

## STUDIES ON THE GENUS *DESCOLEA* SING.

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(With ten Text-figures)

Eight species of *Descolea*, four of which—*D. pallida*, *D. majestatica*, *D. phlebophora*, and *D. pretiosa*—are new, are keyed out and fully described. The area of distribution today stretches from S. America over New Zealand and Australia to India and Japan. According to present knowledge the specific centre of the genus seems to be in New Zealand (three species), but it is presumed that more species occur in the surrounding Pacific area. The generic range of *Descolea* is discussed and compared with closely related genera belonging to the Cortinariaceae.

The genus *Descolea* Sing. is based on *Descolea antarctica* Sing. (1951: 257), a medium-sized, brown agaric which in some respects resembles *Rozites* P. Karst. or *Pholiotina* Fayod. The primarily monotypic genus has found its systematic place near *Leucocortinarius* (J. E. Lange) Sing. and *Gymnopilus* P. Karst. and despite additional data (Singer, 1962: 630) its position has remained unchanged.

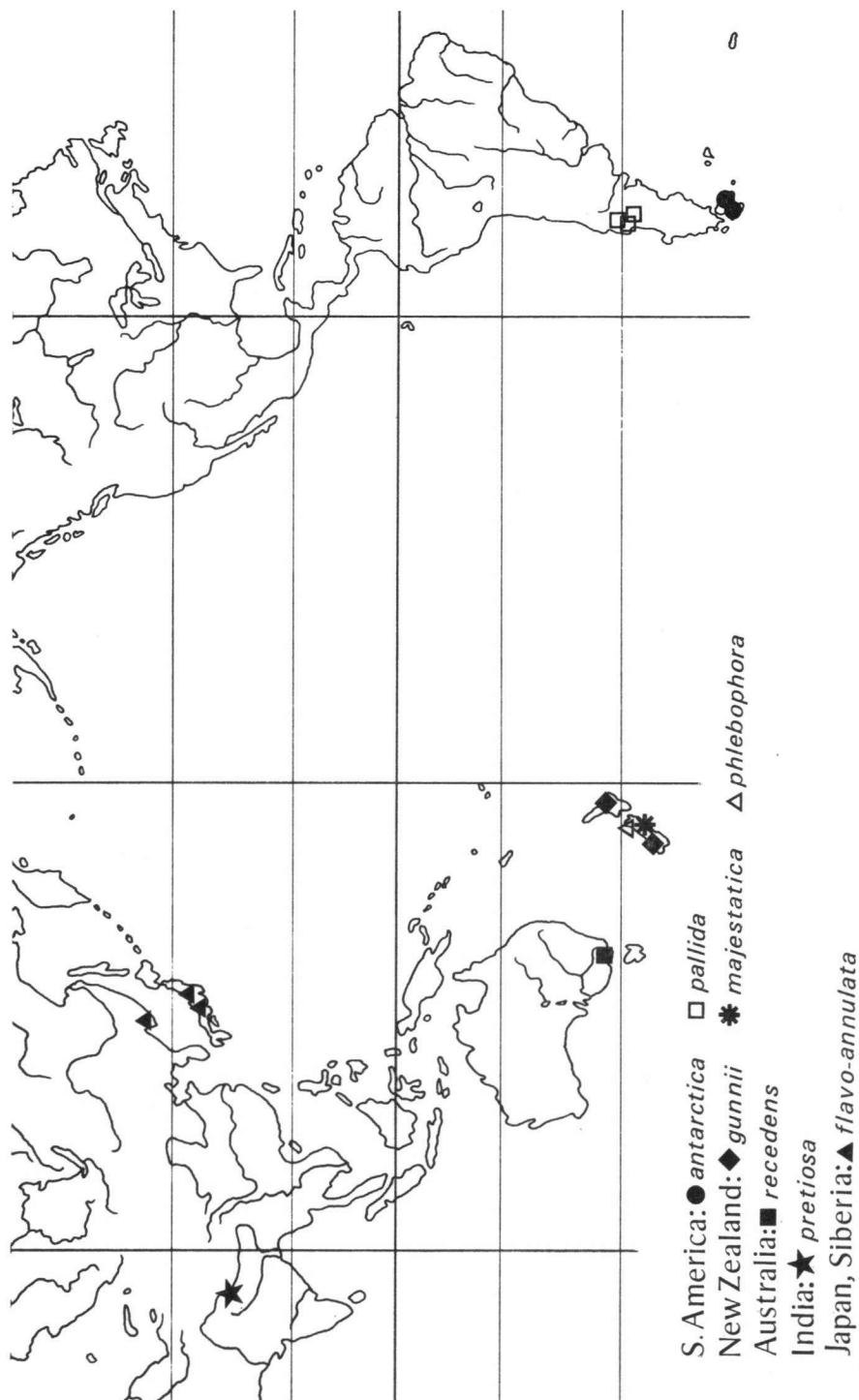
During his studies on Australian types at Kew Singer (1955: 407) detected a second species, *D. recedens*, conforming to the current taxonomic concept of the genus *Descolea*. Together with another, undescribed, species from Patagonia, probably representing *D. pallida*, the area of distribution was then known to cover the southern part of S. America and the southeast corner of Australia (Victoria). This particular pattern of distribution encouraged Singer (1955: 407) to speculate: "I have no doubt that it [*Descolea*] also occurs in New Zealand." This was subsequently confirmed.

Apart from a full redescription of the type species of *Descolea* (Horak, 1968: 221) no further ecological or taxonomic information about this genus was ever published.

Inspired by Singer's remarks the author explored the *Nothofagus* forests of New Zealand in 1967-1969. Two new species of *Descolea* were recorded (*D. majestatica* and *D. phlebophora*). Thus the number of known species rose to five, all confined to the area of distribution of *Nothofagus* (Fagaceae) in the southern hemisphere.

From the descriptions of *Rozites flavo-annulata* (Moser, 1953: 169; Hongo, 1966: 58) it appeared that this species belongs to *Descolea* rather than to *Rozites*. A thorough investigation of material kindly sent by T. Hongo (Japan) verified this.

Later the author was lent excellent material of an unidentified agaric collected by R. A. Maas Geesteranus in a coniferous forest in the foothills of the Himalayas (India). It was illustrated by a water-colour and also accompanied by detailed notes

Fig. 1. Area of distribution of the species of *Descolea*.

by C. Bas; it finally permitted the taxonomic position of *Descolea* to be determined.

The above mentioned data seem to indicate that the genus *Descolea* migrated from its endemic habitat in the southern *Nothofagus* forests to the northern hemisphere (see Fig. 1).

### Mycorrhizal associations

According to field observations made in S. America (Singer, l.c.; Horak, unpubl. data), New Zealand, and Australia species of *Descolea* represented in these countries seem to form a facultative mycorrhiza with different host trees. This opinion is substantiated by the finding that the same species occurs in pure stands of trees which are not closely related, for example in New Zealand *Nothofagus* (Fagaceae) and *Leptospermum* (Myrtaceae); in Japan *Pinus*, *Larix* (Pinaceae) and *Quercus*, *Castanopsis* (Fagaceae).

No known studies on the microscopic characters of this mycorrhiza have yet been made. Nor has a synthesis of mycorrhiza in pure culture been attempted. The mycorrhizal relationships of *Descolea* species are shown best in the following table.

TABLE I  
MYCORRHIZAL RELATIONSHIPS OF DESCOLEA SPECIES

Country \ Host	Fagaceae	Myrtaceae	Pinaceae
	<i>Nothofagus</i> (N) <i>Quercus</i> (Qu) <i>Castanopsis</i> (C)	<i>Eucalyptus</i> (E) <i>Leptospermum</i> (Le)	<i>Abies</i> (A) <i>Picea</i> (P) <i>Pinus</i> (Pi) <i>Larix</i> (La) <i>Taxus</i> (T)
S. America	<i>D. antarctica</i> (N) <i>D. pallida</i> (N)	—	—
New Zealand	<i>D. gunnii</i> (N) <i>D. majestatica</i> (N) <i>D. phlebophora</i> (N)	<i>D. gunnii</i> (Le)	—
Australia	<i>D. recedens</i> (? N)	<i>D. recedens</i> (? E) <i>D. spec.</i> (E)	—
India	—	—	<i>D. pretiosa</i> (A, P, Pi, T)
Japan, S.E. Siberia	<i>D. flavo-annulata</i> (Qu, C)	—	<i>D. flavo-annulata</i> (Pi, La)



### Taxonomy

Singer (1951: 555; 1962: 630) in his classification placed *Descolea* between the two cortinariaceous genera *Leucocortinarius* and *Gymnopilus*, despite the lack of any evident relationships.

*Leucocortinarius* and *Descolea*, although considered to have the same ochraceous colour of the spore print, differ so widely in microscopic and macroscopic characters that no connection can be shown. There is apparently also no connection between *Descolea* and *Gymnopilus*. The latter has a deep rust brown spore print, warty spores with a plage, and cheilocystidia often encrusted or filled with a brown resinous pigment. Like *Leucocortinarius* it never has a double veil. Furthermore neither of the two genera mentioned (*Leucocortinarius* and *Gymnopilus*) is characterized by a hymeniform cuticle (Horak, 1968: 222) while in *Descolea* a double veil is always clearly developed and visible, at least in young fruiting bodies.

The structure of the cuticle and the double veil are characteristic features of *Descolea*, which must accordingly be placed near *Rozites*. The data presented and further unpublished material (Moser & Horak, 1972; Horak, in prep.) show that as far as the structure of the cuticle is concerned the two taxa could be linked by the intermediate species *Descolea majestatica*. This impression is also verified from data on about ten as yet undescribed species of *Rozites* occurring mainly in the *Nothofagus* forests of S. America, New Zealand, and Australia. Further proof of the relationship *Descolea*—*Rozites* is found in the broad, amygdaliform or limoniform spores with isolated warts; these are never found in *Gymnopilus*, *Leucocortinarius* or any other cortinariaceous genus.

The main difference separating the two genera is well revealed however in the structure of the cuticle; in (typical) *Descolea* this is epithelium-like, but in *Rozites* it always consists of repent cylindrical hyphae.

At first sight several characters in *Descolea* and *Pholiotina* Fayod are strikingly similar, e.g. the striate, permanent annulus and the hymeniform cuticle. By contrast the spores of *Pholiotina* (except for *P. verrucispora* Sing., which probably belongs to *Descolea*) are smooth and have an obvious germ pore, but there is no double veil. Paradoxically Singer (1969: 220), in spite of these data, remains inclined to place *Descolea* close to *Pholiotina* (Fam. Bolbitiaceae).

Based on the additional material gathered the genus *Descolea* can now be typified as follows:

D E S C O L E A Sing. em. Horak

*Descolea* Sing. in Lilloa 23: 256. "1950" [1951].

Spore print ochraceous; spores amygdaliform to limoniform, always distinctly mucronate, without germ pore or plage (occasionally present in *D. majestatis*),

### EXPLANATION OF FIGURE 2

Fig. 2. Habit sketches of the species of *Descolea*. — a. *D. antarctica*. — b. *D. pallida*. — c. *D. majestatica*. — d. *D. gunnii*. — e. *D. phlebophora*. — f. *D. pretiosa*. (All natural size.)

warted, with well developed and coloured perispore. Basidia clavate, 4- and 2-spored. Typical cheilocystidia and pleurocystidia absent. Lamellae adnexed or emarginate-adnate. Pileus convex to expanded, dry or viscid; cuticle consisting of clavate cells forming an epithelium-like structure, covered by the cylindrical hyphae of the outer veil, strongly encrusted with pigment; clamp connections present. Stipe cylindrical or tapering upwards, central, dry; velum parziale forming a persistent, striate, rarely smooth, annulus; velum universale consisting of scaly, patchy or volva-like remnants on the lower parts of the stipe and fine floccose squamules especially near the margin of the pileus. No specific chemical reactions. Smell and taste not distinctive. On humus, rotten litter or on wood in forests. Area of distribution: S. America, New Zealand, Australia, India, southeast Siberia, Japan.

Type of the genus: *Descolea antarctica* Sing. (1951)

#### KEY TO THE SPECIES OF DESCOLEA

1. Pileus viscid or slimy . . . . . 2
- 1\*. Pileus dry . . . . . 4
  2. Pileus > 30 mm (–70 mm) diam., robust, dark brown with olive tinge; annulus well developed; spores (12–)12.5–15 × 7–8 μ; under *Nothofagus*; New Zealand
    3. *D. majestatica*
  - 2\*. Pileus smaller; under *Nothofagus* in S. America . . . . . 3
    3. Spores 12–15 × 6.5–8.5 μ; pileus brown, with white scattered veil remnants
      1. *D. antarctica*
    - 3\*. Spores 10–13 × 5–6.5 μ; pileus yellow-brown to ochraceous, often pallid; veil remnants ochraceous . . . . . 2. *D. pallida*
    4. Spores > 12 μ long, coarsely warted; India, Siberia, Japan . . . . . 5
    - 4\*. Spores < 12 μ long, mostly minutely warted; Australia, New Zealand . 6
      5. Base of stipe with several girdles of scales; spores 12–14.5 × 7–8 μ; under *Abies*, *Picea*, *Taxus*; Himalaya (India) . . . . . 7. *D. pretiosa*
      - 5\*. Base of stipe with volva-like veil remnants; spores 14–16 × 8–9 μ; under *Larix*, *Pinus*, *Quercus*, *Castanopsis*; E. Siberia, Japan
        8. *D. flavo-annulata*
      6. Pileus liver brown or dark brown, conspicuously wrinkled; veil remnants white; spores 8–11.5 × 5–6 μ; under *Nothofagus* (and *Leptospermum*); New Zealand . . . . . 6. *D. phlebophora*
      - 6\*. Pileus ochraceous or yellow-brown; veil remnants ochraceous . 7
        7. Base of stipe with conspicuous, sharp-pointed scales; under *Nothofagus* and *Leptospermum*; New Zealand . . 5. *D. gunnii*
        - 7\*. Base of stipe glabrous, without scales; Australia . 4. *D. recedens*

#### 1. DESCOLEA ANTARCTICA Sing.—Figs. 2a, 3

*Descolea antarctica* Sing. in Lilloa 23: 257. “1950” [1951].

This species was fully described by Singer (l.c.) and Horak (1968: 221).

#### COLLECTIONS EXAMINED:

##### ARGENTINA

Tierra del Fuego: Estancia Nueva Argentina, 11 Feb. 1950, *R. Singer*, “sub *Nothofagus* in terra” (holotype, LIL 144a); Ushuaia, Valle del Glaciar Martial, 1 March 1963, *E. Horak*, under *Nothofagus pumilio* (Herb. HK., ZT 64/98).

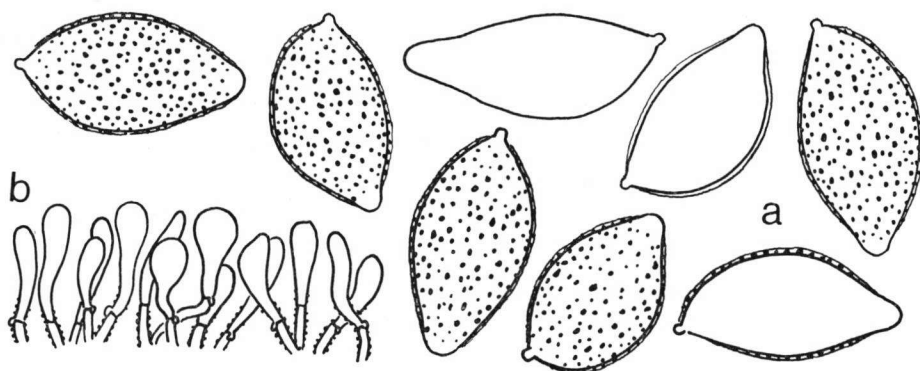


Fig. 3. *Descolea antarctica*. — a. Spores (2000  $\times$ ). — b. Cuticle (500  $\times$ ).

The two collections studied agree in all their characters. According to present knowledge *D. antarctica* is endemic to Tierra del Fuego and its microscopic features (spores  $12-15.5 \times 7-8.5 \mu$ ) are distinctly different from those of *D. pallida*, which is found in the north and the second species of *Descolea* known from the *Nothofagus* forests of S. America. Singer (1969: 220) originally recognized these differences but did not attempt to separate the two "infraspecific taxa", declaring *D. pallida* to be a smaller-spored form of *D. antarctica*.

## 2. *Descolea pallida* Horak, *spec. nov.*—Figs. 2b, 4

Pileo 10–40 mm lato ex hemisphaerico applanato-umbonato, luteo-ochraceo vel brunneo, viscido, striato, hygrophano, glabro vel subrugoso, fragmentis veli concoloribus ornato. Lamellis adnexis vel emarginatis, ochraceis. Stipite 20–60  $\times$  2–5 mm, cylindraco vel superne attenuato, pileo concolori vel pallidiori, sicco, glabro, annulo amplo concolori striatoque persistenter instructo. Carne brunneola. Odore saporeque acidulis vel subfarinaceis. Sporibus 10–13  $\times$  5–6.5  $\mu$ , sublimoniformibus, minute verrucosis. Cystidiis nullis. Epicute e cellulis clavatis, 12–40  $\times$  8–15  $\mu$ , epithelium efformantibus, pigmento brunneo incrustatis. Hyphis fibuligeris. Ad humum et inter folia deiecta in silvis, praecipue nothofagineis. Austroamerica (Argentina, Chile). Holotypus: Chile, Pucatrihue, 26. IV. 1963, E. Horak (herb. HK., ZT 66/332).

Pileus 10–40 mm diam., hemispherical when young, becoming umbonate-applanate, rarely expanded, concave; colour changing from yellowish to ochraceous or dark melleous, at maturity brownish or even reddish-brownish; striate at the margin, hygrophane, distinctly slimy, cuticle folding into radially arranged wrinkles; young fruiting bodies with scattered concolorous squamules along the margin. Lamellae (L 14–22, l 3) adnate or emarginate; yellowish or buff, later turning ochraceous; edge concolorous, fimbriate. Stipe 20–60  $\times$  2–5 mm, single, rarely clustered, central, cylindrical or attenuated upwards, fistulose; at first whitish, later coloured like the pileus; dry and glabrous, towards the base covered by silky whitish fibrils, but without any conspicuous veil remnants from the velum universale;

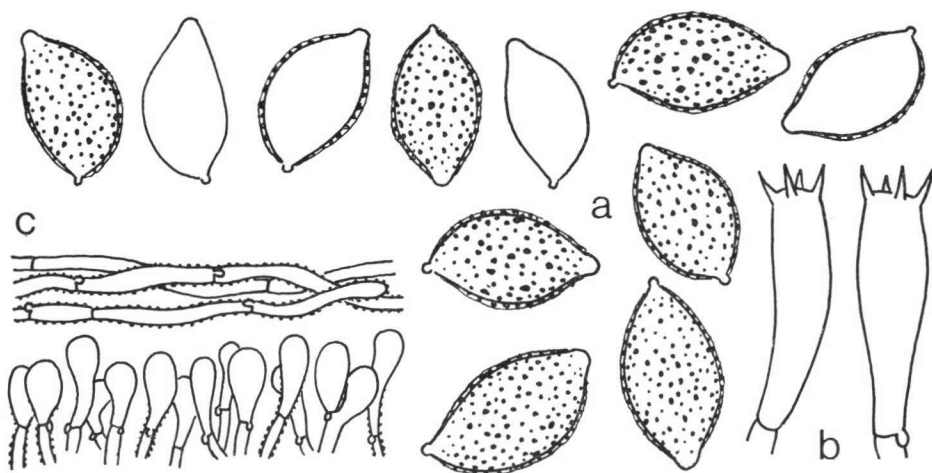


Fig. 4. *Descolea pallida*. — a. Spores (2000  $\times$ ). — b. Basidia (1000  $\times$ ). — c. Cuticle (500  $\times$ ).

ring concolorous with the stipe, strongly striate, pendent, dry, persistent. Context whitish-yellowish, brownish in old fruiting bodies. Smell and taste slightly bitter or subfarinaceous. Chemical reactions on the pileus: KOH and HCl produce no reaction.

Spores  $10-13 \times 5-6.5 \mu$ , almond- or lemon-shaped, mucro prominent and smooth, for the rest covered by isolated minute warts, without germ pore. Basidia  $30-38 \times 6-10 \mu$ , 4-spored, rarely 2-spored. Cystidia absent. Cuticle consisting of clavate cells,  $12-40 \times 8-15 \mu$ , forming a 1-layered epithelium; membrane gelatinized and strongly encrusted with brown pigment; hyphae of veil remnants loosely interwoven, cylindrical, heavily pigmented; clamp connections present.

HABITAT: Among litter and on soil in rain forests with various Myrtaceae and/or *Nothofagus* (mainly *N. dombeyi*). Argentina, Chile.

COLLECTIONS EXAMINED:

#### ARGENTINA

Prov. Rio Negro: between L. Frías and Paso de las Nubes, 8 April 1962, E. Horak, under *Nothofagus dombeyi* (Herb. HK., ZT 62/20); Lago Nahuel Huapi, P. Manzano, 28 March 1962, E. Horak, under *Nothofagus dombeyi* and *Chusquea culeou* (Herb. HK., ZT 66/383); Lago Nahuel Huapi, Quettrihué, 23 April 1962, E. Horak, under *Nothofagus dombeyi* (Herb. HK., ZT 66/590); Lago Nahuel Huapi, P. Manzano, 26 April 1963, M. Moser, under *Nothofagus dombeyi* (Herb. HK., ZT 70/279).

#### CHILE

Prov. Osorno: Pucatrihue, 26 April 1963, E. Horak, on sandy soil under trees in Pacific rain forest (holotype, Herb. HK., ZT 66/332); Frutillar, Centro Forestal, Llanquihue, 5 May 1968, W. Lazo, "en suelo y raíces semipodridas" (FRU-6; Herb. HK., ZT 70/275).



Old and degraded specimens of *D. pallida* may occasionally resemble *D. antarctica* (Singer, 1969: 220), but striking differences occur in the colour of the veil remnants at the margin of the pileus, the size of the spores, and the area of distribution. Apparently this species was at first only mentioned by Singer (1962: 630); later Singer (1969: 220) declared it to be conspecific with *D. antarctica* and *D. recedens* respectively, which see.

Some similarities also exist between *D. pallida* and *D. recedens* from Australia. It would seem that the two species are closely related but unfortunately the macroscopic characters of *D. recedens* are not completely known. Further findings may resolve this still open question.

### 3. *Descolea majestatica* Horak, *spec. nov.*—Figs. 2c, 5

Pileo 30–70 mm lato, hemisphaerico demum umbonato-convexo, margine incurvo, brubneo et distincte olivaceo-tincto, glutinoso, marginem versus venoso-subsulcato, striato, hygrophano, fragmentis veli universali nullis. Lamellis emarginatis, ex argillaceo ochraceo-brunneis, fimbriatis. Stipite 40–80 × 8–15 mm, cylindraco, robusto, fistuloso, sicco, pileo concolori vel pallidiori, superne glabro, basim versus squamis squarrosis instructo, annulo albo vel argillaceo, amplo, patulo, perstriato, fixo, marginem versus partibus glutinosis brunneisque ornato. Carne obscure brunnea. Odore saporeque nullis. Sporibus 12.5–15 × 7–8  $\mu$ , amygdaliformibus, grosse verrucosis, depressione suprahilari indistincta instructis. Cheilocystidiis 25–60 × 10–35  $\mu$ , conspicuis, clavatis, tenuitunicatis, fibuligeris. Epicute e cellulis clavatis, 18–45 × 12–25  $\mu$ , epithelium efformantibus, membrana glutinosa et pigmento brunneo incrustata. Inter folia deiecta in silvis nothofagineis. Novazelandia. Holotypus: Novazelandia, Lake Rotoiti, 30. IV. 1969, *E. Horak* (Herb. HK., ZT 69/277).

Pileus 30–70 mm diam., at first hemispherical with strongly incurved margin, becoming umbonate-convex, rarely expanded, fleshy; dark (date) brown, always showing a distinct olive-greenish tinge, hygrophanous; covered with a thick layer of slime (up to 3 mm), near the striate margin grooved or wrinkled, without any squamulose remnants of the velum universale. Lamellae emarginate, crowded; argillaceous to coffee brown or ochraceous-brown; gill edge whitish and fimbriate. Stipe 40–80 × 8–15 mm, cylindrical, robust, at maturity fistulose; brown or lighter than the pileus; dry, apically glabrous to longitudinally fibrillose, below the annulus with squarrose squamules; ring very conspicuous, pendent, strongly striate, immobile; whitish or concolorous with the stipe; at the crenulate margin frequently with brown, gelatinous patches (originating from the margin of the pileus). Context brown. Smell and taste not distinctive.

Spores 12.5–15 × 7–8  $\mu$ , almond-shaped, strongly warted except for the mucro, with conspicuous perispore embedding the warts, plage smooth. Basidia 35–46 × 10–14  $\mu$ , 4-spored. Cystidia at the gill edge conspicuous, 25–60 × 10–35  $\mu$ , clavate, thin-walled, partially encrusted with brown pigment, with clamp connections. Cuticle consisting of loosely arranged cells, 18–45 × 12–25  $\mu$ , more or less forming an epithelium; membrane of hyphae strongly gelatinized and covered by crusts of a brown pigment.

HABITAT: Among litter in *Nothofagus* forests (*N. cliffortioides*, *N. fusca*, *N. menziesii*). New Zealand.

COLLECTIONS EXAMINED:

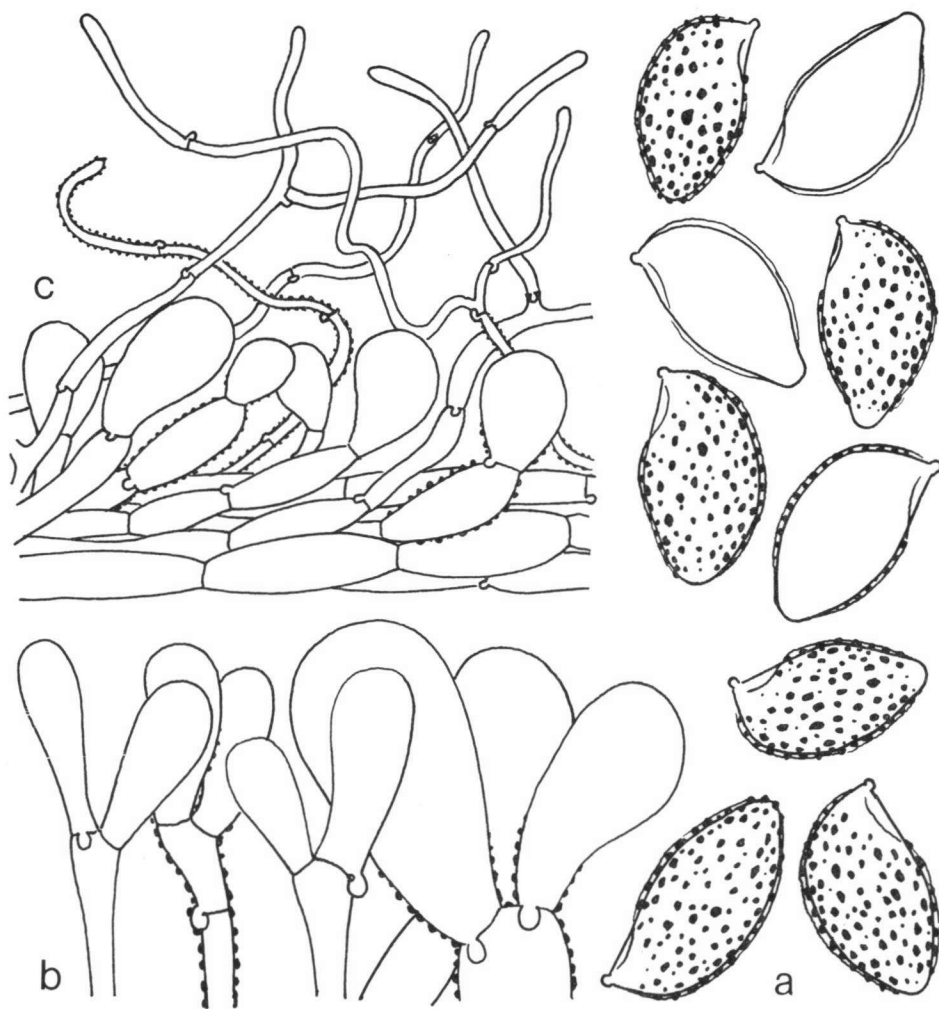


Fig. 5. *Descolea majestatica*. — a. Spores (2000  $\times$ ). — b. Cheilocystidia (1000  $\times$ ). — c. Cuticle (500  $\times$ ).

#### NEW ZEALAND

South Island: Maungatua, 18 April 1953, Mrs. G. Stevenson 877, under *Nothofagus menziesii* (K); Prov. Canterbury, Craigieburn Range, Cave Stream, 19 April 1968, C. Baker, under *Nothofagus cliffortioides* (Herb. HK., ZT 68/272); Prov. Nelson, Lake Rotoiti, St. Arnaud Range, 30 April 1969, E. Horak, in litter under *Nothofagus fusca* and *N. menziesii* (holotype, Herb. HK., ZT 69/277).

*Descolea majestatica*, the third member of the genus with a gelatinized cuticle, is characterized by several peculiarities which place it in a somewhat transitional taxonomic position. According to the robust and fleshy nature of the fruiting bodies and the thick gelatinous layer on the pileus, this species could be taken as related to *Rozites*. The latter genus is also known from the *Nothofagus* forests of S. America, New Zealand, and Australia, and represented by some ten species. The occurrence of articulate cheilocystidia and the generally amygdaliform spores brings out the close relationship between *D. majestatica* and southern *Rozites*. The hymeniform cuticle, the smooth mucro of the spores, and the strongly striate persistent ring are however distinct characters of *Descolea*. Therefore this species is considered to be a member of the genus *Descolea*.

#### 4. *DESCOLEA RECEDENS* (Cooke & Masee) Sing.—Fig. 6

*Agaricus (Pholiota) recedens* Cooke & Masee *apud* Cooke in Grevillea 18: 25, 1889. — *Pholiota recedens* (Cooke & Masee) Sacc., Syll. Fung. 9: 93, 1891 — *Descolea recedens* (Cooke & Masee) Sing. in Sydowia 9: 407, 1955.

A few additional observations can be added to the original diagnosis of Cooke & Masee and Singer's redescription (1955) of this Australian fungus from the type in the Kew Herbarium. The amygdaliform to sublimoniform spores measure about  $10-11.5 \times 5.5-6.5 \mu$ , are minutely verrucose, and have a thin perispore and smooth mucro. The clavate cells of the hymeniform cuticle are about  $20-30 \times 10-15 \mu$ , the membrane of the hyphae is not conspicuously gelatinized, is encrusted by brown pigment, and has clamp connections.

COLLECTION EXAMINED:

#### AUSTRALIA

Victoria: Mordiallac, 1889, O. French (holotype, K).

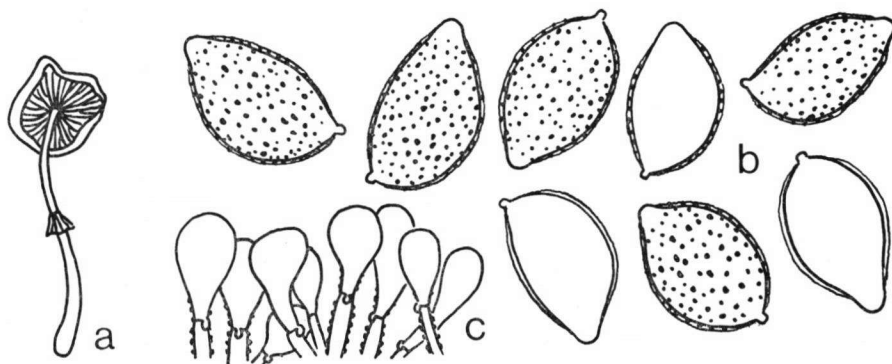


Fig. 6. *Descolea recedens*. — a. Carpophore (dried material; nat. size). — b. Spores (2000  $\times$ ). — c. Cuticle (500  $\times$ ).

Recently Singer (1969: 218) expressed the opinion that *D. antarctica* and *D. recedens* are conspecific, and are one of the first examples of a non-cosmopolitan fungus occurring on both sides of the Pacific. But the details presented in this study clearly show that the two taxa are distinct and should therefore be kept apart.

There is no doubt that *D. recedens* is not only closely related to *D. pallida* in Patagonia but also to *D. gunnii* in New Zealand. All three species have the same type of spore ornamentation (consisting of small warts) and the colours of the fruiting bodies are also quite similar. However, the macroscopic characters differ in so many ways (for example the cuticle, the presence of a velum universale and the distribution of its remnants, the occurrence of cheilocystidia, etc.) that well-established and independent taxa are defined.

### 5. *Descolea gunnii* (Berk.) Horak, *comb. nov.*—Figs 2d, 7

*Scotium gunnii* Berk. *apud* Massee in Grevillea 19: 96. 1891 (basionym).

Pileus 10–45 mm diam., hemispherical when young, later becoming convex or umbonate and expanded; dark (date) brown, sometimes even umber brown but also becoming ochraceous in old fruiting bodies; always striate near the margin, hygrophanous, dry, densely and permanently covered by appressed fibrillose squamules of rusty or dark ochraceous colour. Lamellae (L 10–18, 13) adnate or emarginate-adnexed; argillaceous, turning brown, sometimes with whitish serrulate gill edge. Stipe 15–60 × 1.5–7 mm, cylindrical, when old often subclavate, fistulose; dry, apically whitish and farinaceous, below the striate, permanent, submobile ring (sometimes attached near the base) densely covered with squarrose, upwards pointed, ochraceous or golden yellow scales from the velum universale. Context brown, not gelatinous. Smell and taste not distinctive.

Spores 9.5–12 × 6–7  $\mu$ , sublimoniform, verrucose with smooth mucro, isolated warts embedded in brownish perispore, without particular plage, germ pore absent. Basidia 30–38 × 10  $\mu$ , 4-spored, Cheilocystidia 30–60 × 7–13  $\mu$ , cylindrical or fusoid, thin-walled, forming a sterile zone at the gill edge. Cuticle consisting of clavate cells, 12–40 × 8–20  $\mu$ , forming an epithelium; hyphae thin-walled, strongly encrusted with brown pigment, not gelatinized. Hyphae of the velum universale cylindrical, thin-walled, encrusted, with clamp-connections.

HABITAT: on soil or on rotten wood in forests (various species of *Nothofagus*, *Leptospermum*, etc.). New Zealand.

COLLECTIONS EXAMINED:

#### NEW ZEALAND

**North Island:** Auckland, Titirangi Range, Atkinson Park, 8 Oct., 1967, R. F. R. McNabb & E. Horak, on soil or rotten trunks of *Cyathea dealbata* under *Agathis*, *Leptospermum*, etc. (Herb. HK., ZT 67/145); Rotorua, Te Weranga Pool, 15 July 1968, E. Horak, under *Leptospermum scoparium* and *L. ericoides* (Herb. HK., ZT 68/668); Rotorua, Sulphur Springs, Gunn 257 (type, K).

**South Island:** Prov. Nelson, Lewis Pass, Springs Junction, 5 Dec. 1967, E. Horak, on rotten wood under *Nothofagus fusca* (Herb. HK., ZT. 67/208); Prov. Westcoast, Kopara, 13 Dec. 1967, E. Horak, among litter and on rotten wood under

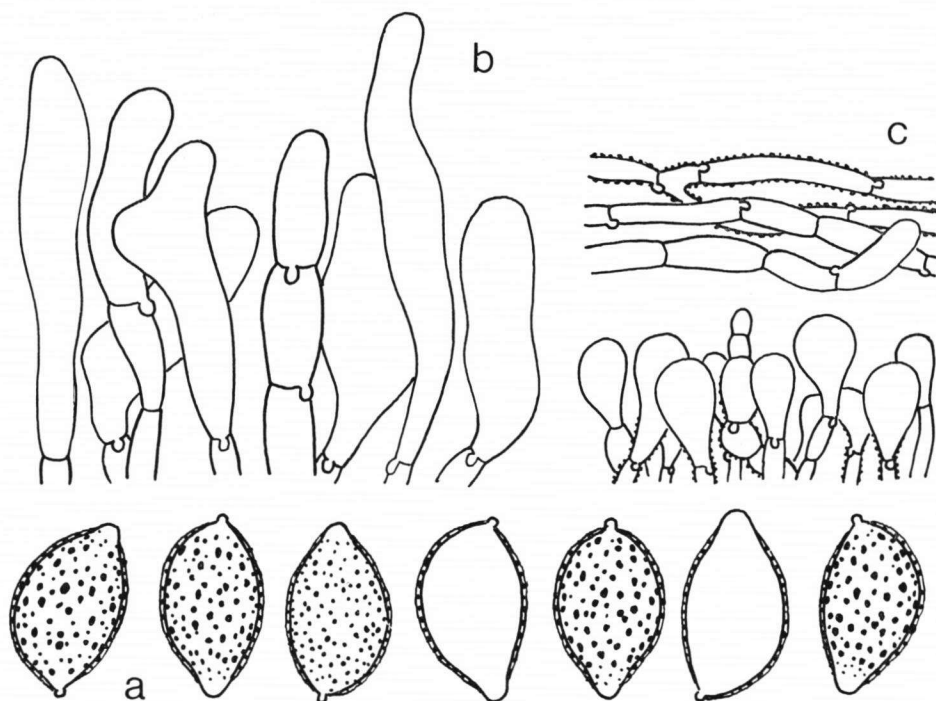


Fig. 7. *Descolea gunnii*. — a. Spores (2000  $\times$ ). — b. Cheilocystidia (1000  $\times$ ). — c. Cuticle (500  $\times$ ).

*Nothofagus fusca* (Herb. HK., ZT 67/251); Prov. Westcoast, Karamea, Opara Road, 30 Dec. 1967, R. F. R. McNabb, under *Leptospermum scoparium* (Herb. HK., ZT 68/84).

This species occurs frequently in all kinds of forests in New Zealand, probably forming a facultative mycorrhizal association with species of *Nothofagus* and *Leptospermum* as well.

*Secotium gunnii* Berkeley, as the examination of the type specimen showed, undoubtedly belongs to *Descolea*. The spores observed are characteristic and fragments of the obviously striate ring can still be seen in the poorly preserved collection.

## 6. *Descolea phlebophora* Horak, *spec. nov.*—Figs. 2e, 8

Pileo 10–30 mm lato, hemisphaerico deinde campanulato, ex carneo-brunneo hepatico, sicco, distincte rugoso. Lamellis adnaxis, brunneolo-ochraceis, mox ochraceo-ferrugineis, intermixtis. Stipite 30–70  $\times$  2–6 mm, cylindraceo vel apicem versus attenuato, fistuloso, sicco, pileo concolori vel pallidiori, annulo albo immobili striato instructo, basin versus zonis albis

nonnullis numquam squarrosis cingulato. Carne brunneola. Odore saporeque fructuolentis vel farinaceis. Sporis  $8-11.5 \times 5-6 \mu$ , amygdaliformibus, minute verrucosis, subtruncatis. Cheilocystidiis clavatis vel ampullaceis,  $20-35 \times 5-10 \mu$ , tenuitunicatis. Epicute e cellulis clavatis,  $20-35 \times 10-20 \mu$ , epithelium efformantibus, pigmento brunneo incrustatis, fibuligeris, membrana hyphorum haud gelatinosa. Inter folia deiecta in silvis praecipue nothofagineis. Novazelandia. Holotypus: Novazelandia, Lake Rotoiti, 30. IV. 1969, E. Horak (Herb. HK., ZT 69/274).

Pileus 10–30 mm diam., hemispherical when young, later becoming campanulate or umbonate, rarely flat and expanded; reddish brown, liver brown or sometimes dark melleous; dry, hygrophanous, at the centre deeply wrinkled and radially veined, striate near the margin, veil remnants absent. Lamellae adnexed, crowded; pallid brownish, ochraceous or rusty brown at maturity; edge whitish, finely fimbriate. Stipe 30–70  $\times$  2–6 mm, cylindrical or attenuated upwards, solid, later fistulose; concolorous with the pileus or lighter; dry, densely covered by white silky fibrils, towards the base with several white conspicuous bands of the velum universale, never squarrose or scaly; ring white, striate (sometimes smooth), persistent, immobile. Context brownish. Smell and taste fruity or intensely farinaceous.

Spores  $8-11.5 \times 5-6 \mu$ , amygdaliform, minutely warted, warts sometimes even covering the indistinct mucro, germ pore or plage absent. Basidia  $25-34 \times 5-8 \mu$ , 4-spored. Cheilocystidia  $20-35 \times 5-10 \mu$ , clavate or ampullaceous, indistinct, forming a sterile zone at the gill edge. Cuticle consisting of clavate cells,  $20-35 \times 10-20 \mu$ , rarely 1-layered, usually forming several horizons (see Fig. 6), strongly encrusted with brown pigment; membrane not gelatinized. All hyphae with clamp connections.

HABITAT: Among litter, mainly in *Nothofagus* forests (*N. cliffortioides*, *N. fusca*, *N. menziesii*; occasionally mixed with species of *Leptospermum*). New Zealand.

COLLECTIONS EXAMINED:

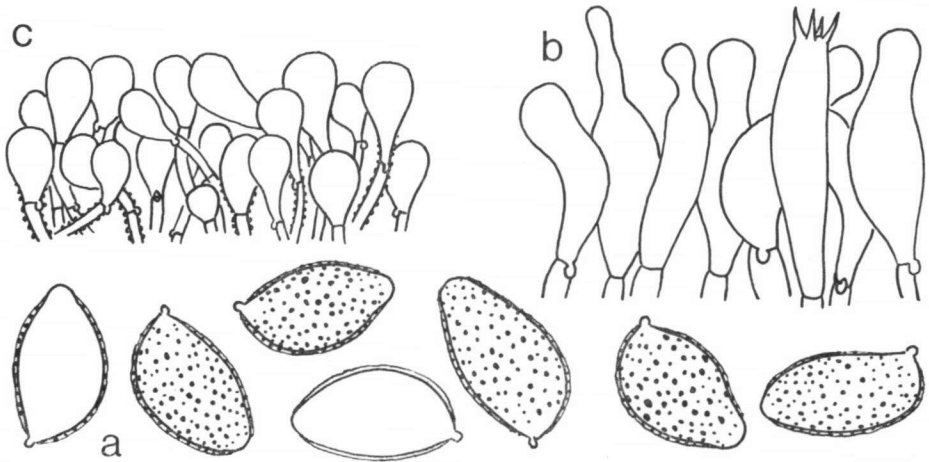


Fig. 8. *Descolea phlebophora*. — a. Spores (2000  $\times$ ). — b. Cheilocystidia (1000  $\times$ ). — c. Cuticle (500  $\times$ ).

## NEW ZEALAND

South Island: Prov. Nelson, Lake Rotoiti, 23 May 1968, *E. Horak*, under species of *Nothofagus* and *Leptospermum* (Herb. HK., ZT 68/500); Lake Rotoiti, St. Arnaud, 30 April 1969, *E. Horak*, under species of *Nothofagus* (holotype, Herb. HK., ZT 69/274).

This species is easily recognizable by its deeply wrinkled and veined pileus and the conspicuous white remnants of the velum partiale and velum universale. Thus *D. phlebotomophora*, which has roughly the same ecological requirements as *D. gunnii* differs from it morphologically in the absence of scales towards the base of the stipe and the liver brown colour of the pileus respectively. Owing to these characters both taxa can be readily identified in the field.

7. *Descolea pretiosa* Horak, *spec. nov.*—Figs. 2f, 9

Pileo 70–85 mm lato, ex obtuso-conico plano-convexo, fusco (humido olivaceo-tincto vel spadiceo) dein bruno-ochraceo, sicco, in centro rugoso, squamis concoloribus dense instructo, primo margine appendiculato. Lamellis adnexis, argillaceis dein tabacinis. Stipite 75–80 × 11–13 mm, cylindrico, apicem versus attenuato, stramineo vel tabacino, sicco, basin versus squamis concoloribus instructo, annulo amplo, membranaceo, perstriato et margine dentato instructo. Carne pallide straminea. Odore saporeque rancidis. Sporis 12–14.5 × 7–8 μ, sublimoniformibus, grosse verrucosis, mucronatis. Basidiis 36–40 × 8 μ, 4-sporigeris. Cystidiis nullis. Epicute e cellulis clavatis, 15–36 × 10–23 μ, epithelium efformantibus, membrana hyphorum haud gelatinosa, pigmento brunneo instructis, fibuligeris. Sub arboribus (*Abies*, *Picea*, *Taxus*). Himalaya, India. Holotypus: India, Himachal Pradesh, Narkanda, 8. VIII. 1964, R. A. Maas Geesteranus 14192 (L); pars holotypi (Herb. HK., ZT 70/274).

Pileus 70–85 mm diam., irregularly obtuse-conical with inflected margin at first, later becoming plano-conical to plano-convex with broad, somewhat truncate umbo, strongly rugulose; hygrophamous, dry; fuscous with slight olivaceous tinge to date brown when moist, becoming rich brownish ochraceous (with very faint olivaceous tinge) when dry, with crowded ochraceous brown to pale ochraceous yellow, small, floccose, loose scales; surface between scales somewhat furfuraceous; while pileus still closed, edge of pileus conspicuously rusty ochraceous brown dentate-appendiculate. Lamellae rather crowded, 3–7 short gills between each pair; rich tobacco brown (= rich ochraceous brown with very slight olivaceous tinge), more or less clay-coloured when young, somewhat paler near the very slightly irregular edge, densely venose transversely, adnexed to very narrowly adnate. Stipe 75–80 × 11–13 mm, attenuate upwards; at first pale stramineous buff, more brownish yellow downward and with pale tobacco brown tinge below, later entire stem tending to the same colour as the gills; near the base with some irregular girdles of appressed, felted, more or less concolorous scales, slightly appressedly and longitudinally fibrillose above the ring, more loosely fibrillose and concolorous below; ring very remarkable, felted submembranous, rather thick, persistent, pendent-patent, with sharp upper edge, strongly grooved to nearly lamellate on the upper side, with dentate edge when young; approximately concolorous with the stem. Context pallid in the pileus, pale stramineous in the stem and adjacent part of the pileus. Smell rancid when cut. Taste strongly rancid.

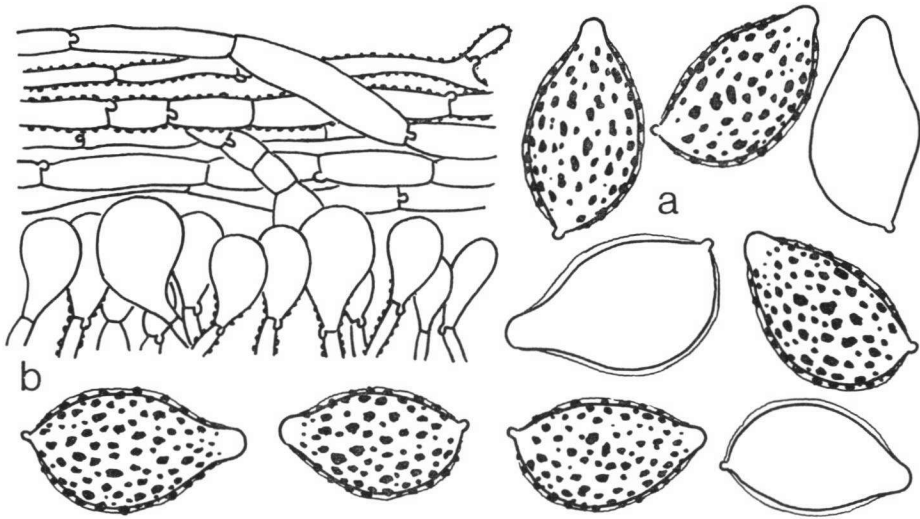


Fig. 9. *Descolea pretiosa*. — a. Spores (2000 ×). — b. Cuticle (500 ×).

Spore print light chocolate brown when fresh. Spores  $12-14.5 \times 7-8 \mu$ , lemon-shaped, strongly verrucose by isolated warts, mucro distinct and smooth, germ pore and plage absent. Basidia  $36-40 \times 8 \mu$ , 4-spored. Cheilocystidia absent. Cuticle consisting of clavate cells,  $15-36 \times 10-23 \mu$ , forming an epithelium; hyphae thin-walled, not gelatinized, strongly encrusted with brown pigment, with clamp connections.

HABITAT: Terrestrial in coniferous forest, Narkanda, India.

COLLECTION EXAMINED:

#### INDIA

Himachal Pradesh: Simla Hills, Narkanda, 8 Aug. 1964, R. A. Maas Geesteranus 14192, in forest of *Abies pindrow*, *Picea smithiana*, *Taxus*, with *Fragaria* and *Prunella* covering the soil, on north-exposed slope, 2750 m alt. (holotype, L; part o holotype, Herb. HK., ZT 70/274).

*Descolea pretiosa* and *D. majestatica* of New Zealand are conspicuously connected by reason of the large size of their fruiting bodies, the olive tinge of the colours, the scales near the base of the stipe, and the characters of the spores.

#### 8. *Descolea flavo-annulata* (Vasilieva) Horak, *comb. nov.*—Fig. 10

*Rozites flavo-annulata* Vasilieva in Bot. Mater. Inst. spor. Rast. 6: 199. 1950 (basionym).

Pileus 50–80 mm broad, subglobose to convex, then expanded and obtusely umbonate; surface not viscid, radially wrinkled; melleous ocher to dark brown



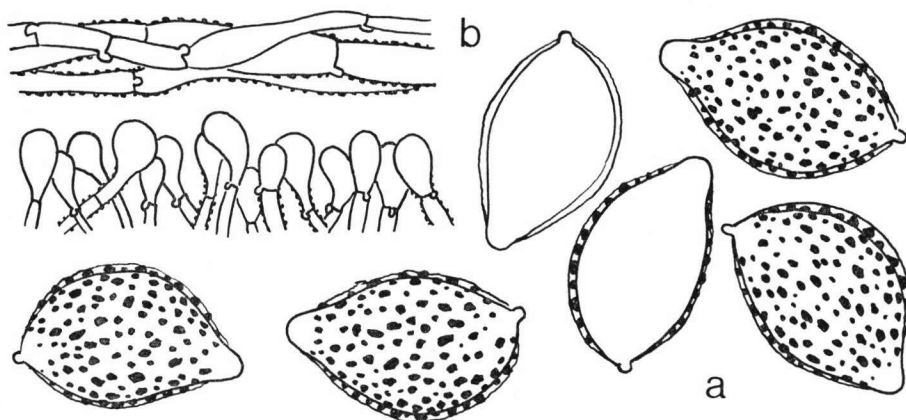


Fig. 10. *Descolea flavo-annulata*. — a. Spores (2000 ×). — b. Cuticle (500 ×).

(burnt umber or van Dyke brown); sprinkled with concentrically arranged, small, floccose, yellow fragments of the universal veil. Lamellae adnate, then separating, subdistant, broad; yellowish, then dark rusty cinnamon; edge yellow and minutely fimbriate. Stipe 60–100 × 7–10 mm, equal, with subbulbous base, ochraceous yellow, paler at the apex, somewhat brownish from the base upwards; solid; the universal veil felty and often cohering at the base in the form of a rudimentary volva; ring yellow, membranous, striate, rather fugacious. Smell and taste unknown.

Spores (11–)12–16 × 8–9  $\mu$ , lemon-shaped, coarsely verrucose, with prominent smooth mucro, perispore distinct, rust brown. Basidia 35–45 × 10–12  $\mu$ , 4-spored. Cheilocystidia 30–40 × 7–15  $\mu$ , clavate, forming a sterile zone at the gill edge. Cuticle consisting of clavate cells, 10–25 × 6–15  $\mu$ , forming a distinct epithelium; membrane of the hyphae strongly encrusted with rust brown pigment, not gelatinized. Hyphae of the remnants of the velum universale cylindrical, heavily encrusted with pigment, with clamp connections.

HABITAT: On the ground in various forest associations (under *Pinus*, *Larix*, *Quercus*, *Castanopsis*). Far eastern Siberia (type), Japan.

COLLECTION EXAMINED:

#### JAPAN

K y u s h u: Oita Pref., Mt. Kurodake, 26 Oct. 1968, T. Hongo, in forest of *Quercus serrata* (Herb. HK., ZT 70/325).

The type of *D. flavo-annulata* could not be studied but a collection was examined which T. Hongo had made in Japan. A comparison of the original description of *D. flavo-annulata* (translated by Moser, 1953: 164) with the observations made on the Japanese fungi showed no apparent differences. Hence the description given by Hongo (1966: 57) is faithfully copied and some as yet undescribed microscopic data are added.

By the presence of the large, strongly warted spores *D. flavo-annulata* could be

identified with *D. pretiosa*, also occurring in the northern hemisphere, and the rather atypical *D. majestatica* from New Zealand. Like *D. majestatica*, systematically *D. flavo-annulata* falls close to *Rozites*, even though the remnants of the velum universale cohere as a volva at the base of the stipe. But the characteristic spores and the structure of the cuticle clearly place this fungus in *Descolea*.

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