

## New species of *Dermocybe* (Agaricales) from New Zealand

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**Abstract.** – Fourteen new species of *Dermocybe* (FR.) WÜNSCHE (Cortinariaceae, Agaricales) viz. *D. alienata*, *D. aurantiella*, *D. canaria*, *D. cardinalis*, *D. castaneodisca*, *D. cramesina*, *D. egmontiana*, *D. icterinoides*, *D. indotata*, *D. largofulgens*, *D. leptospermarum*, *D. olivaceonigra*, *D. purpurata*, *D. vimicolor* and *D. splendida* HORAK (1983) are described from New Zealand. Illustrations and a key to *Dermocybe* in New Zealand are presented. The taxonomic concept of the species treated is supported by chemotaxonomic data (thin-layer chromatography and analysis of anthraquinonoid pigments), cf. KELLER & al. (1988).

### Introduction

From the taxonomic point of view *Dermocybe* (FR.) WÜNSCHE is by tradition a difficult agaricoid genus belonging to the fam. Cortinariaceae. Its reported representatives (MOSER in SINGER, 1986) are mainly characterized by (1) rust brown spore print, (2) verrucose spores, and (3) the occurrence of distinctive anthraquinonoid pigments (KELLER, 1979; GILL & STEGLICH, 1987). The often brilliant colours in the carpophores of *Dermocybe* range from red to purple, orange, saffron, yellow, ochre, green (olive), dark brown or black. These anthraquinones are encountered in complex combinations which vary both in quality and quantity from species to species. In fresh material and in dried specimens as well the presence of anthraquinone-derivatives is readily detected by application of KOH (5–10%). As a rule this reagent stains the plasmatic (and the less frequently observed encrusting or intercellular) pigment(s) immediately red, red-brown, lilac, blue, olive or black.

For both practical and theoretical taxonomical purposes the positive (or negative) colour reaction of the KOH spot test is of indispensable value (MOSER & HORAK, 1975).

To present knowledge all species of *Dermocybe* reported from the northern hemisphere enter ectomycorrhiza with host plants belonging either to gymnosperms or angiosperms. In the southern hemisphere, however, the taxa so far described are exclusively associated with angiospermic trees and shrubs. The majority of the southern ectotrophic *Dermocybe* have either *Nothofagus* (Fagaceae: for southern South American records cf. MOSER & HORAK, 1975) or

*Eucalyptus-Leptospermum* (Myrtaceae: New Zealand, Australia, Papua, New Guinea) as ectomycorrhizal partners.

The pileipellis of typical northern *Dermocybe* is a cutis or trichoderm composed of non-gelatinized hyphae. MOSER & HORÁK (1975), however, demonstrated, that in the subantarctic *Nothofagus*-forests of Chile and Argentina the carpophores of numerous *Dermocybe* have a viscid or glutinous pileus (and often also stipe). These taxonomically distinctive species are now assembled in *Dermocybe* subgen. *Icterinula* (MOSER in SINGER, 1986). Among the New Zealand species described in the present paper *Dermocybe olivaceonigra* and *D. castaneodisca* obviously belong to this subgenus (restricted to the southern hemisphere) and have close affinities to several South American taxa being associated with *Nothofagus* spp.

This contribution holds up as another convincing example that in *Dermocybe* taxonomic concepts, essentially based upon morphological characters, are effectively supported by chemotaxonomic data deduced from thin layer chromatography and analysis of species-specific anthraquinonoid pigments (GILL & STEGLICH, 1987; KELLER & al. 1988).

### Key to New Zealand species of *Dermocybe*

1. Pileus, lamellae and/or stipe ± red (crimson red, cinnabar red, red-purple, wine red, blood red, chestnut brown) . . . . . 2
- 1\*. Colours different . . . . . 7
2. Pileus, lamellae and stipe dark red (at least in young specimens); pileus -25 mm, dry; KOH-negative; cheilocystidia present; spores 5-7 × 3.5-4 µm; under *Nothofagus* . . . . . 3
- 2\*. Pileus and stipe red (lamellae yellow to ochre) or lamellae red only . . . . . 4
3. Carpophores red-purple to dark marron red; spores minutely verrucose . . . . . 1. *D. purpurata*
- 3\*. Carpophores brilliant crimson red or wine red; spores coarsely verrucose, warts often embedded in conspicuous perispore . . . . . 2. *D. vinicolor*
4. Lamellae red to red-orange; pileus black brown; stipe golden yellow . . . . . cf. 5. *D. splendida*
- 4\*. Pileus and stipe with red to marron red colours; lamellae ochre to yellow . . . . . 5
5. Marron red colours only over centre of viscid pileus . . . . . cf. 9. *D. castaneodisca*
- 5\*. Both pileus and stipe with conspicuous red colours; stipe ± fusoid; KOH-black; cheilocystidia absent; under *Nothofagus* . . . . . 6
6. Pileus -30 mm, cinnabar red to crimson red, dry, fibrillose-squamulose; spores 6-7 × 4-4.5 µm . . . . . 3. *D. cramesina*
- 6\*. Pileus -50 mm, crimson red, wine red or purple, viscid to subglutinous; spores 8-9.5 × 4.5-5 µm . . . . . 4. *D. cardinalis*
- 7(1\*). Lamellae red-orange to saffron orange; pileus black to dark brown at centre, orange-yellow towards margin, dry; stipe golden yellow or brass yellow; odour not distinctive; KOH (on pileus)-negative, KOH (on lamellae)-lilac; spores 7-9 × 5.5-6 µm, strongly verrucose; cheilocystidia absent; under *Leptospermum* (New Zealand) or *Eucalyptus* (Australia) . . . . . 5. *D. splendida*
- 7\*. Lamellae (in young specimens) yellow to orange; odour (and often also taste) raphanoid (except *D. canaria*); KOH (on pileus)-positive . . . . . 8

8. Pileus, lamellae and stipe uniformly brilliant yellow or orange; pileus dry; cheilocystidia absent (cf. also *D. icterinoides*, *D. leptospermarum*) ..... 9
- 8\*. Yellow colours of pileus always superimposed by other colour components (e.g. black, grey, brown, red-brown, olive) especially at centre; pileus dry or glutinous-viscid ..... 10
9. Pileus, lamellae and stipe brilliant yellow, canary yellow; pileus -80 mm; stipe fusoid; odour not distinctive; KOH-red; spores  $7.5-8.5 \times 4-5 \mu\text{m}$ , ovoid,  $\pm$  smooth, with asperulate apex; under *Nothofagus* and/or *Leptospermum* .....  
6. *D. canaria*
- 9\*. Pileus, lamellae and stipe orange to saffron yellow; pileus -20 mm; stipe cylindrical; odour raphanoid; KOH-olive; spores  $8.5-11 \times 4.5-5.5 \mu\text{m}$ , amygdaliform, verrucose; under *Nothofagus* ..... 7. *D. aurantiella*
10. Centre of pileus black to fuscous (with marron red tinge), -25 mm, dry, fibrillose-squamulose; KOH-black to lilac; spores  $5.5-6 \times 4.5-5 \mu\text{m}$ , subglobose, verrucose; cheilocystidia conspicuous; under *Leptospermum* .....  
8. *D. egmontiana*
- 10\*. Centre of pileus with different colours as above mentioned, dry or glutinous; KOH-red to red-brown; cheilocystidia present or absent ..... 11
11. Centre of pileus marron red, pileus -50 mm, viscid; spores  $7.5-9.5 \times 5-6 \mu\text{m}$ , ovoid, verrucose; cheilocystidia conspicuous; under *Nothofagus* and/or *Leptospermum* ..... 9. *D. castaneodisca*
- 11\*. Centre of pileus with different colours; pileus dry or glutinous; cheilocystidia absent or present ..... 12
12. Centre of pileus black to fuliginous with conspicuous green or olive tinge, glutinous, -60 mm; stipe fusoid to subbulbous, glutinous; spores  $7-9 \times 4.5-5.5 \mu\text{m}$ , minutely verrucose, with coarse warts at apex; cheilocystidia absent ..... 13
- 12\*. Centre of pileus without conspicuous olive colours (with faint tinge of olive cf. *C. leptospermarum*), viscid or dry; cheilocystidia present or absent; spores distinctly verrucose ..... 14
13. Pigments (pileipellis) readily dissolving in KOH-mounts, solvent immediately staining red-purple; rare, under *Nothofagus* ..... 10. *D. olivaceonigra*
- 13\*. Pigments (pileipellis) weakly dissolving in KOH-mounts, solvent staining pale olive-brown; common, under *Nothofagus* and/or *Leptospermum* (cf. *D. icterinoides*) ..... 11. *D. alienata*
14. Centre of pileus dark brown or black, yellow towards margin; stipe cylindrical ..... 15
- 14\*. Centre of pileus brown (with olive tinge) or grey, surface viscid when moist; lamellae golden yellow or mustard yellow; cheilocystidia absent ..... 16
15. Spores  $5.5-6.5 \times 3.5-4 \mu\text{m}$ ; pileus -40 mm, centre dark brown, viscid when moist; cheilocystidia absent; under *Leptospermum* ..... 12. *D. largofulgens*
- 15\*. Spores  $6-7 \times 3.5-4.5 \mu\text{m}$ ; pileus -25 mm, centre black to fuscous, dry; cheilocystidia balloon-shaped; under *Nothofagus* ..... 13. *D. indotata*
16. Centre of pileus brown, often with olive tinge; stipe cylindrical; spores  $6-7.5 \times 3.5-4 \mu\text{m}$ ; under *Leptospermum* ..... 14. *D. leptospermarum*
- 16\*. Centre of pileus brown or grey (without olive tinges); stipe fusoid; spores  $7-9 \times 4.4-5 \mu\text{m}$ ; under *Nothofagus* ..... 15. *D. icterinoides*

### Enumeration and description of species

#### 1. *Dermocybe purpurata* HORAK & KELLER sp. n. - Fig. 1

Pileus -25 mm, hemisphaericus dein umbonatusplanus, ruber vel purpureoconcoloratus, velutinus vel subsquamulosus, siccus. Lamellae emarginatae, pileo concolorae. Stipes -45  $\times$  -3 mm, cylindricus, pileo concolor, cortina fugacea. Sapor sub-

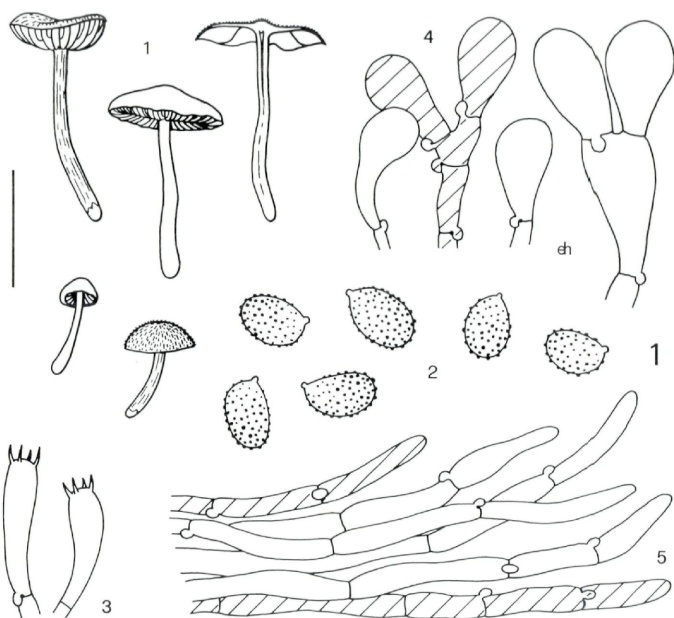


Fig. 1. *Dermocybe purpurata* HORAK & KELLER (PDD 27171, holotype): 1. carphophores. – 2. spores. – 3. basidia. – 4. cheilocystidia. – 5. pileipellis.

raphanoideus. Sporae 5.5–6 (–6.5) × 3.5–4 μm ovoideae, minute verrucosae. Cheilocystidia conspicua pigmento rubro instructa. Fibulae praesentes. Ad terram vel inter Sphagna in silvis nothofagineis. Novazelandia. Holotypus PDD 27171.

Pileus –25 mm, hemispherical or convex becoming umbonate-expanded in aged carphophores; brilliant red-purple, blood red or dark marron red; velvety to coarsely fibrillose or minutely squamulose; dry, not hygrophanous, margin non-striate, veil remnants absent. – Lamellae 12–15, –3, broadly emarginate and subdecurrent with short tooth; at first blood red turning concolorous with pileus, with orange to rust brown tinge, –4 mm wide, edges with red fimbriate seam. – Stipe –45 × –3 mm, cylindrical, rarely with swollen base, single; concolorous with pileus, base often covered with pale ochre fibrils from veil; dry, fibrillose, cortina not persistent, hollow. – Context red, ochre in base of stipe. – Odour not distinctive. – Taste slightly raphanoid. – Chemical reactions on pileus: KOH-negative; HCl – orange.

Spore print rust brown. – Spores  $5.5-6(-6.5) \times 3.5-4 \mu\text{m}$ , ovoid, minutely verrucose, rust brown. – Basidia  $20-30 \times 4-6 \mu\text{m}$ , 4-spored. – Cheilocystidia conspicuous, composed of articulated cell chains, terminal cells  $-60 \times 20 \mu\text{m}$ , clavate, membranes thin-walled, with red plasmatic pigment. – Pileipellis a cutis or trichoderm composed of cylindrical hyphae ( $8-16 \mu\text{m}$  diam.), terminal cells cylindrical or fusoid-conical, membranes not gelatinized, with red(-purple) plasmatic pigment readily dissolving in KOH. – Clamp connections present.

Habitat. – On soil in litter or among *Sphagnum* (pakihi), rarely also on rotten wood, in *Nothofagus* forests (*N. solandri* var. *cliffortioides*, *N. menziesii*). – New Zealand.

Material examined. – NEW ZEALAND: South Island: Nelson: Tophouse Saddle, among *Sphagnum*/rotten wood under *N. solandri* var. *cliffortioides*, 3. III. 1968, leg. HORAK, PDD 27171, holotype (ZT 68/100, isotype); same locality, among *Sphagnum* under *N. solandri* var. *cliffortioides*, *Phyllocladus alpinus*, *Podocarpus nivalis*, 25. II. 1969, leg. HORAK (ZT 69/108). – Otago: Haast Pass, Makarora Valley, under *N. menziesii*, 19. X. 1964, leg. TAYLOR (203).

Remarks. – This conspicuous species typically grows among *Sphagnum* in small bogs along the edge of *Nothofagus*-forests. It rarely was also observed on rotten wood of *Nothofagus* spp.

The dark red *D. purpurata* may be distinguished from *D. vinicolor*, the second New Zealand taxon of *Dermocybe* with red colour, by the comparatively large basidiomes, by the smaller and less ornamented spores and by a pigment pattern which is characterized by the high concentration of physcion and dermocybinglucoside. Emodin, however, was not detected on chromatograms (KELLER & al., 1988).

## 2. *Dermocybe vinicolor* HORAK sp. n. – Fig. 2

Pileus –25 mm, umbonateplanus, sanguineus vel cinnabarinus, fibrilloso-squamulosus, siccus. Lamellae emarginatae, sanguineoferrugineae. Stipes –30 × 1 (–1.5) mm, cylindricus, pileo concolor. Odor saporeque nulli. Sporae  $5-7 \times 3.5-4 \mu\text{m}$ , ovoideae, verrucosae. Cheilocystidia conspicua, pigmento rubro impleta. Fibulae praesentes. Ad terram in silvis nothofagineis. Novazelandia. Holotypus PDD 27172.

Pileus –25 mm, hemispherical, convex or campanulate becoming umbonate-expanded; brilliant cinnabar red, blood red or wine red; strongly fibrillose to velutinous or minutely squamulose; dry, non-striate margin, veil remnants none. – Lamellae 8–12, –3, adnate to emarginate, ventricose, –3 mm wide; concolorous with pileus later turning rust brown, edges concolorous, fimbriate to serrulate from cheilocystidia. – Stipe –30 × 1(–1.5) mm, cylindrical, occasionally swollen at base, slender, single or cespitose; con-

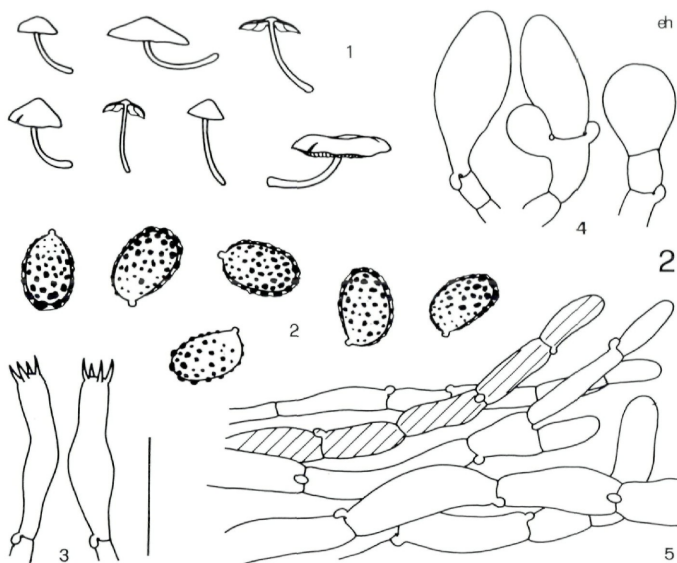


Fig. 2. *Dermocybe vinicolor* HORÁK (PDD 27172, holotype): 1. carpophores. – 2. spores. – 3. basidia. – 4. cheilocystidia. – 5. pileipellis.

colourous with pileus, base often covered with orange-ochre fibrils from universal veil (but without distinct cortina); dry, fibrillose, hollow, basal tomentum often well developed. – Context cinnabar red. – Odour and taste not distinctive. – Chemical reactions on pileus: KOH, HCl – negative.

Spore print rust brown. – Spores  $5-7 \times 3.5-4 \mu\text{m}$ , ovoid, verrucose, especially at apical end, warts sometimes embedded in perispore, rust brown. – Basidia  $18-30 \times 5-8 \mu\text{m}$ , 4-spored, cylindrical but also urniform. – Cheilocystidia composed of cell-chains with clavate to broadly ovoid terminal cells ( $15-55 \times -22 \mu\text{m}$ ), membranes thin-walled, with brown to red-brown plasmatic pigment. – Pileipellis a cutis or trichoderm composed of cylindrical hyphae ( $5-18 \mu\text{m}$  diam.), terminal cells cylindrical, membranes not gelatinized, with brilliant red plasmatic pigment (rarely also encrusting) which readily dissolves in KOH. – Clamp connections present.

Habitat. – On soil (occasionally also on rotten wood) in *Nothofagus*-forests. – New Zealand.

Material examined. – NEW ZEALAND: North Island: North Auckland, Warkworth, The Dome, on rotten wood under *N. truncata*, 6. VI. 1981, leg. HORÁK (ZT 881). – Gisborne: Urewera N. P., Black Beech Track, under *N. fusca-menziesii*, 23. V. 1981, leg. HORÁK, PDD 27171, holotype (ZT 647, isotype). – South Island: Southland: Takitimu Range, Princeston Stream, under *N. menziesii*, 9. XI. 1967, leg. HORÁK (ZT 67/188).

Remarks. – *D. vinicolor* is recognized by the brilliant cinnabar red of its rather small carpophores and the coarsely verrucose, subglobose spores. In New Zealand *Nothofagus*-forests basidiomes of this taxon often occur in large numbers both among litter on soil and on rotten wood of southern beeches.

The pigment pattern observed in *D. vinicolor* is dominated by high concentrations of emodin-emodingleucoside (both compounds being absent in the related *D. purpurata*) and dermocycbinglucoside (KELLER & al., 1988).

### 3. *Dermocybe cramesina* HORÁK sp. n. – Fig. 3

Pileus –30 mm, convexus dein campanulatus, cinnabarinus, subsquamulosus, siccus. Lamellae emarginatae, ochraceoluteae dein ferrugineae. Stipes –50 × –4 (–10 ad basim) mm, fusoides, apicaliter ochraceus infra fibrillis zonisque cinnabarinis e velo dense obtectus, siccus. Odor saporque raphanoidei. KOH – niger. Sporae 6–7 × 4–4.5 µm, ovoideae, verrucosae. Cystidia nulla. Ad terram in silvis nothofagineis. Novaezelandia. Holotypus PDD 27173.

Pileus –30 mm, convex to broadly umbonate or campanulate; uniformly cinnabar red or crimson red, purple tints absent; dry, minutely squamulose, neither hygrophanous nor striate near margin. – Lamellae 10–16, 3(–5), broadly adnate-emarginate, ventricose, –5 mm wide; yellow-ochre becoming ochre-ferruginous, edges concolorous, entire. – Stipe –50 × –4 mm, distinctly fusoid or clavate (base –10 mm diam.), cespitose or single; yellow-ochre at apex, from cortina (composed of ochre fibrils) to base densely covered with cinnabar red or crimson red coarse fibrils or several appressed zones of veil; dry, longitudinally fibrillose, solid. – Context orange, orange-brown in base of stipe. – Odour and taste raphanoid (occasionally with slight component of raw potato). – Chemical reactions on pileus: KOH – black (with lilac tinge); HCl, NH<sub>3</sub> – negative.

Spore print rust brown. – Spores 6–7 × 4–4.5 µm, ovoid, minutely verrucose, rust brown. – Basidia 25–35 × 7–8 µm, 4-spored. – Cheilocystidia absent. – Pileipellis a cutis or trichoderm of cylindrical hyphae (5–12 µm diam.), terminal cells cylindrical or conical, membranes not gelatinized, purple plasmatic pigment slowly turning to grey and finally black, weakly dissolving in KOH. – Clamp connections present.

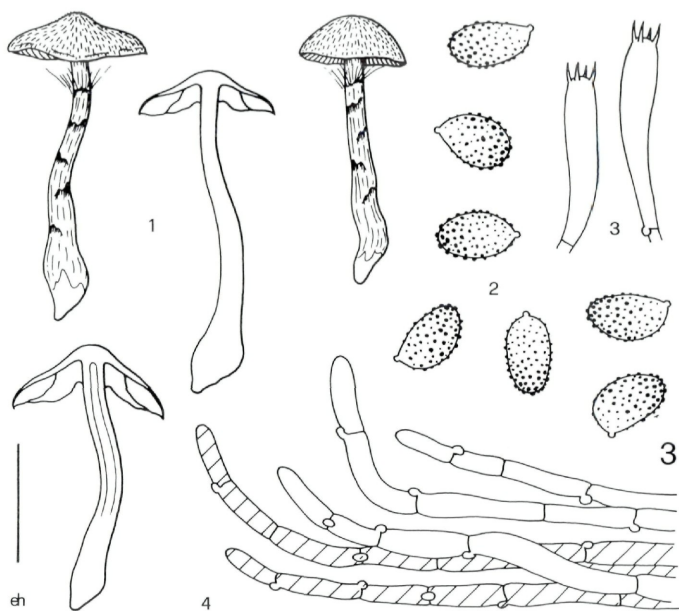


Fig. 3. *Dermocybe cramesina* HORAK (PDD 27173, holotype): 1. carpophores. – 2. spores. – 3. basidia. – 4. pileipellis.

**Habitat.** – On soil in *Nothofagus*-forests (*N. fusca*, *N. menziesii*). – New Zealand.

**Material examined.** – NEW ZEALAND: Nelson, Lake Rotoiti, trail to St. Arnaud Range, under *N. fusca-menziesii*, 30. IV. 1968, leg. HORAK, PDD 27173, holotype (ZT 68/321, isotype).

**Remarks.** – The epithet of this characteristic but rare species indicates the predominant crimson red colour in the basidiomes of *D. cramesina*. Even in moist conditions the surface of its pileus remains dry and the at first radially fibrillose hyphae slowly break up and subsequently form small squamules in aged specimens. This distinctive macrocharacter on the pileus readily separates *D. cramesina* from the purple *D. cardinalis* whose size and habit of the carpophores, however, closely resemble those of the former taxon. In addition KOH stains the pigments in the pileipellis of both species immediately black and the negative reaction of HCl and NH<sub>3</sub> is also reported both for *D. cramesina* and *D. cardinalis*. Microscopically,



however, *D. cramesina* differs by much smaller spores and non-gelatinized hyphae in the epicutis of the pileus.

4. *Dermocybe cardinalis* HORAK sp. n. – Fig. 4

Pileus –50 mm, convexus dein campanulatus, e cinnabario vinaceopurpureus, viscidus. Lamellae emarginatae, aureae vel aurantioferrugineae. Stipes –80 × –6 (–12 ad basim) mm, fusoidoclavatus, apicaliter luteus basim versus fibrillis pileo concoloribus dense obtectus. Odor saporque raphanoidei. KOH-niger. Sporae (7–)8–9.5 (–10.5) × 4.5–5(–6) μm, ellipsoideae vel subamygdaliformes, verrucosae. Cystidia nulla. Ad terram in silvis nothofagineis. Novazelandia. Holotypus PDD 27174.

Pileus –50 mm, at first convex to conico-convex becoming broadly umbonate-expanded to campanulate; crimson red, red-brown, wine red or purple, darker in centre but paler towards margin; viscid to subglutinous when moist, radially fibrillose in dry conditions, striate near margin, hygrophanous, distinct veil remnants lacking at margin. – Lamellae 15–20, 3–7, broadly

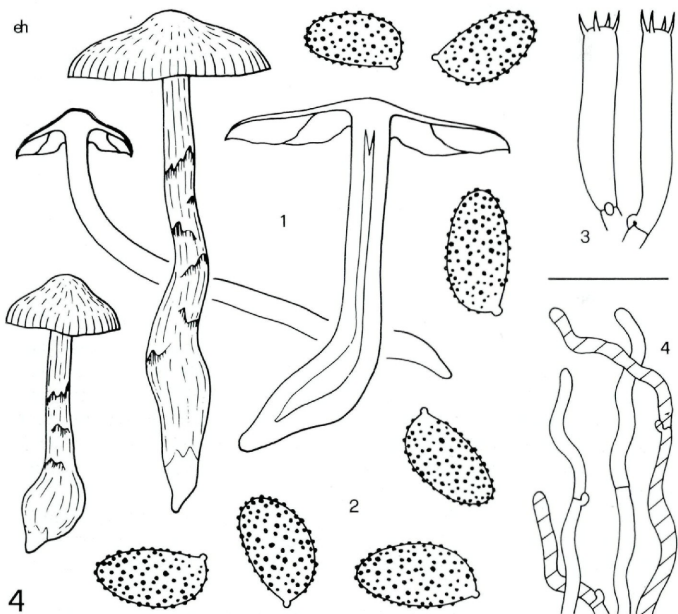


Fig. 4. *Dermocybe cardinalis* HORAK (PDD 27174, holotype): 1. carpopores. – 2. spores. – 3. basidia. – 4. pileipellis.

adnate to emarginate, subdecurrent with short tooth, ventricose, -6 mm wide; apricot, golden yellow or ochre when young turning orange then rust brown in mature specimens, edges concolorous, entire. - Stipe -80 × -6 m, subclavate to fusoid at base (-12 mm diam.), rarely equally cylindrical, single or cespitose; yellow to orange at apex, from cortina to base densely covered with brilliant red-brown, crimson or purple coarse fibrils or agglutinated zones of veil; dry, except veil remnants when fresh, hollow. - Context red in pileus, red-brown in base of stipe. - Odour and taste raphanoid. - Chemical reactions on pileus: KOH - black; HCl, NH<sub>3</sub> - negative.

Spore print rust brown. - Spores (-7)8-9.5(-10.5) × 4.5-5 (-6) μm, elliptical (to subamygdaliform), minutely verrucose, rust brown. - Basidia 22-37 × 6-8 μm, 4-spored. - Cheilocystidia absent. - Pileipellis a cutis or trichoderm of entangled cylindrical hyphae (4-8 μm diam.), terminal cells cylindrical with rounded apex, membranes gelatinized, with pale red-brown to grey-purple plas-matic (rarely encrusting) pigment, more or less insoluble in KOH. - Clamp connections present.

Habitat. - On soil in *Nothofagus*-forests (*N. solandri* var. *cliffortioides*, less common under *N. fusca-menziesii*). - New Zealand.

Material examined. - NEW ZEALAND: North Island: North Auckland, Hunua Ranges, Franklin Co., Mangatangi Valley, under *Nothofagus* (*Leptospermum*, *Agathis*), 9. VI. 1974, leg. DINGLEY (PDD 32252, ZT 76/240). - Wellington: Tongariro N. P., Silicia Springs, under *N. solandri* var. *cliffortioides*, 27. V. 1974, leg. BRAGGINS, Herb. TAYLOR (917); Whakapapanui Valley, under *N. solandri* var. *cliffortioides*, 21. V. 1973, leg. TAYLOR (831); same locality, 24. V. 1973, leg. TAYLOR (845). - South Island: Nelson: Lake Rotoiti, track to St. Arnaud Range, under *N. menziesii-fusca*, 5. V. 1968, leg. HORAK, PDD 27174, holotype (ZT 68/373, isotype). - Canterbury: Craigieburn Range, Broken River, near FRES Station, under *N. solandri* var. *cliffortioides*, 18. IV. 1969, leg. HORAK (ZT 69/257). - Southland: Lake Te Anau: Dock Bay, under *N. solandri* var. *cliffortioides*, 2. V. 1970, leg. TAYLOR (597); trail to Mt Luxmore (Fjordland), under *N. solandri* var. *cliffortioides-menziesii*, 9. VI. 1969, leg. HORAK (ZT 69/327).

Remarks. - In the New Zealand *Nothofagus*-forests *D. cardinalis* represents one of the most remarkable species of *Dermocybe*. The available ecological records indicate that this common purple *Dermocybe* occurs on both North Island and South Island. It prefers *Nothofagus solandri* var. *cliffortioides* as ectomycorrhizal host plant but occasionally it was also observed in association with *N. menziesii* and *N. fusca*.

The chromatographic analysis of the pigments revealed that the purple colour of *D. cardinalis* is actually composed of 10 different anthraquinonoid compounds (KELLER & al., 1988). Among those emodin and dermolutein (and their glucosides respectively) have been detected but the identity of the three principal pigments with highest concentrations still remains unidentified.

5. *Dermocybe splendida* HORAK (1983) – Fig. 5

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Pileus –45 mm, hemispherical, convex to broadly umbonate or obtusely campanulate; centre black, black-brown or dark brown, yellow-orange near margin in mature specimens; dry, radially fibrillose or minutely squamulose, neither hygrophanous nor margin striated, margin often splitting, persistent veil remnants none. – Lamellae 16–28, 3(–5), adnexed to emarginate becoming sinuate

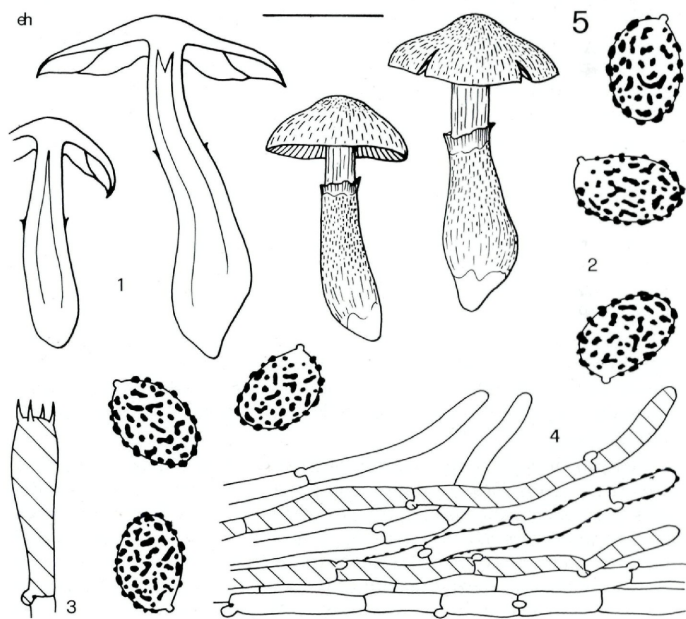


Fig. 5. *Dermocybe splendida* HORAK (PDD 27168, holotype): 1. carpophores. – 2. spores. – 3. basidium. – 4. pileipellis.

with short decurrent tooth in aged carpophores, -5 mm wide; brilliant orange, cinnabar red-orange, brick red turning bright orange-ferruginous, edges concolorous, entire. - Stipe -60 × 3-8 mm, clavate, subbulbous or fusoid (-13 mm diam.), rarely cylindrical, single; golden yellow or brass yellow, at base with yellow tomentum or yellow rhizoids, persistent dark brown or black cortina fibrillose or occasionally agglutinated and submembranaceous, below ring coarsely fibrillose or covered with minute concolorous squamules; dry, solid becoming hollow. - Context dark brown in pileus, yellow-orange in stipe. - Odour and taste not distinctive. - Chemical reactions on pileus: KOH - red-brown; on lamellae: KOH - lilac-blue.

Spore print rust brown. - Spores 7-9 × 5-6.5 µm, broadly ovoid (or subglobose), covered with conspicuous isolated warts which can be connected to short crests, rust brown, plage or perispore absent. - Basidia 36-34 × 6-9 µm, 4-spored, often with brilliant purple plasmatic pigment. - Cheilocystidia absent. - Pileipellis a cutis or trichoderm composed of cylindrical hyphae (5-10 µm diam.), terminal cells cylindrical or subconical, membranes not gelatinized, with dark brown plasmatic (rarely also encrusting) pigment readily dissolving in KOH and staining solvent brilliant wine red or bright purple. - Clamp connections present.

Habitat. - On soil under *Leptospermum* spp. - New Zealand, Australia.

Material examined. - NEW ZEALAND: North Island: North Auckland: Omahuta-Puketi Forest, Waipapa River, under *Leptospermum* spp., 13. V. 1981, leg. HORAK (ZT 578); same locality, 18. V. 1981, leg. HORAK (ZT 1446); Waitakere Ranges: Piha Valley, under *L. ericoides* (*Vitex*, *Fuchsia*), 2. VI. 1969, leg. HORAK, PDD 27168, holotype (ZT 69/370, isotype); Goldie's Bush, under *L. scoparium*, 9. V. 1971, leg. PARRIS & CROXALL, PDD 29076 (ZT 71/81); Kauri Glen, under *L. ericoides* (*Agathis*, *Phyllocladus*), 12. V. 1973, leg. TAYLOR (824). - Little Barrier Island, Thumb Track, under *Leptospermum* sp., 12. VI. 1981, leg. HORAK (ZT 920). - AUSTRALIA: cf. HORAK (1983).

Remarks. - The description of *D. splendida* is based upon four collections from New Zealand. The present distribution area indicates that this species is strictly associated with the two native taxa of *Leptospermum* (*L. scoparium*, *L. ericoides*) in the subtropical northern parts of North Island. *D. splendida* is also reported from Australia. The Western Australian (HORAK, 1983) and the Victorian (GILL, unpubl.) specimens examined were gathered in broadleaved forests dominated by several species of *Eucalyptus*. Nevertheless this material agreed in all essential morphological characters and

pigment pattern with the New Zealand specimens (KELLER & al., 1988). Regarding the qualitative composition of the anthraquinoid derivatives in *D. splendida* the simultaneous occurrence of xanthopurpurin, austrocortilutein and austrocortirubin is unique among the austral-asian representatives of *Dermocybe*. A similar pigmentation pattern (GILL & STEGLICH, 1987) is only known from another, taxonomically yet doubtful (MOSER & HORAK, 1975) Australian taxon viz. *Cortinarius (Dermocybe) umbonatus* CLELAND & HARRIS (1948).

6. *Dermocybe canaria* HORAK sp. n. – Fig. 6

Pileus –80 mm, hemisphaericus dein campanulatus vel planus, luteus, aetate luteobrunneus, siccus, innate fibrillosus. Lamellae emarginatae, luteae dein brunneae. Stipes –80 × 30 mm, fusioideus vel bulbosoturbinatus, pileo concolor, infra

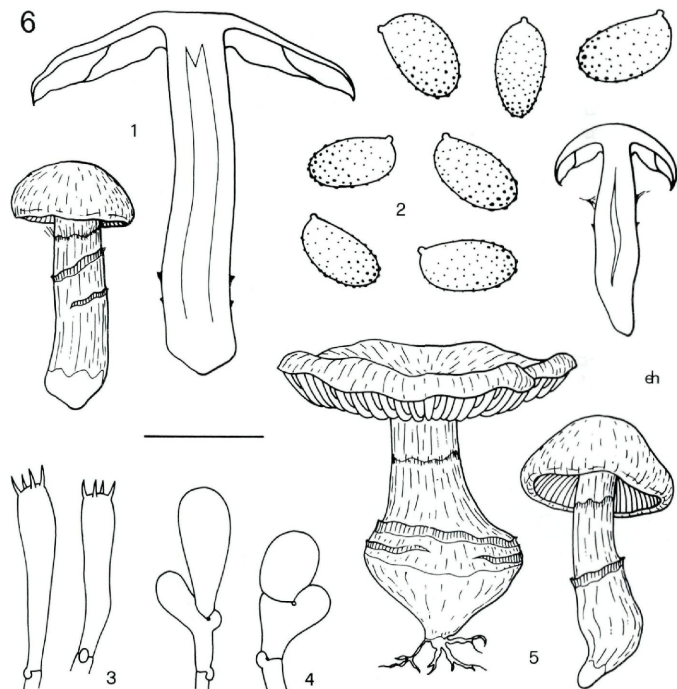


Fig. 6. *Dermocybe canaria* HORAK (PDD 27175, holotype): 1. carpophores. – 2. spores. – 3. basidia. – 4. cheilocystidia. – 5. carpophores (ZT (68/178).

cortina lutea zonis concoloribus submembranaceisque praeditus, siccus. Caro lutea vel aurantiaca. Odor saporque amari. KOH – ruber vel castaneus. Sporae 7.5–8.5 × 4–5 µm, ovoideae, minute asperulatae, luteobrunneae. Cystidia nulla. Ad terram in silvis nothofagineis, raro sub *Leptospermo*. Novaezelandia. Holotypus PDD 27175.

Pileus –60 (–80) mm, hemispherical becoming convex, centre broadly umbonate to campanulate or flat and expanded, margin inrolled; brilliant yellow turning yellow-brown (especially at disk) with age; dry, neither hygrophanous nor striate, minutely to coarsely innate-fibrillose or subsquamulose (in dry condition), in young specimens margin covered by yellow fibrillose veil remnants. – Lamellae crowded, emarginate, sometimes decurrent with short tooth; golden yellow turning mustard yellow then brown-yellow, edges entire, concolorous. – Stipe –80 × –30 mm, fusoid to bulbous with root-like base, rarely cylindrical; yellow, yellow-brown in aged specimens; dry, below yellow cortina with 1–3 persistent, membranaceous, yellow to yellow-brown belts of veil, at first solid becoming hollow, single, rarely cespitose. – Context yellow to orange-yellow. – Odour none. – Taste bitter. – Chemical reactions on pileus: KOH – red to red-brown, NH<sub>3</sub>–pink to pale orange, HCl – negative.

Spore print (yellow-)brown with rusty shade. – Spores (7–) 7.5–8.5(–9) × 4–5 µm, ovoid, yellow-brown with rusty tinge, minutely asperulate at apex, ± smooth in immature spores, membrane thin-walled. – Basidia 20–35 × 6–8 µm, 4-spored. – Cystidia absent, but edge of lamellae often covered with articulate cells, terminal cell clavate to vesiculose (10–35 × 6–10 µm), membrane hyaline, pigment absent. – Pileipellis a cutis composed of cylindrical hyphae (5–10 µm diam.), terminal cells rarely fusoid, membranes thin-walled, not gelatinized, smooth, with red to orange plasmatic pigment dissolving in KOH, rarely also with encrusting and/or intercellular pigment. – Clamp connections present.

Habitat. – On soil among litter in *Nothofagus*-forests (*N. solandri* var. *cliffortioides*, *N. menziesii* and/or *N. fusca*; often in association with conifers viz. *Libocedrus bidwillii*, *Phyllocladus alpinus*, *Ph. glaucus*, *Podocarpus nivalis* both in *Sphagnum* swamps and on dry sites), rarely also under *Leptospermum scoparium*. – New Zealand.

Material examined. – NEW ZEALAND: North Island: Gisborne: Urewera National Park: Lake Waikareiti, under *N. fusca* – *N. menziesii*, 13. V. 1975, leg. TAYLOR (982); Lake Waikareiti, near Headquarter N. P., under *N. solandri* – *Leptospermum* sp., 31. V. 1981, leg. HORAK (ZT 1440). – South Island: Nelson: Tophouse Saddle, under *N. solandri* var. *cliffortioides* (in *Sphagnum* swamp), 3. III. 1968, leg. HORAK, PDD 27175, holotype (ZT 68/98, isotype) . – Westcoast: S-shore of Lake Hochstetter, under *N. solandri* var.

*cliffortioides*, 17. III. 1968, leg. HORAK (ZT 68/178). – Otago: Lake Ohau, Temple Creek, under *N. solandri*, 13. IV. 1969, leg. TAYLOR (444); same locality, 22. III. 1970, leg. TAYLOR (579). – Southland: Lake Te Anau, E-shore, under *N. fusca-menziesii-solandri*, 26. II. 1982, leg. HORAK (ZT 1901); Lake Te Anau, W-shore, under *N. solandri*, 7. IV. 1969, leg. NEWSTEAD in TAYLOR (457). – Steward Island: Christmas Village, under *L. scoparium*, 14. III. 1969, leg. HORAK (ZT 1432).

Remarks. – In New Zealand *Nothofagus*-forests *D. canaria* is a common species met within a remarkably wide ecological range. This *Dermocybe* is readily identified by the brilliant yellow colours of the often rather robust carpophores with fusoid to bulbous stipes. The most distinctive microscopical feature are  $\pm$  smooth spores whose roughened apices are covered with very inconspicuous asperulate warts.

KOH turns the yellow pigment on all parts of the carpophore immediately red. Chromatographic pigment analysis showed that physcion and erythroglaucon are the most abundant anthraquinones of *D. canaria*. In addition another metabolite, 4-aminophyscion (KELLER & STEGLICH, 1987), was isolated representing the first record of a natural anthraquinone with an amino group.

Adding the macroscopical, microscopical and chemical characters *D. canaria* obviously occupies an isolated taxonomic position within the infrageneric frame of *Dermocybe*.

### 7. *Dermocybe aurantiella* HORAK sp. n. – Fig. 7

Pileus –20 mm, hemisphaericus dein convexo-campanulatus, aurantiacus, siccus, radialiter fibrillosus. Lamellae pallide aurantiacae tarde ferruginascentes. Stipes –55  $\times$  –3 mm, cylindricus, pileo concolor, fibrillis zonisque concoloribus e velo tote praeditus. Odor saporque raphanoidei. KOH – pallide olivaceus. Sporae 8.5–11  $\times$  4.5–5.5  $\mu$ m, cylindraco-amygdaliformes, verrucosae. Cystidia nulla. Ad terram in silvis nothofagineis. Novazelandia. Holotypus PDD 27176.

Pileus –20 mm, hemispherical to convex becoming broadly campanulate, centre flat to subdepressed in aged specimens, margin incurved; orange, later turning argillaceous brown; dry, hygrophonous, margin non-striate, covered with coarse concolorous fibrils, margin appendiculate from orange veil remnants. – Lamellae 8–12, –3, adnate to emarginate; pale orange turning rust brown, edges entire, concolorous. – Stipe –55  $\times$  –3 mm, cylindrical, rarely subfusoid with tapering base; brilliant orange to saffron yellow; dry, below cortina zonate from numerous concolorous appressed belts of veil, hollow, single. – Context orange. – Odour and taste raphanoid. – Chemical reactions on pileus: KOH – pale olive; HCl, NH<sub>3</sub> – negative.

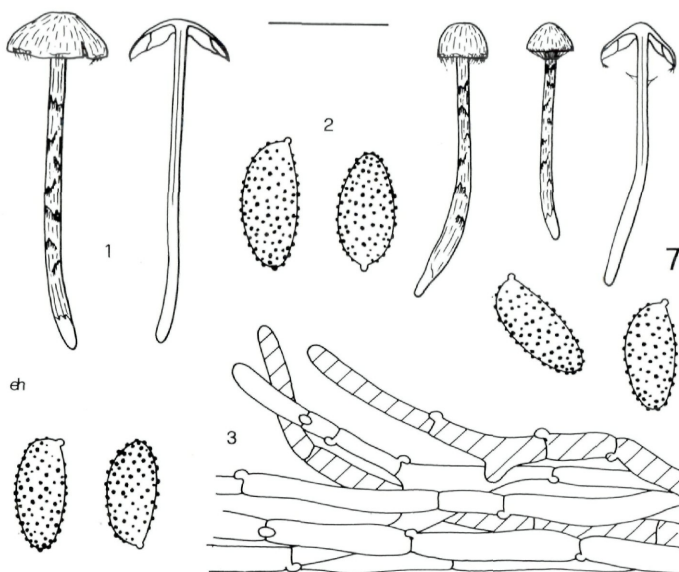


Fig. 7. *Dermocybe aurantiella* HORAK (PDD 27176, holotype): 1. carpophores. – 2. spores. – 3. basidia. – 4. cheilocystidia. – 5. pileipellis.

Spore print rust brown. – Spores  $8.5\text{--}11 \times 4.5\text{--}5.5 \mu\text{m}$ , sub-cylindrical to slender amygdaliform, minutely warted, rust brown. – Basidia  $30\text{--}42 \times 6\text{--}7 \mu\text{m}$ , 4-spored. – Cystidia none. – Pileipellis a cutis composed of cylindrical hyphae ( $8\text{--}12 \mu\text{m}$  diam.), membranes not gelatinized, with yellow plasmatic pigment dissolving in KOH. – Clamp connections present.

Habitat. – On soil among litter in *Nothofagus*-forest. – New Zealand.

Material examined. – NEW ZEALAND: South Island: Fjordland: Milford Sound, W of Homer Tunnel, under *N. menziesii*, 1. IV. 1969, leg. HORAK, PDD 27176, holotype (ZT 69/203, isotype); Lake Te Anau, North Fjord, Lugar Burn, under *N. solandri* var. *cliffortioides*, 10. IV. 1969, leg. HORAK (ZT 69/251).

Remarks. – The orange to yellow carpophores of *D. aurantiella* resemble small specimens of *D. canaria* but differ by the olive KOH-reaction on the pileus and the verrucose,  $\pm$  amygdaliform spores. Nothing is known yet about the chemical nature and structure of the pigments.



### 8. *Dermocybe egmontiana* HORAK sp. n. – Fig. 8

Pileus –25 mm, hemisphaericus vel convexus, ex nigro fuscocastaneus, luteomarginatus marginem versus, fibrillososquamulosus, siccus. Lamellae late adnatae, laete aurantiacae. Stipes –50 × –5 mm, cylindricus vel basim versus attenuatus, fusco(-castaneus), fibrillis luteis infra obtectus. Caro fusca purpureo tinctu. Odor saporque raphanoidei. KOH – nigroviolaceus. Sporae 5.5–6 × 4.5–5 µm, subgloboseae vel late ovoideae, verrucosae. Cystidia conspicua. Fibulae praesentes. Ad terram in silvis *Leptospermi scoparii*. Novazelandia. Holotypus PDD 27177.

Pileus –25 mm, hemispherical to convex, sometimes umbonate or flat at centre; black to fuscous with chestnut brown tinge, brilliant yellow-orange at margin, conspicuous veil remnants absent; dry, coarsely fibrillose to minutely squamulose, neither hygrophanous nor striate near margin. – Lamellae 16–22, –7, broadly adnate, –4 mm wide; bright orange becoming orange-brown with rust brown tint, edges paler, fimbriate from cheilocystidia. – Stipe –50 × –5 mm, cylindrical or gradually tapering towards base, single; fuscous with red-brown tinge, below fragmentary cortina densely covered with pale orange or yellow fibrils from veil (but without distinct zones or belts); fibrillose, dry, hollow. – Context black or fuscous in pileus, date brown with purplish tint in stipe. – Odour raphanoid. – Taste raphanoid, bitter. – Chemical reactions on pileus: KOH-black with wine red to lilac tint.

Spore print rust brown. – Spores 5.5–6 × 4.5–5 µm, subglobose to ovoid, verrucose, rust brown. – Basidia 20–28 × 6–7 µm, 4-spored, often with wine red plasmatic pigment. – Cheilocystidia conspicuous, composed of cell-chains, terminal cells (15–25 × –10 µm) cylindrical to subclavate, membranes thin-walled, with wine red plasmatic pigment. – Pileipellis a cutis or trichoderm of cylindrical hyphae (5–14 µm diam.), terminal cells cylindrical or subconical, membranes not gelatinized, with wine red to lilac (later turning brown) plasmatic pigment dissolving in KOH. – Clamp connections present.

Habitat. – On soil under *Leptospermum scoparium* (pure stand). – New Zealand.

Material examined. – NEW ZEALAND: Taranaki, Mt. Egmont N. P., near Dawson Falls, under *L. scoparium*, 19. VI. 1968, leg. HORAK, PDD 27177, holotype (ZT 68/572, isotype).

Remarks. – *D. egmontiana* represents another outstanding species of New Zealand's *Dermocybe*. The minutely squamulose and dry pilei are black or fuscous at the centre but this colour turns bright yellow near the margin. The orange lamellae are in conspicuous contrast to the dark brown stipe which is densely covered with orange-yellow fibrillose veil remnants. In addition *D. egmontiana* is characterized by the black-lilac KOH reaction on the surface of the pileus. The fimbriate edges of the lamellae bear large articulate

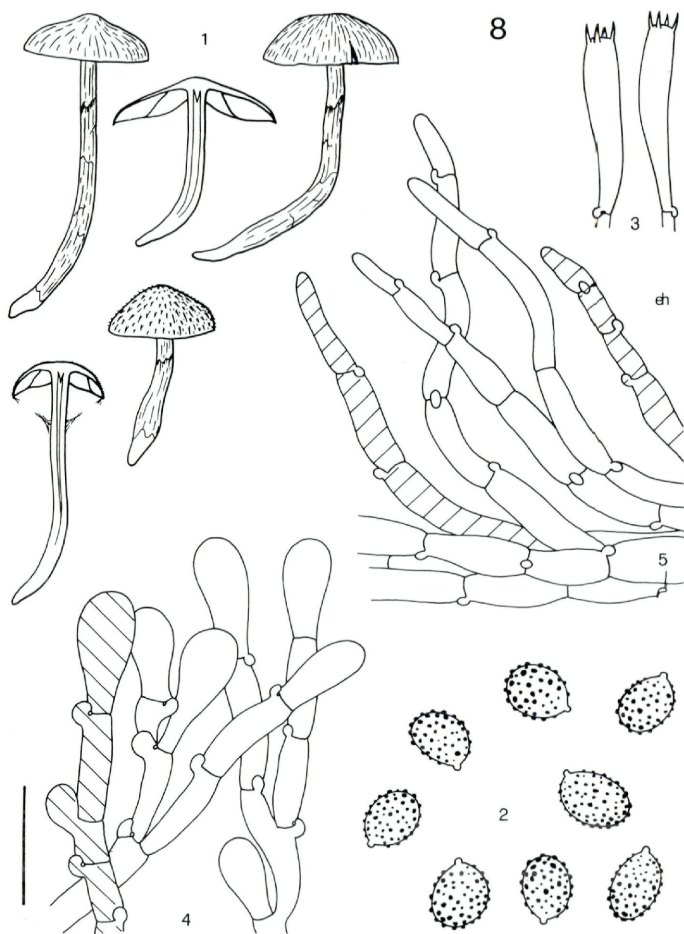


Fig. 8. *Dermocybe egmontiana* HORÁK (PDD 27178, holotype): 1. carpophores. – 2. spores. – 3. basidia. – 4. cheilocystidia. – 5. pileipellis. – 6. carpophores (ZT 68/338).

cheilocystidia which, together with the subglobose-ovoid verrucose spores, yield a reliable feature for its safe identification.

The type locality of *D. egmontiana* is situated in a small remote pure stand of *Leptospermum scoparium* on the southern slopes of Mt. Egmont. This myrtaceous tree obviously represents the mutual ectomycorrhizal partner for this striking *Dermocybe*. Finally pigment analysis demonstrated that physcion, emodin and dermatocyanin (and some of their derivatives) are the most distinctive pigments of *D. egmontiana* recorded only once with numerous carpophores (KELLER & al., 1988).

### 9. *Dermocybe castaneodisca* HORÁK sp. n. – Fig. 9

Pileus –50 mm, ex hemisphaerico campanulatus, castaneus vel luteoaurantiacus marginem versus, viscidus. Lamellae emarginatae, luteae dein ferrugineoaurantiacae. Stipes –70 × –7 mm, cylindricus vel subclavatus, sulphureus, zonis luteobrunneis subviscidis e velo obtectus. Odor saporque raphanoidei. KOH – ruber. Spores (7)7.5–9.5 × (4–)5–6 µm, ovoideae, verrucosae. Cheilocystidia conspicua. Ad terram in silvis nothofagineis. Novaezelandia. Holotypus PDD 27178.

Pileus –50 mm, hemispherical or conico-convex becoming broadly umbonate or campanulate; red-brown or chestnut brown at centre, yellow or orange towards margin; viscid to subglutinous when moist, innately fibrillose in dry condition, often radially wrinkled, hygrophorous, margin distinctly striate, with fibrillose to agglutinated semipersistent veil remnants along margin. – Lamellae 10–20,5(–7), emarginate and subdecurrent with short tooth, ventricose, –5 mm wide; yellow, ochre or orange at first turning rust orange in mature specimens, edges concolorous or paler, fimbriate or subserrate from cheilocystidia. – Stipe –70 × –7 mm, cylindrical or subclavate, often subfusoid at base, single or cespitose; sulphur yellow to yellow-ochre, below fugaceous cortina with several yellow to yellow-brown viscid zones and belts of veil; dry (except veil remnants when fresh), longitudinally fibrillose, hollow, often with yellow rhizomorphs. – Context yellow-orange in pileus and stipe. – Odour and taste raphanoid (or like raw potatoes), often faint. – Chemical reactions on pileus: KOH – red; HCl, NH<sub>3</sub>-negative.

Spore print rust brown. – Spores (7–)7.5–9.5 × (4–)5–6 µm, ovoid, verrucose, rust brown. – Basidia 25–40 × 7–10 µm, 4-spored. – Cheilocystidia conspicuous, composed of articulated cell-chains, terminal cells (10–30 × 12 µm) ovoid or clavate, membranes thin-walled, hyaline. – Pileipellis a cutis or trichoderm composed of cylindrical hyphae (4–8 µm diam.), terminal cells cylindrical or fusoid-conical, membranes gelatinized, with red-brown to purple-grey plasmatic pigment dissolving in KOH, subcuticular layers cellular. – Clamp connections present.

Habitat. – On soil in *Nothofagus*-forest (*N. solandri* var. *clifortioides-fusca-menziesii*), sometimes in mixed stands with *Leptospermum* spp. – New Zealand.

Material examined. – NEW ZEALAND: North Island: North Auckland, Hunua Range, Franklin Co., Mangatangi Valley, under *Nothofagus-Leptospermum*, 19. VI. 1974, leg. HAYDON, PDD 32253,

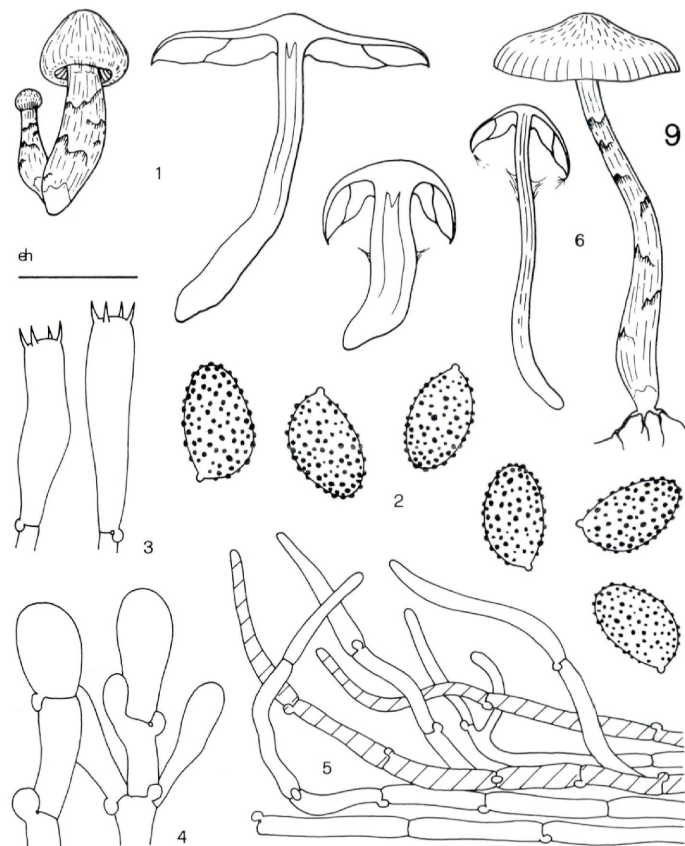


Fig. 9. *Dermocybe castaneodisca* HORÁK (PDD 27178, holotype): 1. carpophores. – 2. spores. – 3. basidia. – 4. cheilocystidia. – 5. pileipellis. – 6. carpophores (ZT 68/338).

(ZT 76/239). – Gisborne: Urewera N. P., Ngamoko Track, under *Nothofagus-Leptospermum*, 22. V. 1981, leg. HORAK (ZT 641). – South Island: Nelson, Tophouse Saddle, under *N. solandri* var. *cliffortioides-menziesii-fusca*, sometimes in association with *Sphagnum*, 1. V. 1968, leg. HORAK (ZT 68/338). – Westland, Ngahere, Lake Haupiri, Kopara, under *N. fusca*, 13. XII. 1967, leg. HORAK, PDD 27178, holotype (ZT 67/249, isotype).

Remarks. – In New Zealand *D. castaneodisca* is found to be a common species in mixed *Nothofagus-Leptospermum* forests. There is ecological evidence, however, that this agaric can enter ectomyorrhiza only with *Nothofagus* spp. (HORAK, unpubl.).

Macroscopically *D. castaneodisca* is recognized by the yellow-orange pileus with maroon red disk. In moist conditions both the pileal surface and the yellow-orange veil remnants scattered over the stipe are viscid or glutinous. Based upon these characters *D. castaneodisca* must be considered a typical representative of *Dermocybe* subgen. *Icterinula* (MOSER & HORAK, 1975). Seven different pigments have been extracted from carpophores of *D. castaneodisca*. Apart from endocrocin, however, the molecular properties of the remaining six components are not yet elucidated (KELLER & al., 1988).

#### 10. *Dermocybe olivaceonigra* HORAK sp. n. – Fig. 10

Pileus 40 mm, ex convexo obtuse campanulatus, olivaceofuliginosus ad apicem, luteus marginem versus, glutinosus. Lamellae emarginatae, aureae. Stipes 70 × 4 (–13) mm, fusoides vel subclavatus, luteus (olivaceo tinctu), glutinosus. Odor saporque raphanoidei. KOH – rubrobrunneus. Sporae 7.5–9 × 4.4–5 µm, ellipticae, minute verrucosae. Cystidia nulla. Ad terram in silvis nothofagineis. Novazelandia. Holotypus PDD 27179.

Pileus – 40 mm, convex to broadly umbonate or obtusely campanulate; fuliginous or olive-brown at centre, towards margin turning olive-yellow or bright yellow; subgelatinous to viscid, striate margin when moist, hygrophanous, conspicuous veil remnants absent. – Lamellae 18–26, –7, emarginate, subdecurrent with tooth, –6 mm wide; dark yellow (with greenish tinge) turning yellow-rust brown; edges concolorous, entire. – Stipe 70 × 4 (–13 at base) mm, slender, fusoid to subbulbous towards base, rarely cylindrical, single; yellow to olive-yellow, occasionally with yellow rhizoids; glutinous from base to evanescent cortina, longitudinally fibrillose in dry conditions, solid becoming hollow. – Context olive-brown in pileus and stipe, yellow beneath stipe's cuticle. – Odour and taste raphanoid (or like raw potatoes). – Chemical reactions on pileus and stipe: KOH – red to red-brown; HCl, NH<sub>3</sub> – negative.

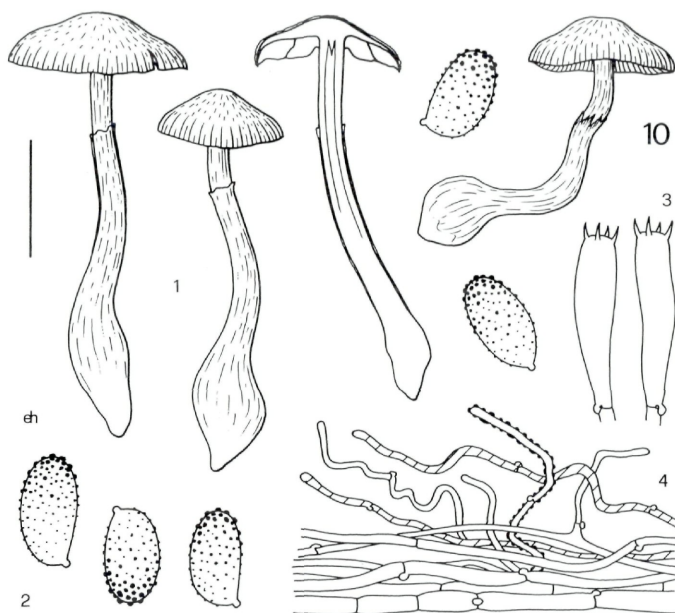


Fig. 10. *Dermocybe olivaceonigra* HORAK (PDD 27179, holotype): 1. carpophores. – 2. spores. – 3. basidia. – 4. pileipellis.

Spore print rust brown. – Spores  $7.5-9 \times 4.5-5 \mu\text{m}$ , elliptical, minutely verrucose, with coarse warts at apex, rarely with distinct perispore, rust brown. – Basidia  $25-35 \times 6-8 \mu\text{m}$ , 4-spored. – Cheilocystidia none. – Pileipellis an ixocutis composed of cylindrical, gelatinized, entangled hyphae ( $2-6 \mu\text{m}$  diam.), subcutis cellular, with red-brown encrusting and plasmatic pigment, readily dissolving in KOH (solvent stains red-purple). – Clamp connections present.

Habitat. – On soil in *Nothofagus*-forests. – New Zealand.

Material examined. – NEW ZEALAND: South Island: Nelson, Lake Rotoiti, track to St. Arnaud Range, under *N. fusca-menziesii-solandri* var. *cliffortioides*, 30. IV. 1968, leg. HORAK, PDD 27179, holotype (ZT 68/322, isotype). – Canterbury, Craigieburn Range, Broken River, near FRES Camp, under *N. solandri* var. *cliffortioides*, 19. VI. 1968, leg. HORAK (ZT 68/273).

Remarks. – *D. olivaceonigra* closely resembles the more common *D. alienata* by similar habit, the presence of olive-green pigments (in both taxa KOH-spot test red!), the glutinous to viscid pileus and the occurrence in *Nothofagus*-forests. The two species, however, are distinguished by the size of the spores (larger in *D. olivaceonigra*) and the number and variety of anthraquinonoid pigments (KELLER & al., 1988). In *D. olivaceonigra* the olive-yellow colour of the carpophores is partly caused by endocrocin which lacks in the pigment chart of *D. alienata*.

11. *Dermocybe alienata* HORAK sp. n. – Fig. 11

Pileus –60 mm, ex hemisphaerico obtuse campanulatus, nigroolivaceus vel fuliginosus ad apicem, luteus marginem versus, glutinosus. Lamellae emarginatae, pallide luteae. Stipes –100 × –8(–15) mm, fusoides vel subbulbosus ad basim, luteus, glutinosus. Odor saporque (sub)raphanoidei. KOH – rubrobrunneus. Sporae 7–8.5–11 × (4–)4.5–5.5 μm, ex ovoideo ellipticae, verrucosae. Cystidia nulla. Ad terram in silvis Nothofagi Leptospermiq. Novazelandia. Holotypus PDD 27180.

Pileus –60 mm, hemispherical or convex becoming broadly umbonate or obtusely campanulate finally depressed around umbo,

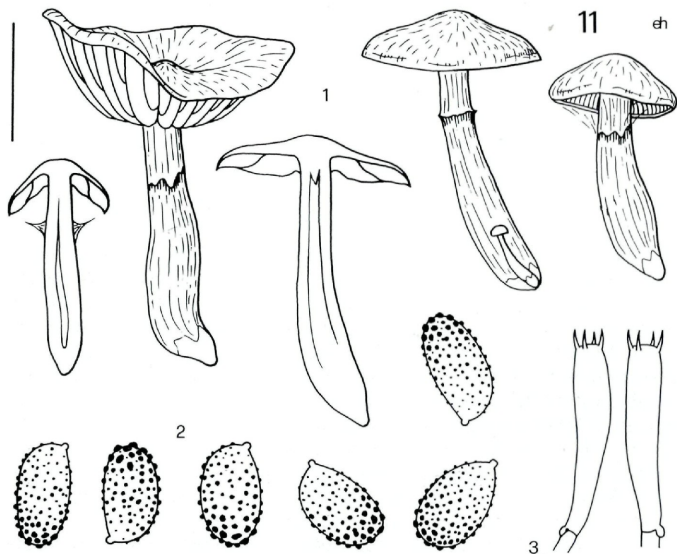


Fig. 11. *Dermocybe alienata* HORAK (PDD 27180, holotype): 1. carpophores. – 2. spores. – 3. basidia. – 4. pileipellis.

margin distinctly inrolled in young specimens; centre black-olive, pale fuliginous-green or grey-green, fading towards margin to ochre-yellow or golden yellow; glutinous to viscid, remaining sticky, occasionally radially wrinkled, margin striate in aged carpophores, conspicuous veil remnants absent. – Lamellae 20–30, –7, adnate to broadly emarginate, subdecurrent with tooth, –7 mm wide; pale yellow to apricot (any green-olive tinge absent) turning yellow rust brown with age; edges concolorous, entire to serrulate. – Stipe –100 × –8 (–15 at base) mm, (sub)fusoid, subbulbous or clavate at base, rarely cylindrical, single or cespitose; pale yellow (occasionally with pale grey-olive shine); glutinous to viscid from base to subpersistent fibrillose or agglutinated cortina, apex dry, sometimes with yellow rhizoids at base; solid when young, becoming hollow. – Context pale yellow (turning brown upon bruising), distinctly olive-grey beneath cuticle of pileus. – Odour and taste acidulous to (weakly) raphanoid. – Chemical reactions on pileus (and stipe): KOH-red to red-brown.

Spore print rust brown. – Spores 7–8.5–11 × (4–)4.5–5.5 µm, oval to subelliptical, minutely verrucose but with coarse warts at apex (often embedded in perisporial remnants), rust brown. – Basidia 25–35 × 6–7 µm, 4-spored, often with purple-brown plasmonic pigment. – Cheilocystidia absent. – Pileipellis an ixocutis composed of cylindrical, strongly gelatinized, entangled hyphae (2–6 µm diam.), subcutis cellular, in KOH with brilliant red-purple both plasmonic, encrusting and intercellular pigment which scarcely dissolves in KOH, solvent stains pale olive brown, rarely with oleiferous hyphae. – Clamp connections present.

Habitat. – On soil both in *Nothofagus* and *Leptospermum*-forests. – New Zealand.

Material examined. – NEW ZEALAND: North Island: North Auckland: Waikatore Range: Piha Valley, under *L. ericoides* (with *Vitex*, *Rhopalostylis*, *Knightia*), 2. VI. 1969, leg. HORAK, PDD 27180, holotype (ZT 69/372, isotype); Mill Bay, under *Leptospermum* sp. (with *Phyllocladus*), 6. VII. 1981, leg. HORAK (ZT 1052); Northcote, Kauri Glen, 8. VI. 1972, leg. TAYLOR (761). – Gisborne: Urewera N. P.: Ngamoko Track, under *Leptospermum-Nothofagus*, 22. V. 1981, leg. HORAK (ZT 640); near N. P. Headquarters, under *N. fusca-menziesii*, 27. V. 1981, leg. HORAK (ZT 805); Lake Ruapani, under *N. fusca-menziesii*, 30. V. 1981, leg. HORAK (ZT 825). – Wellington, Tokaanu, Lake Rotopounamu, under *N. fusca*, 22. V. 1973, leg. TAYLOR (839). – South Island: Otago, Lake Ohau, Temple Forest, under *N. solandri*, 9. V. 1971, leg. TAYLOR (673). – Southland, Lake Manapouri, Surprise Bay, under *N. solandri* (with *Dacrydium*, *Podocarpus*), 5. V. 1970, leg. TAYLOR (624).



Remarks. – In New Zealand *D. alienata* represents the most common species of the genus. It is found in mixed broadleaved forests but also occurs in pure stands of both *Nothofagus* spp. and *Leptospermum* spp.

Due to the olive-green tinge on the yellow pileus *D. alienata* is readily confused with *D. olivaceonigra* or *D. icterinoides*. According to personal experience the definite identification and/or separation of the species belonging into this complex is often not possible in the field. A thorough microscopical examination should be supported by data obtained from thin-layer chromatography of the anthraquinonoid pigments (KELLER & al., 1988). Skyrin, hypericin and to a lesser degree dermolutein are the principal pigments which are responsible for the yellow colours of *D. alienata*. A similar pigment pattern is also found in *D. icterinoides* which, however, differs not only by the presence of additional pigment components but also several other distinctive macroscopical characters.

## 12. *Dermocybe largofulgens* HORÁK sp. n. – Fig. 12

Pileus –40 mm, ex convexo umbonaticampanulatus, fuscus, luteobrunneus marginem versus, viscidus. Lamellae ex adnato emarginatae, ope safranaceae. Stipes –50 × –5 mm, cylindricus, luteus vel aurantiacus, zonis inconspicuis concoloribus e velo obtectus. Odor saporque nulli vel subraphanacei. KOH – rubrobrunneus. Sporae 5.5–6.5 × 3.5–4 µm, ovoideae, verrucosae. Cheilocystidia praesentia, haud conspicua. Ad terram in silvis Leptospermarum. Novaezelandia. Holotypus PDD 27181.

Pileus –40 mm, convex to conico-convex becoming broadly umbonate-expanded to campanulate; dark brown to umber brown, orange to yellow-brown near margin, olive tints absent; viscid when moist, innately fibrillose or smooth in dry conditions, hygrophanous and striate near margin with fibrillose orange veil remnants. – Lamellae 15–22, 3–15, adnate to emarginate ventricose, –3.5 mm wide; brilliant orange to saffron, with ferruginous tinge in mature specimens, edges concolorous, entire. – Stipe –50 × –5 mm, cylindrical occasionally subfusoid or gradually tapering at base, single or cespitose; yellow to orange, below the ± distinct cortina with several mostly inconspicuous appressed concolorous veil zones; dry, fibrillose, hollow. – Context orange-brown. – Odour and taste not distinctive or faintly raphanoid. – Chemical reactions on pileus: KOH – red-brown.

Spore print rust brown. – Spores 5.5–6.5 × 3.5–4 µm, ovoid, verrucose, rust brown. – Basidia 20–28 × 5–6 µm, 4-spored. – Cheilocystidia inconspicuous, scattered clavate cells (15–20 × –10 µm) forming a ± sterile gill edge, hyaline or with red-brown plasmatic pigment. – Pileipellis an ixocutis of strongly gelatinized hyphae (3–8 µm diam.), with (red-)brown to purple plasmatic (rarely

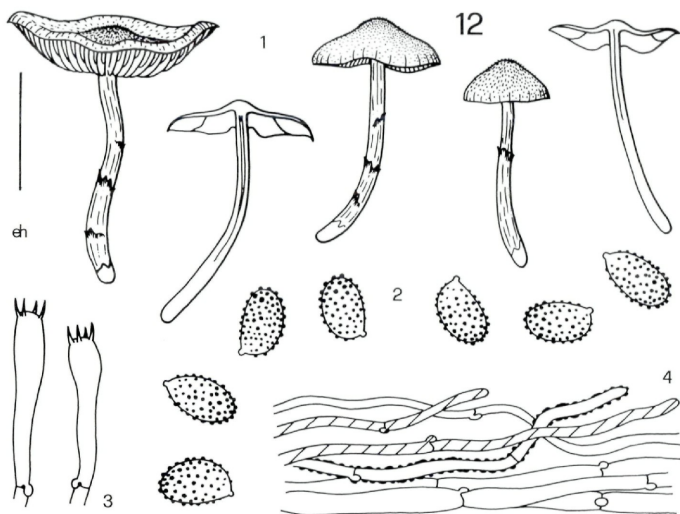


Fig. 12. *Dermocybe largofulgens* HORAK (PDD 27181, holotype): 1. carpophores. – 2. spores. – 3. basidia. – 4. pileipellis.

also encrusting) pigment readily dissolving in KOH. – Clamp connections present.

**Habitat.** – On soil under *Leptospermum* spp. mixed with *Knightia*, *Phyllocladus* and *Agathis*. – New Zealand.

**Material examined.** – NEW ZEALAND: North Auckland: Waikare Range, Titirangi, under *L. ericoides*, 1. VI. 1969, leg. HORAK, PDD 27181, holotype (ZT 69/371, isotype); Hunua Range, Orere, Te Morehue, under *L. scoparium* (pure stand), 4. VII. 1981, leg. HORAK (ZT 1045).

**Remarks.** – The colours on the carpophores of *D. largofulgens* are composed of 12 individual pigments (KELLER et al., 1988). Out of these endocrocin is the only compound positively detected whereas the identity of the other 11 pigments still remains unknown. Microscopically *D. largofulgens* is well characterized by its small verrucate spores which actually are the smallest in all *Dermocybe* hitherto reported from New Zealand.

The ecological data taken from the two recorded localities in North Island suggest that *D. largofulgens* must be considered an obligate ektomycorrhizal partner of *Leptospermum* spp.

13. *Dermocybe indotata* HORAK sp. n. – Fig. 13

Pileus –25 mm, ex hemisphaerico umbonatus, nigrofuscus vel luteobrunneus (olivaceo tinctu ad apicem), fibrillosus, siccus. Lamellae adnatae, sinapicolores vel aurantiobrunneae. Stipes –45 × –3 mm, cylindricus, luteus fibrillis concoloribus inconspicue obtectus. Odor saporque raphanoidei. KOH – rubrobrunneus. Sporae 6–7(–7.5) × 3.5–4.5 μm, ovoideoellipticae, verrucosae. Cheilocystidia conspicua. Ad terram in silvis mixtis. Novazelandia. Holotypus PDD 27182.

Pileus –25 mm, hemispherical or conico-convex, usually with small umbonate papilla at centre in mature specimens; black, fuscous or yellow-brown (with olive tinge) at centre, paler to pale yellow-brown towards margin; dry, hygrophanous, indistinctly striate near margin, coarsely fibrillose, conspicuous veil remnants absent. – Lamellae 12–20, –3, adnexed to broadly adnate, –3 mm wide; bright mustard yellow or orange-brown, with ferruginous tinge in old material, edges concolorous or paler, fimbriate from cheilocystidia. – Stipe –45 × –3 mm, cylindrical, sometimes

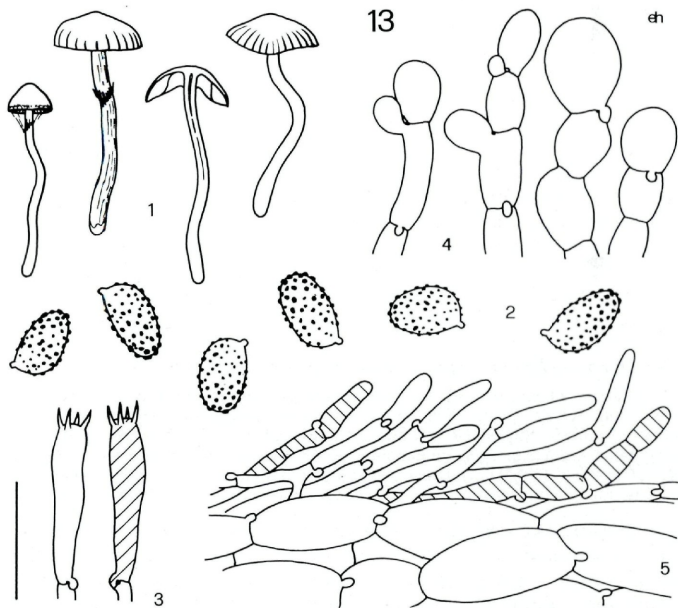


Fig. 13. *Dermocybe indotata* HORAK (PDD 27182, holotype): 1. carpopores. – 2. spores. – 3. basidia. – 4. cheilocystidia. – 5. pileipellis.

attenuated at base, single or cespitose; yellow, below inconspicuous cortina with fragmentary, yellow or pale rust brown veil zones; dry, fibrillose, hollow. – Context yellow-brown-olive in pileus, brown-black in base of stipe. – Odour and taste raphanoid. – Chemical reactions on pileus: KOH – red brown to brown; HCl, NH<sub>3</sub> – negative.

Spore print rust brown. – Spores 6–7(–7.5) × 3.5–4.5 μm, ovoid to elliptical, verrucose, rust brown. – Basidia 20–28 × 5–7 μm, 4-spored, often with red-brown plasmatic pigment. – Cheilocystidia conspicuous, composed of cell-chains, terminal cells (10–30 × 15 μm) clavate to ovoid, membranes thin-walled, with red-brown to wine red plasmatic pigment. – Pileipellis a cutis (or a trichoderm) composed of cylindrical hyphae (5–12 μm diam.), terminal cells cylindrical or conical, membranes not gelatinized, with pale red-brown to grey-lilac plasmatic pigment readily dissolving in KOH. – Clamp connections present.

Habitat. – On soil in forests dominated by *Nothofagus-Leptospermum*. – New Zealand.

Material examined. – NEW ZEALAND: South Island: Nelson, Lake Rotoiti, Westbay, under *L. scoparium* – *N. solandri* var. *cliffortioides*, 29. IV. 1968, leg. HORAK, PDD 27182, holotype (ZT 68/310, isotype). – Southland, Fjordland, Milford Sound, under *N. menziesii*, 1. IV. 1969, leg. HORAK (ZT 69/216).

Remarks. – *D. indotata* shares its most distinctive microscopical character, viz. the remarkably small spores, with *D. largofulgens*. From the latter species it is distinguished, however, by the dry and much darker pileus, the presence of balloon-shaped cheilocystidia and its occurrence in *Nothofagus*-forests. As principal pigments emodin and its glucoside have been identified which are absent on chromatograms obtained from *D. largofulgens* (KELLER & al., 1988).

#### 14. *Dermocybe leptospermarum* HORAK sp. n. – Fig. 14

Pileus –40 mm, ex umbonato campanulatus, obscure brunneus vel luteobrunneus, subolivaceo tinctu, subviscidus. Lamellae emarginatae, sinapicolores dein luteoferrugineae. Stipes –50 × –7 mm, cylindricus, luteus, zonis luteibrunneis e velo cingulatus. Odor saporque raphanoidei. KOH – ruber vel rubrobrunneus. Sporae 6–7.5(–8) × 3.5–4(–4.5) μm, ovatae, verrucosae. Cystidia nulla. Fibulae praesentes. Ad terram in silvis Leptospermarum. Novaezelandia. Holotypus PDD 27183.

Pileus –40 mm, hemispherical or broadly umbonate-expanded to campanulate; brown to yellow-brown, often with distinct olive tinge, towards margin paler or yellow; dry, but subviscid in moist condition, glabrous, innately fibrillose or subsquamulose, hygrophanous, margin striate when fresh, occasionally with yellow-brown fibrillose veil remnants at margin. – Lamellae 14–20, 3–5,

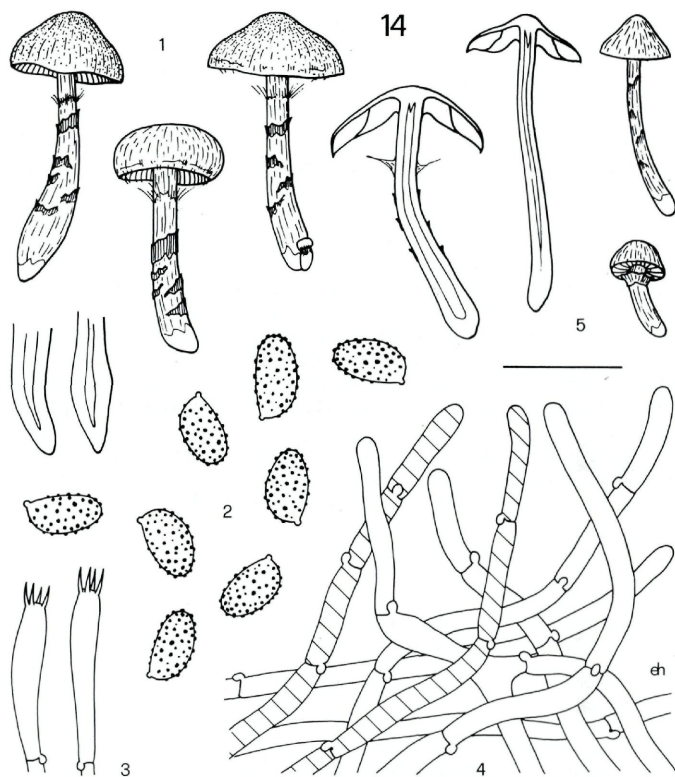


Fig. 14. *Dermocybe leptospermarum* HORAK (PDD 27183, holotype): 1. carpopores. – 2. spores. – 3. basidia. – 4. pileipellis. – 5. carpopores (ZT 68/354).

emarginate, sometimes slightly decurrent with short tooth, –5 mm wide; mustard yellow, turning yellow-brown with rust brown tinge; edges concolorous, even or dentate. – Stipe –50 × –7 mm, cylindrical (rarely subclavate or subfusoid), central, single or cespitose; yellow below yellow-brown fibrillose cortina with several inconspicuous or persistent appressed zones of yellow-brown veil remnants; dry, longitudinally fibrillose, hollow, occasionally with yellow basal tomentum which turns pink or pale cinnabar red in dried specimens. – Context yellow-brown, dark brown in base of

stipe. – Odour raphanoid. – Taste bitter to raphanoid. – Chemical reactions on pileus: KOH – red-brown.

Spore print rust brown. – Spores  $6-7.5(-8) \times 3.5-4(-4.5) \mu\text{m}$ , ovoid, verrucose. – Basidia  $20-35 \times 5-7 \mu\text{m}$ , 4-spored often with red-brown plasmatic pigment. – Cheilocystidia absent. – Pileipellis a cutis or trichoderm of cylindrical hyphae ( $4-10 \mu\text{m}$  diam.), terminal cells cylindrical or fusoid-conical, membranes slightly gelatinized, with encrusting and plasmatic red-brown pigment,  $\pm$  insoluble in KOH. – Clamp connections present.

Habitat. – On soil under *Leptospermum scoparium*. – New Zealand.

Material examined. – NEW ZEALAND: South Island: Nelson: N of Puponga, under *L. scoparium* (pure stand), 9. V. 1968, leg. HORAK, (ZT 68/405); Lake Rotoiti, trail to Mt Robert, under *L. scoparium*, 3. IV. 1969, leg. HORAK (ZT 69/226). Southland: Lake Te Anau, trail to Lake Manapouri, under *L. scoparium* and *N. solandria* var. *cliffortioides*, 6. IV. 1969, leg. HORAK, PDD 27183, holotype (ZT 69/232, isotype).

Remarks. – All records of *D. leptospermarum* are reported from localities dominated by *Leptospermum* spp. and an ectomycorrhizal relationship with *L. scoparium* and/or *L. ericoides* can be assumed.

In this *Dermocybe* bright mustard yellow lamellae contrast with the rather dark brown colours of the pileus which occasionally shows distinct olive shades over its disk.

It is noteworthy that KOH (applied to the pileocutis) causes a colour change from yellow-brown to a distinct red-brown. The actual pigment, however, does not dissolve in KOH (3%). Chemical analysis of the pigments has demonstrated that endocrin and flavomannin (and related derivatives) predominate in carpophores of *D. leptospermarum*. Other anthraquinones (emodin, dermolutein, etc.) frequently isolated in related New Zealand taxa are absent in *D. leptospermarum* (KELLER & al., 1988).

#### 15. *Dermocybe icterinoides* HORAK sp. n. – Fig. 15

Pileus –40 mm, ex conico convexus dein papillatocampanulatus, siccus, aureus (subfuliginoso tinctu ad apicem). Lamellae emarginatae, aureae. Stipes –55  $\times$  –4(–6) mm, fusoides, aureus, fibrillosus, siccus. Odor saporque raphanoidei. KOH – rubrobrunneus dein niger. Sporae  $7-9 \times 4.5-5 \mu\text{m}$ , subellipticae, minute verrucosae. Cheilocystidia nulla. Ad terram in silvis nothofagineis. Novaezelandia. Holotypus PDD 27184.

Pileus –40 mm, hemispherical-convex with conspicuous conical papilla or umbonate-campanulate; golden yellow with distinct brownish or sooty tinge over apex, olive colour shades none; dry, slightly viscid only when moist, innately fibrillose to glabrous,

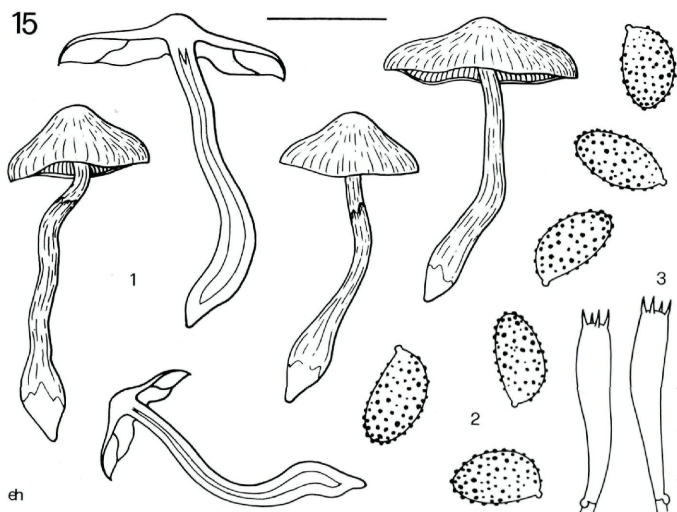


Fig. 15. *Dermocybe icterinoides* HORÁK (PDD 27184, holotype): 1. carpophores. – 2. spores. – 3. basidia.

scarcely hygrophanous, margin rarely striate, distinct veil remnants absent. – Lamellae 12–20, –7, emarginate, subdecurrent with tooth, –5 mm wide; bright golden yellow (without olive tinges) turning yellow-rust brown in mature specimens; edges concolorous, entire or serrulate. – Stipe –55 × 4 (–6) mm, fusoid, slender, rarely cylindrical, single; dry, concolorous with lamellae or paler, longitudinally fibrillose, cortina evanescent, solid becoming hollow. – Context yellow. – Odour and taste raphanoid. – Chemical reactions on pileus: KOH – orange-brown to red-brown, slowly turning black.

Spore print rust brown. – Spores 7–9 × 4.5–5 µm, ovoid to subelliptical, minutely verrucose, warts slightly coarser at apex, perisporeal remnants none. – Basidia 25–35 × 6–8 µm, 4-spored, often with red-brown plasmatic pigment. – Cheilocystidia absent. – Pileipellis a cutis (or trichoderm) composed of cylindrical hyphae (3–6 µm diam.), membranes weakly gelatinized or not at all, with red-brown (to purple) encrusting and plasmatic pigment, scarcely dissolving in KOH (solvent stains pale olive-brown with purple tinge). – Clamp connections present.

Habitat. – On soil in *Nothofagus*-forests. – New Zealand.

Material examined. — NEW ZEALAND: North Island: Gisborne: Urewera N. P., Lake Waikareiti, under *N. menziesii-fusca* (with *Phyllocladus*, *Dracophyllum*), 30. VI. 1968, leg. HORAK, PDD 27184, holotype (ZT 68/628, isotype) — South Island: Nelson: Top-house Saddle, among *Sphagnum* under *N. solandri* var. *cliffortioides* (pakihi), 3. III. 1968, leg. HORAK (ZT 68/106). Southland: Lake Te Anau, Harry Creek, under *N. solandri* var. *cliffortioides*, 8. IV. 1969, leg. HORAK (ZT 69/250).

Remarks. — On carpophores of *D. icterinoides* bright golden yellow colours predominate on all parts. Applying KOH on the surface of pileus or stipe these conspicuous pigments immediately turn red-brown or brown. Concerning quality and quantity of the anthraquinones involved this species shares its major pigments (skyrin, endocrocin, hypericin and dermolutein) with *D. alienata*. On chromatograms of the former species, however, two further, yet unidentified compounds are detected. Summing up all distinctive pigment characters there is much evidence that the two taxa must have close taxonomic relationships. In addition the size and the shape of spores are almost identical and the KOH-reaction of *D. alienata* is also reported to be red or red-brown (KELLER & al., 1988).

The two taxa are separated, however, by the absence of olive colours on the pileus and the dry (or much less gelatinized) pileipellis in *D. icterinoides*.

Unless otherwise stated the magnifications of the Figures are: carpophores (nat. size; bar = 20 mm), spores ( $\times 2000$ ; bar = 10  $\mu\text{m}$ ), basidia and cheilocystidia ( $\times 1000$ ; bar = 20  $\mu\text{m}$ ) and pileipellis (vertical section,  $\times 500$ ; bar = 40  $\mu\text{m}$ ).

Holotype material is kept in PDD (Herbarium, Plant Diseases Division, Auckland, New Zealand), isotypes and additional collections are kept in ZT (Herbarium, Geobotanical Institute, ETHZ, Zürich, Switzerland).

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