

## The genus *Abundisporus* (Hymenomycetes, Basidiomycotina)

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Four species of *Abundisporus* Ryvarden are described including two new combinations: *A. pubertatis* (Lloyd) Parmasto and *A. subflexibilis* (Berk. & M.A. Curtis) Parmasto. Absorption spectra demonstrated uniformity of the pigments in this genus, but also in *Loweporus tephroporus* (Mont.) Ryvarden; to distinguish the species, statistical measurement of spore size have been used. Relations of the genera *Abundisporus*, *Perenniporia* and *Loweporus* are discussed.

Key words: *Abundisporus*, *Loweporus*, *Perenniporia*, polypores, taxonomy

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### Introduction

The genus *Abundisporus* was described by Ryvarden (1998) for tropical polypores closely related to *Perenniporia* Murrill and *Loweporus* Wright but differing in pale yellow non-dextrinoid basidiospores always present in large numbers, and in pale umber to deep purplish brown basidiomata. Four closely related species are known in this genus, differing mainly in slight differences in spore measurements and pore size. The main aim of this study is to evaluate intra- and interspecific variation of these characters: are the four taxa really independent species? Beside this, descriptions of the species studied, distribution data and a key to species are given.

### Materials and methods

Specimens from the herbaria FH, K, LE, NY, O, TAA and TRTC were studied as well as five spore prints of *A. pubertatis* obtained in field conditions. In each specimen (or spore sample) 30 randomly taken spores were

measured at magnification  $\times 1000$ . The 90-percent expected tolerance limits of mean spore size were calculated as described by Parmasto and Parmasto (1988). Colour of the basidiomata was described using the handbook by Kornerup and Wanscher (1967). Microscopical study of basidiomata was carried out as described by Gilbertson and Ryvarden (1986: 64–65). Common malt agar has been used as medium in culture studies; culture codes are from Nobles (1965) with emendations by Boidin and Lanquetin (1983). Drop-tests for extracellular oxidases follow Marr's directions (1979), nuclear staining has been made with Giemsa according to Boidin (1958). Absorption spectra (Figs. 1–3) were determined in 330–650 nm band of aqueous extract of ground to powder dried basidiomata, and of alkalized extract as described by Parmasto and Parmasto (1979: 206) using Zeiss spectrophotometer Specord UV-VIS. Infrared spectra were determined in 2.5–25  $\mu\text{m}$  band as 1% basidiomata powder in KBr tablet using Zeiss spectrophotometer Specord IR 75. Herbarium abbreviations follow Holmgren et al. (1990).

The results of the morphological and cultural studies are presented under species descriptions; spectrophotometric data are discussed in the concluding part of the paper.

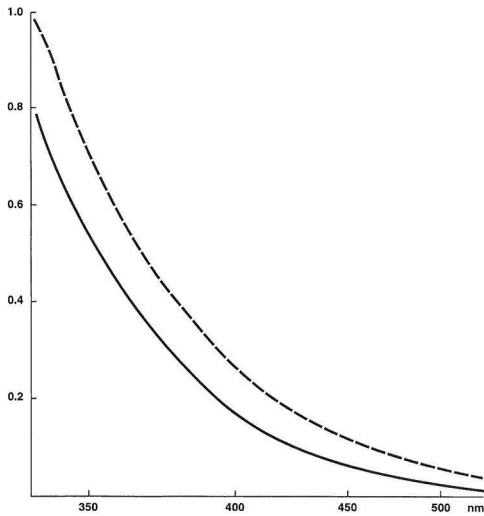


Fig. 1. Absorption spectra of the pigments of *Abundisporus fuscopurpureus*: of aqueous extract, and of alkalinized aqueous extract (broken line).

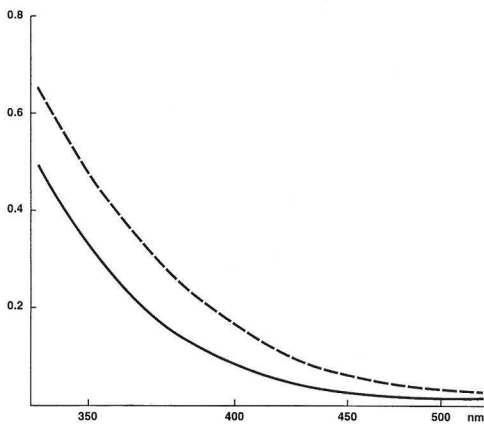


Fig. 2. Absorption spectra of the pigments of *Perenniporia (Loweporus) tephropora*: of aqueous extract, and of alkalinized aqueous extract (broken line).

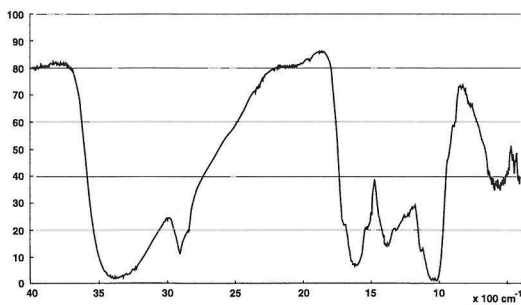


Fig. 3. IR-absorption spectrum of the pigments of *Perenniporia (Loweporus) tephropora*.

### *Abundisporus* Ryvarden

Belg. J. Bot. 131 (2): 154 (1998).

Basidiomata pileate or resupinate, annual or perennial. Pileus sessile or effused-reflexed, corky, light in weight when dry; pileal surface glabrous, mostly concentrically sulcate and zonate, brown, fuscous to deep purplish brown; context homogeneous, greyish, brown or fuscous, usually with a reddish tint; pore surface pale pinkish in young basidiomata, then pinkish to buff, pale umber, chocolate to vinaceous brown with age; tubes concolorous with pore surface or slightly darker.

Hyphal system dimitic or subtrimitic; generative hyphae with clamps; skeletal hyphae pale yellow to pale brown, slightly dextrinoid; skeletal-binding hyphae few, moderately branched; cystidia absent, cystidioles rarely present; basidia clavate,  $8-20 \times 4-9 \mu\text{m}$ , with (2) 4 thin sterigmata; spores with slightly or distinctly thickened pale yellowish non-dextrinoid or slightly dextrinoid walls, somewhat truncate or with subangular tip, ellipsoid,  $3-6 \times 2-5 \mu\text{m}$ ; spore print brown.

Tetrapolar (2 species studied), spores uninucleate (1 species studied).

On wood of angiosperms; causes white rot.

Not less than four species in mainly tropical and subtropical zones of Old and New World.

Type: *Polyporus fuscopurpureus* Pers. (1827) = *Abundisporus fuscopurpureus* (Pers.) Ryvarden (1998).

**Key to species**

- 1. Skeletals hyaline. Basidiomata white, cream or ochraceous ..... *Perenniporia* Murrill
- Skeletals pale yellow, yellow or brownish. Basidiomata darker coloured ..... 2
- 2 Pores 2.5–6 per mm ..... 3
- Pores 6–10 per mm ..... 5
- 3. Pore surface grey to greyish dirty brown, without violaceous or rosy tint; context dark brown. Spores 4.5–6(–7) × 3.5–4.5 µm. .... *Perenniporia tephropora* (Mont.) Ryvarden  
(*Loweoporus tephroporus* (Mont.) Ryvarden)
- Pore surface violaceous buff, vinaceous purple fawn or clay buff with a rosy tint; context cinnamon buff to fawn. Spores 2.5–3.5 µm wide ..... 4
- 4. Pileal surface covered with blackish (in section) crust; pores (4–)5–6 per mm; context indistinctly zonate ..... *Abundisporus pubertatis*
- Surface without crust; pores (2.5–)3.5–4.5 per mm; context zonate ..... *A. violaceus*
- 5. Pileal surface without crust. In context mainly skeleto-binding hyphae, skeletal hyphae rare; spores 3.5–5.5 µm wide ..... *Perenniporia inflexibilis* (Berk.) Corner
- Surface covered with blackish (in section) crust. Skeleto-binding hyphae few, skeletal hyphae abundant; spores 2–3.4 µm wide ..... 6
- 6 Pileal surface zonate. Hyphae strongly swelling in KOH solution; spores up to 3.9(–4.2) µm long ..... *A. fuscopurpureus*
- Surface azonate or indistinctly zonate. Hyphae not swelling in KOH solution; spores (3.6–)3.8–5 µm long ..... *A. subflexibilis*

*Abundisporus fuscopurpureus* (Pers.) Ryvarden Belg. J. Bot. 131 (2):154 (1998). – *Polyporus fuscopurpureus* Pers. in Gaudichaud, Voy. Monde, Bot. 172 (1827) non Boud. (1881) = *Phellinus torulosus* (Pers.) Bourdot & Galzin. – *Loweoporus fuscopurpureus* (Pers.) Ryvarden in Ryvarden & Johansen, Prelim. polyp. fl. E. Africa 415, f. 139 a–d, 140 a–d (1980); Corner, Ad Polyporaceas 5:88 (1989). – *Polyporus roseoalbus* Jungh., Verh. Batav. Genootsch. 17: 43 (1838). – *Loweoporus roseoalbus* (Jungh.) Ryvarden in Ryvarden & Johansen, Prelim. polyp. fl. E. Africa 415 (1980). – *Abundisporus roseoalbus* (Jungh.) Ryvarden, Belg. J. Bot. 131 (2): 154 (1998). – *Fomes roseotubulatus* Lloyd, Mycol. Writ. 5, Letter 67:14(1918).

Basidiomata perennial, solitary or rarely 2–3 basidiomata imbricately confluent, semicircular, broadly attached, slightly conchate or almost unguulate, sometimes applanate, exceptionally effuso-reflexed or resupinate, densely corky, usually light in weight when dry. Pileus 2.5–8 × 4–12(–14) × 0.7–1.5(–2.5) cm, densely distinctly concentrically zonate and slightly sulcate, sometimes radially striate, in the middle part uneven or rugulose, first finely tomentose, dark cinnamon or umber, then glabrous, chocolate brown, sienna umber or blackish; margin acute or thin but

rounded. Crust present, hard, 0.02–0.1(–0.25) mm thick, black and shiny in section, in very young parts sometimes indistinct; context 2–7(–15) mm thick (about 1 mm in resupinate specimens), densely cottony or corky, with no zones or indistinctly zoned, light to dark fulvous, sometimes fulvous buff or fulvous umber, darkening to blackish in KOH. Tubes in one strata or indistinctly 2–3(–5)-layered, each stratum up to 10 mm (totally up to 25 mm thick), slightly darker than context, light umber, dark fulvous or fulvous umber; pore surface pinkish buff, dark clay buff (sometimes with a violaceous tint), dark vinaceous buff or vinaceous brown when old; sterile margin of the hymenial surface 0.5–2 mm wide; pores rounded, slightly angular, 7–9(–9.5) per mm, with thin walls and entire margins.

Hyphal system subtrimitic with numerous skeletals and scarce or very rare skeleto-binding hyphae. Generative hyphae sparsely branched, thin-walled, hyaline, with clamps, 1.5–3 µm in diameter; skeletal hyphae thick-walled, yellowish to brownish, strongly swelling in 2% KOH, 2.5–6.5 µm in diameter (2–4.5 µm in Melzer’s Reagent); skeleto-binding hyphae moderately or rarely branched, thick-walled, yellowish, with rare simple septa, 2–4 µm in diam; skeletal and skeleto-binding hyphae slightly or distinctly

dextrinoid. No cystidia; basidia 15–20 × 4–5 µm; spores ellipsoid, with one side flattened, mostly slightly angular, some spores almost truncate, sometimes with 1(–2) guttula, with thickened or thick walls, pale yellowish, slightly dextrinoid (pale greyish yellow in Melzer's Reagent), (3.0–) 3.2–3.9(–4.2) × 2.0–2.8(–3.0) µm.

*Distribution.* Angola, Kenya, Malawi, Tanzania, Uganda, Zaire; Indonesia (Jawa, Krakatau, Sulawesi), Malaysia (Malacca, Sarawak), Papua New Guinea; Australia (Tweed River), New Caledonia; ? South China, ? Japan (Kiusiu), ? Philippines.

*Specimens examined.* **Angola.** Loanda, *J. Grossweiler* (*Fomes roseotubulatus*, holotype: Lloyd 15529, BPI). **Kenya.** Coast Prov., Shimba Hills, 12.X.1972 *D. Taylor* 863 (O); Shimba Hills, alt. 400 m, 14.II.1973 *L. Ryvardeen* 10472 (O); Western Prov., Kakamega Distr., alt. 1500–1700 m, 21.I.1970 *L. Ryvardeen* 5534, 5558 (O); Kakamega Forest, alt. 1500 m, 25–27.I.1973 *L. Ryvardeen* (O); Kakamega Forest, on *Croton megaio-carpus*, 26.I.1973, no. 2217 (NY); Chogoria track, on *Ilex mitis*, 1.II.1973, no. 2380 (NY); Central Prov., Mt. Elgon, alt. 2100 m, 23–24.I.1973 *L. Ryvardeen* 9245 (O); Eastern Prov., Mt. Kenya, alt. 1900–2000 m, 31 Jan–1.II.1973 *D. Taylor* 1060 (O); Mt. Kenya, on *Canthium rubrocostatum* log, 1.II.1973, no. 2378 (NY). **Malawi.** Southern Prov., Thyolo Distr., Thyolo Mt., alt. 1100–1400 m, 13.III.1973 *L. Ryvardeen* 11566 (O). **Malaysia.** Pahang, Tembling, 16.II.1930 *J. Corner*, det. E. Wakefield as *Polyporus caliginosus* (K); Pahang, Frazers Hill, 28.XI.1930 *E. Corner* (K). **New Caledonia.** Kroghio Mts., 24.V.1964 *B. Hugheneri*, det. D. Reid as *P. caliginosus* (K); Col de la Pirogue, 19.III.1977 *Horak* (O). **Tanzania.** E. Usambaras, Kwamkoro Arboretum, Amani, 19.XII.1972, no. 1918 (NY); E. Usambaras, Amani, 20.XII.1972, no. 1990 (NY); Arusha Nat. Park, alt. 1800 m, 8.II.1973 *L. Ryvardeen* 10079 (O); Tanga Prov., Usambara Mts., alt. 800–1000 m, 18–19.II.1973 *L. Ryvardeen* 10642, 10656 (O); Morogoro Prov., Uluguri Mts., alt. 1500–2100 m, 24–26.II.1973 *L. Ryvardeen* 10950 (O). **Uganda.** W of Masindi, Budongo Forest, alt. 3500 ft, 30.VII.1966 *R.F. Cain*, *H.D. Griffin* & *J.C. Krug* (TRTC 66.782, 66.795). **Zaire.** Kivu Prov., Irangi, III.1972 *Rammeloo* Z 88 (O).

*Remarks.* *Abundisporus fuscopurpureus* is a species easily recognizable by the skeletal hyphae swelling in KOH, the small spores, zonate pileal surface and the context with no zones. Its spore size is normally variable; intraspecific coefficient of variation of spore length is  $V = 4.6$ , of spore width  $V = 5.6$ , of spore length / width  $V = 2.8$ . *Loweporus roseoalbus* has been distinguished from *A. fuscopurpureus* as a species with different spore size (2–3 × 1.5–2 µm and 3–4.5 × 2–3 µm, respectively); the spore size of the specimens studied by us and identified earlier as two different species do not differ statistically (cf. Table 1).

Table 1. Mean spore measurements (in µm) and mean spore length / width quotient  $Q$  in four *Abundisporus* species

<b>A. fuscopurpureus</b>			
NY 1990	3.25 × 2.26		1.44
Lloyd 155529	3.29 × 2.15		1.53
Corner 1930	3.29 × 2.22		1.48
Ryvardeen 10656	3.30 × 2.39		1.38
Rammeloo Z 88	3.31 × 2.29		1.45
Ryvardeen 10950	3.31 × 2.29		1.45
NY 1918	3.31 × 2.32		1.43
Ryvardeen 10642	3.35 × 2.33		1.44
TRTC 66.795	3.36 × 2.31		1.45
Corner 1930	3.37 × 2.28		1.48
NY 2217	3.39 × 2.39		1.42
Ryvardeen 11566	3.39 × 2.41		1.41
TRTC 66.782	3.41 × 2.29		1.49
Hugheneri 1964	3.41 × 2.34		1.46
Taylor 1060	3.42 × 2.37		1.44
Ryvardeen 5534-1	3.43 × 2.43		1.41
Taylor 863	3.44 × 2.26		1.52
NY 2380	3.49 × 2.46		1.42
Ryvardeen 9397	3.50 × 2.47		1.42
Ryv. 10472-1	3.59 × 2.34		1.53
NY 2378	3.54 × 2.43		1.46
Ryvardeen 5558-1	3.54 × 2.50		1.42
Ryv. 10472-2	3.55 × 2.42		1.47
Ryvardeen 5534-2	3.61 × 2.53		1.43
Ryvardeen 5558-2	3.64 × 2.59		1.41
Ryvardeen 10079	3.66 × 2.61		1.40
Ryvardeen 9245	3.78 × 2.69		1.41
Horak 1977	3.91 × 2.64		1.48
<b>Mean</b>	<b>3.46 × 2.39</b>		<b>1.45</b>
Coefficient of variation $V$	4.6	5.6	2.8
90%-expected tolerance limits: 3.18–3.73 × 2.16–2.62; 1.38–1.52			
<b>A. pubertatis</b>			
TAA 105775	4.24 × 2.59		1.64
TAA 105776	4.47 × 2.73		1.64
TAA 105773	4.61 × 3.00		1.54
O. querc. type	4.64 × 2.91		1.59
TAA 105761	4.66 × 3.07		1.52
TAA 106802	4.68 × 2.87		1.63
TAA 105777	4.68 × 3.01		1.55
TAA 105763	4.69 × 3.02		1.55
TAA 106259	4.72 × 2.95		1.60
O. quercinus	4.81 × 2.86		1.68
(another part of the type)			
<b>Mean</b>	<b>4.62 × 2.90</b>		<b>1.59</b>
Coefficient of variation $V$	3.5	5.2	3.4
90%-expected tolerance limits: 4.31–4.93 × 2.62–3.18; 1.49–1.70			
<b>A. subflexibilis</b>			
Rick 1930	4.05 × 2.53		1.60
NY 2856	4.07 × 2.58		1.58

Ryvarden 10737	4.11 × 2.65	1.55
NY 775	4.15 × 2.47	1.68
Lowy et al. 560	4.16 × 2.53	1.64
Wurdach 39468	4.19 × 2.47	1.70
Malawi, BM 291	4.21 × 2.75	1.53
Ryvarden 10445	4.24 × 2.59	1.64
Ryvarden 10463	4.39 × 2.75	1.60
TRTC 66.1489	4.49 × 2.63	1.71
Wright (type)	4.55 × 2.93	1.55
Wright 159	4.71 × 2.93	1.61

<b>Mean</b>	<b>4.28</b>	<b>2.65</b>	<b>1.62</b>
Coefficient of variation <i>V</i>	5.0	6.1	3.7

90%-expected tolerance limits:

3.88–4.67 × 2.35–2.95; 1.50–1.73

#### **A. violaceus**

TRTC 66.1244	4.59 × 3.38	1.36
TRTC 66.124	4.92 × 3.23	1.52
Ryvarden 10775	5.19 × 3.21	1.62
NY 2951	5.22 × 3.36	1.55

<b>Mean</b>	<b>4.98</b>	<b>3.30</b>	<b>1.51</b>
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The eastern-northeastern boundary of the distribution area of this species is unclear. The difference between *A. fuscopurpureus* and *A. pubertatis* was not clear for the earlier authors; however, it is questionable if the areas of both species really overlap in East Asia.

There is one herbarium specimen studied by us which deviates from the description given above (Zaire: Irangi, Kivu, IV.1972 *J. Rammeloo* 291, O). All characteristics including spore size (means: 3.29 × 2.28 μm; *Q* = 1.44) are typical for this species except hard, *Phellinus*-like consistency of the heavy basidiome and presence of thick (up to 0.5 mm) crust on its surface.

#### **Abundisporus pubertatis** (Lloyd) Parmasto **comb. nova**

– Basionym: *Polyporus pubertatis* Lloyd, Mycol. Writ. 4: 358, f. 692 (1915). – *Fomitopsis pubertatis* (Lloyd) Imaz., Bull Tokyo Sci. Mus. 6:92 (1943); Imazeki & Hongo, Colour. ill. fungi Japan 2, pl. 50, f. 292. – *Nigroporus pubertatis* (Lloyd) Teng, Fungi China 762 (1963). – *Loweporus pubertatis* (Lloyd) Hattori, Bull. Nat. Sci. Mus. Tokyo B 21 (2):99 (1995). – *Osmoporus quercinus* Bondartsev & L. Vass., Not. Syst. Sect. Crypt. Inst. Bot. Ac. Sci. URSS 16:114, f. 1–3 (1963).

Basidiomata perennial, solitary or 2–3 basidiomata laterally confluent, semicircular, broadly

attached, ungluate or triquetrous in radial section; sometimes effused-reflexed or almost resupinate; densely corky. Pileus 0.5–2.5(–3) × 2–6 × 1–2 cm (2–7 cm in diam and 0.5–1.5 cm thick when resupinate), azonate or indistinctly zonate, in old specimens with 1–2 deep concentric furrows, uneven, somewhat tuberculate, vinaceous buff, then fawn, greyish brown and at base almost black when old. Crust usually absent, but present in old specimens, hard, 0.02–0.1 mm thick, black in section, usually covered with a thin layer of cottony context. Context up to 10 mm thick (1–3 mm in resupinate specimens), indistinctly zoned in section, fawn or with a slight vinaceous tint. Tubes in one strata or 2–4(–5)-layered, each stratum 2–4(–5) mm (totally up to 15 mm), trama concolorous with the context but hymenial surface whitish pruinose. Pore surface covered with vinaceous pruina, brownish when bruised, later vinaceous grey or almost vinaceous purple fawn. Pores rounded or slightly angular, 0.1–0.2 mm in diam, (4–)5–6 per mm, with more or less entire margins. New tube layer usually narrower (less wide) than the older one, and the margin of the pore surface stepped (like that in *Heterobasidion annosum* (Fr.) Bref.).

Hyphal system subtrimitic with numerous skeletal and few skeleto-binding hyphae. Generative hyphae rare, scarcely branched, thin-walled, hyaline or yellowish, with clamps, 2–3.5 μm in diameter. Skeletal hyphae thick-walled, dark yellow or brownish, not swelling in 2% KOH, 2–4 μm in diameter; skeleto-binding hyphae moderately or rarely branched, thick-walled, yellowish, 2–3.5 μm in diameter; skeletal and skeleto-binding hyphae slightly dextrinoid. Cystidia none; basidia 8–10 × 4.5–5.5 μm. Spores ellipsoid, one side flattened, some slightly angular or subtruncate, usually with 1–2 guttula, more or less thick-walled, yellowish, slightly dextrinoid, 4–5.2 × 2.5–3.5 μm; spore print vinaceous brown.

Causes white rot on wood.

*Culture characters* of the specimen TAA 106242 (culture no. GB 1415). Aerial mycelium absent, except in old parts, where it is pellicular-felty, whitish – light ochraceous–rose-coloured; advancing zone even, submerged; odour slightly fruity. After 3 weeks' growth the whole colony was uniform, with a scattered downy aerial mycelium. All hyphae thin-walled and constantly provided with clamps at the septa. After 6 weeks

growth no clamps were found in the agar mycelium, covering the greatest part of the plate; hyphae thin-walled, regularly branched, 2–3.5  $\mu\text{m}$  wide. Aerial mycelium in the old part consists of more differentiated hyphae: A) hyphae with thin to slightly thickened walls, 1.5–4  $\mu\text{m}$  wide, constantly clamped, frequently with irregular swellings in apices and branching nodules (Fig. 4 A), hyaline but with light-refracting content (in phase contrast microscope); B) binding hyphae, thick-walled, 1–3  $\mu\text{m}$  wide, without clamps, more or less brown-pigmented (Fig. 4 B). Plates covered in 6 weeks.

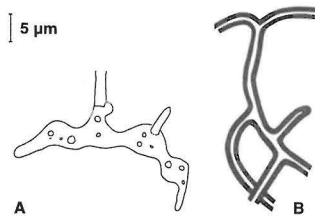


Fig. 4. *Abundisporus pubertatis*, aerial mycelium of a culture: A – swelling in an apex of a hypha; B – skeletonizing hyphae.

*Code.* 2a. 4. 8. 26. 32. (36.) (37.) 38. 50. 54. 60. 61.

*Oxidase reactions.* Weak to moderate staining in Syringaldazine, Gum Guaiac and Guaiacol. No staining with 1-Naphtol, p-cresol and L-Tyrosine.

*Polarity.* Tetrapolar, but the polarity pattern obtained was imperfect:

A<sup>1</sup>B<sup>1</sup>: SS-1, 2; A<sup>2</sup>B<sup>1</sup>: SS-3, 4, 5, 6, 8, 9, 15;

A<sup>1</sup>B<sup>2</sup>: SS-7, 10; A<sup>2</sup>B<sup>2</sup>: SS-11, 17.

Matings between SS-7 and SS-11 were negative in spite of repeated confrontations.

*Cytology.* Spores uninucleate. SS-mycelium with uninucleate cells, constantly clamped PS-mycelium dicaryotic.

*Nuclear behavior.* According to the cytological study, *A. pubertatis* has a normal behavior. The diagnostic study of the mycelium indicates that the occurrence of clamps is variable, according to conditions of aeration. This has hitherto only been associated with *astatocoenocytic* behavior where, however, both SS-mycelium and submerged PS-mycelium have pluri- to multinucleate cells (see Boidin & Lanquetin 1984).

*Distribution.* Russia (Primorski Terr.), Japan (Honsju), China (Yunnan and Zhejiand Prov.).

*Specimens examined.* **Russia.** Primorski Terr., Vladivostok, Botanical Garden, on *Quercus mongolica*, 5.X.1960 L. Vassiljeva (LE, lectotype of *Osmoporos quercinus*); Hasan Distr., Kedrovaya Pad' Nature Reserve, on *Quercus mongolica*, 23.VI.1984 E. Parmasto (TAA 105761, 105763, 105767), 24.VI.1984 E. Parmasto (TAA 105773, 105775–105778), 18.VII.1985 U. Kõljalg (TAA 106802; O, sine num.), 24.VII.1985 E. & I. Parmasto and U. Kõljalg (TAA 106242, 106259).

*Remarks.* *Abundisporus pubertatis* is externally very similar to *Fomitopsis rosea* (Alb. & Schwein. : Fr.) P. Karst., but also to *Melanoporia castanea* (Imazeki) T. Hattori & Ryvardeen, which differ in dimitic hyphal system without skeletonizing hyphae and type of rot (brown rot fungi). The very closely related *A. subflexibilis* has spores quite similar to those of *A. pubertatis* (Fig. 5) but differs by smaller pores (6.5–8 per mm), sometimes also by a concentrically zonate and sulcate pileal surface. Both species are geographically vicarious, *A. subflexibilis* occurs in Africa, Central and South America.

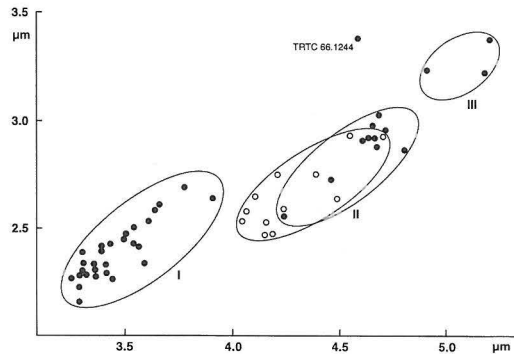


Fig. 5. Mean spore size of *Abundisporus* species. I – *A. fuscopurpureus*; II – *A. pubertatis* (•) and *A. subflexibilis* (o), III – *A. violaceus*.

*A. pubertatis* has been synonymized with *A. roseoalbus* (= *A. fuscopurpureus*) by Ryvardeen (Ryvardeen & Johansen, 1980), but they have different size of pores and spores.

***Abundisporus subflexibilis*** (Berk. & M.A. Curtis) Parmasto **comb. nova**

– Basionym: *Polyporus subflexibilis* Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10: 311 (1868). –

*Fomes subflexibilis* (Berk. & M.A. Curtis) Sacc., Syll. fung. 6: 178 (1888). – *Polystictus vibratilis* Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10:314 (1868).

Basidiomata perennial (sometimes annual?), solitary or rarely 2–3 basidiomata confluent and imbricate, semicircular, broadly attached, slightly conchate or almost unguulate, rarely applanate, sometimes effused-reflexed, densely corky, light in weight when dry. Pileus 2.5–6.5 × 4–11 × 0.5–3 cm; pileal surface with no zones when young but afterwards with one broad marginal zone or indistinctly concentrically zonate and slightly sulcate, at base uneven, fulvous umber, umber or dark date brown, at base later blackish; marginal zone sometimes fulvous clay. Crust in perennial specimens present, hard, 0.03–0.15 mm thick, black and shiny in section. Margin acute or thin but rounded. Sterile margin of the pore surface 0.5–1.5 mm wide. Context 5–20 mm thick (1–3 mm in resupinate part of the basidiome), densely cottony or corky, not zonate or indistinctly zoned, fulvous, brownish fulvous or umber. Pore surface glaucous or bay with a vinaceous tint, fulvous when bruised, then fulvous, fulvous umber or date brown; pores rounded, 6.5–8.5 per mm, with thin, entire walls.

Hyphal system subtrimitic with numerous skeletals and more rare skeleto-binding hyphae. Generative hyphae scarcely branched, thin-walled, hyaline or slightly yellowish, with clamps, 1.5–3 µm in diameter. Skeletal hyphae thick-walled, yellowish to brownish yellow, not swelling in 2% KOH solution, 2–5 µm in diameter; skeleto-binding hyphae moderately or rarely branched, thick-walled, yellowish, 1.5–3.5 µm in diameter; skeletal and skeleto-binding hyphae slightly dextrinoid. Cystidia none; basidia 13–17 × 5–5.5 µm. Spores ellipsoid, one side flattened, slightly angular, some rare spores almost truncate, usually with 1–2 guttula, with thickened or thick walls, slightly or distinctly yellowish, slightly dextrinoid, (3.6–)3.8–5 × 2.2–3.2(–3.4) µm.

**Distribution.** Brazil, Cuba, Kenya, Malawi, Tanzania, Venezuela.

**Specimens examined.** **Brazil.** Sao Leopoldo, Rio Grande do Sul, 1930 J.E. Rick (FH); SE of Rio Branco, 9.X.1980 B. Lowy et al. 560 (NY); between Rio Branco and Quixada, 19.X.1980 B. Lowy et al. 775 (NY). **Cuba.** C. Wright 165 (K, holotype of *Polyporus subflexibilis*); C. Wright 159 (K, holotype of *Polyporus vibratilis*). **Kenya.** Coast Prov., Shimba Hills, 24.VIII.1966 R.F. Cain et al. (TRTC 66.1489); Shimba Hills, 14.II.1973 L. Ryvardeen 10445, 10463 (O).

Malawi. BM 291 (Herb. Univ. Malawi). **Tanzania.** Tanga Prov., Usambara Mts., 18–19.II.1973 L. Ryvardeen 10737 (O); Amani East Usambaras, on *Hura crepitans*, 19.II.1973, no. 2856 (NY). **Venezuela.** Esludo Maragas, Hemuga Area, 25.IX.1955 J. Wurdach 39468 (O).

**Remarks.** *Abundisporus subflexibilis* has been synonymized with *A. roseoalbus* (= *A. fuscopurpureus*) by Ryvardeen (Ryvardeen & Johansen, 1980), a closely related species distinguished by its shorter, up to 4 µm long spores, and hyphae strongly swelling in KOH solution. Another similar species is *A. violaceus*, separated by bigger spores (4.5–5.5 × 2.8–3.5 µm) and soft, light coloured pileal surface without a crust. The difference between *A. subflexibilis* and *A. pubertatis* is described at the last named species. It is possible that the taxa are two vicarious subspecies.

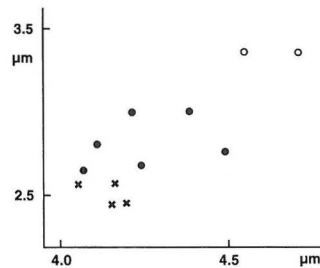


Fig. 6. Mean spore size in *Abundisporus subflexibilis*: collections from Venezuela and Brazil (x), Africa (•) and Cuba (o).

According to the spore size, three populations may be distinguished in *A. subflexibilis*: Cuban population, African and Venezuelan–Brazilian ones (Fig. 6). However, the number of specimens studied is too low to assert that they are different taxa.

***Abundisporus violaceus*** (Wakef.) Ryvardeen Belg. J. Bot. 131 (2): 154 (1998). – *Polystictus violaceus* Wakef., Kew Bull. Misc. Inf. 1916:72 (1916). – *Loweporus violaceus* (Wakef.) Ryvardeen in Ryvardeen & Johansen, Prelim. polyp. fl. E. Africa 417, f. 140 g (1980).

Basidiomata annual or perennial, solitary or imbricate and laterally fused, dimidiate, slightly conchate or semitriquetrous in section, at base with a slightly decurrent tube layer, corky, light in weight when dry. Pileus 3–5 × 3–10 × 0.5–3 cm,

surface without zones, uneven, somewhat tuberculate or irregularly warted, finely adpressed-velutinate, soft at touch, greyish cinnamon, ochraceous to buff with a pink to violet tinge; crust absent. Margin acute or rounded-acute, entire; sterile margin of the hymenophore surface up to 12 mm wide. Context 4–15(–20) mm thick, fibrous-cottony or soft-corky, zonate, cinnamon buff or light cinnamon, darkening to dark castaneous brown in KOH solution. Tubes in one strata, (2–) 4–8 mm deep; pore surface dark vinaceous buff, ochraceous pink or clay buff with a rosy tint; pores rounded or slightly angular, (2.5–)3.5–4.5 per mm, with thin or slightly thickened walls and entire margins.

Hyphal system dimitic or subtrimitic with numerous skeletal and rare or none skeleton-binding hyphae. Generative hyphae scarcely branched, thin-walled, hyaline, with clamps, 2–4 µm in diameter. Skeletal hyphae thick-walled, yellow or pale brown, 2.5–5 µm in diam, almost not swelling in 2% KOH solution; skeleton-binding hyphae moderately branched, thick-walled, brownish, 2–4 µm in diam; skeletal and skeleton-binding hyphae slightly, rarely – strongly dextrinoid. Cystidia none; basidia 15–20 × 3.5–5 µm, with 4 thin, 3–4 µm long sterigmata. Spores ellipsoid, with one side flattened, slightly angular, some few spores almost truncate, usually with 1–2 guttula, thick-walled, slightly or distinctly yellowish, slightly dextrinoid (greyish yellow in Melzer's Reagent), 4.5–5.5(–6) × 2.8–3.5(–4) µm.

*Distribution.* Kenya, Tanzania, Uganda (Wakefield, 1916; Ryvarden & Johansen, 1980).

*Specimens examined.* **Kenya.** Central Prov., W of Endeless, Mt. Eglon Forest Station, alt. 8 000 ft, 2.VIII.1966 R.F. Cain et al. (TRTC 66.124). **Tanzania.** Tanga Prov., Lushoto Distr., Usambara Mts., alt. 1600–2000 m, 21–22.II.1973 L. Ryvarden 10775 (O); Lushoto, Sungur Forest, W Usambawar, on *Podocarpus* sp., 21.II.1973, no. 2951 (NY). **Uganda.** Namutambula Forest, 1.1915 Maitland (K, holotype).

*Remarks.* The type of this species is sterile; only two spores have been seen by us: one unripe one, still attached to a basidium was 4.4 × 2.8 µm, and another, damaged spore was about 5 × 3 µm.

There is one specimen collected in Kenya (W of Endeless, alt 8,000 ft, 2.VIII.1966 R.F. Cain et al., TRTC 66.1244) which differs from typical *Abundisporus violascens* by being 3-layered in older parts of the basidiome, and tubes up to 4 mm long in each layer, and short spores (mean size of 30 spores measured: 4.59 × 3.38 µm).

*Abundisporus violascens* is easily recognizable thanks to its large spores and pores, and absence of crust on its soft pileal surface.

### Species incertae sedis

*Loweporus inflexibilis* (Berk.) Ryvarden  
Ryvarden in Ryvarden & Johansen, Prelim. polyp. fl. E. Africa 413, f. 139 e-g (1980). – *Polyporus inflexibilis* Berk., Hook. J. Bot. 8:199 (1856). – *Perenniporia inflexibilis* (Berk.) Corner, Beih. Nova Hedwigia 96:107 (1989).

A good description of this species is given by Ryvarden and Johansen (1980). It differs from the species of *Abundisporus* by absence of rosy, reddish or violaceous colour, and abundance of dextrinoid binding hyphae. We have not studied specimens of this fungus; according to the description given by Ryvarden and Johansen (1980), it has abundant yellowish brown, weakly dextrinoid spores; according to Corner (1989), the spores are white. This species was not mentioned by Ryvarden in his later paper (1998) when discussing on the taxonomy of the species of *Loweporus*.

*Loweporus castaneus* Corner, Beih. Nova Hedwigia 96: 86 (1989).

*L. corticola* Corner, Beih. Nova Hedwigia 96: 88 (1989).

*L. mollis* Corner, Beih. Nova Hedwigia 96: 91 (1989).

*L. ochraceicinctus* Corner, Beih. Nova Hedwigia 96: 91 (1989).

*L. pileoliferus* Corner, Beih. Nova Hedwigia 96: 92 (1989).

*L. rufescens* Corner, Beih. Nova Hedwigia 96: 93 (1989).

All six species of *Loweporus* mentioned above have white spores and obviously do not belong to the genus *Abundisporus*.

### Discussion

Only few groups of polypores have basidiomata with pinkish, rose-coloured or violaceous context and pore surface. Seven species of *Fomitopsis* are somewhat similar to *Abundisporus* species not only by their colour but also by a dense crust on their perennial pilei which sometimes is present (cf. Carranza-Morse & Gilbertson 1986). Nevertheless, *Fomitopsis* species are distinctly



different by their distinctly trimitic hyphal system, hyaline cylindrical or allantoid spores, brown rot and bipolar mating system.

Only the colour of basidiomata, skeletal hyphae and spores are the characteristics which enable to discriminate the closely related genera *Abundisporus*, *Perenniporia* Murrill and *Loweoporus* Wright. Corner (1989) tried to distinguish *Perenniporia* and *Loweoporus* on base of different hyphal systems, but in this group of fungi this character is too variable and hyphal types are not clearly distinguishable. *Perenniporia* is characterized by mainly white or ochraceous colour of basidiomata and skeletal hyphae; spores are hyaline (spore print is white), variable in size, in many cases strongly dextrinoid. The type of *Loweoporus*, *L. tephroporus* has grey to greyish dirty brown pore surface, ochraceous to pale brown skeletal which turn pale olivaceous in KOH solution, and small hyaline to yellow spores, dextrinoid in various degree. Basidiomata of the species of both genera are without any violaceous or rosy tint. In *Abundisporus*, basidiomata have pinkish to buff, pale umber, chocolate or vinaceous brown colour; spores are non-dextrinoid or only slightly dextrinoid, yellow, brownish or (in spore print) vinaceous brown.

The difference in colour is striking between *Loweoporus tephroporus* and *Abundisporus* species, but this is possibly mainly caused by structure of basidiomata and location of their pigments on hyphae, not by presence of different pigments. Absorption spectra of aqueous and alkalized aqueous extracts of 16 basidiomata (*A. fuscopurpureus*, *A. pubertatis*, *A. subflexibilis*, *A. violaceus*, *L. tephroporus*) are all quite similar and unspecific in the region of visible light, representing more or less gently declining curves without any maxima, minima or inflexions (Figs. 1–2). Infrared spectra of *A. fuscopurpureus* (TAA 10472), *A. pubertatis* (TAA 105777) and *P. tephropora* (TAA 103401, 103567, both collected in India) are identical (Fig. 3) except some very slight differences in the spectrum of *A. pubertatis*.

Are the small differences in the colour of basidiomata and skeletal hyphae sufficient to discriminate the three closely related genera? Ryvar den (1998) found that this was not the case, and rejoined *Loweoporus tephroporus* with *Perenniporia*. When describing the genus *Abundisporus* for the other species of *Loweoporus*, he

stressed out the small, pale yellow slightly thick-walled non-dextrinoid basidiospores while *Perenniporia* species are characterized by thick-walled, truncate, hyaline and dextrinoid spores. However, some spores of *Abundisporus* species have thick walls, being slightly dextrinoid and almost truncate. On the other side, several *Perenniporia* species have weakly truncate or variably dextrinoid spores; in some species they have been described as hyaline to pale yellow or yellow (*P. contraria* (Berk. & M.A. Curtis) Ryvar den, *P. medulla-panis* (Fr. : Fr.) Donk, *P. mundula* (Wakef.) Ryvar den, *P. ochroleuca* (Berk.) Ryvar den, *P. subacida* (Peck) Donk; see Ryvar den & Johansen 1980). Spores of *P. (Loweoporus) tephropora* have been described as hyaline by most authors but hyaline to yellow by Ryvar den and Johansen (1980).

In some poroid genera of Hymenochaetales, species with hyaline (white) and coloured (brown) spores may be observed within a single genus, such as *Phellinus* Quél. and *Inonotus* P. Karst. In Polyporaceae, there are only a few genera with coloured spores (*Bondarcevomyces* Parmasto, *Phaeotrametes* Wright, *Pseudopiptoporus* Ryvar den and *Abundisporus*), and this character has been considered to be useful to distinguish genera. If "*Perenniporia*" *tephropora* has coloured spores, it would be reasonable to distinguish *Abundisporus* and *Loweoporus* as subgenera of the genus *Loweoporus*. But even then, the distinction between this genus and *Perenniporia* will remain vague until the spore colour of all *Perenniporia* species will be distinctly known. The reality of generic taxa unlike species is only in their common genealogy, and the scope of genera depends on the general genus "concept" in use in any time in any group of organisms. The contemporary polypore taxonomy is based on relatively small-scope genus "concept" which actually does not recognize subdivision of genera into infrageneric subdivisions, and favours splitting on generic level.

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