

Phellinus setifer sp. nov. and *P. acontextus*, two noteworthy polypores from temperate areas of Japan, with notes on their allies

Tsutomu Hattori

Forestry and Forest Products Research Institute Tsukuba, Ibaraki 305–8687 Japan

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Type examination of *Trametes gilvodes* revealed that it is distinct from the fungus hitherto known as *Phellinus gilvodes* in Japan. *Phellinus setifer* sp. nov. is described for the Japanese materials. This species is characterized by effused-reflexed basidiocarps with strigose pileus surface, often dentate dissepiments, subulate setae, and cylindrical basidiospores. *Phellinus acontextus*, known only from the type material collected in Nepal, is newly reported from Japan. This species is characterized by sessile and often pendent basidiocarps with multisulcate pileus surface, very thin context, lack of setae, and dark-colored basidiospores. Cultural characters of the two species are also described. *Phellinus acifer* comb. nov. is proposed. *Phellinus contiguus* and *P. ferreus* are newly reported from Japan.

Key Words—Hymenochaetaceae; *Phellinus acontextus*; *Phellinus setifer*; polypores.

Phellinus Quél. is one of the largest of the polypore genera, in which Larsen and Cobb-Pouille (1990) recognized about 220 species. Later, Corner (1991) described 15 species mainly from tropical areas of Asia. On Japanese species of *Phellinus*, Ito (1955) listed 29 species under the genera *Phellinus* and *Cryptoderma* Imazeki, since when further species have been reported (Aoshima and Ogimi 1974; Hattori and Ryvardeen, 1996). However, a number of *Phellinus* spp. are still unreported and undescribed in Japan.

In this study, fungus reported as *P. gilvodes* (Lloyd) Imazeki in Japan is described as *P. setifer* sp. nov. *Phellinus acontextus* Ryvardeen, originally described from Nepal, is also reported next to the type collection, and detailed descriptions were made.

Materials and Methods

Descriptions of basidiocarp characters

Basidiocarp characteristics are described for *P. setifer* and *P. acontextus* macro- and microscopically. Information from the type specimens and other specimens is incorporated into the descriptions. Additionally, some allied species to these two species were also examined. A key to the world species of *Phellinus* with cylindrical spores and hymenial setae is provided based on observations by the author and descriptions made by several mycologists. Herbaria holding specimens are abbreviated according to Holmgren et al. (1990).

Descriptions on cultural characters

Cultural studies were made on Potato Dextrose Agar plates at 25°C. Cultural characters were described

mainly based on 6-wk-old cultures. Species codes of Nobles (1965) and Stalpers (1978) were recorded for 6-wk-old cultures. Mycelial growth rate K_r at 25°C was calculated from the following equation:

$$R_1 = R_0 + K_r (t_1 - t_0)$$

where R_1 = colony radius at time t_1 , R_0 = colony radius at time t_0 . Extracellular oxidase reactions were tested according to Nobles (1958), Käärik (1965), and Harkin et al. (1974).

Cultures examined in this study were deposited in the culture bank of Wood Decay and Mycology Lab. Forestry and Forest Products Research Institute, and the Ministry of Agriculture Forestry and Fisheries (MAFF) Genbank, National Institute of Agrobiological Resources, Tsukuba, Japan.

Results

Phellinus setifer T. Hattori sp. nov. Figs. 1, 2
= *Phellinus gilvodes* (Lloyd) Imazeki auct. sensu Imazeki: Bull. Tokyo Sci. Mus. 6: 104, non *Trametes gilvodes* Lloyd.

Basidiocarpi effuso-reflexi vel resupinati, annui. Pilei usque ad 20 cm lati, usque ad 2 cm dilatati, fulvi, badii vel fuscii, azonati, strigis longis rigidis ramosis usque ad 10 mm longis obducti, margine rotundato vel acuto. Caro usque ad 0.5 mm crassa, fibroso-suberosa, fulva, acrustosa. Tubi usque ad 5 mm longi, cinereo-fulvi. Pori 2–4/mm, angulares, dissepimentis integris vel dissectis. Setae 25–40 × 5–7.5 μm, acuminatae. Sporae 5.5–7.5 × 1.5–2.5 μm, hyalinae, cylindricae, inamylo-

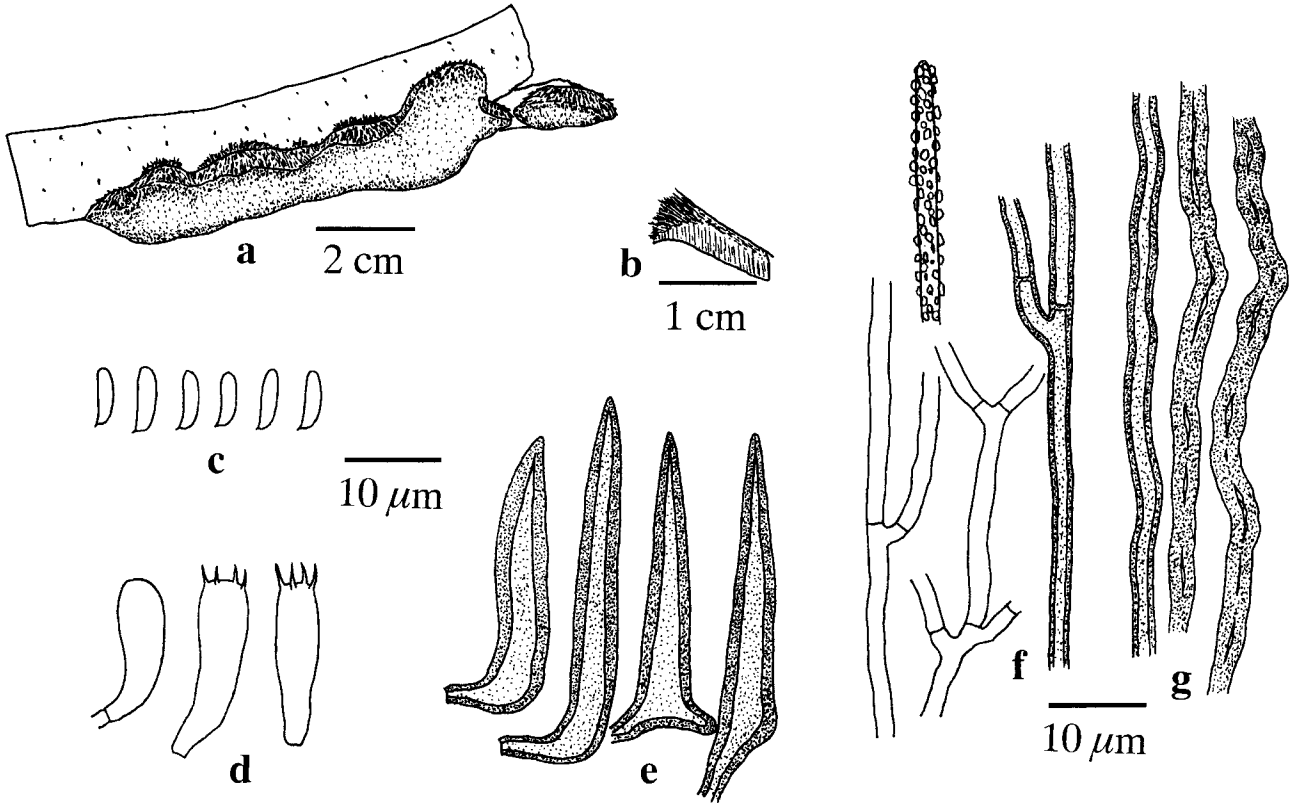


Fig. 1. Structures of *Phellinus setifer* from basidiocarps (a: from TFM-F-15833, b–g: from holotype). a. Basidiocarps. b. Vertical section view of a basidiocarp. c. Basidiospores. d. Basidia. e. Hymenial setae. f. Generative hyphae from the trama. g. Skeletal hyphae from the trama.

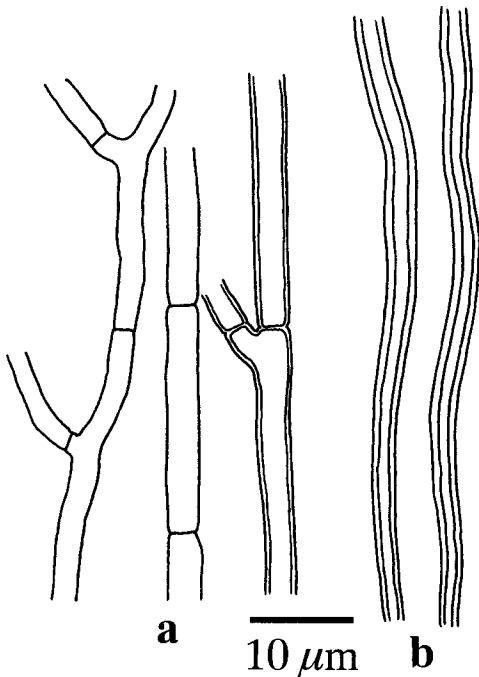


Fig. 2. Structures of *Phellinus setifer* from culture (WD-763). a. Generative hyphae from the aerial mycelium. b. Fiber hyphae from the aerial mycelium.

deae.

Holotypus: TFM-F-18319. Okazaki, Aichi Pref., Japonia, 2 Jan. 1994, S. Honda leg.

Etymology: Latin, setifer = seta-bearing; refers to the characteristics of pileus with distinct striga on its surface.

Basidiocarp characters Basidiocarps effused-reflexed to almost resupinate or sessile, usually with a narrow pileus, annual. Pileus occasionally fused, up to 20 cm long, up to 2 cm wide, tawny, chestnut brown to dark grayish brown, azonate, strigose with long stiff and branched hairs, hairs up to 10 mm long, pileus margin round to acute. Context usually very thin, up to 0.5 mm thick, present as the basal part of superficial hairs, fibrous-corky, tough, light brown to brown, without a crust. Tubes up to 5 mm deep, light brown to grayish tawny, pores 2–4/mm, angular or fused then sinuous, occasionally almost irpicoid, dissepiments thin, margin at first entire, often eroded, dentate.

Context hyphae dimitic, generative hyphae 1.5–2.5 μm in diam, thin to slightly thick walled, hyaline to pale brown, without clamp-connections, skeletal hyphae 2–4 μm in diam, thick walled, rusty brown. Trama hyphae dimitic, coarsely encrusted generative hyphae abundantly seen near the pore mouths, otherwise same as context hyphae. Setae abundant, 25–40 × 5–7.5 μm, acuminate, straight. Setal hyphae or tramal setae ab-

sent. Basidia cylindrical, 15–20 × 5–6 μm , 4-sterigmate. Basidiospores 5.5–7.5 × 1.5–2.5 μm , cylindrical, hyaline, non-amyloid.

Specimens examined: Aichi Pref., Okazaki, 2 Jan. 1994, leg. S. Honda (Holotype TFM-F-18319, Isotypes: K, BPI, TNS); Kochi Pref., Taisho-cho, 26 Nov. 1950 (TFM-F-2547); Tokyo, Asakawa, 11 Oct. 1957, leg. Y. Yamauchi (TFM-F-4674); the same place, 20 June 1957, leg. R. Imazeki (TFM-F-4859); the same place, 10 Aug. 1957, leg. Y. Yamauchi (TFM-F-4863); Shiga Pref., Kutsuki, Asoh, 20 Oct. 1990, leg. T. Hattori (TFM-F-15833); the same place, on *Quercus serrata* Murray, 3 Nov. 1991, leg. M. Inaba (TFM-F-16380; 16391); the same place, 11 Oct. 1996, leg. T. Hattori (TFM-F-17535); the same place, 9 Oct. 1995, leg. T. Hattori (TFM-F-17848); Shiga Pref., Hira, 17 Oct. 1993, leg. Y. Shimono (TFM-F-16981); Ibaraki Pref., Tsuchiura, Shishizuka, on fallen branch of *Q. serrata*, 16 Oct. 1998, leg. T. Hattori (TFM-F-19002).

Cultural characters Growth moderately fast, 8.8–9.5 mm/d, plates covered in 1–2 wk. Advancing zone entire to bayed, appressed, white. Mat light brown to cinnamon, aerial mycelium abundant, wooly to felty. Reverse unchanged after 6 wk. Odor indistinctive. Hymenophore not seen within 6 wk.

Hyphae from the advancing zone: generative hyphae hyaline, thin walled, without clamp-connections, 1.5–6 μm in diam. Hyphae from aerial mycelium: generative hyphae hyaline to pale brown, thin to slightly thick walled, without clamp-connections, 1.5–6 μm in diam, fiber hyphae abundant, thick walled, almost straight and unbranched, up to 3 μm in diam. Conidia none.

Extracellular peroxidase activities: gum guaiac +, syringaldazine +, α -naphthol +, tyrosine –. Species code (Nobles): 2, 6, 8, 32, 37, 38, 42, 54. Species code (Stalpers): 1, 2, 4, 6, 12, 13, (15), 22, 25, 34, 46, 52, 53, (54), 67, 83, 89.

Cultures examined: WD-763, isolated from the decayed wood attached to TFM-F-15833; WD-1648, isolated from the decayed wood attached to TFM-F-16380; WD-1657, isolated from the decayed wood attached to TFM-F-16391; WD-2066, isolated from the decayed wood attached to TFM-F-19002.

Species related to *P. setifer* examined

***Trametes gilvodes* Lloyd** Basidiocarps effused-reflexed, light brown to brown, strigose, context fibrous, up to 2 mm thick, tubes somewhat fragile, up to 5 mm deep, pores 2–3/mm, angular to round, partly elongated, dissepiments moderately thick, entire. Hyphal system dimitic, setae abundant, (30–)50–70 × 5–8 μm , basidiospores not seen.

Specimens examined: USA: Florida, Jan. 1897, leg. C. G. Lloyd (BPI, holotype, US0319973).

***Phellinus contiguus* (Fr.) Pat.** Basidiocarps resupinate, subiculum thin, pores 2–3(–4)/mm, angular to irregular, dissepiments thin, dentate. Hyphal system dimitic, hymenial setae 40–60 × 6–10 μm , tramal setae 40–120 × 5–12 μm , basidiospores 5–7 × 3–3.5 μm .

Specimens examined: JAPAN: Iwate Pref., Esashi,

on *Pinus densiflora* Sieb. & Zucc., 17 Oct. 1917, leg. C. Wagawa (TNS-202448, as *Poria viticola* (Schwein.: Fr.) Cooke); Gumma Pref., 28 Oct. 1920, leg. K. Tsunoda (TNS-202449, as *Poria viticola*); Saitama Pref., Otaki, Kawamata, 16 Oct. 1992, leg. T. Hattori (TMF-F-16681); Okinawa Pref., Iriomote Is., Shiira Riv., 19 June 1994, leg. M. Nuñez.; Nagano Pref., Oshika-mura, 20 Aug. 1950, leg. K. Aoshima (TFM-F-19267, as *Fuscoporia viticola* (Schwein.: Fr.) Murrill); Nagano Pref., Nobeyama, 25 Aug. 1962, leg. K. Aoshima (TFM-F-19268, as *F. viticola*). CZECH: Moravia, Vysoka, on *Populus tremula* L., 8 July 1989, leg. P. Vampola (ex MJ).

***Phellinus ferreus* (Pers.) Bourdot & Galzin** Basidiocarps resupinate, context corky, thin, pores (4–)5–7/mm, dissepiments moderate to thin, usually entire. Hyphal system dimitic, hymenial setae 25–40(–50) × 5–8 μm , basidiospores 5–7.5 × 2–2.5 μm .

Specimens examined: JAPAN: Chiba Pref., Sakae, 28 Sep. 1991, leg. T. Hattori (TFM-F-16322); Chiba Pref., Kiyosumi, 7 Dec. 1991, leg. T. Hattori (TFM-F-16465); Tokyo Pref., Tama, 7 Jul. 1991, leg. S. Kigawa (TFM-F-16559); Yamagata Pref., Asahi-Kosen, 28 Oct. 1992, leg. T. Hattori (TFM-F-16688); Nagano Pref., Chino, Minoto, 19 Sep. 1993, leg. T. Hattori (TFM-F-16903); Nagano Pref., Sugadaira, 4 Oct. 1998, leg. T. Hattori; Gifu Pref., Nakane, Hiwada, 11 Sep. 1994, leg. T. Hattori (TFM-F-17214); Aomori Pref., Towadako, Tsuta-onsen, 19 Oct. 1994, leg. T. Hattori (TFM-F-17357); Nagasaki Pref., Hirado, 27 Sep. 1994, leg. T. Kubayashi (TFM-F-17375). CHINA: Jilin Prov., Antu, Changbaishan, on *Tilia* sp., 4 Sep. 1993, leg. Y. C. Dai (ex. Dai 1032); the same Prov., Wangqing, Lanjia, on *Acer* sp., 11 Sep. 1993, leg. Y. C. Dai (ex. Dai 1218, 1224); the same Prov., Hinan, Hongqi, on *Acer* sp., 12 Oct. 1993, leg. Y. C. Dai (ex. Dai 1557). USA: Washington, Olympic Pen., on birch, 16 Aug. 1957, leg. J. L. Lowe et al. (ex. Lowe 8002).

***Phellinus viticola* (Schwein.: Fr.) Donk** Basidiocarps resupinate, effused reflexed or sessile, upper surface rusty brown, hirsute to glabrous, pores round to angular, 4–7/mm. Hyphal system dimitic, hymenial setae 30–75 × 5–8 μm , basidiospores cylindrical, 5.5–8 × 1.5–2 μm .

Specimens examined: JAPAN: Nagano Pref., Hara, on *Pinus densiflora*, 23 Aug. 1998, leg. T. Hattori (TFM-F-18934; 18935). CANADA: British Columbia, Vancouver Is., on conifer, 16–23 June 1938, leg. I. Mounce (ex H, as *Fomes viticola* (Schwein.: Fr.) J. Lowe) CZECH: Bohemia, Pohori, on *Picea abies* Karsten, 22 Sep. 1991, leg. P. Vampola (ex MJ). FINLAND: Lammi, Kotinen, on *Picea* sp., 28 July 1992, Y. C. Dai (ex H). NORWAY: Lierne, Sandmo, on *P. abies*, 26 July 1986, leg. H. Kotiranta (ex H). POLAND: Zawoja, Bbia Gora Nat. Park, on *P. abies*, 15 Aug. 1973, leg. T. Niemelä (ex H, as *Phellinus isabellinus* (Fr.) Bourdot & Galzin). USA: Ohio, Davis Memorial Adams Co., on *Pinus virginianus* Mill., 3 May 1970, leg. W. B. & V. G. Cooke (ex H); Arizona, Coronado Nat'l Forest, on cherry?, 7 Sep. 1958, leg. J. L. Lowe & R. L. Gilbertson (Lowe 9596, as *F. viticola*); Idaho, McCall, on conifer, 11 Sep. 1959, leg. J. L. Lowe

& R. L. Gilbertson (Lowe 6852, as *Fomes tenuis* P. Karst.).

Phellinus acontextus Ryvar den

Figs. 3, 4

Basidiocarp characters Basidiocarps sessile, somewhat pendent or effused-reflexed, annual. Pileus semicircular to fused, up to 10 cm long, up to 2 cm wide, triquetrous to unguulate, chestnut brown to dark brown, glabrous, multisulcate, margin acute, entire. Context almost lacking, up to 1 mm thick, woody, cinnamon, with a thin black crust. Tubes up to 10 mm deep, concolorous with context, pores 4–6/mm (6–8/mm in holotype), angular, dissepiment margin entire.

Context hyphae dimitic, generative hyphae 2–4 μm in diam (1.5–2.5 μm in diam in holotype), thin to slightly thick walled, hyaline to pale brown, without clamp-connections, skeletal hyphae 2.5–7 μm in diam (2–4 μm in diam in holotype), thick walled, brown. Trama hyphae dimitic, generative hyphae 1.5–3 μm in diam, skeletal hyphae 2–4 μm in diam, otherwise same as in context hyphae. Setae absent. Setal hyphae or tramal setae absent. Basidia clavate, 12–18 \times 4.5–6 μm , 4-sterigmate. Basidiospores short ellipsoid, 5–6.5 \times 3–4 μm ,

pale brown to brown, non-amyloid.

Specimens examined: NEPAL: Gandaki Prov., Ghorapani, alt 2800 m, on *Abies* sp., 30 Oct. 1979, leg. L. Ryvar den, (holotype, O). JAPAN: Nara Pref., Kami-Kitayama, Mt. Wasamata, 24 Sep. 1989, leg. N. Iwata (TFM-F-19265); the same place, 1992, leg. N. Iwata (TFM-F-19266); Aomori Pref., Towadako, Tsuta-onsen, 19 Oct. 1994, leg. T. Hattori (TFM-F-17357).

Cultural characters Growth slow, 2.1–6.7 mm/d, plates covered in 3–6 wk. Advancing zone bayed, mycelia sparse, appressed, some mycelia submerged in the agar, hyaline to white. Mat light brown to cinnamon, felty to floccose, crustose areas seen from the backsides. Reverse unchanged or brownish after 6 wk. Odor none. Hymenophore not seen within 6 wk.

Hyphae from the advancing zone: generative hyphae hyaline, thin walled, without clamp-connections, 1.5–3 μm in diam. Hyphae from aerial mycelium: generative hyphae hyaline to pale brown, thin walled, without clamp-connections, fiber hyphae abundant, brown, thick walled to almost solid, unbranched and almost straight to conspicuously branched, interlocked hyphae seen in the crustose areas. Conidia absent.

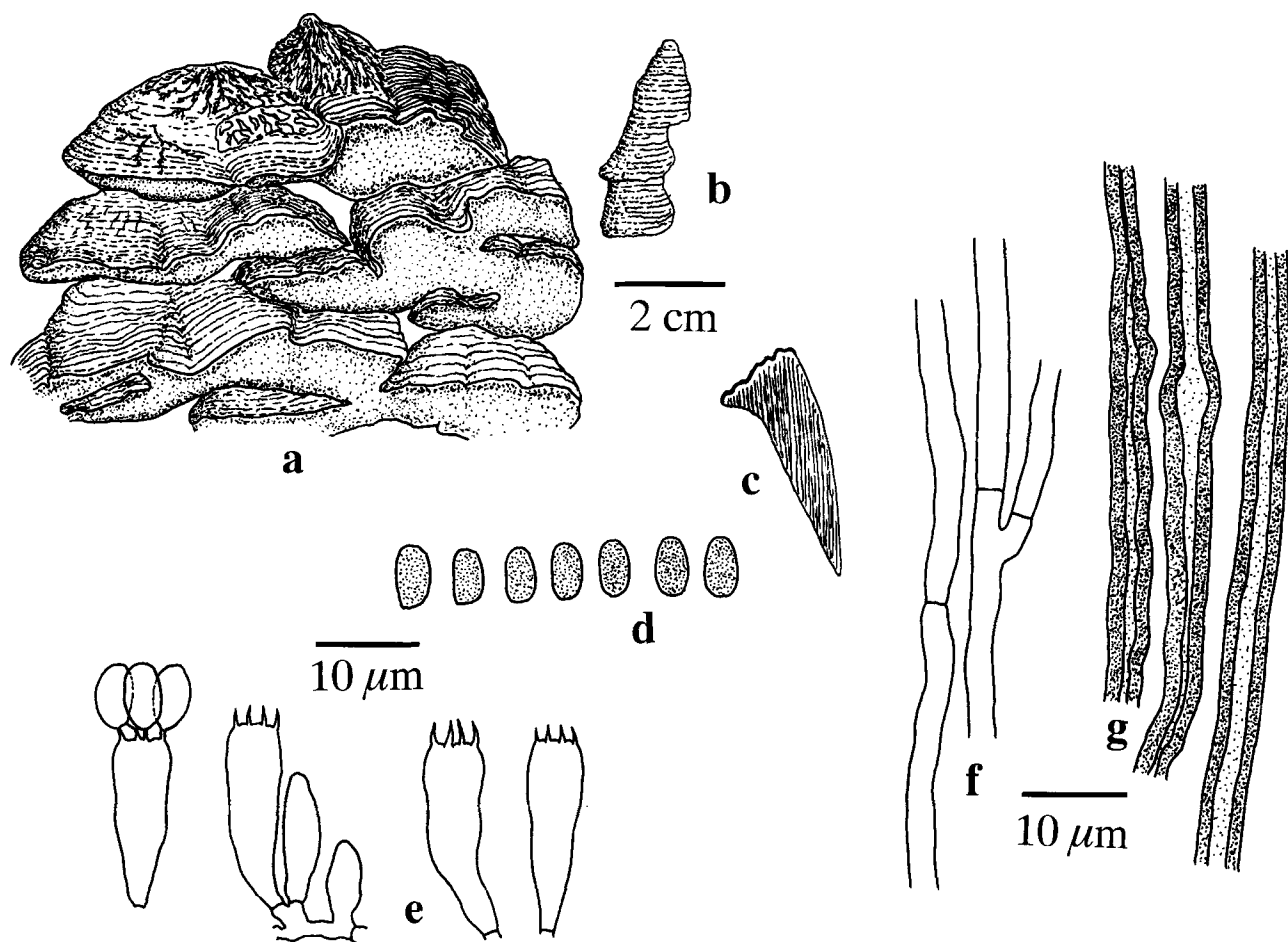


Fig. 3. Structures of *Phellinus acontextus* from basidiocarps (TFM-F-19265).

a. Basidiocarps. b. Side view of a basidiocarp. c. Vertical section view of a basidiocarp. d. Basidiospores. e. Basidia. f. Generative hyphae from the context. g. Skeletal hyphae from the context.

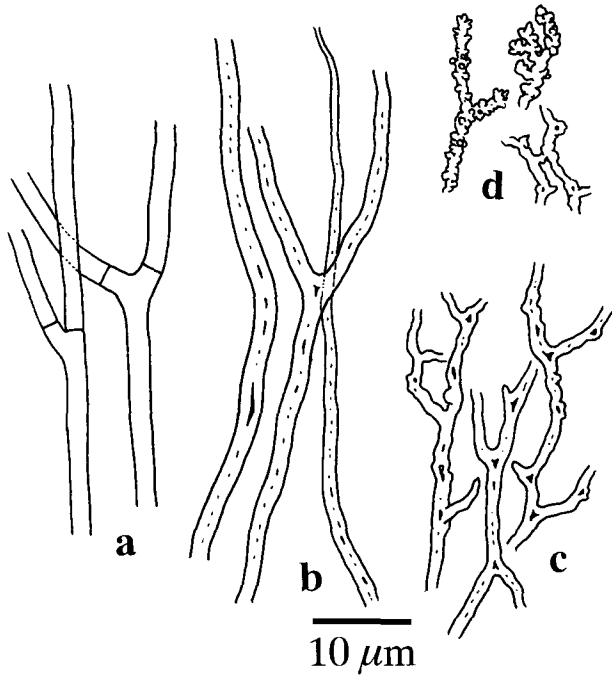


Fig. 4. Structures of *Phellinus acontextus* from culture (WD-1764).

a. Generative hyphae from the aerial mycelium. b. Fiber hyphae with few branches from the aerial mycelium. c. Fiber hyphae with abundant branches from the aerial mycelium. d. Interlocked hyphae from crustose mycelium.

Extracellular peroxidase activities: gum guaiac +, syringaldazine +, α -naphthol +, tyrosine -. Species code (Nobles): 2, 6, 8, 11, 32, 37, (38), (39), 43-46, 54, (55). Species code (Stalpers): 1, 2, 4, 7-9, 13, 14, 15, 19, 25, 34, (38), 46, 47, 52-53, 64, 67, 89, (90).

Cultures examined: WD-1764, isolated from the tissue of the basidiocarp of TFM-F-19266; WD-1923, isolated from the tissue of the basidiocarp of TFM-F-17357.

Species related to *P. acontextus* examined

***Phellinus sinensis* (Pilát) Pilát** Basidiocarps effused-reflexed to almost resupinate, upper surface dark brown, velutinous to almost glabrous, context corky, with a crust, pores angular, partly irregular, (2-)3-4/mm, dissepiments entire to eroded. Hyphal system dimitic, hymenial setae absent, basidiospores ellipsoid, pale yellow to pale brown, $4-6 \times 2.5-3.5 \mu\text{m}$.

Specimens examined: CHINA: Uhansi, Yav. Chan, alt. 2178 m, 5 Sep. 1935, leg. E. Lincent (PRM-500758, Holotype). USSR: regio Krasnojarsk, Montes Sajanen-ses, on *Populus tremula*, 27 Aug. 1958, leg. E. Parmasto (PRM-821748); ugio Khabarovsu, Reservatum olshe, on *Populus davidiana* Dode, 21 Aug. 1979, leg. E. Parmasto (PRM-822023).

Discussion

Trametes gilvodes was originally described from the United States by Lloyd (1912) without further report

from this country. Later, Lloyd (1924) took it as an anomalously pileate form of *Poria contigua* (Pers.: Fr.) P. Karst. Imazeki (1943) applied this name for a strigose *Phellinus* sp. collected in Japan under the combination *Phellinus gilvodes* (Lloyd) Imazeki. Since then, this name has long been used for the fungus with strigose pileus surface in Japan (Ito, 1955; Imazeki and Hongo, 1988; Imazeki et al., 1988). Teng (1963) also reported a similar fungus from Yunnan Province of China under the name of *Inonotus gilvodes* (Lloyd) Teng. Ryvarden (1992) made a type study on *T. gilvodes* and regarded it as synonymous with *Phellinus viticola*.

Type material of *T. gilvodes* has characteristically strigose pileus surface as in the Japanese materials. However, hymenial setae are much longer in the type (up to $80 \mu\text{m}$ long) than in the Japanese materials. Macroscopically, round and regular pores with entire dissepiments, spongy-fibrous and fragile trama consistency of the type material are also distinct from the Japanese materials. The Japanese materials are apparently distinct from the type material of *T. gilvodes* and not keyed out in the published keys to the *Phellinus* spp. (Larsen and Cobb-Poule, 1990; Corner, 1991). Thus, *P. setifer* was described as new based on the Japanese materials.

Phellinus setifer is a member of *Fuscoporia* defined by Fiasson and Niemelä (1984), and probably most allied to *P. viticola* with similar cylindrical basidiospores, subulate hymenial setae, occasionally effused-reflexed to resupinate basidiocarps with more or less rough pileus surface without a distinct crust. However, *P. setifer* is discriminated from *P. viticola* by its consistently strigose pileus surface, often eroded dissepiments, and shorter setae. Besides, *P. setifer* is hitherto known only on hardwood, usually on *Quercus serrata*, while *P. viticola* is most frequently seen on conifer trees in Eurasian countries (Ito, 1955; Bondartsev, 1953; Ryvarden and Gilbertson 1994).

Phellinus contiguus and *P. ferreus* are also allied to *P. setifer*. *Phellinus setifer* has large (usually 2-4/mm) and often irregular pores as seen in *P. contiguus*. The resupinate form of *P. setifer* resembles *P. contiguus*, occasionally with nodulous and tomentose marginal sterile zones. However, *P. setifer* is easily discriminated from *P. contiguus* by the narrower spores, shorter hymenial setae and lack of tramal setae. *Phellinus setifer* is microscopically similar to *P. ferreus*, but macroscopically distinct by the larger pores, usually more or less pileate basidiocarps with branched hairs, and fibrous consistency.

Herbarium specimens of *P. setifer* are frequently sterile, and their basidiospores are mostly not observed. Sterile specimens of this species may be confused with effused and strigose form of *P. gilvus* (Schwein.) Pat. However, *P. setifer* is easily discriminated from *P. gilvus* by its long, stiff and branched hairs on pileus surface, thin and brown context without yellowish tint, and larger pores with often eroded dissepiments. Besides, *P. setifer* is most frequently seen on fallen branches of *Q. serrata*, while *P. gilvus* is seen on fallen or standing trunks of various hardwood trees.

Distribution of *P. setifer* is still unclear, but it is known from temperate areas of Japan and China. This species may be an endemic species in temperate areas of East Asia.

Phellinus acontextus was described by Hjortstam and Ryvarden (1984) from Nepal and has long been known only from the type material. Its basidiocarps are described as pendent, pores 6–8/mm. Some of the Japanese materials are not pendent but effused-reflexed and have wider pores 4–6/mm.

This species is characterized by its occasionally pendent basidiocarps, multisulcate pileus surface, lack of setae, and dark colored basidiospores. There are several *Phellinus* spp. without setae and with dark-colored basidiospores in tropical areas (Larsen and Cobb-Pouille, 1990; Ryvarden and Johansen, 1980), but only a few species with such characters are reported in temperate

Eurasia. *Phellinus sinensis* is another species distributed in temperate Asia with similar microscopic characters to *P. acontextus*. *Phellinus acontextus* is distinguished from *P. sinensis* by its more distinctly pileate basidiocarps, long tubes, and smaller pores. Besides, trama of *P. acontextus* consists of parallel hyphae, while trama of *P. sinensis* consists of interwoven hyphae, which make its tubes not easily squashed in KOH solution.

A number of *Phellinus* spp. with cylindrical basidiospores and hymenial setae has been reported (Buchanan and Ryvarden, 1988; Corner, 1991; Cunningham, 1965; Dai, 1995; Gilbertson, 1979; Gilbertson and Ryvarden, 1987; Jahn, 1981; Larsen and Cobb-Pouille, 1990; Lowe, 1957; 1966; Ryvarden and Gilbertson, 1994). A key to the *Phellinus* spp. with cylindrical basidiospores and hymenial setae based on the author's observations in addition to the former descriptions is given below.

A key to the world species of *Phellinus* with cylindrical spores and hymenial setae.

1. Setal hyphae present in the trama or in the subiculum. 2
1. Setal hyphae or tramal setae absent. 4
2. Hymenial setae distinct, 40–60 × 6–10 μm, basidiospores oblong ellipsoid, 5–7 × 3–3.5 μm. Basidiocarps resupinate, perennial, pores angular to irregular, 2–3/mm. On dead deciduous wood. Widely distributed in warm temperate to tropical areas. *P. contiguus* (Pers.: Fr.) Pat.
2. Hymenial setae present as ends of setal hyphae, basidiospores up to 5.5 μm long. Pores mostly regular, smaller than 4/mm. 3
3. Basidiospores cylindrical, curved, 4–5.5 × 1–1.5 μm. On conifers. Basidiocarps resupinate, perennial, pores angular to sinuous, 7–9/mm (4–7/mm by Dai, 1995). Widely distributed in boreal conifer forest regions of the N. Hemisphere. *P. ferrugineofuscus* (P. Karst.) Bourdot
3. Basidiospores cylindrical, 3–4 × 1.1–1.5 μm. On hardwoods. Basidiocarps resupinate, perennial, pores round or angular, 4–6 / mm. Known from Jilin Prov., China. *Phellinus acifer* (Y. C. Dai) T. Hattori comb. nov. (Basionym, *Phellinidium aciferum* Y. C. Dai, Ann. Bot. Fenn. 32: 64, 1995; isotype TFM!)
4. Hymenial setae long, mostly longer than 50 μm long. 5
4. Hymenial setae shorter, up to 50 μm long. 6
5. Basidiocarps resupinate, pores oblong angular, 2–3/mm. Hymenial setae 50–70 × 5–7 μm, basidiospores cylindrical, 7–8 × 1.5–2 μm. On *Pinus*. Known from Russia (Siberia). *P. contiguiformis*
5. Basidiocarps resupinate, effused-reflexed or sessile, upper surface rusty brown, hirsute to glabrous, pores round to angular, 4–7/mm. Hymenial setae 30–75 × 5–8 μm, basidiospores cylindrical, 5.5–8 × 1.5–2 μm. On conifers and hardwoods. Widespread in the N. Hemisphere. *P. viticola*
5. Basidiocarps resupinate, pores round to irregular, 3–4/mm. Hymenial setae 36–56 × 6–10 μm, basidiospores short cylindrical, 6–6.5 × 2–2.5 μm. Known from the S. Hemisphere. *P. cryptacanthus* (Mont.) Pat.
6. Basidiocarps effused-reflexed or sessile. 7
6. Basidiocarps resupinate. 12
7. Basidiocarps sessile to effused-reflexed, perennial, broadly attached, ungluate to triquetrous, up to 10 cm thick, upper surface glabrous. 8
7. Not as above. 9
8. Basidiocarps light in weight, tubes soft papery, upper surface reddish brown, velvety to glabrous, pores 5–6(–8)/mm. Hymenial setae 20–32 × 4–8 μm, basidiospores subcylindrical, 6–8 × 2.5–3.5 μm. On hardwood. Known from neotropical areas and India. *P. cinchonensis* (Murrill) Ryvarden
8. Basidiocarps heavy, tubes corky and rigid, upper surface reddish brown, glabrous, pores angular, 6–8/mm. Hymenial setae 25–40 × 6.5–9 μm, basidiospores cylindrical, 6.5–7.5 × 2–2.5 μm. On hardwood. Known from Japan (Bonin Is.) *P. macroferreus* T. Hattori & Ryvarden
9. Basidiocarps sessile, flabelliform to semicircular and strongly contracted at the base, 1–3 mm thick, upper surface rusty brown, glabrous, strongly zonate, pores 6–8/mm. Hymenial setae 25–35 × 5–12 μm, basidiospores cylindrical, 6.5–7 × 2–2.5 μm. Known only from Panama. *P. cylindrosporus* Ryvarden
9. Basidiocarps effused-reflexed to sessile, broadly attached. 10

10. Context soft and spongy, with thin black layers within context, pores circular to angular, 5–7/mm with thick and entire dissepiments. Hymenial setae 25–37 × 6.5–8.5 μm, basidiospores cylindrical, straight, tapering at the apex, 7–10 × 2–2.5 μm. On conifers. Distributed in boreal areas of the N. Hemisphere.
..... *P. nigrolimitatus* (Romell) Bourdot & Galzin
10. Context corky to woody, without black layers. Basidiospores shorter than 8 μm. On hardwood. 11
11. Basidiocarps annual, effused-reflexed to sessile, upper surface yellowish brown to brown, strongly strigose with rough and branched hairs, context fibrous corky, pores angular, 2–4/mm, dissepiments often dentate. Hymenial setae 25–40 × 5–7.5 μm, basidiospores cylindrical, 5.5–7.5 × 1.5–2.5 μm. On *Quercus*. Temperate areas of E. Asia. *P. setifer* T. Hattori
11. Basidiocarps perennial, imbricate from resupinate foot, upper surface umber to black, glabrous, context woody, pores round, 5–7/mm, pore surface grayish when young. Hymenial setae 30–40 × 6–8 μm, basidiospores cylindrical, 7–8 × 2–2.5 μm. *P. tawhai* (G. H. Cunn.) G. H. Cunn.
12. Black layers present within context. Basidiospores tapering at the apex, 7–10 × 2–2.5 μm. *P. nigrolimitatus*
12. Black layers absent. Basidiospores not tapering or shorter. 13
13. Hymenial setae longer than 35 μm. Basidiospores short cylindrical, 6–6.5 × 2–2.5 μm. *P. cryptacanthus*
13. Hymenial setae mostly shorter than 40 μm. Basidiospores cylindrical to short cylindrical. 14
14. Pores angular, dissepiments often dentate, 2–4/mm. Usually with stiff hairs in the margin. *P. setifer*
14. Pores round to angular, dissepiments smooth, 4–7/mm, without stiff hairs. 15
15. Basidiospores 7–8 × 2–2.5 μm. Usually effused-reflexed with nodulous pileus, pore surface grayish when young. *P. tawhai*
15. Basidiospores mostly up to 7 μm. Distinctly resupinate, pore surface yellowish to reddish brown. 16
16. Basidiospores subcylindrical with a tapering base, 4–6 × 1.5–2 μm, hymenial setae 18–25 × 4–8 μm. Basidiocarps resupinate, pores round, 6–7/mm. On hardwoods. Known from USA (Florida) and Brazil.
..... *P. punctatiformis* (Murrill) Ryvardeen
16. Basidiospores cylindrical, base not tapering, longer than 5 μm. Hymenial setae 20–40 μm long. 17
17. Hymenial setae subulate to slightly ventricose, 25–40(–50) × 5–8 μm, basidiospores 5–7.5 × 2–2.5 μm. Basidiocarps resupinate, perennial, pores 4–7/mm. On hardwood and conifers. Cosmopolitan.
..... *P. ferreus* (Pers.) Bourdot & Galzin
17. Hymenial setae mostly ventricose, 20–26 × 6–8 μm, basidiospores 5–7 × 2.5–3 μm. Basidiocarps resupinate, perennial, pores 6–7/mm. Known from New Zealand. *P. kamahi* (G. H. Cunn.) P. K. Buchanan & Ryvardeen

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