Das, J.R. Sharma & Montoya, *L. verbekena* K. Das, J.R. Sharma & Montoya, *L. montoyae* K. Das & J.R. Sharma, *L. capitatus* K. Das, J.R. Sharma & Montoya and *L. dhakurianus* K. Das, Basso & J.R. Sharma have already been described from Eastern Himalaya (Berkeley 1852) and Western Himalaya (Rawla & Sarwal 1983, Sharma & Das 2003, Das et al. 2003, Das & Sharma 2004, Das et al. 2004a, Das et al. 2004b, Das et al. 2005) respectively. During a macrofungal foray to West district of Sikkim (Eastern Himalaya) in the year 2010, subtropical to subalpine areas like Yuksom, Dubdi, Khechiperi, Pemangtse, Bharen, Hilltok, Takredara, Hilley, Barsey and Tal were surveyed and a number of wild mushrooms were collected by one of us (KD). Out of these collections, several appeared to belong to undescribed taxa. In the present contribution, three of the *Lactarius* species are proposed as new to science: *Lactarius elaioviscidus*, *L. ermineus* and *L. byssaceus*. They were collected from two of the above mentioned sites namely, Hilltok and Yuksom. The first site is a temperate mixed forest (2200-2300 m) dominated mainly, by *Castanopsis hystrix*, *Ilex dipyrena* Wall., *Eurya cerasifolia* (D. Don) Kobuski, *Tsuga dumosa*, *Pinus wallichiana*, *Cryptomeria japonica* D. Don, *Macaranga denticulata* Müll. Arg. and *Alnus* sp. The second site is a subtropical to temperate broad-leaved forest (1690-1725 m) mainly dominated by *Castanopsis tribuloides*, *C. hystrix*, *Prunus cerasoides* D. Don, *Michelia velutina* Blume, *Engelhardtia spicata* Blume, *Eurya cerasifolia* (D. Don) Kobuski, *Camellia kissi* Wall., *Macaranga denticulata*, *Ficus roxburghii* Wall. and *Alnus nepalensis*.

## MATERIALS & METHODS

Macromorphological characters were recorded from the fresh basidiomata. Colour codes and terms following Colour identification chart of the Flora of British fungi, edited by Her Majesty's Stationery Office, Edinburgh (1969) indicated in the descriptions as "a" and Kornerup & Wancher (1981), indicated in the descriptions as "b". Kränzlin (2005) was used for the colours of the spore prints and is referred to in the descriptions as "c". Field photographs of the fresh basidiomata were taken with Nikon D300s.

Micromorphological characters were observed from the dry samples mounted in a mixture of 5% KOH, 1% Phloxin, Congo red and 30% Glycerol and Melzer's reagent. Drawings of basidiospores were made mainly at 6000x & 2000x magnification and other micromorphological structures were drawn at an original magnification of 1000x. Basidium length excludes sterigmata, gill-density includes lamellae and lamellulae and spore-dimensions exclude the dimension of the ornamentations. Basidiospore measurements are based on twenty basidiospores. Spores are measured in side view and sizes are given as KDa-KDc-KDb × KDx-KDz-KDy in which KDa = minimum value for the length of measured collections, KDb = maximum value for the length of measured collections, KDc = mean value for the length of measured collections and KDx = minimum value for the width of measured collections, KDy = maximum value for the width of measured

collections, KDz = mean value for the width of the measured collections. Quotient of spore indicates length-width ratio ( $Q = L/W$ ) and is given as  $Q_a$ - $Q_c$ - $Q_b$  where  $Q_a$  = minimum quotient value amongst measured collections,  $Q_b$  = maximum quotient value amongst measured collections,  $Q_c$  = mean quotient value amongst measured collections. Scanning Electron Microscope (SEM) illustrations of basidiospores were obtained from dry spores from spore print that were directly mounted on a double-sided adhesive tape pasted on a metallic specimen-stub and then scanned with gold coating at different magnifications in high vacuum mode to observe patterns of spore-ornamentation. SEM work was carried out with a FEI's Quanta 200 model imported from The Netherlands and installed at the Bose Institute, Kolkata, India. Herbarium names follow Holmgren et al. (1990).

## RESULTS

*Lactarius elaioviscidus* K. Das & Verbeken **sp. nov.**

**Figs 1-8, 17-20**

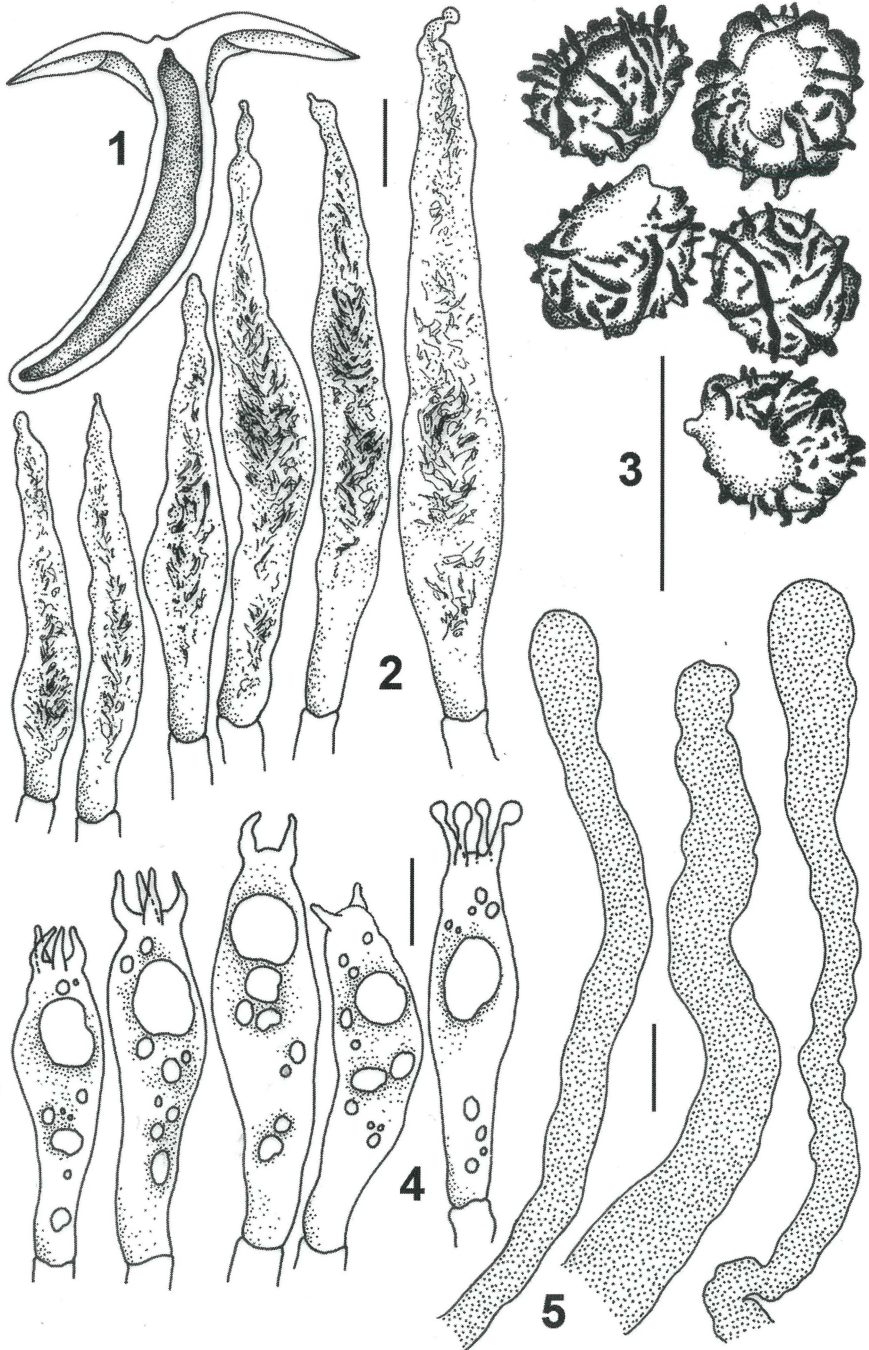
*Mycobank*: 561651

*Ethymology*: Referring the colour and nature of pileus i.e. olive and viscid to glutinous.

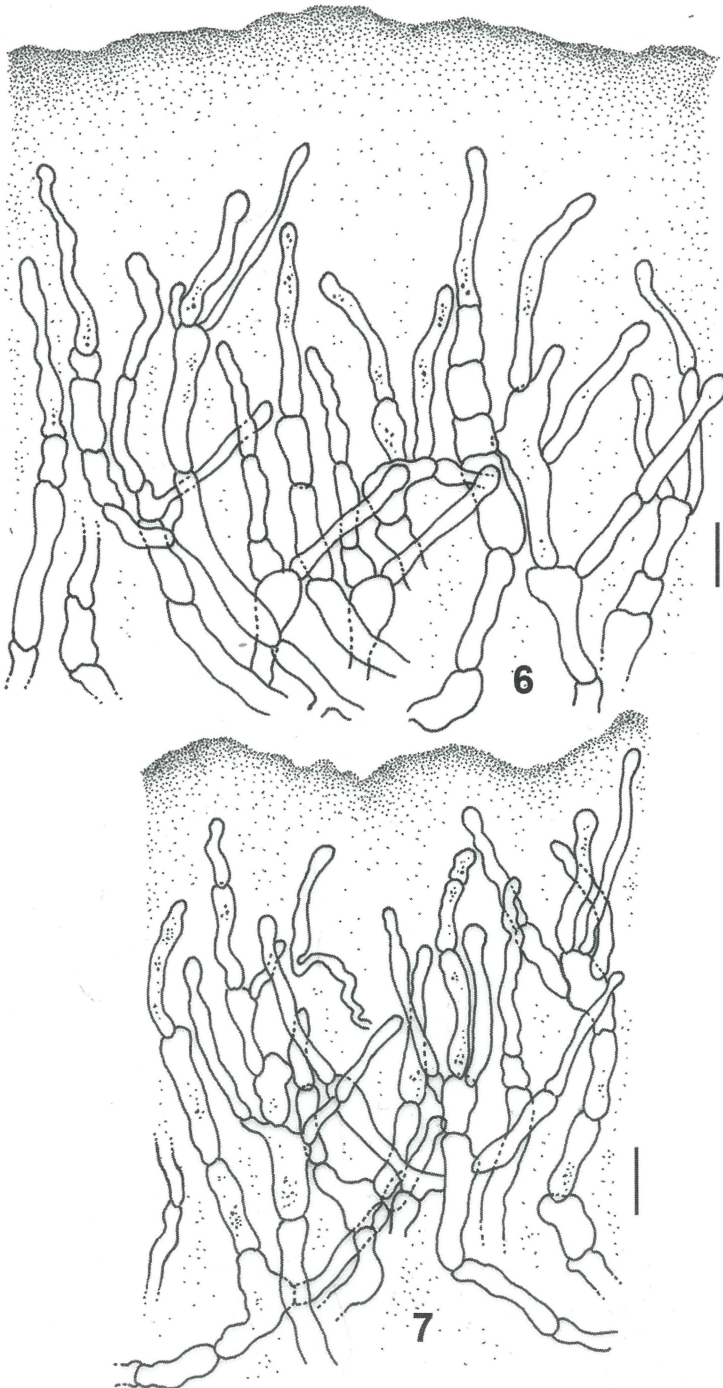
*Pileus* 35-53 mm diam., convex ad planoconvexum, dein depressus, interdum papilla conica, glutinosus, viscidus, griseo-viridis ad pallide olivaceum. *Lamellae* densae, late adnatae vel decurrentes, luteoalbae. *Stipes* 45-62 × 8-10 mm, subcylindricus, griseoluteus. *Latex* aquosus vel albus, immutabilis. *Basidiosporae* in cumulo subluteae, 7.0-8.1-8.7 × 6.0-6.7-7.1 μm, subglobosae vel ellipsoideae, amyloideae, reticulatae, cristis acutis usque ad 1 μm altis ornamentatae. *Basidia* 40-50 × 11-14 μm, bi- vel tetraspora. *Pleuromacrocytidia* 53-121 × 10-13.5 μm, abundantia, subfusiformia. *Cheilomacrocytidia* 50-77 × 8-11 μm, fusiformia vel subfusiformia. *Pileipellis* ex hyphis multiseptatis erectis trichodermium formantibus.

*Typus*: INDIA-SIKKIM - Hilltok, 3 September, 2010, K. Das, KD 10692 (*holotypus* BSHC, *isotypus* GENT).

**Pileus** 35-53 mm diam., at first convex with incurved margin, in centre depressed, with or without conical papilla, gradually planoconvex with depressed centre, sticky, very glutinous, slimy, greyish green (b: 30B5) to pale olive (b: 3C5), darker towards centre; papilla snuff brown (a: 17); margin non-striate. **Lamellae** broadly adnate to decurrent, crowded (17-21/cm at pileus margin), sometimes forked near the stipe, yellowish white (b: 4A2), with abundant lamellulae in 7 series; edge entire, concolorous. **Stipe** 45-62 × 8-10 mm, subcylindrical to ventricose, tapering upwards and downwards, sticky, greyish yellow (b: 2B4 to 1B4), gradually yellowish white (b: 4A2) towards base and with a slightly paler and whitish zone just underneath the lamellae. **Context** watery hyaline, hollow in stipe, unchanging with FeSO<sub>4</sub> and KOH, but changing to dark green with guaiac after an exposure of 10 minutes; smell not remarkable; taste unknown. **Latex** watery white, abundant, initially unchanging after exposure, unchanging even with KOH, but changing to yellow to yellowish green or paler (b: 30A8) after nearly half an hour of drying. **Spore print** pale yellow (c: 20 Y 2 M).



Figs 1-5. *Lactarius elaioviscidus* sp. nov. 1. Basidiomata showing lamellae and lamellulae. 2. Cheilocystidia. 3. Basidiospores. 4. Two- and four-spored basidia. 5. Pleuropseudocystidia. Scale bars = 10  $\mu$ m. (KD 10692, drawings by K. Das)



Figs 6-7. *Lactarius elaioviscidus* sp. nov. 6-7. Radial section through pileipellis. Scale bars = 10  $\mu$ m. (KD 10692, drawings by K. Das)

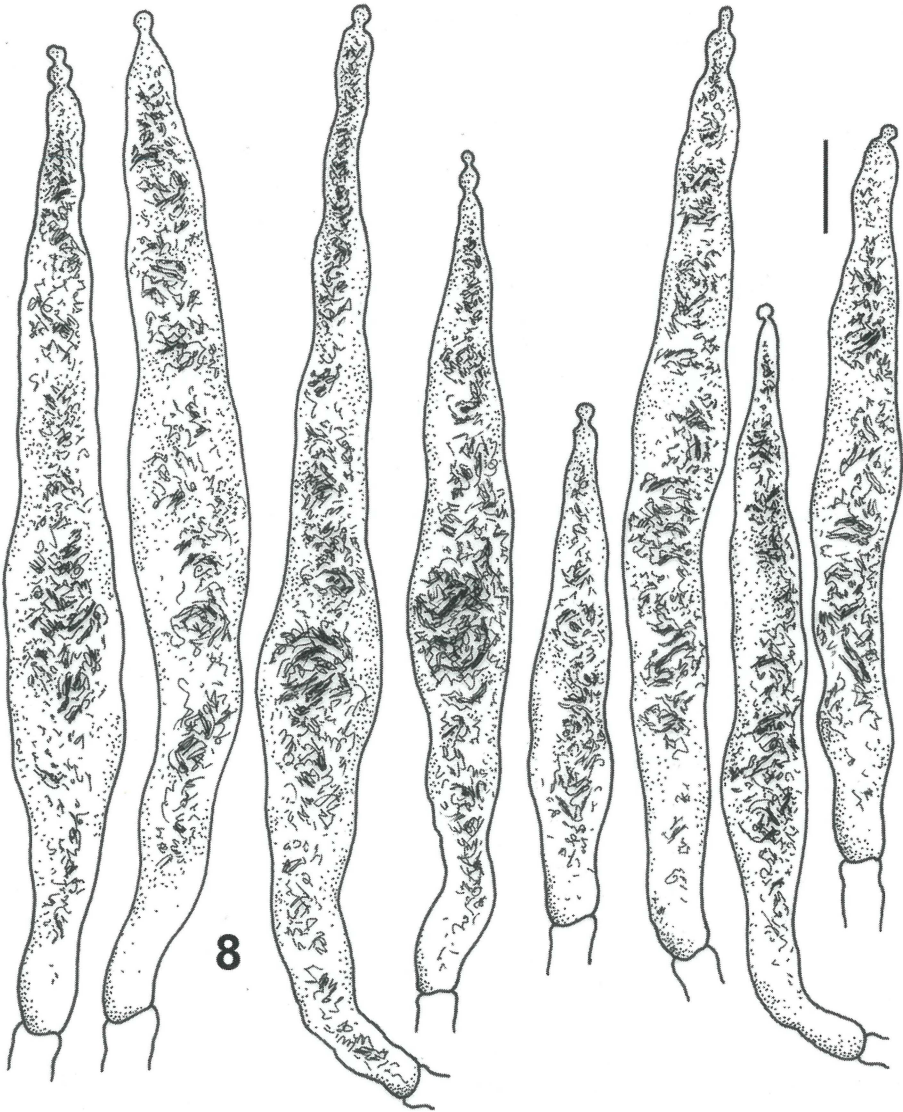


Fig 8. *Lactarius elaioviscidus* sp. nov. 8. Pleuromacrocytidia. Scale bar = 10  $\mu\text{m}$ . (KD 10692, drawings by K. Das)

**Basidiospores** 7.0-8.1-8.7  $\times$  6.0-6.7-7.1  $\mu\text{m}$ , ( $n = 20$ ,  $Q = 1.10-1.21-1.32$ ), subglobose to broadly ellipsoid; ornamentation amyloid, up to 1  $\mu\text{m}$  high, composed of regular to irregular, rather broad ridges forming an irregular zebroid to occasionally reticulate pattern; short ridges and irregular warts present between long and parallel ridges; plage not amyloid. **Basidia** 40-50  $\times$  11-14  $\mu\text{m}$ , 2- to 4-spored, clavate to subclavate or ventricose; sterigmata 5-7  $\times$  2-3  $\mu\text{m}$ . **Pleuromacrocytidia** 53-121  $\times$  10-14  $\mu\text{m}$ , abundant, subfusiform with mucronate to moniliform or subcapitate apex, emergent up to 70  $\mu\text{m}$ ; content dense, somewhat needle-like.

**Pleuropseudocystidia** subcylindric with rounded apex, mostly not emergent, 9-10  $\mu\text{m}$  diam.; content refringent. **Lamellar edge** fertile. **Cheilomacrocystidia** 50-77  $\times$  8-11  $\mu\text{m}$ , fusiform to subfusiform, often with mucronate to subcapitate or lageniform apex; content dense, needle-like. **Hymenophoral trama** with lactifers. **Pileipellis** 90-280  $\mu\text{m}$  thick, an ixotrichoderm, composed of erect, multiseptate hyphae (up to 6  $\mu\text{m}$  broad) which are embedded in a layer of slime (highly variable in thickness); underlying repent hyphae slightly narrower; terminal elements of erect hyphae mostly subcapitate. **Clamp connections** absent.

*Studied material:* INDIA-SIKKIM - Hilltok, alt. 2233 m, N 27°11'15.3" E 88°04'21.3", under *Tsuga dumosa*, temperate mixed forest, 3 September, 2010, K. Das, KD 10692 (holotypus BSHC; isotypus GENT).

*Notes:* The proposed species *L. elaioviscidus* is a clear representative of *L.* subgenus *Piperites* due to the extremely viscid pileipellis, a feature that is also reflected in the microscopy, where we observe a thick ixotrichoderm with a very distinct slime layer. This subgenus is well-represented in Asia, but this species is well-characterized by the smooth pileus without zonation or hairy margin and without scrobicules, the olivaceous pileus and the milk that dries yellowish green. Other Asian species with latex that dries greenish are *L. lacteovirescens* Verbeken & E. Horak from Papua New Guinea, *L. akanensis* S. Imai from Japan and *L. maitlyensis* from India. *L. lacteovirescens* is differing by the yellowish white to pale yellow cap with some zones near the margin and the spore ornamentation that lacks the zebroid pattern (Verbeken & Horak 2000). In the original description of *L. akanensis* it is mentioned that the spores are echinulate (Imai 1935), which is a striking difference with the species described here. The pileipellis in *L. akanensis* is also different (ixolattice) from *L. elaioviscidus* (Wang & Liu 2010). The Indian species *Lactarius maitlyensis* which was collected from Western Himalaya resembles through the light greenish yellow staining latex and the zebroid ornamentation of the spores, but the pileus is zonate, greyish to deep grey-reddish brown with pileipellis of ixocutis nature (Das et al. 2003).

***Lactarius ermineus* K. Das & Verbeken sp. nov.**

**Figs 9-16, 21-22**

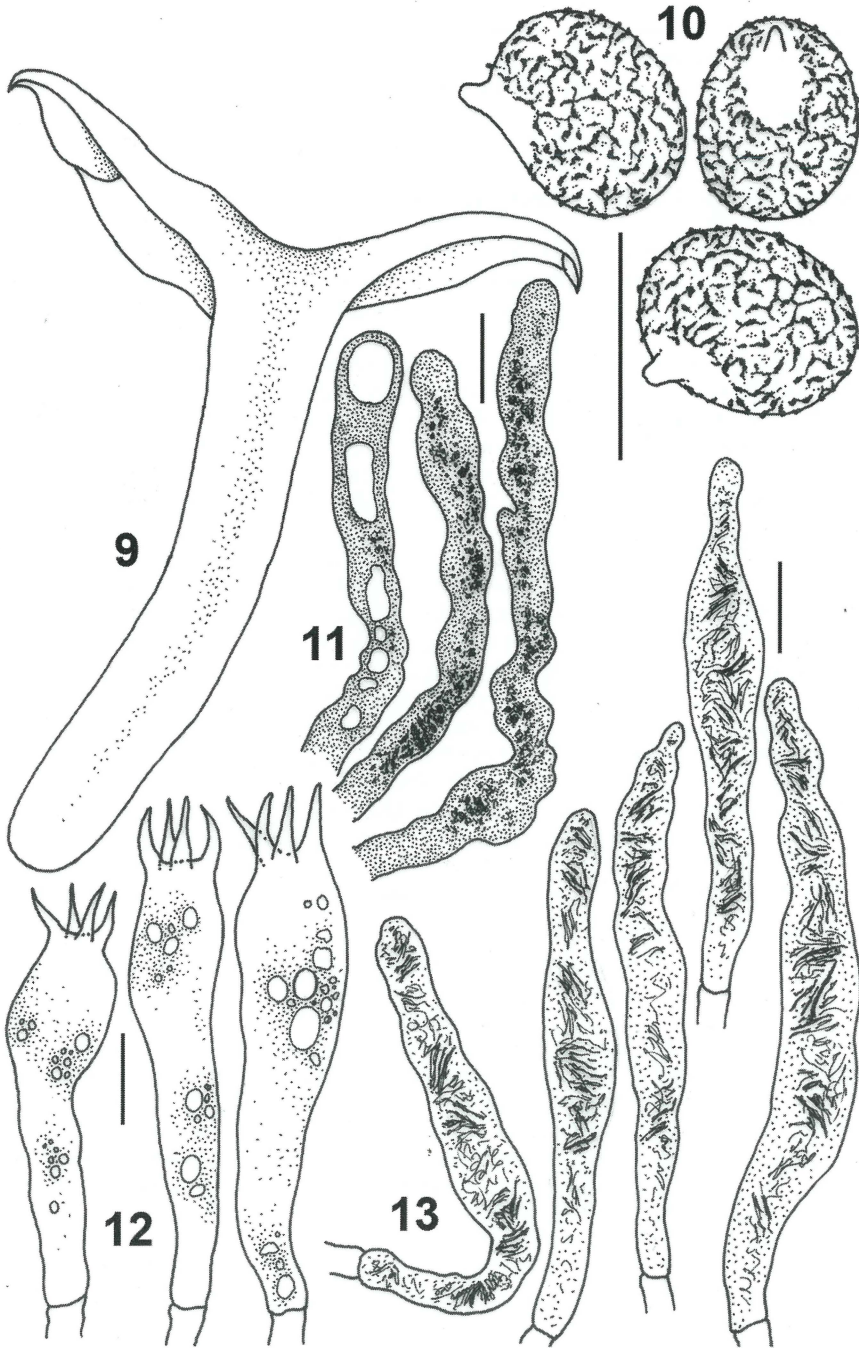
*Mycobank:* 561652

*Etymology:* Referring the colour of pileus i.e. white with slight yellow tinge.

*Pileus* 65-155 mm diam., convexus ad planoconvexum, dein depressus, papilla nulla, eburneus. Lamellae distantes, adnatosubdecurrentes, subflavae. Stipes 40-110  $\times$  20-32 mm, cylindricus, calceus. Latex albus, immutabilis. Basidiosporae in cumulo subflavae, 7.2-9.0-10.0  $\times$  6.9-7.8-9.3  $\mu\text{m}$ , globosae vel ellipsoideae, amyloideae, subreticulatae. Basidia 35-50  $\times$  10-13  $\mu\text{m}$ , tetraspora. Pleuromacrocystidia 70-118  $\times$  8-13  $\mu\text{m}$ , abundantia, subcylindrica vel subfusiformia. Cheilomacrocystidia 50-77  $\times$  8-11  $\mu\text{m}$ , subfusiformia. Pileipellis bistrata; suprapellis ex hyphis erectis, subpellis pseudoparenchymaticus.

*Typus:* INDIA-SIKKIM - Yuksom, 27 August, 2010, K. Das, KD 10622 (holotypus BSHC, isotypus GENT).

**Pileus** 65-155 mm diam., at first convex with incurved to inrolled margin, gradually planoconvex with depressed centre, without papilla; surface never sticky, white to pale yellow (a: 3C), gradually with small sienna (a: 11) to fulvous spots;



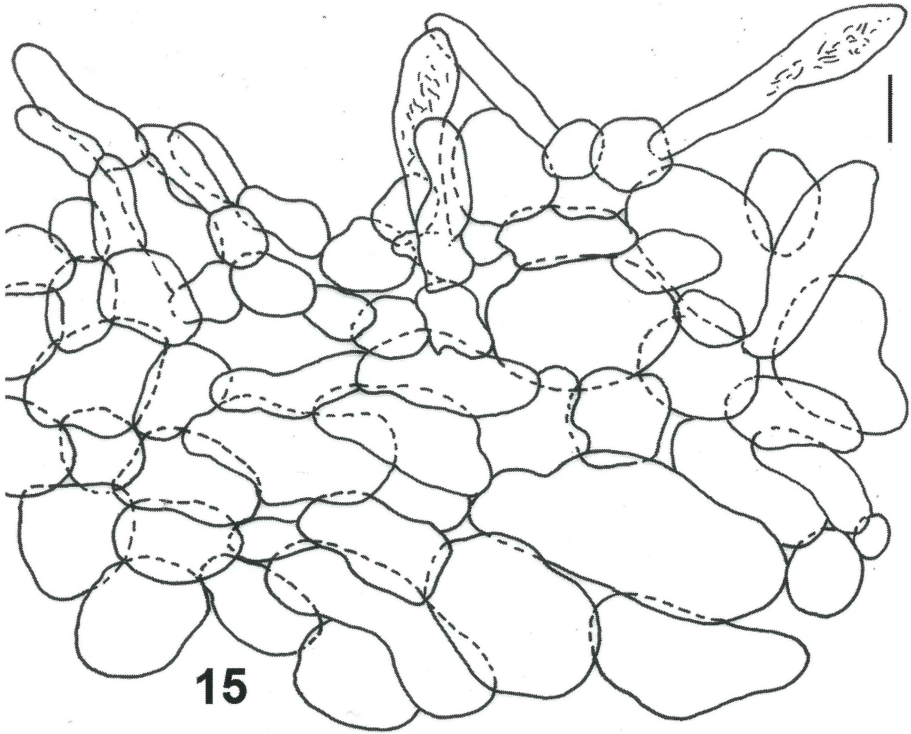
Figs 9-13. *Lactarius ermineus* sp. nov. 9. Basidiomata showing lamellae and lamellulae. 10. Basidiospores. 11. Pleuropseudocystidia. 12. Basidia. 13. Cheilocystidia. Scale bars = 10  $\mu$ m. (KD 10622, drawings by K. Das)



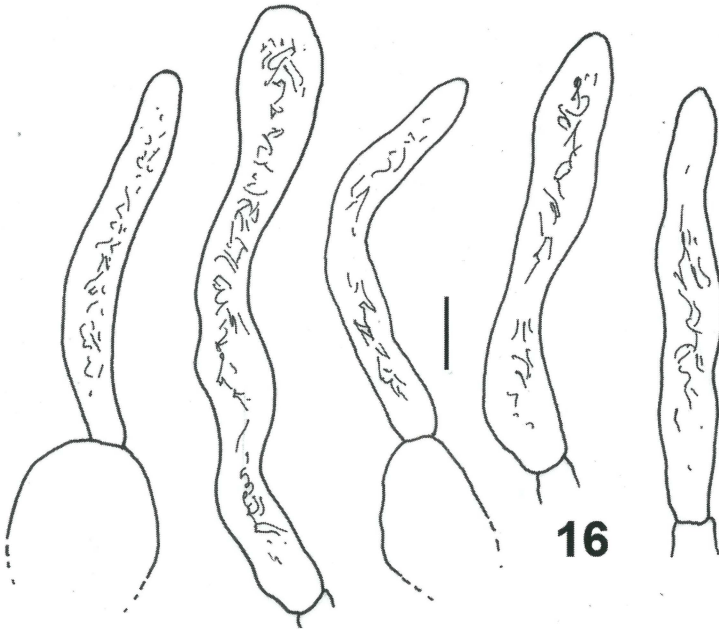


Fig 14. *Lactarius ermineus* sp. nov. 14. Pleuromacrocystidia. Scale bar = 10  $\mu$ m. (KD 10622, drawings by K. Das)

margin non-striate. **Lamellae** broadly adnate to subdecurrent, distant (5-6/cm at pileus margin), sometimes forked, pale yellow (a: 3C), with lamellulae in 6-7 series; edge entire, concolorous. **Stipe** 40-110  $\times$  20-32 mm, cylindrical, occasionally tapering towards base, never sticky, white (chalky), with rust (13) spots (but no scrobicules) at maturity. **Context** initially white, slowly yellowing, solid (never hollow) in stipe, changing to salmon or peach with  $\text{FeSO}_4$ , yellow with KOH and dark green with guaiac; smell not remarkable. **Latex** white, abundant, unchanging after exposure and when drying. **Spore print** pale yellow (a: 3C).

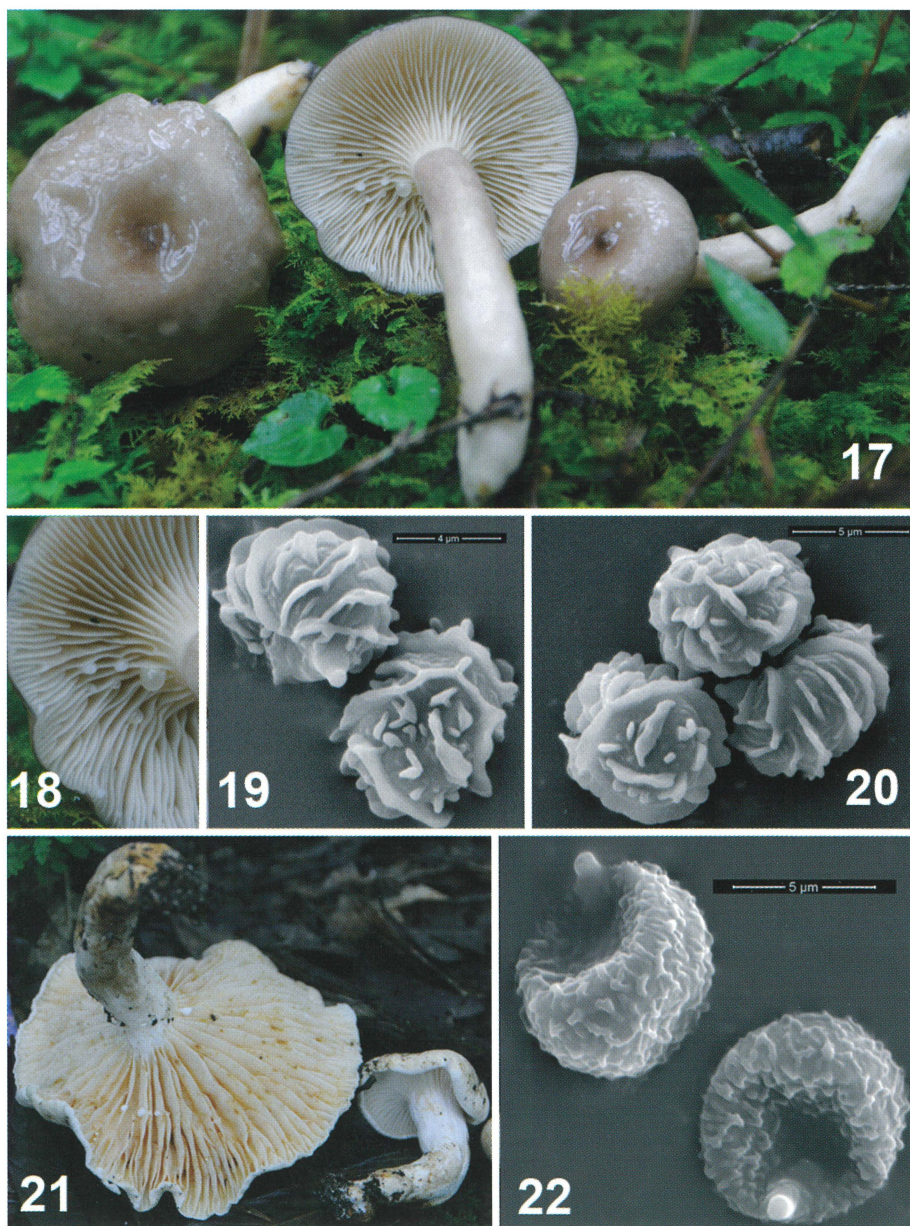


15



16

Figs 15-16. *Lactarius ermineus* sp. nov. 15. Pileipellis. 16. Pileocystidia. Scale bars = 10  $\mu$ m. (KD 10622, drawings by A. Verbeke)



Figs 17-22. *Lactarius elaioviscidus* sp. nov. 17. Fresh basidiomata. 18. Lamellae showing latex. 19-20. Scanning electron micrographs of basidiospores. 21-22. *Lactarius ermineus* sp. nov. 21. Fresh basidiomata. 22. Scanning electron micrographs of basidiospores.

**Basidiospores** 7.2-9.0-10.0 × 6.9-7.8-9.3 μm (n = 20, Q = 1.04-1.15-1.33), globose to broadly ellipsoid or rarely ellipsoid; ornamentation amyloid, up to 0.5 μm high, composed of irregular, mostly conical or blunt warts and ridges, aligned or connected and forming a broken or incomplete reticulum; plage not amyloid. **Basidia** 35-50 × 10-13 μm, 4-spored, clavate to subclavate; sterigmata long, 6.0-8.5 × 2.5-3.5 μm. **Pleuromacrocystidia** 70-118 × 8-13 μm, abundant, subcylindrical to subfusiform, mostly tapering upwards, often with subcapitate, subfusoid, slightly attenuated or rounded apex, emergent up to 60 μm; content dense, somewhat needle-like. **Pleuropseudocystidia** cylindrical with rounded apex, mostly not emergent, up to 8 μm diam., with refringent content. **Lamellar edge** fertile. **Cheilomacrocystidia** 50-77 × 8-11 μm, mostly subfusiform, often with mucronate to attenuated or lageniform apex; content dense, needle-like. **Hymenophoral trama** mixed, with sphaerocytes and with abundant lactifers. **Pileipellis** up to 120 μm thick, an undistinct palisade with a well-developed subpellis of sphaerocytes but a rather poorly developed suprapellis; terminal elements 15-45 × 4-12 μm, some thin-walled and hyaline, but others prominent as pileocystidia with a clearly needle-like content and sometimes slightly thickened-wall. **Clamp connections** absent.

*Studied material:* INDIA-SIKKIM - Yuksom, Near Forest Rest House, alt. 1693 m, N 27°22'06.0" E 88°13'29.3", under *Castanopsis tribuloides*, subtropical to temperate broad-leaved forest, 27 August, 2010, K. Das, KD 10622 (holotype BSHC, isotype GENT); *ibid.* 28 August, 2010, K. Das, KD 10635 (BSHC).

*Notes:* The white colour and dry aspect of pileus and stipe, distant lamellae, the lowly ornamented spores and the rather large pleurocystidia with needle-like content, all make this species distinct and argue for a position in the *L.* subg. *Lactarius*. Micromorphologically, the pileipellis of this subgenus is characterized by a distinct cellular layer (subpellis) with a narrow layer of hyaline hyphae (suprapellis) on top. Usually, this suprapellis is found to be arranged periclinally, whereas, present species is characterized by the presence of anticline elements, a bit aberrant in the subgenus. However, terminal elements are not very dense and many of them are typically pileocystidia with dense needle-like content and sometimes with a slightly thickened and refringent wall. These prominent pileocystidia make the species unique in the group. Other closely related Asian species in this group are *L. leucophaeus* Verbeke & E. Horak, *L. paleus* Verbeke & E. Horak and *L. olivescens* Verbeke & E. Horak, all described from Papua New Guinea (Verbeke & Horak 1999, 2000), *L. dwaliensis* K. Das, J.R. Sharma & Verbeke described from India (Das et al. 2003) and *L. roseophyllus* R. Heim and *L. subpiperatus* Hongo described from Thailand (Heim 1962) and Japan respectively. Micromorphologically, all these species differ from the present taxon by lacking pileocystidia in the pileipellis. Moreover, *L. subpiperatus* lacks pleuromacrocystidia in the hymenium (Hesler & Smith 1979).

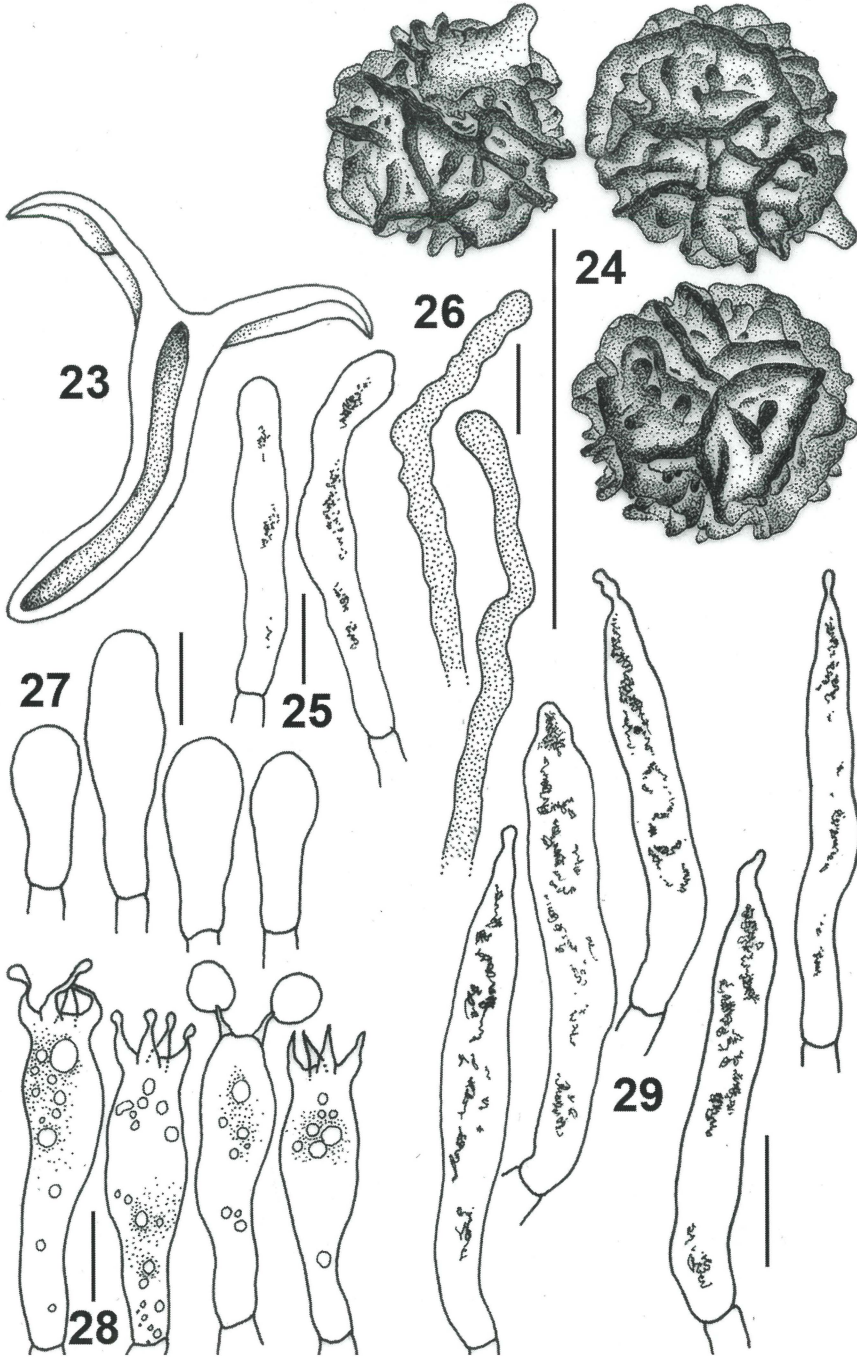
***Lactarius byssaceus* K. Das & Verbeke sp. nov.**

**Figs 23-34**

*Mycobank:* 561653

*Etymology:* Referring to the whitish, cottony margin of the pileus.

*Pileus* 50-60 mm diam., convexus ad planoconvexum, dein depressus, papilla nulla, viscidus, zonatus, subluteus vel subroseus. *Lamellae densae, late adnatae vel subdecurrentes, luteolae. Stipes* 35-52 × 7-10 mm, cylindricus, pileo



Figs 23-29. *Lactarius byssaceus* sp. nov. 23. Basidiomata showing lamellae and lamellulae. 24. Basidiospores. 25. Cheilocystidia. 26. Pleuropseudocystidia. 27. Marginal cells. 28. Two- and four-spored basidia. 29. Pleuromacrocystidia. Scale bars = 10  $\mu$ m. (KD 10628, drawings by K. Das)

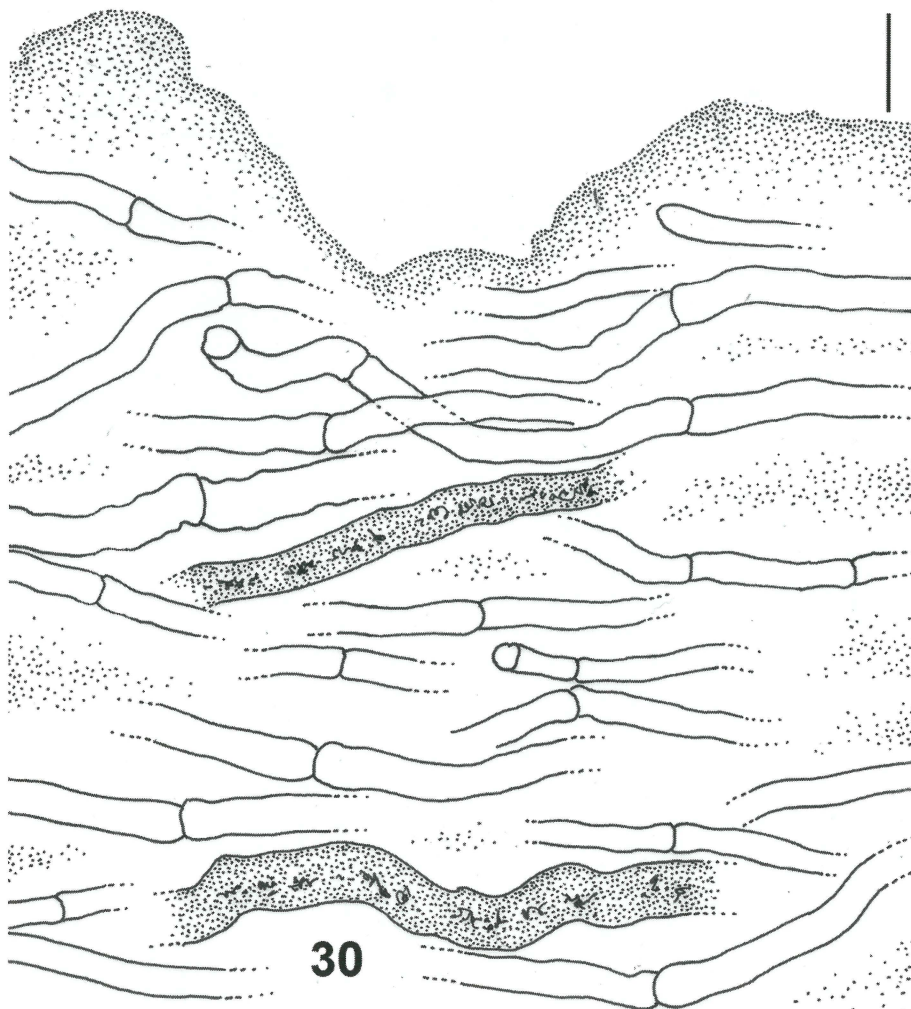
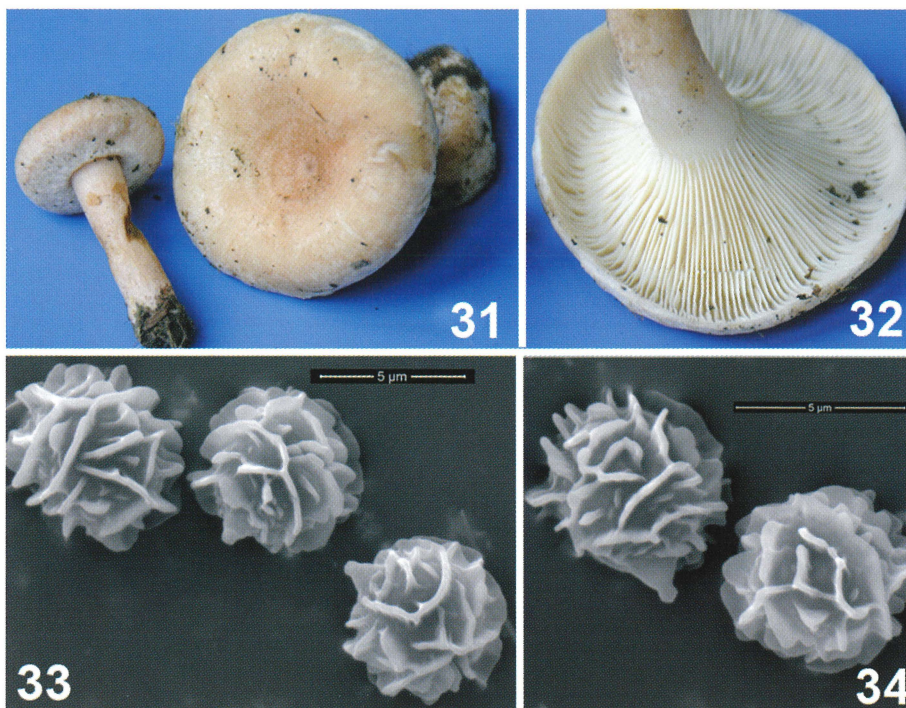


Fig 30. *Lactarius byssaceus* sp. nov. 30. Radial section through pileipellis. Scale bars = 10  $\mu$ m. (KD 10628, drawings by K. Das)

*concoloris*, *scrobiculatus*. Latex albus, immutabilis. Basidiosporae in cumulo subluteae, 5.8-6.1-7.2  $\times$  5.4-5.6-6.5  $\mu$ m, globosae vel subglobosae, amyloideae, subreticulatae vel reticulatae. Basidia 30-40  $\times$  8-9  $\mu$ m, bi- vel tetraspora. Pleuromacrocystidia 35-47  $\times$  5.5-6.5  $\mu$ m, fusiformia, ad apicem acuta vel moniliformia. Cheilomacrocystidia 38-50  $\times$  7-8  $\mu$ m, subcylindrica vel cylindrica. Cellulae marginales 15-35  $\times$  7-10  $\mu$ m, clavatae vel subclavatae. Pileipellis ex hyphis hyalinis dense intertextis ixocutem formantibus.

Typus: INDIA-Sikkim - Yuksom, 28 August, 2010, K. Das, KD 10628 (holotypus BSHC, isotypus GENT).

**Pileus** 50-60 mm diam., at first convex with inrolled margin, becoming planoconvex to applanate with depressed centre, without papilla, sticky, with



Figs 31-34. *Lactarius byssaceus* sp. nov. 31-32. Fresh basidiomata. 33-34. Scanning electron micrographs of basidiospores.

distinct zonations, pale yellow to pinkish, cream-coloured (b: 3A3 to 4A3), darker towards centre; margin whitish and cottony when young, concolorous when mature, non-striate, slightly pubescent. **Lamellae** broadly adnate to subdecurrent, crowded (20/cm at margin), never forked, with lamellulae in 9 series, yellowish (c: 30 Y, 2 M), unchanging when bruised; edge entire, concolorous. **Stipe** 35-52 × 7-10 mm, cylindrical, concolorous with pileus, yellowish white (b: 4A2) to white beneath the juncture of lamellae, scrobiculate; scrobicules saffron. **Context** white (chalky), hollow in stipe, unchanging with  $\text{FeSO}_4$ , but changing to yellowish green (b: 30A7) with KOH and dark green (a: 60) with guaiac; smell not remarkable; taste not recorded. **Latex** white, unchanging after exposure. **Spore print** pale yellow (c: 20Y 2M).

**Basidiospores** 5.8-6.1-7.2 × 5.4-5.6-6.5  $\mu\text{m}$ , (n = 20, Q = 1.01-1.03-1.16), globose to subglobose or rarely broadly ellipsoid; ornamentation amyloid, up to 0.7  $\mu\text{m}$  high, composed of regular to irregular, rather broad ridges and isolated warts forming an incomplete to complete reticulum; plage amyloid but often not distinguishable. **Basidia** 30-40 × 8-9  $\mu\text{m}$ , 2- to 4-spored, clavate to subclavate; sterigmata 5-6 × 2.5-3  $\mu\text{m}$ . **Pleuromacrocystidia** 35-47 × 5-7  $\mu\text{m}$ , scattered, subfusiform with mucronate to moniliform or rarely acute apex, emergent up to 18  $\mu\text{m}$ ; content slightly dense but never needle like. **Pleuropseudocystidia** cylindrical to tortuous with rounded apex, never emergent, 4-4.5  $\mu\text{m}$  wide; contents refringent. **Lamellar edge** fertile. **Cheilomacrocystidia** 38-50 × 7-8  $\mu\text{m}$ , rare, subcylindrical to cylindrical. **Marginal cells** 15-35 × 7-10  $\mu\text{m}$ , clavate to subclavate, thin-walled, hyaline. **Hymenophoral trama** with abundant lactifers. **Pileipellis** an

ixocutis, up to 85 µm thick, composed of repent hyaline hyphae (4-6 µm broad) and lactifers which are embedded in a thick layer of slime. **Clamp connections** absent.

*Studied material:* INDIA-SIKKIM - Yuksom, Near Forest Rest House, alt. 1693 m, N 27°22'06.0" E 88°13'29.3", under *Castanopsis tribuloides*, subtropical to temperate broad-leaved forest, 28 August, 2010, K. Das, KD 10628 (holotype BSHC, isotype GENT).

*Notes:* The species belongs to *L.* subg. *Piperites*. The unchanging milk, zonate and sticky cap and the cottony, slightly pubescent margin place the species *L.* in sect. *Piperites* Fr., reminding the European *Lactarius pubescens* Fr. (but, pileus less tomentose and beardy and without any zonation) and *L. scoticus* Berk. & Br. (but pileus without any zonation) (Heilmann-Clausen et al. 1998, Kränzlin 2005). Related species in Asia are *L. austrotorminosus* H.T. Le & Verbeken, described from Thailand (Le et al. 2007), differing by the drier and more scaly pileus and a more strigose margin, and *L. strigosus* Verbeken & E. Horak, described from Papua New Guinea, differing also by the distinctly fibrillose and strigose pileus (Verbeken & Horak 2000).

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