

**Additions to the Neotropical *Perenniporia*:
Perenniporia albo-incarnata comb. nov.
and *Perenniporia guyanensis* sp. nov.**

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Abstract – In the continuation of the revision of the Neotropical species of *Perenniporia* (Basidiomycota) with resupinate basidiomes, the new combination *Perenniporia albo-incarnata* and the new species *Perenniporia guyanensis* are proposed; both species are described and illustrated.

Neotropics / *Perenniporia* / South America / taxonomy

INTRODUCTION

Perenniporia medulla-panis (Jacq.: Fr.) Donk was commonly considered as a cosmopolitan species, present on all continents (e.g. Cunningham 1965, Gilbertson & Ryvarden 1987, Núñez & Ryvarden 2001, Ryvarden & Gilbertson 1994, Ryvarden & Johansen 1980). The concept used was evidently too large, representing a heterogeneous assemblage from which smaller entities could be sorted (Decock and Stalpers 2006b).

Decock & Stalpers (2006a, b) discussed the status and identity of *P. medulla-panis* and, in the interests of nomenclatural stability, designated an epitype for the latter name and redescribed the species. Its main morphological features are a resupinate, perennial basidiome, a white pore surface with 4-5 pores/mm, a dimitic hyphal system with non-dextrinoid skeleto-binding hyphae having the inner side of the wall amyloid, and ellipsoid to ovoid, dextrinoid basidiospores, 4.5-5.5 × 3.5-4.5 µm, averaging 4.9 × 3.9 µm (Decock & Stalpers 2006b). From a biogeographical and ecological perspective, *P. medulla-panis* s.s. might be restricted to temperate areas of Northern and Central Europe, where it grows on angiosperms, preferably *Quercus* (Fagaceae) (Decock & Stalpers 2006b). Its occurrence outside Northern and Central Europe is very uncertain; yet, *sensu stricto*, the species is probably absent from North America (C. Decock, in prep.). *A fortiori*, all records of *P. medulla-panis* from the southern, Neotropics (e.g. Rajchenberg & de Meijer 1990, Gibertoni et al. 2004, Popoff & Wright 1998), should be critically analyzed.

During the revision of *Perenniporia* from the Neotropics (Decock & Ryvardeen 1998, 1999a, b, 2000, 2003, Decock et al. 2001, 2010), the type of *Polyporus albo-incarnatus* Pat. & Gaillard (Patouillard and Gaillard 1888), a name presumed to be a synonym of *P. medulla-panis* (Ryvardeen 1983), was found to represent a distinct species. It is here recombined in *Perenniporia*, redescribed, and illustrated.

Two *Perenniporia* collections originating from French Guyana, provisionally identified as *P. medulla-panis* s.l. at MUCL, were also revised and found to represent a different, undescribed species. It is described and illustrated below as *Perenniporia guyanensis*.

MATERIALS AND METHODS

Material and Collection localities. — Materials from French Guyana were collected at approximately 04°53' N - 52°47' W and 04°34' N - 52°28' W at an elevation ranging 10-120 masl. The local ecosystem is the lowland Neotropical rainforest. Specimens studied are preserved at FH, MUCL, NY, and O (herbarium acronyms are from Thiers B. [continuously updated]). MUCL original strains were isolated from basidiome tissues during field works, on malt extract agar supplemented with 2 ppm benomyl (benlate) and 50 ppm chloramphenicol, and later, when necessary, purified in the laboratory. Living cultures (strains) are preserved at MUCL, with the ex-type strain deposited also at the CBS.

Specimen's description. — Colors are described according to Kornerup & Wanscher (1981). Sections of the basidiome were carefully dissected under a stereomicroscope in hot (40°C) NaOH 3% solution, and later examined in NaOH 3% solution at room temperature (Decock et al. 2010). Sections were also examined in Melzer's reagent, and lactic acid cotton blue. All the microscopic measurements were done in Melzer's reagent. In presenting the size range of several microscopic elements, 5% of the measurements at each end of the range are given in parentheses when relevant. In the text, the following abbreviations are used: ave = arithmetic mean, R = the ratio of length/width of basidiospores, and ave_R = arithmetic mean of the ratio R.

TAXONOMY

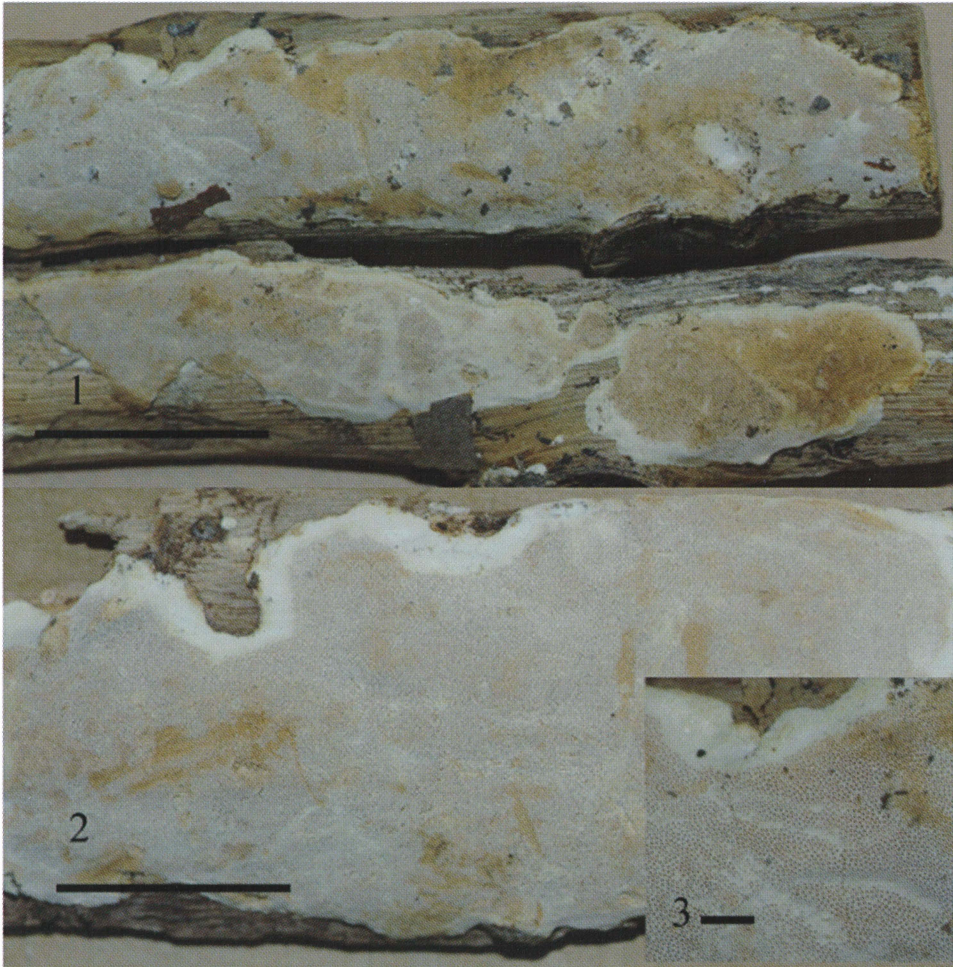
Perenniporia albo-incarnata (Pat. & Gaillard) Decock & Ryvardeen, **comb. nov.**
Figs. 1-3, 7, 9

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≡ *Polyporus albo-incarnatus* Pat. & Gaillard, Bull. Soc. Mycol. Fr. 4: 35, 1888 (basionym).

≡ *Poria albo-incarnata* (Pat. & Gaillard) Saccardo, Syll. Fung. 9: 192, 1891.

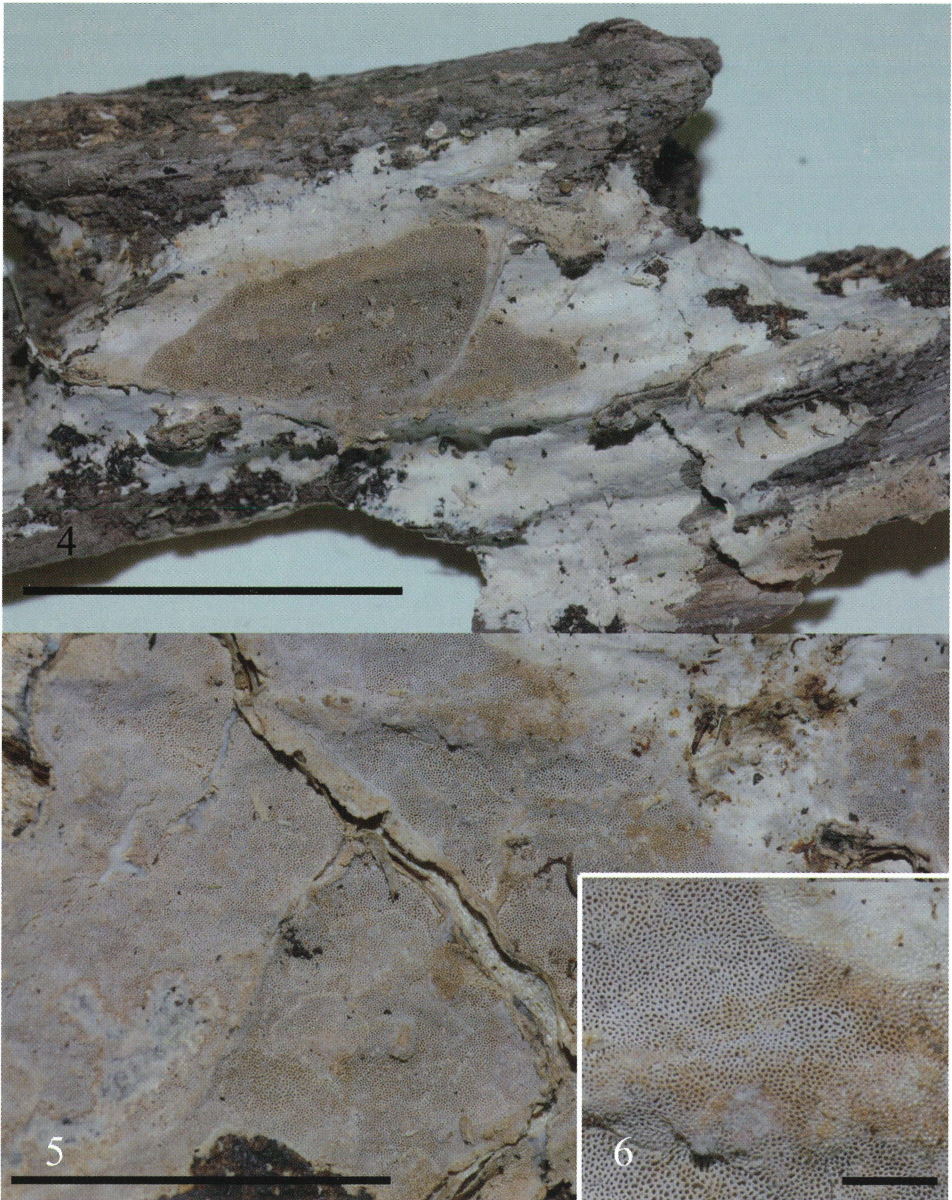
Basidiome seasonal to bi-seasonal, resupinate, adnate, effused, confluent, reaching 50–100 × up to 30 mm wide (*fide* Patouillard & Gaillard 1888), 1-4 mm thick (4–5 mm thick at the centre, *fide* Patouillard & Gaillard 1888); *margin* well marked, 0.5–3 mm wide appressed, whitish, pinkish, pale creamy to light grayish



Figs. 1-3. *Perenniporia albo-incarnata*. **1.** Basidiome, Colombia LR 16701, scale bar = 15 mm; **2.** Basidiome, Costa Rica LR 29603, scale bar = 15 mm. **3.** Details of the pore surface, scale bar = 2 mm Costa Rica LR 29603.

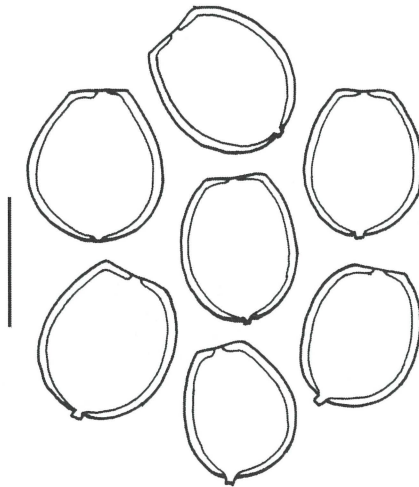
orange; *pores surface* white to pinkish (6A2) bruising yellowish (*vide* Patouillard & Gaillard 1888), cream, pale orange white (4A[3-4], 5A2) to pale grayish orange (5B[2-3]) to light brown on places (6D[5-6], sunburn to cinnamon); *pores* round to angular, regular, (4-) 5-6 (-7) / mm, (90-) 90-165 (-200) μm wide, (ave = 114 μm); *dissepiments* thin, entire, smooth, (20-) 25-65 (-72) μm thick (ave = 42 μm); *tube layer* single, up to 2.5 mm thick pale brown (6D(5-6), sunburn, pale cinnamon); *context* thin, up to 0.5 mm thick, grayish orange, corky.

Hyphal system dimitic in the context and the hymenophoral trama; *generative hyphae* hyaline, with clamps, poorly branched, 1.5-2.3 μm wide; *vegetative hyphae* of the skeleto-binding type, hyaline, non- to weakly dextrinoid (better seen in mass), cyanophilous; in the *hymenophoral trama* skeleto-binding hyphae with an arboriform pattern, made of a unbranched basal stalk, arising



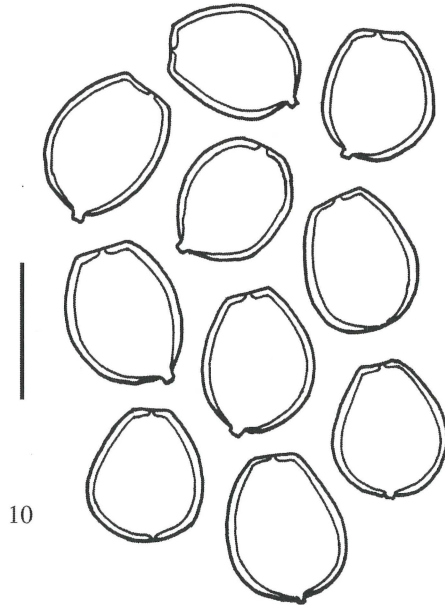
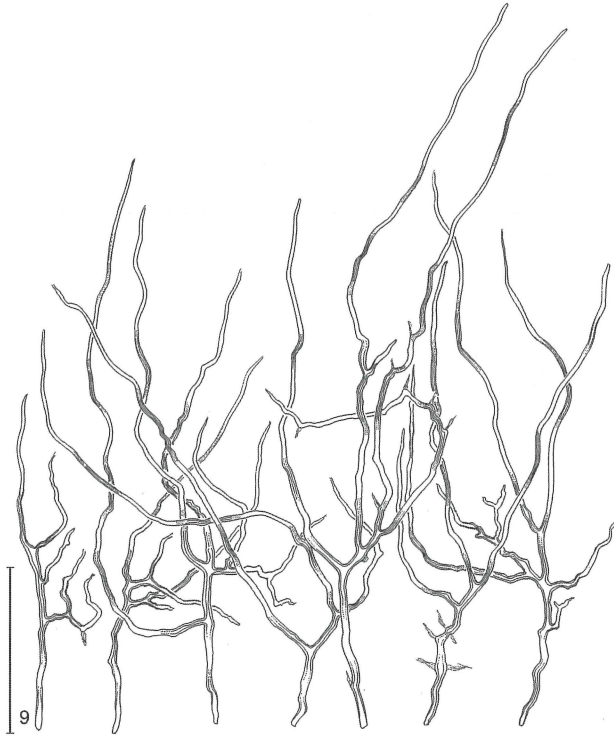
Figs. 4-6. *Perenniporia guyanensis*, type, MUCL 41995. **4-5.** Basidiome, scale bar = 15 mm; **6.** Details of the pore surface, scale bar = 2 mm.

from a clamp, (25-) 25-75 (-98) μm long (ave = 44 μm), straight to occasionally geniculated, then with occasional aborted lateral processes, thick-walled, lumen visible, progressively widening from (1.3-) 1.7-2.3 (-2.5) μm wide at the basal septum (ave = 2.0 μm) to (2.2-) 2.5-3.5 (-3.5) μm wide at the apex (ave = 2.7 μm), and several, 1-4, lateral (then in the upper third) or apical branches, thick-walled,



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Figs. 7-8. *Perenniporia albo-incarnata*. 7. Vegetative hyphae from the hymenophoral trama, from the type specimen, scale bar = 40 μm . 8. Basidiospores, from the type specimen, scale bar = 5 μm .



Figs. 9-10. *Perenniporia guyanensis*. **9.** Vegetative hyphae from the hymenophoral trama, scale bar = 40 μ m; **10.** Basidiospores, from the type, scale bar = 5 μ m.

from 25 μm up to 180 μm long, not or few branched (0-1 \times dichotomous), (1.5-) 1.5-2.5 (-2.5) μm wide (ave = 2.0 μm), ending in a thin-walled whip-like tips; in the *context* similar, though the arboriform pattern less marked, and with longer, less ramified branches; deep in the *context*, close to the substrate, vegetative hyphae short, much branched, narrow, 1.0-1.5 μm wide. *Basidia*, *basidioles* and *cystidioles* clamped at the basal septum; mature *basidia* mostly collapsed, hyaline, with 4 sterigmata; *basidioles* 14-18 \times 7-8 μm , pear-shaped; *cystidioles* fusiform to slightly ventricose, 13-20 \times 7-8 μm ; *basidiospores* subglobose to broadly ovoid, truncate, thick-walled, with an apical germ pore, apiculus small to inconspicuous, hyaline, weakly to strongly dextrinoid, cyanophilous, (5.5-) 6.0-7.0 (-7.5) \times (4.5-) 5.0-6.0 (-6.3) μm , (ave = 6.3 \times 5.4 μm), R = (1.0-) 1.05-1.3 (-1.3), ave_R = 1.15; *chlamydospores* absent.

Type of rot: a white rot (identified on wood fragments attached to the basidiome);

Substrate: on rotten trunks and dead fallen branches of unidentified angiosperms;

Distribution: known so far only from Central (Costa Rica) to South America (Venezuela and Colombia).

Specimens examined: COLOMBIA, DEP. DEL CHOCO: Municipio Rio Sucio, Parque Nacional Katio, Sautata, 50 masl., 28-30 Jun. 1978, L. Ryvar den 16701, O; COSTA RICA, PROV. HEREDIA: Reserva forestal La Selva, 50 masl, 10 Jun. 1991, L. Ryvar den # 29603, O; VENEZUELA, HAUT ORENOQUE: Puerto Zamuro, "les troncs pourris" [on rotten trunks], Jul. 1887, A. Gaillard n° 87, FH (HOLOTYPE).

Commentary: The present description is based on the type (Patouillard & Gaillard 1888) and two additional collections found within the unidentified *Perenniporia* collections from O. Both latter, are very similar to the type but have slightly smaller pores (Table I). Given that all other morphological features point toward conspecificity, we include them in the concept of *P. albo-incarnata*.

Lowe (1963) and Ryvar den (1983) considered *Polyporus albo-incarnatus* as a synonym of *P. medulla-panis*. It differs, however, from *P. medulla-panis* in several morphological features: a broad sterile margin, slightly smaller pores (5-6 (-7) / mm, 90-165 μm wide against 4-5 / mm, 125-200 μm wide in *P. medulla-panis*), none to weakly dextrinoid vegetative hyphae without any amyloid reaction of the inner side of the hyphal wall, and larger basidiospores (ave = 6.3 \times 5.4 μm in *P. albo-incarnata* versus ave = 4.9 \times 3.9 in *P. medulla-panis*).

Within the neotropical area, *P. albo-incarnata* is comparable to *P. roseo-isabellina* (Pat. & Gaillard) Ryvar den (Ryvar den 1983). The latter has distinctly larger pores and distinctly longer basidiospores (Table I). *Perenniporia cremeopora* Decock & Ryvar den, *P. minutopora* Ryvar den & Decock, *P. parvispora* Decock & Ryvar den (Decock & Ryvar den 2000), and *P. guyanensis* (see below) all differ in having distinctly smaller basidiospores (Table I).

Perenniporia albo-incarnata could be compared also to *P. centrali-africana* Decock & Mossebo, described from tropical Africa (Decock & Mossebo 2001). The latter was described with pileate to broadly decurrent basidiomes (Decock & Mossebo 2001) but additional collections from the western part of Central Africa showed that the basidiomes can be widely effused, with only marginal pseudopilei (Decock, pers. obs.). In addition to the pseudopilei, *P. centrali-africana* differs from *P. albo-incarnata* in having distinctly dextrinoid skeletal hyphae and slightly smaller, more globose basidiospores (4.8-6.0 (-6.5) \times 3.8-5.3 (-5.5) μm , ave = 5.4 \times 4.7).

Table 1. Pores and basidiospores data of several Neotropical *Perenniporia* species with resupinate basidiomes

| Species | Specimen | Country | Basidiospores | | | Pores/mm |
|----------------------------|-------------|-------------|---|-----------|-------------------------|----------|
| | | | Range | ave | l/L (ave _R) | |
| <i>P. albo-incarnata</i> | Type | Venezuela | (5.5-) 6.0-7.0 (-7.5) × (4.5-) 4.5-6.0 (-6.3) | 6.4 × 5.4 | 1.0-1.3 (1.18) | (4-) 5-6 |
| | LR 29603 | Costa Rica | (6.0-) 6.5-7.5 (-7.5) × (4.7-) 4.5-6.0 (-6.3) | 6.9 × 5.4 | 1.0-1.4 (1.2) | 6-7 (-8) |
| | LR 16701 | Colombia | (5.7-) 6.0-6.5 (-7.0) × (4.8-) 4.8-6.0 (-6.0) | 6.1 × 5.4 | 1.0-1.25 (1.14) | 7-8 |
| <i>P. chromatica</i> | Type | Brazil | (5.5-) 5.5-7.0 (-7.0) × (4.5-) 4.5-6.0 (-6.2) | 6.2 × 5.2 | 1.1-1.4 (1.25) | 4 |
| | Farr AM104 | Brazil | (5.3-) 5.5-6.5 (-6.5) × (4.3-) 4.5-5.5 (-5.8) | 6.1 × 4.9 | 1.1-1.4 (1.2) | 4-5 |
| | Patouillard | Venezuela | (5.0-) 5.5-7.0 (-7.0) × (4.0-) 4.0-5.7 (-6.0) | 6.3 × 4.8 | 1.1-1.6 (1.3) | 4-5 |
| <i>P. cremeopora</i> | Type | Domin. Rep. | (3.8-) 4.0-5.0 (-5.0) × (3.0-) 3.0-3.5 (-3.8) | 4.4 × 3.3 | 1.0-1.5 (1.2) | 6-8 |
| | LR 41730 | Jamaica | (3.5-) 4.0-5.0 (-5.0) × (3.0-) 3.2-3.5 (-3.8) | 4.3 × 3.4 | 1.1-1.4 (1.25) | 8-9 |
| <i>P. guyanensis</i> | Type* | Fr. Guyana | (5.0-) 5.0-5.5 (-5.5) × (3.7-) 4.0-4.5 (-4.5) | 5.2 × 4.1 | 1.1-1.4 (-1.25) | (7-) 8-9 |
| | PT | Fr. Guyana | (5.0-) 5.0-5.5 (-6.0) × (3.5-) 4.0-4.5 (-4.5) | 5.3 × 4.1 | 1.1-1.4 (-1.25) | (7-) 8-9 |
| <i>P. minutopora</i> | Type | Guyana | (4.0-) 4.2-5.0 (-5.2) × (3.0-) 3.0-3.7 (-4.0) | 4.6 × 3.3 | 1.2-1.6 (1.4) | (5-) 6-7 |
| <i>P. parvispora</i> | Type | Venezuela | (3.5-) 3.5-4.0(-4.0) × (3.0-) 3.0-3.7 (-4.0) | 3.8 × 3.4 | 1.0-1.3 (1.1) | (6-) 7-8 |
| | Corner | Brazil | (3.5-) 3.5-4.2 (-4.5) × (2.5-) 2.8-3.5 (-3.5) | 4.0 × 3.2 | 1.1-1.5 (1.2) | 8-9 |
| | LR 42332 | Venezuela | (3.5-) 3.8-4.2 (-4.5) × (3.0-) 3.0-3.7 (-3.7) | 3.9 × 3.4 | 1.0-1.3 (1.2) | (7-) 8-9 |
| <i>P. roseo-isabellina</i> | Type (FH) | Venezuela | (7.0-) 7.6-9.2 (-9.4) × (5.2-) 5.5-6.5 (-6.7) | 8.2 × 5.9 | 1.2-1.6 (1.4) | (2-) 3-4 |
| | IT (NY) | Venezuela | (7.2-) 7.5-8.9 (-9.5) × (5.3-) 5.5-6.8 (-7.0) | 8.1 × 6.0 | 1.1-1.5 (1.3) | (2-) 3-4 |
| | LR 29227 | Venezuela | (6.8-) 7.0-8.0 (-8.0) × (5.2-) 5.5-6.5 (-6.8) | 7.6 × 6.0 | 1.1-1.4 (1.3) | (2-) 3-4 |

* Basidiospores measurements from a basidiospores print; IT = Isotype; LR = Leif Ryvarden; PT = paratype

***Perenniporia guyanensis* Decock & Ryvarden sp. nov.**

Figs. 4-6, 8, 10

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Basidiomata resupinata; *marginē alba*; *pori rotundati* (7-) 8-9 / mm, (75-) 80-110 (-115) μm lati, griseo-brunnei; *systema hypharum dimiticum*, *hyphae generativae hyalinae*, *fibulatae*; *contextus hyphis skeletalibus pauci ramosis*, *crassitunicatis*, *hyalinis*; *trama hymenophori hyphis skeletalibus hyalinis*, *laxe ad dense arboriformibus*, *crassitunicatis*, *dextrinoideis*, *parte stipitiiforme* (10)-15-45 (-50) μm longo, *ramulis* 1-3, *crassitunicatis*, *laxe ramosis*, *usque ad 120 \mu\text{m} longis efformata*; *basidia clavata vel pedunculata*, *tetraspora*; *basidiosporae ovoideae*, *apice truncatae*, *crassitunicatae*, *leviter ad distincte dextrinoideae*, 5.0-5.5 (-6.0) \times (3.5-) 4.0-4.5 μm , $R = (1.1-)$ 1.2-1.4 (-1.4), ($\text{ave} = 5.2 \times 4.1 \mu\text{m}$, $\text{ave}_R = 1.25$). *Holotypus* in herb. MUCL conservatur sub nr 41995, *isotypi*: NY, O. (culture ex-holotype MUCL 41995, CBS)

Basidiome seasonal, resupinate, effused, adnate, individual basidiomes up to 50 \times 30 mm, merging to form larger patches, up to 1-1.2 mm thick; *margin* narrow, almost absent, or spreading, then forming wide sterile patches, up to 4 mm wide, white when fresh, whitish to grayish cream when dried, contrasting with the pore surface; *pores surface* cork-colored to pale brown (grayish orange, 6[C-D] [3-4], café au lait, camel); *pores* round to slightly ellipsoid, (7-) 8-9 / mm, (75-) 80-110 (-115) μm wide ($\text{ave} = 91 \mu\text{m}$); *dissepiments* entire, agglutinated, 35-80 μm thick, ($\text{ave} = 48 \mu\text{m}$ thick); *tubes* layer single, up to 1 mm thick, whitish to pale cork-colored (pale grayish orange), with a corky consistency; *context* very reduced, to 0.2 mm thick.

Hyphal system dimitic, identical in the subiculum and the hymenophoral trama; *generative hyphae* hyaline, clamped, sparingly branched, 1.5-2.5 μm wide; *vegetative hyphae* of the skeleto-binding type, hyaline, strongly dextrinoid, cyanophilous; *in the subiculum*, skeleto-binding hyphae terminal, then with a poorly developed arboriform branching pattern, or occasionally intercalary; *in the hymenophoral trama* skeleto-binding hyphae with an variably developed arboriform branching pattern, densely intertwined, and difficult to separate, with a basal stalk, arising from a clamp, (10)-15-45 (-50) μm long ($\text{ave} = 28 \mu\text{m}$), straight to geniculated, then with occasional lateral aborted processes, thick-walled but the lumen open, slightly swelling in KOH 4%, progressively widening from 1.8-2.2 μm wide at the basal septum to 2.2-2.7 μm wide at the apex ($\text{ave} = 2.4 \mu\text{m}$), occasionally widened up to 3.2 μm , and several lateral and apical/sub-apical (occasionally basal) branches, thick-walled, measured up to 120 μm long, not or once branched, 2.2-2.5 μm wide down to 1.5-2.0 μm wide in a thin-walled rounded tip. *Basidia* clamped at the basal septum; mature *basidia* seen mostly collapsed, hyaline, with 4 sterigmata; *basidiospores* broadly ellipsoid to broadly ovoid, with a small basal apicule, the apex truncate, thick-walled but with an apical germ pore, hyaline, faintly to moderately dextrinoid, cyanophilous, 0-1 gutta, 5.0-5.5 (-6.0) \times (3.5-) 4.0-4.5 μm , $R = (1.1-)$ 1.2-1.4 (-1.4), ($\text{ave} = 5.2 \times 4.1 \mu\text{m}$, $\text{ave}_R = 1.25$); *chlamydospores* absent.

Type of rot: white rot (presence of laccases positive when tested with syringaldazine [Harkin and Obst 1974]);

Substrate: on dead fallen branches (5-10 cm diam) of an unidentified angiosperm;

Distribution: known so far only from French Guyana.

Specimens examined: FRENCH GUYANA, CACAO MUNICIPALITY: Montagne de Cacao, approx. 04°34' N, 52°28' W, on a dead fallen, rotten branch on the ground, covering the inferior side, 25 Jan. 2000, C. Decock FG-2154, in MUCL (MUCL 41995, Holotype; NY, O, Isotype) (culture ex-holotype MUCL 41995, CBS); KOUROU MUNICIPALITY: Montagne Saint Michel, on the hill above the carbet of Lionel Collado (Association Canopée), approx. 04°53' N,

52°47' W, on a small dead, fallen and rotten trunk, suspended to a liana, 04 Jul. 2002, C. Decock FG-02-76, in MUCL (MUCL 43986) (culture ex. MUCL 43986).

Commentary. *Perenniporia guyanensis* is characterized by the combination of a cork-colored to greyish brown (coffee with milk) pore surface, small pores (Figs 4-6), dextrinoid basidiospores, and dextrinoid vegetative hyphae.

In the Neotropics, *P. guyanensis* could be compared to *P. minutopora* or *P. cremeopora*. It differs from *P. minutopora* in having smaller pores, slightly larger basidiospores (Table I), and strongly dextrinoid vegetative hyphae (not dextrinoid in *P. minutopora*, Decock and Ryvardeen 2000). *Perenniporia cremeopora* has a distinctly whitish to pale cream pore surface (Decock & Ryvardeen 2000).

Outside of the Neotropics, *P. guyanensis* resembles superficially also *P. djaensis* Decock & Mossebo (Decock & Mossebo 2002). The latter is, so far, its closest relative in phylogenetic inferences based on a combined data set of partial LSU and ITS regions (sequence data set of > 200 collections of *Perenniporia* of worldwide origin, unpubl. data). *Perenniporia guyanensis* shares with *P. djaensis* the cork-colored pore surface and similar basidiospores, both in size and shape (5.0–6.0 × 3.6–4.2 µm, averaging 5.4 × 3.9 µm in *P. djaensis*, Decock & Mossebo 2002) but differs in having much smaller pores (3–4 / mm in *P. djaensis*,) and a different branching pattern of the vegetative hyphae that are poorly branched, almost skeletal-like (Decock & Mossebo 2002).

The Neotropical species of *Perenniporia* with resupinate basidiomes have been dealt with in various publications (e.g. De Jesus & Ryvardeen 2010, Decock & Ryvardeen 1999b, 2000, Rajchenberg & Wright 1982, Ryvardeen 1983, 1984, 1987). Fifteen species are currently reported from the area. These are, in addition to *P. guyanensis* and *P. albo-incarnata*: *P. amazonica* De Jesus & Ryvardeen, *P. aurantiaca* (David & Rajchenb.) Decock & Ryvardeen, *P. chromatica* (Berk. & Cooke) Decock & Ryvardeen, *P. cremeopora*, *P. gomezii* Rajchenb. & Wright, *P. inflexibilis* (Berk.) Ryvardeen, *P. isabellina* (Pat. ex. Sacc.) Ryvardeen, *P. minutopora*, *P. parvispora*, *P. roseo-isabellina*, *P. sinuosa* Ryvardeen, *P. tephropora* (Mont.) Ryvardeen, and *P. xantha* Decock & Ryvardeen.

Acknowledgements. Cony Decock gratefully acknowledges the financial support received from the Belgian State – Belgian Federal Science Policy through the BCCM research program (contract BCCM C4/10/013) and the FNRS-FRFC (projects # 2.4551.99 and 2.4.544.10.F).

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