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STUDIES IN CLITOPILUS (BASIDIOMYCETES, AGARICALES) IN EUROPE

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Clitopilus paxilloides Noordel., spec. nov., a grey-brown paxilloid taxon from mixed boreal forest is described from Norway. Descriptions are given of *C. rhodophyllus* (Bres.) Sing. and *C. passeckerianus* (Pilát) Sing. with a discussion on the taxonomic and nomenclatural problems involved with these pleurotoid taxa. A key is given to all taxa known from Europe.

The genus *Clitopilus* is a small genus in the Entolomataceae, characterized by a clitocyboid, omphalioid, or pleurotoid basidiocarp, pink or pinkish brown spore-print, and ellipsoid spores, with more or less conspicuous longitudinal ribs, appearing angular in polar view. The basidiocarps are usually white, rarely pigmented. Although the genus is relatively well known (Fayod, 1889; Josserand, 1937, 1955; Pegler, 1975; Singer, 1946; 1978; Noordeloos, 1984, 1988), there still is the need of a critical revision of the taxa in section *Pleurotelloides*. This group comprises small, whitish, pleurotoid taxa of variable size and shape, that now are mainly distinguished on account of their growth-form, smell, spore-size and habitat. A critical study, also based on cultural, genetical, physiological and ecological characteristics would be very helpful to create a more sound species concept in this section.

KEY TO THE SPECIES

1a. Basidiocarp with well developed, centrally or more rarely eccentrically inserted stipe 2
b. Basidiocarp pleurotoid with short, eccentric or lateral, or entirely lacking stipe . . . 7
2a. Basidiocarp white or pallid, without visible pigmentation in cortical layers 3
b. Basidiocarp grey or grey-brown, with pigments in cortical layers 5
3a. Pileus 30–80 mm broad, hemispherical to convex, rarely concave, often with low, broad umbo; spores 10.5–12.5 × 5.0–6.5 µm . . . . . *C. prunulus*
b. Pileus 5–25 mm broad, convex, applanate or concave, with slightly depressed centre, rarely with small umbo; spores less than 10 µm long 4
4a. Smell none or farinaceous; spores 6.0–8.5 × 3.5–5.0 µm
C. scyphoides (Fr.: Fr.) Sing. var. *scyphoides*
b. Smell sweetish (fruit, aniseed); spores 7.0–10.0 × 3.5–5.0 µm
C. scyphoides var. *intermedius*
5a. Basidiocarp omphalioid; pileus 5–15 mm broad, umbilicate to infundibuliform, pale greyish-brown; pigment intracellular in pileipellis . . . . . *C. giovanellae*
b. Basidiocarp clitocyboid; pileus 20–65 mm broad, convex-umbonate, relatively intensely coloured; pigment incrusting in pileipellis 6

6a. Pileus 45–65 mm broad, relatively thick-fleshed, with strongly involute margin, grey to grey-brown, often with concentrically arranged darker spots; spores 9.5–13.5 × 5.5–7.0 µm ..... *C. paxilloides*
b. Pileus about 20 mm broad, relatively thin-fleshed, reddish brown; spores 8.0–9.5 × 4.0–4.5 µm. ..... *C. quisquiliaris*
7a. Basidiocarp growing on beds of cultivated mushrooms (on sterilized Horse-dung) 8
b. Basidiocarp growing on various types of vegetal debris, including wood, herbaceous plants and other fungi 9
8a. Spores 4.5–6.0 × 3.0–3.5(–4.0) µm; basidiocarp growing in dense, head-like clusters ..... *C. fasciculatus*
b. Spores 6.0–8.0 × 3.5–5.5 µm; basidiocarp single or in small groups *C. passeckerianus*
9a. Spores 3.5–4.0 µm broad ..... *C. scyphoides* f. *reductus*
b. Spores in average more than 5 µm broad 10
10a. Pileus 15–45 mm broad; lamellae ochre-pink or brownish pink; on deciduous logs *(Quercus, Ulmus)* in large groups; spores 7.0–9.5(–11.0) × 4.5–6.0 µm *C. rhodophyllus*
b. Pileus 2–15 mm; lamellae white then pale pink; on herbaceous plants, other fungi, rarely on rotten wood 11
11a. Spores (6.5–)7.5–8.5(–10.0) × 5.0–5.5(–6.0) µm ..... *C. hobsonii*
b. Spores (7.0–)8.0–11.5(–12.5) × 5.0–7.0 µm ..... *C. daamsii*

SECTION CLITOPILUS

Clitopilus paxilloides Noordel., *spec. nov.* — Fig. 1

Basidiomata solitaria vel subcongregata, paxillus similis. Pileus 45–65 mm latus, convexus, leviter depressus, toto griseo-brunneus vel griseo-brunneo maculatus, leviter hygrophanus, velutinus; lamellae decurrentes, arcuatae, albidae demum griseo-roseae; stipus 25–50 × 10–15 mm, versus basim attenuatus, griseo-brunneus pileo concolor vel pallide griseus; odore saporeque farinaceis.

Sporae 9.5–11.5 × 5.5–7.0 µm, amygdaliformae vel fusiformae, 5–8 costatae; basidia 4-sporigera, fibulata, cystidia nulla; pileipellis cutis vel trichoderma hyphis cylindraceae, 1.5–4 µm latae; subpellis compacta, elementis curtis distincte incrustatae; fibulae abundantae.

Ad terram inter muscos in silvis mixtis.

Holotypus. 'Fungi Norvegici / *Clitopilus paxilloides* Noordel. / leg. Thor Lunder s.n. / 19 Oct. 1984 / Buskerud, Helgelandsmoen near Hönefoss' (O, L).

Etymology. Paxilloides = resembling *Paxillus*.

Basidiocarps solitary or in small groups. Pileus 45–65 mm, convex with slightly depressed centre and involute margin, weakly hygrophanous, not translucently striate, uniformly grey-brown (K&W 5BC3, 5D3-4, 6D4-5), or with numerous grey-brown spots on slightly paler beige-grey background, dry, velutinous, somewhat pubescent at margin. Lamellae crowded, arcuate-decurrent, occasionally forked, cream-coloured then pinkish-grey with entire, concolorous edge. Stipe 25–50 × 10–15 mm, straight, usually tapering towards base, concolorous with pileus or paler, fibrillose lengthwise, white tomentose at base. Context firm and thick, grey in cortex of pileus and stipe, white in inner parts. Smell and taste strongly farinaceous.

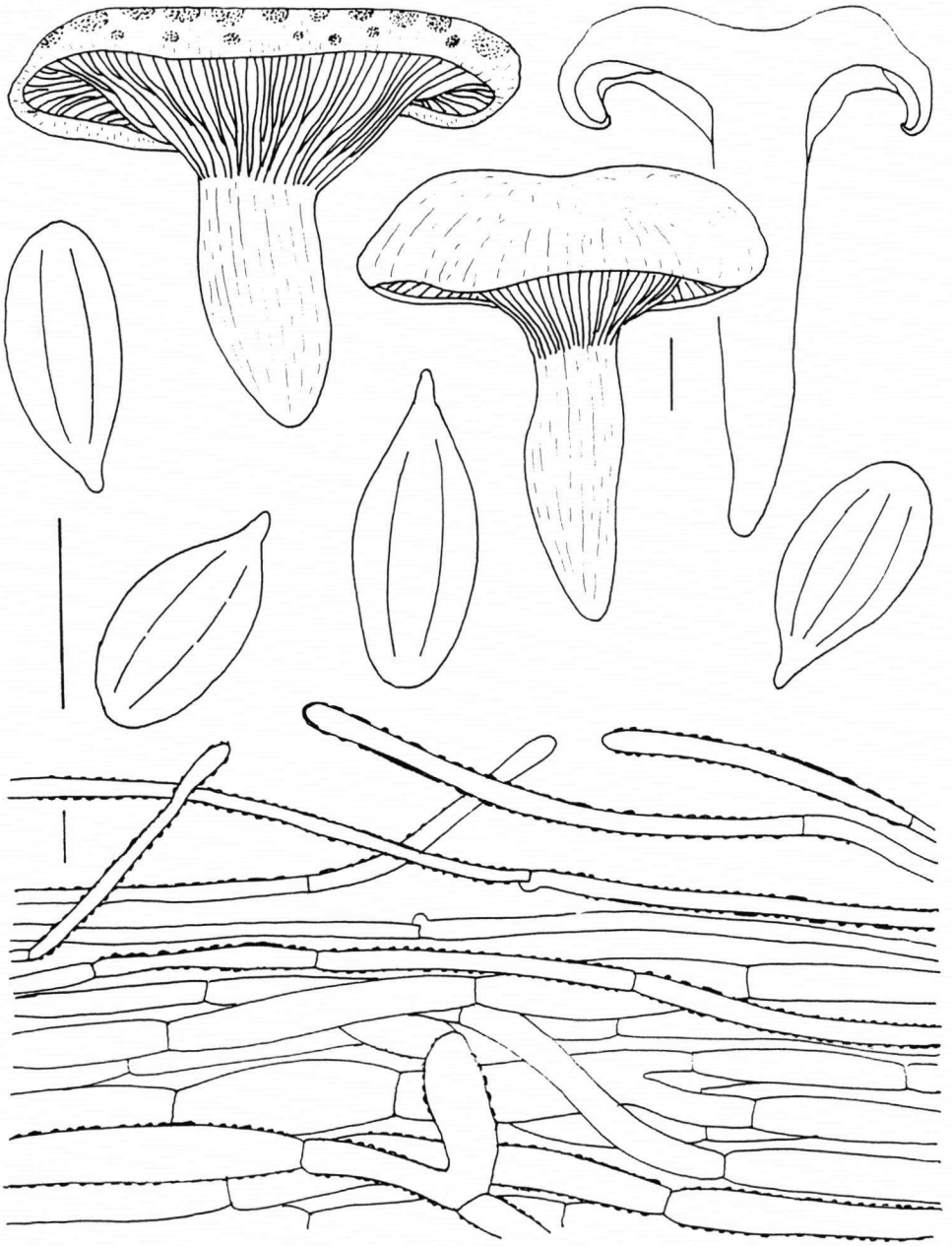

Fig. 1. *Clitopilus paxilloides*. Habit, spores, and pileipellis (bar equals 1 cm/10 μm).

Spores 9.5–13.5 × 5.5–7.0 µm average 11.5 × 6.0 µm, Q = 1.45–2.1, average Q = 1.75, very variable from ellipsoid to amygdaliform with 5–8, distinct longitudinal ribs, thin-walled, colourless in water, pinkish brown in mass. Basidia 30–50 × 8–10 µm, 4-, rarely also 2-spored, clamped. Lamella edge fertile. Cheilo- and pleurocystidia absent. Hymenophoral trama regular to subregular, made up of 4–10 µm wide, cylindrical or slightly inflated hyphae. Pileipellis a transition between a cutis and a trichoderm, made up of narrow, 2–5 µm wide, cylindrical hyphae, subpellis well developed, made up of short, inflated 2–10 µm wide elements. Pigment coarsely encrusting the hyphae of subpellis and upper pileitrama. Clamp-connections rare, only seen with certainty in hymenium.

Terrestrial among moss in mixed forest.

Collections examined. NORWAY, Buskerud, Helgelandsmoen near Hönefoss, 19 Oct. 1984, *Thor Lunder s.n.* (holotype, O, L); same locality: 13 Oct. 1985, *Thor Lunder s.n.* (O, L); Oslo, Lörenskog, 17 Oct. 1991, *L. Joly* (O).

The distinctive characters of *Clitopilus paxilloides* are the grey-brown colour of pileus and stipe, the habit with thick-fleshed pileus with strongly involute margin, resembling *Paxillus involutus,* and the encrusting pigment in the pileipellis. *Clitopilus prunulus* has whitish to very pale grey or cream carpophores, thinner flesh in the pileus, and lacks encrusting pigments. *Clitopilus quisquiliaris* (P. Karst.) Noordel. is a slender fungus with red-brown pileus and smaller spores (Noordeloos, 1981) and needs to be rediscovered.

SECTION PLEUROTELLOIDES SING.

Clitopilus rhodophyllus (Bres.) Sing. — Fig. 2

Pleurotus rhodophyllus Bres., Annls. mycol. 3 (1905) 159. — *Clitopilus rhodophyllus* (Bres.) Sing., Sydowia 15 (1961) 80.

Misapplied name. Clitopilus pinsitus sensu auct. (Josserand, Kühner & Romagnesi, Courtecuisse, and others).

Selected icones. Bres., Iconogr. mycol. (1929) tab. 295, fig. 1; Cetto, Funghi Vero 5 (1987) tab. 1858 (as *C. pinsitus*).

Selected literature. Josserand, Bull. Soc. mycol. Fr. 53 (1937) 212–213 (as *Pleurotus pinsitus*); Watling & Gregory, Br. Fung. Fl. 6 (1989) 115 (as *C. pinsitus*).

Original diagnosis

"*Pleurotus rhodophyllus* Bres. Caespitosus, raro simplex; pileus carnosis, flabelliformibus, siccis, albis, glabris, 1.5–4 cm latis, 1–3 cm productis; lamellis albis, dein incarnato-isabellinis, confertis, postice attenuato-decurrentibus; stipite laterali, albo, 2–3 mm longo crassoque, in caepitibus tuberculoso, unico; sporis hyalinis, in cumulo carneolis, oblongo-obovatis, 7–9 × 4–5 µ; basidiis clavatis, 20–25 × 8 µ; carne alba, molli, odore et sapore haud notabilis. Hab. ad truncos Ulmi campestris."

Description

Basidiocarp pleurotoid, growing in dense clusters. Pileus semicircular to spathulate, about 10–25 mm broad and up to 25 mm wide, more or less plano-convex with involute or deflexed margin, not hygrophanous, not translucently striate, whitish or rather pale cream-coloured with slight pink tinge, smooth, glabrous or somewhat hairy. Lamellae very crowded, L ≥ 40, l = 3–9, adnate or adnexed, narrowly ventricose, white then pale pink, finally brownish pink, with entire or slightly pruinose, concolorous edge. Stipe completely lacking. Context white. Smell and taste farinaceous.

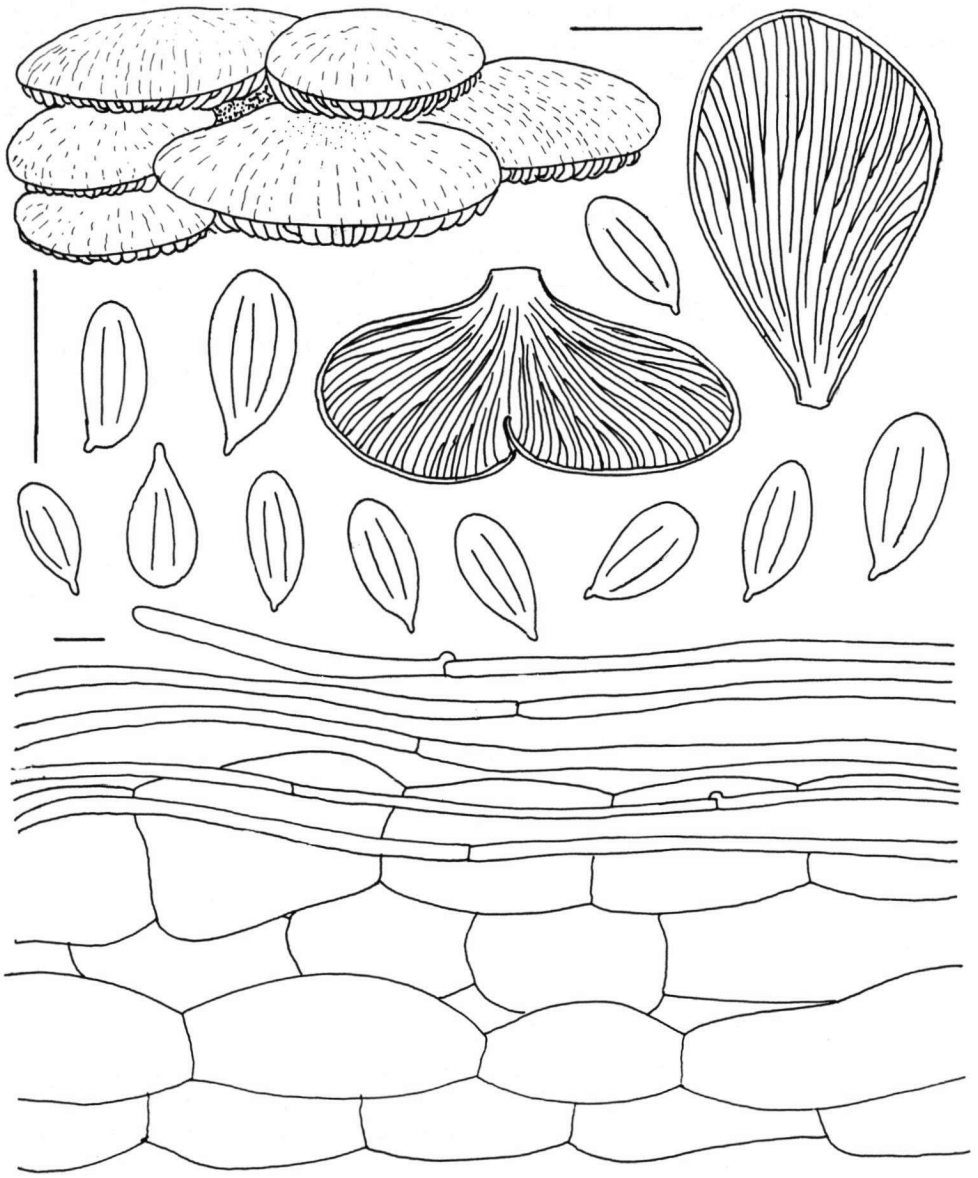

Fig. 2. *Clitopilus rhodophyllus*. Habit, spores, and pileipellis (bar equals 1 cm/10 µm).

Spores 7.0–9.5(–11.0) × 4.5–6.0 µm, average spore 8.5 × 5.2 µm, Q = 1.4–1.85, average Q = 1.6, ellipsoid to ovoid in side-view with weak longitudinal ridges, somewhat angular in polar view, thin-walled, colourless, cyanophilous. Basidia 23–27 × 5.5–7.5 µm, 4-spored, clampless. Lamella edge fertile. Cheilo- and pleurocystidia absent. Pileipellis a cutis of narrow, cylindrical hyphae, 2–4(–5) µm wide, without visible pigmenta-

tion. Pileitrama fairly irregular, made up of short, inflated elements, 15–45 × 7–20 µm. Clamp-connections absent.

In dense, imbricate clusters on decayed wood of *Ulmus* in old Park-forest.

Collection examined. THE NETHERLANDS, Prov. Utrecht, Nijenrode, 28 Oct. 1988, *Th.W. Kuijper 2965* (WBS).

The collection described above agrees well with *Clitopilus pinsitus* Fr. sensu Josserand (1937). *Agaricus pinsitus* Fr. in its original concept is a species with white spore-print (Fries, 1821), and furthermore there is no indication of pink lamellae. In our collection, and in the description of Josserand, the lamellae are definitely ochraceous-pink to brown-pink when mature, and the spore-print, which is produced abundantly, is pinkish-brown, like in other *Clitopilus* species. Therefore Josserand's interpretation of *Agaricus pinsitus* Fr. is considered as a misapplication. *Pleurotus rhodophyllus,* however, as described by Bresadola (1929), agrees in a very satisfactory way with our fungus, except for the smell, that is said to be indistinct.

Clitopilus rhodophyllus is a relatively poorly known species, that lacks modern descriptions. Kühner & Romagnesi (1953) key out both *Clitopilus pinsitus* sensu Josserand and *C. rhodophyllus,* and distinguish them on smell (*C. pinsitus* with strong farinaceous smell, *C. rhodophyllus* with inconspicuous smell), and a distinct separating zone between the pileitrama and hymenophoral trama, consisting of collapsed hyphae in the latter. I have not noticed such a layer in the Netherlands' collection. Courtecuisse (1986) keys out both taxa. *Clitopilus pinsitus* with pileus more broad than long, with strong farinaceous smell and growing on leaves, and *C. rhodophyllus* without smell, a pileus longer than broad, and growing on wood. The collection from the Netherlands is intermediate in this respect with relatively broad pilei, strong farinaceous smell growing on wood. Therefore the existence of two species is questioned. *Clitopilus passeckerianus* (Pilát) Sing. is also very similar (see below).

Clitopilus passeckerianus (Pilát) Sing. — Fig. 3

Pleurotus passeckerianus Pilát, Atl. Champ. Eur. II (1935) 49 (nom. nud., no Latin diagnosis). — *Clitopilus passeckerianus* (Pilát) Sing., Farlowia 2 (1946) 560.

Selected literature. Nathorst-Windahl, Friesia 9 (1969) 161; Runge, Z. Mykol. 50 (1984) 13–16; Watling & Gregory, Br. Fung. Fl. 6 (1989) 114–115.

Basidiocarp solitary or in small clusters. Pileus 5–50 mm broad, reniform to flabelliform or spathulate, not hygrophanous, white, silky-shining, fibrillose to subtomentose. Lamellae adnate to slightly decurrent, white then pale pink. Stipe strongly reduced, lateral or lacking, white, pruinose.

Spores 6.0–8.0 × 3.5–5.5 µm, average spore 6.5–7.7 × 4.0–5.0 µm, Q = 1.45–2.25, elliptical to elongate with 5–9, distinct ribs. Basidia 4-spored, clamped. Pileipellis a simple cutis of narrow hyphae, 2–5 µm wide. Clamp-connections present.

On mushroom-beds, but also found on decayed paper and on a waste heap in the open field; once found on snail-eggs.

Collections examined. UNITED KINGDOM, Herthshire, Chestnut, 25 Oct. 1951, *R.E. Taylor* (K); Kent, Canterbury, 8 Dec. 1934, *W.M. Ware* (K); Huntshire, Monk's Woods Experimental Station, 15 Dec. 1972, *S. Wells* (K); Kent. Worthing, 3 Febr. 1955, *Wood* (K); Northern Ireland, Belfast, 25 Sept. 1937,

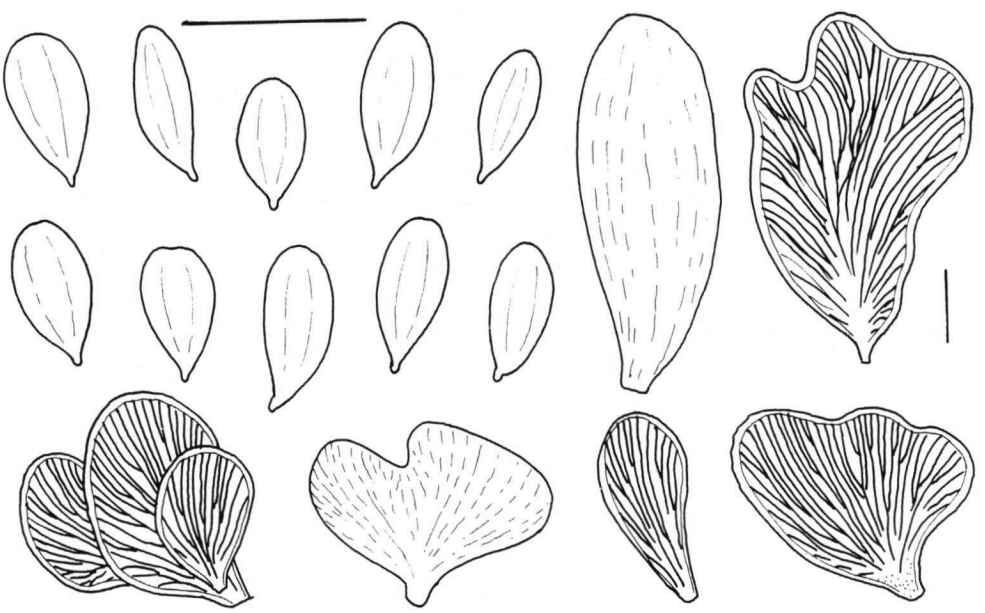

Fig. 3. *Clitopilus passeckerianus*. Habit and spores (bar equals 1cm/10 µm).

J.C. Taylor; Sweden, Västergötland, Göteborg, 22 Oct. 1942, *F. Karlvall* (Lundell & Nannfeldt, Fungi Exs. Suecici 2015, K).

I have not seen original material from Pilát, but I was able to study a number of collections of *Clitopilus passeckerianus* in the herbarium of the Royal Botanic Gardens, Kew. In general these collections strongly resemble *Clitopilus rhodophyllus*, except for the basidiocarps growing solitary or in small clusters, and the slightly smaller, and more distinctly ribbed spores. This agrees also with the description given by Watling & Gregory (1989). *Clitopilus fasciculatus* Noordel., also growing on mushroom-beds, has still smaller spores, and in addition a completely different growth-form with very dense, cauliflower-like clusters (Noordeloos, 1984). *Clitopilus hobsonii* is also very similar, but differs in having broader spores with distinct ribs, and usually has smaller basidiocarps, growing on vegetal debris, grasses etc. I agree with Watling & Gregory (l.c.) that the differences are small. It would be very interesting to study representatives of all taxa concerned in culture, trying to find out genetic differences, and studying the influence of substrate. For this reason I refrain from a formal validation of the epithet *passeckerianus*, awaiting more evidence as to the status of this taxon.

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