

***Xeromphalina* and *Heimiomyces* in Indomalaya and Australasia**

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Summary. Four new species of *Xeromphalina* (*X. javanica*, *X. melizea*, *X. podocarpi*, *X. testacea*) and four new species of *Heimiomyces* (*H. cespitosus*, *H. flavobrunneus*, *H. fulvus*, *H. vitiosus*) are described from New Zealand, Papua New Guinea and Java (Indonesia). Based upon fresh collections *X. leonina* (MASSEE), *H. neovelutipes* (HONGO) and *H. atrofulvus* (STEVENSON) are interpreted and discussed regarding their taxonomic position. All species are keyed out and illustrations are presented.

Introduction

SINGER (1942) proposed *Heimiomyces* as an independent genus of Agaricales (HORAK 1968) related to *Xeromphalina*. Later (SINGER 1962) *Heimiomyces* lost its generic rank again and is now considered a subgenus of *Xeromphalina*, at present accomodating about two or three different species (SINGER 1975, SINGER & DIGILIO 1952).

In the course of our studies on Australasian and Indomalayan agarics several new taxa belonging both to *Xeromphalina* and *Heimiomyces* have been identified. Based upon this additional information on the macro- and micromorphology and ecology of the species described below I do not hesitate now to reinstall *Heimiomyces* again as an well delimited genus (cp. key and illustrations).

To present knowledge *Xeromphalina* and *Heimiomyces* are undoubtedly related genera and there are several intermediate species linking the two generic units.

Ecology: The area of distribution of *Xeromphalina* and *Heimiomyces* spreads from the tropics to habitats under temperate climatic conditions both in the northern and southern hemisphere. As a rule all known species occur on rotting organic debris (wood, bark, stems, branches, leaf-mould, etc.) and according to their host preference three peculiar ecologic groups can be observed (table 1).

To date the north American species of *Xeromphalina* and *Heimiomyces* are well studied after being monographed twice (SMITH 1953, MILLER 1968). Admittedly there are still obvious gaps in our knowledge regarding European representatives of *Xeromphalina*. This is a fact not only in rather rare species (*X. cornui*) but also in common taxa like *X. caulicinalis* s. l. and *X. fellea* (= *amara*) (cp. MOSER 1978: 187).

Under these circumstances a monographic revision of the European species of both genera is overdue.

From the southern hemisphere *Xeromphalina* and *Heimiomyces* are reported from South America (SINGER & DIGILIO 1952, SINGER 1952, HORAK 1979), Africa (PEGLER 1977), Papua New Guinea (HONGO 1974) and New Zealand (STEVENSON 1964, HORAK 1971).

species	host	tree-fern	monocotylous plants	dicotylous plants
<i>X. testacea</i>		<i>Cyathea</i>	—	—
<i>brunneola</i>		—	<i>Pinus, Larix</i>	—
<i>campanella</i>		—	<i>Picea, (Pinus)</i>	—
<i>caulicinalis</i> s. l.		—	<i>Pinus, Picea, Tsuga, Pseudotsuga, (Larix)</i>	—
<i>cornui</i>		—	<i>Pinus, (Larix)</i>	—
<i>curtipes</i>		—	<i>Chamaecyparis</i>	—
<i>jellea</i> (= <i>amara</i>)		—	<i>Pinus, Cedrus, (Picea)</i>	—
<i>helbergeri</i>		—	<i>Podocarpus</i>	—
<i>orickiana</i>		—	<i>Sequoia</i>	—
<i>podocarp</i>		—	<i>Podocarpus</i>	—
<i>austroandina</i>		—	—	<i>Nothofagus</i>
<i>fraxinophila</i>		—	—	<i>Fraxinus</i>
<i>javanica</i>		—	—	<i>Castanopsis</i>
<i>kauffmannii</i>		—	—	<i>Quercus</i>
<i>leonina</i>		—	—	<i>Nothofagus</i>
<i>melizea</i>		—	—	+
<i>picta</i>		—	—	? <i>Fagus</i>
<i>pumanquensis</i>		—	—	? <i>Nothofagus</i>
<i>H. atrofulvus</i>		—	—	<i>Nothofagus, Weinmannia</i>
<i>cespitosus</i>		—	—	+
<i>flavobrunneus</i>		—	—	+
<i>fulvipes</i>		—	+	<i>Alnus</i>
<i>fulvus</i>		—	—	<i>Anisoptera</i>
<i>neovelutipes</i>		—	—	? <i>Castanopsis</i>
<i>tenuipes</i> s. l.		—	<i>Pinus, Juniperus</i>	<i>Anisoptera, Cassipourea</i>
<i>vitiosus</i>		—	—	<i>Anisoptera</i>

Table 1. Ecologic relationships of *Xeromphalina* spp. and *Heimiomyces* spp. to hostplant(s) or plant associations respectively

Finally an interesting species of *Xeromphalina* has been published from Japan (HONGO 1962).

Acknowledgements

I am indebted to the authorities of the Department of Forests both in New Zealand and Papua New Guinea for providing facilities and the opportunity to work in these countries. My thanks are also expressed to the Swiss Society of Natural Sciences for a travelling grant to Indomalaya and Australasia.

Unless otherwise stated the magnifications of the figures are: carpophores (nat. size), spores ($\times 2000$), basidia and cystidia ($\times 1000$) and cuticle ($\times 500$, vertical section).

Type material is deposited in ZT (Herbarium, Institute for Special Botany, ETHZ, Zürich, Switzerland).

Key to Australasian and Indomalayan species of
Xeromphalina and *Heimiomyces*

1. Lamellae broadly adnate, decurrent or arcuate; centre of pileus always depressed to umbilicate; cheilocystidia (and caulocystidia) fusoid, thin-walled, projections absent 2
- 1*. Lamellae adnexed, adnate or broadly emarginate; centre of pileus conic, papillate or umbonate (rarely depressed in aged specimens); stipe entirely pruinose or velvety; cheilocystidia (and/or caulocystidia) with few to numerous irregular rod-like projections, mostly thick-walled membranes 6

Xeromphalina

2. Pileus and lamellae orange-red to brick red; pileus —7 mm, coarsely fibrillose; stipe —15 $\times$ —0.5 mm, concolorous with pileus; spores 3.5—4.5 $\times$ 2.5—3 μ m; cheilocystidia none; caulocystidia clavate; on rotten trunk of *Cyathea* sp. New Zealand 1. *X. testacea*
- 2*. Pileus and lamellae yellow, yellow-brown, honey brown; cheilocystidia fusoid to lageniform, thin-walled 3
3. Base of stipe (in mature specimens) red-brown 4
- 3*. Base of stipe not red-brown, stipe equally coloured, apex of stipe pruinose 5
4. Spores 3—4 $\times$ 1.5—2 μ m; pileus —8 mm; stipe —12 $\times$ —1 mm, often eccentric, entirely pruinose; cheilocystidia 20—35 $\times$ 6—10 μ m; cuticular hyphae with distinct subfusoid to clavate terminal cells; on rotten wood of conifers (*Podocarpus* sp.). New Zealand 2. *X. podocarp*i
- 4*. Spores 5.5—7 $\times$ 4—5 μ m; pileus —10 mm; stipe —15 $\times$ —1 mm, central; cheilocystidia 20—60 $\times$ 8—15 μ m; cuticular hyphae devoid of distinct terminal cells; on rotten wood of broadleaved trees. New Zealand, Papua New Guinea, England (adventitious!) 3. *X. leonina*
5. Pileus —15 mm, smooth; stipe —15 $\times$ —1 mm, central; dried specimens turning black; spores 3.5—4.5 $\times$ 2.5 μ m; cheilocystidia 35—55 $\times$ 10—16 μ m; on rotten wood of broad-leaved trees (*Castanopsis* sp.). Indonesia (Java) 4. *X. javanica*
- 5*. Pileus —15 mm, radially fibrillose; stipe —8 $\times$ 1.5 mm, relatively robust, usually eccentric; spores 4—4.5 $\times$ 2—2.5 μ m;

cheilocystidia $30-65 \times 12-23 \mu\text{m}$; on rotten wood of broad-leaved trees. Papua New Guinea 5. *X. melizea*

Heimiomyces

- 6 (1*). Cuticle a celluloderm of globose to clavate, thick-walled, encrusted cells; cheilocystidia thin-walled; stipe often attenuated towards base; context tough but not gelatinous. 7
- 6*. Cuticle a cutis, trichoderm or palisade, terminal cells of cuticular hyphae distinctly cystidioid; stipe equal or attenuated towards base, rarely cespitose; context gelatinous. 8
7. Pileus —15 mm, convex to plane or subdepressed, centre papillate to conic, orange-brown to reddish yellow, glabrous; stipe — 18×0.5 mm, slender, rust brown, pale yellow at apex, single; spores $4-4.5 \times 2.5-3 \mu\text{m}$, ovoid; on rotten wood in broad-leaved forest. Papua New Guinea 6. *H. fulvus*
- 7*. Pileus —35 mm, convex to campanulate, centre umbonate, orange-brown, yellow towards strongly striate margin, centre conspicuously venose or wrinkled; stipe — 50×4 mm, rather robust, orange, orange-brown at base, cespitose; spores $4.5-6 \times 2-3 \mu\text{m}$, subcylindric; on rotten wood. Papua New Guinea 7. *H. cespitosus*
8. Carpophores small, fragile; cuticle a cutis, cystidioid terminal cells clavate to diverticulate; spores smaller $7 \mu\text{m}$ 9
- 8*. Carpophores medium-sized, robust; cuticle a trichoderm or palisade, cylindric terminal cells thick-walled, occasionally branched at apex; cheilocystidia (and caulocystidia) conspicuously branched; spores larger $7 \mu\text{m}$, ellipsoid to subcylindric (rarely suballantoid) 10
9. Pileus —18 mm, convex to plane, papillate, golden yellow to orange-brown, sometimes wrinkled at disc; stipe — 35×1 mm, orange to ochraceous, ochre basal tomentum fibrillose to strigose; spores $4-6 \times 2.5-3 \mu\text{m}$, elliptic to subcylindric; cheilocystidia thin-walled, fusoid, rarely with short irregular projection(s); subcuticular hyphae thin-walled; on rotting debris in broad-leaved forests. Papua New Guinea 8. *H. flavobrunneus*
- 9*. Pileus —20 mm, convex to plane, obtusely umbonate, golden yellow, smooth; stipe — 20×1 mm, yellow, base brown, strigose hairs absent; spores $3.5-4 \times 2.5 \mu\text{m}$, ovoid; cheilocystidia branched by numerous irregular projections, thick-walled; subcuticular hyphae thick-walled, strongly refractive; on rotten wood. Papua New Guinea 9. *H. vitiosus*
10. Pileus —50 mm, distinctly obtuse-umbonate or campanulate, strongly striate, yellow-brown to rust orange, minutely

velvety; stipe —40 (90)×—4 (6) mm, cylindric or attenuated towards base, yellow-brown, velvety; spores 7—8 (9)×3.5—4 (5) μ m; on rotten wood. Papua New Guinea, New Zealand (?)

- 10. *H. neovelutipes*
 10*. Pileus —20 mm, convex soon becoming plane or subdepressed at centre, margin not striate, dark red-brown, strongly velvety, with distinct yellow hoary tomentum; stipe —35×—3 mm, cylindric, yellow-brown, strongly velvety; spores 7—10×4—5 μ m; on rotten wood and on soil. New Zealand.....
 11. *H. atrofulvus*

XEROMPHALINA KÜHNER & MAIRE 1934

ap. KONRAD & MAUBLANC, Icon. Sel. fung. 236

Type species: *Agaricus campanella* FRIES 1821: Syst. Myc. 1: 166

1. *Xeromphalina testacea* HORAK sp. n.

Fig. 1

Pileus —7 mm, ex hemisphaerico convexus dein subumbilicatus, auranti-rufus vel testaceus, innatè fibrillosus. Lamellae decurrentes, pileo concolores. Stipes —12×—1 mm, cylindricus, testaceus, apicaliter pruinosis. Sporae 3.5—4.5×2.5—3 μ m, ovoideae, vix amyloideae. Ad truncos putridos Cyatheae. Nova Zelandia. Typus PDD, 27153.

Pileus —7 mm, hemispheric or convex when young, centre becoming depressed or subumbilicate with age; pale orange-red or deep

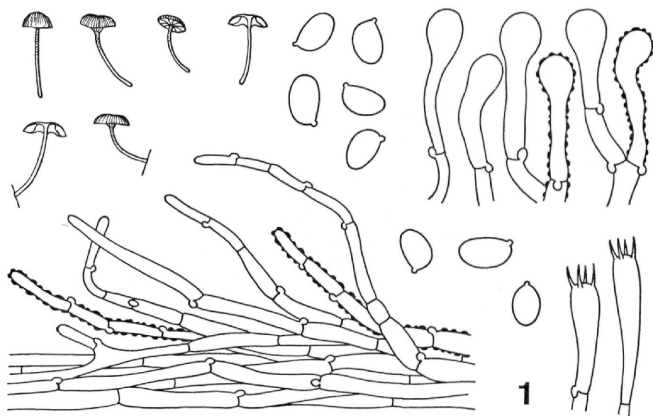


Fig. 1. *Xeromphalina testacea* HORAK (type): carpophores, spores, basidia, caulocystidia, cuticle

brick-red; dry, membranaceous, coarsely innate-fibrillose (reminds of *Crinipellis* sp.), margin not striate, not hygrophanous. Lamellae (L 6—8, —1), rather distant, broadly adnate to decurrent arcuate in old specimens, sometimes ventricose; concolorous with pileus, edge not fimbriate. Stipe —12×—1 mm, cylindric, equal or tapering downwards, central; concolorous with pileus; apex pruinose, appressed-fibrillose towards base, dry, tough, solid, single in groups. Context orange to brick red, tough. Odour and taste not distinctive. Chemical reactions on pileus: KOH — yellow. Spore print white.

Spores 3.5—4.5×2.5—3 µm, ovate, smooth, hyaline, indistinctly amyloid (dextrinoid in young spores). Basidia 16—25×5 µm, 4-spored. Cheilo- and pleurocystidia none. Caulocystidia 15—25×6 µm, club-shaped, membrane thin-walled, encrusted with conspicuous yellow (KOH) pigment. Cuticle a cutis of repent, cylindric, bundled hyphae (4—10 µm diam.), membranes thin-walled, not gelatinized, encrusted with yellow to orange pigment (KOH). Clamp connections on septa.

Habitat. — On rotting trunk of *Cyathea* sp. — New Zealand.

Material. — NEW ZEALAND: Coromandel Peninsula, Kirikiri Valley, 10. VII. 1968, leg. HORAK (PDD, 27153, holotype; ZT, 68/663, isotype).

A number of characters are distinctive for this species: brick red colour of the carpophores, lack of cheilocystidia and habitat on rotting trunk of ferns.

2. *Xeromphalina podocarp* HORAK sp. n.

Fig. 2

Pileus —8 mm, ex hemisphaericus convexus dein depresso-umbilicatus, ochraceus vel melleus. Lamellae decurrentes, ochraceae. Stipes —12×—1 mm, excentricus vel sublateralis, cylindricus, ochraceus basim versus refescens. Sporae 3—4×1.5—2 µm, ellipticae, amyloideae. Ad lignum putridum Podocarpi. Nova Zelandia. Typus PDD, 27154.

Pileus —8 mm, hemispheric or convex becoming expanded, always with defined eccentric umbilicus; ochraceous to yellow-brown, paler towards striate margin; smooth, dry, membranaceous. Lamellae (L 8—10, —3) moderately crowded, decurrent; ochraceous-yellow, edge concolorous, even. Stipe —12×—1 mm, eccentric or sublateral, cylindric, sometimes tapering towards base; ochraceous to orange, brown, base reddish brown; pruinose at apex, rhizomorphs absent, dry, tough, single or gregarious in dense groups. Odour none, taste bitterish. Context tough, pale yellow. Chemical reactions on pileus: KOH — brown. Spore print white.

Spores 3—4×1.5—2 µm, elliptic, hyaline, smooth, amyloid. Basidia 15—18×3—5 µm, 4-spored. Cheilocystidia 20—35×6—10 µm, fusoid or lageniform, membranes hyaline, smooth, thin-

walled. Pleurocystidia none. Caulocystidia like cheilocystidia. Cuticle a cutis or trichoderm of repent cylindric hyphae (4–8 μ m diam.), membranes not gelatinized, terminal cells subclavate with thickened, brown (membranous and encrusting pigment) membranes. Clamp connections numerous.

Habitat. — On rotten conifer wood (*Podocarpus dacrydioides*). — New Zealand.

Material. — NEW ZEALAND: Westcoast, Ahaura, 14. III. 1968, leg. Horak (PDD, 27154, holotype; ZT, 68/157, isotype).

Due to the yellow-brown colour of the carpophores *X. podocarpi*

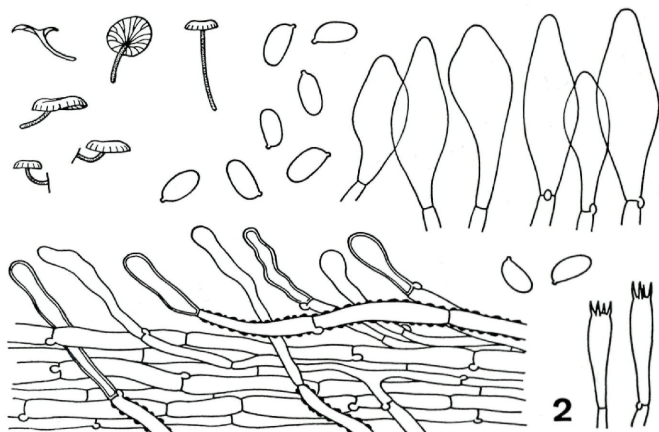


Fig. 2. *Xeromphalina podocarpi* HORAK (type): carpophores, spores, basidia, cheilocystidia, cuticle

can be mistaken for *X. leonina* (MASSEE) which also occurs in New Zealand. The former species, however, is well characterised by its eccentric stipe, smaller spores and its habitat on conifers.

3. *Xeromphalina leonina* (MASSEE) HORAK comb. nov.

Bas. *Omphalia leonina* MASSEE 1898: Trans. Proc. N. Zeal. Inst. 31: 317. Syn. *Xeromphalina racemosa* STEVENSON & TAYLOR 1964: Kew Bull. 19: 57. Illustrations: STEVENSON (1964: l. c.); Fig. 3.

Description of fresh material collected in New Zealand:

Pileus —10 mm, hemispheric or convex later becoming plano-convex or depressed and finally umbilicate at centre; yellow-brown

to pale yellow-brown or cinnamon, paler towards striate incurved margin; hygrophane, smooth, dry, tough, membranaceous. Lamellae (L 6—12, —3) crowded, broadly adnate or arcuate-decurrent; concolorous with pileus or paler, occasionally forked

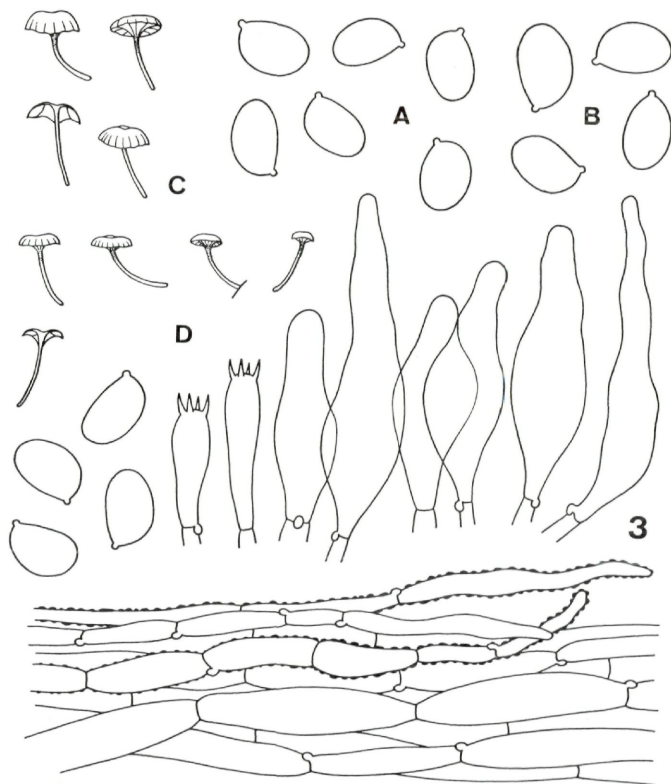


Fig. 3. *Xeromphalina leonina* (MASSEE) HORAK: A. spores (type); B. spores (type of *X. racemosa* STEV. & TAYLOR); C. carpophores (ZT, 68/41); D. carpophores, spores, basidia, cheilocystidia, cuticle (ZT, 68/204)

towards margin of pileus, edge even. Stipe —15×—1 mm, cylindric or tapering towards base, central; pale yellow-brown above, reddish brown towards base, sometimes with concolorous strigose hairs and/or dark brown rhizomorphs at base; apex pruinose, smooth below, dry,

tough, fistulose, single or cespitose in dense groups. Odour and taste not distinctive. Context pale yellow. Chemical reactions on pileus: KOH — brown.

Spores (5) $5.5-7 \times 4-5 \mu\text{m}$, ovate, smooth, hyaline, amyloid. Basidia $20-30 \times 5-7 \mu\text{m}$, 4-spored. Cheilocystidia $20-60 \times 8-15 \mu\text{m}$, fusoid or lageniform, membranes hyaline, thin-walled. Pleurocystidia absent. Caulocystidia like cheilocystidia or clavate, walls with red-brown (KOH) membranous and encrusting pigment. Cuticle a cutis of repent, cylindric or subfusoid hyphae ($4-8 \mu\text{m}$ diam.) membranes thin-walled, not gelatinized, encrusted with yellow-brown pigment. Clamp connections present.

Habitat. — On rotten wood of broad-leaved trees (e. g. *Nothofagus* sp. in New Zealand). — New Zealand, Papua New Guinea, England (type specimens adventitious on imported wood from New Zealand, Botanical Gardens, Kew).

Material. — ENGLAND: Kew, Botanical Gardens, on wood along with *Hymenophyllum* from New Zealand, IV. 1898, leg. MASSEE (K, holotype). — NEW ZEALAND: N. Zealand, on logs in woods, leg. COLENSO b 138 (K, as "*Ag. (Omphalia) epichysium* PERS."). — Wellington, Butterfly, 8. IV. 1961, leg. TAYLOR 74 (K, holotype of *X. racemosa* STEV. & TAYLOR). — Westcoast, Ahaura, Kopara, Nelson Creek, 18. I. 1968, leg. HORAK (ZT 68/41). — Westcoast, Ahaura, 21. III. 1968, leg. HORAK (ZT 68/204). — PAPUA NEW GUINEA: Morobe district, Bulolo, Taun Creek, 10. XI. 1971, leg. HORAK (ZT 71/273).

W. COLENSO was the first who came across *X. leonina* (MASSEE). He collected this small agaric in New Zealand and the specimen was sent to Kew Herbarium labelled as "*Omphalia epichysium* PERS." (cp. material examined). Unaware of this misidentified record MASSEE (1898: l. c.), a few years later, observed the same species in a greenhouse at Kew Botanical Garden where *X. leonina* (MASSEE) was found growing on wood imported from New Zealand. The "natural" area of distribution of this fungus, a common species on rotting logs (mostly *Nothofagus* spp.) in New Zealand, is not restricted to this region alone since (at least once) it was also recorded in Papua New Guinea.

The rather large ovate spores are the most significant feature of this species.

4. *Xeromphalina javanica* HORAK sp. n.

Fig. 4

Pileus — 15 mm, convexus dein expando-umbilicatus, melleus vel ochraceo-brunneus. Lamellae arcuato-decurrentes, pallide luteo-ochraceae, distantes. Stipes — $15 \times -1 \text{ mm}$, centralis, cylindricus, pileo concolor. Sporae $3.5-4.5 \times 2.5 \mu\text{m}$, ellipticae, amyloideae. Ad lignum putridum Castanopsidis. Indonesia (Java). Typus ZT, 77/202.

Pileus —15 mm, convex when young, centre soon depressed to umbilicate; yellow-brown, paler towards the expanded, striate margin; tough, membranaceous, dry, smooth. Lamellae (L 6—8, —3), rather distant, arcuate-decurrent; pale yellow-ochre, edge even, concolorous. Stipe —15×—1 mm, cylindric, central, equal, often curved; concolorous with pileus; smooth except pruinose apex, dry, tough, solid, rhizomorphs absent, single and cespitose, in groups. Odour and taste

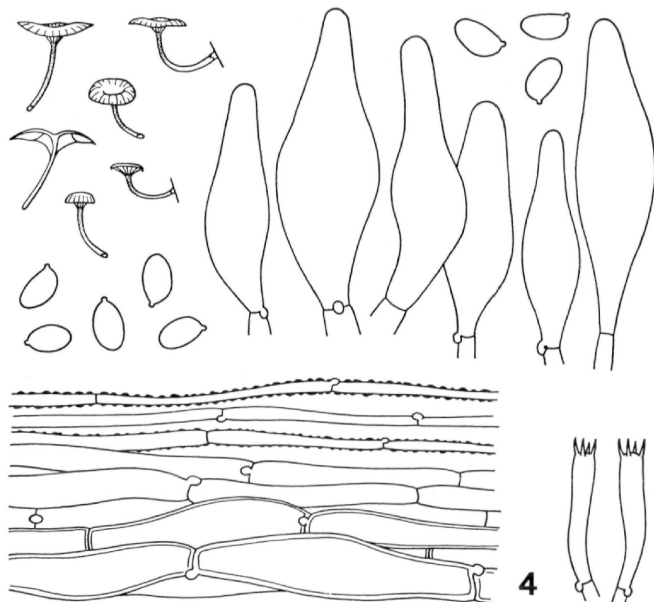


Fig. 4. *Xeromphalina javanica* HORAK (type): carpophores, spores, basidia, cheilocystidia, cuticle

not distinctive. Context pale yellow-brown. Chemical reactions unknown.

Spores $3.5-4.5 \times 2.5 \mu\text{m}$, ovate to elliptic, smooth, hyaline, amyloid. Basidia $18-24 \times 4 \mu\text{m}$, 4-spored. Cheilocystidia $35-55 \times 10-16 \mu\text{m}$, lageniform to fusoid, membranes hyaline, thin-walled. Pleurocystidia none. Caulocystidia $25-40 \times 12-16 \mu\text{m}$, clavate to broadly fusoid, thin-walled, hyaline or yellow-brown. Cuticle a cutis of cylindric hyphae ($3-5 \mu\text{m}$ diam. in epicutis, $-20 \mu\text{m}$ diam. in subcutis), membranes not gelatinized, slightly thick-walled on sub-

cuticular hyphae, encrusted with yellow-brown (KOH) pigment. Clamp connections numerous.

Habitat. — On rotten wood of *Castanopsis* sp. — Indonesia (Java).

Material. — INDONESIA (Java): Bogor, Tjibodas, 1860 m, 16. III. 1977, leg. HORAK (ZT, 77/202, holotype).

This elegant species is distinguished by the yellow-brown carpophores whose colour turns black with age or after drying. Furthermore the small and narrow spores and the absence of cystidioid terminal cells on the cuticular hyphae are notable features for its separation from related taxa.

5. *Xeromphalina melizea* HORAK sp. n.

Fig. 5

Pileus —15 mm, convex dein umbilicatus, melleus, innatofibrillosus. Lamellae adnato-decurrentes, pallide luteoargillaceae. Stipes —8×—1.5 mm, cylindricus, centralis vel excentricus, pileo concolor. Sporae 4—5.5×2—2.5 μm, ellipticae, amyloideae. Ad lignum putridum. Nova Guinea. Typus ZT, 72/152.

Pileus —15 mm, convex when young soon becoming plane with depressed centre, finally conspicuously umbilicate; ochre-brown to honey brown, paler towards striate margin; dry, minutely fibrillose, membranaceous, vaguely hygrophanous. Lamellae distant, decurrent to arcuate; pale yellow-argillaceous turning pale yellow-brown, edge even, concolorous. Stipe —8×—1.5 mm, central when young becoming eccentric with age, cylindric, often tapering towards base; concolorous with pileus, base often orange-brown; tough, dry, apex, pruinose, smooth towards base, solid, rhizomorphs absent, single (and caespitose) in groups. Odour and taste not distinctive. Context yellow-brown. Chemical reactions unknown. Spore print white.

Spores 4—5.5×2—2.5 μm, elliptic, smooth, hyaline, amyloid. Basidia 18—22×4—5 μm, 4-spored. Cheilocystidia 30—65×12—23 μm, broadly fusoid, membranes hyaline or pale brown, pleurocystidia of similar size and shape. Caulocystidia 30—60×15—23 μm, clavate, membranes (especially near apex) up to 1 μm diam., reddish brown in KOH. Cuticle a cutis (or trichoderm) of large, fusoid or ventricose hyphae (20—35 μm diam.), membranes not gelatinized, encrusted with brown pigment. Clamp connections present.

Habitat. — On rotten wood in broad-leaved forest. — Papua New Guinea.

Material. — PAPUA NEW GUINEA: Morobe district, Wau, Mt. Kaindi, 1850 m, 17. II. 1972, leg. HORAK (ZT, 72/152, holotype).

The rather robust habit of *X. melizea* strongly reminds of the Japanese *X. curtipes* HONGO (1962). After examining type material (kindly presented by T. HONGO) the two species, however, can be

separated readily by microscopic characters such as shape and size of the spores and cheilocystidia respectively.

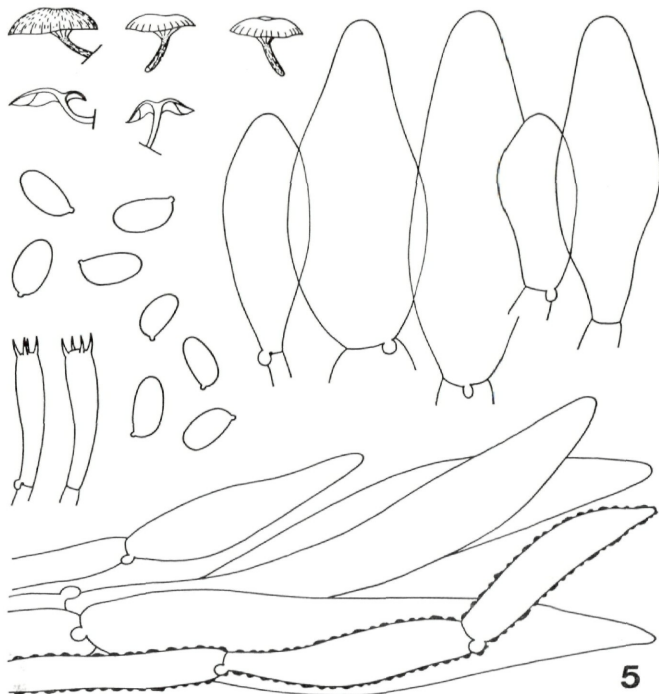


Fig. 5. *Xeromphalina melizea* HORAK (type): carpophores, spores, basidia, cheilocystidia, cuticle

HEIMIOMYCES SINGER 1942

Lloydia 5: 127

Type species: *Agaricus rheicolor* BERKELEY 1839: Ann. Mag. Nat. Hist. 3: 376

6. *Heimiomyces fulvus* HORAK sp. n.

Fig. 6

Pileus —15 mm, convexus vel planus, distincte papillato-umbonatus, luteus vel vulpinus, glabrus. Lamellae adnato-adnexae, luteae. Stipes —18 × 0.5 mm, cylindricus vel subattenuatus, apicaliter luteus deorsum ferrugineus, pruinosis. Sporae 4—4.5 × 2.5—3 μm, ovatae, amyloideae. Cheilocystidia

coralloideoramificata. Cuticula e cellulis subglobosis. Ad lignum putridum. Nova Guinea. Typus ZT, 72/517.

Pileus —15 mm, convex to plane, subdepressed with age, always with distinct conic to papillate umbo; yellow to ochre-orange or pale rust brown-yellow; dry, striate margin, tough, smooth, hygrophanous. Lamellae (L 10—14, —7, sometimes up to 15), crowded, adnexed to adnate, never decurrent, narrow; pale yellow, edge concolorous, subfimbriate. Stipe —18×0.5 mm, cylindric or gradually tapering towards base, central; rust brown with yellow apex; minutely pruinose all over, dry, cartilaginous, solid, single in groups. Odour and taste not distinctive. Context yellow-brown. Chemical reactions on pileus: KOH — dark brown.

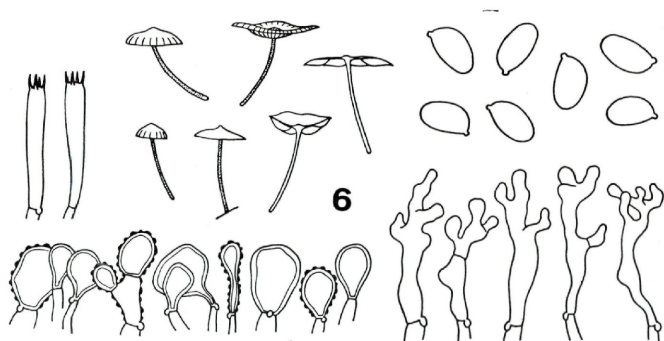


Fig. 6. *Heimomyces fulvus* HORÁK (type): carpophores, spores, basidia, cheilocystidia, cuticle

Spores 4—4.5×2.5—3 μ m, ovate, smooth, hyaline, amyloid. Basidia 18—22×3 μ m, 4-spored. Cheilocystidia 20—35×4—6 μ m, with rod- or finger-like, irregular projections (reminds of *Marasmiellus* sp.), hyaline, membrane thin-walled. Pleurocystidia absent. Caulocystidia like cheilocystidia but larger and membranes conspicuously thick-walled, red-brown. Cuticle a celluloderm of clavate, subglobose or clavate cells (10—25×6—20 μ m), membranes thick-walled, not gelatinized, strongly encrusted with rust brown (KOH) pigment, hyphae of subcutis thick-walled. Clamp connections present.

Habitat. — On rotten wood in broad-leaved forests dominated by *Anisoptera polyandra* (Dipterocarpaceae). — Papua New Guinea.

Material. — PAPUA NEW GUINEA: Morobe district, Markham Valley, Oomsis, 150 m, 13. VII. 1972, leg. HORÁK (ZT, 72/517, holotype).

Among all known species of *Heimomyces* this fungus has the most

delicate carpophores. In addition *H. fulvus* (recorded once on rotting wood of dipterocarpous trees in Papua New Guinea) is distinctly characterised by the globose to clavate cells of its pileal cuticle.

7. *Heimiomyces cespitosus* HORAK sp. n.

Fig. 7

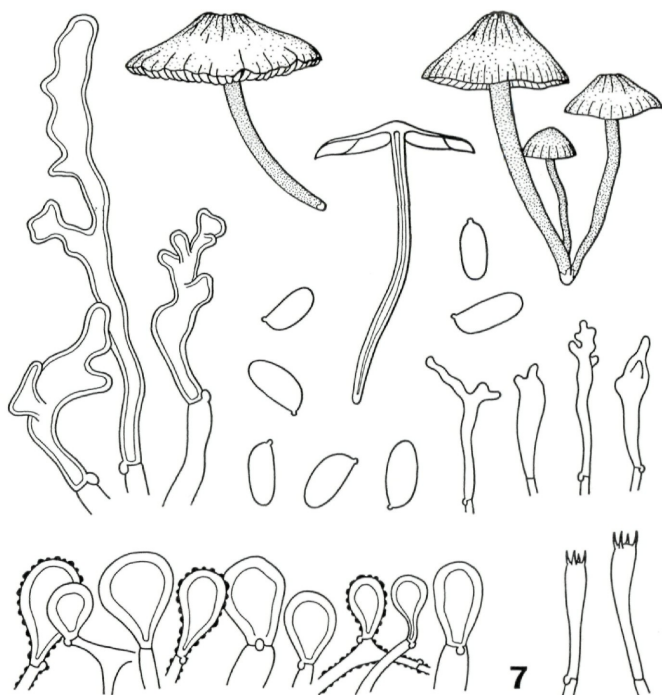


Fig. 7. *Heimiomyces cespitosus* HORAK (type): carpophores, spores, basidia, cheilocystidia, caulocystidia, cuticle ($\times 1000$)

Pileus —35 mm, convexus dein umbonato-campanulatus, aurantio-brunneus, conspicue striatus, venosus. Lamellae adnexae, aurantioluteae. Stipes —50 $\times$ —4 mm, cespitosus, basim versus attenuatus, aurantiobrunneus. Sporae 4.5—6 $\times$ 2—3 μ m, subcylindricae. Cuticula e cellulis clavato-globosis. Ad lignum putridum. Nova Guinea. Typus ZT, 71/274.

Pileus —35 mm, hemispheric or convex when young becoming umbonate or campanulate with obtuse centre; orange-brown, orange-

yellow or yellow towards the strongly striate margin; dry, disc covered with conspicuous veins and wrinkles, smooth or granulose towards margin. Lamellae (L 8—12, —3) moderately crowded, adnexed to adnate, rather narrow, interstices often intervenose especially near margin; pale apricot turning orange-yellow with age, edge smooth, concolorous. Stipe —50×—4 mm, tapering towards base, central, in dense clusters or cespitose; apical portion orange-yellow, brown towards base, with yellow hoary tomentum; velvety, dry, fistulose, often compressed, tough, elastic. Context yellow-brown, not gelatinous. Odour and taste not distinctive. Spore print white.

Spores 4.5—6×2—3 μ m, subcylindric, membrane thin-walled, smooth, amyloid, germ pore none. Basidia 16—22×5 μ m, 4-spored. Cheilocystidia 15—30×2—5 μ m, fusoid, with few irregular rod-like projections, scattered, hyaline. Pleurocystidia absent. Caulocystidia irregularly branched, membrane thick-walled, hyaline-yellowish or rust brown (KOH). Cuticle a celluloderm of globose to clavate, thick-walled cells (5—15 μ m diam.), strongly encrusted with rust brown (KOH) pigment, membrane not gelatinized. Clamp connections present.

Habitat. — On rotten wood in broad-leaved forest. — Papua New Guinea.

Material. — PAPUA NEW GUINEA: Morobe District, Bulolo, Taun Creek (1300 m), 10. XI. 1971, leg. HORAK (ZT, 71/274, holotype).

Due to the clustered, yellow-brown carpophores and the occurrence on rotten wood *H. cespitosus* is masquerading successfully *Flammulina velutipes* (CURT. ex FR.) SINGER. Like the preceding species this remarkable agaric is characterised not only by the peculiar cuticular structure but also by the subcylindric spores and the scattered rarely branched cheilocystidia.

8. *Heimiomyces flavobrunneus* HORAK sp. n.

Fig. 8

Pileus —18 mm, convexus vel planus, umbone distincta instructus, aureus vel aurantiobrunneus, velutinus, subvenosus. Lamellae adnatae vel subdecurrentes, luteobrunneae. Stipes —35×—1 mm, cylindricus, centralis, pileo concolor, pruinoso-velutinus. Sporae 4—6×2.5—3 μ m, ellipticae, amyloideae. Ad frustula putrida in silvis frondosis. Nova Guinea. Typus ZT, 71/384.

Pileus —18 mm, convex or hemispheric with pronounced conic or umbonate papilla, becoming expanded with depressed centre; yellow-brown or orange-brown; distinctly velutinous to pruinose all over, often with radially arranged wrinkles around disc; dry, membranaceous, tough, margin not striate, vaguely hygrophanous. Lamellae (L 10—14, —3) crowded, broadly adnate to subdecurrent with short tooth; yellow-brown, edge concolorous, even; often anastomosing, especially towards the margin of the pileus. Stipe —35×

—1 mm, cylindric, equal, central; brown to orange-ochre; base with conspicuous, ochre, fibrillose to strigose hairs, pruinose over whole length; dry, solid, cartilaginous, single to cespitose, in groups. Context tough, orange-brown. Odour and taste not distinctive. Chemical reactions unknown. Spore print white.

Spores $4-6 \times 2.5-3 \mu\text{m}$, ellipsoid to subcylindric, hyaline, smooth, amyloid. Basidia $20-28 \times 3-4 \mu\text{m}$, 4-spored. Cheilo-

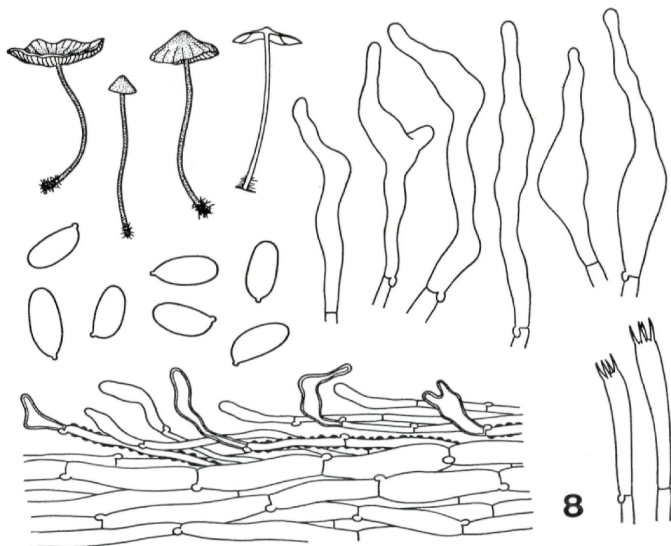


Fig. 8. *Heimiomycetes flavobrunneus* HORAK (type): carpophores, spores, basidia, cheilocystidia, cuticle

cystidia $30-55 \times 4-7 \mu\text{m}$, cylindric to fusoid, sometimes with few rod-like projections, membranes thin-walled, hyaline, forming dense seam on lamellar edge. Pleurocystidia absent. Caulocystidia $20-60 \times 7-16 \mu\text{m}$, clavate to fusoid, polymorphous, membrane thick-walled, pale red-brown in KOH. Cuticle a cutis of cylindric hyphae ($4-7 \mu\text{m}$ diam.), conspicuous terminal cells with thick-walled membranes, clavate to fusoid, occasionally with blunt, short projections, strongly encrusted with red-brown (KOH) pigment, membranes not gelatinized, thin-walled. Clamp connections present.

Habitat. — On rotting organic debris (leaves, branches, fruit shells) in broad-leaved rain forest. — Papua New Guinea.

Material. — PAPUA NEW GUINEA: Eastern Highlands, Goroka, Mt. Michael, Frigano, 2400 m, 6. XII. 1971, leg. HORAK (ZT, 71/384, holotype).

Habit and colour of this montane species are reminiscent of *H. fulvus* HK. (cp. no. 6) which in Papua New Guinea, however, is encountered only in lowland rain forests. Microscopically *H. flavo-brunneus* is also remarkable due to the conspicuous cystidioid terminal cells on the cuticular hyphae and the rare (if any) rod-like projections both on cheilocystidia and caulocystidia.

9. *Heimiomyces vitiosus* HORAK sp. n.

Fig. 9

Pileus —20 mm, convexus dein planus, umbonatus, aureus, glabrus. Lamellae adnato-adnexae vel submarginatae, aureae. Stipes —20 × —1 mm, cylindricus, aureus, brunneus basim versus, velutinus. Sporae 3.5—4 × 2.5 µm, ovoideae. Ad lignum putridum. Nova Guinea. Typus ZT, 72/554.

Pileus —20 mm, hemispheric when young becoming broadly campanulate or obtusely umbonate, subconcave with depressed centre in aged specimens; golden yellow; dry, smooth, strongly striate and hygrophanous. Lamellae (L 10—16, —5) crowded, adnate to adnexed, also emarginate in mature specimens, rather narrow; golden yellow, edge concolorous or paler, fimbriate. Stipe —20 × —1 mm, cylindric, equal, central; yellow, brown towards base but with distinct yellow hoar; dry, entirely velvety or pruinose, rhizoids absent, fistulose, tough, single in groups. Context yellow. Odour and taste not distinctive. Spore print white.

Spores 3.5—4 × 2.5 µm, ovoid, membrane smooth, thin-walled, amyloid, hyaline. Basidia 22—25 × 5—6 µm, 4-spored. Cheilocystidia 18—30 × 3—7 µm, with rod-like projections, membrane thick-walled, hyaline. Pleurocystidia none. Caulocystidia conspicuously branched with irregular rod-like projections, membrane thick-walled, hyaline to orange-brown (in KOH). Cuticle a cutis of cylindric hyphae (2—4 µm diam.), terminal cells with few antler-like projections, membranes not gelatinized, thin-walled, strongly encrusted with rust brown (KOH) pigment, hyphae of subcutis subregular, membranes very thick-walled, hyaline, strongly refractive. Clamp connections present.

Habitat. — On rotten wood in forests, dominated by *Anisoptera polyandra* (Dipterocarpaceae). — Papua New Guinea.

Material. — PAPUA NEW GUINEA: Morobe District, Oomsis, 26. VIII. 1972, leg. HORAK (ZT, 72/554, holotype).

H. vitiosus (also growing on rotten wood of *Anisoptera polyandra* in Papua New Guinea) has close affinities to *H. tenuipes* (SCHWEINITZ) SINGER and related taxa (for list of synonyms cp. PEGLER 1977). This

assumption is supported by the following morphologic features: adnate to emarginate (in aged specimens even subdecurrent) lamellae and the conspicuous, thick-walled, strongly refractive (KOH) hyphae in the subcuticular layers of the pileus.

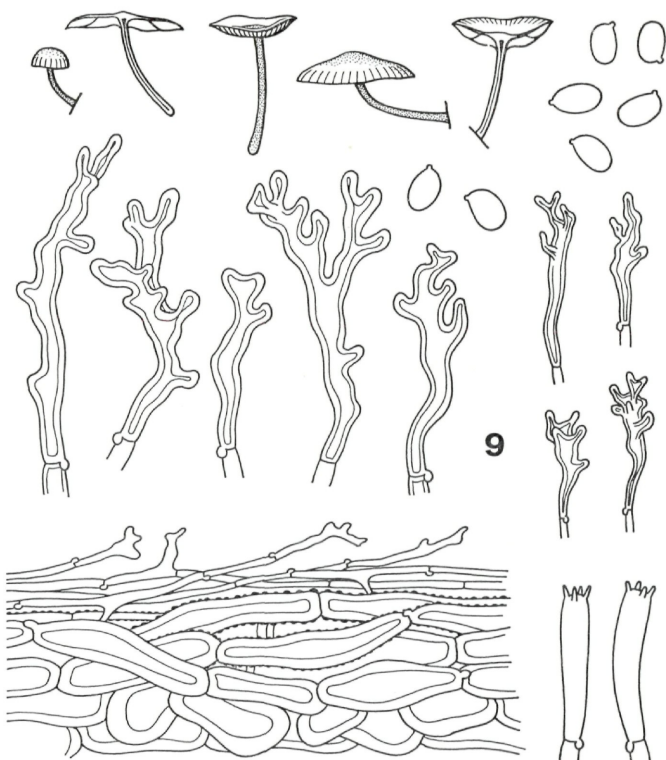


Fig. 9. *Heimiomycetes vitiosus* HORAK (type): carpophores, spores, basidia, cheilocystidia, caulocystidia, cuticle

10. *Heimiomycetes neovelutipes* (HONGO) HORAK comb. nov.

Bas. *Collybia neovelutipes* HONGO 1974: Rept. Tottori Mycol. Inst. (Japan) 11: 33.

Syn. *Xeromphalina tenuipes* (SCHWEINITZ) SMITH ss. HONGO 1976: Rept. Tottori Mycol. Inst. (Japan) 14: 103.

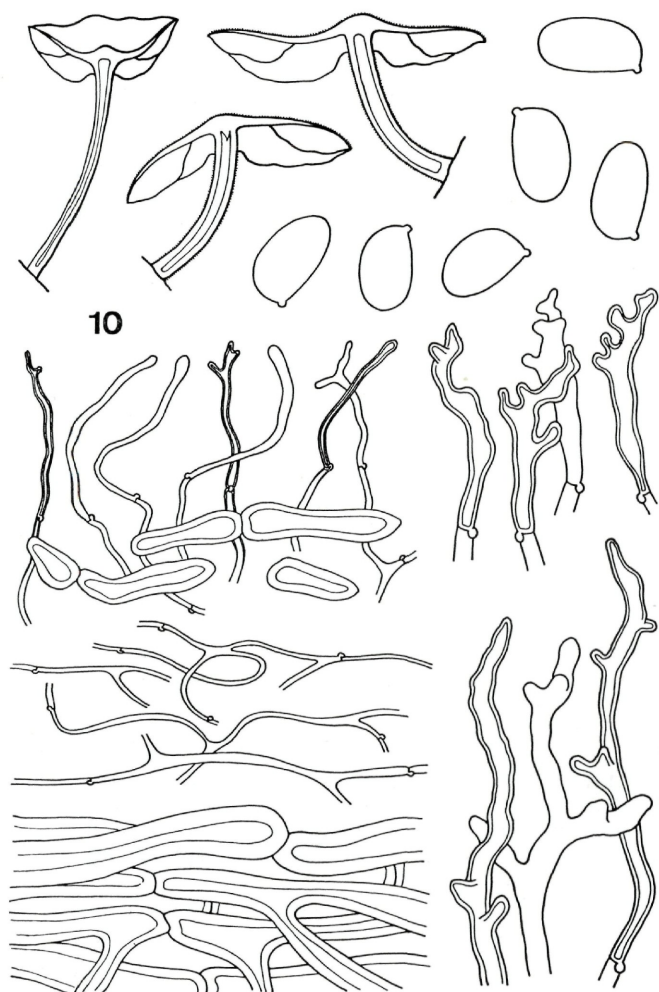


Fig. 10. *Heimiomycetes neovelutipes* (HONGO) HORÁK (ZT, 71/172): carpophores, spores, cheilocystidia, caulocystidia, cuticle

?*Crinipellis velutipes* STEVENSON 1964: Kew Bull. 19: 45 (type material sterile, cp. HORAK 1971: 459).

Illustrations: HONGO (1974: l. c.); STEVENSON (1964: l. c.); Fig. 10.

Description of personal collections from Papua New Guinea:

Pileus —50 mm, convex, plane or concave with broad obtuse umbo, campanulate; yellow-brown at disc, yellow towards strongly striate margin; dry, smooth to granulose becoming minutely velvety, strongly hygrophanous. Lamellae (L 8—10, —3) rather distant emarginate, subdecurrent with tooth, ventricose, up to 10 mm wide, often intervenose; yellow, with reddish brown tint in mature specimens, edge concolorous, even. Stipe —40×—4 mm, cylindric, equal, central; yellow-brown; dry, entirely pruinose to velvety, hollow, tough, veil remnants absent, single in groups. Context gelatinous. Odour and taste acidulous. Spore print white.

Spores 7—8 (9)×3.5—4 (5) μ m, elliptic, smooth, hyaline, amyloid, thin-walled. Basidia 25—35×5—6 μ m, 4-spored. Cheilocystidia 25—40×3—6 μ m, branched with irregular, rod-like projections, membranes hyaline, thick-walled. Pleurocystidia none. Caulocystidia irregularly branched near tips, membranes thick-walled, yellow-brown or rust brown (KOH). Cuticle a trichoderm or palisade of fasciculate, projecting, cylindric or clavate terminal cells (pilocystidia), apically with short antler-like projections, membranes thick-walled, hyaline to rust brown, sometimes with yellow-brown plasmatic pigment; intermixed with ovoid to polymorphous cells with thick-walled and strongly refractive walls. Subcutis divided into 2 well defined layers: a) strongly gelatinized, hyaline, entangled hyphae (1—3 μ m diam.) — below epicutis; b) irregularly arranged, cylindric, often branched hyphae (up to 20 μ m diam.) with thick-walled, strongly refractive, gelatinized membranes. Clamp connections present.

Habitat. — On rotten wood in broad-leaved forests. — Papua New Guinea.

Material. — PAPUA NEW GUINEA: Morobe District: Bulolo (1200 m), 20. XI. 1971, leg. HORAK (ZT, 71/172). — Bulolo, Manki (1450 m), 20. XI. 1971, leg. HORAK (ZT, 71/320). — Madang, near Maiwara, in secondary rain forest, 5. X. 1969, leg. SHEPHERD (CANB, 227258).

According to all morphologic data observed on *H. neovelutipes* (HONGO) and *H. atrofulvus* (STEVENSON) these two taxa are undoubtedly closely related to the polymorphic (?) and widely distributed *H. tenuipes* (SCHWEINITZ) SINGER (PEGLER 1977). After examining type material (and additional collections made in the USA) of the latter fungus I came to the conclusion that *H. neovelutipes* and *H. atrofulvus* can be considered as geographic microspecies distinctive

enough to be separated from *H. tenuipes* proper. Under these circumstances I do not follow HONGO (1976) who considers his *H. neovelutipes* now as a further synonym of *H. tenuipes*. Unfortunately the fragmentary condition (HORAK 1971) of the type material prevents the final decision where to accomodate the New Zealand *Crinipellis velutipes* STEVENSON (1964). Macroscopically all details seen on the coloured plate nr. 9 are strongly resembling *H. neovelutipes* (HONGO) which I collected myself twice in Papua New Guinea. It is very likely that *C. velutipes* STEVENSON is conspecific to this species, however, fresh material is needed to resolve this problem.

11. *Heimiomyces atrofulvus* (STEVENSON) HORAK 1971

N. Z. J. of Botany 9: 408

Bas. *Panellus atrofulvus* STEVENSON 1964: Kew Bull. 19: 29.

Illustrations: STEVENSON (1964: l. c.); HORAK (1971: l. c.);

Fig. 11.

Description of personal collections from New Zealand:

Pileus —20 mm, convex when young soon becoming plane or depressed, centre flat to subumbonate; dark red-brown with conspicuous yellow felty or velvety tomentum; dry, velvety to hairy, sometimes with low radially arranged veins at disc, membranous, tough, margin not striate. Lamellae (L 10—18, —3) crowded, broadly adnate to emarginate (decurent with short tooth), ventricose; pale yellow turning yellow-brown, edge albofimbriate. Stipe —35 × —3 mm, cylindric or gradually enlarged into pileus, central; yellow-brown, with obvious orange tomentum over entire length; dry, entirely velvety to hairy, pruinose in upper portion, hollow, tough, single and cespitose, in groups. Context dark brown, gelatinous. Odour and taste acidulous or not distinctive. Spore print white.

Spores 7—10 × 4—5 μ m, elliptic, sometimes subcylindric to subballantoid, smooth, hyaline, amyloid, germ pore none. Basidia 25—40 × 5—7 μ m, 4-spored. Cheilocystidia —60 × —6 μ m, conspicuously branched, with irregular, numerous rod-like projections, membranes thick-walled, hyaline or yellow-brown. Pleurocystidia none. Caulocystidia like cheilocystidia but larger, membrane brown (KOH). Cuticle a palisade of erect, fasciculate, cylindric or subfusoid terminal cells (pilocystidia), membranes thick-walled, apex rounded, rarely with antler-like projections, intermixed with clavate to subovate thick-walled, strongly refractive cells. Structure of subcutis like *H. neovelutinus* (HONGO). Clamp connections numerous.

Habitat. — On rotten wood in broad-leaved forest (dominated by *Nothofagus* sp., *Weinmannia* sp., *Schefflera* sp., *Aristotelia* sp. and *Fuchsia* sp.) or on soil (buried wood?). — New Zealand.

Material. — NEW ZEALAND: North Island: Wellington, Hut

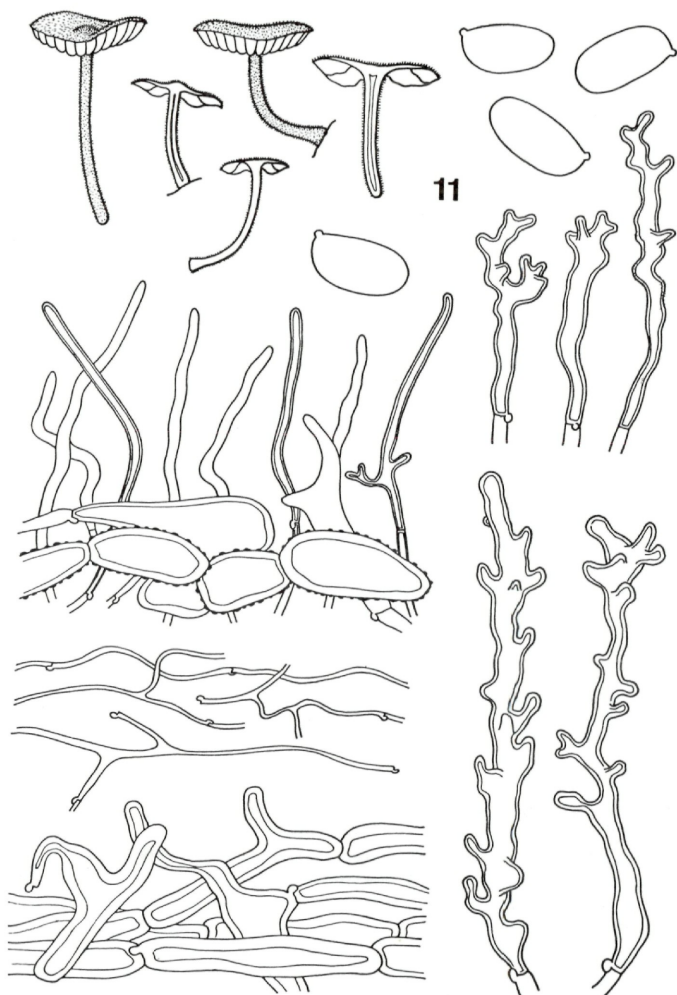


Fig. 11. *Heimomyces atrofulvus* (STEVENSON) HORAK (ZT, 68/415): carpophores, spores, cheilocystidia, caulocystidia, cuticle

Valley, Silverstream, 21. IV. 1956, leg. STEVENSON 1291 (K, holotype of *Panellus atrofulvus* STEV.). — South Island: Nelson, Kaihoka Reserve, 10. V. 1968, leg. HORAK (ZT, 68/415). Westland, Hari Hari, 15. II. 1969, leg. HORAK (ZT, 69/79).

For discussion compare *H. neovelutipes* (HONGO).

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