

Fuscoporia insolita (Hymenochaetales, Basidiomycota), a new species from Russian Far East

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A new polypore species, *Fuscoporia insolita* Spirin, Vlasák & Niemelä (Hymenochaetales, Basidiomycota), is described from Khabarovsk Reg., Russian Far East. It is characterized by resupinate or nodulose, tough, dimitic basidiocarps, scarce and short hymenial setae, narrow, cylindrical to fusiform basidiospores, and a unique ITS sequence. DNA data confirm that the species belongs in *Fuscoporia*. It seems to be a pathogenic species, growing on living angiosperm trees.

Fuscoporia is a polypore genus of Hymenochaetales and comprises nearly 40 species worldwide. Its current concept was established by Fiasson and Niemelä (1984) who indicated the presence of crystal-bearing hyphae and some spore characters (cylindric or ellipsoid form, thin wall, absence of pigments and reactions with Melzer's reagent and Cotton Blue) as crucial features of *Fuscoporia*. This generic outline, initially based on morphological data, was later supported by DNA data (Wagner & Fisher 2002). Most of the *Fuscoporia* species have abundant hymenial setae except for *F. discipes* that is the only species without hymenial setae so far included in the genus (Ghobad-Nejhad & Dai 2007). In 2012, the first author investigated a unique woodland by the river Ulika (Khabarovsk Reg., Russia) and collected three specimens evidently belonging to *Fuscoporia* in the current sense but representing an undescribed species with very few hymenial setae. Because of the

peculiar morphology and ITS sequence, we here describe a new species based on those three specimens.

Macroscopic and microscopic characters were studied on fresh fruitbodies and herbarium specimens deposited in the mycological herbarium of the Botanical Museum, University of Helsinki (H) and in the private herbarium of the author Vlasák.

Three specimens of the new species and 12 of related *Fuscoporia* species were sequenced in the course of this study. DNA isolation and nrDNA ITS region sequencing methods follow Vlasák and Kout (2011). The ITS sequence alignment with introduced gaps consisted of 653 positions and all were included in the analysis. The evolutionary history was inferred by using the Maximum Likelihood method based on the Tamura-Nei model (Tamura & Nei 1993) conducted in MEGA5 (Tamura *et al.* 2011). The phylogenetic tree is rooted with *F. contigua*.

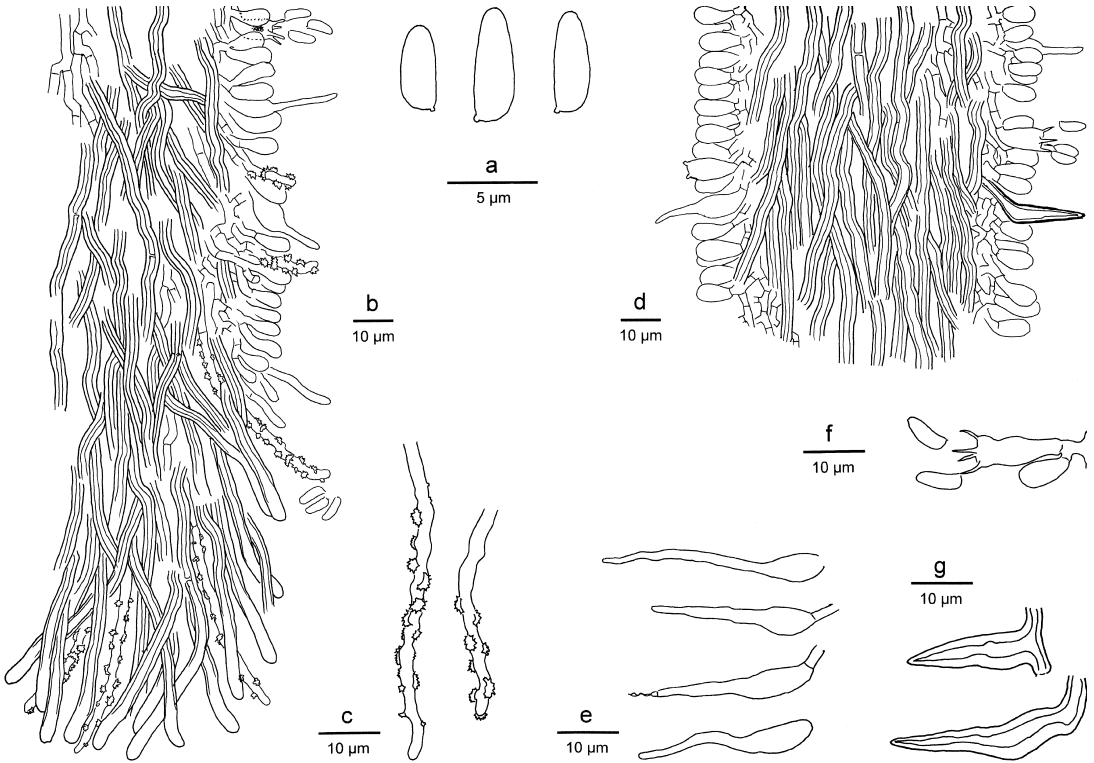


Fig. 1. Microscopic characters of *Fuscoporia insolita* (from the holotype). — **a:** Basidiospores. — **b:** Dissepiment edge in a vertical section. — **c:** Encrusted generative hyphae. — **d:** Section through upper dissepiment. — **e:** Cystidioles. — **f:** Basidia and basidiospores. — **g:** Setae.

According to the newly performed phylogenetic analysis of *Fuscoporia* (J. Vlasák unpubl. data), *F. contigua* is very distant from *F. ferruginosa* (the generitype of *Fuscoporia*) and the related species (*F. ferrea*, *F. viticola* and *F. insolita*), so it is convenient as an outgroup.

Fuscoporia insolita Spirin, Vlasák & Niemelä, *sp. nova* (Fig. 1)

MycoBank number 808652; GenBank KJ677115, KJ677116

Fuscoporiae ferrea similis, sed sporis angustioribus, 4.7–7.2 × 1.9–2.4 µm; setae rarissimae, 14.4–31.6 × 4.6–6.9 µm.

HOLOTYPE: Russia. Khabarovsk Reg.: Khabarovsk Dist., Ulika, 49.32909°N, 133.9378°E, on *Quercus mongolica*, 13 August 2012 Spirin 5208 (H).

Basidiocarps perennial (persisting for 2–4 years), resupinate to nodulose, at first appearing

as small roundish patches several mm across, later fusing together and reaching a width of 5–6 cm. Margin initially cream colored with rosy tint, in older basidiocarps ferruginous-brown to almost black, 1–3(5) mm wide, in biennial basidiocarps becoming elevated and sometimes partly detached from substrate. Pore surface even or notched step-wise (nodulose) on vertical substrates, at first reddish-brown, later yellowish-brown, sometimes with grayish hue; pores angular to sinuous, on sloping positions elongated, (5)6–7 per mm, dissepiments thick, entire. Section: context distinct, ferruginous-brown, corky, 0.5–1 mm thick, in older basidiocarps degenerating; tubes hard-corky, concolorous with pore surface, 3–15 mm thick, stratified (2–4 layers), annual layers separated from each other by ferruginous-brown sterile tissue 0.2–0.4 mm thick, oldest tube layers degenerating and filled by whitish mycelium. No distinct smell, taste mild. *Hyphal structure* dimitic; hyphae without clamps. *Context.* Skeletal

hyphae dominating, dark-brown, with capillary lumen, arranged in parallel bundles, some of them with secondary septa, (2.7)2.8–5.3(6.2) μm in diam. ($n = 30/2$); generative hyphae hyaline, thin-walled, 2.5–4 μm in diam. *Tubes*. Skeletal hyphae dominating, dark-brown, with capillary lumen, irregularly arranged to mostly subparallel close to dissepiments edges, (2.5)2.6–4.6(6.1) μm in diam. ($n = 70/3$); generative hyphae hyaline, thin-walled, 2.2–3.8 μm in diam., in subhymenium short-celled, in dissepiment edges covered by rosette-like crystals. Hymenial setae sharp-pointed, usually very rare and seemingly absent but in a few sections rather abundant, 14.4–31.6 \times 4.6–6.9 μm ($n = 11/2$); a few setae embedded in tramal layer, some malformed, 17.3–41.3 \times 3.6–6.8 μm ($n = 7/2$). Basidia short-clavate, (7.4)8.0–13.2(13.7) \times (3.3)3.4–5.2(5.3) μm ($n = 37/3$), with 4 sterigmata. Cystidioles conspicuous, bottle-shaped, with long, narrow, hyphoid or conical neck, (13.0)14.0–29.7(29.8) \times (3.2)3.3–4.3(4.4) μm ($n = 20/3$). Hyphal pegs present in well-developed hymenium, 20–25 \times 4–5 μm , consisting of 3–6 hyphae. Hyphidia abundant, simple, encrusted by rosette-like crystals, 1.5–2 μm in diam. *Basidiospores* hyaline, thin-walled, narrowly cylindrical, longest spores more or less clearly fusiform, (4.3)4.7–7.2(8.3) \times (1.8)1.9–2.4(2.5) μm ($n = 90/3$), $L = 5.66$, $W = 2.11$, $Q' = (2.0)2.2–3.5(3.8)$, $Q = 2.69$; some spores malformed and up to 10 μm long (excluded from measurements).

IDENTIFICATION AND TAXONOMY. In its outer shape, *F. insolita* resembles many other resupinate representatives of *Fuscoporia*, *Phellinidium* or *Fomitiporia*. The reddish-brown coloration, characteristic of its young basidiocarps, is similar to that of *Phellinidium ferrugineofuscum*; however, it fades out to yellowish-brown, rendering the basidiocarps more or less indistinguishable from many other similar species. A good macroscopic feature of *F. insolita* is its ability to produce a finally black, crustulose, elevated margin, so that the whole basidiocarp looks like a resupinate form of some pileate species. The notched step-wise hymenial surface strengthens this impression.

Scarcity of the hymenial setae is the primary anatomic character of *F. insolita*, separating it from the other resupinate species of the genus.

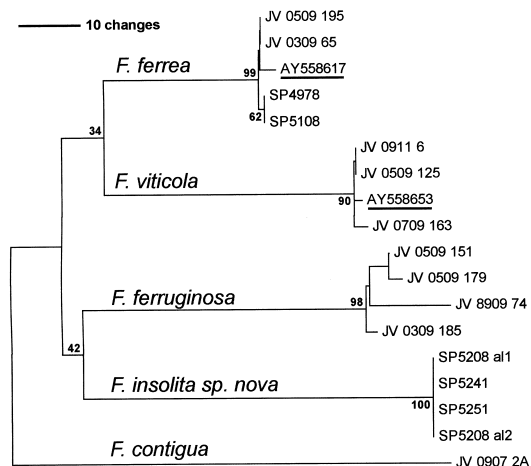


Fig. 2. Phylogenetic relationships of five *Fuscoporia* species inferred from ITS rRNA sequences. Topology from maximum likelihood analysis. *Fuscoporia contigua* sequence was used to root the tree. Support values along branches from maximum likelihood 1000 \times bootstrap. Branch lengths are drawn proportional to the number of substitutions. Underlined accession numbers indicate sequences retrieved from GenBank. Accession numbers of the other specimens are given in "Additional specimens examined".

In addition, a few embedded setae are found in two specimens (*Spirin 5241*, *5251*); they seemingly represent remnants of the previous year's hymenial layers.

According to the phylogenetic analysis (Fig. 2), *F. insolita* is related to *F. ferruginosa* (the generic type) and *F. ferrea*. The latter one differs from *F. insolita* in having abundant hymenial setae and peculiar hyphoid setae, present in the subiculum and sterile margin. The basidiospores of *F. insolita* are similar to those of *F. ferrea*. However, in *F. ferrea* they are slightly wider, (5.3)5.4–7.4(8.1) \times (2.0) 2.1–2.8(3.0) μm ($n = 24/2$), $L = 6.43$, $W = 2.38$, and cylindrical, not fusiform. In addition, the hymenial setae of *F. ferrea* are common and distinctly longer than in *F. insolita*, 25.4–43.8 \times 3.7–7.3 μm ($n = 20/2$).

HABITAT AND DISTRIBUTION. *Fuscoporia insolita* was collected three times in forests mainly dominated by deciduous trees (*Quercus mongolica*, *Acer mono*, *Tilia amurensis*, *Fraxinus mandshurica*) and *Pinus koraiensis*. The forests were virgin or near-to virgin communities with coarse woody debris. The holotype specimen was collected from a fallen log of *Q. mongolica*;

two other collections were made from living trees of *Acer mono*. The records on living trees imply that *F. insolita* is a pathogenic species. It was found at least once in the northern part of China, on fallen log of *Tilia* sp. [specimen Dai 3613, reported as *F. ferrea* in Dai (2010); Y.C. Dai pers. comm.]

ADDITIONAL SPECIMENS EXAMINED (specimens sequenced during this study are marked with an asterisk). *Fuscoporia insolita* (paratypes). **Russia.** Khabarovsk Reg.: Khabarovsk Dist., Ulika, *Acer mono*, 14.VIII.2012 Spirin 5241*, 5251* (H; GenBank KJ677114, KJ677113). — *Fuscoporia contigua*. **Czech Republic.** Jihočeský Kraj: Hluboká nad Vltavou, Karlův Hrádek ruins, *Quercus robur*, July 2009 Vlasák JV0907/2A (herb. Vlasák; GenBank JQ794547). — *Fuscoporia ferrea*. **Russia.** Khabarovsk Reg.: Khabarovsk Dist., Malyi Niran, *Corylus mandshurica*, 6 August 2012 Spirin 4978* (H; GenBank KJ677117), Ilga, *A. mono*, 10 August 2012 Spirin 5108* (H; GenBank KJ677119). **USA.** Pennsylvania: Wilkes-Barre, Ricketts Glen State Park, *Acer* sp., September 2003 Vlasák JV0309/65 (herb. Vlasák; GenBank JQ794582). New York: Adirondack Park, Johns Brook Trail, *Acer* sp., September 2005 Vlasák JV0509/195 (herb. Vlasák; GenBank JQ794581). — *Fuscoporia ferruginosa*. **Germany.** Sachsen-Anhalt: Thale, Bodethal, *Sorbus aucuparia*, September 1989 Vlasák JV8909/74 (herb. Vlasák; GenBank JQ794573). **USA.** Pennsylvania: Promised Land State Park, on hardwood, September 2003 Vlasák JV0309/185 (herb. Vlasák; GenBank JQ794567). New York: Adirondack Park, Fish Creek Pond, *Tsuga* sp., September 2005 Vlasák JV0509/151 (herb. Vlasák; GenBank JQ794568), Moose Pond, *Thuja* sp., September 2005 Vlasák JV0509/179-J (herb. Vlasák; GenBank JQ794569). — *Fuscoporia viticola*. **Czech Republic.** Jihočeský Kraj: Kubany Virgin Forest Nat. Res., *Picea abies*, September 2009 Vlasák JV0911/6 (herb. Vlasák; sequence identical with GenBank AY558653). **USA.** Pennsylvania: Promised Land State Park, *Acer rubrum*, September 2005 Vlasák JV0509/125 (herb. Vlasák; sequence identical with GenBank AY558653). Virginia: Mason Neck State Park, *Pinus* sp., September 2007 Vlasák JV0709/163

(herb. Vlasák; GenBank JQ794583).

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