

## ***Cortinarius* Fr. subgen. *Cortinarius* in the SW-Pacific area\*)**

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Summary. – *Cortinarius* subgen. *Cortinarius* has reached a high degree of diversification in the Pacific area. Besides of the type species, *C. violaceus* Fr., four further new taxa are described: *C. atroviolaceus* (with small spores), *C. atrolazulinus*, *C. subcalyptosporus*, and *C. paraviolaceus*.

### **Introduction**

Collections made by Prof. E. J. H. CORNER in Malaysia and North Bornea and Dr. E. HORAK in New Zealand show a higher degree of diversification in *Cortinarius* Fr. subgen. *Cortinarius* as found in Europe (MOSER 1967, 1976; BRANDRUD, 1983). All taxa belonging to this group are characterized by dark violett or blue colours in all parts due to a vacuolar pigment, more or less strongly developed cheilo- and pleurocystidia and often caulo- and sometimes even pileocystidia. The spores show a tendency to form a plage which can be clearly delimited in some taxa. The chemical nature of the pigments is not yet known, anthraquinonic pigments, however, can be excluded. The pigments are very sensitive to oxidation. They are also readily formed in mycelial cultures, however, at a much weaker concentration as in fruitbodies. In the area treated at least four (or five?) taxa belonging to this subgenus can be distinguished.

### **Key to the SW-Pacific taxa of Subgen. *Cortinarius***

- |    |   |                               |
|----|---|-------------------------------|
| 1  | Spores small, 8.5–10(–11.5) × 6.5–7.5 (–8.5) µm; fruitbodies often small, cap 3–5 cm, sometimes reaching about 8 cm. . . . .      | 2. <i>C. atroviolaceus</i>    |
| 1* | Spores generally more than 10 µm long . . . . .   | 2                             |
| 2  | Spores large, almond-shaped, 10.5–15(–16) × 7.5–8.5 µm; pleurocystidia strongly developed . . . . .                               | 1. <i>C. violaceus</i>        |
| 2* | Spores smaller, hardly exceeding 12.5 µm . . . . .  | 3                             |
| 3  | Spores broadly elliptic, (8)–10–12.3(–12.5) × 5–8.5 µm, often with a distinctly delimited plage and visible perisporium . . . . . | 3. <i>C. subcalyptosporus</i> |
| 3* | Spores more almond-shaped, rather slender . . . . .   | 4                             |

\*) Dedicated to Prof. E. J. H. CORNER, on occasion of his 80th birthday.

- 4 Spores 9–12.5 × 5.5–6.5 μm, more or less almond-shaped and rather slender; pleurocystidia strongly developed, with a rather long neck; stem more or less cylindrical, only innately fibrillose; smell slightly raphanoid. . . . 4. *C. atrolazulinus*
- 4\* Spores 10.5–12–(12.5) × 6.3–7.3–(7.5) μm, almond-shaped. Pleurocystidia rare, atypical for the group, clavate-lanceolate, up to 70 × 12 μm), cap only slightly fibrillose-scaly to almost glabrous. Smell strongly fishy . . . . 5. *C. paraviolaceus*

1. *Cortinarius violaceus* FR. – Fig. 1 a.

Cap 3–8 cm, convex to plane, dry, finely fibrillose-subtomentose with small appressed fibrillose scales, fibrillose towards margin, very dark fuliginous violaceous. – Gills dark fuliginous violaceous, adnate-decurrent, emarginate, subdistant, L = about 24, l = 7–(14), from 4–14 mm broad. – Stem 6–14 cm / 3–12 mm above, 10–20 mm at the base, clavate, more rarely cylindrical, very dark fuliginous violaceous, appressedly fibrillose, mycelium at the base pinkish violaceous. – Context dry, intensely violaceous, whitish in the center of the stem towards the base in young specimen, solid.

Gives a very deep violet solution in alcohol-formalin.

Spores almondshaped, yellow brown, 10.5–15 × 7.5–8.5 μm, verrucose, often with a more or less distinct plage. – Basidia 4-spored, 45–50 × 10.5–12 μm, clavate, hyaline, sterigmata 3–6 μm long, edge of gills completely covered with fusiform to ventricose-bottle-shaped cheilocystidia from 35–80 and more μm long, (12)–15–25 μm thick, in KOH filled with brown pigment. Seem to generate from the subhymenium but some also from the trama. – Pleurocystidia numerous, more or less bottle-shaped, 50–80 × 12–20 μm, in dry material with brown content, originating from the subhymenium. – Cap surface with fascicles of 400–600 μm long hairs (in KOH with brown content), septate, often terminated with a bottle-shaped or lanceolate pilocystidium (70–110 × 14–25 μm), with clamp connections, epicuticular hyphae with brown pigment content, 12–15 μm thick subcutis ± cellular, nearly hyaline, hyphae of the trama 10–18 μm, nearly hyaline, in deeper layers pigmented.

Habitat: In humus in mixed deciduous forests.

Material. – NORTH BORNEO: Mt. Kinabalu, 1700 m, 31 Jan. 1964, Corner (RSNB 5180).– Two further collections but without notes belong to the same taxon: RSNB 5258 A and 5258 C. – MALAYSIA: According to notes of CORNER two collections (*Cort.* 4 and 4 A) seem also to belong here, but the specimens are missing. – PAPUA NEW GUINEA: Eastern Highlands, Frigano (Hut Track), SE of Goroka 11 Dec. 1971, HORAK (ZT 71/420).

Comments. – These collections can hardly be separated from *C. violaceus* FR. The microscopic characters agree very well, shape and colours are the same. The carpophores are smaller but from these few collections it can not be judged whether this is a constant

character. The spores sometimes show a more distinctly delimited plage and the occurrence of pileocystidia has not been observed in European material.

2. *Cortinarius atrovioleaceus* MOSER, sp. nov. – Fig. 1 b; 2 f; 4 o, p.

Pileo 3–5(–8) cm lato, convexo, demum disco depresso, violaceo, sicco, subtiliter fibrilloso-squamoso, squamulis suberectis, lamellis emarginatis, subdistantibus, obscure violaceis, latis. Stipite 4–12 cm longo, 4–11 mm crasso, basi usque ad 6–20 mm, leviter clavato, violaceo, fibrilloso, cortina pallidiori violacea, carne violacea, odore leviter raphanoideo. Sporis 9–5–10.5–(11.8) × 6.3–8 μm, Q = 1.53, verrucosis, interdum cum zona suprahilari ± delimitata praeditis, basidiis 4-sporigeris, cheilocystidiis lanceolatis vel lageniformibus, 80–140 × 10–25 μm, pleurocystidiis sparsis, minoribus, lanceolatis vel fusoido-ventricosis lageniformibusve, 40–100 × 10–18–(20) μm. Hyphis fibuligeris. Habitatio in humo, in silvis frondosis mixtis, 7. 2. 1964, CORNER (RSNB 5228, holotypus), ad montem Kinabalu in 1700 m altitudine, Borneo septentrionali, in herb. IB conservatur.

Cap 3–8 cm wide, persistently convex but the centre becoming depressed, violaceous, dry, finely fibrillose-squamulose all over, the scales more or less suberect. – Gills emarginate, sinuate-adnate, subdistant, L = 24–40, l = 7–14, intensely and dark violaceous, almost violet-black, from spores becoming rusty dusted, 5–14 mm wide, slowly becoming very broad. – Stem 4–12 cm long, 4–11 mm thick at the apex, 6–20 mm at the subclavate base, cortina pale violaceous, slightly developed, basal mycelium pale violaceous. – Context 4–6 mm thick in the centre of the pileus, dry, firm, violaceous. – Smell slight, reminiscent of radish.

Spores (9.2)–10–11.8–(14) × 6.3–8 μm, mean 10.8 × 7.1, Q = 1.53, broadly elliptic, dark yellow-brown, fine to roughly verrucose, some spores showing a more or less distinct plage. Basidia 4-spored, 35–40 × 8–10 μm, sterigmata 2–4 μm. – Cheilocystidia frequent, large, lanceolate to bottleshaped and with ventricose basal part, 50–80–140 × 10–25 μm, sometimes with amorphous excretion at the top. – Pleurocystidia relatively scarce for the group, broadly lanceolate or ventricose-fusoid, or bottleshaped, 40–100 × 10–18 (20) μm. – Epicuticular hyphae 10–14 μm thick, with brown content in KOH, the fascicules of hairs on the surface formed from septate, 10–18 μm thick, bluntly ending hyphae; trama pseudoparenchymatous, hyaline, subhymenium subcellular, elements 15–30 × 15–20 μm; hyphae of the stem 6–10 μm, granulose incrustated in KOH, hyphae of the cortina 4–8 μm, some with brown content in KOH. – Clamp connections present.

Habitat. – In humus, between litter.

Material. – NORTH BORNEO: Mt. Kinabalu, 1700 m, 7 Febr. 1964, CORNER (RSNB 5258, holotype); other collections under the same number from 10 April and 2 May 1964, all made by CORNER. The collection RSNB 5258 B has more finely sculptured spores of the

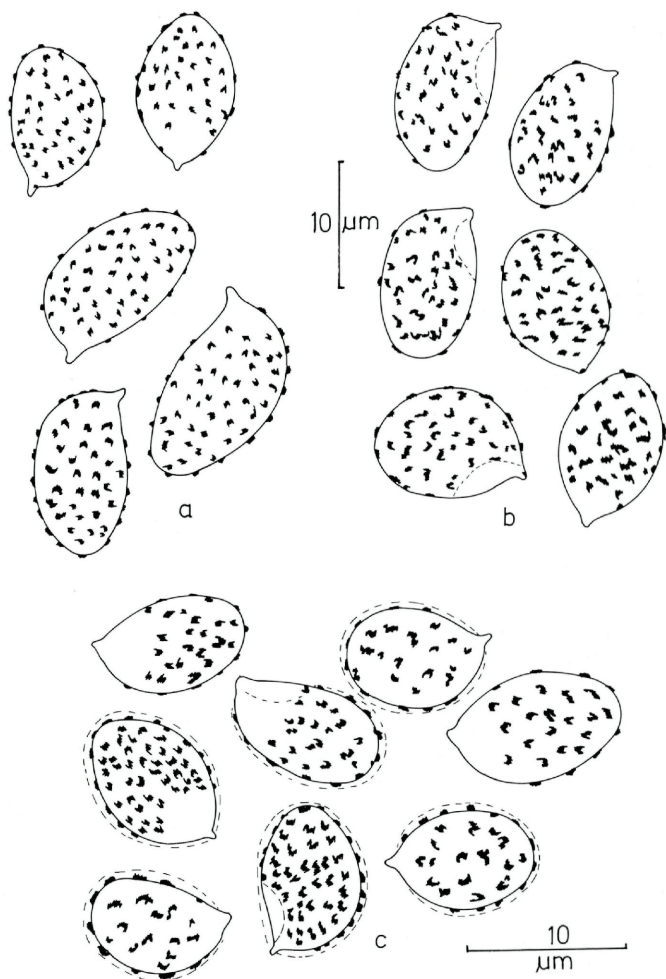


Fig. 1: *Cortinarius violaceus*: a. spores (RSNB 5180). – *Cortinarius atroviolaceus*: b. spores (RSNB 5228). – *Cortinarius subcalyptrosporus*: c. spores (RSNB 8202).

same size and smaller cheilocystidia but seems to belong to the same taxon. — NEW ZEALAND: Among litter under *Nothofagus menziesii*, *N. fusca*, *Libocedrus*, *Metrosideros*, *Dracophyllum*, trail to Mt. Nelson, Nelson, South Island, 3 May 1969, HORAK (ZT 69/285).

Comment: The taxon seems different from *C. violaceus* by reason of distinctly smaller spores and smaller habit of the fruit-bodies.

3. *Cortinarius subcalyptrosporus* MOSER, sp. nov. — Fig. 1 c; 3 i, k.

Pileus usque ad 11 cm lato, convexo, demum plano, obscure violaceo, demum fusco-fuligineo-violaceo, sicco, subtiliter fibrilloso-squamoso, squamulis suberectis. Lamellis obscure violaceis, brunnescentibus, emarginatis, confertis, 11–13 mm latis. Stipite clavato, 10–14 cm longo, 10–13 mm crasso, basin versus usque ad 20–28 mm crasso, sicco, appresse peronato-fibrilloso-lanuginoso, carne violacea. Sporis (9.8)–10.5–12–(12.5) × 6.8–8 (8.7) µm, valde verrucosis cum zona suprahilari laevi saepe delimitata praeditis et vulgo a perisporio eximie separato, basidiis tetrasporigeris, cheilo-pleurocystidiisque lageniformibus, ventricosis, 50–80 × 15–20 µm, fibulis praesentibus. Habitatio in humo in silvis mixtis frondosis, ad monte Kinabalu, Borneo septentrionali, in 1600 m altitudine, 17. 4. 1964, CORNER (RSNB 8302, holotypus), in herb. IB conservatur.

Cap up to 11 cm, convex to plane, umbonate, dark violaceous, becoming fuscous fuliginous violaceous, dry, finely fibrillose-squamulose all over, the squamules somewhat villose-squarrose, opaque. — Gills dark violaceous, becoming clouded brownish, sinuate, crowded, L = 50–52, l = 7–14, broad, 11–13 mm wide. — Stem 10–14 cm long, 10–13 mm thick at the apex, 20–28 mm at the clavate base, dry faintly appressedly peronate-fibrillose-lanuginose with pale brownish cortina, base violaceous tomentose. — Context 10–12 mm thick in the centre of the pileus, rather thick, violaceous but paler than the surface.

Spores (9.8)–10.5–12–(12.5) × 6.8–8–(8.7) µm, average 10.9 × 7.22, Q = 1.52, yellow-brown, coarsely verrucose, with more or less distinct plage in many spores and a distinct hyaline perisporium covering the ornamentation. — Basidia 4-spored, 35–45 × 8–12 µm, sterigmata 3–6 µm long, often rather thick. — Cheilo- and pleurocystidia lageniform ventricose to lanceolate, 50–80 × 15–20 µm, originating in the subhymenium. Hyphae of the scales erect to suberect, 170–250 and more µm long, 7–9 µm thick, with brown content in KOH, epicuticular hyphae 8–12 µm thick, in KOH yellow brown, hyphae of the stem 7–11 µm, with yellow brown content in KOH. — Clamp connections present.

Habitat. — In humus in mixed frondose forest.

Material. — NORTH BORNEO: Mt. Kinabalu, 1600 m, 17 April 1964, CORNER (RSNB 8302, holotype). — NEW ZEALAND: Under *Nothofagus fusca* and *N. menziesii*, Black Beech Track, Urewera N P., Gisborn, 23 May 1981, HORAK (ZT 649).

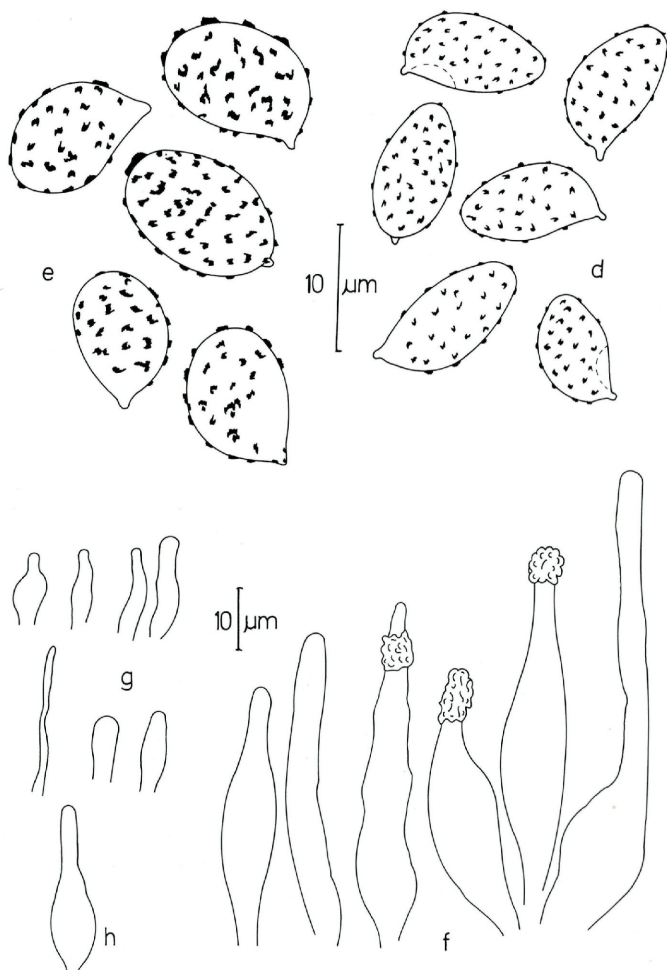


Fig. 2. *Cortinarius atrolazulinus*: d. spores (ZT 69/276). – *Cortinarius paraviolaceus*: e. spores (RSNB 8305). – *Cortinarius atroviolaceus*: f. cheilocystidia (RSNB 5258). – *Cortinarius paraviolaceus*: g. cheilocystidia (?), h. pleurocystidia (RSNB 8305).

Comments. – The taxon seems macroscopically very much like *C. violaceous*. The spores and cystidia are smaller but reach the lower range of variation of this species, the spores, however, show a more or less distinct plage and the perisporium can often be easily observed (as in *Hebeloma calyptrosporium* BRUCHET). – According to the microscopical characters a collection from New Zealand must also be assigned to this taxon although the spores show the subcalyptrate appearance less clearly. Further records must show the constancy of these characters.

4. *Cortinarius atrolazulinus* MOSER, sp. nov. – Fig. 2 d; 3 m, n; 4 q.

Pileo valde convexo, diu involuto, 4–4.5 cm lato, squarruloso-squamuloso, atrocoeruleo. Lamellis emarginatis, atrocoeruleis, ferruginascentibus, subdistantibus, 5–6 mm latis. Stipite cylindrico, 8–8.5 cm longo, 10–12 mm crasso, sicco, innato-fibrilloso, solido, basin versus tomentosum, vivide lilaceo-coeruleo, cortina concolori, annulis incompletis e velo praedito, carne lilaceo-coerulea, sapore subraphanoideo. Sporis amygdaliformibus, 9–12.5 × 5.5–6.5 μm, verrucosis, basidiis 4-sporigeris, 32–38 × 7.5–8 μm, cheilo-pleurocystidiisque lageniformibus, lanceolatis, 45–70 × 12–20 μm. Habitatio inter folia putrida in silvis nothofagineis (*Nothofagus menziesii-fusca*), prope St. Arnaud Range, lacus Rotoiti, 30. 4. 1969, HORAK (ZT 69/276, holotypus), in herb. ZT conservatus.

Cap strongly convex, later applanate, 4–4.5 cm across, margin longtimes involute, completely covered by numerous persistent hairy tufts and scales, dry blackish blue. – Gills emarginately adnate, blackish blue, old with rusty tints by the spores, subdistant, L = 20–30, l = 7, 5–6 mm wide, edge more or less entire, concolorous. – Stem cylindrical, the very base rounded and somewhat tapering, 8–8.5 cm long, 10–12 mm thick, dry, longitudinally innately fibrillose, solid, the base tomentose, bright (reddish) lilac-blue, with strongly developed concolorous cortina, with some patches or incomplete belts of the universal veil. – Context blue lilac in the cap and stem, becoming blackish blue when exposed to the air. – Smell damp, taste slightly of radish, slightly acid.

Spores almond-shaped, relatively slender, 9–12.5 × 5.5–6.5 μm, average 10.8 × 5.8, Q = 1.86, verrucose, with a hilar depression, without plage, slightly mucronate. – Basidia 4-spored, 32–38 (including sterigmata) × 7.5–8 μm. – Cheilocystidia bottle-shaped or broadly lanceolate with an extended neck, 45–70 × 12–20 μm, neck 7–15 × 4–5 μm. – Pleurocystidia similar, slightly more slender, 50–70 × 12–17 μm, neck 15–25 × 4–5 μm. – Cap surface with fascicles of more or less cylindrical, septate, not gelatinized hyphae. Segments about 50–100 μm long, 14–18 μm wide, the terminal segments with a blunt but slightly narrowed end, pigment vacuolar, in KOH turning red. Clamp connections present.

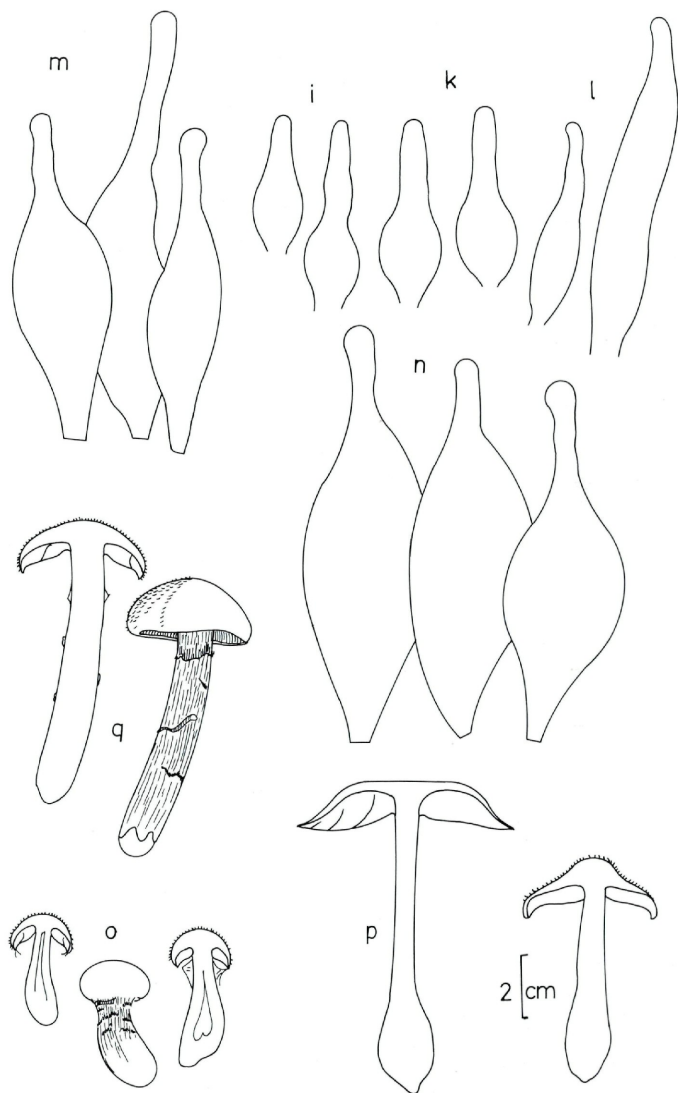


Fig. 3: *Cortinarius subcalyptosporus*: i. pleurocystidia (RSNB 8302), k. cheilocystidia (RSNB 8302), l. cheilocystidia (ZT 649). – *Cortinarius atrolazulinus* (ZT 69/276): m. pleurocystidia. – *Cortinarius atroviolaceus* (ZT 69/285): o. carpophores (ZT 69/285), p. carpophores (RSNB 5258 B). – *Cortinarius atrolazulinus*: q. carpophores (ZT 69/276).



Habitat. – In litter under *Nothofagus menziesii* and *N. fusca*.

Material. – NEW ZEALAND: Nelson, Lake Rotoiti, St. Arnaud Range, 30 April 1969, HORAK (ZT 69/276, holotype).

Comments: This taxon is remarkable by the relatively slender spore-shape, unusual in this group, and by the cylindrical stipe, which is bulbous in all other taxa of the group.

5. *Cortinarius paraviolaceus* MOSER, sp. n. – Fig. 2 e, g, h.

Pileo 6–10 cm lato, convexo, dein subumbonato, saturate violaceo, dein pallidior, disco ochrascescente, sicco, subtiliter et adpresse fibrilloso usque fibrilloso-squamuloso, subglabro. Lamellis emarginatis, violaceis, 7–11 mm latis, subdistantibus. Stipite 6–10 cm longo, 5–8 mm crasso, basi clavato usque ad 10–15 mm crasso, ad basin violaceo-tomentoso, super brunneofibrilloso, interdum subperonato, carne concolori, odore valde piscino. Sporibus amygdaliformibus,  $9.8-11.5(-12) \times 6.8-7.5(-8) \mu\text{m}$ , verrucosis, basidiis 4-sporigeris,  $35-40(-45) \times 10-12.5 \mu\text{m}$ , pleurocystidiis sparsis, clavato-lanceolatis, usque ad  $70 \times 12 \mu\text{m}$ , absentibus cheilocystidiis(?). Habitatio in humo in silvis frondosis mixtis, ad montem Kinabalu, Borneo septentrionali, 17. 4. 1964, CORNER (RSNB 8305, holotypus), in herb. IB conservatur.

Cap 6–10 cm across, convex, becoming plane to subumbonate, rather intensely violaceous, paler on expansion, the center becoming dull tawny ochraceous, dry, minutely appressedly fibrillose or fibrillose-squamulose, appearing nearly smooth. – Gills emarginately adnate, violaceous, 7–11 mm broad, rather distant, L = 32–40, l = 7–14. – Stem 6–10 cm long, 5–8 mm thick above, 10–15 mm at the base, for the most part cylindrical but the base clavate, violaceous tomentose at the base, otherwise thinly brownish fibrillose with the cortina, sometimes slightly peronate towards the base. – Context 6–8 mm thick in the centre of the pileus, concolourous with the surface. Smell strong, rather fishy.

Spores almond-shaped,  $9.8-11.6(-12) \times 6.8-7.5(-8) \mu\text{m}$ , average  $11.2 \times 7.2$ , Q = 1.56, verrucose, with a slight, sometimes delimited plage, basidia 4- rarely 2-spored,  $35-40(-45) \times 10-12.5 \mu\text{m}$ , sterigmata 2–4  $\mu\text{m}$  long. – Pleurocystidia rare, clavate-lanceolate, hyaline, up to  $70 \times 12 \mu\text{m}$ , occasionally also smaller clavate cells with yellowish content present (rather basidioles), no cheilocystidia observed. – Epicutis of hyphae of 8–10  $\mu\text{m}$  with yellowbrown wall in KOH, subcutis of thick hyphae (up to 18–20  $\mu\text{m}$  thick), trama irregular of hyphae 8–25–(30)  $\mu\text{m}$  thick, walls pale yellowish to hyaline, hyphae of the stipe 8–10  $\mu\text{m}$  thick. – Clamp connections present.

Habitat. – In humus in mixed frondose woods.

Material. – NORTH BORNEO: Mt. Kinabalu, about 1600 m, 17 and 19 April 1964, CORNER (RSNB 8305, holotype).

Comments. – The type of the spores with a slight plage could suggest an affiliation with subgen. *Cortinarius*; the cystidia are, however, not typical for this group, the pileus is not strongly squar-

rose-fibrillose-squamulose and the carpophores are less intensely violet. The *exsiccata* permit hardly a judgment of the type of pigmentation. So we place this taxon only with some reservation in this group.

### Literature

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