Indian Boletales and Agaricales
Revisions and new taxa.

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Zusammenfassung. In den Jahren 1848—1850 sammelte J. D. Hooker in Indien (Darjeeling, Sikkim und Khasi-Berge) 15 Boletales, die später von M. J. Berkeley beschrieben wurden. Nach Untersuchung des Typusmateriales werden 4 neue Kombinationen vorgeschlagen, nämlich: *Suillus furfuraceus* (Berk.) c. n., *Leccinum ustale* (Berk.) c. n., *Phaeogyroporus fragicolor* (Berk.) c. n. und *Pulveroboletus flavipes* (Berk.) c. n. — Im Herbst 1979 besuchte der Autor die Hooker'schen Typuslokalitäten bei Darjeeling und in Sikkim (Upper Rangit) und brachte u. a. 11 Agaricales als Ausbeute mit. Davon sind 5 Arten neu (*Mniopetalum distinctum* sp. n., *Panellus aureofactus* sp. n., *Xeromphalina disseminata* sp. n., *Rhodocybe villosa* sp. n., *Phaeocollybia coniuncta* sp. n.) und, mit Ausnahme von *Laccaria laccata* (Fr.), werden im weiteren *Cystoderma amianthinum* (Fr.), *Panellus serotinus* (Fr.), *Pluteus lutescens* (Fr.) und *Pholiotina filaris* (Fr.) zum ersten Mal im sikkimesischen Himalaya nachgewiesen. *Mycena flavominiata* (Berk.) wird an Hand von frischem, topotypischem Material beschrieben und abgebildet.

Introduction

Taking into account the large horizontal and vertical range and the innumerable ecologic niches (especially along the southern slopes) the Himalayas are still little explored from the mycological point of view. It is surprising that this fact is also true regarding the large and conspicuous (but rapidly decaying!) Boletales and Agaricales.

The first account on Himalayan boletes and agarics was published by M. J. Berkeley (1851a, b; 1852; 1854) based upon material collected by J. D. Hooker in Khassya Hills, Darjeeling and the then kingdom of Sikkim. Subsequently the Himalayan forests lost their attraction as hunting grounds for fleshy fungi and only the odd collection(s) picked up at random by botanists, explorers, surveyors, etc. came into the hands of taxonomists in India and overseas.

Much information about Indian fungi (Sikkim belongs now also to India) is in fact found in the periodically published check-lists starting with Butler & Bisby (1931) to the most recent edition (Bilgrami, Jamaluddin & Rizwi, 1979). However, the majority of papers dealing with macrofungi have been published in journals and books difficult to get and therefore this information is not considered at all in these lists (i. e. Balfour-Browne (1955, 1968), Hongo (1965) or Horak (1971, 1974)).

After 130 years HOOKER's collection from Sikkim and its close neighbourhood offers still the most complete source of information concerning Asco- and Basidiomycetes. For anybody interested in Himalayan mycology these specimens (kept at K) have to be looked at under all circumstances. Since the taxonomic concepts have changed over the last centenary it is obvious that a sound identification can be obtained only after the original specimens have been revised.

Interested in the classification of Australasian boletes I was forced to re-examine BERKELEY's relevant material. In several taxa unfortunately not all microcharacters could be studied due to bad preservation. In all these cases no effort was made concerning speculative transfers at all costs and therefore BERKELEY's original generic concept was accepted and followed.

As a contribution to the taxonomy and the geographic distribution of the Boletales and Agaricales the results of my observations on the Himalayan exsiccata are reported herewith.

Acknowledgements

I am indebted to Prof. E. J. H. CORNER (Cambridge, U. K.) and Dr. D. N. PEGLER (Kew Herbarium, Kew, U. K.) for the loan of type material and information on Indian fungi.

If not otherwise stated the magnifications of the figures are: carpophores (nat. size), spores (×2000), basidia and cystidia (×1000), cuticle (vert. section, ×500).

Type material of the new species is kept in ZT.

Boletales

Key to Indian Boletales (originally described by M. J. BERKELEY, 1851—1854)

1. Spores globose to subglobose, covered by warts, cylindric projections or net-like ornamentation 2
1*. Spores elliptic, fusoid or ovoid (rarely subphaseoliform) 4
2. Spores 9—10.5 µm (excl. ornamentation), echinulate by isolated or confluent (cristate) cylindric to conic projections, up to 3 µm high, brown; pileus —140 mm, umber brown, areolate due to large pyramidal warts; pores pale red; stipe —140×—3 mm, clavate, brown-purple, smooth; context reddening; on soil. Jillapahar ..... 1. *Strobilomyces polypyramis*
2*. Spores 9—13 µm, conspicuously reticulate .....
3. Spores with regular, complete, polygon-like net, meshes up to 1 µm deep, dark brown; pileus —80 mm, covered by dark brown or black, large, pyramidal warts; tubes dark brown, pores yellow; stipe —100×—25 mm, dark brown, scaly;

context brown; basidia 35×15 µm, 4-spored; cystidia 40—50×18—24 µm, fusoid, dark brown plasmatic pigment present; cuticle composed of cylindric hyphae (8—12 µm diam.), with dark brown plasmatic pigment; clamp connections none; on rotten wood and soil. Darjeeling..... 2. *Strobilomyces montosus*

3*. Spores with irregular, crest-like, often disconnected net, meshes up to 3 µm deep; pileus—70 mm, dark purple-brown: small hexagonal warts at centre, margin shaggy from floccose veil; pores ?; stipe —50×—15 mm, cylindric, equal, shaggy like margin of pileus; context tough; on soil. Khassya ..... 3. *Strobilomyces nigricans*

4. Spores elliptic to subfusoid, longitudinal ridges-grooves and transversal wrinkles-ribs prominent, 14—20×7—9 µm, exospore up to 1.5 µm thick, yellow-brown; pileus —150 mm, ovate-globose at first, false veil splitting and forming appendiculate, membranous remnants on margin, reddish purple or tan, floccose to scaly, dry; pores large, yellowish to olive, cyanescent; stipe —140×—30 mm, equal to subbulbous, concolorous or darker as pileus, with red-yellow tints, smooth, ring absent; context cyanescent; basidia 35—50×13—16 µm, 4-spored; cystidia 35—80×14—15 µm, fusoid, yellow-brown pigment present; cuticle composed of cylindric hyphae (6—16 µm diam.), brown plasmatic pigment; clamp connections absent; on soil. Darjeeling, Khassya.... 4. *Boletellus emodensis*

4*. Spores smooth, fusoid to ovoid (rarely subphaseoliform)..... 5

5. Pileus viscid, —60 mm, reddish grey, sprinkled with rufous, floccose squamules; tubes and pores yellow; stipe —60×—6 mm, cylindrical, equal, annulate, yellow above ring; context pale; spores 7—8.5×2.5—3 µm, fusoid, pale yellow to hyaline; basidia 14—20×5 µm, 4-spored; cystidia, cuticle and clamp connections ?; on soil. Khassya..5. *Suillus furfuraceus*

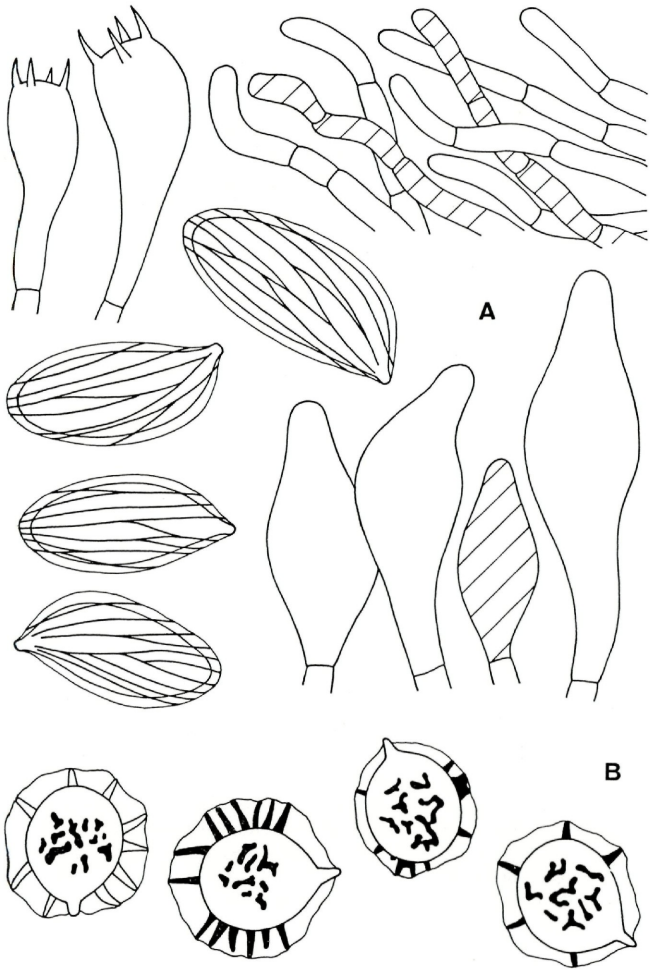
5*. Pileus dry, stipe lacking ring (from veil) 6

6. Stipe conspicuously reticulated 7

6*. Stipe smooth, innately fibrillose or mealy-pulverulent..... 9

7. Pileus —150 mm, pale brown, fasciculate-pilose from scales; tubes and pores pale yellow to argillaceous; stipe —150×—60 mm (at base), bulbous, pale umber; context pale pink, bluish in base of stipe; spores 12.5—17×4—5 µm, fusoid; basidia 20×7 µm, 4-spored; cystidia 25—36×8—10 µm, fusoid, yellow plasmatic pigment present; cuticle composed of cylindric hyphae (5—12 µm diam.) with yellow plasmatic pigment; clamp connections absent; on soil under *Andromeda* and *Betula*. Sikkim (Lachen)..... 6. *Boletus gigas*

7*. Carpophores smaller, pileus —70 mm, purple-brown to purple-black; stipe —70×—25 mm; spores fusoid 8



Pl. 1. A. *Boletellus emodensis* (Berk.) Singer (type): spores, basidia, cystidia, cuticle. — B. *Strobilomyces polypyramis* Berk. (type): spores

8. Pileus pruinose, with glaucous tint; pores purple-brown; stipe clavate, dark brown; context white turning to purple-brown; spores 10—12.5×4—5 µm, brown; basidia, cystidia, cuticle, clamp conections ?; on soil. Khassya ..... 7. *Boletus scrobiculatus*

8*. Pileus tomentose, margin at first involute; pores ochre; stipe equal, purple-black to black; context white changing to black; spores 9.5—12×3.5—4.5 µm, hyaline to pale yellow; basidia 30—35×8 µm, 4-spored; cystidia not observed; cuticle composed of clavate-vesiculose cells (20—40×10—25 µm) with brown plasmatic pigment; clamp connections absent; on rotten wood. Darjeeling ..... 8. *Leccinum ustale*

9. Pileus white, 25 mm, dry, downy; colour of tubes and pores ?; stipe —30×—15 mm, subclavate; context yellow, cyanescent; spores 9—11×4.5(—5) µm, broadly fusoid, pale yellow-brown; basidia 25—35×8—10 µm, 4-spored; cystidia 30—40×10—14 µm, fusoid, hyaline; cuticle and clamp connections ?; on soil. Khassya ..... 9. *Boletus pusillus*.

9*. Pileus not white, larger than 25 mm diam. 10

10. Spores oval (to subphaseoliform), 7—9×4—5 µm, hyaline to pale yellow; pileus —150 mm, turbinate, purple, margin lobed; tubes and pores greenish yellow, decurrent, short; stipe —80×—30 mm, bulbous, purple; context yellow, pale red beneath cuticle; basidia 25—32×7—9 µm, 4-spored; cystidia 28—45×14—22 µm, fusoid to subclavate, yellow-brown plasmatic pigment present; cuticle and clamp connections ?; habitat ?. Khassya ..... 10. *Phaeogyroporus fragicolor*.

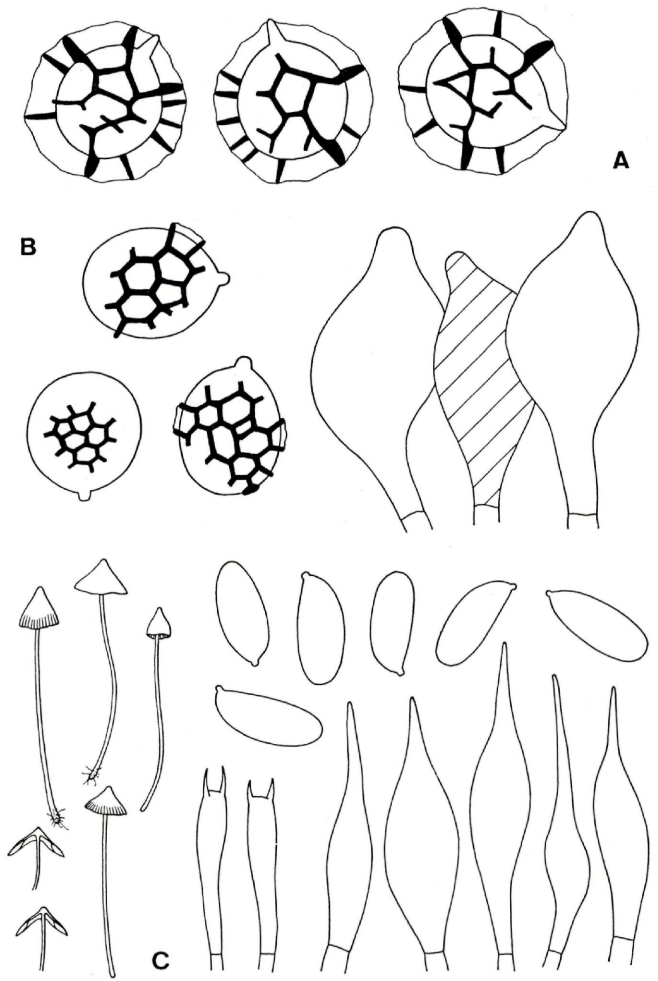
10*. Spores fusoid 11

11. Surface of pileus and stipe pulverulent-mealy; pileus —50 mm, yellow to pale fuscous; pores large; stipe —40 mm long, yellow; context ?; spores 8—9.5×4—5 µm, yellow-brown; basidia 25—32×10—11 µm, 4-spored; cystidia and cuticle ?; clamp connections none; on soil. Khassya ..... 11. *Pulveroboletus flavipes*.

11*. Pileus and stipe not pulverulent (from mealy veil remnants).. 12

12. Pileus —130 mm, tan, areolate from hexagonal warts; pores pink; stipe —100 mm long, equal, cylindric, brownish; context yellowish, tough; spores 6.5—8×3—3.5 µm, hyaline to pale yellow; basidia 22—30×6—7 µm, 4-spored; cystidia and cuticle ?; clamp connections absent; on soil in pastures. Khassya ..... 12. *Boletus areolatus*

12*. Pileus —50 mm, reddish brown, smooth to tomentose; pores yellow; stipe —50×—15 mm, cylindric, reddish brown, apex red; context immediately changing to blue (especially in base of stipe); spores 12.5—16.5×4.5—5.5 µm, yellow-brown; basidia and cystidia ?; cuticle composed of cylindric hyphae



Pl. 2. A. *Strobilomyces nigricans* Berk. (type): spores. — B. *Strobilomyces montosus* Berk. (type): spores, cystidia. — C. *Mycena flavominiata* (Berk.) Sacc. (ZT, 0165): carpophores, spores, basidia, cheilocystidia

(5—10 μm diam.), with yellow plasmatic pigment; clamp connections absent; on soil. Darjeeling... 13. *Boletus delphinus*

Not considered in this key are the following Indian boletes:

Strobilomyces indicus LLOYD 1924: Myc. Not., No. 73: 1331 (syn. *Strobilomyces velutipes* C. & M., cp. PERREAU—BERTRAND, 1961).

Strobilomyces kalimpongensis BOSE 1946: Polyporaceae of Bengal. XI. — J. Dept. Sci. Calcutta Univ. 2: 53—87.

Pulveroboletus shoreae SINGER & SINGH 1971: Mycopath. Myc. Appl. 43: 25.

Xerocomus bakshii SINGER & SINGH 1971: Mycopath. Myc. Appl. 43: 25.

1. *Strobilomyces polypyramis* BERKELEY 1851 — Pl. 1, B

Hooker J. Bot. 3: 78

Illustrations. — BOEDIJN (1951).

Material. — India: Sikkim, No. 104, leg. HOOKER (K, holotype). — USA: Florida, Alachuana Co., Gainesville, 17. VII. 1943, leg. SINGER (F, 2782, holotype of *Str. confusus*). — Malaysia: Johore, Sungei Dohol, 12. 1931, leg. CORNER (CBS, holotype of *Str. annulatus*).

Habitat. — On soil. — India, Indonesia (Java; BOEDIJN, 1951, 1960).

Remarks. — The globose to subglobose spores (9—10.5 μm) of *Str. polypyramis* are distinguished by conspicuous conic or cylindric spines (up to 3 μm high). Both *Str. confusus* SINGER (1945) and *Str. annulatus* CORNER (1945) have spores whose shape, size and ornamentation is very similar to those of the Himalayan bolete. Unfortunately the type material of *Str. polypyramis* is in fragmentary condition and it is impossible to examine the structure of the cuticle, basidia and cystidia. Based upon the existing information nothing can be said whether or not the three mentioned species are contaxic. However, it appears that these boletes are closely related at least.

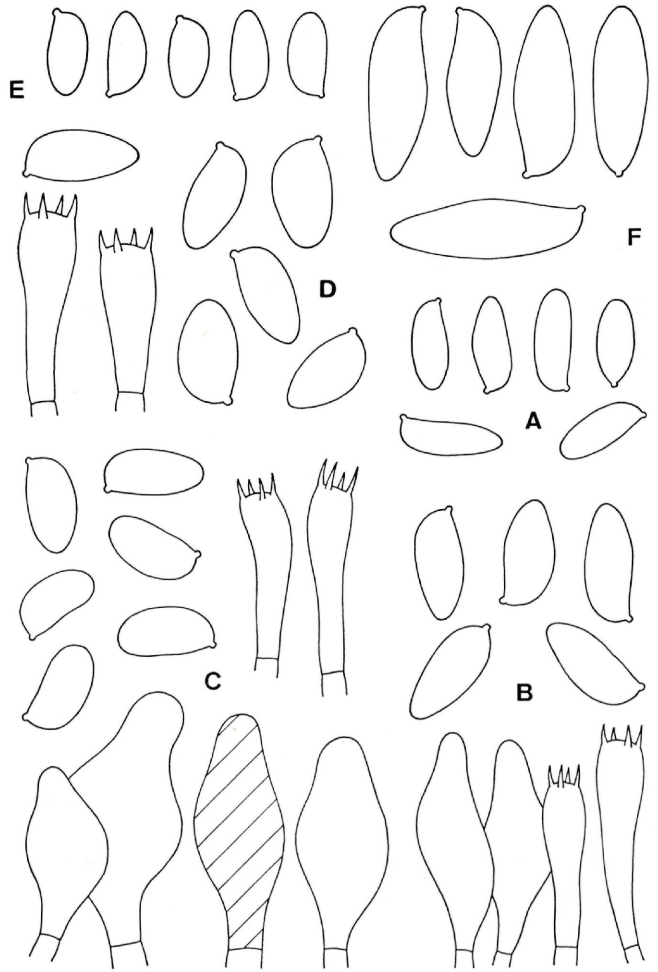
2. *Strobilomyces montosus* BERKELEY 1851 — Pl. 2, B

Hooker J. Bot. 3: 78

Material. — India: Darjeeling, Jillapahar, No. 121, leg. HOOKER (K, holotype). — Malaysia: Sabah, Mt. Kinabalu, 6. IV. 1964, leg. CORNER (RSNB, 8137: holotype of *Str. mollis*).

Habitat. — On rotten wood and soil. — India.

Remarks. — Apart from the size of the subglobose spores (9—13 μm, netlike ornamentation up to 1 μm deep) *Str. montosus* resembles in all other macroscopic and microscopic characters *Str. mollis* CORNER (1972) described from Borneo and Singapore. It is unfortunate that the type material of *Str. montosus* is in bad condition.



Pl. 3. A. *Suillus furfuraceus* (Berk.) Horak (type): spores. — B. *Boletus pusillus* Berk. (type): spores, basidia, cystidia. — C. *Phaeogyroporus fragicolor* (Berk.) Horak (type): spores, basidia, cystidia. — D. *Pulveroboletus flavipes* (Berk.) Horak (type): spores, basidia. — E. *Boletus areolatus* Berk. (type): spores. — F. *Boletus delphinus* Berk. (type): spores

Fresh topotypic material is needed for a thorough comparison of the two related taxa. After studying the type material BOEDIJN (1951) has suggested that *Str. montosus* and *Str. polypyramis* are probably contaxic. The relevant spore drawings on plates 1, B and 2, B clearly demonstrate that the two species are not conspecific at all.

3. *Strobilomyces nigricans* BERKELEY 1852 — Pl. 2, A

Hooker J. Bot. 4: 139

Material. — India: Khasia, No. 4, leg. HOOKER (K, holotype).

Habitat. — On soil in forests. — India, Indonesia (Java; BOEDIJN, 1960), Cambodia (PERREAU—BERTRAND, 1961).

Remarks. — This species is readily recognized by the black-purple colour of the shaggy to floccose pileus and stipe. Another distinctive character are the large subglobose spores (9.5—12 µm) covered by spiny warts (up to 3 µm high) which are often confluent to short crests and thus forming a wide-meshed mostly incomplete net-like sculpture.

According to the sketches (PERREAU-BERTRAND, 1961) the spores of "*Strobilomyces phaeus* PAT." (1923, unpublished, FH) are identical to those of *Str. nigricans*. Anotations later added on the herbarium-sheet demonstrate that PATOUILLARD came to the same conclusion. Therefore *Str. nigricans* occurs also in Cambodia.

4. *Boletellus emodensis* (BERKELEY) SINGER 1942 — Pl. 1, A

Ann. Myc. 40: 18

Bas. *Boletus emodensis* BERKELEY 1851, Hooker J. Bot. 3: 48.

Syn. *Boletus squamatus* BERKELEY 1852, Hooker J. Bot. 4: 137; s. n. *Boletellus squamatus* (BERK.) SINGER 1955: Sydowie 9: 424.
Boletus verrucarius BERKELEY 1854, Hooker J. Bot. 6: 135; s. n. *Boletellus verrucarius* (BERK.) SINGER 1955: Sydowia 9: 425.

Illustrations. — PERREAU-BERTRAND (1961), CORNER (1972).

Material. — India: Darjeeling, No. 100, leg. HOOKER (K, holotype). — Sikkim, leg. HOOKER (holotype of *B. verrucarius* BERK.). — Khasia, No. 11, leg. HOOKER (K, holotype of *B. squamatus* BERK.).

Habitat. — On soil (in woods). — India, Thailand, Malaysia, Singapore, Vietnam, Borneo, Japan, Papua New Guinea, New Caledonia, Australia.

Remarks. — For further information regarding synonyms and geographical distribution compare CORNER (1972) and HORAK (1976).

5. *Suillus furfuraceus* (BERKELEY) HORAK, comb. nov. — Pl. 3, A

Bas. *Boletus furfuraceus* BERKELEY 1852, Hooker J. Bot. 4: 137.

Material. — India: Khasia, No. 9, leg. HOOKER (K, holotype).

Habitat. — On soil. — India.

Remarks. — The macroscopic characters reported by HOOKER in combination with the microscopic data observed on the poorly preserved type material unquestionably indicate that this bolete belongs to *Suillus*.

6. *Boletus gigas* BERKELEY 1852 — Pl. 4, A

Hooker J. Bot. 4: 138

Material. — India: Sikkim, 1849, No. 36, leg. HOOKER (K, holotype).

Habitat. — Under *Andromeda* and *Betula* in forests. — India.

Remarks. — The sketch in pl. 4, A pictures the outlines of the well preserved type material. At the first glimpse I expected that this species could represent a member of *Leccinum* (habitat in *Betula* forest!). However, the cuticle of *B. gigas* is composed of long, cylindric hyphae (5—12 μm diam.) and therefore *Leccinum* is excluded. Further, the strongly reticulated stipe makes this bolete a typical representative of *Boletus* s. l.

7. *Boletus scrobiculatus* BERKELEY 1852 — Pl. 4, B

Hooker J. Bot. 4: 139

Material. — India: Khasi, No. 9, leg. HOOKER (K, holotype).

Habitat. — On soil. — India.

Remarks. — The taxonomic position of *B. scrobiculatus* is obscure. No microscopic features could be extracted from the very badly kept original material except the fusoid, pale brown spores (10—12.5×4—5 μm).

8. *Leccinum ustale* (BERKELEY) HORAK, comb. nov. — Pl. 4, C

Bas. *Boletus ustalis* BERKELEY 1851, Hooker J. Bot. 3: 48.

Material. — India: Sikkim, No. 122, leg. HOOKER (K, holotype).

Habitat. — On rotten wood. — India.

Remarks. — Owing to the features found on the type material (especially the celluliform cuticle) *B. ustalis* belongs to *Leccinum*. Macroscopically the most distinctive characters are the tomentose, purple-black pileus, the ochraceous pores and the black and coarsely scrobiculate-reticulate stipe. HOOKER collected the specimen on rotten trunks of trees in the vicinity of Darjeeling.

9. *Boletus pusillus* BERKELEY 1854 — Pl. 3, B

Hooker J. Bot. 6: 135

Material. — India: Moflong, Khasi, June 29, 1850, No. 26, leg. HOOKER (K, holotype).

Habitat. — On soil. — India.

Remarks. — The type material of this remarkable, small bolete (pileus white, —25 mm diam., stipe and tubes-pores also white) is still in relatively good condition, and accordingly spores, basidia and cystidia have been found on the exsiccatum. The cuticle of the pileus is destroyed and hence its structure remains unknown. Additionally *B. pusillus* is characterized by the yellow context which immediately turns blue if cut or bruised.

10. *Phaeogyroporus fragicolor* (Berkeley) Horak comb. nov. —Pl. 3, C

Bas. *Boletus fragicolor* Berkeley 1852, Hooker J. Bot. 4: 137.

Material. — India: Nunklow, Khasi, July 1850, No. 29, leg. Hooker (K, holotype).

Habitat. — Unknown. — India.

Remarks. — The broadly umbonate, purple pileus of *B. fragicolor* reaches about 150 mm diam. and the rather stout, bulbous and concolorous stipe is smooth. Reportedly the context of pileus and stipe turn red. The analysis of these macroscopic data leads straight to *Phaeogyroporus* Singer (1944). The oval-subphaseoliform, hyaline to yellowish spores and the fusoid cystidia (with yellow-brown plasmatic pigment) are providing further proofs that this bolete has to be relegated into *Phaeogyroporus*. Nowadays the original collection of *B. fragicolor* consists of nothing more than fragments and despite intensive search no clamp connection have been observed. I expect, however, that the septa of the hyphae are actually clamped.

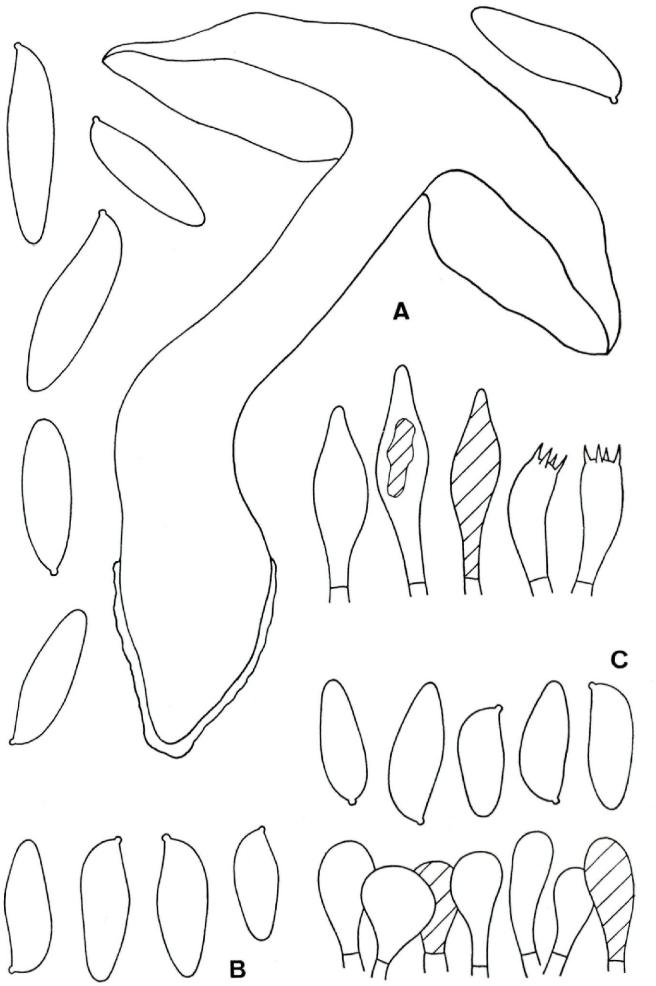
11. *Pulveroboletus flavipes* (Berkeley) Horak, comb. nov. — Pl. 3, D

Bas. *Boletus flavipes* Berkeley 1854, Hooker J. Bot. 6: 135.
(non *B. flavipes* Peck 1886, N. Y. State Mus. Rep. 39: 42
non *B. flavipes* Massee 1909, Kew Bull. p. 208)

Material. — India: Myrong, Khasi, leg. Hooker (K, holotype).

Habitat. — On soil. — India.

Remarks. — In the field-notes to *B. flavipes* Hooker stresses the presence of a "bright yellow meal" on the surface of the stipe (and probably also pileus). Examining the original material Berkeley already came to the conclusion that *B. flavipes* resembles *B. ravenelii*, the type species of *Pulveroboletus* Murrill (1909; cp. Horak, 1968). To my opinion *B. flavipes* is very likely to be another synonym of *B. ravenelii* (Berk. & Curt.) — published one year earlier. Its occurrence in India can be safely expected since this fungus is already reported from Indomalaya (Singapore, Malaysia, Borneo), China and USA (Corner, 1972). Unfortunately the very poor state of preservation of the type material (*B. flavipes*) prohibits to make the final decision concerning the suggested synonymity. In addition the above-mentioned *Pulveroboletus shoreae* Singer & Singh (1971) represents probably also another synonym of *P. ravenelii*.



Pl. 4. A. *Boletus gigas* Berk. (type): carpophores (drawn from dried material), spores, basidia, cystidia. — B. *Boletus scrobiculatus* Berk. (type): spores. — C. *Leccinum ustale* (Berk.) Horak (type): spores, cuticle

12. *Boletus areolatus* BERKELEY 1852 — Pl. 3, E

Hooker J. Bot. 4: 138

Material. — India: Khasia, No. 6, leg. HOOKER (K, holotype).

Habitat. — On soil in pastures. — India.

Remarks. — According to the original description *B. areolatus* is macroscopically distinguished by hexagonal warts on the tan-coloured pileus and by pink pores. The most distinctive character, however, are the rather small subfusoid spores (6.5—8×3—3.5 µm). No further microscopic data can be furnished since the original specimen is in very desolate condition.

13. *Boletus delphinus* BERKELEY 1851 — Pl. 3, F

Hooker J. Bot. 3: 77

Material. — India: Darjeeling, No. 76, leg. HOOKER (K, holotype).

Habitat. — On soil. — India.

Remarks. — This bolete from the Sikkimese foothills is recognized by few remarkable features only: reddish brown, smooth or minutely tomentose pileus, yellow tubes-pores and smooth reddish brown stipe. The context immediately turns blue on exposure. The most characteristic criterion are the large, yellow-brown (KOH) spores which measure about 12.5—16.5×4.5—5.5 µm. Size and shape both of basidia and cystidia unknown.

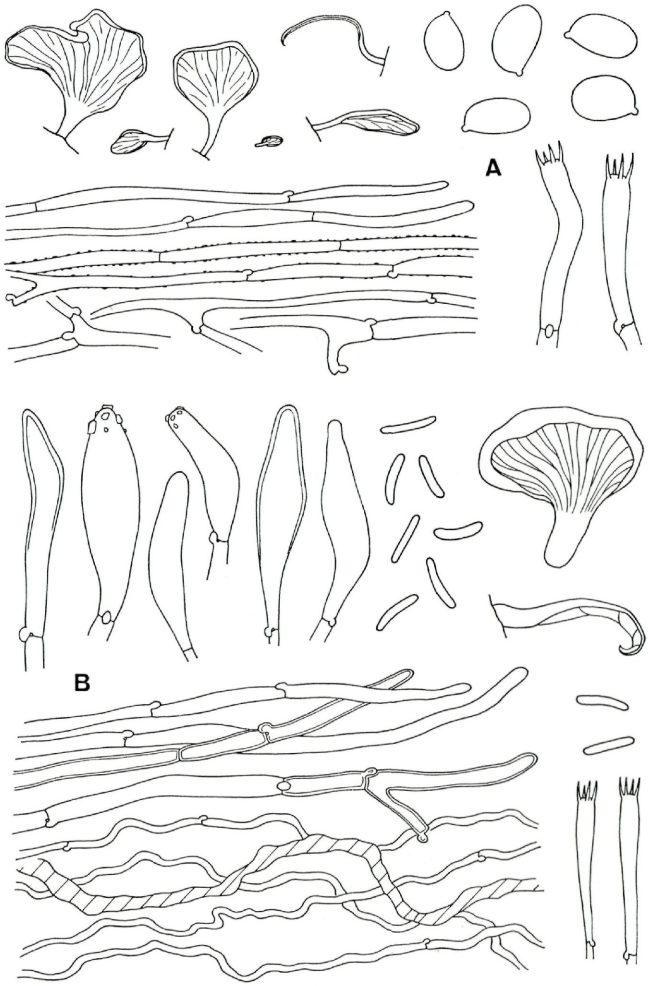
Agaricales

14. *Mniopetalum distinctum* HORAK, spec. nov. — Pl. 5, A

Pileus —25 mm, cupuliformis dein flabelliformis, cremeus, haud gelatinosus, membranaceus. Lamellae venosae vel nullae, plicae saepe dichotomiter ramosae, e cremeo argillaceae. Stipes —8×—2 mm, bene evolutus, lateraliter insertus, cylindricus, pileo concolor. Sporae 4.5—6×3—4 µm, ovatae, hyalinae, inamyloideae. Cystidia nulla. Hyphae fibulatae. Ad muscos vivos. India (Sikkim). Typus, ZT, 0158.

Pileus 4—25 mm, spathuloid, spoon- or cup-shaped, margin irregularely lobed in mature specimens; whitish to cream; dry, smooth, membranous, not gelatinous, not translucedly striate, veil remnants absent. Lamellae venose to plicate, often dichotomously forked towards margin (occasionally hymenium smooth), subdecurrent; cream to pale brown. Stipe 3—8×1—2 mm, always lateral, cylindric, equal or attenuated towards base; concolorous with pileus; glabrous, solid, dry, single, in groups. Context whitish, not gelatinous. Odour and taste not distinctive.

Spores 4.5—6×3—4 µm, ovoid, hyaline, smooth, inamyloid. Basidia 22—30×4—5 µm, 4-spored. Cystidia absent. Cuticle a cutis composed of cylindric hyphae (2—5 µm diam.), membranes



Pl. 5. A. *Mniopetalum distinctum* HORAK (type): carpophores, spores, basidia, cuticle. — B. *Panellus aureofactus* HORAK (type): carpophores, spores, basidia, cheilocystidia, cuticle

minutely encrusted by pale brown pigment. Clamp connections numerous.

Material. — India: Sikkim, Upper Rangit, Zompuk, N of Yoksam, 2100 m, 5. XI. 1979, leg. HORAK (ZT, 0158, holotype).

Habitat. — On living mosses along creek. — India.

Remarks. — This species fits well into the generic concept of *Mniopetalum* DONK & SINGER ap. DONK (1962). The Himalayan taxon apparently is closely related to *Mniopetalum bryophilum* (FR.) DONK, differs, however, by the larger size of the carpophores and spores.

15. *Panellus aureofactus* HORAK, spec. nov. — Pl. 5, B

Pileus —30 mm, pleurotoideus vel flabelliformis, marginem versus involutus, aureus, innate fibrillosus, siccus. Lamellae decurrentes, aureae vel ochraceae. Stipes —10×—5 mm, cylindricus, lateraliter insertus, aureus, fibrillosus. Caro subgelatinosa. Sporae 3.5—5×0.8—1.2 µm, cylindrico-bacilliformes, amyloideae, hyalinae. Cystidia subfusoidea. Hyphae fibulatae. Ad lignum Rhododendri. India (Sikkim). Typus, ZT, 0163.

Pileus 15—30 mm, pleurotoid, conchate or flabelliform, margin strongly inrolled in young carpophores; golden yellow; dry, minutely fibrillose, margin not striate, veil remnants none. Lamellae decurrent, dense, up to 3 mm wide; golden yellow at first turning to ochraceous in aged specimens; edge concolorous, even or indistinctly notched. Stipe 5—10×3—5 mm, lateral, cylindric, equal; concolorous with pileus; dry, minutely fibrillose, solid, veil absent, single, in groups. Context whitish, soft, subcartilaginous. Odour and taste not distinctive.

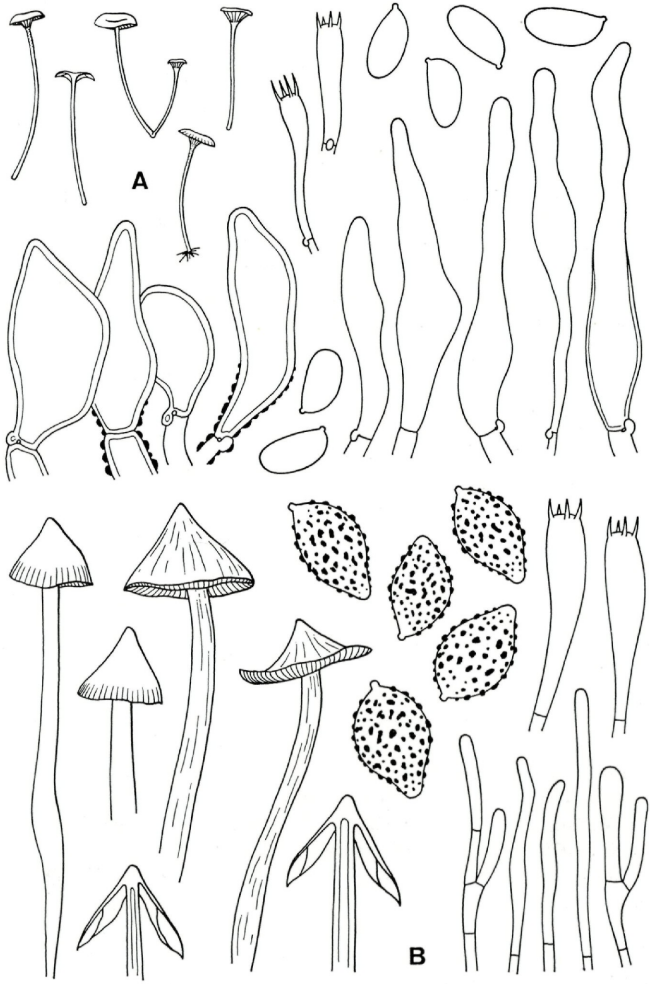
Spores 3.5—5×0.8—1.2 µm, cylindric, curved (in lateral view), hyaline, amyloid, smooth. Basidia 20—28×3—4 µm, 4-spored, Cheilocystidia 30—40×5—10 µm, fusoid to lageniform, hyaline, membrane thin-walled (rarely submetuloid in apical region), occasionally encrusted by crystals. Cuticle a cutis composed of cylindric hyphae (5—8 µm diam.), membranes hyaline, often thick-walled (up to 0.5 µm diam.), gelatinised (especially hyphae of subcutis). Yellow (KOH) oleiferous hyphae present in subcutis. Clamp connections present.

Material. — India: Sikkim, Upper Rangit, Dzongri, 3700 m, 10. XI. 1979, leg. HORAK (ZT, 0163, holotype).

Habitat. — On rotten trunk of *Rhododendron* sp. — India.

Remarks. — In the pertinent literature on *Panellus* actually no species can be found which fits this new taxon (MALKOVSKY, 1932; PILAT, 1935; MILLER, 1970; BURDSALL & MILLER, 1978).

Panellus melleo-ochraceus MALENÇON (MALENÇON & BERTAULT, 1975), described from Morocco, seems to be the most related ally to *P. aureofactus* but is distinguished by smaller carpophores, larger spores and different habitat. Due to the size and the shape of the



Pl. 6. A. *Xeromphalina disseminata* Horak (type): carpophores, spores, cheilocystidia, caulocystidia. — B. *Phaeocollybia coniuncta* Horak (type): carpophores, spores, basidia, cheilocystidia

spores the Indian *P. rupicola* (MASSEE, 1898) SINGER (1942) is another species close to *P. aureofactus*. It is separated, however, by larger grey-brown fruitingbodies.

Likewise, *Ag.* (*Pleurotus*) *placentodes* BERKELEY (1852) and *Panus ochraceus* MASSEE (1906), both agarics reported from the Himalayas, are macroscopically similar to *Panellus aureofactus*, differ however by larger spores as observed on the pertinent type material (K).

16. *Xeromphalina disseminata* HORAK, spec. nov. —Pl. 6, A

Pileus —7 mm, e convexo subumbilicatus, carnicolor vel ochraceoferrugineus, glabrus. Lamellae arcuatae, pileo concolores dein aureoferrugineae. Stipes —25× —1 mm, cylindricus, apicaliter pruinosus, ad basim mycelio luteo instructus. Odor saporque nulli. Sporae 5—6.5×3 µm, ovoideae, amyloideae. Cheilocystidia caulocystidiaque presentes. Septa fibulata. Ad lignum putridum. India (Sikkim). Typus, ZT, 0164.

Pileus 3—7 mm, convex at first soon becoming plane to subumbilicate, margin incurved (never up-turned); reddish brown changing to ochre-ferruginous in aged specimens; dry, glabrous to subsquamulous, margin striate, tough. Lamellae (L 8—14, —3) arcuate to decurrent, rather crowded; concolorous with pileus turning rust brown or yellow rust brown; edge even, concolorous. Stipe 15—25×—1 mm, cylindric, equal; reddish brown to ochre rust brown; dry, pruinose at apex, stipe originating from yellow basal mycelium, tough, solid, single or cespitose, in large colonies. Context tough, ochre-brown. Odour and taste not distinctive.

Spores 5—6.5×3 µm, ovoid, hyaline, amyloid, smooth. Basidia 20—25×4 µm, 4-spored. Cheilocystidia 30—70×6—12 µm, fusoid, thin-walled, occasionally becoming thick-walled towards basal septum, membrane hyaline to pale yellow. Caulocystidia 20—40×10—18 µm, vesiculose to fusoid, membrane 0.5 µm diam., often encrusted by red-orange (KOH) pigment. Cuticle a cutis (or trichoderm) composed of thick-walled, subgelatinised hyphae (4—12 µm diam.), terminal cells cylindric or subfusoid, strongly encrusted by red-orange (KOH) pigment. Clamp connections on septa.

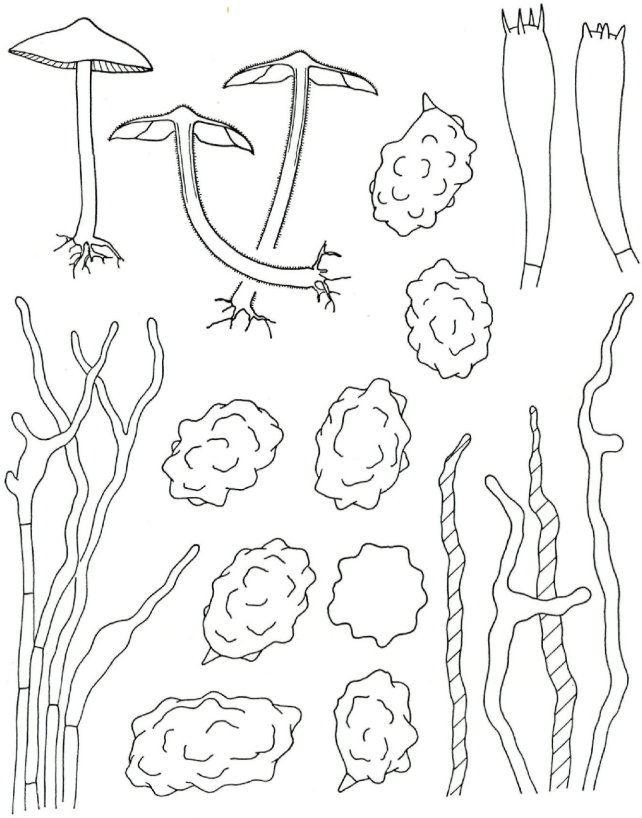
Material. — India: Sikkim, Upper Rangit, Dzongri, 3500 m, 10. XI. 1979, leg. HORAK (ZT, 0164, holotype).

Habitat. — On rotten wood of *Rhododendron* sp. and/or *Quercus* sp. — India.

Remarks. — Recently (HORAK, 1979a) the species of *Xeromphalina* have been surveyed on a world wide basis. *Xeromphalina disseminata* is distinguished by its rather large spores and the slender carpophores which can be found by the hundreds on the substrate. This collection represents the first report of the genus *Xeromphalina* in India.

17. *Rhodocybe villosa* HORAK, spec. nov. — Pl. 7, A

Pileus —30 mm, convexo-umbonatus, papilla bene distincta, cinnamomeus vel pallide castaneus, e tomentoso pervillosus, siccus. Lamellae emarginatae, pallide brunneae. Stipes —45 × —3 mm, cylindricus, pileo concolor, apicaliter albo-pruinosus, basim versus lanosus vel pervillosus, rhizoidibus albo-distinctis instructus. Odor ingratus. Sporae 10—13 × 6—9 µm, ovoideae, gibbosae. Pseudocystidia numerosa. Hyphae defibulatae. Ad terram in silvis frondosis. India (Sikkim). Typus, ZT, 0159.



Pl. 7. *Rhodocybe villosa* HORAK (type): carpophores, spores, pseudocystidia, caulocystidia

Pileus 15—30 mm, hemispheric to convex with distinct conic to umbonate papilla; pale brown to pale chest nut brown, often with reddish brown tint; tomentose to villous, or velutinous; dry, margin not striate, veil none. Lamellae (L 16—20, —7) crowded, emarginate to adnate; argillaceous to cinnamon; edge paler, even. Stipe 25—45× 2—3 mm, cylindric, equal; concolorous with pileus or paler, apex white from pruina, lanose or villous-hairy towards base, strong white rhizomorphs present; dry, tough, no veil remnants, solid or stuffed, single, in groups. Context soft, concolorous. Taste none. Odour strong, unpleasant.

Spores 10—13×6—9 µm, ellispoid, gibbose, almost hyaline, with pronounced apiculus, inamyloid. Basidia 35—40×9—10 µm, 4-spored. Pseudocystidia numerous, rooting in subhymenium, cylindric or gradually tapering towards apex, occasionally forked or with finger-like projections, membrane thin-walled, yellow-brown (KOH) pigment present. Cuticle a trichoderm or palisade of cylindric hyphae (1.5—3 µm diam.), membrane hyaline, pigment localisation ?. Clamp connections absent. Caulocystidia similar, often with finger-like to forked projections.

Material. — India: Sikkim, Upper Rangit, Zompuk, N of Yoksam, 2100 m, 15. XI. 1979, leg. Horak (ZT, 0159, holotype).

Habitat. — On soil among litter in *Quercus-Castanopsis* forest. — India.

Remarks. — *Rhodocybe villosa* is one of the most oustanding members of the genus (Horak, 1978; 1979b). The large size of the spores in the present species is shared only by *Rh. gibbosa* Horak (1978), originally described from rain forests in Papua New Guinea.

Screening the relevant Indian literature I once assumed that *Ag.* (*Collybia*) *blandulus* Berkeley (1852), reported to have a pruinose-tomentose stipe, could represent the above described *Rhodocybe*. Subsequently Dr. Pegler (Kew) checked for me the Sikkimese type material which, however, demonstrated that *Ag. blandulus* has smooth, hyaline spores measuring 7—8×4.5—5.5 µm.

18. *Phaeocollybia coniuncta* Horak, spec. nov. — Pl. 6, B

Pileus —25 mm, conoideus dein acuto-conicus, luride brunneus, subviscidus. Lamellae adnexae, albidae vel luteolae, aetate ochraceoferrugineo-maculatae. Stipes —140×—5 mm, radicato-fasciculatus, subfusoideus vel gradatim basim versus attenuatus, cereus, aetate castaneus, siccus. Caro cartilaginea. Odor saporque raphanoideus. Sporae 9—10×5—6.5 µm, limoniformes, verrucosae, ferrugineae. Cheilocystidia cylindracea. Hyphae defibulatae. Ad terram in silvis abietinis. India (Sikkim). Typus, ZT, 0162.

Pileus 10—25 mm, conoid at first soon becoming acuto-conic, conic papilla present also in aged carpophores; dirty brown (with yellow tinge), any rust brown colours absent; slightly viscid, minutely

fibrillose, obliquely striate towards margin. Lamellae crowded, adnexed to subfree, ventricose; whitish or yellowish when young, becoming ochre-ferruginous spots; edge concolorous, even. Stipe —140×3—5 mm, fasciculate, rooting, subfusoid or gradually tapering towards base; at first whitish, turning red-brown; dry, hollow, cartilaginous, glabrous, veil remnants none. Context tough-cartilaginous, red-brown in cortex of stipe. Odour and taste raphanoid.

Spores 9—10×5—6.5 µm, limoniform, verrucose, ferruginous, distinct plage absent, germ pore absent. Basidia 30—35×5—7 µm, 4-spored. Cheilocystidia 15—50×2—4 µm, cylindric, inconspicuous. Cuticle an ixoderm composed of gelatinised hyphae (2—8 µm diam.), membranes of hyphae in subcutis encrusted by yellow-brown (KOH) pigment. Clamp connections none.

Material. — India: Sikkim, Upper Rangit, Dzongri, 3750 m, 10. XI. 1979, leg. HORAK (ZT, 0162, holotype).

Habitat. — On soil under *Abies* sp. — India.

Remarks. — This species is the third representative of the genus in the Himalayas (HORAK, 1974). In the field *Ph. coniuncta* could be mistaken for *Ph. spoliata* reported from coniferous forests in Himachal Pradesh. The two taxa, however, are well separated by microscopic characters.

Two further species of *Phaeocollybia* are obviously close allies of *Ph. coniuncta*, viz. *Ph. similis* (BRESADOLA) SINGER (from Yünnan, China) and *Ph. piceae* SMITH & TRAPPE (from Oregon—Washington, USA). For detailed description and illustrations consult HORAK (1977).

19. *Mycena flavominiata* (BERKELEY) SACCARDO 1887 — Pl. 2, C

Syll. Fung. 5: 289

Bas. *Agaricus flavominiatus* BERKELEY 1852: Hooker J. Bot. 4: 103.

Material. — India: Sikkim, No. 26, 1849, leg. HOOKER (K, holotype). — Sikkim, Upper Rangit, Bakhim, 2600 m, 11. XI. 1979, leg. HORAK (ZT, 0165).

Habitat. — On rotten branches and twigs in forests (*Pinus*, *Quercus*). — India.

Description of fresh ("topotypic") material:

Pileus 5—12 mm, hemispheric to convex with conspicuous conic papilla, umbonate; coral red to vermilion, becoming paler with age; dry, striate towards margin, smooth, membranaceous. Lamellae (L 8—12, —3) adnexed to subemarginate, subventricose, narrow; whitish with vermilion tinge; edge albofimbriate, concolorous. Stipe 25—40×0.5—1 mm, cylindric, equal, at base slightly swollen; whitish to pale yellow; dry, smooth, flexous, brittle, solid, base with short white rhizoids or substrigose, single, in groups. Odour and taste not distinctive.

Spores 8.5—10.5×3.5—4 µm, elliptic to subcylindric, hyaline, weakly amyloid, smooth. Basidia 20—30×4—6 µm, 2-spored. Cheilocystidia 35—55×7—13 µm, fusoid with subacute neck, lanceolate, hyaline, thin-walled membrane. Pleuro- and caulocystidia absent. Hyphae of stipe with short irregular projections. Cuticle a cutis of repent, cylindric hyphae (3—5 µm diam.) with short, finger-like projections, pale yellow plasmatic pigment present. Clamp connections absent.

Remarks. — The type collection in K is in poor condition and neither spores nor basidia and cystidia could be found on the material. The detailed macroscopic description of the original specimens, however, leaves no doubt about the identity of the above mentioned collection and the type. *M. flavominiata* (Berk.) resembles macroscopically (vermilion colour of pileus!) *M. acicula* (Fr.) but the microscopic characters indicate its close relationship to *M. adonis* (Fr.).

20. *Laccaria laccata* (Fr.) Berkeley & Broome 1883
Ann. Mag. Nat. Hist. 12: 370

Material. — India: Sikkim, Upper Rangit, Tangshing, 3800 m, 7. XI. 1979, leg. Horak (ZT, 0161).

Habitat. — Among moss in *Abies-Rhododendron* forest, or under pines. — India (Berkeley, 1852), Nepal (Balfour-Browne, 1968); probably cosmopolitan in temperate and frigid zones.

Remarks. — All macroscopic and microscopic characters found on the Himalayan material correspond with those observed on European specimens. The globose spores measure about 7—9 µm diam. and bear slender, conic, up to 1.5 µm long projections.

L. laccata (Fr.) is already reported from Sikkim by Berkeley (1852) and according to Balfour-Browne (1968) its presence is also recorded from the neighbouring Nepal.

21. *Cystoderma amianthinum* (Fr.) Fayod 1889
Hist. Nat. Agar., 351

Material — India: Darjeeling, Tiger Hill, 3200 m, 31. X. 1979, leg. Horak (ZT, 0152).

Habitat. — Among moss and grass in *Quercus* forest. — India, probably world-wide distribution in temperate and frigid zones.

Remarks. — This Indian collection of *C. amianthinum* (Fr.) is characterised by the following features: pileus —30 mm diam., ochre-yellow, radially wrinkled; annulus membranous when young later desintegrating and leaving both appendiculate lumps of veil on the margin of the pileus and several incomplete zones on the upper portion of the stipe; spores 5—6.5×2.5—3 µm, elliptic, hyaline, amyloid; habitat on soil among organic litter in frondose forests dominated by *Quercus* spp.

22. *Panellus serotinus* (Fr.) Kühner 1953

Fl. Anal. Champ. sup., 67

Material. — India: Sikkim, Upper Rangit, 2600 m, 11. XI. 1979, leg. Horak (ZT, 0167).

Habitat. — On rotten wood in *Quercus* forest. — India; Europe, North America (Miller, 1970), Siberia, Japan (Hongo, 1959).

Remarks. — This distinct conchate agaric is widely distributed on hardwoods (rarely also on conifers) in the temperate belt of the northern hemisphere. The present collection from Sikkim was found growing on rotten logs of *Quercus* sp. As in European material the greenish olive colour of the pileus had also the typical purple-lilac tinge. In addition the microscopic features fully agree in all details with those of representative specimens (Miller, 1970).

23. *Pluteus lutescens* (Fr.) Bresadola 1929

Ic. Myc., 544, 1

Material. — India: Sikkim, Upper Rangit, Bakhim, 2650 m, 11. XI. 1979, leg. Horak (ZT, 0166).

Habitat. — On rotting branches and sticks in *Quercus* forest. — India; Europe.

Remarks. — Taking into account the most distinctive characters observed on this species (shape, size and colour of the carpophores) this *Pluteus* readily keys out as *P. lutescens* (Fr.). A thorough comparison of the present collection proved that the Himalayan material is identical both in macroscopic and microscopic details with specimens of European origin.

24. *Pholiotina filaris* (Fr.) Fayod 1889

Prodr. Hist. Nat. Agar., 359

Material. — India: Sikkim, Upper Rangit, Zompuk, N of Yoksam, 2100 m, 5. XI. 1979, leg. Horak (ZT, 0157).

Habitat. — On soil in *Quercus* forest. — India; Europe.

Remarks. — The following annotations unmistakably refer this *Pholiotina* to *Ph. filaris* (Fr.): pileus ochre-brown, striate (if moist only); annulus white, grooved, persistent; spores $9-10\times4.5-5$ µm; cheilocystidia $25-35\times6-10$ µm, fusoid; habitat on soil among litter in frondose forest.

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Addendum:

This contribution was already in print before the following publication came to my attention; my conclusions on Indian species of *Suillus* and *Xeromphalina*, therefore, have to be revised:

Watling, R. & Gregory, N. M. (1980). Larger fungi from Kashmir. — Nova Hedwigia 32: 493—564.