

## ***Cortinarius* Fr. (Agaricales) in Australasia. 1. Subgen. *Myxadium* and subgen. *Paramyxadium***

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Thirty five species of *Cortinarius* subgen. *Myxadium* (25 spp.) and subgen. *Paramyxadium* (10 spp.) are recorded from Australasia including Australia (10 spp.), New Zealand (21 spp.), New Caledonia (3 spp.) and Papua New Guinea (3 spp.). In subgen. *Myxadium* 15 new taxa are described. Type or authentic material of 6 formerly reported Australasian taxa are redescribed. The extralimital taxa *C. magellanicus* (from subantarctic South America) and *C. salor* (from the northern hemisphere) are recorded for the first time in Australasia (New Zealand, Papua New Guinea). In subgen. *Paramyxadium* 8 new taxa are described. Upon re-examination of type material *C. melleomitis* and *C. paraochraceus* var. *australiensis*, both originally described in subgen. *Myxadium*, are transferred into subgen. *Paramyxadium*. The extralimital *C. melleomitis* (from subantarctic South America) is recorded for the first time in Australasia (New Zealand). All 35 species of *Cortinarius* treated in this contribution are considered to enter ectomycorrhiza. Ecosociological data assessed at the pertinent collecting sites support evidence that the following trees interact as mycotrophic host plants with mycelia both of *Myxadium* and *Paramyxadium*: Fagaceae: *Nothofagus* (20 spp.), *Castanopsis* (2 spp.); Myrtaceae: *Eucalyptus* and *Leptospermum* (15 spp.). Illustrations of all taxa mentioned and a key to *Cortinarius* subgen. *Myxadium* and subgen. *Paramyxadium* in Australasia are presented.

In this contribution the current knowledge about taxonomy, ecology and distribution of rust brown spored taxa belonging to the notoriously difficult complex of *Cortinarius* subgen. *Myxadium* and subgen. *Paramyxadium* in Australasia (Australia, New Zealand, New Caledonia, Papua New Guinea) is presented. The systematic circumscription of these two subgenera in *Cortinarius* s.l. closely follows the concept outlined by MOSER & HORAK (1975) for the representatives described from the subantarctic forests in southern South America.

According to currently accepted interpretation (MOSER, 1962; MOSER in SINGER, 1986) subgen. *Myxadium* is perceived to encompass agarics whose basidiomes have both a glutinous to viscid pileus and stipe. In addition species of that group are characterized by a pale ochraceous to dark rust brown spore print. Furthermore, the more or less distinctly verrucose spores lack a germ pore and range in shape from globose, ovoid, elliptic, amygdaliform to sublunifoliate.

In contrast MOSER & HORAK (1975) proposed to include in the subgen. *Paramyxa* all those related taxa having comparatively small basidiomes with conspicuously striate-translucent, more or less hygrophanous and membranaceous pilei with or without vivid colours. The authors are fully aware of the fact that the subgeneric delimitation of subgen. *Paramyxa* is still rather diffuse and far of being well defined within the polymorphic genus *Myxa*. Accordingly the taxonomic position of several species described below is not fully established yet. Additional material from the Australasian region and relevant chemotaxonomic data must be awaited before premature steps are taken to disentangle the still complex taxonomy of the southern hemispheric representatives of subgen. *Myxa* and subgen. *Paramyxa*.

To present knowledge the 10 taxa so far described (MOSER & HORAK, 1975; HORAK, 1979; 1982) as belonging to the segregate subgenus *Paramyxa* are exclusively restricted to habitats in the subantarctic forest associations of South America (Argentina, Chile).

The pattern of extant distribution supports the hypothesis in this paper that several taxa referred to either subgen. *Myxa* or subgen. *Paramyxa* actually originated as obligate and/or facultative ectomycorrhizal fungi both in *Nothofagus* and to a lesser extent and geohistorically later in *Eucalyptus-Leptospermum* forests before Gondwanaland broke up millions years ago (HORAK, 1983; with detailed maps). Despite the geographically rather scattered and random collections within Australasia and southern South America the following examples indicate that several taxa can be considered "living fossils":

- C. (Myx.) magellanicus*, *C. (Myx.) melleomitis*: under *Nothofagus* spp. in Argentina-Chile and New Zealand (? also in Tasmania).
- C. (Myx.) rotundisporus*, ? *C. paraochraceus* s.l.: under *Eucalyptus-Leptospermum* in Australia and New Zealand.
- C. salor*: under *Castanopsis* (and ? *Lithocarpus*) in New Guinea (immigrated there rather recently as symbiont of northern chestnut trees and ? oaks).

As pointed out in the following keys numerous species of Australasian *Myxa* and *Paramyxa* are outstanding due to the colourful basidiomes, and accordingly they often represent some of the most attractive and eye-catching mushrooms in the local austral-antarctic mycoflora. Thus it is not surprising that e.g. the Australian *C. erythraeus* and *C. archeri* have been described for a long time because of the extraordinary red and blue pigments which attracted the attention of the early plant collectors DRUMMOND and ARCHER who subsequently sent specimens and paintings to M.J. BERKELEY for

identification (HILTON, 1983). To date nothing is known yet about the chemical structure and properties of the pigments in any of the Australasian taxa (GILL & STEGLICH, 1987). As soon as chemotaxonomic data become available it will be possible to speculate more about the systematic relationships of the SW-Pacific representatives of *Myxadium* and *Paramyxadium* within the fam. Cortinariaceae.

Except for a few early records (*C. erythraeus*, *C. archeri*) the most important contribution towards the present knowledge about Australasian *Myxadium* and *Paramyxadium* is due to J.B. CLELAND (1934, with accumulated data taken from all earlier publications). Starting off collecting in New South Wales CLELAND later gathered material in South Australia and described altogether 7 taxa with *C. rotundisporus* and *C. sinapicolor* probably the two most common *Cortinarii* found in any Australian myrtaceous forests.

During the following years no further critical papers have been published about Australasian "Slippery Curtain Fungi" (TAYLOR, 1981), and therefore the majority of taxa reported from New Zealand, New Caledonia and New Guinea are new to science and at the same time represent first records for these regions.

In the present list all those species of *Myxadium* and *Paramyxadium* have been excluded which bear no clamp connections on the hyphal septa (sect. Defibulati MOSER, 1969). In our herbaria several collections belonging to this systematically difficult group of species are kept. The publication of the relevant New Zealand and Australian material is being postponed until additional information is accumulated to draw further conclusions about the taxonomic position of these yet inadequately understood group of taxa.

Twenty-one out of 35 species (i.e. more than 70%) dealt with herein have been gathered in New Zealand, the only region in Australasia whose mycoflora by comparison is known best. Considering the small area and the rather uniform vegetation of New Zealand it can be safely expected that the number of taxa belonging to *Myxadium* and *Paramyxadium* will dramatically increase as soon as further mycofloristic field-work can be carried out in other parts of Australasia which so far have been almost completely neglected (e.g. Tasmania, New Caledonia, New Guinea).

Under these circumstances the authors consider the present report nothing but another fragmentary addition which one day might help to tackle systematic and taxonomic problems involving taxa of *Cortinarius* s.l. in the Australasian region.

## Abbreviations

Herbarium abbreviations follow the Index herbariorum (HOLMGREN & al., 1981). Host-trees: *E.c.*, *Eucalyptus calophylla* R. BR. ex LINDE. *E.w.*, *Eucalyptus wandoo* BLAKELY.

*L.e., Leptospermum ericoides* A. RICH. *L.s., Leptospermum scoparium* J.R. & G. FORST. *N.f., Nothofagus fusca* (HOOK.f.) OERST. *N.m., Nothofagus menziesii* (HOOK.f.) OERST. *N.s., Nothofagus solandri* (HOOK.f.) OERST. *N.s.-cl., Nothofagus solandri* var. *cliffortioides* (HOOK.f.) POOLE. *N.t., Nothofagus truncata* (COL.) CKN.

Unless otherwise stated the magnifications of the Figures are: basidiomes (natural size, bar = 20 mm), spores ( $\times 2000$ , bar = 10  $\mu\text{m}$ ), basidia and cystidia ( $\times 1000$ , bar = 20  $\mu\text{m}$ ).

## Key to *Cortinarius* subgen. *Myxaciaceae* and subgen. *Paramyxaciaceae*

(cf. MOSER & HORAK, 1975: 541)

1. Basidiomes rather robust and fleshy; pileus and stipe strongly and persistently glutinous; pileus not (or in old specimens only) transparently striate, not hygrophanous ..... I. *Cortinarius* subgen. *Myxaciaceae* (p. 91)
- 1\*. Basidiomes rather fragile and brittle; pileus and stipe glutinous to viscid, gluten quickly drying up or washed off; pileus membranaceous, with conspicuous, transparent striations, usually strongly hygrophanous ..... II. *Cortinarius* subgen. *Paramyxaciaceae* (p. 146)

## I. Key to Australasian species of *Cortinarius* subgen. *Myxaciaceae*

1. Lamellae at first olive or green ..... group C (p. 102)
- 1\*. Lamellae at first of different colours ..... 2
2. Lamellae at first blue-lilac-purple ..... 3
- 2\*. Lamellae at first of different colours ..... 4
3. Pileus and/or stipe at first blue-green ..... group C (p. 102)
- 3\*. Pileus and/or stipe at first blue-lilac-purple (often bleached out in old specimens) ..... group D (p. 110)
4. Lamellae at first bright yellow, dark ochre or rust orange; KOH-reaction positive ..... group E (p. 139)
- 4\*. Lamellae at first pallid, argillaceous, pale brown or pale rust brown ..... 5
5. Pileus (and stipe) pure white ..... group A (p. 92)
- 5\*. Pileus (and stipe) of different colours ..... 6
6. Pileus (and stipe) red, red-brown, brick red, porphyry brown, etc. .... group B (p. 96)
- 6\*. Pileus pallid, argillaceous, pale brown, ochre brown, date brown, dark brown, etc. .... group E (p. 139) and subgen. *Paramyxaciaceae* (p. 146)

## A. Key to species of group A

(basidiomes white)

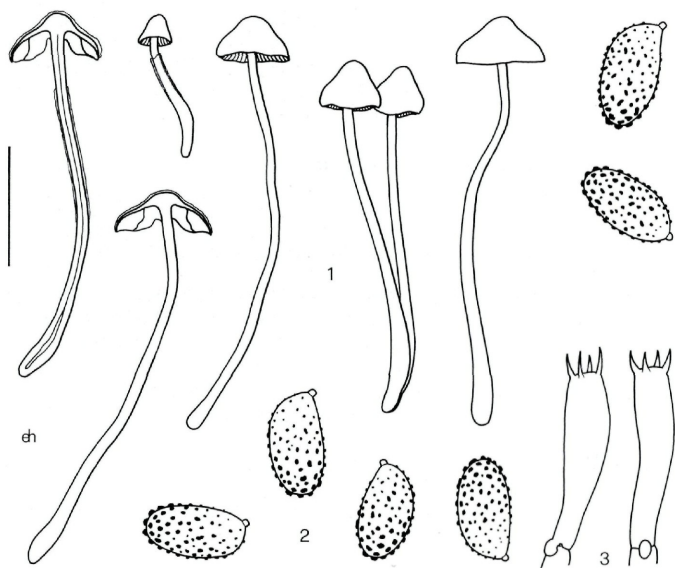
1. Basidiomes fragile, slender; pileus (–20 mm diam.) and fusoid-attenuated stipe (–4 mm diam.) viscid, soon dry and becoming silky; lamellae apricot to ochre; spores  $8\text{--}10 \times 4.5\text{--}5.5 \mu\text{m}$ , ovoid to subelliptic; under *Nothofagus* spp. and *Leptospermum* spp., New Zealand ..... 1. *C. (Myx.) olorinatus*
- 1\*. Basidiomes rather robust [cf. also bleached specimens of 33. *C. (Paramyx.) vitreopileatus* and 34. *C. (Paramyx.) viscostriatus*] ..... 2
2. Pileus (–50 mm diam.) and stipe (–10 mm diam.) white, without yellow or lilac tints, strongly glutinous; lamellae chocolate brown to rust brown; spores  $8\text{--}11 \times 5\text{--}6\text{ (–}6.5\text{)} \mu\text{m}$ , ovoid to subelliptic; under *Nothofagus* spp., New Zealand ..... 2. *C. (Myx.) cygneus*
- 2\*. Pileus (–60 mm diam.) and stipe (–12 mm diam.) white, turning pale yellow, stipe with pale lilac tinge; spores  $8.5\text{--}10.5 \times 5\text{--}5.5 \mu\text{m}$ , ovoid to subamygdaliform, minutely verrucose; under *Eucalyptus*, Australia .. 22. *C. (Myx.) austroalbidus*

1. ***Cortinarius (Myxacium) olorinatus*** HORAK, sp.nov. – Pl. 1, figs. 1–3.

Pileus –20 mm latus, eburneus, viscidus, sericeus. Lamellae albedoargillaceae dein ochraceoferrugineae. Stipes –80 × –4 mm, fusioideus vel attenuatus basim versus, albus, viscidus. Sapor amariuscus. Sporae  $8\text{--}10 \times 4.5\text{--}5.5 \mu\text{m}$ , ovoideae, verrucosae. Ad terram sub *Nothofago* *Leptospermoque*. Nova Zelandia. Typus PDD 27255.

Pileus –20 mm diam., hemispheric to broadly campanulate with incurved margin, becoming convex with age; persistently pure white (chalk white, ivory); viscid to lubricous, soon becoming dry, smooth to minutely fibrillose or silky, margin non-striate. – Lamellae 8–20 (3–5) adnate to adnexed, rarely emarginate, –3 mm wide; at first whitish or pale argillaceous turning apricot or ochre finally becoming ferruginous; entire edges concolorous. – Stipe –80 × –4 mm, very slender fusoid or cylindric-attenuated towards base, fragile; white, in old specimens occasionally pale yellow-brown from base; viscid but soon becoming dry, minutely fibrillose or silky, apex often with transparent guttation droplets, cortina remnants absent; solid when young but later fistulose, single or cespitose. – Context white, turning pale yellow-brown in stipe of old specimens. – Odour indistinct. – Taste mild to bitterish. – Chemical reactions unknown.

Spore print rust brown. – Spores  $8\text{--}10 \times 4.5\text{--}5.5 \mu\text{m}$ , ovoid to subcylindric, verrucose, warts coarser in apical region, plage



Pl. 1. – *Cortinarius olorinatus* (PDD 27255, holotype): 1. basidiomes. – 2. spores. – 3. basidia.

and perispore inconspicuous, rust brown. – Basidia  $25\text{--}35 \times 7\text{--}8$   $\mu\text{m}$ , 4-spored. – Cheilocystidia and pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae ( $2\text{--}4$   $\mu\text{m}$  diam.). – Pileipellis composed of cylindric to ovoid cells ( $7\text{--}20$   $\mu\text{m}$  diam.), membranes without pigment, oleiferous hyphae absent. – Clamp connections present.

Habitat. – On soil both under *Nothofagus* (*N.fusca*, *N.menziesii*, *N.truncata*) and *Leptospermum scoparium*. April–June.

Distribution. – New Zealand.

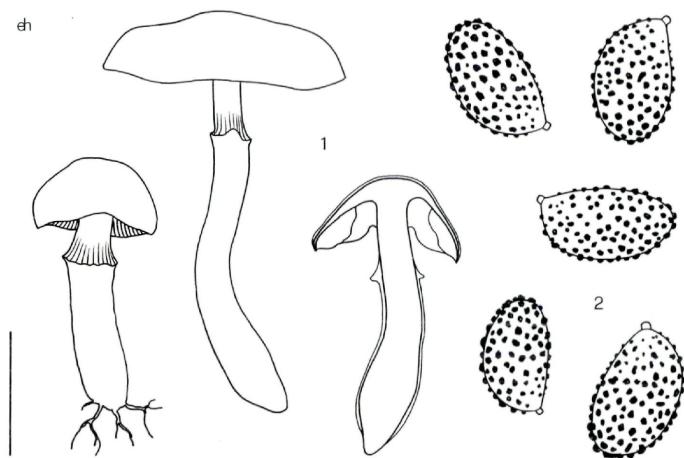
Material examined. – NEW ZEALAND: South Island: Nelson, Collingwood, Pakawau Creek, on base of *Polystichum* sp. under *N.f.* (and *Dacrydium cupressinum*), 7 v 1968, leg. HORAK (ZT 68/386). Fjordland: Lake Te Anau, Middle Fjord, Junction Burn, under *N.m.* and *L.s.*, 3 iv 1969, leg. HORAK (ZT 69/223). North Island: Gisborne, Urewera National Park, near Headquarters, under *N.f.*, *N.m.* and *N.t.*, 31 v 1981, leg. HORAK (ZT 854). North Auckland: Warkworth, The Dome, in pure *Leptospermum scoparium* forest, 5 vi 1981, leg. HORAK (PDD 27255, holotype; ZT 877, isotype).

This attractive and remarkably fragile species is in particular characterized both by the white, slender pileus and stipe contrasting with apricot or ochre lamellae. Microscopically it is distinguished from the second, white New Zealand *Myxaciium* (*C. cygneus*) by the smaller spores and the lack of cheilocystidia.

2. ***Cortinarius (Myxaciium) cygneus* HORAK, sp.nov.** – Pl. 2, figs. 1–2.

Pileus –50 mm latus, albidus, glutinosus. Lamellae albae dein pallide argillaceae postremo fuscae. Stipes –65 × –10 mm, fusoides vel subclavatus, albus, glutinosus. Sapor mitis. Sporae 8–11 × 5–6(–6.5) μm, ovoideae vel subellipticae. Ad terram sub Nothofago Leptospermoque. Nova Zelandia. Typus PDD 27254.

Pileus –50(–70) mm diam., hemispheric with strongly inrolled margin, becoming umbonate-convex, finally expanded with broad grey shine from dry gluten; persistently white, but occasionally with pale grey shine from dry gluten; strongly glutinous (also in dry condition), smooth or occasionally radially wrinkled, margin non-striate. – Lamellae (15–20, 3–5–7) emarginate, often subdecurrent with short tooth, – 5 mm wide; at first whitish to pale argillaceous turning coffee brown to chocolate brown with distinct ferruginous tinge; fimbriate edges white or grey, occasionally gelatinised. – Stipe –65 × –10 mm, fusoid to subclavate, rarely cylindric or tapering towards base; white; glutinous, in young specimens sometimes with fibrillose to



Pl. 2. – *Cortinarius cygneus* (PDD 27254, holotype): 1. basidiomes. – 2. spores.

submembranaceous remnants of cortina, at base often with white rhizomorphs; solid becoming hollow with age, single or cespitose. – Context white, sometimes pale yellow in base of stipe. – Odour indistinct. – Taste mild. – Chemical reactions on pileus: KOH, HCl and  $\text{NH}_3$  – negative.

Spore print dark rust brown. – Spores  $8-11 \times 5-6$  ( $-6.5$ )  $\mu\text{m}$ , ovoid to subelliptic, verrucose, warts coarser at apex, plage or perispore inconspicuous, rust brown. – Basidia  $30-40 \times 8-9 \mu\text{m}$ , 4-spored. – Cheilocystidia  $15-45 \times 6-15 \mu\text{m}$ , clavate, hyaline, forming a sterile seam at the edges – Pleurocystidia none. – Epicutis of strongly gelatinised, cylindric hyphae ( $1-3 \mu\text{m}$  diam.). – Pileipellis composed of cylindric to ovoid cells ( $6-16 \mu\text{m}$  diam.), localisation of pigment unknown, oleiferous hyphae absent. – Clamp connections present.

Habitat. – On soil under *Nothofagus* spp. (*N. solandri*, *N.s.* var. *cliffortioides*, *N. fusca*, *N. menziesii*), occasionally also associated with *Leptospermum scoparium*. March–June.

Distribution. – New Zealand.

Material examined. – NEW ZEALAND: South Island: Nelson: Lake Rotoiti, Tophouse Saddle, under *L.s.* (and *N.s.-cl.*, *N.f.*), 1 v 1968, leg. HORAK (PDD 27254, holotype; ZT 68/330, isotype); Lake Rotoiti, trail to Mt. Robert, under *N.m.* and *N.f.*, 1 v 1969, leg. HORAK (ZT 69/280). Canterbury, Craigieburn Range, Cave Stream, under *N.s.-cl.*, 12 iii.1983, leg. HORAK (ZT 1997). North Island: Gisborne, Urewera National Park, Black Beech Track, under *L.s.* and *N.m.*, 2 vi 1981, leg. HORAK (ZT 874).

Material of compared species. – ARGENTINA: Tierra del Fuego, Ushuaia, Valle Gl.Martial, under *Nothofagus pumilio*, 11 iii 1963, leg. HORAK (ZT 64/21, holotype of *Thaxterogaster cretaceus* HORAK). – CHILE: Magallanes, Voces Bay, v 1882, leg. SPEGAZZINI (LPS 39337, holotype of *C. (Myx.) darwinii* SPEGAZZINI).

The most distinctive character of this striking *Myxaciium* is its pure white basidiomes, a colour rarely encountered in this genus. Undoubtedly the closest relative of this New Zealand taxon is *C. (Phlegmacium) cretaceus* (HORAK) HORAK formerly described in *Thaxterogaster* subgen. *Hemicortinari* from Tierra del Fuego (HORAK & MOSER, 1965; HORAK, 1979). Apart from the unusual colour this taxon (representing a member of subgen. *Phlegmacium*) shares with the present species the general habit of the basidiomes and the spores being similar in size and shape. However, the Fuegian taxon is readily distinguished by the absence of a glutinous sheath on the stipe whose shape is not (or rarely only) fusoid but rather gradually tapering towards the (occasionally marginate) base.

A second species described from Fuegian *Nothofagus* forests, *C. (Myx.) darwinii* SPEGAZZINI (1887) also has close relationships to the New Zealand *C. (Myx.) cycneus*. However, with age the white colour of its pileus becomes pale ochre and the bulbous base of the stipe is always marginate (HORAK, 1979).

Compare also 22. *C. austroalbidus* CLELAND & HARRIS (see below).

## B. Key to species of group B

(basidiomes with more or less red colours, e.g. salmon pink, cin-nabar red, brick red, wine red, red-brown, liver brown, blood red)

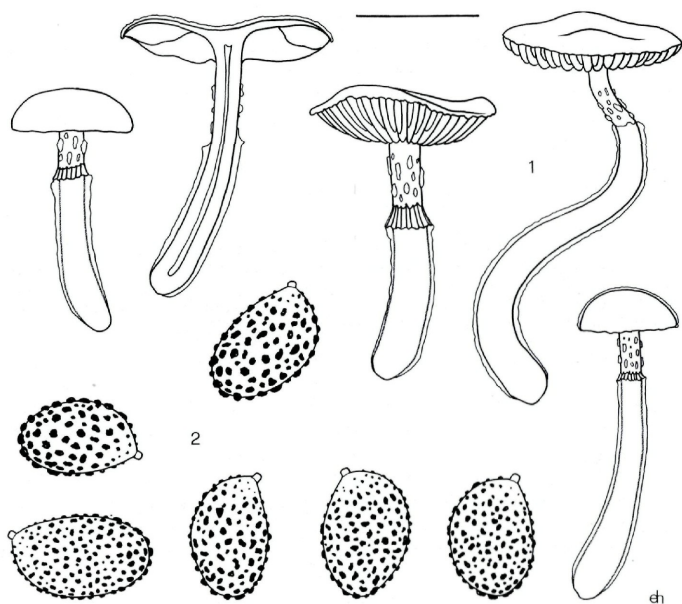
1. Smell very unpleasant of skatol; pileus –35 mm diam., apex of cylindric stipe dotted with glutinous drops; spores  $10-14 \times 6.5-7.5(-8) \mu\text{m}$ , ovoid to subamygdaliform; cheilocystidia absent; KOH-reaction negative; under *Nothofagus* spp., New Zealand ..... 3. *C. (Myx.) indolicus*
- 1\*. Smell indistinct ..... 2
2. Pileus –120 mm diam., radially wrinkled; stipe rooting, – 200 mm long; spores  $12-13.5 \times 7-7.5 \mu\text{m}$ , amygdaliform; cheilo-cystidia present; KOH-reaction olive-yellow; under *Nothofagus* spp., New Caledonia ..... 4. *C. (Myx.) verecundus*
- 2\*. Pileus –50 mm diam., smooth; stipe –45 mm long, base bulbous (and often submarginate); spores  $8-10 \times 5-7 \mu\text{m}$ , ovoid; under *Eucalyptus* spp., Australia ..... 5. *C. (Myx.) erythraeus*

3. ***Cortinarius (Myxacium) indolicus*** HORAK., sp.nov. – Pl. 3, figs. 1–2.

Pileus –35 mm latus, salmoneus, pallide incarnatus vel lateritius, glutinosus. Lamellae pallide argillaceae vel brunneae. Stipes –70  $\times$  –7 mm, cylindricus, pileo concolor; glutinosus. Odor ingratus. Sapor mitis. Sporae  $10-14 \times 6.5-7.5 (-8) \mu\text{m}$ , ovoideae, verrucosae. Ad terram sub *Nothofago*. Nova Zelandia. Typus PDD 27256.

Pileus –35 mm diam., at first hemispheric with incurved margin, soon becoming convex and finally expanded, centre either with low umbo or depressed; salmon pink, pale reddish brown or brick red; smooth, persistently covered with a clear, thick (– 3 mm diam.) coat of gluten, in dry condition minutely radially fibrillose, margin non-striate. – Lamellae (15–22, –5) broadly adnate or emarginate with decurrent tooth, –7 mm wide, ventricose; pale argillaceous turning pale brown with brick red tinge, entire edges concolorous. – Stipe –70  $\times$  –7 mm, cylindric, rarely gradually attenuate upwards; concolorous with pileus, at base becoming dark red-brown; apex dry, with conspicuous coarse agglutinated drops of gluten, lower half coated with thick layer of gluten, above ending with submembranaceous, radially furrowed ring-zone, cortina absent; fistulose to hollow, single or cespitose. – Context white, changing to salmon pink. – Odour very unpleasant and strongly fetid, like skatol (indolic compound). Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print rust brown. – Spores  $10-14 \times 6.5-7.5(-8) \mu\text{m}$ , ovoid (to subamygdaliform), verrucose, warts distinctly coarser at



Pl. 3. — *Cortinarius indolicus* (PDD 27256, holotype): 1. basidiomes. — 2. spores.

apex, perispore present, occasionally with plage-like zone, rust brown. — Basidia  $35\text{--}55 \times 7\text{--}8 \mu\text{m}$ , 4-spored. — Cheilocystidia and pleurocystidia absent. — Epicutis of strongly gelatinised, cylindric hyphae ( $2\text{--}5 \mu\text{m}$  diam.), membranes minutely encrusted. — Pileipellis composed of cylindric to ovoid cells ( $6\text{--}15 \mu\text{m}$  diam.), oleiferous hyphae absent. — Clamp connections present.

Habitat. — On soil under *Nothofagus* (*N.fusca*, *N.menziesii*, *N.solandri* var. *cliffortioides*). April–June.

Distribution. — New Zealand.

Material examined. — NEW ZEALAND: North Island: Gisborne, Urewera National Park, Lake Waikareiti, under *N.f.* and *N.m.*, 25 vi 1968, leg. HORAK (PDD 27256, holotype; ZT 68/600, isotype). South Island: Otago: Makarora, under *N.m.*, 16 iv 1965, leg. TAYLOR (239); Haast Pass, under *N.m.*, 12 iv 1969, leg. HORAK (ZT 69/254). Nelson: Tophouse Saddle, Big Bush, under *N.m.* and *N.s.-cl.*, 4 v 1969, leg. HORAK (ZT 69/287).

Within subgen. *Myxaciium* this is a unique species whose strong nauseous smell recalls that of several European taxa of *Tricholoma* viz. *T.sulphureum* BULL.: FR. or *T.inamoenum* FR.. In addition the brick red or red-brown basidiomes are covered with an unusually

thick and sticky coat of gluten. Thus *C.indolicus* is readily recognized and identified in the field. The colours of this New Zealand taxon closely resemble those of the related *C.verecundus* (cf. below) described from New Caledonian *Nothofagus* forests. Taxonomically these two species, however, are clearly separated by the shape and size of the spores.

4. ***Cortinarius (Myxacium) verecundus* HORAK, sp.nov.** – Pl. 4, figs. 1–4.

Pileus –120 mm latus, castaneus vel hepaticus purpureo vel vinaceo tinctus, glutinosus. Lamellae pallide argillaceae dein ferrugineae. Stipes –200 mm × –20 mm, cylindricus vel attenuatus basim versus, pileo concolor, glutinosus. Sapor mitis. Sporae 12–13.5 × 7–7.5 µm, amygdaliformes, minute verrucosae. Ad terram sub Nothofago. Nova Caledonia. Typus ZT 77/38.

Pileus –120 mm diam., at first hemispheric with strongly involuted margin, becoming convex and later expanded with more or less depressed centre; red-brown to liver brown, often with purple or wine red tinges; viscid to glutinous, in dry condition smooth then conspicuously wrinkled in old specimens, margin non-striate, rather robust. – Lamellae crowded, at first adnexed later emarginate with short, decurrent tooth, –11 mm wide; pale argillaceous turning rust brown with wine red tinge, white edges conspicuously fimbriate. – Stipe –200 × –20 mm (at apex), cylindric when young, with long tapering base; concolorous with pileus, turning wine red with age; viscid below ring-like, submembranaceous, grooved veil zone, apex coarsely fibrillose with irregular patches of veil remnants; solid, single. – Context white in pileus and upper portion of stipe but wine red towards base of stipe. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – olive yellow.

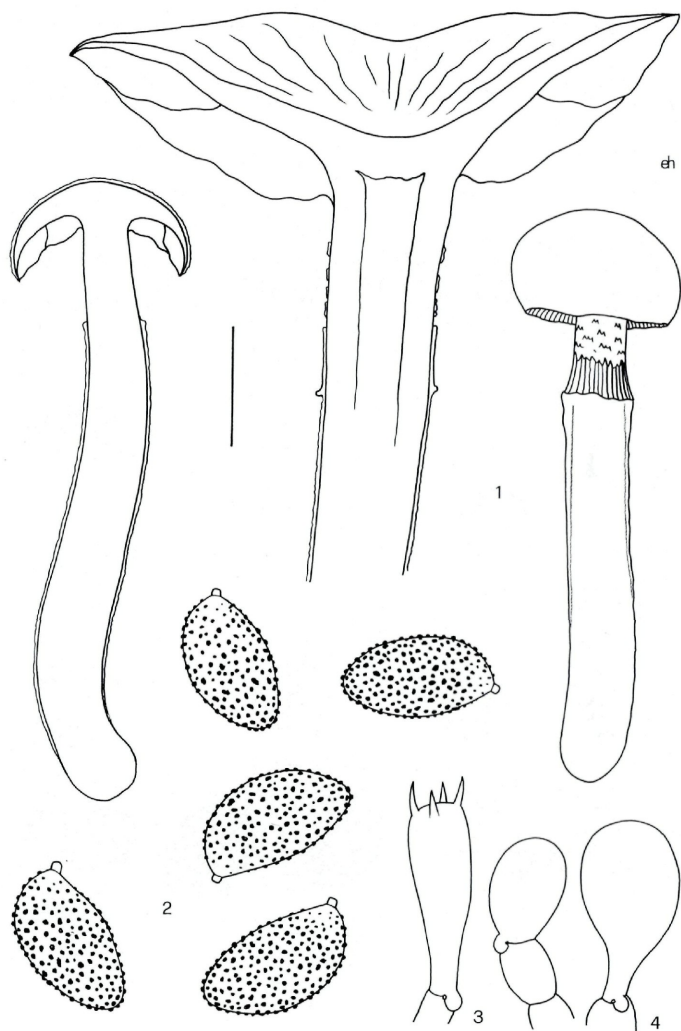
Spore print rust brown. – Spores 12–13.5 × 7–7.5 µm, distinctly amygdaliform, minutely verrucose, plage and perispore inconspicuous, rust brown. – Basidia 30–35 × 10–11 µm, 4-spored. – Cheilocystidia 20–40 × 7–16 µm, cylindric to clavate or balloon-shaped, hyaline, pigment absent. – Pleurocystidia none. – Epicutis of strongly gelatinised, cylindric hyphae (2–4 µm diam.). – Pileipellis composed of cylindric to broadly ovoid, cells (8–25 µm diam.), membranes encrusted with yellowish pigment, numerous oleiferous hyphae with yellow (KOH), plasmatic pigment. – Clamp connections present.

Habitat. – On soil under *Nothofagus* spp. in montane rain forest. February.

Distribution. – New Caledonia.

Material examined. – NEW CALEDONIA: N of Paita, Mt Mou, under *Nothofagus* spp., 1150 m, 22 ii 1977, leg. HORAK (ZT 77/38, holotype).

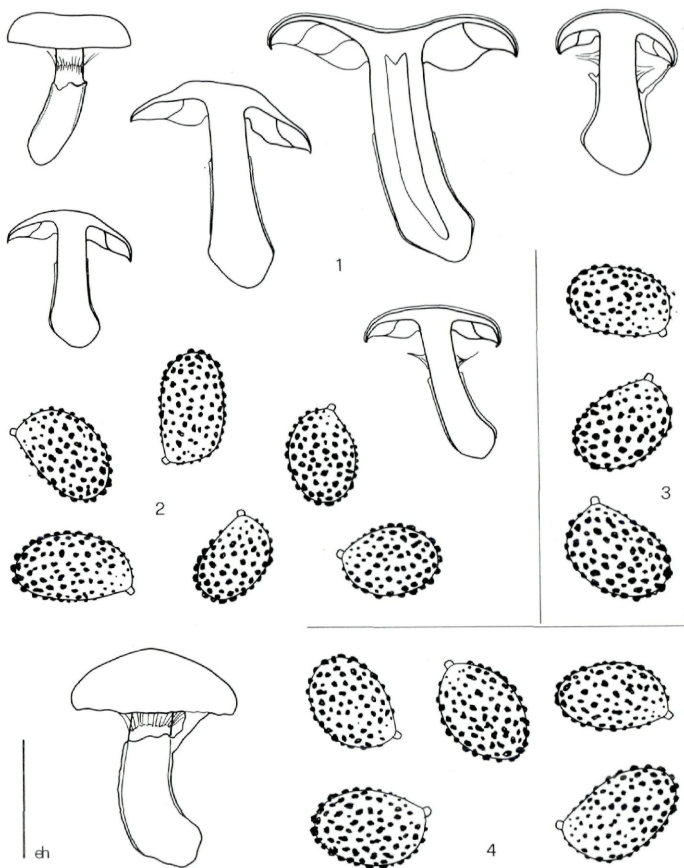
For discussion cf. 3. *C. (Myx.) indolicus*.



Pl. 4. – *Cortinarius verecundus* (ZT 77/38, holotype): 1. basidiomes. – 2. spores. – 3. basidium and cheilocystidia.

5. *Cortinarius (Myxacium) erythraeus* BERKELEY. – London J. Bot. 4: 48. 1845. – Pl. 5, figs. 1–4.

SYN.: *Cortinarius (Myxacium) ruber* CLELAND. – Trans. R. Soc. S. Australia 51: 303. 1927



Pl. 5. – *Cortinarius erythraeus* (ZT 2754): 1. basidiomes. – 2. spores. – (K; DRUMMOND 112, holotype); 3. spores. – (ADW 16148, holotype of *Cortinarius ruber* CLEL.); 4. spores.

Original description in BERKELEY (1845: 48): "Parvus sanguineus; pileo convexo glabro stipiteque brevi viscoso; lamellis adnatis ventricosis; mycelio flavo. — Drumm., n. 112. — On the ground. Pileus 1–1 1/5 inch broad, blood red, clothed with a thick gelatinous coat, smooth, often lobed; veil consisting of strong fibres, covered with a mucous coat. Stem 3/4 of an inch high, 2 lines thick, slimy, like the pileus; root and mycelium yellow; gills ventricose, adnexed. Spores of a red-ochre".

Illustration: CLELAND (1934: 109).

Description of recent material:

Pileus –50 mm diam., hemispheric with incurved margin, soon becoming convex or expanded with depressed centre, occasionally with broad and low umbo; cinnabar red, brick red or red-brown (dark chestnut brown in dry material); persistently glutinous, in dry condition smooth to innately fibrillose, margin non-striate. — Lamellae (20–30, –7) emarginate and subdecurrent with short tooth, –6 mm wide; at first pale argillaceous turning to rust brown, entire edges concolorous. — Stipe –45 × –10 mm, cylindric to subbulbous, base often swollen and indistinctly marginate; pale brown at fibrillose apex, cinnabar red under sheath of gluten below the rudimentary, fibrillose cortina, occasionally with whitish or pale ochre rhizomorphs; solid becoming hollow with age, single, gregarious. — Context white, pale brown in old specimens. — Odour indistinct. — Taste mild. — Chemical reaction on pileus and stipe: KOH – purple red (also observed on exsiccata).

Spore print rust brown. — Spores 8–10 × 5–7 µm, broadly ovoid, strongly verrucose, plage absent, perispore sometimes distinct at apical region, rust brown. — Basidia 30–40 × 7–10 µm, 4-spored. — Cheilocystidia and pleurocystidia none. — Epicutis of strongly gelatinised, cylindric hyphae (2–3 µm diam.). — Pileipellis composed of ovoid to subglobose cells (5–15 µm diam.), plasmatic and encrusting pigment in KOH immediately eosine red or purple red, oleiferous hyphae absent. — Clamp connections present.

Habitat. — On soil under *Eucalyptus* spp. (in Western Australia collected under *E.wandoo* and *E.calophylla*). June–July.

Distribution. — Australia.

Material examined. — AUSTRALIA: Western Australia: Perth: Swan River, leg. DRUMMOND 112 (K, holotype); Gl. Eastern Highway, under *Eucalyptus* spp., 23 vi 1974, leg. DELL (UWA 1921). Darling Range, North Bannister, under *E.ac.* and *E.c.*, 25 vi 1985, leg. HORAK (ZT 2754). South Australia: Kinchina, 7 vii 1923, leg. CLELAND (ADW 16148, holotype of *C. ruber* CLEL.).

Material of compared species. — ARGENTINA: Rio Negro, Valle Frias, under *Nothofagus dombeyi*, 8 iv 1963, leg. MOSER (IB 63/314, holotype of *C. (Myx.) pyromyxa* MOSER & HORAK).

The original material for *C.erythraeus* BERK. has been gathered by DRUMMOND in the neighbourhood of Perth, WA (HILTON, 1982;

1983). In the course of this study two further collections from the same region were examined and found to agree well in all essential characters with the type specimen. The most distinctive feature is the red-brown encrusting and plasmatic pigment in the pileipellis which (in KOH 3% on slide) turns immediately eosine red or purple red.

MOSER & HORAK (1975: 574) suggested that *C. ruber* CLELAND (1927) represents a later synonym of *C. erythraeus*. The comparison of both type collections convincingly demonstrated that the two agarics are contaxic for they share not only the principal morphological characters but also the broadly ovoid spores and the distinctive KOH-reaction in the pileal tissues.

In the monograph of the South American Cortinariid MOSER & HORAK (1975: 227) proposed to allocate *C. erythraeus* in sect. *Pyromyxa*, typified by the Patagonian *C. pyromyxa* MOSER & HORAK. Later collections of both taxa demonstrated, however, that the Australian species actually does not belong in this species complex.

No doubt the red-brown to brick red coloured basidiomes of *C. erythraeus* are, by naked eye, similar to those observed both in *C. verecundus* and *C. indolicus*. As pointed out above the different chemical reactions in KOH, however, make a close relationship between the Australian taxon and the two other species rather unlikely. This assumption is further supported by the fact that in *C. erythraeus* the shape of the spores is also different. In addition this species exclusively enters ectomycorrhiza with *Eucalyptus* instead of *Nothofagus* as it is the case in the New Zealand and New Caledonian taxa (cf. also remarks with 25. *C. sinapicolor*).

## C. Key to species of group C

(basidiomes olive-green, especially on pileus, combined with more or less blue colours)

1. Pileus -40 mm diam., olive at centre, yellow to yellow-brown towards margin; lamellae at first green-olive, with bluish tinge; stipe -55 × -10 mm, fusoid to clavate, pale green-olive, coated with yellow, glutinous remnants of universal veil; odour and taste raphanoid; KOH - negative; spores 7.5-9 × 4.5-5 µm, ovoid; cheilocystidia cylindric-clavate, with lilac, plasmatic pigment; under *Nothofagus* and *Leptospermum*, New Zealand ..... 6. *C. (Myx.) viscoviridis*
- 1\*. Pileus blue-green (at least on young and fresh basidiomes, colour fading (from centre) to yellow, ochre or brown, -60 mm diam.; spores amygdaliform-subfusoid or globose-subglobose; KOH - lilac(-pink) ..... 2

2. Pileus with distinct, permanent, conic papilla; spores amygdaliform-subfusoid; under *Nothofagus*, New Zealand ..... 7. *C. (Myx.) aeruginosconicus*
- 2\*. Pileus convex to umbonate or campanulate; spores globose-subglobose; under *Eucalyptus* and *Casuarina* (Australia) and *Leptospermum* (New Zealand) ..... 8. *C. (Myx.) rotundisporus*

6. ***Cortinarius (Myxaciium) viscoviridis*** HORÁK, sp.nov. — Pl. 6, figs. 1–5.

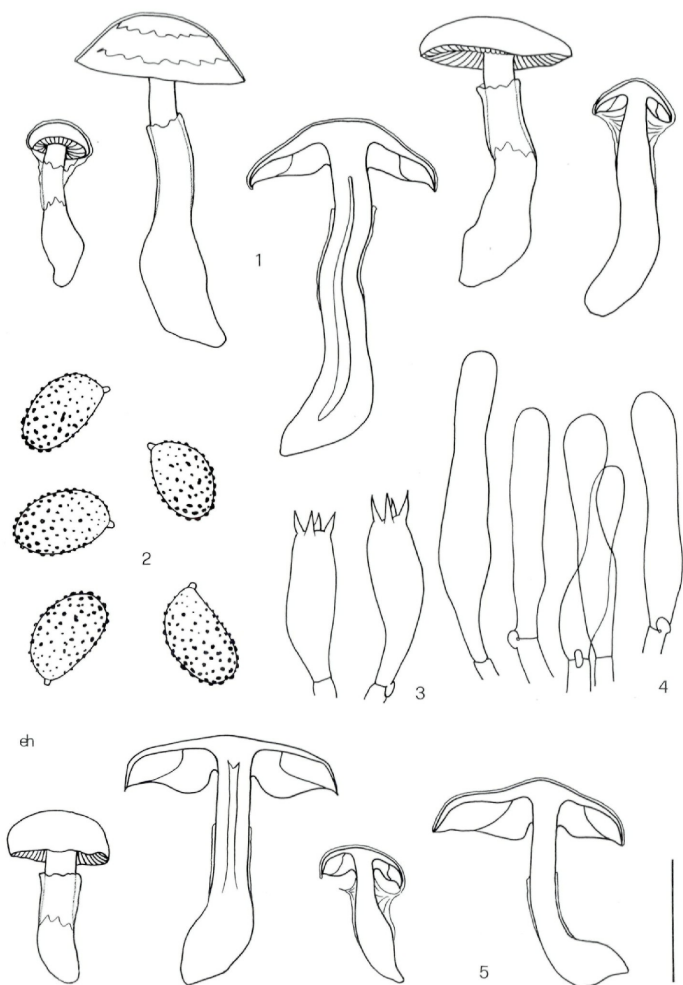
Pileus –40 mm latus, olivaceobrunneus vel olivaceoluteus, glutinosus. Lamellae olivaceae dein argillaceoferrugineae. Stipes –55 × –10 mm, fusoides vel clavatus pallide olivaceus e velo glutinoso limoneo instructus. Odor saporque raphanoidei. Sporae 7.5–9 × 4.5–5 µm, ovoideae, minute verrucosae. Ad terram sub *Nothofago Leptospermoque*. Nova Zelandia. Typus 27257.

Pileus –40 mm diam., hemispheric with incurved margin, convex, finally subumbonate-expanded; centre at first olive, slowly turning olive-brown or olive-yellow, occasionally reddish brown, remaining yellow towards non-striate margin; glutinous to viscid, in dry condition radially fibrillose, not hygrophanous. — Lamellae (20–25, –7) broadly adnate to emarginate, –7 mm wide, ventricose; at first olive-green, sometimes with bluish tinge both on faces and/or edges, becoming argillaceous and ferruginous; entire edges pale blue or concolorous. — Stipe –55 × –10 mm, fusoid to swollen clavate, rarely cylindric; above pale olive-green turning pale grey-brown, below subsistent, fibrillose cortina lemon yellow or chrome yellow from thick, glutinous veil remnants, longitudinally fibrillose in dry condition; solid becoming hollow with age, single or cespitose. — Context pale bottle green to olive, in base of stipe turning yellow to brown. — Odour and taste raphanoid. — Chemical reactions on pileus: KOH, HCl and NH<sub>3</sub> – negative.

Spore print rust brown. — Spores 7.5–9 × 4.5–5 µm, ovoid, minutely verrucose, warts distinctly coarser at apex, perispore inconspicuous, rust brown. — Basidia 25–30 × 6–7 µm, 4-spored. — Cheilocystidia 25–50 × 6–8 µm, cylindric or subclavate-fusoid, membranes thin-walled, with blue to lilac (KOH), plasmati pigment. — Pleurocystidia absent. — Epicutis of strongly gelatinised, cylindric hyphae (2–5 µm diam.). — Pileipellis composed of cylindric cells (5–10 µm diam.), localisation of pigment unknown, oleiferous hyphae absent. — Clamp connections present.

Habitat. — Among moss and litter under *Nothofagus* (*N. fusca*, *N. menziesii*, *N. solandri* var. *cliffortioides*) and *Leptospermum scoparium*. April–May.

Distribution. — New Zealand.



Pl. 6. *Cortinarius viscoviridis* (PDD 27257, holotype): 1. basidiomes. – 2. spores. – 3. basidia. – 4. cheilocystidia. – (ZT 68/485): 5. basidiomes.

Material examined. – NEW ZEALAND: South Island: Nelson: Lake Rotoiti, trail to St. Arnaud Range, under *N.s.-cl.*, *N.m.* and *L.s.*, 30 iv 1969, leg. HORAK (PDD 27257, holotype; ZT 69/275, isotype); Lake Rotoiti, trail to Mt. Robert, under *N.f.* and *N.m.*, 21 v 1968, leg. HORAK (ZT 68/485).

Material of compared species. – AUSTRALIA: South Australia: Stirling West, 23 vii 1927, leg. CLELAND (ADW 14635, holotype of *C.(Phl.) ochraceofulvus* CLEL.)

Macroscopically this New Zealand species, found twice in *Nothofagus* forests in the neighbourhood of Lake Rotoiti, is characterized by its olive pileus, fusoid stipe, raphanoid odour and taste and indistinct KOH-reaction. The yellow, thick gluten of the universal veil covers both the margin of the pileus and the lower portion of the stipe and accordingly these parts of the basidiome are persistently yellow.

The most distinctive, microscopic features of *C. viscoviridis* are its minutely verrucose, ovoid spores and slender cheilocystidia whose shape is rather rarely observed in representatives of subgen. *Myxadium*.

Because of the general shape and size of the basidiomes, the olive tints both on pileus and on the lamellae and the minutely verrucose spores ( $7-8 \times 4.5-5 \mu\text{m}$ ) *Cortinarius (Phlegm.) ochraceofulvus* CLELAND (1933: 191; ADW 14635, holotype) is strongly reminiscent of the New Zealand *C. viscoviridis*. Unfortunately CLELAND's original description is brief and uncomplete so that the identity of this taxon must remain uncertain until new material is found again at the type locality.

7. ***Cortinarius (Myxadium) aerugineoconicus*** HORAK, sp.nov. – Pl. 7, figs. 1–5.

Pileus –50 mm latus, convexus vel applanatus papilla conica semper instructus, caeruleus olivaceo tinctu dein luteobrunneo, glutinosus. Lamellae pallide caeruleae dein ferrugineae. Stipes –80  $\times$  –12 mm, cylindricus vel fusoides, pallide caeruleus, albidus basim versus, glutine luteo instructus. Sapor mitis. Sporae  $7.5-9.5 \times 4.5-5 \mu\text{m}$ , amygdaliformes vel subfusoides, grosse verrucosae. Ad terram sub Nothofago. Nova Zelandia. Typus PDD 27258.

Pileus –50 mm diam., at first hemispheric with incurved margin, later convex or expanded (or even depressed), both in young and old specimens persistently with prominent, conic papilla; (steel) blue with  $\pm$  green or olive tinge, soon fading from centre and exposing yellow-brown or ochre-brown colours; glutinous to viscid in wet conditions, but gluten drying up rather quickly, then with smooth, metallic-micaceous surface, margin non-striate, hygrophanous. – Lamellae (16–26, 7–15) crowded, emarginate and subdecurrent with short tooth, –6 mm wide; at first pale blue or blue turning rust brown with age, concolorous edges entire or subcrenulate. – Stipe –80  $\times$  –12 mm, cylindric, fusoid or slightly swollen clavate at base;

apex pale steel blue, whitish towards base but covered by yellow to pale ochre gluten, in dry condition fibrillose, cortina often poorly developed and hence lacking in old specimens; solid but soon becoming hollow, single and cespitose. – Context orange ochre beneath pileipellis, pale blue in upper portion of stipe, white or yellowish



Pl. 7. – *Cortinarius aerugineoconicus* (PDD 27258, holotype): 1. basidiomes. – 2. spores. – 3. basidia. – (ZT 812): 4. basidiome. – 5. spores.

towards base. – Odour indistinct. – Taste mild. – Chemical reactions on pileus: KOH and HCl – lilac to blue; NH<sub>3</sub> – negative.

Spore print rust brown. – Spores 7.5–9.5 × 4.5–5 µm, distinctly amygdaliform to subfusoid, supraapical depression distinct, coarsely verrucose, perispore inconspicuous, rust brown. – Basidia 24–40 × 8–10 µm, 4-spored. – Cheilocystidia 12–20 × 8–13 µm, rather inconspicuous, clavate to vesiculate, membranes hyaline, pigment absent. – Pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (1–4 µm diam.), localisation of pigment unknown, cells of pileitrama short-cylindric to ovoid, oleiferous hyphae absent. – Clamp connections present.

Habitat. – On soil among litter under *Nothofagus* (*N. fusca*, *N. menziesii*, *N. solandri* var. *cliffortioides*) in mixed broad-leaved and conifer forests. May.

Distribution. – New Zealand.

Material examined. – NEW ZEALAND: South Island: Southland: Lake Manapouri, Surprise Bay, under *N.s.* (and *Dacrydium cupressinum*, *Podocarpus totara*, *Weinmannia racemosa*), 5 v 1970, leg. TAYLOR (626). Nelson: Takaka Hills, Mt. Evans, under *N.m.*, *N.f.*, *N.s.-cl.* (and *Libocedrus*, *Metrosideros*, *Dracophyllum*), 3 v 1969, leg. HORAK (PDD 27258, holotype; ZT 69/284, isotype). North Island: Gisborne: Urewera National Park, near Headquarter, under *N.f.* and *N.m.*, 27 v 1981, leg. HORAK (ZT 812).

In the New Zealand forests *C. aerugineoconicus* is obviously entering ectomycorrhiza with *Nothofagus* spp. It can be easily mistaken for *C. rotundisporus* which, however, is strictly associated with *Leptospermum* spp. In mixed woods a correct identification is only possible by carrying out a microscopic analysis for the size and the shape of the spores are being the most distinctive features to separate these two similar looking species.

8. *Cortinarius* (*Myxacium*) *rotundisporus* (CLELAND & CHEEL)  
HORAK & WOOD, comb.nov. – Pl. 8, figs. 1–4.

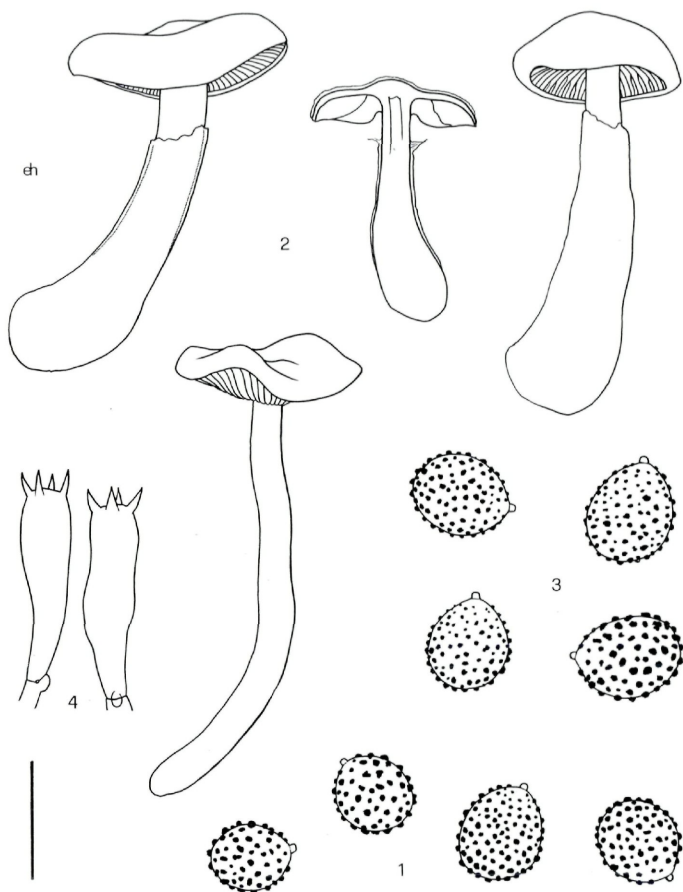
Bas.: *Cortinarius* (*Phlegmacium*?) *rotundisporus* CLELAND & CHEEL. – Trans. R. Soc. S. Austr. 42: 96. 1918.

Syn.: *Cortinarius* (*Telamonia*) *austro-evernius* CLELAND & CHEEL. – Trans. R. Soc. S. Austr. 42: 100. 1918.

*Cortinarius* (*Dermocybe*) *oleaginus* CLELAND & HARRIS. – Rec. S. Austr. Mus. 9: 49. 1948.

Illustrations. – Australia: CLELAND & CHEEL (1918); CLELAND & HARRIS (1948); FUHRER (1985:36).

Pileus –60 mm diam., hemispheric with strongly incurved margin, later convex, umbonate or campanulate, expanded to sub-depressed at centre in old specimens, never conic-papillate; at first



Pl. 8. – *Cortinarius rotundisporus* (ADW 14680, holotype): 1. spores. – (ZT 68/568; New Zealand); 2. basidiomes. – 3. spores. – 4. basidia.

steel blue with conspicuous green or olive tinge, blue-grey, slowly turning yellow, ochre or ochre-brown from centre, often also radially streaked by discolouring zones or patches, finally ochre-brown or orange brown with no traces of blue; glutinous only if fresh and in

wet conditions, mostly viscid, gelatinised pileipellis rather thin and quickly drying up, then surface smooth, radially fibrillose, occasionally also minutely squamulose, margin non-striate. — Lamellae (15–30, –7) crowded, emarginate, subdecurrent with short tooth, becoming ventricose with age, –6 mm wide; at first blue to lilac turning argillaceous and finally rust brown, bluish edges concolorous or crenulate — Stipe –75 × –8 mm (–15 mm at base), polymorphic, fusoid to bulbous-clavate, rarely cylindric; blue to grey-blue at apex, colour fading with age, whitish at or below rudimentary cortina, gradually changing to yellowish or ochre towards base; glutinous to viscid when young, transparent to pale blue, gluten soon drying up, often leaving appressed, subgelatinised velar zones, fibrillose in old specimens; solid becoming hollow, single, rarely also cespitose. — Context whitish to bluish in pileus, blue in upper portion of stipe, yellow to ochre towards base of stipe. — Odour indistinct. — Taste mild or slightly raphanoid but not bitter. — Chemical reactions on pileus: KOH purplish to lilac-pink, HCl and NH<sub>3</sub> – negative.

Spore print rust brown. — Spores (5.5)6–8.5(–9) µm, globose to subglobose, coarsely verrucose, perispore inconspicuous, rust brown. — Basidia 25–40 × 7–9 µm, 4-spored. — Cheilocystidia and pleurocystidia absent. — Epicutis of strongly gelatinised, cylindric hyphae (2–5 µm diam.), with lilac-pink or yellow-brown (KOH), plasmatic (rarely also encrusting) pigment. — Pileipellis composed of cylindric to ovoid cells (5–10 µm diam.), oleiferous hyphae absent. — Clamp connections present.

Habitat. — On soil among litter under *Eucalyptus* spp. (Australia), *Casuarina* (cf. UNSW 85/459, Australia, ) or *Leptospermum* (*L. ericoides*, *L. scoparium*., New Zealand). (March–)April–July (–August).

Distribution. — Australia (type), New Zealand (distribution map in HORAK 1983: fig.1,12).

Material examined. — AUSTRALIA: New South Wales: Mosman, vi 1916, leg. CLELAND (ADW 14680, holotype); Mt Wilson, under *Eucalyptus* spp., 7 v 1983, leg. WOOD (UNSW 83/635); Braidwood, Monga State Forest, under *Eucalyptus* sp., 18 v 1983, leg. WOOD & BRUHL (UNSW 83/754); Sydney, Royal National Park, near Tram Mus., under *Casuarina* sp., 23 v 1985, leg. TAEKER in WOOD (UNSW 85/459); same locality, under *Casuarina* sp., 9 vi 1983, leg. WOOD (UNSW 83/898); Batemans Bay, Kioloa State Forest, Higgins Creek, under *Eucalyptus* sp., 15 v 1984, leg. WOOD & GARTRELL (UNSW 84/492; same locality and date, leg. WOOD & GARTRELL (UNSW 84/493). Southern Australia: Waterfall Gully, 12 v 1916, leg. CLELAND (ADW 14752, holotype of *C. (Tel.) austro-evernius* CLEL. & CHEEL); Mt. Lofty, 4 viii 1922, leg. CLELAND (ADW 14691); Mt Lofty, 12 vi 1943, leg. CLELAND (ADW 14734, holotype of *C. (Derm.) oleaginus* CLEL. & HARRIS). Western Australia: Armadale, Gleneagle, Bee Farm Rd., under *Eucalyptus* spp., 1 vii 1981, leg. HORAK (ZT 1152; cf. HILTON, 1988). Also recorded from Victoria (SINNOTT, 1976).

NEW ZEALAND: South Island: Otago: Makarora, Pipsen's Creek, under *L.e.*, 15 iv 1965, leg. TAYLOR (237). Nelson: Lake Rotoiti, West Bay, under *L.s.* (and *N.m.*), 29 iv 1968, leg. HORAK (ZT 68/311). North Island: Wellington: Botanical Gardens, 19 vii 1960, under *L.e.*, leg. PERRY in TAYLOR (228). Taranaki, Mt Egmont National Park, Dawson Falls, under *L.s.*, 17 vi 1968, leg. HORAK (ZT 68/568). Gisborne: Urewera National Park, near Headquarter, under *L.s.* (and *Nothofagus* sp.), 30 v 1981, leg. HORAK (ZT 1448). North Auckland: Auckland, North Cote: Atkinson Park, under *L.e.* (and *Rhopalostylis*, *Agathis*, *Knightia*), 31 v 1969, leg. HORAK (ZT 69/363); Kauri Glen, under *L.s.*, 7 vii 1981, leg. HORAK (ZT 1078); Whangarei, Mair Park, under *Leptospermum* sp. (and *Cyathea dealbata*), 4 vi 1972, leg. TAYLOR (755).

In Australia and in New Zealand *C. rotundisporus* is strictly associated with host plants belonging to the Myrtaceae and it can be safely assumed that this species forms ectomycorrhiza both with *Eucalyptus* and *Leptospermum*.

In our herbaria there are two records from NSW, however, where *C. rotundisporus* was collected under *Casuarina* sp. Further collections must be awaited to prove the actual mycotrophic relationships between these two partners.

The analysis of all above mentioned records demonstrated that *C. rotundisporus* is not only a common but, at least regarding its macrocharacters (shape, size and colours of basidiomes), also a very variable species. In addition the gelatinised remnants of the universal veil are often difficult to observe for the thin layer of gluten can be rather inconspicuous on middle-aged and even more so on old specimens. These particular veil conditions as a result of the prevailing weather conditions misled CLELAND who named the taxon three times, and allocated it to two different subgenera of *Cortinarius* (viz. *Phlegmacium*, *Telamonia*) and finally in *Dermocybe*. Comparing the paintings published in CLELAND & HARRIS (1948) there is no doubt that *C. austroevernius* and *C. oleaginus* are syntaxic with *C. rotundisporus* whose microscopic characters are also identical with those of its two later synonyms.

## D. Key to species of group D

(basidiomes all over or partially dark blue-lilac-purple, at least in young specimens, colours fading with age or replaced by yellow, ochre or brown tinges)

1. Clamp connections absent. — Cf. *Cortinarius* (*Myx.*) sect. *Defibulati* MOSER (1969); Australian and New Zealand taxa are described elsewhere.
- 1\*. Clamp connections consistently present (on all septa) . . . . . 2
  2. Whole basidiomes equally (dark)blue-lilac-purple in

- young specimens, on pileus later fading and becoming red-brown, brown or ochre (cf. also 17. *C. cucumeris* and 21. *C. porphyrophaeus*) ..... 3
- Australian and New Zealand taxa belonging to *Cor-tinarius* (Tel.) sect. *Myxotelamon* MOSER & HORAK (1975: 279) are described elsewhere.
- 2\*. Only parts of basidiome (most often lamellae and apex of stipe in young specimens) with pale blue-lilac-purple colours ..... 10
3. Spores globose to subglobose,  $7-8.5 \times 5.5-7 \mu\text{m}$  (cf. also 21. *C. porphyrophaeus*) ..... 4
- 3\*. Spores ovoid or amygdaliform-subfusoid ..... 5
4. Pileus -60 mm diam., stipe clavate to fusoid; spores coarsely warted; under *Castanopsis-Lithocarpus*, New Guinea ..... 9. *C. (Myx.) salor*
- 4\*. Pileus -25 mm diam.; stipe cylindric (to subclavate); spores minutely warted; under *Nothofagus*, New Guinea ..... 10. *C. (Myx.) indigoverus*
5. Spores  $5.5-7 \times 4-5 \mu\text{m}$ , ovoid; pileus -60 mm diam.; stipe -80 mm long, subclavate; under *Eucalyptus*, Australia ..... 11. *C. (Myx.) microarcheri*
- 5\*. Spores larger, ovoid or amygdaliform-subfusoid ..... 6
6. Spores ovoid,  $9.5-10.5 \times 5.5-6.5 \mu\text{m}$ , pileus -85 mm diam.; stipe -40 mm long, cylindric, robust; under *Eucalyptus*, Australia ..... 12. *C. (Myx.) subarcheri*
- 6\*. Spores amygdaliform-subfusoid (taxa 13-16 belong to a species complex whose systematics are not yet fully disentangled) ..... 7
7. Stipe distinctly fusoid or swollen-clavate at base; pileus -100 mm diam., spores  $10.5-13(-14) \times 4-7(-8) \mu\text{m}$  ..... 8
- 7\*. Stipe cylindric, base equal(-subclavate) or pestle-like to submarginate ..... 9
8. Under *Eucalyptus*, Australia ..... 13. *C. (Myx.) archeri*
- 8\*. Under *Nothofagus*, New Zealand ..... 14. *C. (Myx.) taylorianus*
9. Basidiomes robust; pileus -120 mm; stipe -130  $\times$  -12 mm, base pestle-like or swollen-submarginate; spores  $11-13 \times 5.5-6.5 \mu\text{m}$ ; under *Nothofagus*, New Zealand ..... 15. *C. (Myx.) bellus*
- 9\*. Basidiomes slender; pileus -35 mm diam.; stipe -55  $\times$  -6 mm, base equal(-subclavate); spores  $10-12 \times 4.5-6 \mu\text{m}$ ; under *Nothofagus*, New Zealand, Argentina (type), Chile ..... 16. *C. (Myx.) magellanicus*
10. (2\*). Pileus white to pale yellow; lamellae pale ochre-yellow; pale lilac tints only on stipe. Cf. 22. *C. austroalbidus*
- 10\*. Pileus  $\pm$  pale grey-brown, brown, red-brown or porphyry

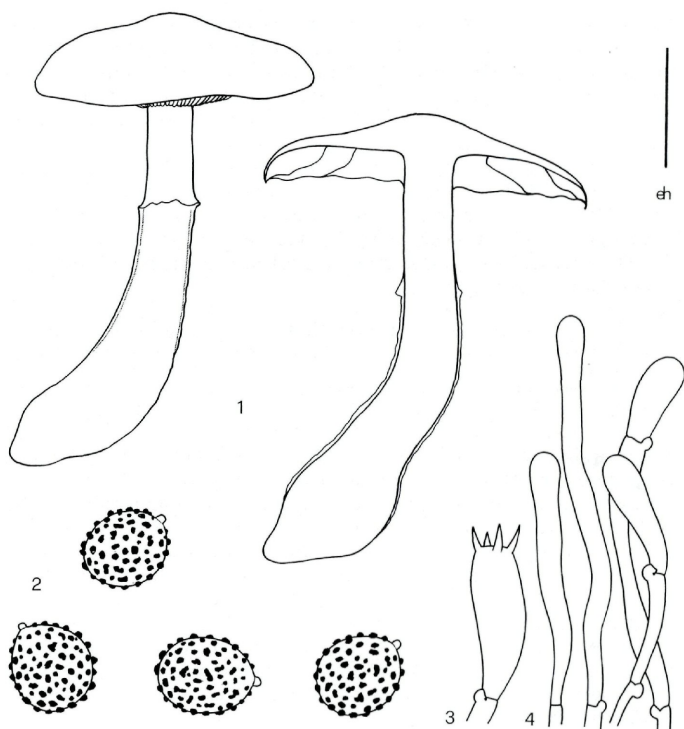
- brown, occasionally with lilac tinges (from glutinous universal veil at margin ..... 11
11. Pileus with persistent, conic papilla, -50 mm diam.,  $\pm$  dark brown; lamellae at first dark lilac; stipe -90  $\times$  -8 mm, cylindric, apex pale lilac fading to whitish; odour and taste very unpleasant, like raw cucumber; spores 9.5-12  $\times$  5.5-6  $\mu$ m, elliptic (to guttiform); under *Nothofagus*, New Zealand ..... 17. *C. (Myx.) cucumeris*
- 11\*. Pileus convex to broadly umbonate, never with conic papilla; odour and taste indistinct ..... 12
12. Pileus -50 mm diam., pale grey-brown, argillaceous, conspicuously marbled by darker, radially arranged streaks; lamellae at first pale lilac; stipe -50  $\times$  -16 mm, clavate, white; spores 13-16  $\times$  6.5-7  $\mu$ m, elongate amygdaliform, minutely verrucose; under *Leptospermum* - *Nothofagus*, New Zealand ..... 18. *C. (Myx.) marmoratus*
- 12\*. Pileus dark brown, red-brown, liver brown or porphyry brown; spores coarsely warted ..... 13
13. Pileus -60 mm diam., dark brown to date brown, any red-brown tinges absent; lamellae at first lilac; stipe -65  $\times$  -13 mm (at apex), subfusoid to gradually tapering-rooting, white; spores 11.5-15  $\times$  6-7  $\mu$ m, elongate amygdaliform; under *Castanopsis*, New Guinea ..... 19. *C. (Myx.) pituitosus*
- 13\*. Pileus red-brown, liver brown or porphyry brown ..... 14
14. Pileus -65 mm, dark liver brown; lamellae at first lilac; stipe -65  $\times$  -12 mm, subclavate, pale lilac turning white to pale brown; spores 11.5-14  $\times$  6.5-7.5  $\mu$ m, sublimoniform; conspicuous cheilocystidia fusoid with cylindric neck; under *Nothofagus*, New Caledonia ..... 20. *C. (Myx.) neocaledonicus*
- 14\*. Pileus -40 mm diam., dark liver brown to dark porphyry brown (margin often lilac in young specimens); lamellae at first lilac; stipe -60  $\times$  -8 mm, slender fusoid, apex lilac, otherwise white; spores 6-7  $\times$  5-6  $\mu$ m, subglobose; cheilocystidia cylindric-subclavate; under *Leptospermum*, New Zealand ..... 21. *C. (Myx.) porphyrophaeus*

9. *Cortinarius (Myxacium) salor* FRIES. - Epicrisis, 276. 1838. - Pl. 9, figs. 1-3.

Illustrations. - IMAZEKI & HONGO (1971: pl. 23, 146: pale specimens).

Description of New Guinean collections:

Pileus -60 mm diam., hemispheric to convex becoming umbonate-expanded; at first blue-lilac-purple, in age gradually fading



Pl. 9. – *Cortinarius salor* (ZT 72/352; Papua New Guinea): 1. basidiomes. – 2. spores. – 3. basidium and cheilocystidia.

and increasingly ochre or pale yellow-brown; glutinous, margin non-striate. – Lamellae (20–30, –5) crowded, broadly adnate or emarginate, subdecurrent with short tooth, –6 mm wide; lilac or blue-lilac turning rust brown; fimbriate edges bluish. – Stipe –80 × –14 mm (at base), subclavate or fusoid; pale blue (in upper portion), pale grey-blue towards base, which becomes yellow to ochre-brown in old specimens; glutinous below fibrillose cortina; solid, single or cespitose. – Context white, pale blue at apex of stipe, ochre in base of stipe. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH-negative.

Spore print rust brown. – Spores 7–8.5 × 6–7 µm, globose to subglobose, coarsely verrucose, often with defined perispore, rust

brown. — Basidia 25–30 × 8–10 µm, 4-spored. — Cheilocystidia 15–60 × 4–10 µm, cylindric to subclavate, forming a dense, sterile margin at edges, membrane thin-walled, with yellow-brown (KOH), plasmatic pigment. — Pleurocystidia absent. — Epicutis of strongly gelatinised, cylindric hyphae (2–6 µm diam.), with yellow-brown both plasmatic and encrusting pigment. — Pileipellis composed of cylindric to ovoid cells (8–20 µm diam.), oleiferous hyphae absent. — Clamp connections present.

Habitat. — On soil among litter under *Castanopsis acuminatissima* and *Lithocarpus* spp. (Fagaceae). April–October.

Distribution. — Common in northern hemisphere: Sweden (type); New Guinea.

Material examined. — PAPUA NEW GUINEA: Morobe distr., Bulolo (Manki), under *Castanopsis-Lithocarpus*, 1400 m, 25 × 1971, leg. HORAK (ZT 71/213); same locality, 1 iv 1972, leg. HORAK (ZT 72/352).

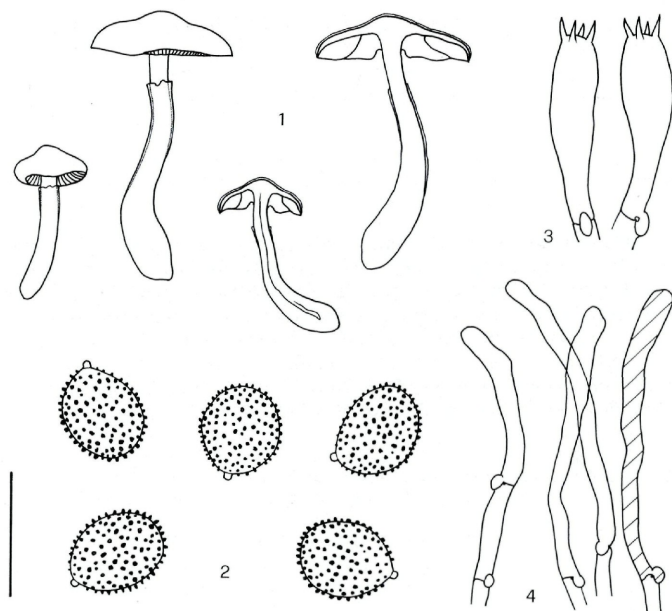
Additional material: several collections from Central Europe (Herb. HORAK, ZT).

The two New Guinean records correspond in all essential microscopic and macroscopic characters with material encountered in the temperate zone of the northern hemisphere. In Europe *C. salor* has a wide ecological spectrum and is known to enter ectomycorrhiza both with broad-leaved and less often also with coniferous trees. The specimens gathered in Papua New Guinea have been found in montane, pure stands of *Castanopsis* and *Lithocarpus*, which reach there the southernmost limit of their Southeastern area of distribution. *C. salor* is also reported from Japan, representing the northernmost region of occurrence and it can be safely assumed that this species once, as an facultative symbiont with the before mentioned Fagalean host-plants, crossed the equator and subsequently migrated southwards into New Guinea.

10. ***Cortinarius (Myxacium) indigoverus*** HORAK, sp.nov. — Pl. 10, figs. 1–4.

Pileus –25 mm latus, azureolilacinus vel purpureus, glutinosus. Lamellae caeruleae dein ferrugineae. Stipes –45 × –6 mm, cylindricus, primo pileo concolor dein ochraceus, glutinosus. Odor saporque raphanoidei. Sporae 7–8.5 × 5.5–7 µm, globosae vel subglobosae, minute verrucosae. Ad terram sub Nothofago. Nova Guinea. Typus ZT 72/466.

Pileus –25 mm diam., hemispheric to convex, campanulate or umbonate-expanded; dark blue-lilac, purple or indigo blue, paler towards non-striate margin, colour unchanging with age; glutinous, in dry conditions becoming radially fibrillose or minutely squamulose. — Lamellae (14–18, –5) broadly adnate to emarginate, subdecurrent with short tooth, –4 mm wide; blue to lilac turning rust



Pl. 10. — *Cortinarius indigoverus* (ZT 72/466, holotype): 1. basidiomes. — 2. spores. — 3. basidia. — 4. cheilocystidia.

brown, fimbriate edges often remaining blue. — Stipe  $45 \times 6$  mm, cylindric to subclavate; at first blue to lilac over whole length, in old specimens slowly turning ochraceous at base; fibrillose, apex dry, but glutinous below fibrillose, rudimentary cortina, slimy sheath often disrupted into belt-like zones; solid becoming fistulose, single. — Context blue beneath pileipellis and in apex of stipe, ochre to pale olive brown in base of stipe. — Odour indistinct or slightly raphanoid. — Taste raphanoid, bitterish. — Chemical reactions unknown, but with KOH expected to be pink or pale wine red.

Spore print rust brown. — Spores  $7-8.5 \times 5.5-7 \mu\text{m}$ , globose to subglobose, rather minutely verrucose, perispore inconspicuous, rust brown. — Basidia  $25-35 \times 7-9 \mu\text{m}$ , 4-spored. — Cheilocystidia  $35-60 \times 3-5 \mu\text{m}$ , cylindric, with lilac to wine red (KOH), plasmatic pigment. — Pleurocystidia none. — Pileipellis and epicutis composed of entangled, often  $\pm$  erect, cylindric, gelatinised hyphae ( $4-7 \mu\text{m}$  diam.), with conspicuous wine red

(KOH), plasmatic pigment, oleiferous hyphae absent. – Clamp connections present.

Habitat. – On soil among litter under *Nothofagus* spp., above 2000 m in upper montane forests. December–May.

Distribution. – New Guinea.

Material examined. – PAPUA NEW GUINEA: Eastern Highlands: Kainantu, Mt Michael (Okapa trail), 9 xii 1971, leg. HORAK (ZT 71/407). Western Highlands: Mt Hagen, E of Kuna, 20 v 1972, leg. HORAK (ZT 72/466, holotype).

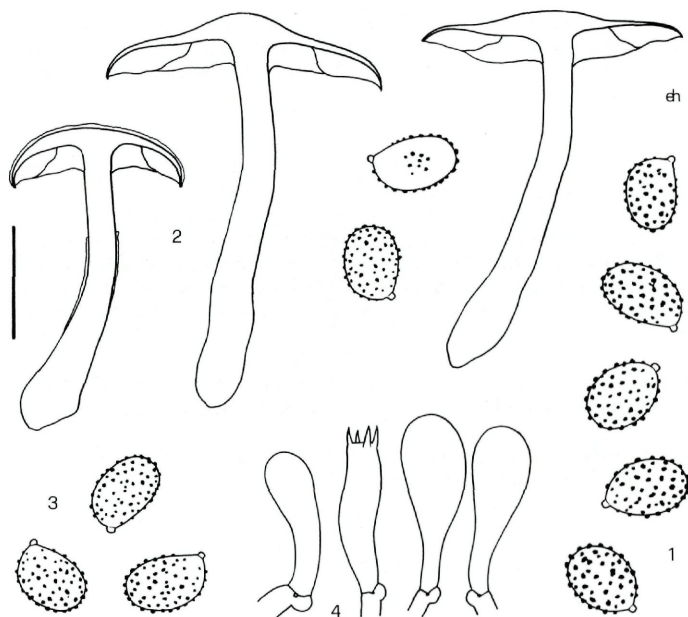
Concerning general shape and colours this distinct species recalls a diminutive *C. salor*. However, the two taxa are readily separated by their microscopic features and ecology. *C. indigoverus* is strictly associated with *Nothofagus* spp. (and hence of southern origin) whereas the New Guinean records of *C. salor* represent mycorrhizal fungi of northern Fagaceae (viz. *Castanopsis* and *Lithocarpus*) which in the New Guinean mountains always occur at altitudes well below the *Nothofagus* belt.

11. *Cortinarius (Myxacium) microarcheri* CLELAND. – Trans. R. Soc. S. Austr. 57: 191. 1933. – Pl. 11, figs. 1–4.

Original description in CLELAND (1933: 191): "Pileus 1.8–6.2 cm, convexus vel subplanus, substriatus, glutinosus, perviolaceus vel violaceo-brunneus, exsiccatus tabacino-brunneus vel succineo-brunneus. Lamellae subsinuatae vel adnexae, subconfertae, pallido-violaceae vel violaceo-brunneae, deinde tabacino-brunneae. Stipes 3.1–5 cm, subtenuis, ad basim subcrassus, fibrillosus, subcavus, solidus, pallidus vel pallide-violaceus. Caro subviolacea vel albida. Sporae obliquae, subglobosae, glabrae,  $5.5\text{--}8.4 \times 4.5\text{--}5\ \mu\text{m}$ . SA. – Mt. Lofty"

Description of recent material (ZT 2700):

Pileus –60 mm diam., hemispheric to convex becoming umbonate-expanded; blue-lilac-purple, with age gradually changing ochre-brown to brown from centre, in old basidiomes often without any blue tinges; glutinous, margin non-striate to substriate. – Lamellae crowded, broadly adnate to emarginate, subdecurrent with short tooth, –5 mm wide; lilac turning rust brown, subfimbriate edges concolorous. – Stipe –80  $\times$  –10 mm, cylindric to subclavate, comparatively slender; blue to lilac in young specimens becoming paler with age with white to pale ochre base; glutinous to viscid, slimy coat rather thin and soon drying up, cortina absent or rudimentary; solid becoming fistulose, single or cespitose, at base sometimes with strongly developed, white rhizomorphs. – Context lilac in pileus and upper portion of stipe, ochre-brown in base of stipe. –



Pl. 11. — *Cortinarius microarcheri* (ADW 16127, holotype): 1. spores. — (ZT 2700): 2. basidiomes. — 3. spores. — 4. basidium and cheilocystidia.

Odour indistinct. — Taste slightly raphanoid, not bitter. — Chemical reaction on pileus: KOH — negative.

Spore print rust brown. — Spores  $5.5-7 \times 4-5 \mu\text{m}$ , ovoid, (often minutely) verrucose, perispore inconspicuous, rust brown. — Basidia  $20-35 \times 5-7 \mu\text{m}$ , 4-spored. — Cheilocystidia  $25-40 \times 6-10 \mu\text{m}$ , clavate to cylindric, rarely with pale brown (KOH) pigment, rather inconspicuous. — Pleurocystidia absent. — Epicutis of cylindric, gelatinised hyphae ( $1-3 \mu\text{m}$  diam.) encrusted with brown (KOH) pigment. — Pileipellis composed of subglobose to ovoid cells ( $5-15 \mu\text{m}$  diam.), oleiferous hyphae absent. — Clamp connections present.

Habitat. — On soil under *Eucalyptus* spp. — June.

Distribution. — Australia.

Material examined. — AUSTRALIA: South Australia: Mt Lofty, 16 vi 1917, leg. CLELAND (ADW 16127, holotype). Western Australia: Walpole, Weld River, 20 vi 1985, leg. BOUGHER in HORAK (ZT 2700). For Victorian record cf. SINNOTT (1976).

The present, rather incomplete, systematic concept is based upon the type material from South Australia and a recent collection from Western Australia which in all important details fits well CLELAND's circumscription.

The most significant character of *C. microarcheri* are the small, ovoid spores (in CLELAND's original description erroneously reported to be "smooth") which distinguish this taxon from all other described Australian Myxacia with blue colours.

The base of the stipe in Western Australian specimens (ZT 2700) is partly covered by a strongly developed tomentum which extends with white to ochre rhizomorphs into the substrate. These mycelial remnants (not mentioned by CLELAND) may represent the volva-like structures as observed by M. MOSER (pers. comm.) on the type material.

In CLELAND's herbarium (ADW 16139) a second collection is filed under *C. microarcheri*. The microscopic data, however, do not correspond with those of the type and hence its identity remains doubtful.

12. *Cortinarius (Myxacium) subarcheri* CLELAND. – Trans. R. Soc. S. Austr. 52: 220. 1928. – Pl. 12, fig. 1.

Original description in CLELAND (1928: 220): "Pileus up to 8.7 cm, convex, sometimes irregular, viscid, violet, becoming pale brownish above or brownish-violet to brown or pallid lavender. GILLS sinuate, slightly toothed, moderately close, Pinkish Cinnamon (xxix) tinged with violet or violet becoming Vinaceous Fawn (xl). Stem 3.7 cm high, becoming more elongated, at first thick (up to 3.7 cm), downy fibrillose, violet tinted or Pale Lobelia Violet (xxxviii), mycelial mass at the base. Flesh with violet-lilac tint. Spores yellow-brown, obliquely elliptical,  $9-10 \times 5.5-5.5 \mu\text{m}$ . – SA. – Bundaleer State Forest, June 1928".

Illustrations. – MACDONALD & WESTERMAN (1979:40); GRIFFITHS (1985: 25): – The identity of the illustrated specimens named "*subarcheri*" remains doubtful, for the accompanying descriptions lack any microscopic data.

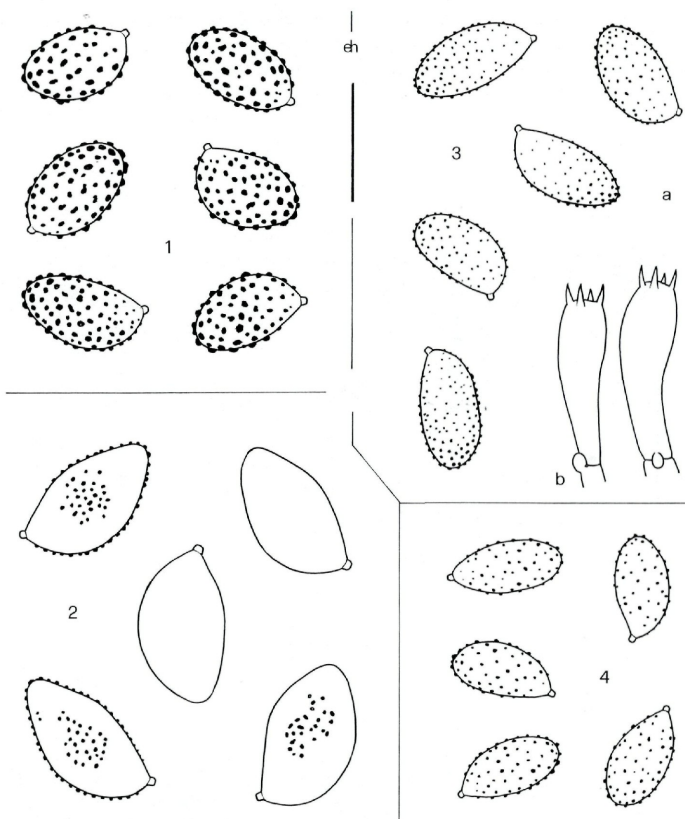
Microscopic data observed on the type material:

Spore print rust brown. – Spores  $9.5-10.5 \times 5.5-6.5 \mu\text{m}$ , broadly ovoid (to subamygdaliform), verrucose, perispore inconspicuous, rust brown. – Basidia  $30-40 \times 7-8 \mu\text{m}$ , 4-spored. – Cheilocystidia not observed.

Habitat. – On soil under *Eucalyptus baxteri*. June.

Distribution. – Australia

Material examined. – AUSTRALIA: South Australia: Bundaleer State Forest, June 1928, leg. CLELAND (ADW 16125, holotype).

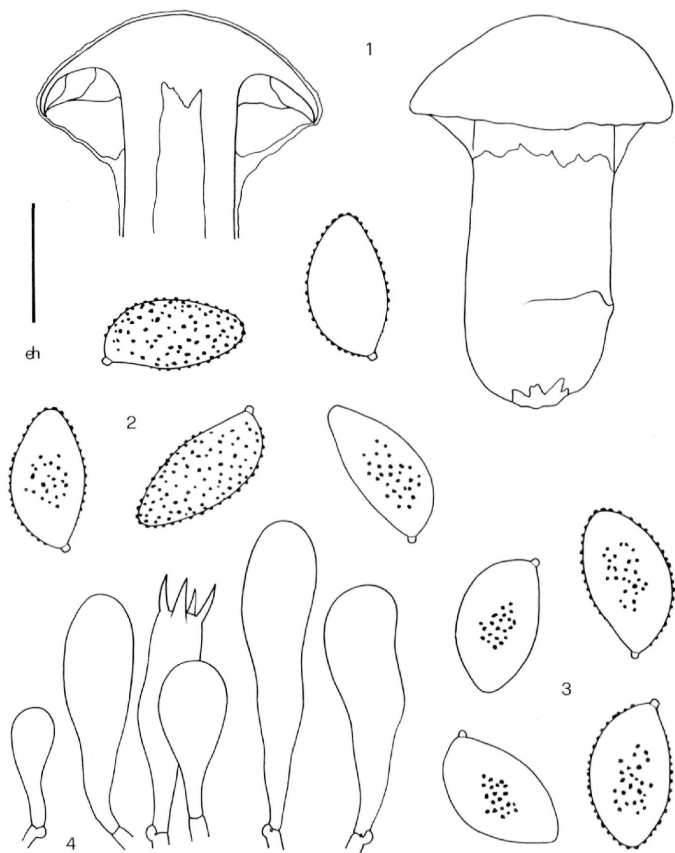


Pl. 12. – *Cortinarius subarcheri* (ADW 16125, holotype): 1. spores. – *Cortinarius subarvinaceus* (IB, holotype): 2. spores. – *Cortinarius austroalbidus* (ADW 16133, holotype of "*Cort. albidus*" CLEL.): 3. a. spores. – b. basidia. – *Cortinarius paraochraceus* var. *australiensis* (IB, holotype of "*Cort. ochraceus*" CLEL., 1921): 4. spores.

Based upon the available data *C. subarcheri* has to be considered a doubtful taxon. CLELAND refers this violet-purple species to subgen. *Myxaciium* but in the original description the stipe is not reported to be glutinous. In addition the "viscid" pileipellis can not be clearly demonstrated in microscopic sections prepared from the authentic exsiccata.

Further topotypic material is needed to clarify the actual systematic position of *C. subarcheri* which otherwise is rather well defined by its large ovoid, coarsely warted spores.

According to the literature *C. subarcheri* has been recorded from Victoria (SINNOTT, 1976) and also from two localities in Western Australia (HILTON, 1988).



Pl. 13. – *Cortinarius archeri* (K; ARCHER, 1856, holotype): 1. basidiomes (from original painting). – 2. spores. – (UNSW 83/897): 3. spores. – 4. basidium and cheilocystidia.

13. *Cortinarius (Myxacium) archeri* BERKELEY in HOOKER f. – Fl.Tasm. 2: 247. 1860. – Pl. 13, figs. 1–4.

Original description in BERKELEY in HOOKER (1860: 247): “Pileo convexo carnosio rivuloso brunneo-violaceo, stipite valido aequali viscoso violaceo, lamellis pallido-argillaceis latiusculis adnatis transversim rugosis. Hab. On the ground: Cheshunt, April, 1856, ARCHER”:

Illustrations. – BERKELEY (1860: t. 181,7); CLELAND (1934: fig. 20); PEGLER (1965: fig. 5,1); MACDONALD & WESTERMAN (1979: 40, as “*sub-archeri*”); COLE & al. (1984: pl. 2); FUHRER (1985:30); YOUNG (1986: 75; pl. F,1 ?).

Description based on fresh material collected in NSW:

Pileus –100 mm diam., hemispheric with incurved margin then convex to plane or expanded-umbonate, occasionally margin upturned; at first dark blue-lilac-purple changing to brown at centre with bluish tinges at non-striate margin; glutinous, smooth in dry conditions. – Lamellae crowded, broadly adnate to decurrent† with short tooth, –10 mm wide; blue or grey blue, changing to rust brown, fimbriate edges concolorous. – Stipe –100 × 25 (–30) mm, robust, polymorphic: equal, broadly fusoid, subclavate or gradually tapering; pallid blue at dry apex, concolorous with pileus below fibrillose or submembranaceous cortina; becoming paler towards base; glutinous; solid but hollow with age, single (to cespitose). – Context white in pileus, blue in upper portion of stipe. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print rust brown. – Spores 10.5–13 × 5.5–7 µm, distinctly amygdaliform to elongate subfusoid (cf. Pegler 1965: pl. 5,1), minutely warted, perispore inconspicuous, rust brown. – Basidia 25–45 × 8–11 µm, 4-spored. – Cheilocystidia 15–55 × 10–20 µm, clavate to vesiculose, with pale lilac (KOH), plasmatic pigment. – Pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (1–3 µm diam.). – Pileipellis composed of globose to ovoid cells (5–15 mm diam.), with yellow-brown (KOH), both plasmatic and encrusting pigment, oleiferous hyphae often present. – Clamp connections present.

Habitat. – On soil under *Eucalyptus* spp. (but associated trees unknown for type material). April–June.

Distribution. – Australia.

Material examined. – AUSTRALIA: Tasmania, Cheshunt, 16 iv 1856, leg. ARCHER (K, holotype). Southern Australia: Mt Lofty, National Park, 16 v 1931, leg.

CLELAND (ADW 16182). New South Wales: Oatley, under *Eucalyptus* spp., 25 vi 1980, leg. WOOD (UNSW 80/279); Windsor, Howes Valley, Tari Ck, under *Eucalyptus* spp., 12 v 1983, leg. WOOD (UNSW 83/687); same locality, 2 vi 1983, leg. WOOD (UNSW 83/865). Western Australia: Mundaring, Zamia Rd., under *E. marginata*, 20 vi 1981, leg. MAZANEC (UWA 2515; cf. HILTON, 1988). – According to YOUNG (1986) also recorded from Queensland, Victoria, South Australia.

This taxon is the type species of *Cortinarius* (*Myx.*) sect. *Archeriani* (MOSER & HORAK, 1975: 243), the majority of whose representatives occur in the southern hemisphere either in *Nothofagus* or *Eucalyptus* forests. The type material of *C. archeri* was gathered some 130 years ago by ARCHER in Tasmania. Nothing is known about the ecology and vegetation at the collecting site but *Eucalyptus* appears to be the most likely mycorrhizal host tree.

Judging from the painting going with the authentic exsiccata it appears that only young basidiomes have been available for the original description. According to the sketches the stout stipe is cylindric and equal, whereas in the presented concept (which follows CLELAND's interpretation; cf. 1934: fig. 20) the base of the stipe is described to range from cylindric to fusoid or clavate. However, the shape and size of the spores are so characteristic that we do not hesitate to consider the above mentioned collections as being *C. archeri*.

Having re-examined the rather poorly preserved type material of *C. archeri* MOSER & HORAK (1975: 256) reported erroneously the absence of cheilocystidia in that species. As a matter of fact cheilocystidia, though small and evanescent, have been detected in all samples collected over the last few years.

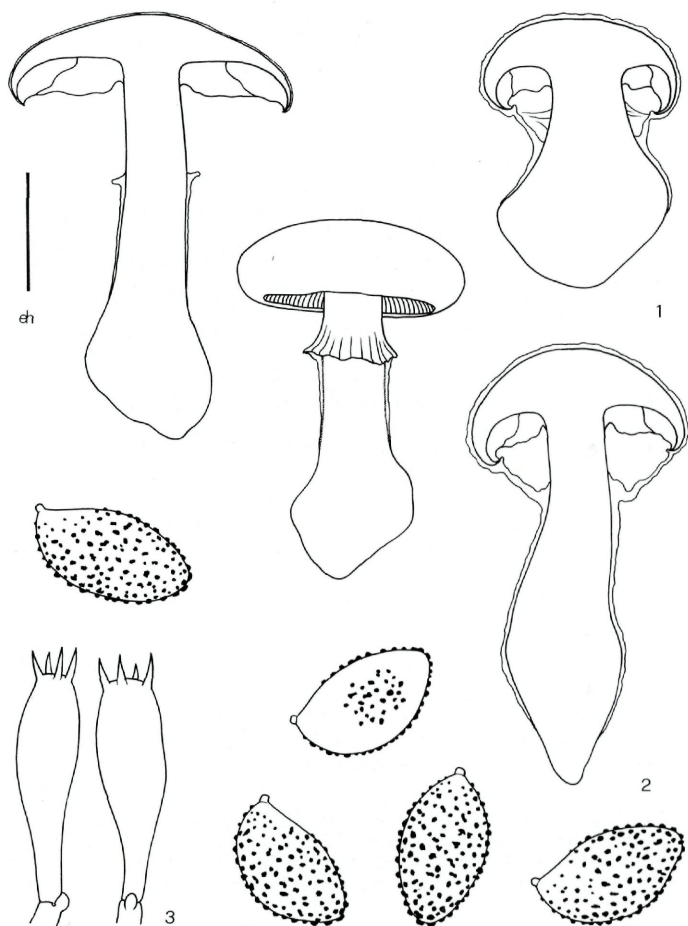
In CLELAND's herbarium a second collection filed under "*C. archeri*" (ADW 16178: Mt Lofty, 9 vii 1921) is certainly misidentified, for its large spores ( $10-12 \times 6-7.5 \mu\text{m}$ ) are strictly ovoid and covered with very coarse warts. It seems, therefore, that another still unnamed, blue-purple *Myxaciium* can be expected in the forests on Mt Lofty near Adelaide, SA.

For further discussion cf. 14. *C. taylorianus* and 15. *C. bellus*.

14. ***Cortinarius* (*Myxaciium*) *taylorianus*** HORAK, sp.nov. – Pl. 14, figs. 1–4.

Pileus –80 3–100) mm latus, azureopurpureus, glutinosus. Lamellae pileo colores dein ferrugineae. Stipes –120  $\times$  –15 mm, fusoidobulbosus (–30 mm diam.), pallide azureopurpureus, albidus vel pallide argillaceus basim versus, glutinosus. Sapor mitis. Sporae  $10.5-14 \times 6-7.5 \mu\text{m}$ , amygdaliformes, verrucosae. Ad terram sub *Nothofago*. Nova Zelandia. Typus PDD 27259.

Illustrations. – TAYLOR (1970: 16 "*Cortinarius* sp.").



Pl. 14. – *Cortinarius taylorianus* (PDD 27259, holotype): 1. basidiomes. – 2. spores. – 3. basidia. – (ZT 68/271): 4. basidiome.

Pileus –80 (–100) mm diam., at first hemispheric with inrolled margin then convex, campanulate or umbonate-expanded, occasionally plane or depressed at centre; blue-lilac-purple in very young

specimens, ageing gradually changing to dark brown, orange brown or ochre-brown, often with grey or silvery tinge; glutinous, upon drying becoming radially wrinkled, non-striate margin often with submembranaceous remnants of gluten, hygrophanous. – Lamellae (20–35, –15) densely crowded, broadly adnate to emarginate, subdecurent with short tooth, –12 mm wide, often ventricose in old specimens; at first dark blue-lilac becoming paler and finally rust brown, fimbriate or crenulate edges sometimes conspicuously blue. – Stipe –120 × –15 mm (at apex), –30 mm (at bulb), upper portion cylindric or gradually tapering above, always with conspicuous, fusoid bulb or fusoid-tapering; at first pale blue-lilac over whole length, whitish, pale argillaceous or pale ochre towards base; pruinose and dry at apex, cortina absent or consisting of sparse fibrils, below glutinous till base, in dry weather condition gluten often forming a persistent, membranaceous ring; solid becoming hollow in old basidiomes, single (or rarely cespitose). – Context white to pale blue in pileus, blue-lilac above lamellae and in upper parts of stipe, ochre-brown in base of stipe. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print rust brown. – Spores 10.5–14 × 6–7.5 µm, broadly amygdaliform, mucro absent, verrucose, perispore present, rust brown. – Basidia 35–50 × 9–12 µm, 4-spored. – Cheilocystidia 15–55 × 8–16 µm, clavate to vesiculose, sometimes subfusoid, with lilac to pale pink (KOH), plasmatic pigment. – Pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (2–5 µm diam.), with lilac or orange-brown (KOH), encrusting rarely also plasmatic pigment. – Pileipellis composed of cylindric to ovoid cells (6–20 µm diam.), oleiferous hyphae scattered. – Clamp connections present.

Habitat. – On soil under *Nothofagus* spp. (*N. fusca*, *N. menziesii*, *N. solandri* var. *cliffortioides*). April–June.

Distribution. – New Zealand.

Material examined. – NEW ZEALAND: South Island: Southland: Lake Manapouri, Surprise Bay, 5 v 1970, leg. TAYLOR (no material); Lake Te Anau, Dock Bay, under *N.s.-cl.*, 2 v 1970, leg. TAYLOR (633). Otago: Lake Ohau, Temple River, under *Nothofagus* sp., 13 iv 1969, leg. TAYLOR (453). Canterbury: Craigieburn Range, Cave Stream, under *N.s.-cl.*, 19 iv 1968, leg. HORAK (ZT 68/271). Nelson: Lake Rotoiti, eastern shore, under *N.f.*, *N.m.*, *N.s.-cl.*, 30 iv 1968, leg. HORAK (PDD 27259, holotype; ZT 68/327, isotype). North Island: Gisborne: Urewera National Park: trail to Panekiri Range, under *N.f.*, *N.m.* and *Leptospermum ericoides*, 28 vi 1968, leg. HORAK (ZT 68/619); Ngamoko Track, under *N.f.* and *N.m.*, 22 v 1981, leg. HORAK (ZT 642); near Headquarters, under *N.f.* and *N.m.*, 27 v 1981, leg. HORAK (ZT 813); same locality, 31 v 1981, leg. HORAK (ZT 858).

Material of compared species. – ARGENTINA: Neuquén, Lago Nahuel Huapi, Puerto Manzano, under *Nothofagus dombeyi*, 1965, leg. SINGER 4097 (IB 70/99, holotype of *C. (Myx.) opulentus* Mos.).

This spectacular New Zealand species is named after Mrs. Marie TAYLOR (Auckland) who kindly contributed additional information about its ecology and distribution (TAYLOR, 1970, 1981).

Among the large, blue-purple representatives of stirps *Archeri* *C. taylorianus* is best recognized by its rather broad amygdaliform spores densely covered with medium-sized warts. *C. bellus* (see below), *C. archeri* (Australia) and *C. opulentus* MOSER in MOSER & HORAK (1975: 256; Argentina-Chile) have to be considered as the closest relatives of *C. taylorianus*, which, however, can be neatly separated by the size, shape and ornamentation of the spores.

All ecological data available till now indicate that in New Zealand *C. taylorianus* is a wide-spread agaric which enters ectomycorrhiza with different species of *Nothofagus* occurring from sea level to timber-line.

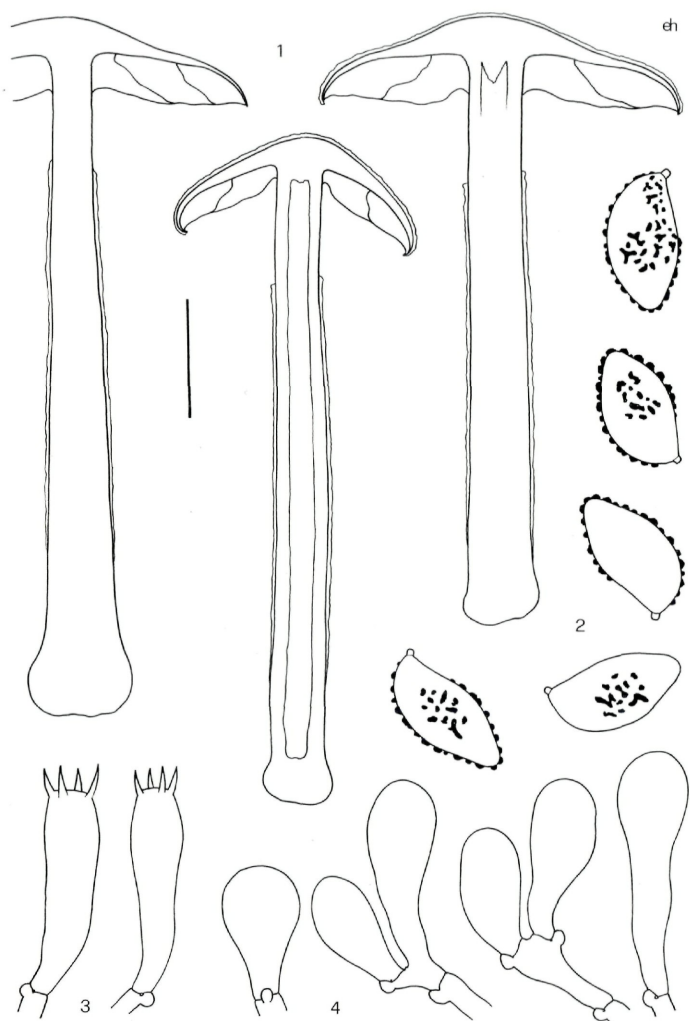
15. ***Cortinarius (Myxacium) bellus*** HORAK, sp.nov. — Pl. 15, figs. 1–4.

Pileus 120 mm latus, fuscus, castaneus vel porphyreus, azureus marginem versus, glutinosus. Lamellae caeruleopurpureae dein ferrugineae. Stipes –130 × –12 mm, cylindricus, basaliter conspicue marginatus, glutinosus. Sapor mitis. Sporae 11–13 × 5.5–6.5 µm, amygdaliformes, grosse verrucosae. Ad terram sub Nothofago. Nova Zelandia. Typus PDD 27260.

Illustration. — ? TAYLOR (1981: pl. 15,76).

Pileus –120 mm, at first hemispheric or convex with strongly incurved margin becoming broadly umbonate-expanded; centre dark brown, reddish brown or porphyry, but blue to purple towards the striate-costate margin, hygrophanous; glutinous, drying often becoming radially wrinkled. — Lamellae (25–35, –15) very crowded, broadly adnate or emarginate, subdecurrent with short tooth, –8 mm wide; at first dark blue-purple then turning to rust brown, fimbriate edges blue to lilac. — Stipe –130 × –12 mm, cylindric, comparatively slender, base equal or pestle-like swollen, occasionally also with abrupt, submarginate base; at first blue-purple, pale blue above rudimentary cortina, base whitish or pale brown; glutinous, hollow, single or in dense clusters, several times observed forming large fairy rings. — Context dark brown beneath pileipellis, blue in upper portion of stipe, ochre-brown in base of stipe. — Odour indistinct. — Taste mild. — Chemical reaction on pileus: KOH – negative.

Spore print rust brown. — Spores 11–13 × 5.5–6.5 µm, amygdaliform, with distinct supraapical depression, occasionally sublimoniform due to blunt mucro, very coarsely verrucose, warts embedded in perispore, rust brown. — Basidia 30–45 × 8–10 µm, 4-spored. — Cheilocystidia 15–45 × 0–15 µm, scattered, clavate



Pl. 15. – *Cortinarius bellus* (PDD 27260, holotype): 1. basidiomes. – 2. spores. – 3. cheilocystidia. – 4. basidia.

to vesiculose, with lilac (KOH), plasmatic pigment. – Pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (2–4  $\mu$ m diam.). – Pileipellis composed of cylindric to ovoid cells (8–20  $\mu$ m diam.), with brown (KOH) encrusting pigment, oleiferous hyphae present. – Clamp connections present.

Habitat. – On soil among litter under *Nothofagus* (*N. fusca*, *N. menziesii*), sometimes fruiting in large numbers, also in fairy rings. May–June.

Distribution. – New Zealand.

Material examined. – NEW ZEALAND: North Island: Gisborne: Urewera National Park: trail to Lake Waikareiti, under *N.f.* and *N.m.*, 25 vi 1968, leg. HORAK (ZT 68/607); near Headquarters, under *N.f.* and *N.m.*, 30 v 1981, leg. HORAK (PDD 27260, holotype; ZT 842, isotype).

In the New Zealand *Nothofagus* forests this species can be taken for the related *C. taylorianus* from which it is at once distinguished, however, by its long, cylindric stipe with a pestle-like base. In case of doubt the two taxa are readily separated by the amygdaliform to subluniform spores being very coarsely warted in *C. bellus*.

In the Urewera National Park (NZ) this species was found 1968 and again 1981 in mixed *Nothofagus* woods. At both occasions *C. bellus* occurred in large quantities and without exception the stipes of the basidiomes were constantly cylindric and abruptly swollen and submarginate at the base. Thus this particular shape appears to be a reliable character to keep apart the two large, blue-purple *Myxaciium* recorded so far from New Zealand.

16. *Cortinarius* (*Myxaciium*) *magellanicus* SPEGAZZINI. – Bol. Acad. Nac. Cs. Cordoba 11: 15. 1887. – Pl. 16, figs. 1–3.

SYN.: *Cortinarius* (*Myx.*) *aiacapiiae* SPEG. – Bol. Acad. Nac. Cs. Cordoba 11: 152. 1887.

*Cortinarius* (*Myx.*) *capitellinus* HORAK ap. MOSER & HORAK. – Nova Hedwigia Beih. 52: 260. 1979.

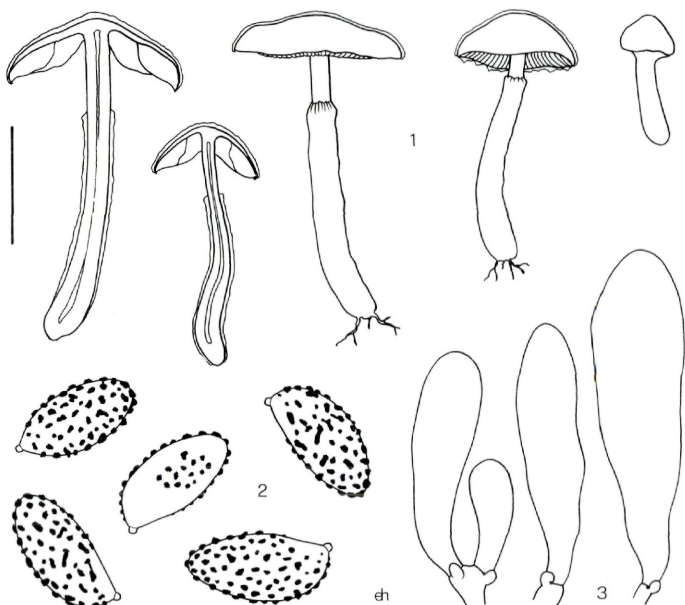
Illustrations. – South America: HORAK & MOSER (1975: pl. 1, 4 as "*C. tyriomyxa*"); HORAK (1979: 411).

Description of the New Zealand material:

Pileus –35 mm diam., hemispheric with incurved margin, convex, rarely with umbo, expanded in old specimens; at first dark blue-lilac-purple then fading and changing to ochre-brown or brown; glutinous, margin becoming translucently striate with age. – Lamellae (12–20, –5) adnexed to adnate or broadly adnate-emarginate, 5 mm wide; at first dark lilac-purple becoming rust

brown, fimbriate edges remaining lilac. — Stipe  $-55 \times -6$  mm, cylindric or subclavate; at first concolorous with pileus then apex lilac but base slowly turning pale yellow-brown; glutinous, gluten often ending above with striate ring, cortina absent or rudimentary; solid soon fistulose, single (or cespitose), at base sometimes with white rhizomorphs. — Context lilac in pileus and upper portion of stipe, pale ochre-brown in base of stipe. — Odour indistinct. — Taste mild. — Chemical reactions on pileus: KOH, HCl and  $\text{NH}_3$  — negative.

Spore print rust brown. — Spores  $10-12 \times 4.5-6$   $\mu\text{m}$ , elliptic to subamygdaliform, coarsely warted (at least at apex), perispore inconspicuous, rust brown. — Basidia  $25-35 \times 8-10$   $\mu\text{m}$  diam., 4-spored. — Cheilocystidia  $15-55 \times 10-20(-25)$   $\mu\text{m}$ , polymorphic, mostly clavate to vesiculose, with lilac (KOH), plasmatic pigment. — Pleurocystidia none. — Epicutis of strongly gelatinised, cylindric hyphae (2–4  $\mu\text{m}$  diam.). — Pileipellis com-



Pl. 16. — *Cortinarius magellanicus* (ZT 69/252; New Zealand): 1. basidiomes. — 2. spores. — 3. cheilocystidia.

posed of cylindric to ovoid cells (6–20 mm diam.), with lilac or brown, plasmatic or encrusting pigment, oleiferous hyphae scattered in pileitrama. – Clamp connections absent.

Habitat. – On soil under *Nothofagus* spp. (*N. fusca*, *N. menziesii*, *N. solandri* var. *cliffortioides*). March–May.

Distribution. – New Zealand (cf. distribution map in HORAK, 1983: fig. 4,14). – South American records: Argentina (type), Chile (MOSER & HORAK, 1975; HORAK, 1979).

Material examined. – NEW ZEALAND: South Island: Fjordland: Lake Te Anau, North Fjord, Lugar Burn, under *N.s.-cl.*, *N.m.*, *Fuchsia* and *Dicksonia*, 10 iv 1969, leg. HORAK (ZT 69/252). Canterbury: Lewis Pass, under *N.f.*, *N.m.* and *N.s.-cl.*, 15 iii 1983, leg. HORAK (ZT 2001). Nelson: Lake Rotoiti, trail to Mt. Robert, under *N.f.* and *N.m.*, 1 v 1969, leg. HORAK (ZT 69/273). North Island: Gisborne, Urewera National Park, near Headquarters, under *Nothofagus-Leptospermum*, 30. v 1981, leg. HORAK (ZT 847).

Additional material. – Numerous collections from both Argentina and Chile (cf. MOSER & HORAK, 1975; HORAK, 1979) and unpublished records in Herb. HORAK (ZT).

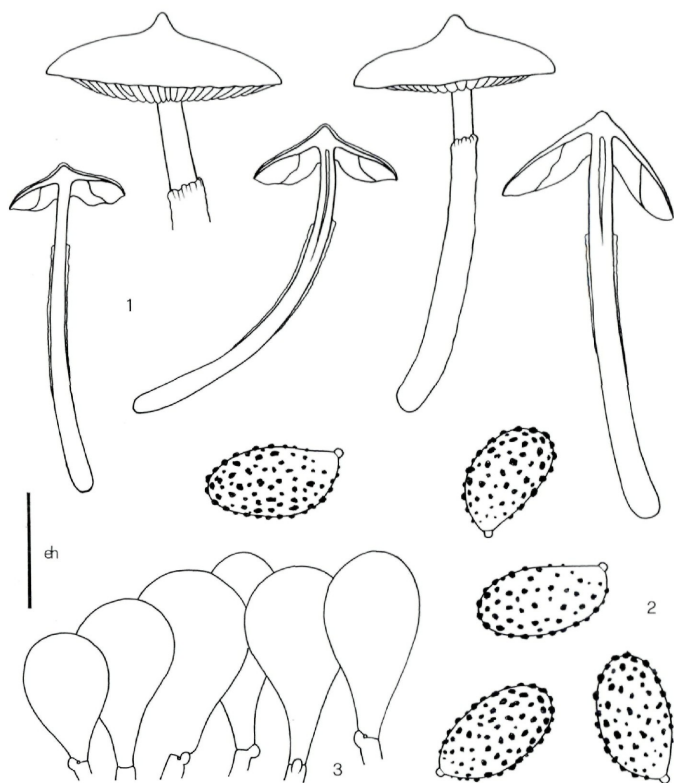
Morphologically the New Zealand specimens are in good agreement with those gathered at several occasions in the *Nothofagus* forests of Argentina and Chile (MOSER & HORAK, 1975; HORAK, 1979). As a rule the brilliant blue-purple colour can be observed in young basidiomes but upon ageing it is gradually replaced by brown or ochre pigments. Under these circumstances old and weathered basidiomes of this taxon are sometimes difficult to recognize as *C. magellanicus*.

As before described in South American collections also New Zealand specimens show much variation regarding the size and shape of the cheilocystidia. Obviously this particular character is of little specific value and can not be employed for the differentiation of local, phenotypic forms or varieties.

17. ***Cortinarius (Myxaciium) cucumeris*** HORAK, sp.nov. – Pl. 17, figs. 1–3.

Pileus –50 mm latus, convexus vel applanatus papilla conica instructus, fuscus vel avellaneus, glutinosus. Lamellae pallide lilacinae dein pallide ferrugineae. Stipes –90 × –8 mm, cylindricus, pallide lilacinus dein argillaceoferrugineo. Odor saporque ingrati, cucumis similis. Sporae 9.5–12 × 5.5–6 µm, ellipticae, verrucosae. Ad terram sub Nothofago. Nova Zelandia. Typus 27261.

Pileus –50 mm diam., at first sharply conic with strongly incurved margin, then convex to expanded but always with persistent conic or umbonate-conic papilla; fuscous, date brown or hazel brown becoming paler or turning ochre-brown with age, occasionally lilac towards margin from gluten; glutinous, hygrophanous



Pl. 17. – *Cortinarius cucumeris* (PDD 27261, holotype): 1. basidiomes. – 2. spores. – 3. cheilocystidia.

but margin not striate, dry specimens with wrinkled surface. – Lamellae (10–24, –15) crowded, adnexed to adnate then broadly adnate-emarginate, –8 mm wide; at first lilac soon changing to argillaceous then pale rust brown, crenulate to fimbriate edges lilac but concolorous in old basidiomes. – Stipe –90 × –8 mm, cylindric, rarely also gradually attenuated towards apex; at first lilac soon fading to white, pale ochre-brown at base of stipe; apically dry, with thick, glutinous coat extending from often submembranaceous, striate, ring-like zone to base, cortina rudimentary or absent; solid

becoming fistulose, single (or cespitose). – Context dark brown in pileus, lilac in upper portion of stipe, whitish then pale ochre in base of stipe. – Odour very strong and unpleasant like raw cucumber (but also fishy in decomposing basidiomes). – Taste similar to odour. – Chemical reaction on pileus: KOH – negative or pale yellow-brown.

Spore print rust brown. – Spores  $9.5\text{--}12 \times 5.5\text{--}6\ \mu\text{m}$ , elliptical, often with distinctive supraapical depression (then guttiform to subamygdaliform), verrucose, warts often coarser towards apex, sometimes with rudimentary perispore, rust brown. – Basidia  $25\text{--}45 \times 6\text{--}10\ \mu\text{m}$ , 4-spored. – Cheilocystidia  $15\text{--}45 \times 10\text{--}22\ \mu\text{m}$ , vesiculose, with lilac (KOH), plasmatic pigment. – Pleurocystidia none. – Epicutis of strongly gelatinised, cylindric hyphae ( $2\text{--}4\ \mu\text{m}$  diam.). – Pileipellis composed of short-cylindric to ovoid cells ( $8\text{--}15\ \mu\text{m}$  diam.), with lilac or yellow-brown encrusting pigment, oleiferous hyphae rare. – Clamp connections present.

Habitat. – On soil under *Nothofagus* spp. (*N. fusca*, *N. menziesii*). December–June.

Distribution. – New Zealand.

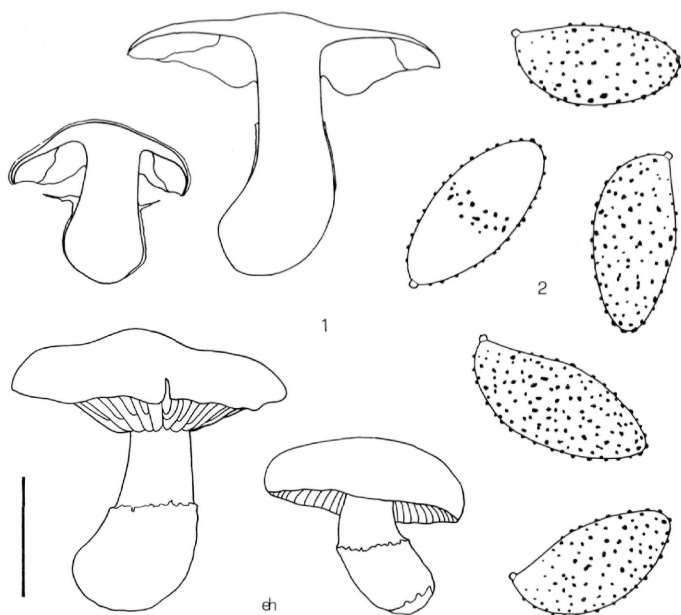
Material examined. – NEW ZEALAND: South Island: Westland: Ngahere, Ahaura, Granite Creek, under *N.f.*, 16 xii 1967, leg. HORAK (ZT 67/264). Nelson: Tophouse Saddle, under *N.f.* and *N.m.*, 5 v 1969, leg. HORAK (ZT 69/298). North Island: Gisborne: Urewera National Park: Lake Waikareiti, under *N.m.*, *Ixerba* and *Coprosma*, 13 v 1975, leg. TAYLOR (981); trail to Lake Waikareiti, under *N.f.*, *N.m.*, *Fuchsia* and *Dicksonia*, 25 vi 1968, leg. HORAK (PDD 27261, holotype; ZT 68/603, isotype); Ngamoko Track, under *N.f.* and *N.m.*, 22 v 1981, leg. HORAK, ZT 638.

Among all more or less lilac coloured representatives of *Myxarium* hitherto recorded from New Zealand this species is immediately recognized by its strong odour of raw cucumber. In addition *C. cucumeris* is macroscopically well characterized by the persistent conic papilla both in young and old specimens.

18. ***Cortinarius (Myxarium) marmoratus*** HORAK, sp.nov. – Pl. 18, figs. 1–2.

Pileus –50 mm latus, griseobrunneus vel pallide rufobrunneus, viscidus, haud vel indistincte striatus. Lamellae primo lilacinae dein argillaceoferrugineae. Stipes –  $50 \times 16\ \text{mm}$ , clavatus, albus, glutinosus. Sapor mitis. Sporae  $13\text{--}16 \times 6.5\text{--}7\ \mu\text{m}$ , amygdaliformes, minute verrucosae. Ad terram sub *Nothofago Leptospermoque*. Nova Zelandia. Typus PDD 27262.

Pileus –50 mm diam., hemispheric with incurved margin then convex to expanded with low umbo; grey-brown to very pale reddish brown, centre gradually turning pale ochre, conspicuously marbled



Pl. 18. – *Cortinarius marmoratus* (PDD 27262, holotype): 1. basidiomes. – 2. spores.

from irregular,  $\pm$  radially arranged, darker (opaque) streaks and spots; glutinous, fibrillose in dry conditions, margin non-striate. – Lamellae rather distant, broadly adnate or emarginate with short decurrent tooth, ventricose, –10 mm wide; at first brilliant lilac soon changing to argillaceous with lilac tinge, pale rust brown in old specimens, entire edges concolorous. – Stipe –50  $\times$  –16 mm, gradually swollen downwards, clavate base not marginate; white; fibrillose at dry apex, glutinous below the ill-defined, white, fibrillose cortina; solid, single and cespitose. – Context pale brown beneath pileipellis, whitish in stipe. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print pale rust brown. – Spores 13–16  $\times$  6.5–7  $\mu$ m, elongate amygdaliform, minutely verrucose, perispore inconspicuous, pale rust brown. – Basidia 35–40  $\times$  8–11  $\mu$ m, 4-spored. – Cheilocystidia and pleurocystidia absent. – Epicutis and Pileipellis composed of strongly gelatinised, cylindric hyphae (2–4  $\mu$ m

diam.), membranes finely encrusted with pale brown pigment, oleiferous hyphae none. — Clamp connections present.

Habitat. — On soil under both *Nothofagus* (*N. solandri* var. *cliffortioides*) and *Leptospermum* (*L. scoparium*). May.

Distribution. — New Zealand.

Material examined. — NEW ZEALAND: South Island: Nelson: Lake Rotoiti, trail to Mt Robert, under *N.s.-cl.* and *L.s.*, 3 v 1968, leg. HORAK (PDD 27262, holotype; ZT 68/362, isotype).

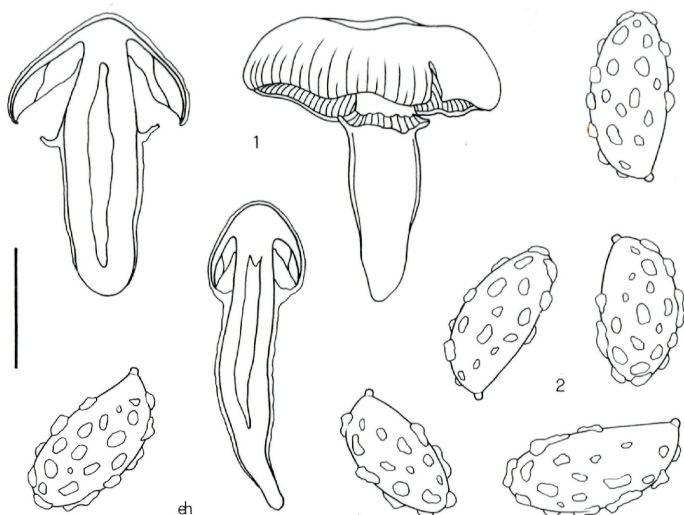
Since *C. marmoratus* has been recorded in New Zealand only once, further collections are needed before the full range of its morphologic and colour variation can be fully described. Nevertheless this taxon is characterized by several, unique macroscopic (colour and structure of pileipellis; brilliant lilac lamellae in young and fresh basidiomes) and microscopic characters (exceptionally large, minutely warted spores) so that it is herewith described as new. According to our knowledge of the *Myxacium*-flora in the southern hemisphere *C. marmoratus* has no apparent relatives and takes a rather isolated systematic position within this subgenus of *Cortinarius*.

The type collection of the present species was made in a mixed forest dominated by *Nothofagus* and *Leptospermum*. Due to the lack of additional records the ecology of *C. marmoratus* also remains doubtful for the time being since both host-trees can be expected to be its possible ectomycorrhizal partners.

19. ***Cortinarius (Myxacium) pituitosus*** HORAK, sp.nov. — Pl. 19, figs. 1–2.

Pileus –60 mm latus, fuscus dein ochraceobrunneus, glutinosus, striatus. Lamellae lilacinae dein argillaceoferrugineae. Stipes –65 –13 mm, cylindricus vel attenuatus basim versus, albus, glutinosus. Sapor mitis. Sporae 11.5–15 × 6–7 µm, amgdaliformes, grosse verrucosae. Ad terram sub Castanopside. Nova Guinea. Typus ZT 71/153.

Pileus –60 mm diam., at first hemispheric or conico-convex with incurved margin then convex-campanulate or umbonate-expanded, sometimes becoming depressed at centre; fuscous to dark date brown, with age gradually fading to ochre-brown or argillaceous; glutinous, margin strongly striate, hygrophalous, surface wrinkled in dried up specimens. — Lamellae (20–36, –7) adnexed to broadly adnate, rarely emarginate, –5 mm wide; at first lilac soon changing to argillaceous, finally rust brown, crenulate or fimbriate edges lilac or white. — Stipe –65 × –13 mm (at apex), cylindric or gradually tapering to fusoid-rooting; white; fibrillose



Pl. 19. – *Cortinarius pituitosus* (ZT 71/153, holotype): 1. basidiomes. – 2. spores.

apex dry, any fibrillose cortina remnants absent, glutinous coat ending above with submembranaceous, striate,  $\pm$  persistent ring-like zone; solid when young becoming hollow, single. – Context brown beneath pileipellis, otherwise white. – Odour indistinct. – Taste mild. – Chemical reactions on pileus: KOH – negative.

Spore print rust brown. – Spores  $11.5\text{--}15 \times 6\text{--}7 \mu\text{m}$ , elongate amygdaliform, covered with rather few but very coarse warts occasionally embedded in perispore, pale rust brown. – Basidia  $40\text{--}55 \times 8\text{--}12 \mu\text{m}$ , 4-spored. – Cheilocystidia and pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae ( $2\text{--}4 \mu\text{m}$  diam.), encrusted with brown pigment. – Pileipellis composed of cylindric to ovoid cells ( $6\text{--}218 \mu\text{m}$  diam.), oleiferous hyphae conspicuous due to brown (KOH), plasmatic pigment. – Clamp connections present.

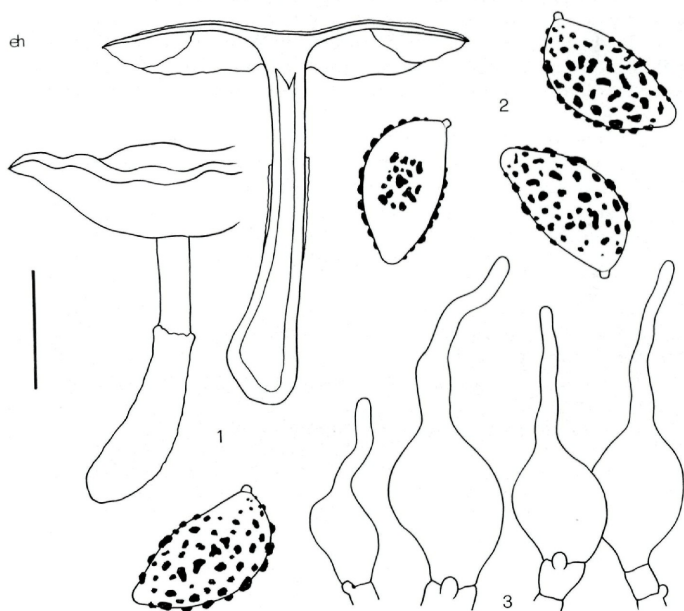
Habitat. – On soil under *Castanopsis acuminatissima* (pure stand) in montane forest. October–November.

Distribution. – New Guinea.

Material examined. – PAPUA NEW GUINEA: Morobe distr., Bulolo, Manki, about 1450 m, under *C.a.*, 19  $\times$  1971, leg. HORAK (ZT 71/153, holotype); same locality and association, 3 xi 1971, leg. HORAK (ZT 71/238).

The description of *C. pituitosus* is based upon two records with perfect specimens made at the same locality in New Guinea. On the basidiomes of both collections the margin of the hygrophanous pileus was distinctly striate and therefore this taxon takes an intermediate systematic position between *Myxarium* and *Paramyxarium*. The main reason to allocate it in subgen. *Myxarium* are the comparatively robust basidiomes.

According to the ecological situation at the collecting site this species obviously enters ectomycorrhiza with the Fagalean *Castanopsis*. This broad-leaved tree is wide-spread not only in the highlands of New Guinea but occurs also in Indo-Malaya and southern China while Japan is the northern border of its large area of distribution. For that reason it can be assumed that *C. pituitosus* will eventually also be detected in SE-Asian *Castanopsis* forests north of the equator.



Pl. 20. — *Cortinarius neocaledonicus* (ZT 77/156, holotype): 1. basidiomes. — 2. spores. — 3. cheilocystidia.

20. *Cortinarius (Myxadium) neocaledonicus* HORAK, sp.nov. – Pl. 20, figs. 1–3.

Pileus –65 mm latus, castaneus vel hepaticus, glutinosus. Lamellae azureoilacinae dein ferrugineae. Stipes –65 × –12 mm, cylindricus vel subclavatus, caeruleus ad apicem, albus vel pallide ochraceobrunneus basim versus, glutinosus. Sapor mitis. Sporae 11.5–14 × 6.5–7.5 µm, sublimoniformes, conspicue verrucosae. Ad terram sub Nothofago. Nova Caledonia. Typus ZT 77/156.

Pileus –65 mm diam., at first convex with incurved margin then expanded with depressed centre; dark red-brown, liver brown, but paler or reddish brown towards non-striate margin; glutinous, non hygrophanous, becoming radially wrinkled in dry specimens. – Lamellae crowded, emarginate and subdecurent with short tooth, ventricose, –8 mm wide; at first blue-lilac gradually changing to rust brown, fimbriate edges remaining blue. – Stipe –65 × –12 mm, cylindric or slender clavate (but base not bulbous) and gradually attenuated above; apex pale blue-lilac in young and fresh material, soon bleaching out to whitish or pale ochre-brown; glutinous, any fibrillose remnants of cortina absent; hollow, single. – Context pale lilac in upper part of stipe, otherwise whitish. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print rust brown. – Spores 11.5–14 × 6.5–7.5 µm, sublimoniform, with distinct mure, very coarsely verrucose, perispore inconspicuous, rust brown. – Basidia 20–30 × 7–8 µm, 4-spored. – Cheilocystidia 30–60 × 10–20, broadly fusoid with long cylindric or slightly tapering neck, with blue (KOH), plasmatic pigment. – Pleurocystidia absent. – Epicutis of strongly gelatinised hyphae (2–4 µm diam.). – Pileipellis composed of cylindric to ovoid cells (6–20 µm diam.), localisation of pigment unknown, with red-brown (KOH), oleiferous hyphae. – Clamp connections present.

Habitat. – On soil under *Nothofagus* spp. in montane rain forest. February.

Distribution. – New Caledonia.

Material examined. – NEW CALEDONIA: N of Paita, Mt. Mou, under *Nothofagus* spp., 1350 m, 22 ii 1977, leg. HORAK (ZT 77/156, holotype).

Material of compared species. – ARGENTINA: Tierra del Fuego, Ushuaia, Valle Gl. Martial, under *Nothofagus pumilio*, 2 iii 1963, leg. HORAK TF 40 (IB, holotype of *C. (Myx.) fuligineoviolaceus* HORAK).

Due to the conspicuous, fusoid cheilocystidia *C. neocaledonicus* is an outstanding species of subgen. *Myxadium*. Taking all its characters into account it seems to be closely related to *C. fuligineoviolaceus* HORAK ap. MOSER & HORAK (1975: 233; HORAK 1979: 412) which in

Tierra del Fuego (Argentina) has been collected under *Nothofagus pumilio-antarctica* several times near timber-line.

The New Caledonian species is unequivocally separated from the Fuegian taxon by the following characters: red-brown pileus, clavate stipe, and distinctly sublimoniform spores. To present knowledge *C. neocaledonicus* is only the second representative in *Myxaciium* stirps Fuligineoviolaceus which in the southern hemisphere is restricted to subantarctic *Nothofagus* forests.

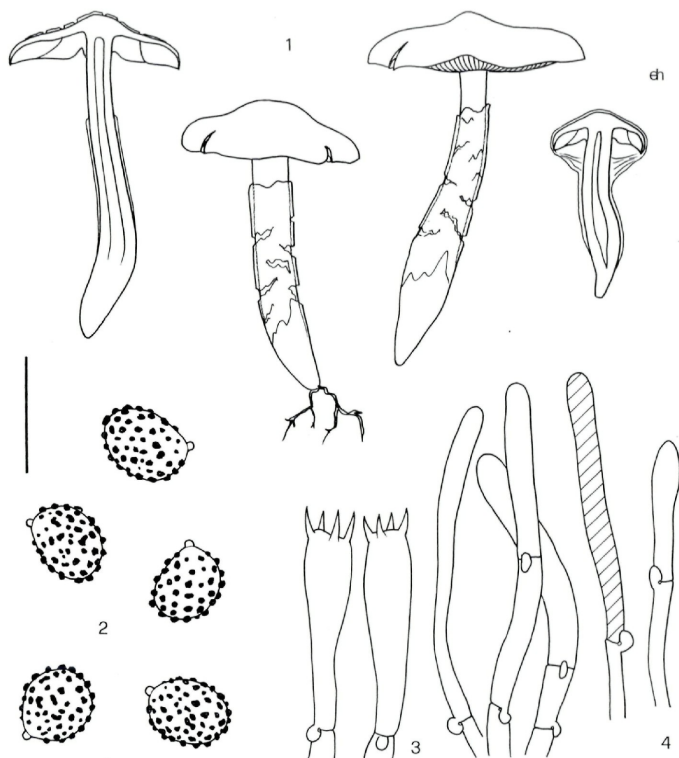
Macroscopically it resembles also *C. porphyrophaeus* (see below). This New Zealand taxon, associated with a myrtaceous host-plant, is clearly distinguished by its subglobose spores and cheilocystidia of different shape.

21. ***Cortinarius (Myxaciium) porphyrophaeus*** HORAK, sp.nov. – Pl. 21, figs. 1–4.

Pileus –40 mm latus, hepaticus vel porphyreus, glutinosus. Lamellae primo lilacinopurpureae dein brunneae ferrugineo tinctu. Stipes –60 × –8 mm, fusoides vel attenuatocylindricus, apicaliter lilacinus, basim versus albidus glutine brunneo instructus. Sapor mitis. Sporae 6–7 × 5–6 µm, subglobosae, grosse verrucosae. Ad terram sub Leptospermo. Nova Zelandia. Typus PDD 27263.

Pileus –40 mm diam., hemispheric or convex with inrolled margin then broadly umbonate or campanulate finally umbonate-expanded; red-brown, liver brown or dark porphyry brown in young and old specimens, at first non-striate margin with lilac tinges; glutinous, upon drying jelly coat breaking up into small squamules. – Lamellae (16–24, –5) emarginate and subdecurrent with short tooth, –4 mm wide; at first lilac-purple turning chocolate brown with rust brown tinge, fimbriate edges lilac. – Stipe –60 × –8 mm, slender fusoid or cylindric with tapering base; apex lilac, towards base at first whitish but soon changing to brown, gluten at first transparent but often changing to chocolate brown; dry and silvery-fibrillose at apex above cortina, below glutinous, sheath breaking up into glutinous belts and circular zones girdling the stipe; hollow already in young basidiomes, single. – Context brownish beneath pileipellis, pale lilac in upper portion of stipe, brown towards base of stipe. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print rust brown. – Spores 6–7 × 5–6 µm, subglobose, coarsely verrucose, perispore inconspicuous, rust brown. – Basidia 30–35 × 7–8 µm, 4-spored. – Cheilocystidia 20–50 × 4–7 µm, cylindric to subclavate, scattered on edge, with pale brown (KOH), plasmatic pigment. – Pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (2–5 µm diam.). – Pileipellis composed of cylindric cells (6–18 µm diam.), with both



Pl. 21. — *Cortinarius porphyrophaeus* (PDD 27263, holotype): 1. basidiomes. — 2. spores. — 3. basidia, — 4. cheilocystidia.

plasmatic and encrusting, brown (KOH) pigment, oleiferous hyphae not observed. — Clamp connections present.

Habitat. — On soil under *Leptospermum* spp. (*L. scoparium*, *L. ericoides*). — June.

Distribution. — New Zealand.

Material examined. — NEW ZEALAND: North Auckland, Hauraki Gulf, Little Barrier Island, Tirikawa Stream, under *L.s.* and *L.e.*, 14 vi 1981, leg. HORAK (PDD 27263, holotype; ZT 942, isotype).

The subglobose, coarsely verrucose spores and the cylindric cheilocystidia indicate that taxonomically *C. porphyrophaeus*

belongs to the species complex around *C. salor*. It differs, however, from typical representatives in this section by the red-brown colours both on pileus and stipe whereas lilac tints are restricted to the lamellae and the upper portion of the stipe.

Another distinctive character of *C. porphyrophaeus* is its occurrence in a pure stand of *Leptospermum* (Myrtaceae) which accordingly must be considered the ectomycorrhizal partner of this unique taxon.

## E. Key to species of group E

(basidiomes with white-yellow, ochre-yellow or bright yellow-orange pileus; lamellae more or less yellow to mustard yellow)

1. Pileus –60 mm diam., at first white turning yellowish; stipe –60 × –12 mm, equal to subclavate, white (occasionally with lilac tinge); odour of “curry powder”; spores 8.5–10.5 × 5–5.5 µm, ovoid (to subamygdaliform), minutely verrucose; KOH-reaction ?; under *Eucalyptus* spp., Australia ..... 22. *C. (Myx.) austroalbidus*
- 1\*. Pileus ochre-brown to bright ochre-yellow or orange-yellow ... 2
  2. Pileus –85 mm, ochre-brown; spores 12.5–15 × 7–8 µm, amygdaliform, minutely verrucose; stipe –75 × –17 mm, cylindric, equal, whitish; KOH-reaction ?; under *Eucalyptus* spp., Australia ..... 23. *C. (Myx.) subarvinaceus*
  - 2\*. Pileus (lamellae and stipe) bright ochre-yellow, mustard yellow or orange-yellow, umbo often darker, stipe ± fusoid; spores ovoid, smaller, verrucose; odour strong ranging from unpleasant to sweet-fragrant; KOH-reaction red(brown) ... 3
3. Spores 6–7.5 × 4–4.5 µm; pileus –50 mm diam.; stipe –60 × –10 mm; under *Leptospermum* spp., New Zealand ..... 24. *C. (Myx.) ignotus*
- 3\*. Spores 7.5–10 × 5–5.5 µm; pileus –75 mm diam.; stipe –80 × –15 mm; under *Eucalyptus* spp., Australia ..... 25. *C. (Myx.) sinapicolor*

22. *Cortinarius (Myxacium) austroalbidus* CLELAND & HARRIS. – Rec. S. Austr. Mus. 9:54. 1948. – Pl. 12, figs. 3 a-b.

SYN.: *Cort. (Myx.) albidus* CLELAND. – Trans. R. Soc. S. Austr. 57: 191 1933. – (syn.post.), non *Cort. (Phl.) albidus* PECK. – 44th Rep.N.Y.Stat.Mus., 20. 1891.

Illustration. – FUHRER (1985: 29, as “*C. albidus*”).

Macroscopic description in CLELAND (1933); for later additions cf. CLELAND & HARRIS (1948).

Spores  $8.5\text{--}10.5 \times 5\text{--}5.5 \mu\text{m}$ , ovoid to subamygdaliform, minutely verrucose, warts coarser at apex, perispore inconspicuous, rust brown. – Basidia  $25\text{--}30 \times 8\text{--}9 \mu\text{m}$ , 4-spored. – Cheilocystidia not observed.

Habitat. – On soil under *Eucalyptus* spp.; common in mountain forests (cf. FUHRER 1985). June.

Distribution. – Australia.

Material examined. – AUSTRALIA: South Australia, Mt Lofty, National Park, vi 1932, leg. CLELAND (ADW 16133, holotype of *C. albidus* CLEL.).

All knowledge about this enigmatic species is based solely on the type collection. FUHRER (1985) published a fine photograph under the epithet “*albidus*”, but unfortunately the cursory description lacks any details relating to distinctive microscopic and macroscopic characters. Judged from this illustration *C. austroalbidus* could well belong to the species complex of *C. cygneus* and *C. cretaceus* (HORÁK) both reported from subantarctic *Nothofagus* forest in New Zealand or South America respectively.

According to CLELAND the basidiomes of “*C. albidus*” are reported to have the smell of “curry powder” (cf. also FUHRER, 1985). This particular smell could indicate that the present taxon systematically is allied to *C. ignotus* and *C. sinapicolor* (see below) which are characterized by a strong odour ranging from unpleasant to sickly sweet.

23. *Cortinarius (Myxacium) subarvinaceus* CLELAND. – Trans. R. Soc. S. Austr. 51: 304. 1927. – Pl. 12, fig. 2.

Original description in CLELAND (1927: 304): “Pileus and stem viscid. Pileus 4.6–8.7 cm in diameter, convex, sometimes repand, finally irregularly upturned, edge a little turned in, sometimes substriate, round at edge, very viscid, Ochraceous Tawny (xv) becoming much darker and shining in the centre. Gills adnate to subsinuate, moderately close, slightly ventricose, pallid greyish – cinnamon then Tawny Olive (xxix) and darker. Stem 3.7–7.5 cm high, stout, up to 17 mm thick, equal, mealy fibrillose, base viscid, pallid whitish becoming brownish. Flesh slightly brownish, when old becoming semitranslucent, thick over the disk, thin externally, cuticle thick and dark brown. Spores oblique with pointed ends, spore mass near Tawny Olive,  $13\text{--}15 \times 7.5 \mu\text{m}$ . Under trees. SA. – Stirling West, July 1927”.

Microscopic data observed on type collection:

Spores  $12.5\text{--}15 \times 7\text{--}8 \mu\text{m}$ , amygdaliform to sublimoniform with distinct mucro, minutely but densely warted, perispore incon-

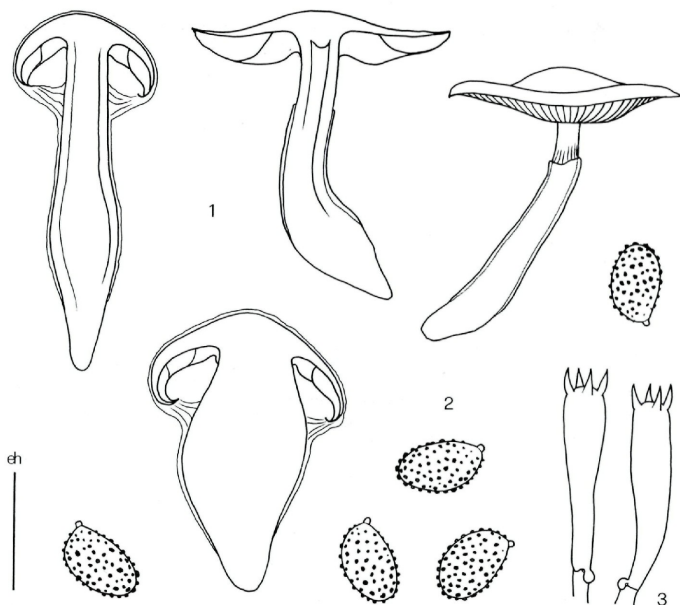
spicuous, plage none, rust brown. — Basidia 30–40 × 10 µm, 4-spored. — Cheilocystidia not observed.

Habitat. — On soil under *Eucalyptus* spp. July.

Distribution. — Australia.

Material examined. — AUSTRALIA: South Australia: Stirling West, 23 vii 1927, leg. CLELAND (IB, ex herb. CLELAND, holotype). — A second collection made by CLELAND at the same locality (23 vii 1927, ADW 16160) represents another taxon since its spores are smaller and bear much coarser warts than recorded in the type material.

Additional material from the type locality is needed to establish the systematic position of *C. subarvinaceus*. Following CLELAND's description the basidiomes of this macroscopically little distinctive species are uniformly pale brown with some ochre tints over the centre of the pileus. The size, the shape and the ornamentation of the spores, however, are characteristic and that feature distinguishes *C. subarvinaceus* from all other hitherto described, Australasian representatives of *Myxaciium*.



Pl. 22. — *Cortinarius ignotus* (PDD 27264, holotype): 1. basidiomes. — 2. spores. — 3. basidia.

24. *Cortinarius (Myxaciium) ignotus* HORAK, sp.nov. – Pl. 22, figs. 1–3.

Pileus –50 mm latus, ochraceoluteus vel aureobrunneus, glutinosus. Lamellae sinapicoles dein ochraceoferrugineae. Stipes –60 × –10 mm, fusioideus, luteus vel aureus, glutinosus. Odor ingratus vel nauseosus. Sapor mitis. Sporae 6–7.5 × 4–4.5 µm, ovoideae, verrucosae. Ad terram sub *Leptospermum*. Nova Zelandia. Typus PDD 27264.

Pileus –50 mm diam., at first hemispheric or conic with incurved or even inrolled margin then broadly umbonate-convex or umbonate-expanded; pale yellow-ochre to golden brown, centre honey brown or date brown; (very) glutinous, not hygrophanous, margin non-striate, innately fibrillose in dry conditions. – Lamellae (22–30, –15) crowded, emarginate and subdecurrent with short tooth, –6 mm wide; at first mustard yellow, ochre-yellow slowly turning rust ochre-brown, entire to crenulate edges concolorous. – Stipe –60 × –10 mm, fusoid, rarely cylindric with swollen base; yellow, ochre or golden yellow (especially under the gluten in lower portion of stipe); fibrillose apex dry, below rudimentary cortina with thick coat of gluten, occasionally with yellow rhizoids; solid becoming hollow, single. – Context yellow especially beneath pileipellis and in cortex of stipe. – Odour strongly unpleasant-pungent, or sweet (like dust). – Taste mild. – Chemical reaction: KOH on pileus and on context brown.(without distinct red components).

Spore print rust brown. – Spores 6–7.5 × 4–4.5 µm, ovoid, verrucose, perispore inconspicuous, rust brown. – Basidia 25–35 × 6–7 µm, 4-spored. – Cheilocystidia and pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (2–4 µm diam.), encrusted with red-brown to wine red (KOH) pigment. – Pileipellis composed of cylindric cells (6–12 µm diam.), oleiferous hyphae absent. – Clamp connections present.

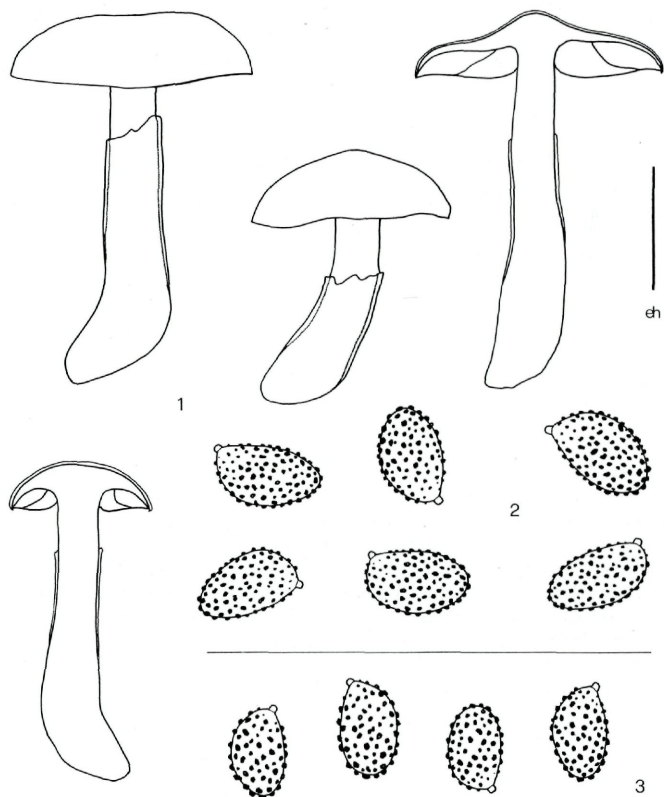
Habitat. – On soil among litter of *Leptospermum* spp. (*L. scoparium*, *L. ericoides*). June.

Distribution. – New Zealand.

Material examined. – NEW ZEALAND: North Island: North Auckland: Warkworth, The Dome, under *Leptospermum* sp., 5 vi 1981, leg. HORAK (ZT 887); Hauraki Gulf, Little Barrier Island, Tirikawa Stream, under *Leptospermum* sp., 14 vi 1981, leg. HORAK (PDD 27264, holotype; ZT 945, isotype).

Taking the ecological data into account this striking taxon is obviously an ectomycorrhizal symbiont of *Leptospermum*, a genus represented in New Zealand with two, wide-spread species. Macroscopically *C. ignotus* can not be separated from *C. sinapicolor*, its closest relative in Australia, which is also associated with myrtaceous trees. Both agarics share not only basidiomes of the same, general shape and similar colours but also the very distinctive yet unpleasant smell.

The yellow pigments of *C. ignotus* (and *C. sinapicolor*) have not yet been examined. Their brown (or red-brown) KOH-reaction, however, indicate that these two species may contain substances of anthraquinonic structures (GILL & STEGLICH, 1987) which are (exclusively) reported from numerous, circumantarctic taxa belonging to both *Cortinarius* s.l. and *Dermocybe* (Fr.) (MOSER & HORAK, 1975; KELLER & al., 1988). If this assumption proves to be correct then these two species take an intermediate, taxonomic position with systematic ties to several subgenera of *Cortinarius*.



Pl. 23. – *Cortinarius sinapicolor* (ADW 16154, holotype): 1. spores. – (ZT 2751, New Zealand). – 2. basidiomes. – 3. spores.

25. *Cortinarius (Myxaciium) sinapicolor* CLELAND. – Trans. R. Soc. S. Austr. 57: 191. 1933. – Pl. 23, figs. 1–3.

SYN.: ? *Cort. (Myx.) vibratilis* FR. SS. CLELAND. – Trans. R. Soc. S. Austr. 42: 97. 1918.

*Cort. (Myx.) ochraceus* CLELAND (p.p. 1927, 1928) SS. CLELAND (1934), SS. WILLIS (1963: 32), SS. COLE & al. (1984: pl.2), SS. FUHRER (1985: 34).

Illustrations. – CLELAND (1934: 110, as “*C. ochraceus*?”); COLE & al. (1984: pl.2, as “*C. ochraceus*”); FUHRER (1985: 34, as “*C. ochraceus*”).

Pileus –75 mm diam., at first hemispheric to convex with inrolled or incurved margin then broadly campanulate or umbonate-expanded; yellow, yellow-orange, ochre or mustard yellow (cf. epithet), darker or honey brown to date brown at centre; (very) glutinous, not hygrophanous, margin non-striate (or vaguely only). – Lamellae (15–35, –7) crowded, broadly adnate to emarginate and subdecurrent with short tooth, –7 mm wide; at first bright yellow to mustard yellow gradually changing to rust brown-ochre, entire or subserrate edges concolorous. – Stipe –80 × –15(–20) mm, fusoid or cylindric with inflated base; in lower portion (under gluten) concolorous with pileus, paler at dry apex; glutinous below rudimentary cortina, occasionally with yellow-orange rhizomorphs at base; solid becoming hollow, single and cespitose. – Context bright yellow to orange-yellow fading with age, yellow-brown in base of stipe. – Odour unpleasant-pungent, or sweet-fragrant (like dust). – Taste mild. – Chemical reaction on pileus (on context): KOH – red to red(-brown).

Spore print rust brown. – Spores 7.5–10 × 5–5.5 µm, ovoid, often with distinctive supraapical depression, verrucose, perispore inconspicuous, rust brown. – Basidia 20–35 × 5–7 µm, 4-spored. – Cheilocystidia and pleurocystidia none. – Epicutis of strongly gelatinised, cylindric hyphae (2–5 µm diam.), conspicuously encrusted with wine red to red-brown (KOH) pigment. – Pileipellis composed of short-cylindric cells (5–12 µm diam.) with encrusting pigment, oleiferous hyphae absent. – Clamp connections present.

Habitat. – On soil under *Eucalyptus* spp. (in WA: *E. marginata*, *E. calophylla*), rarely also under *Casuarina* sp. May–August.

Distribution. – Australia.

Material examined. – AUSTRALIA: South Australia: Mt Lofty, National Park, 20 vi 1931, leg. CLELAND (ADW 16154, holotype); same locality, 9 vii 1927, leg. CLELAND (ADW 16147, as “*Cort. ochraceus*” CLEL.). New South Wales: Oatley, 16 vi 1980, leg. WOOD (UNSW 80/223); same locality, 24 vii 1982, leg. WOOD (UNSW 82/434).

Windsor, Howes Valley, Tari Ck, 22 vi 1982, leg. WOOD (UNSW 82/373); same locality, 30 v 1985, leg. WOOD & TAEKER (UNSW 85/520). Sydney, Royal National Park, Marley Track, 26 v 1983, leg. WOOD (UNSW 83/817). Sydney, Cowan Field Station, 25 v 1985, leg. VAUGHAN in WOOD (UNSW 85/475). Western Australia: Armadale, Gleneagle, Bee Farm Rd., 1 vii 1981, leg. HILTON in HORAK (ZT 1154); same locality, under *Eucalyptus-Casuarina*, 2 viii 1981, leg. HORAK (1173). Cobiac, Jarrahdale, under *E.c.* and *E.m.*, 25 vi 1985, leg. HORAK (ZT 2751).

Material of compared species. — ARGENTINA: Neuquén, Lago Frias, under *Nothofagus dombeyi*, 8 iv 1963, leg. MOSER (IB 63/314, holotype of *C. pyromyxa* MOSER & HORAK); further collections in ZT (75/361, 334, 415).

The rather long list of records given above emphasizes that in Australia *C. sinapicolor* is widely distributed under *Eucalyptus* spp. ecologically ranging from dry, sclerophyll woods to more moist forests. It can be safely assumed that this agaric enters ectomycorrhiza with numerous eucalypts occurring from sea level to the timberline in southern New South Wales and Tasmania.

The specific name given by CLELAND adequately relates to the bright mustard yellow coloured basidiomes of *C. sinapicolor* which recently has been erroneously identified (but well illustrated) by COLE & al. (1984) and FUHRER (1985) as "*C. ochraceus*". The colours on the less glutinous carpophores of the latter taxon (considered to belong to subgen. *Paramyxacium*), however, are much paler (and probably lack the significant red(-brown) KOH-reaction known for *C. sinapicolor*) and the more slender spores are only covered with comparatively minute warts.

Apart from its conspicuous colours *C. sinapicolor* is also readily recognized in the field by the peculiar odour of the fresh basidiomes. Surprisingly in all descriptions dealing with this agaric CLELAND never mentioned this strong odour which even gets more unpleasant upon drying. The nauseous smell, however, was first recognized by WILLIS (1963: 32: as "rather strong pepper-like"), and later described again by FUHRER (1985: 34: as "mild curry-like").

Exsiccata of *C. sinapicolor* are readily recognized as the yellow-ochre colours, conspicuous on the fresh specimens, have changed (especially at the pileus' centre) to red-brown or chestnut brown. In addition the base of the stipe often shows pale cinnabar red remnants of the universal veil remnants.

In the first contribution towards the agaric flora of South Australia and New South Wales CLELAND & CHEEL (1918) refer to *C. (Myx.) vibratilis* Fr. This European taxon, however, has been omitted in all subsequently published lists on Australian fungi. Although no authentic material has been examined it is suggested that these records actually represent additional collections of *C. sinapicolor*. Our opinion is supported by the fact that i) CLELAND gathered the South Australian specimens at Mt Lofty (type locality of *C. sinapicolor*; cf. also ADW 16147, which probably refers to *C. ochraceus*

CLELAND (1928: 219) and ii) the microscopic data given for the spores in shape and size match those of typical *C. sinapicolor*.

In the present taxonomic concept *C. (Myx.) ochraceus* CLEL. (1927) is separated from *C. sinapicolor* mainly because of its much less intensive yellow colours in all parts of the basidiomes, the lack of a positive KOH-reaction (both on pileus and context) and the minutely warted spores. In addition on fresh specimens collected recently in New South Wales by one of us (A.W.) the rather thin fleshed pilei are conspicuously striate towards the margin and for that reason there is even more evidence that *C. ochraceus* s.str. must be excluded from subgen. *Myxaciium* and accordingly is transferred to subgen. *Paramyxaciium*.

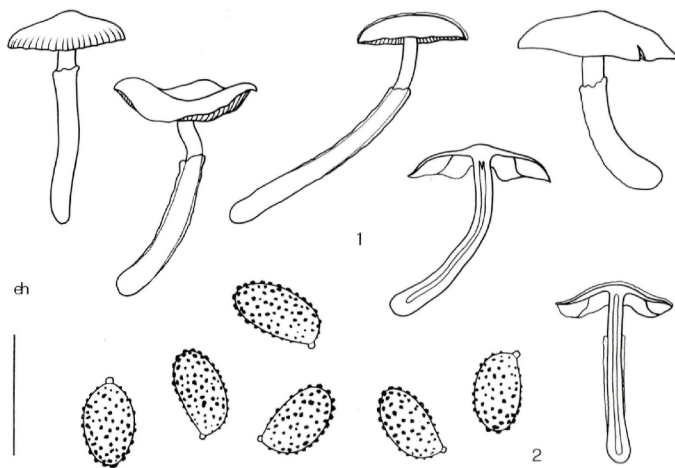
After having seen numerous collections of *C. sinapicolor* and several new records of *C. pyromyxa* (MOSER & HORAK, 1975) we propose that the Australian taxon has to be taken out from subgen. *Myxaciium* sect. *Pyromyxa*. Although the spores of both taxa are similar in size, shape and ornamentation, some leading characters (especially KOH-reaction, presence of brilliant yellow to orange, plasmatic pigment in *C. pyromyxa*) strongly indicate that *C. sinapicolor* can not be closely related to *C. pyromyxa*. Future pigment analysis might eventually support our suspicion that *C. sinapicolor* actually has systematic affinities rather to *Dermocybe* subgen. *Icterinula* than to *Cortinarius* subgen. *Myxaciium*, where presently it is keyed out by MOSER & HORAK (1975: 227).

## II. Key to Australasian species of *Cortinarius* subgen. *Paramyxaciium*

1. Pileus, lamellae and stipe olive (or olive brown); pileus -35 mm diam.; stipe -40 × -5 mm, cylindric (to subclavate); spores 6.5-7.5 × 4-4.5 µm, ovoid; KOH-reaction - brown; under *Leptospermum*, New Zealand ..... 26. *C. (Paramyx.) phaeochlorus*
- 1\*. Pileus, lamellae and stipe of different colours ..... 2
2. Lamellae (and context of stipe) at first lilac; pileus -15 mm, date brown; stipe -35 × -2.5 mm, cylindric, pale yellow-brown; spores 12.5-14.5 × 5.5-6.5 µm, slender amygdaliform; cheilocystidia (with lilac, plasmatic pigment) present; under *Nothofagus*, New Caledonia ..... 27. *C. (Paramyx.) necessarius*
- 2\*. Lamellae and context of stipe not lilac (cf. also 29. *C. melimyxa*) ..... 3
3. Pileus bright yellow-ochre-orange, fulvous (often with ferruginous tinge) or golden brown with date brown centre .... 4

- 3\*. Pileus chestnut brown or pallid, argillaceous to brown (any yellow or ochre tinges absent) ..... 7
4. Stipe equal (to subclavate); whitish to subconcolorous with pileus; odour indistinct; KOH-reaction (reddish) brown; spores  $\pm$  amygdaliform ..... 5
- 4\*. Stipe distinctly fusoid to bulbous with tapering base, at first  $\pm$  white; KOH-reaction none; cheilocystidia absent ..... 6
5. Pileus –50 mm diam., bright yellow-ochre-orange; stipe –50  $\times$  –10 mm; spores 8–9.5  $\times$  4.5–5  $\mu$ m, cheilocystidia absent; under *Eucalyptus*, Australia ..... 35. "*C. (Paramyx.) paraochraceus* var. *australiensis*"
- 5\*. Pileus –20 mm diam., yellow-brown to honey brown; stipe –35  $\times$  –3 mm; spores 7.6–9  $\times$  4–5  $\mu$ m; cheilocystidia present; under *Nothofagus-Leptospermum*, New Zealand ..... 28. *C. (Paramyx.) melimyxa*
6. Pileus –30 mm, yellow-brown to fulvous-orange; stipe –50 mm, –12 mm diam. at bulb; odour unpleasant or weakly of anis seed; spores 8.5–10  $\times$  4.4–5  $\mu$ m, elliptic; under *Nothofagus*, Argentina (type), New Zealand ..... 29. *C. (Paramyx.) melleomitis*
- 6\*. Pileus –18 mm, rust ochre; stipe –65–4 mm, slender fusoid or gradually attenuated towards base; odour indistinct; spores 6–7.5  $\times$  3.5–4  $\mu$ m, ovoid; under *Leptospermum*, New Zealand ..... 30. *C. (Paramyx.) gemmeus*
7. (3\*). Pileus –40 mm diam., dark chestnut brown; stipe –60  $\times$  –10 mm (at bulb), fusoid or gradually attenuated towards base; white; spores 6–7  $\times$  3.5–4.5  $\mu$ m, ovoid; cheilocystidia absent; under *Leptospermum* (and *Nothofagus*), New Zealand ..... 31. *C. (Paramyx.) castaneiceps*
- 7\*. Pileus pallid, argillaceous, caramel or brown (without ochre or red-brown tinges when young); cheilocystidia present or absent ..... 8
8. Pileus –30 mm, margin not conspicuously striate but radially streaked with grey or darker zones, viscid, argillaceous to pale brown; stipe –75 mm, fusoid (bulb –15 mm diam.), white; spores 11.5–13  $\times$  5.5–6.5  $\mu$ m, slender amygdaliform; under *Nothofagus*, New Zealand ..... 32. *C. (Paramyx.) aegrotus*
- 8\*. Pileus with conspicuously striate and translucent, at first pallid (occasionally also whitish) or argillaceous becoming caramel, pale honey brown or date brown (at centre); gills pale argillaceous becoming darker with rust brown tinge .. 9
9. Pileus –55 mm diam., very strongly glutinous; stipe –70  $\times$  –12 mm, subclavate (to cylindric), white, apex gradually turning yellow-brown or brass yellow; spores 10.5–13 (–14)  $\times$  5.5–7  $\mu$ m,

- amygdaliform; cheilocystidia clavate; under *Nothofagus* spp., New Zealand ..... 33. *C. (Paramyx.) vitreopileatus*  
 9\*. Pileus –40 mm diam., viscid; stipe –55 × –7 mm, cylindric (to subclavate), white, unchanging; spores 9.5–12.5 × 5–6 µm, elliptic; cheilocystidia absent; under *Nothofagus* spp., New Zealand ..... 34. *C. (Paramyx.) viscostriatus*



Pl. 24. – *Cortinarius phaeochlorus* (PDD 27265, holotype): 1. basidiomes. – 2. spores..

26. ***Cortinarius (Paramyxium) phaeochlorus*** HORAK, sp.nov. – Pl. 24, figs. 1–2.

Pileus –35 mm, primo olivaceobrunneus dein fuscus, glutinosus, striatus. Lamellae pallide olivaceobrunneae dein tabacinoferugineae. Stipes –40 × –5 mm, cylindricus, primo olivaceus dein ad basim pallide luteus vel brunneus, glutinosus. Sapor mitis. Sporae 6.5–7.5 × 4–4.5 µm, ovoideae, verrucosae. Ad terram sub Lep-  
 tospermo. Nova Zelandia. Typus PDD 27265.

Pileus –35 mm diam., at first plane convex (margin not incurved) or subumbonate-convex becoming expanded with low umbo, centre also depressed in old specimens; dark olive or olive-brown, paler towards striate margin, olive colour changing to dark brown in old basidiomes; glutinous, hygrophanous, innately fibrillose in dry conditions. – Lamellae (10–20, –5) adnate to emarginate and subdecurrent with short tooth, becoming ventricose, –4 mm wide; at

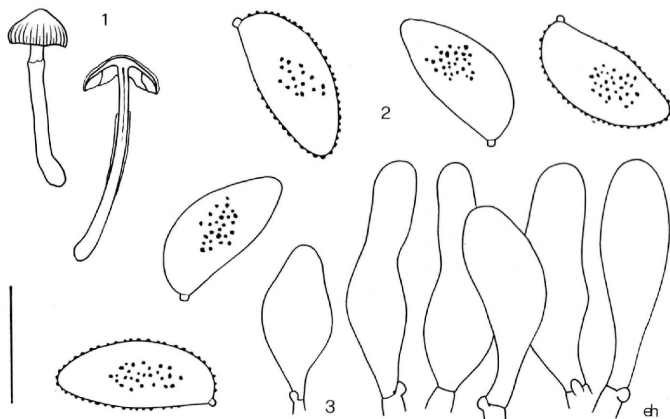
first grey-olive or olive-brown, changing to tobacco brown or dark brown with ferruginous tinge, entire edges concolorous. – Stipe –  $40 \times -5$  mm, cylindric (rarely also subclavate or slightly swollen at base); at first olive then from base turning pale yellow or brown; fibrillose apex dry, below rudimentary cortina strongly glutinous, base occasionally with yellow rhizomorphs; fibrillose beneath gluten, hollow, single to cespitose. – Context brown-olive both under pileipellis and in base of stipe. – Odour indistinct to sub-farinaceous. – Taste mild. – Chemical reaction on pileus: KOH – brown (with weak reddish tinge).

Spore print dark brown with rust brown tinge. – Spores  $6.5-7.5 \times 4-4.5$   $\mu\text{m}$ , ovoid, verrucose, perispore inconspicuous, rust brown. – Basidia  $25-30 \times 6-7$   $\mu\text{m}$ , 4-spored. – Cheilocystidia and pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (2–4  $\mu\text{m}$  diam.). – Pileipellis composed of ovoid to cylindric cells (6–18  $\mu\text{m}$  diam.), membranes encrusted with brown to pale red-brown (KOH) pigment, oleiferous hyphae absent. – Clamp connections present.

Habitat. – On soil under *Leptospermum* (*L. scoparium*, *L. ericoides*). June–July.

Distribution. – New Zealand.

Material examined. – NEW ZEALAND: North Auckland: Waitakere Range, Anawata Road, under *L.s.* and *L.e.*, 7 vi 1981, leg. HORAK (PDD 27265, holotype; ZT 895, isotype); Auckland, Northcote, Kauri Glen, under *L.s.*, 7 vii 1981, leg. HORAK (ZT 1074).



Pl. 25. – *Cortinarius necessarius* (ZT 77/133, holotype): 1. basidiomes. – 2. spores. – 3. cheilocystidia.

Due to the conspicuous, olive colours *C. (Paramyx.) phaeochlorus* recalls two other, related taxa recently described from New Zealand, viz. *Dermocybe olivaceonigra* HORAK and *D. alienata* HORAK (HORAK, 1988). The present species, however, is readily distinguished from both sympatric *Dermocybe* by the striate margin of the pileus, the cylindric stipe, the absence of the raphanoid odour (and taste), the lack of a distinctive red KOH-reaction, the smaller spores and the occurrence in *Leptospermum* forests.

27. ***Cortinarius (Paramyxacium) necessarius*** HORAK, sp.nov. – Pl. 25, figs. 1–3.

Pileus –15 mm latus, brunneus, glutinosus, striatus, Lamellae caeruleoilacinae dein ochraceoferrugineae. Stipes –35 × –2.5 mm, cylindricus, luteobrunneus, glutinosus. Sapor mitis. Sporae 12.5–14.5 × 5.5–6.5 µm, amygdaliformes, minute verrucosae. Ad terram sub Nothofago. Nova Caledonia. Typus ZT 77/133.

Pileus –15 mm diam., at first hemispheric to convex with in curved margin becoming subumbonate-expanded; uniformly dark brown, darker at centre; glutinous, margin conspicuously striate, hygrophanous. – Lamellae (10–12, –3) adnate, subventricose, – 3 mm wide; at first blue-lilac slowly turning ochre with rust brown tinge; subcrenulate edges remaining bluish. – Stipe –35 × – 2.5 mm, equally cylindric, fragile, base occasionally slightly swollen; pale yellow-brown, honey brown, apex paler (? lilac in young basidiomes); glutinous in lower portion, apex dry, cortina rudimentary or absent; fistulose, single. – Context dark brown beneath pileipellis, pale blue-lilac in apex of stipe, pale ochre-brown towards base of stipe. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print rust brown. – Spores 12.5–14.5 × 5.5–6.5 µm, elongate amygdaliform, supraapical depression ± distinct, minutely verrucose, perispore inconspicuous, rust brown. – Basidia 30–35 × 9–10 µm, 4-spored. – Cheilocystidia 25–55 × 10–15 µm, clavate to broadly fusoid, with pale lilac-brown (KOH), plasmatic pigment. – Pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (2–4 µm diam.). – Pileipellis composed of cylindric to ovoid cells (6–20 µm diam.), occasionally with thickened membranes, encrusted with brown (KOH) pigment, oleiferous hyphae none. – Clamp connections present.

Habitat. – On soil among moss under *Nothofagus* spp. February.

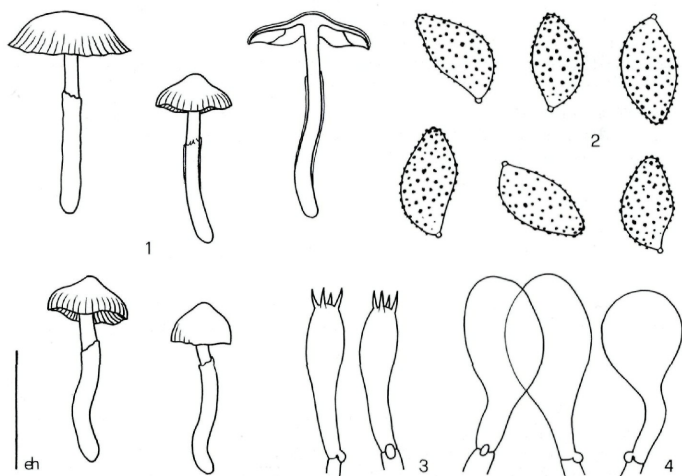
Distribution. – New Caledonia.

Material examined. – NEW CALEDONIA: N of Paita, Mt Mou, under *Nothofagus* spp., 1200 m, 20 ii 1977, leg. HORAK (ZT 77/133, holotype).

Additional material: cf. under 28. *C. melimyxa*.

This New Caledonian taxon is a typical representative of *Cortinarius* subgen. *Paramyxa*. Employing the key on Patagonian species of *Myxarium* (MOSER & HORAK, 1975) it becomes obvious that *C. necessarius* (as its name also indicates) is rather close to *C. illitus* MOSER & HORAK. Both taxa share not only basidiomes of similar size, shape and colours but also the same subamygdaliform spores whose dimensions, however, are significantly different.

In addition the macroscopic characters of *C. necessarius* are reminiscent of those described for the New Zealand *C. melimyxa* (see below). Furthermore the similar cheilocystidia (with a pale blue-lilac, plasmatic pigment) and the amygdaliform spores found in both taxa emphasize their intimate relationships. The two species are systematically well separated by the size of the spores.



Pl. 26. – *Cortinarius melimyxa* (PDD 27267, holotype): 1. basidiomes. – 2. spores. – 3. basidia. – 4. cheilocystidia.

28. *Cortinarius (Paramyxa) melimyxa* HORAK, sp.nov. – Pl. 26, figs. 1–4

Pileus –20 mm latus, obscure melleus vel luteobrunneus, glutinosus, striatus. Lamellae primo pallide argillaceae dein ochraceoferrugineae. Stipes –35 × –3 mm, cylindricus, albus postremo pileo concolor, glutinosus. Sapor mitis. Sporae 7.5–9 × 4–5 µm, amygdaliformes, verrucosae. Ad terram sub Nothofago Leptospermoque. Nova Zelandia. Typus PDD 27267.

Pileus –20 mm diam., hemispheric with incurved margin then convex to umbonate-convex or campanulate; golden brown, honey brown or pale date brown, darker at centre; glutinous, margin strongly striate, hygrophanous. – Lamellae (12–15, –3) adnexed to adnate, without subdecurrent tooth, –3 mm wide; pale argillaceous (? with tinge of lilac in perfectly fresh and young basidiomes; cf. cheilocystidia) changing to yellow-ochre with ferruginous tinge, minutely fimbriate edges concolorous or paler. – Stipe –35 × –3 mm, cylindric; at first white, with age slowly becoming concolorous with pileus; subglutinous to viscid, gluten soon drying up, then base covered with white appressed fibrils, apex dry, cortina absent or rudimentary only; hollow, single. – Context brown beneath pileipellis and in base of stipe. – Odour indistinct. – Taste mild. – Chemical reactions on pileus: KOH – (reddish)brown; HCl and NH<sub>3</sub> – negative.

Spore print rust brown. – Spores 7.5–9 × 4–5 µm, amygdaliform, with distinct supraapical depression (but plage absent), mucro occasionally well formed, verrucose, perispore inconspicuous, pale rust brown. – Basidia 25–30 × 6–7 µm, 4-spored. – Cheilocystidia 20–30 × 9–15 µm, vesiculose, clavate or broadly fusoid with rounded neck, with lilac(KOH), plasmatic pigment. – Pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (2–4 µm diam.). – Pileipellis composed of ovoid to short-cylindric cells (6–20 µm diam.), membranes encrusted with yellow-brown (KOH) pigment, oleiferous hyphae not observed. – Clamp connections present.

Habitat. – On soil under *Nothofagus* spp. (*N. solandri* var. *cliffortioides*, *N. menziesii*) and *Leptospermum scoparium*. May.

Distribution. – New Zealand.

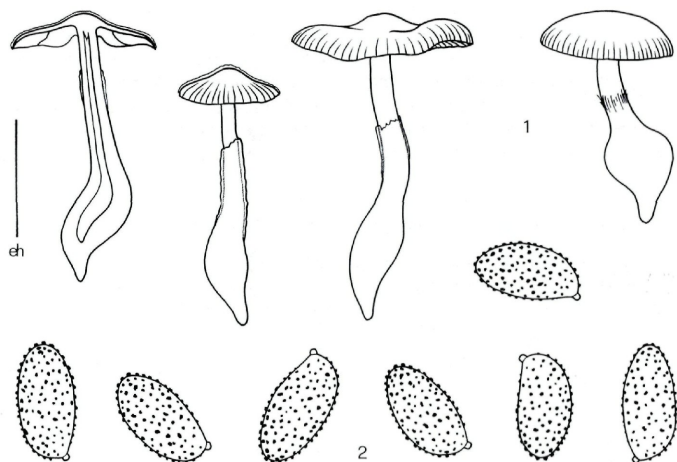
Material examined. – NEW ZEALAND: South Island: Nelson, Tophouse Saddle, Big Bush, under *N.s.-cl.*, *N.m.* and *L.s.*, 4 v 1969, leg. HORAK (PDD 27267, holotype; ZT 69/289, isotype).

Material of compared species. – ARGENTINA: Rio Negro, Lago Frias, under *Nothofagus* spp. (*N. antarctica*, *N. dombeyi*, *N. pumilio*), 4 iv 1963, leg. MOSER (IB 70/79, holotype of *C. illitus* MOSER & HORAK). – CHILE: Osorno, Cord. Pelada, Cerro Mirador, under *Nothofagus* spp. (*N. nitida*, *N. betuloides*), 27 iii 1963, leg. MOSER (IB 70/245, holotype of *C. semiglobatus* MOSER).

On the account of the conspicuously hygrophanous pileus (with striate-translucent margin) and the viscid coat of the universal veil both on pileus and stipe the present taxon represents a typical member of *Cortinari* subgen. *Paramyxa*.

In particular *C. melimyxa* is characterized by the following distinctive features: yellow-brown pileus, rather small, amygdaliform spores and vesiculose to broadly fusoid cheilocystidia with lilac, plasmatic pigment. Macroscopically the New Zealand *C.*

*melimyxa* could be taken for either one of the following South American taxa (both gathered in *Nothofagus* forests) viz. *C. illitus* MOSER & HORAK or *C. semiglobatus* MOSER (cf. paintings in MOSER & HORAK, 1975). Microscopically, however, the three species can be readily distinguished by the size and shape of the spores which are ovoid or elliptic in the South American *Paramyxacia*.



Pl. 27. — *Cortinarius melleomitis* (PDD 27266, ZT 68/282; New Zealand): 1. basidiomes. — 2. spores.

29. *Cortinarius (Paramyxacium) melleomitis* MOSER & HORAK. — Nova Hedwigia Beih. 52: 222. 1975. — Pl. 27, figs. 1–2.

Illustration. — MOSER & HORAK (1975: pl.1,3).

Description of the New Zealand collection:

Pileus –30 mm diam., at first convex with incurved margin becoming campanulate or broadly umbonate-expanded, centre sometimes depressed in old specimens; bright yellow-ochre with strong orange or rust ochre tinge, darker at centre; glutinous, conspicuously striate at margin, hygrophanous – Lamellae crowded, emarginate and subdecurrent with short tooth, ventricose, –3 mm wide; at first pallid turning pale ochre finally ochre with rust brown tinge; entire or subcrenulate edges concolorous. – Stipe –50 mm long, cylindric in upper half (–5 mm diam.), towards base distinctly

fusoid or swollen bulbous (–12 mm diam.), base  $\pm$  rooting; white; glutinous in wet condition, gluten drying up quickly then surface longitudinally fibrillose, cortina present; hollow, single or cespitose. – Context concolorous beneath pileipellis, white then pale ochraceous in stipe. – Odour unpleasant to subspermatric or weakly of anis seed. – Taste mild. – Chemical reactions on pileus unknown.

Spore print rust brown. – Spores  $8.5\text{--}10 \times 4.5\text{--}5 \mu\text{m}$ , elliptic, minutely verrucose, perispore absent, pale rust brown. – Basidia  $25\text{--}30 \times 8\text{--}9 \mu\text{m}$ , 4-spored. – Cheilocystidia and pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (2–4  $\mu\text{m}$  diam.). – Pileipellis composed of ovoid cells, membranes weakly encrusted with brown (KOH) pigment, oleiferous hyphae none. – Clamp connections present.

Habitat. – On soil under *Nothofagus solandri* var. *cliffortioides*. March.

Distribution. – Argentina (type), New Zealand.

Material examined. – ARGENTINA: Rio Negro, Valle Frias, under *Nothofagus* spp. div., 4 iv 1963, leg. MOSER (IB 70/86, holotype of *C. (Myx.) melleomitis* MOSER & HORAK). – NEW ZEALAND: South Island: Canterbury, Mt Grey, Kowai Reserve, under *N.s.-cl.*, 21 iv 1968, leg. HORAK (PDD 27266, ZT 68/282).

Material of compared species. – ARGENTINA: Rio Negro: Valle Frias, under *Nothofagus dombeyi* and *N. antarctica*, 10 iv 1962, leg. HORAK 454 (IB, holotype of *C. (Myx.) xanthocholus* HORAK & MOSER). – Neuquén: Lago Frias, under *Nothofagus* spp. div., 4 iv 1963, leg. MOSER (IB 63/250, holotype of *C. (Phl.) ocellatus* MOSER & HORAK).

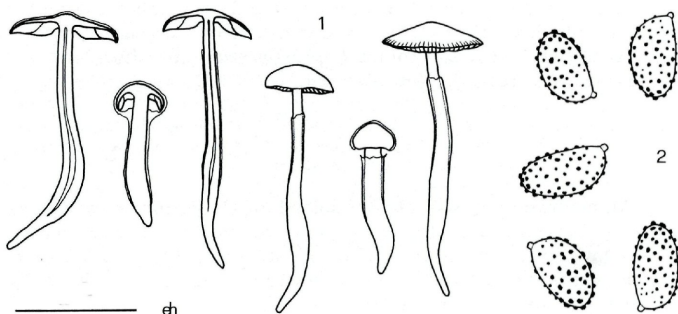
The present record of *C. melleomitis* from New Zealand is both macroscopically and microscopically identical with the type material gathered in *Nothofagus* forests in northern Patagonia (MOSER & HORAK, 1975). Due to the distinctive habit and the brilliant colours of the basidiomes it appears to be related to *C. vibratilis* (Fr.) Fr., being one of the typical representative of northern Myxacia in addition characterized by the bitter taste of the context. The mild-tasting *C. melleomitis* is, therefore, readily separated from the before-mentioned species complex (incl. its only southern member viz. *C. xanthocholus* HORAK & MOSER from Argentina).

From the mycogeographic point of view *C. melleomitis* is also remarkable since it is, together with *C. (Myx.) magellanicus*, the second myxacioid *Cortinari* with the rather rarely encountered South American-New Zealand pattern of distribution. In each sub-region both taxa have been observed in ectomycorrhizal association with several species of local *Nothofagus*. It can be assumed, therefore, that *C. melleomitis* has been there in symbiosis with its host-trees since Gondwanian ages.

*C. (Phl.) ocellatus* (MOSER & HORAK, 1975), also recorded in South American *Nothofagus* forests, appears to be closely related to *C.*

*melleomitis*. Further field work will eventually prove whether or not the former taxon is syntaxic with *C. melleomitis*.

In the New Zealand mycoflora *C. (Paramyxa.) gemmeus* (see below) has to be considered as a close systematic ally of *C. melleomitis*, and hence it is proposed to transfer the latter taxon from subgen. *Myxadium* (MOSER & HORAK, 1975) to subgen. *Paramyxa-*  
*adium*.



Pl. 28. — *Cortinarius gemmeus* (PDD 27268, holotype): 1. basidiomes. — 2. spores.

30. ***Cortinarius (Paramyxa) gemmeus* HORAK, sp.nov.** — Pl. 28, figs. 1–2.

Pileus –18 mm latus, aurantiacus vel fulvus, glutinosus, striatus. Lamellae pallide ochraceae dein ochraceoferrugineae. Stipes –45 × –4 mm, fusoides vel gradatim attenuatus basim versus, albidus, viscidus. Sapor mitis. Sporae 6–7.5 × 3.5–4 µm, ovoideae, minute verrucosae. Ad terram sub Leptospermo. Nova Zelandia. Typus PDD 27268.

Pileus –18 mm diam., hemispheric with strongly inrolled margin then convex to obtusely conico-convex, rarely with low umbo; ochre, ochre-orange or fulvous, darker at centre, actual margin often whitish; glutinous, conspicuously striate, hygrophanous. — Lamellae (12–18, –5) adnexed to adnate, not decurrent with tooth, –2.5 mm wide; at first pale ochraceous turning ochre with ferruginous tinge, subcrenulate edges concolorous. — Stipe –45 × –4 mm, slender fusoid or rarely also gradually tapering towards base; whitish to whitish or pallid; glutinous to viscid below, in dry condition gluten drying up quickly, dry and fibrillose above rudimentary cortina; fragile, fistulose, single and cespitose. — Context fulvous

beneath pileipellis, otherwise pallid. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print pale rust brown. – Spores  $6-7.5 \times 3.5-4 \mu\text{m}$ , ovoid to subelliptic, minutely verrucose, warts coarser at apex, perispore inconspicuous, pale rust brown. – Basidia  $30-35 \times 5-6 \mu\text{m}$ , 4-spored. – Cheilocystidia and pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae ( $1-3 \mu\text{m}$  diam.). – Pileipellis composed of short-cylindric to ovoid cells ( $7-20 \mu\text{m}$  diam.), membranes encrusted with brow (KOH) pigment, oleiferous hyphae not observed. – Clamp connections present.

Habitat. – On soil under *Leptospermum* spp. June.

Distribution. – New Zealand.

Material examined. – NEW ZEALAND: North Island, Hauraki Gulf, Little Barrier Island, Tirikawa Stream, under *Leptospermum* spp., 14 vi 1981, leg. HORAK (PDD 27268, holotype; ZT 943, isotype).

All macroscopic characters reported for *C. (Paramyxa) gemmeus* show this taxon to be a typical member of subgen. *Paramyxium*. The pigmentation of the conspicuously striate and translucent-glutinous pileus is concentrated at its centre and diminishes gradually towards the much paler margin.

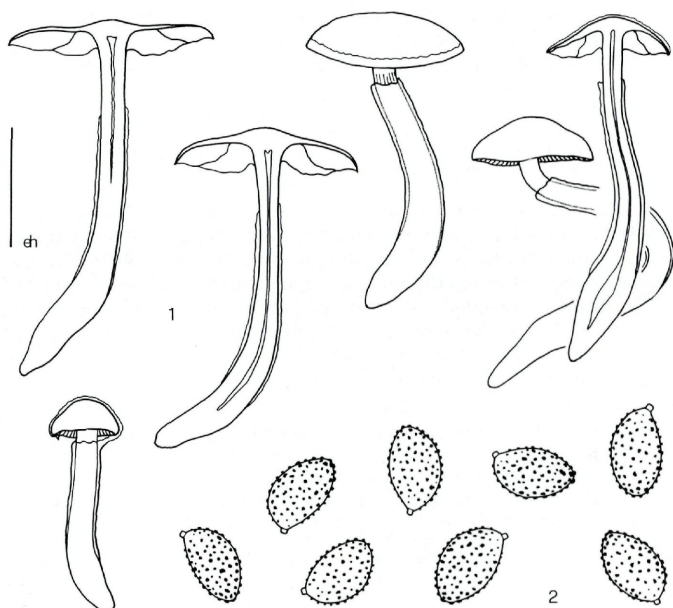
This New Zealand species has been encountered in a pure stand of *Leptospermum* spp. and hence ectomycorrhizal association with these myrtaceous host-trees is expected to take place.

The shape and in particular the bright ochre to fulvous colours observed on the basidiomes of *C. gemmeus* are suggestive of diminutive carpophores of *C. (Paramyxa) melleomitis*. These similarly looking taxa are readily distinguished, however, by their ecology and the size of the spores being significantly larger in the latter species.

31. ***Cortinarius (Paramyxium) castaneiceps*** HORAK, sp.nov. – Pl. 29, figs. 1–2.

Pileus –40 mm latus, castaneus vel atrocastaneus, glutinosus, striatus. Lamellae argillaceae dein ochraceoferrugineae. Stipes –60 mm longus, fusoides (–10 mm diam.), albus, glutinosus. Sapor mitis. Sporae  $6-7 \times 3.4-4.5 \mu\text{m}$ , ovoideae, minute verrucosae. Ad terram sub *Leptospermo* Nothofagoque. Nova Zelandia. Typus PDD 27269.

Pileus –40 mm diam., hemispheric to convex with incurved margin then obtusely umbonate-expanded, centre also depressed-umbonate in old specimens; equally dark red brown, bright chestnut brown, centre darker or even black, only outermost margin paler or whitish; glutinous, margin translucently striate, hygrophaneous. – Lamellae (20–30, –15) crowded, broadly adnate to emarginate and



Pl. 29. – *Cortinarius castaneiceps* (PDD 27269, holotype): 1. basidiomes. – 2. spores.

subdecurrent with short tooth, ventricose, –5 mm wide; at first pale brown becoming argillaceous or ochraceous with ferruginous tinge, entire edges concolorous. – Stipe –60 × –5 mm, cylindric above, fusoid (–10 mm diam.) or gradually tapering towards base; white; apex dry, glutinous below rudimentary remnants of fibrillose cortina; solid becoming fistulose, single or cespitose. – Context dark brown beneath pileipellis, white in stipe. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print pale rust brown. – Spores 6–7 × 3.5–4.5 µm, ovoid (rarely also pip-shaped), minutely verrucose, perispore inconspicuous, pale rust brown. – Basidia 25–30 × 6–7 µm, 4-spored. – Cheilocystidia and pleurocystidia absent. – Epicutis of strongly gelatinised, cylindric hyphae (2–4 µm diam.). – Pileipellis composed of cylindric or short-ovoid cells (6–12 µm diam.), membranes encrusted with dark red-brown (KOH) pigment, oleiferous hyphae not observed. – Clamp connections present.

Habitat. — On soil under *Leptospermum* (*L. scoparium*, ? *L. ericoides*) and *Nothofagus truncata*. June.

Distribution. — New Zealand.

Material examined. — NEW ZEALAND: North Island: Hauraki Gulf, Little Barrier Island, Summit Track, under *Leptospermum* spp. and *N.t.*, 15 vi 1981, leg. HORAK (PDD 27269, holotype; ZT 954, isotype). North Auckland, Waipoua, under *L.s.* (pure stand), 23 vi 1981, leg. HORAK (ZT 1121).

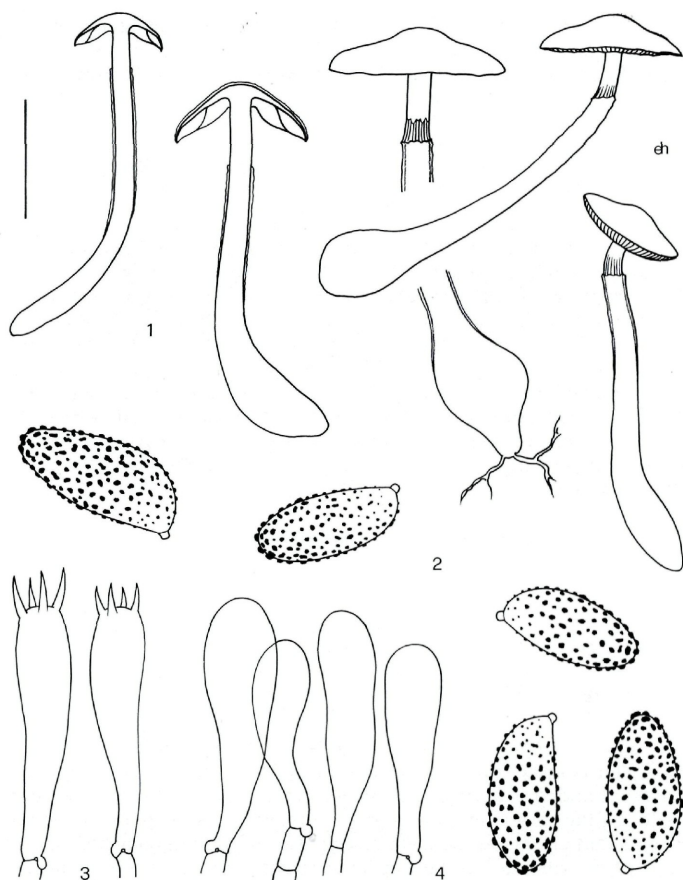
The most significant characters of *C. (Paramyx.) castaneiceps* are the very dark red-brown pileus (in sharp colour-contrast with the white stipe) and the small, ovoid spores. In northern New Zealand this species has been gathered in two localities both either dominated or exclusively wooded by *Leptospermum* spp. Based upon these ecological data *C. castaneiceps* is likely to belong to the ectomycorrhizal fungi associated with one of the two wide-spread, autochthonous species of *Leptospermum*.

32. ***Cortinarius (Paramyxacium) aegrotus*** HORAK, sp.nov. — Pl. 30, figs. 1–4.

Pileus –30 mm latus, pallide argillaceus vel subbrunneus zonis griseomarmoratis radialiter instructus, viscidus, haud conspicue striatus. Lamellae pallide argillaceae dein ochraceoferrugineae. Stipes –75 mm longus, apicaliter cylindricus (–6 mm diam.), basim versus fusoides (–15 mm diam. ad bulbum), albus, viscidus. Sapor mitis. Sporae 11.5–13 × 5.5–6.5 µm, ellipticae usque ad subamygdaliformes, verrucosae. Ad terram sub *Nothofago*. Nova Zelandia. Typus PDD 27270.

Pileus –30 mm, at first hemispheric or convex (but margin not inrolled) then broadly umbonate-expanded; pale argillaceous to pale brown, with radially arranged grey or darker streaks or specks, somewhat marbled, upon drying becoming pale ochraceous at centre; glutinous to viscid, surface subopaque and becoming innately fibrillose, in dry condition gluten quickly collapsing and vanishing, margin non-striate or only vaguely striate in old specimens, hygrophanous. — Lamellae (20–26, –7) adnexed to emarginate, –4 mm wide, ventricose in old specimens; pale argillaceous turning pale ochraceous with ferruginous tinge, subfimbriate edges white. — Stipe –75 mm long, cylindric in upper portion (–6 mm diam.), clavate or fusoid towards base, bulb –15 mm diam.; white; glutinous to viscid, gluten soon drying up and exposing strongly fibrillose surface, cortina rudimentary; solid becoming hollow (especially in the bulb), single or cespitose. — Context pale brown beneath pileipellis, white in stipe. — Odour indistinct. — Taste mild. — Chemical reaction on pileus: KOH – negative.

Spore print pale brown. — Spores 11.5–13 × 5.5–6.5 µm, elliptic to elongate subamygdaliform, verrucose, perispore incon-



Pl. 30. – *Cortinarius aegrotus* (PDD 27270, holotype): 1. basidiomes. – 2. spores. – 3. basidia. – 4. cheilocystidia.

spicuous, rust brown. – Basidia  $40-45 \times 9-10 \mu\text{m}$ , 4-spored. – Cheilocystidia  $25-45 \times 8-12 \mu\text{m}$ , clavate, hyaline. – Pleurocystidia none. – Epicutis of strongly gelatinised, cylindric hyphae ( $2-4 \mu\text{m}$  diam.). – Pileipellis composed of cylindric to short-ovoid cells ( $6-12 \mu\text{m}$  diam.), membranes encrusted

with orange-brown (KOH) pigment, oleiferous hyphae absent. – Clamp connections present.

Habitat. – On soil under *Nothofagus* (*N. fusca*, *N. menziesii*). May.

Distribution. – New Zealand.

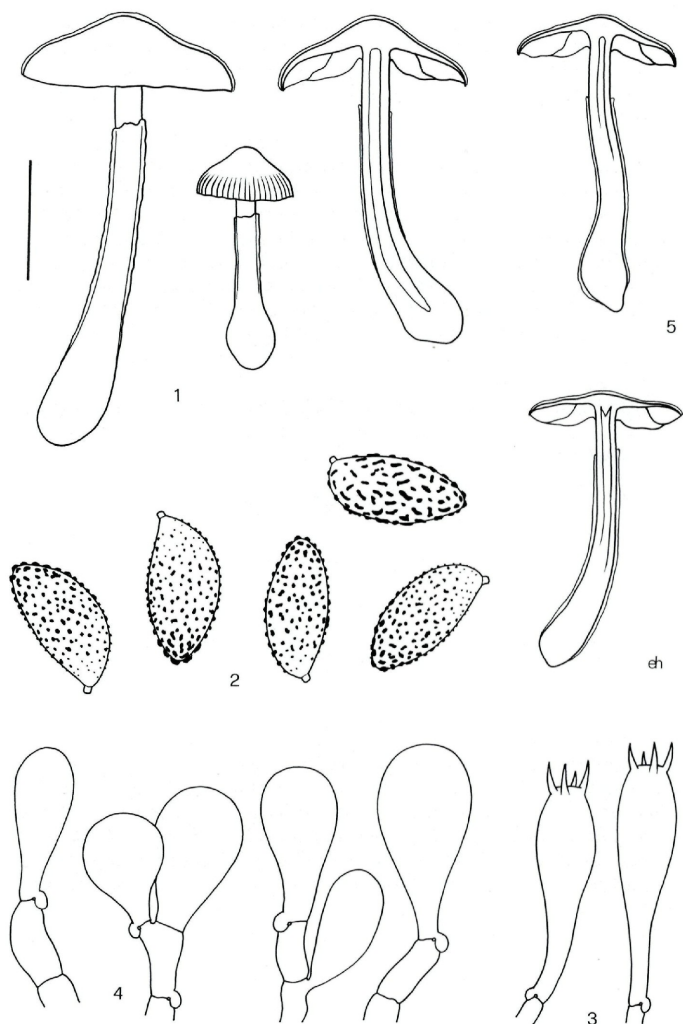
Material examined. – NEW ZEALAND: North Island: Gisborne, Urewera National Park, trail to Lake Waikareiti, under *N.f.* and *N.m.*, 25 v 1981, leg. HORAK (PDD 27270, holotype; ZT 776, isotype).

The hygrophanous pileus of *C. aegrotus* lacks the conspicuous striation which is considered one of the delimitating characters in the circumscription of subgen. *Paramyxacium* (MOSER & HORAK, 1975). In addition the odd coloured and structured surface of the pileus in the present species has not been observed in any other taxa classified as *Paramyxacium*. This peculiar pileipellis, however, is also reported for *C. marmoratus* which in this paper is referred to the New Zealand representatives of subgen. *Myxacium*. Further records of both taxa are needed, however, firstly to establish their actual systematic situation, and secondly to allocate them to their appropriate subgenera.

33. ***Cortinarius (Paramyxacium) vitreopileatus*** HORAK, sp.nov. – Pl. 31, figs. 1–5.

Pileus –55 mm latus, hemisphaericus dein convexus vel umbonatoapplanatus, subalbidus dein pallide argillaceus vel melleus, obscurior ad apicem, conspicue glutinosus, striatus, hygrophanus. Lamellae emarginatae, pallide argillaceae dein pallide brunneoferrugineae. Stipes –70 × –12 mm, subclavatus, albus dein luteobrunneus ad apicem, glutinosus. Sapor mitis. Sporae 10.3–13 (–14) × 5.5–7 µm, amygdaliformes, verrucosae. Ad terram sub Nothofago. Nova Zelandia. Typus PDD 27271.

Pileus –55 mm diam., at first hemispheric with incurved margin then convex finally becoming obtusely campanulate or umbonate-expanded, rarely also depressed at centre; at first pallid, very pale argillaceous changing to pale ochre, caramel, pale honey brown or pale date brown, centre usually darker, becoming bleached out in age, after exposure or during desiccation; very glutinous, buttons sometimes embedded in up to 4 mm thick coat of gluten, strongly translucently striate, hygrophanous. – Lamellae (15–40, –7), rather crowded, emarginate and decurrent with short tooth, ventricose, –6 mm wide; at first pallid then pale argillaceous or pale ochraceous becoming argillaceous with ferruginous tinge, subfimbriate edges concolorous. – Stipe 70 × –12 mm, upper part cylindric, fusoid or swollen towards base, subclavate; at first white or pallid, at apex gradually turning yellow-brown or brass yellow (but basal portion remaining whitish); strongly glutinous, cortina



Pl. 31. – *Cortinarius vitreopileatus* (PDD 27271, holotype): 1. basidiomes. – 2. spores. – 3. basidia. – 4. cheilocystidia. – (ZT 68/612): 5. basidiomes.

rudimentary or absent; solid soon becoming hollow, single or cepitose. – Context pale brown or honey brown beneath pileipellis, white in stipe but turning brown after exposure. – Odour indistinct. – Taste mild. – Chemical reaction on pileus: KOH – negative.

Spore print pale rust brown. – Spores  $10.5\text{--}13\text{--}(14) \times 5.5\text{--}7\text{ }\mu\text{m}$ , distinctly amgdaliform, supraapical depression  $\pm$  significant, verrucose (sometimes warts rather large especially towards apex), perispore indistinct, pale rust brown. – Basidia  $25\text{--}45 \times 8\text{--}11\text{ }\mu\text{m}$ , 4-spored. – Cheilocystidia  $20\text{--}50 \times 10\text{--}18\text{ }\mu\text{m}$ , clavate to vesiculose, hyaline, forming a sterile seam at edges. – Pleurocystidia absent. – Epicutis of strongly gelatinised hyphae ( $2\text{--}5\text{ }\mu\text{m}$  diam.). – Pileipellis composed of subglobose to ovoid or short-cylindric cells ( $6\text{--}18\text{ }\mu\text{m}$  diam.), membranes encrusted with pale brown (KOH) pigment, oleiferous hyphae none. – Clamp connections present.

Habitat. – On soil under *Nothofagus* spp. (*N. menziesii*, *N. fusca*, *N. solandri* var. *cliffortioides*). March–July.

Distribution. – New Zealand.

Material examined. – NEW ZEALAND: South Island: Fjordland: Lake Manapouri, Shallow Bay, under *N.s.-cl.* (and *Leptospermum scoparium*), 6 iv 1969, leg. HORAK (ZT 69/234). Otago: Lake Ohau, Temple River, under *N. solandri*, 13 iv 1969, leg. TAYLOR 450 (no specimens). Canterbury, Lewis Pass, near Lake, under *N.m.* and *N.s.-cl.*, 23 iii 1968, leg. HORAK (ZT 68/216); same locality, 28 iv 1969, leg. HORAK (ZT 69/263). North Island: Wellington: Tongariro National Park, Lake Rotopounamu, under *N.f.*, 22 v 1973, leg. TAYLOR 838. – Gisborne: Urewera National Park: Ngamoko Track, under *N.f.*, *N.m.*, *Elaeocarpus* and *Dacrydium*, 27 vi 1968, leg. HORAK (ZT 68/612); Track to Panekiri Range, under *N.m.* and *N.f.*, 28 vi 1968, leg. HORAK (ZT 68/620); Black Beech Track, under *N.f.* and *N.m.*, 23 v 1981, leg. HORAK (PDD 27271, holotype; ZT 756, isotype); near Headquarter, under *N.f.* and *N.m.*, 27 v 1981, leg. HORAK (ZT 802).

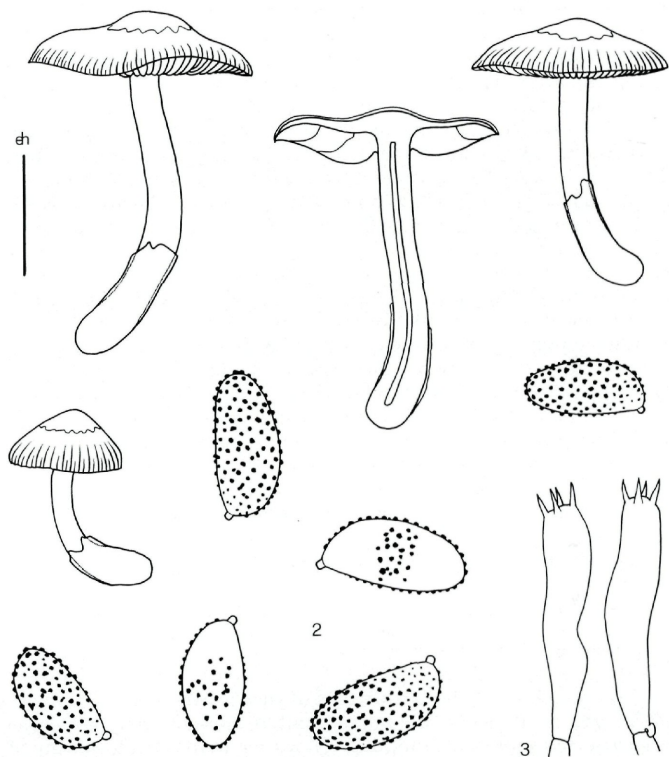
Both on South and North Island of New Zealand this species is common at higher elevations in beech forests dominated by *Nothofagus* spp. The numerous records indicate that *C. (Paramyxa.) vitreopileatus* enters ectomycorrhiza with at least three species of *Nothofagus* viz. *N. menziesii*, *N. fusca* and *N. solandri* var. *cliffortioides*.

In the field *C. (Paramyxa.) vitreopileatus* is readily recognized by its pallid to pale date brown basidiomes which in fresh condition are often covered with an exceptionally thick sheath of gluten. It is noteworthy that the at first white apex of the stipe gradually changes its colour and becomes yellow-brown or brass yellow, thus contrasting with its lower portion which remains constantly white.

*C. (Paramyxa.) vitreopileatus* usually occurs late in the season and it is noteworthy that its basidiomes can stand frost or snow. However, after exposure to low temperatures its rather pale colours can be bleached out leaving specimens with pallid to whitish pilei.

Under these circumstances a sound identification of this taxon can be achieved only after microscopic analysis.

Cf. also 34. *C. (Paramyx.) viscostriatus*.



Pl. 32. – *Cortinarius viscostriatus* (PDD 27272, holotype): 1. basidiomes. – 2. spores. – 3. basidia.

34. *Cortinarius (Paramyxium) viscostriatus* HORAK, sp.nov. – Pl. 32, figs. 1–3.

Pileus –40 mm latus conicoconvexus dein umbonatoapplanatus, pallide argillaceus vel gilvus dein melleus, apicaliter rufo tinctu, viscidus, striatus. Lamellae argillaceae dein pallide brunneoferrugineae. Stipes –55 × –7 mm, cylindricus,

albidus, glutinosus. Sapor mitis. Sporae  $9.5-12.5 \times 5-6 \mu\text{m}$ , ellipticae, minute verrucosae. Ad terram sub Nothofago. Nova Zelandia. Typus PDD 27272.

Pileus 40 mm diam., at first conico-convex becoming broadly umbonate or obtusely campanulate, centre also depressed in old specimens; pale argillaceous-brown to honey brown, occasionally with reddish or fulvous tinge over the centre, pigments fading upon ageing and after exposure to rain or sun; glutinous only in very fresh condition, viscid, conspicuously striate, hygrophanous. — Lamellae (20–30, –7) crowded, emarginate and subdecurent with short tooth, ventricose, 5 mm wide; at first pale argillaceous then pale brown with ferruginous tinge, entire edges concolorous. — Stipe 55–7 mm, cylindric (rarely enlarged or subclavate at base); white also in old specimens; glutinous, fibrillose cortina rudimentary; solid soon becoming hollow, single or cespitose. — Context pale reddish brown in pileus, white in stipe. — Odour indistinct. — Taste mild. — Chemical reaction on pileus: KOH – negative.

Spore print pale rust brown. — Spores  $9.5-12.5 \times 5-6 \mu\text{m}$ , elliptic to cylindric-elliptic, supraapical depression absent, minutely verrucose, perispore inconspicuous, pale rust brown. — Basidia  $35-40 \times 7-8 \mu\text{m}$ , 4-spored. — Cheilocystidia and pleurocystidia absent. — Epicutis and pileipellis composed of strongly gelatinised hyphae ( $2-5 \mu\text{m}$  diam.), cells of pileitrama subglobose to ovoid, membranes encrusted with brown (KOH) pigment, oleiferous hyphae absent. — Clamp connections present.

Habitat. — On soil under *Nothofagus* spp (*N. fusca*, *N. menziesii*). May.

Distribution. — New Zealand.

Material examined. — NEW ZEALAND: South Island: Nelson, Lake Rotoiti, track to St. Arnaud Range, under *N.f.* and *N.m.*, 23 v 1968, leg. HORÁK (PDD 27272, holotype; ZT 68/505, isotype).

Macroscopically the basidiomes of the rather inconspicuous *C. (Paramyx.) viscostriatus* are reminiscent of those of many representatives of *Hebeloma* spp.; they differ, however, in the striate margin of the pileus and the lack of a distinctive odour and taste. Furthermore, in New Zealand forests this species can be confused with the similar *C. (Paramyx.) vitreopileatus*. Since these two taxa often occur together in the same localities their unequivocal separation must be based upon the examination of the microscopic characters. The best way to distinguish these sympatric species is to check the spores which are elliptic in the present taxon versus amygdaliform in *C. (Paramyx.) vitreopileatus*.

The type locality of *C. (Paramyx.) viscostriatus* is situated in a montane forest exclusively composed of *Nothofagus fusca* and *N.*

*menziesii*. The ecological situation points to an ectomycorrhizal relationship between the *Cortinarius* and the two host-trees.

### Species incertae sedis

35. "*Cortinarius (Paramyxa) paraochraceus* MOSER var. *australiensis* MOSER" in MOSER & HORÁK. – Nova Hedwigia Beih. 52: 224. 1975. – Pl. 12, fig. 4.

HOMONYM: *Cortinarius (Myxa) ochraceus* CLELAND. – Trans. R. Soc. S. Austr. 51: 304. 1927.

non *Cortinarius ochraceus* PECK. – 23rd Rep. N.Y. Stat. Mus., 109. 1870.

Illustrations. – cf. 25. *C. sinapicolor*.

Macroscopic description from CLELAND (1927: 304):

"Pileus and stem very viscid. Pileus up to 2 ins. (5 cm) in diameter, convex, repand, finally irregularly upturned, Yellow Ochre, centre darker. Gills adnate, close,  $\frac{1}{4}$  in. (8 mm) deep, near Sudan Brown. Stem 2 ins. (5 cm) high,  $\frac{3}{8}$  in. (10 mm) thick, somewhat bulbous below, then equal, striate above, pallid becoming yellowish-brown. Flesh soapy looking, thick over the disc, rapidly attenuated outwards."

Spores  $8.5-9.5 \times 4.5-5 \mu\text{m}$ , elliptic, gradually attenuated towards apiculus, sparsely covered with minute warts, perispore inconspicuous, pale rust brown. – Basidia, cheilocystidia and pileipellis not recovered from the poorly preserved type material.

Habitat. – On soil under *Eucalyptus* spp. May–June.

Distribution. – Australia.

Material examined. – AUSTRALIA: South Australia: Mt Lofty, 19 vi 1921, leg. CLELAND (IB, holotype of *C. ochraceus*, ex herb. CLELAND). New South Wales: Windsor, Howes Valley, Tari Ck, 22 vi 1982, leg. WOOD (UNSW 82/389). Sydney: Cumberland State Forest, 4 v 1985, leg. WOOD (UNSW 85/310). Wyong, Watagan State Forest, Muir's Lookout Track, 13 vi 1985, leg. WOOD & TAEKER (UNSW 85/616).

Material of compared species. – ARGENTINA: Rio Negro, Valle Frias, under *Nothofagus dombeyi*, 8 iv 1963, leg. MOSER (IB 70/81, holotype of *C. paraochraceus* MOSER).

For the following reasons the identity of *C. (Myx.) ochraceus* CLELAND (1927) is far from being settled:

i) The microscopic data given in the above description are based upon specimens personally selected by CLELAND as type material now kept in Herb. MOSER (IB).

ii) Our personal experience with the CLELAND Herbarium (ADW) has shown that CLELAND (in the erroneous belief to have found the same taxon again) unfortunately did not hesitate to add later collections to material gathered at earlier occasions. Under these circumstances it is not surprising that finally in the same box exsiccata of up to three different species of *Cortinarius* have been kept together (cf. also AMMIRATI, 1975).

iii) Upon analyzing the original diagnosis of *C. ochraceus* we come to the conclusion that CLELAND (1928: 219) himself apparently could not distinguish between *C. ochraceus* and the similar *C. sinapicolor*. Accordingly the description of the former taxon includes characters of both species and thus the protologue of *C. ochraceus* has to be considered ambiguous (nom. confus.).

iv) The assumption that CLELAND published a mixed description of *C. ochraceus* is further supported by the fact that the spores of his designated "type collection" are covered only by very minute, sparsely scattered warts whereas those of *C. sinapicolor* (11 records examined) are constantly much coarser verrucose.

v) MOSER (in MOSER & HORAK, 1975) discovered that *C. ochraceus* CLEL. (1927) is a later homonym of *C. ochraceus* PECK (1870) and consequently the epithet of CLELAND's taxon had to be changed.

vi) According to MOSER the majority of characters (cf. above) published for the Australian species are (except for the smaller spores) identical to those of *C. paraochraceus* recorded as a new species from *Nothofagus* forests in northern Patagonia (Argentina).

vii) To accommodate *C. ochraceus* CLEL. (ecologically in association with *Eucalyptus* spp.) MOSER (in MOSER & HORAK, 1975: 224) proposed the new var. *australiensis* MOSER whose spores, however, differ by size, shape and ornamentation. Further records will demonstrate whether or not the Australian species actually has the rank of a variety or deserves to be considered an independent taxon.

In our opinion CLELAND's fungus quite possibly got now a legitimate name, however, its actual systematic position and relationships remain a puzzle until fresh specimens have been recollected at the type locality on Mt Lofty, SA. Regardless of this rather intricate situation three recent collections, made by one of us (A.W.) at several localities in New South Wales, are tentatively identified as *C. ochraceus* ss. CLEL., for the macroscopic and microscopic features are in close accordance with both the data extracted from the diagnosis and the re-examination of the type material. It must be added that these records did convince us that *C. ochraceus* CLEL. represents at least a defined taxon which can not be considered a mere synonym or a local variety of the similarly looking *C. sinapicolor* which is one of the most common species of *Myxaciium* in the Australian *Eucalyptus* forests.

## Addendum

At the time of proof reading, the paper of GRGURINOVIC (1989) came to the attention of the authors. Unfortunately, it was too late to consider it for the present contribution.

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## References

- AMMIRATI, J.F. (1975). *Cortinarius*, sect. *Dermocybe-Cortinarius clelandii*. – Mycotaxon 3: 95–101.
- CLELAND, J.B. (1927). Australian fungi: notes and descriptions. No. 6. – Trans. R. Soc. S. Austr. 51: 298–306.
- CLELAND, J.B. (1928). Australian fungi: notes and descriptions. No. 7. – Trans. R. Soc. S. Austr. 52: 217–222.
- CLELAND, J.B. (1933). Australian fungi: notes and descriptions. No. 9. – Trans. R. Soc. S. Austr. 57: 187–194.
- CLELAND, J.B. (1934). Toadstools and mushrooms and other larger fungi of South Australia. 1. – Government Printer, Adelaide, 178 pp.
- CLELAND, J.B. & E. CHEEL (1918). Australian fungi: notes and descriptions. No. 1. – Trans. R. Soc. S. Austr. 42: 88–138.
- CLELAND, J.B. & J.R. HARRIS (1948). Illustrations and descriptions of South Australian fungi. 1. *Agaricus* and *Cortinarius* with special references to antibiotic species. – Rec. S. Austr. Mus. 9: 43–55.
- COLE, M., B. FUHRER & A. HOLLAND (1984). A field guide to the common genera of gilled fungi in Australia. (rev. ed.). – Inkata Press Pty. Ltd., Melbourne-Sydney-London, 11 pp.
- COOKE, M.C. (1892). Handbook of Australian fungi. – Williams & Norgate, London, 457 pp.
- FUHRER, B. (1985). A field companion to Australian fungi. – Kyodo Printing Co. Ltd., Singapore, 62 pp.
- GILL, M. & W. STEGLICH (1987). Pigments of fungi (Macromycetes). – Progr. Chem. Org. Nat. Products 51: 1–317.
- GRGURINOVIC, C. A. (1989). Studies on J. B. CLELAND's fungal herbarium. 2. *Cortinarius* subgenus *Myxaciium* (Cortinariales). – Mycotaxon 36: 47–61.
- GRIFFITHS, K. (1985). A field guide to the larger fungi of the Darling scarp and South West of Western Australia. – Amsel Ltd., Hongkong, 80 pp.
- HILTON, R.N. (1982). A census of the larger fungi of Western Australia I. – J. Roy. Soc. West. Australia 65: 1–15.

- HILTON, R.N. (1988). A census of the larger fungi of Western Australia II. – J. Roy. Soc. West. Australia 70: 111–118.
- HILTON, R.N. (1983). The DRUMMOND collection of Western Australian fungi at the Royal Botanic Gardens, Kew. – Nuytsia 4: 333–357.
- HOLMGREN, P. K., W. KEUKEN & E. K. SCHOFIELD (1981). Index herbariorum. Part I. The Herbaria of the world (7th ed.). – Regnum Veg. 106: 1–452.
- HORAK, E. (1979). Fungi, Basidiomycetes: Agaricales y Gasteromycetes secotioides. – Fl. Criptogam. Tierra del Fuego 11: 1–525.
- HORAK, E. (1982). Agaricales in Antarctica and Subantarctica: distribution, ecology, and taxonomy. In: LAURSEN, G.F.A. & J.F. AMMIRATI (eds.): Arctic and Alpine mycology. – University Washington Press, Seattle-London: 82–122.
- HORAK, E. (1983). Mycogeography in the South Pacific region: Agaricales, Boletales. – Austr. J. Bot., Suppl. Ser. 10: 1–41.
- HORAK, E. (1988). New species of *Dermocybe* (Agaricales) from New Zealand. – Sydowia 40: 81–112.
- HORAK, E. & M. MOSER (1965). Fungi Austroamerici. 12. Studien zur Gattung *Thaxterogaster* SING. – Nova Hedwigia 10: 211–241.
- IMAZEKI, R. & T. HONGO (1971). Coloured illustrations of fungi of Japan. II. – Hoikusha Publ. Co. Ltd., Osaka, 238 pp.
- KELLER, G., M. MOSER, E. HORAK & W. STEGLICH (1988). Chemotaxonomic investigations of species of *Dermocybe* (Fr.) WUENSCH (Agaricales) from New Zealand, Papua New Guinea and Argentina. – Sydowia 40: 168–187.
- MACDONALD, R. & J. WESTERMAN (1979). A field guide to fungi of South-eastern Australia. – Th. Nelson Pty. Ltd., Melbourne, 153 pp.
- MOSER, M. (1962). Die bitteren Schleimfüsse (Myxaciens). – Schw. Z. f. Pilzk. 40: 181–187.
- MOSER, M. (1969). Ueber einige kritische oder neue Cortinariens aus der Untergattung *Myracium* Fr. aus Småland und Halland. – Friesia 9: 142–150.
- MOSER, M. & E. HORAK (1975). *Cortinarius* Fr. und nahe verwandte Gattungen in Südamerika. – Nova Hedwigia Beih. 52: 1–628.
- PECK, C. H. (1870). 23rd report of the New York State Museum, 109 pp.
- PEGLER, D.N. (1965). Studies on Australasian Agaricales. – Austr. J. Bot. 13: 323–356.
- SINGER, R. (1986). The Agaricales in modern taxonomy. – Koeltz Scientific Books, Koenigstein, Germany, 981 pp.
- SINNOTT, N. (1976). Victorian Agaricales and Cantharellaceae: a provisional check list. – mimeographed copy of author (Essendon, Victoria), 34 pp.
- SPEGGAZZINI, C. (1887). Fungi Fuegiani. – Bol. Acad. Nac. Cs Cordoba 11: 1–135.
- TAYLOR, M. (1970). Mushrooms and toadstools in New Zealand. – Reed Ltd., Wellington, 32 pp.
- TAYLOR, M. (1981). Mushrooms and toadstools. – Mobile New Zealand Nature Series, Reed Ltd., Wellington, 79 pp.
- WILLIS, J.H. (1963). Victorian toadstools and mushrooms. (3rd ed.). – Field Naturalists Club, Victoria, 88 pp.
- YOUNG, A.M. (1986). Common Australian fungi. – NSW University Press, Kensington, 157 pp.

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