

**On the genus *Microporellus*, with two new species  
and one recombination (*M. papuensis* spec. nov.,  
*M. adextrinoideus* spec. nov., and *M. terrestris* comb. nov.)**

CONY DECOCK

Mycothèque de l'Université catholique de Louvain (MUCL, MBLA),  
Université catholique de Louvain, Place Croix du Sud 3, 1348 Louvain-la-Neuve, Belgium  
cony.decock@uclouvain.be

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*Microporellus papuensis* spec. nov. and *Microporellus adextrinoideus* spec. nov. are described from Papua New Guinea and Gabon, respectively. The new combination *Microporellus terrestris* is proposed. *Perenniporia cystidiata* is demonstrated to belong to *Microporellus*, but its status is uncertain, and for the time being, the name is left as a possible synonym of *M. violaceo-cinerascens*, which concept is in need of revision. The differences between *Microporellus*, *Navisporus*, and the *Perenniporia* complex are outlined.

**Keywords:** Africa, polypores, taxonomy, Neotropics, Southeast Asia

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*Microporellus papuensis* spec. nov. a *Microporellus adextrinoideus* spec. nov. jsou popsány, první z nich z ostrova Papua – Nová Guinea, druhý z Gabunu. Je publikována nová kombinace *Microporellus terrestris*. Je doloženo, že druh *Perenniporia cystidiata* patří do rodu *Microporellus*, ale jeho status je nejistý, a tak je toto jméno zatím považováno za možné synonymum druhu *M. violaceo-cinerascens*, který je však třeba revidovat. Jsou diskutovány rozdíly mezi rody *Microporellus*, *Navisporus* a *Perenniporia*.

INTRODUCTION

During a revision of some terrestrial, poroid fungi from various tropical areas left unnamed, two collections proved to belong to *Microporellus* Murrill. However, they both showed particular combinations of macro- and microscopic features and could not be satisfactorily identified to any of the currently described species (Corner 1987, Decock 2001, Decock and Ryvardeen 2002, Ryvardeen and Johansen 1980). They are described below as *Microporellus papuensis* spec. nov. and *Microporellus adextrinoideus* spec. nov.

Comparing these species with other possibly related taxa, two species came to our attention: *Perenniporia cystidiata* Dai et al., whose type originates from Taiwan (Dai et al. 2002), and *Navisporus terrestris* Gibertoni & Ryvarden, described from a single collection originating from Brazil (Gibertoni et al. 2004). Although described in different genera, both have a macro- and micro-morphology seemingly identical to that present in *Microporellus*, which was confirmed by the examination of their types. The new combination *Microporellus terrestris* is therefore proposed. *Perenniporia cystidiata* is of uncertain status, and for the time being the name is left as a possible synonym of *M. violaceo-cinerascens*.

The confusion between *Microporellus*, *Perenniporia* Murrill s. l. and, although to a lesser degree, *Navisporus* Ryvarden (in Ryvarden and Johansen 1980) is recurrent in literature (Decock 2001; Decock and Herrera Figueroa 2000; Decock and Ryvarden 1998, 2002, 2003). This confusion arises mainly from uncritical uses of basic morphological features (mitism, staining reactions in Melzer's reagent, wall thickness of basidiospores) or confusing generic concepts. In most previous treatments of *Perenniporia* and *Microporellus*, although with the remarkable exception of Corner (1989, 1993), the diversity of the hyphal systems, vegetative hyphae, and basidiospore morphology were poorly emphasised or analysed (Decock 2001); however, all these features are considered important for the taxonomy of polypores (Ryvarden 1991). The main characteristics of *Microporellus* are therefore critically analysed and compared with those of *Perenniporia*.

#### MATERIAL AND METHODS

The study is based on specimens from the herbaria GENT, K, LG, MUCL, O, and TFRI (herbarium acronyms are from Holmgren et al. 1990). Specimens were examined in Melzer's reagent, KOH 4 % and Lactic acid Cotton blue (Kirk et al. 2001). Colours are described according to K rnerup and Wanscher (1981). Pileus size is given as follows: length: from base to margin; width: from side to side; thickness: from pore to pileus surface. In the text, the abbreviations used are:  $\bar{x}$  = arithmetic mean, R = the ratio of length/width of basidiospores, and  $\bar{x}_R$  = arithmetic mean of the ratio R. All microscopic measurements were made in Melzer's reagent. In presenting the range of the size of microscopic elements, 5 % of the measurements were excluded from each end and are given in parentheses. Arithmetic means of different measurements are also provided.

## RESULTS

***Microporellus papuensis* Decock spec. nov.**

Figs. 1–3, 6–7

Basidiocarpus annuus, stipitatus, solitarius vel aggregatus. Stipes lateralis, robustus, usque 30 mm altus, 4–10 mm crassus, in sectione circularis, pallide griseo-aurantiacus. Pileus dimidiatus, applanatus vel convexus, diametro usque 40 mm, 10 mm crassus, glaber, laevis vel leviter undulatus, pallide griseo-aurantiacus, cum adumbratione violacea. Pori regulares, rotundi vel angulares (3–)4(–5)/mm, 150–225(–250)  $\mu\text{m}$  diametro, griseo-aurantiaci. Contextus usque 8 mm crassus, pallide suberis colore et consistentia. Tubi usque 2.5 mm crassi, pallide griseo-aurantiaci, consistentia firme suberosa. Systema hypharum dimiticum. Hyphae generativae fibulatae, hyalinae. Hyphae vegetativae skeletales, eramosae, aseptatae, crassitunicatae, dextrinoideae, cyanophilae, in stipite 3.0–5.0  $\mu\text{m}$ , in contextu (3.7)–4.0–5.8(–6.8)  $\mu\text{m}$ , in tubis (3.2)–3.4–4.5(–5.0)  $\mu\text{m}$  latae. Basidia tetrasterigmata. Basidiosporae ellipsoideae, subglobosae vel lacrimiformes, hyalinae vel pallide luteolae et leviter crassitunicatae, non (usque leviter) dextrinoideae, cyanophilae, 6.5–7.5(–8.0)  $\times$  5.0–6.0(–6.5)  $\mu\text{m}$ ,  $\bar{x} = 7.0 \times 5.6 \mu\text{m}$ , R = 1.1–1.4. Cystidia ventricosa vel fortiter ventricosa, apice rotundata, laevia usque valde incrustata, crassitunicata et apice valde crassitunicata, hyalina vel pallide luteola, non usque leviter dextrinoidea, cyanophila, (12–)14–35(–38)  $\times$  (9.5–)11–18.5(–20)  $\mu\text{m}$ .

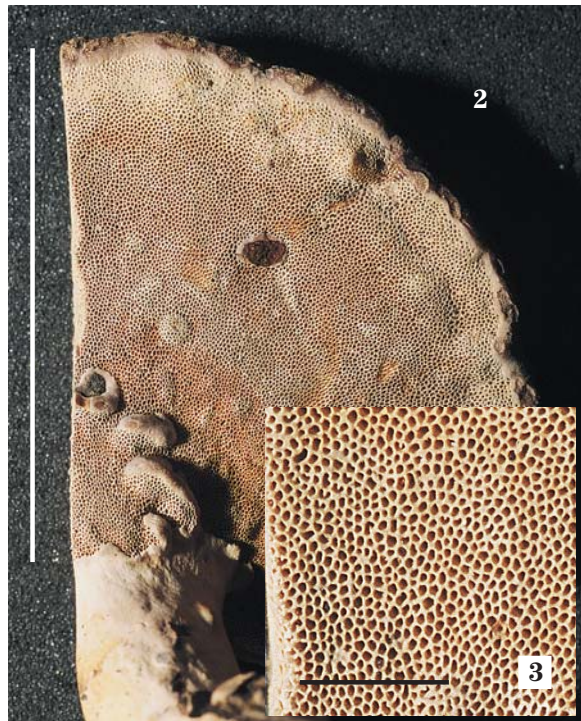
Basidiome annual, stipitate, solitary or several originating from the same basal mycelial sheet, embedded in soil and root fragments, free or fused in their pilei, light in weight, with a generally hard corky consistency when dried; stipe lateral, short, robust, round in section, very pale corky (pale greyish orange, [4–5][A–B]3, 5B2, marble white), 15–30 mm high, 4–10 mm in diam., up to 20 mm at the bulbous base, with a hard corky consistency; pileus pleuropodal, dimidiate, applanate to slightly convex, 20–40 long, up to 65 mm wide, from 1–2.5 mm thick at the margin to 10 mm thick at the base, surface glabrous, smooth or slightly concentrically wavy, especially near the margin, or radially sulcate (probably on drying), irregular near the base, homogeneously pale coloured, with some violet tints when fresh, greyish cream to pale corky on drying (pale greyish orange, 5B[2–3]), the margin darker in some places, faintly bluish grey (up to 5E2); margin regular, even, thin, slightly rounded; pore surface regular, greyish orange, cork coloured (5B[3–4]); pores regular, round to angular, (3–)4(–5)/mm, 150–225(–250)  $\mu\text{m}$  in diam., ( $\bar{x} = 199 \mu\text{m}$  diam.); dissepiments entire, smooth, 50–120  $\mu\text{m}$  thick ( $\bar{x} = 72 \mu\text{m}$ ); trama of the stipe homogeneous, pale greyish orange, pale corky coloured, with a corky consistency and a dense texture; context up to 8 mm thick at the base, down to 1 mm thick at the margin, homogeneous, very pale corky coloured (5B3), with a hard corky consistency and a dense fibrous texture when dried; tube layer up to 2.5 mm deep, concolorous with the context, of corky consistency and fibrous texture; hyphal system dimitic, identical in all part of the basidiome; generative hyphae hyaline, clamped, 2.5–3.0  $\mu\text{m}$  wide; vegetative hyphae dominating in all parts, in the form of long, unbranched skeletal hyphae, clamped at the basal septum, moderately thick-walled, often with a large lumen, which is more striking in the context, non-septate or with a few occasional

secondary septa near the thin-walled end, straight to occasionally knobbed (especially in the trama of the tubes), hyaline, strongly dextrinoid and cyanophilous; skeletal hyphae in the stipe and context loosely compacted, easily torn apart, progressively enlarging from 2.5–3.0  $\mu\text{m}$  wide at the basal septum to 5.5–8.3  $\mu\text{m}$  wide ( $\bar{x}$  = 6.8  $\mu\text{m}$ ), with a large lumen and occasionally collapsed; skeletal hyphae in the trama of the tubes compacted, enlarging from 2.0–2.3  $\mu\text{m}$  wide at the basal clamp to 2.5–3.5(–4.5)  $\mu\text{m}$  wide ( $\bar{x}$  = 3.1  $\mu\text{m}$ ); mature basidia not observed, mostly collapsed, if not then with four sterigmata; basidiospores subglobose to lacrymoid, with an eccentric apiculus, slightly thick-walled, commonly with one large central gutta, hyaline to faintly yellowish, non- or very slightly dextrinoid, cyanophilous, 6.5–7.5(–8.0)  $\times$  5.0–6.0(–6.5)  $\mu\text{m}$ , ( $\bar{x}$  = 7.0  $\times$  5.6  $\mu\text{m}$ ), R = 1.1–1.4, ( $\bar{x}_R$  = 1.2); cystidia present but not abundant, ventricose to strongly ventricose, the apex obtuse, slightly to coarsely incrustated, slightly thick-walled in the basal part and with wall occluding the lumen in the apical part, hyaline, slightly dextrinoid, (12–)14–35(–38)  $\times$  (9.5–)11–18.5(–20)  $\mu\text{m}$ , ( $\bar{x}$  = 24.0  $\times$  15.0  $\mu\text{m}$ ); chlamydospores absent; type of rot: unknown; sexuality: unknown; cultural features: unknown; substrate: forest floor (possibly connected to buried root, V. Demoulin, pers. com.); distribution: known only from the type locality, Prov. Madang, Papua New Guinea.

**Holotype:** Papua New Guinea, Prov. Madang, south west of Bogia, on the road to Naupi, UTM BR 7324, on soil (buried root?), in relatively dry forest, 22 Jul. 1988, V. Demoulin no. 7196, in herbarium LG (isotype in herbarium MUCL as MUCL 49405).

**Remarks.** *Microporellus papuensis* is characterised by stipitate basidiomes with pleuropodal, appanate to slightly convex pilei which are whitish to greyish white (Fig. 1) with some violet tints when fresh (V. Demoulin, pers. com.), a character that disappeared on drying, medium-sized pores, hymenial cystidia (Fig. 6), and subglobose to lacrymoid basidiospores (Fig. 7), 6.5–7.5  $\times$  5.0–6.0  $\mu\text{m}$  ( $\bar{x}$  = 7.0  $\times$  5.6  $\mu\text{m}$ ) in size.

Two other species occurring in Southeast Asia could be compared to *M. papuensis*, viz. *M. violaceo-cinerascens* (Petch) David & Rajchenb. and *M. pahangensis* Corner [Malaya: Pahang, Tembeling, on the ground in the forest, growing from buried wood, 15 Nov. 1930, E. J. H. Corner, E (E00186411), holotype]. They both differ in having commonly flabelliform, ascending and variably “shortly villous strigose”, “hairy” pilei (Corner 1987), with loosely to densely aggregated, erected fascicules of hyphae up to 300  $\mu\text{m}$  long (pers. obs.) in the former, and minutely tomentose [subtiliter tomentosus] (Petch 1916) to pubescent (Ryvarden and Johansen 1980) in the latter. The stipe and pileus of *M. papuensis* lack any tomentum or fascicules of hyphae. Both *M. violaceo-cinerascens* and *M. pahangensis* have also larger pores ranging from 1–3/mm (Corner 1987, Hattori and Murakami 1993, Ryvarden and Johansen 1980).



**Figs. 1-3.** *Microporellus papuensis*.  
1. Basidiomes (upper surface, scale bar = 40 mm).  
2. Basidiomes, pore surface (scale bar = 35 mm).  
3. Basidiomes, detail of the pore surface (scale bar = 2.5 mm).



**Figs. 4–5.** *Microporellus adextrinoideus*. 4. Basidiomes, upper view (scale bar = 25 mm). 5. Basidiomes, pore surface (scale bar = 15 mm).

*Microporellus inusitatus* (Lloyd) Corner (recombination also made by Ryvar den 1990), originally described from Southeast Asia (Malaysia, Lloyd 1925) has flabelliform to infundibuliform pilei, occasionally whitish but more commonly with a brownish tan, greyish brown, or pale vinaceous coloured as illustrated by Corner (1987). Its basidiospores are slightly smaller and more distinctly globose than in *M. papuensis*, viz.  $5\text{--}6 \times 5\text{--}6 \mu\text{m}$  in the type (fide Ryvar den 1990) or  $5\text{--}7 \times 5\text{--}6 \mu\text{m}$  (fide Corner 1987). Corner (1987) recognised also several varieties within *M. inusitatus*, two of them (var. *parvisporus* Corner and var. *lateritius* Corner) having even smaller basidiospores, viz.  $4.3\text{--}5.5 \times 3.7\text{--}4.7 \mu\text{m}$ . Furthermore, neither Corner (1987) nor Ryvar den (1990) reported cystidia in that species.

*Microporellus braziliensis* Decock & Ryvar den has also a white to greyish, convex (conchate) pileus when fresh, but is easily distinguished by having smaller basidiospores,  $4.0\text{--}5.0 \times 3.8\text{--}4.5 \mu\text{m}$ , and occurring in Neotropical areas, where the species is in all probability endemic (Decock and Ryvar den 2002).

***Microporellus adextrinoideus* Decock spec. nov.**

Figs. 4–5, 8–9

Basidiocarpus annuus, stipitatus, solitarius. Stipes lateralis, robustus, 16–25 mm elatus, 3–5 mm crassus, in sectione circularis vel irregularis, pallide griseo-aurantiacus. Pileus solitarius dimidiatus, applanatus, 16–20 mm longus, 25–30 mm latus, 1–6 mm crassus, irregularis, laevis vel tuberculatus, glaber, griseo-aurantiacus, margine acuto. Pori irregulares, circulares vel angulares vel elongati, (0.5–)1–2 / mm, albidus vel pallide griseo-aurantiaci. Contextus usque 5 mm crassus, pallide griseo-aurantiacus, consistentia firme suberosa. Tubi usque 3.5 mm crassi, albidus vel pallide flavidi, consistentia firme suberosa. Systema hypharum dimiticum. Hyphae generativae fibulatae, hyalinae. Hyphae vegetativae skeletales, eramosae, aseptatae, crassitunicatae, non dextrinoideae, cyanophilae, in stipite  $4.2\text{--}6.3 \mu\text{m}$ , in contexto (4.0)–4.7–8.0–(9.0)  $\mu\text{m}$ , in tubis (2.8)–3.0–4.4–(5.0). Basidia tetrasterigmatica, clavata, cum constrictione apicale,  $25.0\text{--}28.0 \times 6.0\text{--}8.0 \mu\text{m}$ . Basidiosporae ellipsoideae, subgloboseae vel lacrimiformes, apiculatae, leviter crassitunicatae, hyalinae vel palide flavidae, haud usque leviter dextrinoideae, cyanophilae, (5.7–)6.0–7.0–(7.0  $\times$  (4.2–)4.2–5.0–(5.5)  $\mu\text{m}$ ,  $R = (1.2\text{--})1.2\text{--}1.6\text{--}(1.7)$  ( $\bar{x} = 6.4 \times 4.7 \mu\text{m}$ ,  $\bar{x}_R = 1.4$ ). Cystidia desunt.

Basidiome annual, stipitate, solitary, the total basidiome up to 26–30 mm high; stipe lateral to sublateral, erect, 16–25 mm long, 3–5 mm in diam., circular to irregular in section, the surface very pale corky coloured (orange white (5A2) to pale greyish orange, 5B3), dull, smooth to irregular, slightly tuberculate, glabrous, with a soft corky consistency when fresh, a corky consistency when dried; pileus dimidiate in pole view, applanate (slightly centrally depressed) in section, 16–20 mm long (base-margin), 25–30 mm wide (side to side), up to 6 mm thick at the base down to 1 mm at the margin, the surface irregular, slightly radially wrinkled, slightly tuberculate, glabrous, dull, mainly very pale corky near the margin (greyish orange 5B4), progressively darker near the centre, very pale brown (5C5, brownish orange, reddish blonde); margin thin, acute, regular in outline, very pale corky coloured (pale greyish orange 5B3); pore surface plane to descending, separated from the stipe, mainly pale coloured, whitish, very

pale greyish orange; pores rather irregular, round to angular, (0.5–)1–2/mm in tangential section, 300–450  $\mu\text{m}$  diam. ( $\bar{x}$  = 370  $\mu\text{m}$  in diam.), sometimes radially elongated, then up to 1 mm long, up to sublamellate in some parts of older specimens, then sinuous; dissepiments thin, entire, smooth, sinuous when sublamellate; trama of the stipe and context continuous, homogeneous, homogeneously greyish orange, cork-coloured (5B4), with a corky consistency and dense fibrous texture; context homogeneous, up to 5 mm thick at the base, down to 1–2 mm thick at the margin; tube layer single, (concolorous to) slightly paler than the context, up to 3.5 mm deep, with a corky consistency, a fibrous texture, more fragile in older, dried specimens; hyphal system dimitic, identical in all parts of the basidiome (stipe, context, and hymenophoral trama); generative hyphae hyaline, clamped, sparingly branched, 2.5–3.0  $\mu\text{m}$  wide; vegetative hyphae as non-branched skeletal hyphae, occasionally with some lateral branches arising close to the basal clamp but soon aborted, moderately thick-walled, often with a large lumen (lumen wider than the wall thickness), especially in the context, non-septate or rarely with few occasional secondary septa near the thin-walled end, straight to occasionally knobbed, hyaline, non-dextrinoid (yellowish in Melzer's reagent), cyanophilous; skeletal hyphae in the stipe and contextual trama densely compacted, progressively enlarging from 2.2–2.5  $\mu\text{m}$  wide at the basal septum to 3.7–5.5  $\mu\text{m}$  ( $\bar{x}$  = 4.6  $\mu\text{m}$ ); in the trama of the tubes enlarging from 2.0–2.3  $\mu\text{m}$  wide at the basal clamp to (2.5)–2.7–4.0–(4.5)  $\mu\text{m}$  wide ( $\bar{x}$  = 3.4  $\mu\text{m}$ ); basidia clamped at basal septum, clavate to slightly pedunculate, with a constriction in the upper third, 25–28  $\times$  6.0–8.0  $\mu\text{m}$ , with four rather large sterigmata; basidiolles (immature basidia) clavate to slightly pedunculate; basidiospores ellipsoid to broadly ellipsoid, up to subobovoid, with an eccentric apiculus, slightly thick-walled, occasionally with one large central gutta, hyaline to faintly yellowish, non-dextrinoid, cyanophilous, (5.7–)6.0–7.0(–7.0  $\times$  (4.2–)4.2–5.0(–5.5)  $\mu\text{m}$ , R = (1.2–)1.2–1.6(–1.7) ( $\bar{x}$  = 6.4  $\times$  4.7  $\mu\text{m}$ ,  $\bar{x}_R$  = 1.4); cystidia absent; chlamydospore absent; type of rot: unknown; sexuality: unknown; cultural features: unknown; substrate: humus at the base of a dead stump, among mosses; distribution: known only from the type locality, Gabon; habitat: Guineo-Congolian rainforest.

**Holotype:** Gabon, Province of Ogooué-Ivindo, Ivindo National Park, “Réserve intégrale d'Ipassa” Nature Reserve, near the bai of Mekadje, on soil, at the base of a dead stump of an unidentified angiosperm, among mosses, 12 Apr. 2006, C. Decock no. GA-06-184, in herbarium MUCL as MUCL 49398.

*Microporellus adextrinoideus* is characterised by small, stipitate, cork-coloured basidiomes (Fig. 4), large (1–2/mm), irregular to sublamellate pores (Fig. 5), absence of cystidia, non-dextrinoid vegetative hyphae, and ellipsoid to broadly ellipsoid basidiospores, averaging 6.4  $\times$  4.7  $\mu\text{m}$  (Fig. 9). It is, so far, the only *Microporellus* species having non-dextrinoid vegetative (skeletal) hyphae. Corner



(1987) reported *M. brunneus* Corner with non-dextrinoid vegetative hyphae, but the type of the latter name was demonstrated to represent a young specimen of *Amauroderma rugosum* (Blume & Nees : Fr.) Torrend (Hattori 2001).

Otherwise, *Microporellus adextrinoideus* reminds *M. straminellus* (Bres.) Decock & Ryvardeen [Indonesia: Java, on soil, v. Höhnelt no. 165, BPI, holotype] or *M. terrestris* (Gibertoni et al. 2004, see below), both with a cork-coloured pileus (at least when dried), large pores, and absence of hymenial cystidia. They differ by their strongly dextrinoid skeletal hyphae and basidiospores characteristics: more distinctly globose and slightly larger in *M. straminellus* (averaging  $7.1 \times 5.6 \mu\text{m}$ , with  $(\bar{x}_R = 1.2)$ ) (Decock and Ryvardeen 1998); elongated lacrymoid in *M. terrestris* (Gibertoni et al. 2004, see below).

*Microporellus clemensiae* (Murrill) Ryvardeen [Philippines: Mindanao, near camp Keithley, Lake Lanao, on dead roots, Sep.-Oct. 1907, M. S. Clement, NY, holotype] has similar basidiospores, both in shape and size, but much smaller pores, (5-)6-7/mm (fide Decock and Ryvardeen 2002).

***Microporellus terrestris*** (Gibertoni & Ryvardeen) Decock, **comb. nov.** Fig. 10

Basionym: *Navisporus terrestris* Gibertoni & Ryvardeen, in Gibertoni, Ryvardeen & Cavalcanti, Synopsis Fungorum 18 : 50, 2004.

A description can also be found in Gibertoni et al. (2004).

Basidiome annual, centrally stipitate, solitary; stipe erect, up to 35 mm long in total, 5-10 mm above the soil level, and up to 25 mm buried (then sinuous), 6-15 mm diam., the surface pale corky coloured (greyish orange, 5B[3-4]), smooth, and glabrous, circular to slightly ellipsoid in section; pileus mesopodal, circular in pole view, applanate to slightly infundibuliform in section, 35-55 mm in diam., the surface wavy, with a few large bands, slightly radially wrinkled, glabrous, dull, mainly pale corky near the margin (greyish orange 6B5), progressively darker near the centre, light brown (6D[5-6], sunburn, cinnamon) to brown (6E5, near leather brown); margin involute (when dried), mainly pale corky coloured (pale greyish orange to pale brownish orange, 5B[3-4]); pore surface irregular, slightly decurrent, mainly pale cork-coloured (greyish orange, 6B5); pores irregular, round to angular, (2-)3(-4)/mm, 300-450  $\mu\text{m}$  in diam. ( $\bar{x} = 370 \mu\text{m}$  in diam.); dissepiments thin, entire, smooth; trama of the stipe homogeneous, pale greyish corky coloured, with a corky consistency, a dense fibrous texture; context homogeneous, thin, 2-5 mm thick at the base, down to 1 mm thick at the margin, with a corky consistency, a fibrous texture, pale corky colored (pale greyish orange, 5B3); tube layer concolorous with the context or slightly darker, up to 3 mm deep, with a corky consistency and a fibrous texture; hyphal system dimitic, identical in all parts of the basidiomes (stipe, context, and hymenophoral trama); generative hyphae hyaline, clamped, 2.5-3.0  $\mu\text{m}$

wide; vegetative hyphae as non-branched skeletal hyphae, clamped at the basal septum, moderately thick-walled, often with a large lumen, especially in the context, and then often partly collapsed, non-septate or with a few occasional secondary septa near the thin-walled end, straight to occasionally knobbed, hyaline, strongly dextrinoid, cyanophilous; skeletal hyphae in the stipe and context loosely compacted, progressively enlarging from 2.3–2.8  $\mu\text{m}$  wide at the basal septum to (4.5–)5.0–8.0 ( $\bar{x}$  = 6.3  $\mu\text{m}$ ); in the trama of the tubes enlarging from 2.0–2.4  $\mu\text{m}$  wide at the basal clamp to (3.0)–3.4–4.5–(5.0)  $\mu\text{m}$  wide ( $\bar{x}$  = 3.6  $\mu\text{m}$ ); mature basidia not observed, mostly collapsed, immature ones with four sterigmata; basidiospores mostly ellipsoid to navicular, or elongated lacrymoid, with an eccentric apiculus, slightly thick-walled, commonly with one large central gutta, hyaline to faintly yellowish, non-dextrinoid, cyanophilous, (8.0–)8.0–10.5(–11.0)  $\times$  (3.5–)3.5–4.5(–5.0)  $\mu\text{m}$ , R = (1.9–)2.1–2.6(–2.9) ( $\bar{x}$  = 9.2  $\times$  4.0  $\mu\text{m}$ ,  $\bar{x}_R$  = 2.3); cystidia absent; chlamydospore absent; type of rot: unknown; sexuality: unknown; cultural features: unknown; substrate: forest floor (buried wood?); distribution: known only from the type locality, Brazil, Rio Grande do Norte State.

**Specimen studied:** Brazil, State of Rio Grande do Norte, Municipality of Baía Formosa, “Reserva Particular do Patrimônio Natural Senador Antônio Farias – Mata Estrela” Nature Reserve, on soil (next to *Caesalpinia echinata* Lam.), Jul. 2001, Tatiana B. Gibertoni no. 46, O (isotype).

**Remarks.** *Microporellus terrestris* is mainly characterised by the combination of stipitate basidiomes, mesopodal pilei, absence of cystidia, and ellipsoid to elongated lacrymoid basidiospores, 8.0–10.5  $\times$  3.5–4.5  $\mu\text{m}$  ( $\bar{x}$  = 9.2  $\times$  4.0  $\mu\text{m}$ ,  $\bar{x}_R$  = 2.3). Obviously, the basidiospore shape and size justified the original placement of this species in *Navisporus* (Gibertoni et al. 2004). However, as all other characters point to *Microporellus*, the species is best accommodated in the latter genus (but see the discussions below).

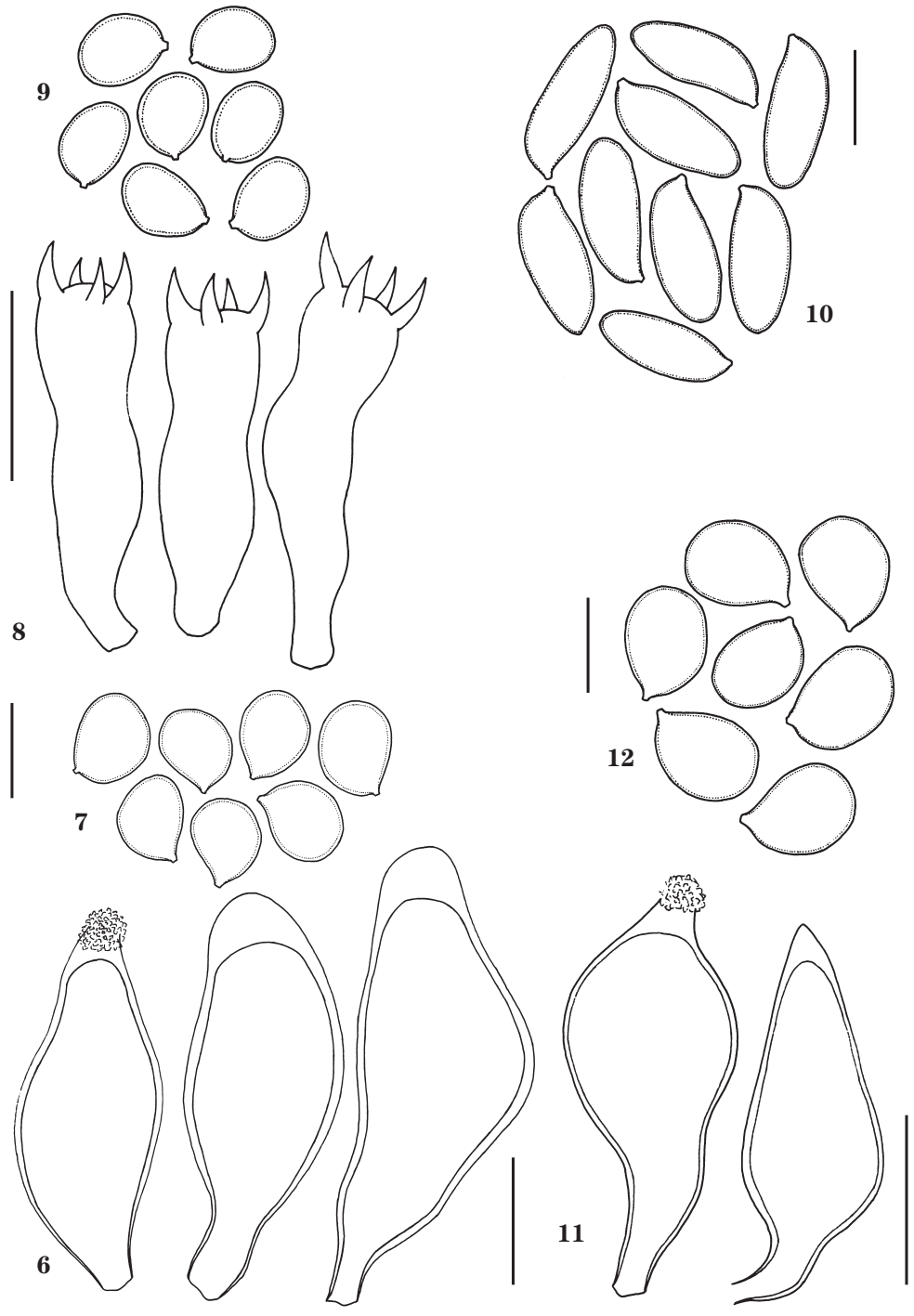
The basidiospores of *M. terrestris* strongly remind those of *M. ellipsosporus* Decock & Ryvarden [Senegal: Basse Casamance, Forêt des Bayottes, *Afzelia africana* forest, Amadou Ba, 21 Dec. 1985, D. Thoen, BR 066216,62 (holotype) and O (isotype)], which have a similar shape, but are slightly larger with R ranging from 1.7 to 2.3 (Decock and Ryvarden 2002). *Microporellus ellipsosporus* differs also from *M. terrestris* in having hymenial cystidia (Decock and Ryvarden 2002). It is so far known only from the type specimen originating from Central Africa.

**Figs. 6–7.** *Microporellus papuensis*. 6. Cystidia (scale bar = 10  $\mu\text{m}$ ). 7. Basidiospores (scale bar = 6  $\mu\text{m}$ ).

**Figs. 8–9.** *Microporellus adextrinoideus*. 8. Basidia (scale bar = 10  $\mu\text{m}$ ). 9. Basidiospores (scale bar = 6  $\mu\text{m}$ ).

**Fig. 10.** *Microporellus terrestris*. Basidiospores (scale bar = 6  $\mu\text{m}$ ).

**Figs. 11–12.** *Perenniporia cystidiata*. 11. Cystidia (scale bar = 10  $\mu\text{m}$ ). 12. Basidiospores (scale bar = 6  $\mu\text{m}$ ).



***Perenniporia cystidiata*** Dai et al., Mycotaxon 83: 209, 2002

Figs. 11–12

≡ *Microporellus violaceo-cinerascens* (Petch) David & Rajchenb., Mycotaxon 22: 303, 1985.

Specimen examined: Taiwan, Nantou, Lienhuachich, 23° 56' N – 120° 53' E, alt. 700 m., on soil, 5 Jul. 1995, W. N. Chou no. CWN 01011, in Herbarium TNMF 3505 (holotype).

Remarks: The main macro- and microscopic features of *P. cystidiata*, viz. its stipitate habit, dimittic hyphal system with strongly dextrinoid skeletal hyphae, ventricose cystidia (Fig. 11), and the slightly thick-walled, broadly ellipsoid, subglobose to lacrymoid, asymmetrical basidiospores (Fig. 12) obviously indicate *Microporellus* as the correct genus for this species. Furthermore, morphologically, and this is especially true if the microscopic characters are considered, the type of *P. cystidiata* shows many resemblance to *M. violaceo-cinerascens*. Consequently, *P. cystidiata* is considered a taxonomic synonym of the former.

#### DISCUSSION

*Microporellus* Murrill (1905) was originally described with *M. dealbatus* (Berk. & Curtis) Murrill as the type. David and Rajchenberg (1985) re-examined the type species emphasising its main features, among others a stipitate habit, a dimittic hyphal system with unbranched, dextrinoid skeletal hyphae, hymenial cystidia, and slightly thick-walled, hyaline, and cyanophilous basidiospores.

Corner (1987) confirmed after detailed observations the essential micro-features of the genus, but broadened the generic concept by including acystidiate taxa as well as some trimitic species. However, as later demonstrated (Hattori 2001, Decock and Ryvarden 2002), Corner's (1987) trimitic (or subtrimitic) species either do not belong to *Microporellus* or are of doubtful identity. Thus, *M. brunneus* and *M. subincarnatus* Corner were demonstrated to represent, respectively, *Amauroderma rugosum* (Hattori 2001) and *Perenniporia stipitata* Ryvarden (Decock and Ryvarden 2002). The taxon represented by *Microporellus burkillii* (Lloyd) Corner sensu Corner is uncertain (V. Demoulin, pers. com.). Hattori (2001) noted that it is identical to *M. fuliginosus* Corner. The type of *M. labyrinthiformis* was demonstrated to be sterile and unidentifiable, representing probably an "abnormal form of *Microporellus* or *Flabellophora*" (fide Hattori 2001), and its status remains uncertain.

Decock (2001) and Decock and Ryvarden (2002) enlarged the generic concept by including species with strictly or variably sessile basidiomes: *Microporellus celtis* (Chang & Chou) Decock, *Microporellus peninsularis* (Corner) Decock (both with sessile basidiomes), and *Microporellus braziliensis* (with variably ses-

sile to stipitate basidiomes), demonstrating the poor taxonomic significance of the pileus habit at genus or species level.

The addition of *M. adextrinoideus* still broadens the generic concept by including species with non-dextrinoid vegetative hyphae. The hyphal system, the morphology of the vegetative hyphae, and the basidiospore shape are otherwise in accordance with *Microporellus*, hence the placement. The taxonomic significance of the dextrinoidity of vegetative hyphae could be discussed but this character alone should not be considered critical at the genus level. There are other examples of polypore genera with species having variably dextrinoid, or totally non-dextrinoid vegetative hyphae; see for instance *Perenniporia* Murrill (Decock and Stalpers 2006b, Ryvarden and Gilbertson 1994), *Amauroderma* Murrill (Corner 1983), or even *Wrightoporia* Pouz. (Stalpers 1996).

### ***Microporellus* main features**

The main features of *Microporellus* are a pileate basidiome, either sessile or stipitate, light in weight when dried, a white to pale cream context and hymenophoral trama; a dimittic hyphal system with unbranched skeletal hyphae, hyphae thick-walled, never solid but with an open lumen (sometime widely open, especially in the context), hyaline, non- to strongly dextrinoid, and cyanophilous; hymenial cystidia if present commonly ventricose and apically mucronate or digitate, thick-walled with the wall distinctly thicker at the apex, the latter frequently as a solid mucro (frequently totally occluded, in other groups of fungi termed as “solid apical mucro” – Cléménçon 1997), apically smooth to lightly or coarsely incrustated; basidiospores subglobose, commonly lacrymoid to elongated-lacrymoid, with a slight adaxial depression near the apiculus, making them asymmetrical in side view, hyaline or faintly yellowish when older, slightly thick-walled, the wall cyanophilous, occasionally slightly dextrinoid, without germ pore, commonly with a large gutta; production of laccase in pure culture indicative of white rot [David and Rajchenberg 1984, pers. obs., checked in *M. violaceo-cinerascens* MUCL 45229 (Ethiopia) by drop tests with syringaldazine (Harkin and Obst 1974)]; tetrapolar sexuality (at least in *M. dealbatus*, David and Rajchenberg 1984); normal nuclear behaviour (at least in *M. dealbatus*, David and Rajchenberg 1984).

Some rare binding processes may occur occasionally, as illustrated by Decock (2001) in *M. peninsularis*. In the latter species, they originate deep in the older part of the context and, in all probability, do not participate in the construction of the basidiome (Decock 2001). The significance of these scattered binding processes is uncertain. It could represent meaningless growing artefacts, but also a residue (relict state) of a previous branching pattern. As well, some rare lateral

processes, soon aborting, can occasionally be observed in the very first part of vegetative hyphae development.

Cystidia in *Microporellus* are peculiar. They have no equivalent in other genera of poroid fungi, but in *Navisporus* Ryvarden in Ryvarden and Johansen, especially in *N. floccosus* (Bres.) Ryvarden in Ryvarden and Johansen (pers. obs.), and to a lesser degree in *Perenniporia latissima* (Bres.) Ryvarden (Decock 2001).

*Navisporus floccosus* is commonly described as acystidiate (Ryvarden and Johansen 1980, Ryvarden 1983, Torres-Torres et al. 2007). However, Roy and De (1980) did report hymenial cystidia in several collections originating from India, a fact overlooked by most authors. The presence of cystidia was confirmed in several specimens originating from Southeast Asia [Malaysia: on poisoned rubber stumps (*Ficus?*), 1961, R.R.I.M. no. 787, K (K(M): 100671); Papua New Guinea: Madang, Silibob, 5° 12' S, 145° 45' E, garden, on dead trunk, 29 Jan. 1997, R. Walley no. 793 (GENT)] and the Caribbean area [Cuba: Prov. Ciudad Habana, Escaleras de Jaruco, grassland by the side of the road, at the base of a living *Ficus*, 16 Jun. 2001, C. Decock & S. Oliva Herrera, MUCL 43445 (also in Herbarium HAC)]. It can be noted that cystidia were not observed in collections originating from Africa (pers. obs.) [Cameroon: on wood, near the station of Barombi, 06 Jun. 1890, Schweinfurth (S, holotype of *N. floccosus*); Gabon: Province of Ogooué-Ivindo, Ivindo National Park, “Réserve intégrale d’Ipassa” Nature Reserve, Ipassa station, at the base of a living trunk, unidentified *Cesalpiniaceae*, among herbs, 07 Apr. 2006, C. Decock no. GA-06-072, MUCL 47513; Senegal: Basse Casamance, Badiouré, Kourouk forest, 15 m. alt., on a dead stump of an unidentified angiosperm, 29 Nov. 1980, C. Vanden Berghem 4083 (BR)]. This might explain why Ryvarden did not report them, neither in his original (Ryvarden and Johansen 1980) nor in the latter diagnosis of *Navisporus* (Ryvarden 1983a), his description being based exclusively on African collections.

The cystidia in *N. floccosus* are in all respect identical to those found in *Microporellus*. This, and the fact that both genera share the same hyphal system (dimitic with dextrinoid, moderately thick-walled skeletal hyphae), similar basidiospores (slightly thick-walled, hyaline to pale yellowish, asymmetrical and with slight adaxial depression), and the production of white rot, indicate strong affinities and make *Navisporus* (as originally described, based on *N. floccosus*) *Microporellus*'s closest relative. As it will be discussed separately, *Navisporus* as latter extended by Ryvarden (Ryvarden 1983a, 2000) and collaborators (Ryvarden and Iturriaga 2003) is morphologically heterogeneous, encompassing several hyphal systems and vegetative hyphae differentiation, and polyphyletic (pers. obs.), and in need of revision; the genus *Mollicarpus* Ginns (Ginns 1984) could be considered for some species. In fact, taken in its original sense (Ryvarden and Johansen 1980), the distinction between *Navisporus* and *Microporellus* becomes tenuous, and in fine, both names could be considered as taxonomic synonyms.

The major difference that would account for their distinction is the gross basidiome habit. *Navisporus floccosus* forms rather large, sessile basidiomes, spongy when fresh, light in weight when dried. The taxonomic implications, at genus or lower taxonomic level, of the basidiome consistency, which is to a certain extent reflected by the hyphal construction, remain difficult to evaluate when not considered in a wider context.

The cystidia in *Perenniporia latissima*, with a seemingly identical morphology, together with the strongly dextrinoid, unbranched skeletal hyphae were misinterpreted by some authors (Chang and Chou 1999, Corner 1987, Dai et al. 2002). Although with a general similar outline, cystidia in *P. latissima* have a wall evenly thickened and strongly dextrinoid, in which they differ from those present in *Microporellus*. Furthermore, the basidiospores and skeletal hyphae, especially their ratio lumen/wall thickness, also distinguish *P. latissima* from *Microporellus*. In *P. latissima*, the basidiospores have a very thick-wall with a small, dome-shaped apical thinning, representing a germ pore. The skeletal hyphae are very thick-walled with a narrow lumen, which in addition to the dense structure makes its basidiome heavy. Basidiomes of *P. latissima* are also perennial and develop a thick, horny crust on the pileus, a feature always absent in *Microporellus*. *Perenniporia latissima* belongs to a distinct, unrelated group of species. Its hyphal system and the germ pore ontogeny also raise doubt about its relation with *P. medulla-panis* (see below) (Decock 2001).

The distinction between *Microporellus* and *Perenniporia* was confused in a recurrent way. In the last 20 years, several species either originally described in or transferred to *Perenniporia* (or one of its presumed taxonomic synonyms, one of which being *Vanderbylia* Reid) were later demonstrated to belong to *Microporellus*: in addition to *P. cystidiata* (cf. above), it includes *M. straminellus* ( $\equiv$  *Perenniporia straminella* (Bres.) Ryvarden; see Ryvarden 1988, Decock and Ryvarden 1998), *M. celtis* ( $\equiv$  *Perenniporia celtis* Chang and Chou; see Chang and Chou 1999, Decock 2001), *M. grandiporus* Corner (1987) ( $\equiv$  *Perenniporia hexagonoides* T. Hatt.; see Decock 2001, Hattori and Lee 1999), and *M. peninsularis* ( $\equiv$  *Vanderbylia peninsularis* Corner; see Decock 2001). The reverse situation existed also, illustrated by *M. subincarnatus* or by *Microporellus chocolatus* (Lloyd) Ryvarden. The former was demonstrated to be a taxonomic synonym of *Perenniporia stipitata* Ryvarden (Decock and Ryvarden 2002), while the latter is an earlier name for *Perenniporia ahmadii* Ryvarden (Ryvarden 1983b) [presently *Pseudopiptoporus chocolatus* (Lloyd) Decock & Ryvarden (Decock and Ryvarden 2003)]. Ryvarden (1990) noted also, dealing with *M. inusitatus*, that “it is a matter of opinion whether this species [*M. inusitatus*] is best placed in *Microporellus* or *Perenniporia*” and justified his choice of *Microporellus* by the “centrally [stipitate] rather thin basidiocarp”.

This confusion originates from a vague definition of both genera (Decock 2001, Decock and Ryvarden 2003) based on uncritical use of basic morphological features (mitism, dextrinoidity of vegetative hyphae or basidiospore characters), in which underlying diversity or similitude and subsequent possible taxonomic implications were overlooked or not critically analysed.

However, when the morphological characteristics of *Microporellus* and *Perenniporia* s. str. (as defined by Decock and Stalpers 2006b based on the type species, *P. medulla-panis* (Jacq.: Fr.) Donk, cf. Donk 1967, Decock and Stalpers 2006a) are compared and their differences/similitude critically analysed, it becomes obvious that both genera differ fundamentally, especially in their vegetative hypha differentiation and basidiospore characteristics. These morphological differences are also reflected in preliminary phylogenies based on DNA sequence data (unpublished data) that clearly resolve *Perenniporia* and *Microporellus* as distantly related clades.

*Perenniporia* (Decock and Stalpers 2006b) is above all characterised by a dimitic hyphal system with skeleto-binding hyphae having an arboriform branching pattern, and thick-walled, broadly ovoid (symmetrical), cyanophilic, and variably dextrinoid basidiospores with a large apical germ pore, whose development leads eventually to the apex' collapse and the resulting truncate aspect. Both vegetative hypha and basidiospore differentiation, especially the ontogenesis and resulting morphology of the germ pore, are important characteristics for the definition of the genus. However, in previous treatments of the former genus, both features were poorly (if at all) considered (e.g. Dai et al. 2002, Niemelä et al. 1992, Núñez and Ryvarden 2001, Ryvarden and Johansen 1980, Ryvarden and Gilbertson 1994), leading to a large, heterogeneous genus from which smaller entities (e. g. *P. latissima* and related taxa, see above) should be sorted out.

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