

THE GENUS *PANELLUS* IN NORTH AMERICA

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The genus *Panellus* has been thoroughly studied in Europe and the species clearly delimited by Kühner and Romagnesi (1953), Moser (1967), Singer (1962), and others. The species have been individually studied in North America and variously reported by Kauffman (1918), Groves (1962), Krieger (1947), and Murrill (1915) under *Pleurotus*, *Panus*, and other taxa. However, the use of the amyloid reaction in connection with a systematic restudy of the morphology of the basidiospores and the sporocarp of the North American species has not been undertaken. The object of this study is to examine the North American taxa which might be included in *Panellus*, and to report on the number, distribution, and ecology of the North American species. Keys are provided which utilize among others many new or previously unused characters to aid in the identification of fresh and dried specimens.

Photomicrographs were taken with a Leitz Orthomat camera mounted on a Leitz-Ortholux research microscope. The line drawings were made with the aid of camera lucida. Ridgway (1912) colors are indicated in quotation marks, e.g., "snuff brown." The location of each collection studied is indicated by the standard herbarium designation, e.g., (MICH), following the collection number.

PANELLUS P. Karst. Bidr. Känn. Finl. Nat. Folk 32: XIV. 96. 1879.

Pileus 8-45 (-100) mm broad, 5-35 mm wide, viscid to dry, glabrous to woolly-pubescent, smooth, white, green, brown, or violaceous. Lamellae close to subdistant, even, edges entire, white, pinkish-buff, ochraceous, olivaceous, to vinaceous or brown. Veil present on young sporophores of one species. Stipe present or absent, if present very short (1-12 mm) and eccentric or laterally attached, dry, minutely pubescent or fibrillose, concolorous with the pileus. Sporocarps revive when moistened. Taste mild to slightly acrid. Odor not distinctive.

Spores 3.0-7.0(-11.0) \times (0.5-)1.0-2.0(3.5) μ , allantoid, oblong, cylindrical to narrowly elliptical, smooth, thin-walled, amyloid (blue to purple in Melzer's solution); spore print white to yellow. Basidia small, 11-28 \times 2.5-4.2(-6.3) μ , clavate, thin-walled, 4-spored, hyaline in KOH and Melzer's solution. Cheilocystidia cylindrical, fusiform, clavate to bifurcate or irregularly shaped, thin-walled, hyaline, embedded to protruding, abundant to infrequent. Pleurocystidia present or absent, when present similar to cheilocystidia. Pileocystidia usually present, typically long, narrow, thin- or thick-walled, and single or in fascicles. Cuticle either a gelatinous pellicle (Fig. 27) or of interwoven thick- and thin-walled hyphae (Figs. 28, 29). The latter usually with hairs (pileocystidia) but sometimes aggregated into fascicles appearing hispid. Trama of pileus of two types: 1. duplex with an upper gelatinous zone and a lower

zone of interwoven, non gelatinous, thick- and thin-walled hyphae; 2. homogeneous, of interwoven thick- and thin-walled hyphae. Trama of the lamellae of interwoven usually thick- and sometimes thin-walled hyphae. Clamp connections are present in all species.

Habit, habitat, and distribution.—Imbricate, often very crowded (e.g. Fig. 34), rarely single, always on twigs, branches, logs, and stumps of woody plants. Most commonly found on hardwoods but occasionally on conifers, noted especially on *Betula*, *Salix*, *Populus*, *Alnus*, *Quercus*, *Tsuga*, *Picea*, and *Pinus*. Fruiting from midsummer in the boreal forests to fall in the temperate forests. Known from Europe, North America, South America, Asia, Australia, and New Zealand.

Observations.—The genus *Panellus* is a lignicolous group of white- to yellow-spored species in the Tricholomataceae. It differs from all other genera by having a combination of amyloid, smooth, allantoid to narrowly elliptical spores; thick-walled hyphae in the trama of the lamellae (see Figs. 4, 10); even gill edges; a sessile to short-stipitate fruiting body; and thin-walled cheilocystidia. Specimens revive when moistened and could be confused with *Lentinellus*, *Phyllotopsis*, and *Plicaturopsis*. *Lentinellus* has short elliptical to subglobose amyloid spores but the serrate gill edges, cellular cutis, amyloid pileus trama in some species, and lack of gelatinous tissue separate it from *Panellus*. The nonamyloid, allantoid spores of *Phyllotopsis*, which are pink in deposit, are distinctive. *Plicaturopsis* appears closely related to *Panellus* but its allantoid spores are nonamyloid, the lamellae are often discontinuous or reduced to veins, and it has distinctive basidia constricted near the apex (Reid, 1964).

Type: *Panellus stipticus* (Bull. ex Fr.) Karst.

KEY TO THE SPECIES OF PANELLUS

1. Pileus viscid, with a thin pellicle (Fig. 27), glabrous or with pileocystidia (Fig. 28), brown to green; upper trama a thick refractive, gelatinous layer; with or without a veil when young; usually on hardwoods 2
1. Pileus dry or moist, white, violaceous to brown; if brown distinctly stipitate; cuticle with pileocystidia and/or loosely interwoven hyphae; lacking a veil; on hardwoods or conifers 3
2. Pileus small (8-15 mm broad), brown, villose to fibrillose in age; a thin-membranous veil (Fig. 32) present on young sporophores but absent at maturity; cheilocystidia (3.5-5.0 μ wide, Fig. 3), pleurocystidia absent 1. *P. patellaris*
2. Pileus large (25-100 mm broad), slimy viscid when moist, green to dark olive-green (drying green); veil absent; cheilocystidia and pleurocystidia abundant (6.5-12 μ wide, Figs. 7, 8) 2. *P. serotinus*
3. Pileus small (5-10 mm), moist, white (drying white), with a thick gelatinous upper trama; gelatinous gill edge (Fig. 31) furnished with small contorted cheilocystidia 12-19 \times 3.2-7.6 μ (Fig. 13); always on conifer wood 3. *P. mitis*
3. Pileus larger (10-35 mm), violaceous to brown; pileus trama and gill edge not gelatinous; on hardwoods and conifers 4
4. Pileus tan, distinctly laterally stipitate; cheilocystidia abundant, protruding, narrow, 18-45 \times 2.5-6.0 μ (Fig. 19); spores elliptical to weakly allantoid in profile (Fig. 17); abundant and common on many hardwoods 4. *P. stipticus*
4. Pileus violaceous, sessile; cheilocystidia infrequent, embedded; spores allantoid to oblong; often on birch, willow, alder, and conifers (usually spruce) 5

5. Spores (4.5-)5.0-6.5(-7.5) \times 1.2-2.0 μ ; lamellae not distinctly intervenose; usually on hardwoods; common in Europe and North America 5. *P. ringens*
5. Spores 6-11 \times 2-3.5 μ ; lamellae conspicuously intervenose; usually on conifers; known from eastern Canada and Europe. 6. *P. violaceofulvus*

1. *Panellus patellaris* (Fr.) Konr. & Maubl.
Icon. sel. fung. VI. p. 379. 1924.

Figs. 1-4, 27, 32.

Panus patellaris Fr. Epicr. p. 400. 1838.

Pileus 8-15 mm broad, sessile to short-stipitate, convex, viscid to glutinous at first, soon becoming fibrillose to villose and moist to dry, brown, "snuff brown." Context a narrow water-soaked brown ("saya brown") layer just beneath the gelatinous cuticle, remainder of context of pileus and stipe of firm pale cinnamon ("pale pinkish cinnamon") tissue. Stipe when present 1-3 mm long, 0.5-1.5 mm wide, eccentric, equal, dry, usually somewhat curved. Lamellae subdistant, narrow, "cinnamon-buff," covered at first by a thin membranous, dry "pinkish buff" veil which soon disappears leaving no traces at maturity.

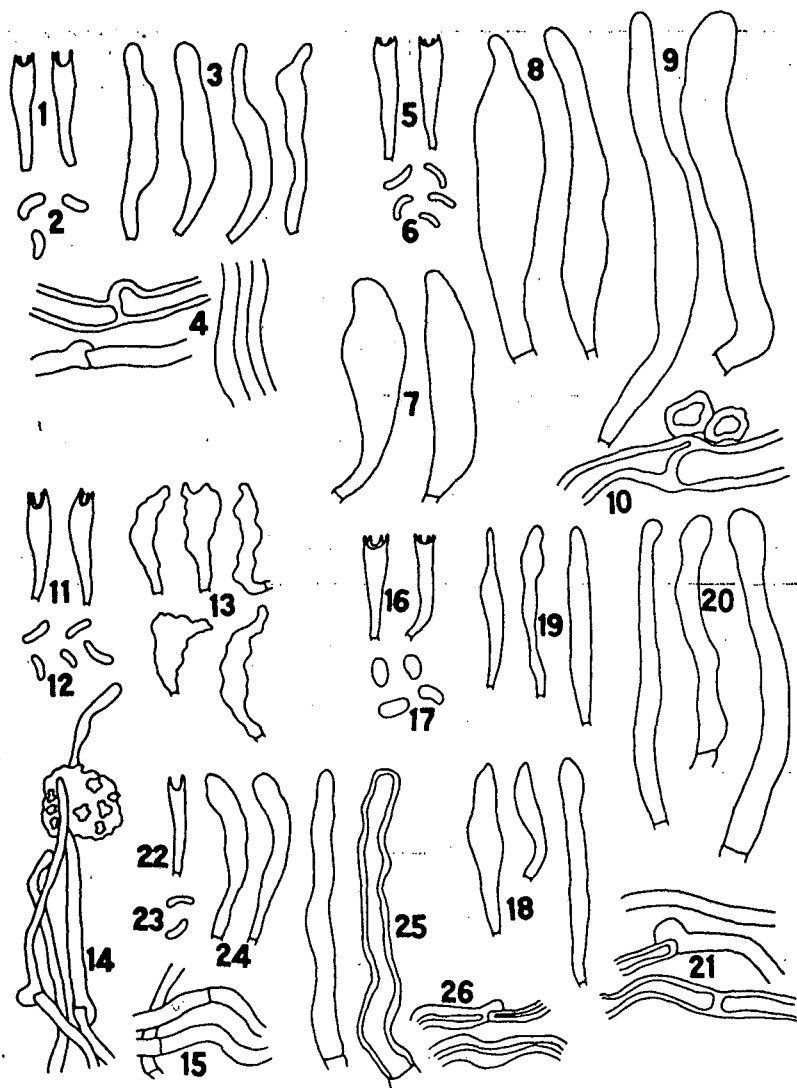
Spores 4.5-5.5 \times 0.5-1.5 μ , allantoid, thin-walled, amyloid (light blue in Melzer's solution); spore print white. Basidia 17-28 \times 3.5-4.2 μ , narrowly clavate, 4-spored. Cheilocystidia 22-35 \times 3.5-5.0 μ , clavate to fusiform, thin-walled, hyaline with some yellowish contents in KOH and Melzer's solution, protruding 1/3 to 1/2 of total length. Pleurocystidia—none seen.

Cuticle of pileus a thick gelatinous layer of interwoven hyphae 1.5-3.5 μ diam., thin-walled, clamps frequent, hyaline except for a thin pigmented zone near the surface; trama of pileus of interwoven hyphae 2.5-3.5 (-4.5) μ diam., thin-walled, clamps frequent, yellow to brown near cuticle, otherwise yellowish to hyaline in KOH or Melzer's solution. Trama of lamellae of interwoven hyphae 2.5-4.5 μ diam., thin- and thick-walled (walls up to 1.5 μ thick), hyaline to yellowish in KOH and Melzer's solution.

Habit, habitat, and distribution.—Solitary, imbricate, or even in caespitose clusters on dead branches or on fallen twigs. Branches usually not decorticated. Noted on species of *Alnus*, *Betula*, *Salix*, and *Fagus*. Widespread in Europe and North America but encountered infrequently. Fruiting from July to October.

Observations.—*P. patellaris* is the only member of the genus with a veil. At maturity the veil has disappeared and one must then look for the combination of a viscid cuticle, gelatinous upper trama, narrow cheilocystidia, small size, and brown coloration. *P. serotinus* is the other pigmented species with a viscid cuticle, but it is much larger, lacks a veil, has wide cheilocystidia and pleurocystidia, and the pileus is green to olivaceous when fresh. Fresh spore prints (Miller, 1968) were used to demonstrate the amyloid spore wall.

Material examined.—Canada: Ontario; R. F. Cain & A. H. Smith 4118 (MICH), L. Overholts 18603 (MICH). Yukon Terr.; O. K. Miller 5547 (BFDL). U.S.A.: Maine; F. L. Harvey 2010 (MICH). Michigan; D. V. Baxter & C. H. Kauffman Aug. 18, 1922 (MICH), A. H. Smith 22308 (MICH), D. E. Stuntz 5508 (MICH). New York; Man. 1884 (NY).



Figs. 1-4. *Panellus patellaris*. 1. Basidia. 2. Basidiospores. 3. Cheilocystidia. 4. Hyphae in the trama of the lamellae.

Figs. 5-10. *P. serotinus*. 5. Basidia. 6. Basidiospores. 7. Pleurocystidia. 8. Cheilocystidia. 9. Pileocystidia. 10. Hyphae in the trama of the lamellae.

Figs. 11-15. *P. mitis*. 11. Basidia. 12. Basidiospores. 13. Cheilocystidia. 14. Pileocystidia. 15. Hyphae in the trama of the lamellae.

Figs. 16-21. *P. stipticus*. 16. Basidia. 17. Basidiospores. 18. Pleurocystidia. 19. Cheilocystidia. 20. Pileocystidia. 21. Hyphae in the trama of the lamellae.

Figs. 22-26. *P. ringens*. 22. Basidium. 23. Basidiospores. 24. Cheilocystidia. 25. Pileocystidia. 26. Hyphae in the trama of the lamellae.

(Figs. 1-26 x750)

2. *Panellus serotinus* (Pers. in Hofmann ex Fr.) Kühner. Figs. 5-10, 33.
Fl. Analytique Champ. sup. p. 67. 1953.

Agaricus serotinus Fries, Syst. Mycol. 1: 187. 1821.

Pileus 2.5-6.0(-10.0) cm broad, 2.0-3.5 cm wide, convex, fan-shaped, conchate; margin often lobed or wavy, viscid, "vetiver green," "olive ochre" to "deep colonial buff" rarely ochraceous in center to "dark greenish olive," "dark ivy green," "citrine drab" to "dark olive buff" occasionally toned purple over the margin, always sessile. Lamellae close to subdistant, narrow, even, clearly marginate, pale orange to "honey yellow" with "yellowish olive" to "brownish olive" rarely "cinnamon buff" on the margin.

Spores 4.0-5.5 × 1.0-1.5 μ, allantoid to cylindric, with amyloid (blue) walls and yellow contents in Melzer's solution; spore print yellow. Basidia 17-21 × 3.0-4.0 μ, narrowly clavate, 4-spored. Pleurocystidia 35-64 × 6.5-11 μ, fusiform, broadly fusiform, to clavate, thin-walled, sometimes with incrustations over the apex, hyaline in KOH, yellowish in Melzer's solution, frequent, projecting up to 1/2 of total length. Cheilocystidia 40-60 × 6.5-12 μ, nearly cylindrical, fusiform to narrowly clavate, thin-walled, hyaline in KOH, yellowish in Melzer's solution, abundant, projecting 1/2 to 3/4 of total length. Cuticle with numerous tangled or decumbent, nearly cylindrical, fusiform to long-clavate, thin-walled pileocystidia 50-90 × 6-9 μ with yellow contents in Melzer's solution, hyaline in KOH, olive in H₂O, and arising from a thin cutis composed of interwoven thin- and thick-walled hyphae 2.5-8.5 μ diam., the hyphae yellow in Melzer's solution, hyaline in KOH. Trama of pileus duplex with an upper gelatinous layer containing interwoven, thin-walled hyphae 1.5-3.5 μ diam. and is often folded or partially gelatinized. Lower trama of non gelatinous, interwoven, thin- and thick-walled hyphae 3.5-18.0 μ diam., bearing clamp connections, dingy yellow-brown in Melzer's solution, light yellowish in KOH. Trama of lamellae of loosely interwoven, mostly thick-walled hyphae 2.5-11.0 μ diam., yellowish in Melzer's solution, light yellowish in KOH.

Habit, habitat, and distribution.—Occasionally solitary but usually imbricate on the sides of logs and sticks of various hardwoods and conifers, usually before they become decorticated. Noted on *Alnus*, *Populus*, *Ulmus*, *Fagus*, *Betula*, and *Quercus*, but also on *Tsuga heterophylla* in the western United States. Fruiting in the fall especially during late September and October. Widely distributed throughout North America, Europe, and Asia.

Observations.—This robust species has a characteristic greenish to olivaceous color of the pileus, is viscid when fresh, and has numerous tangled pileocystidia (Fig. 28). This combination of characters is distinctive in *Panellus*. Herbarium specimens without notes could be recognized by the combination of long, broad, pleurocystidia and cheilocystidia; the distinctive pileocystidia; and the thick gelatinous cuticle.

Material examined.—U.S.A.: California; A. H. Smith 56323 (MICH), 56773 (MICH). Idaho; O. K. Miller 1472 (BFDL), 2222 (BFDL), 2248 (BFDL), 2081 (BFDL), 2851 (BFDL), 2890 (BFDL), 2917 (BFDL). A. H. Smith 53899 (MICH), 54585 (MICH), 54601 (MICH), 55247 (MICH), 55299 (MICH), 67702 (MICH), 70927 (MICH), 71033

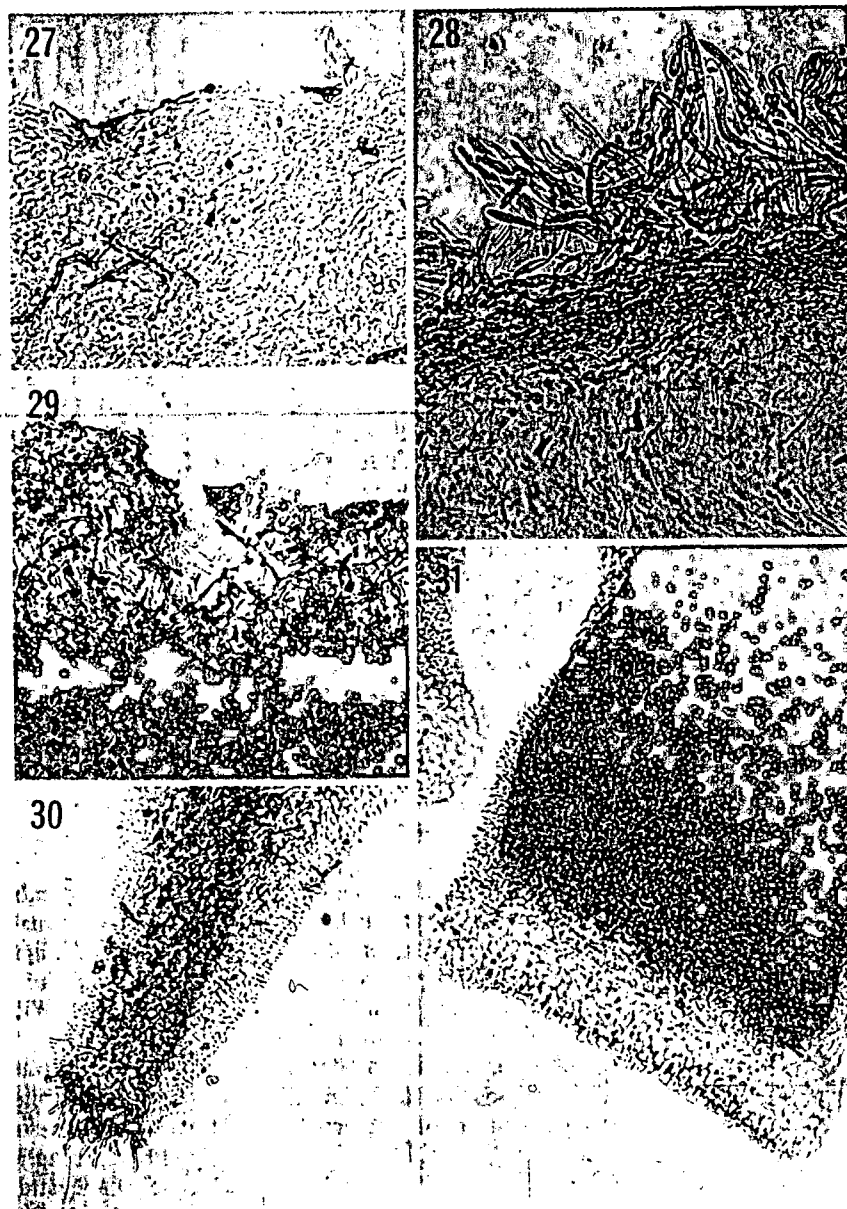


Fig. 27. Viscid cuticle of *P. patellaris*. Fig. 28. Viscid cuticle of *P. serotinus* with tangled pileocystidia. Fig. 29. Dry cuticle of *P. stipticus*, a dense tangle of thick- and thin-walled hyphae. Fig. 30. Elongate cheilocystidia in *P. stipticus*. Fig. 31. Gelatinous edge of lamella on *P. mitis*.

(MICH), 76559 (MICH), 76946 (MICH). J. R. Weir and A. S. Rhoads F.P. 38593 (BFDL). Michigan; O. K. Miller 131 (BFDL); A. H. Smith 43864 (MICH), 44063 (MICH), 50995 (MICH), 58322 (MICH), 58360 (MICH), 60809 (MICH), 62042 (MICH), 62043 (MICH), 62063 (MICH), 62210 (MICH), 62359 (MICH), 62394 (MICH), 64754 (MICH), 75227 (MICH). Montana; J. R. Weir F. P. 11348 (BFDL), F. P. 11411 (BFDL). New Hampshire; P. Spaulding F.P. 2318 (BFDL). North Carolina; G. C. Hedgecock F.P. 55086 (BFDL). Canada: British Columbia; O. K. Miller 4856 (BFDL).

3. *Panellus mitis* (Pers. ex Fr.) Sing.
Ann. Mycol. 34: 334. 1936.

Figs. 11-15, 31, 35.

Agaricus mitis Pers. ex Fr., Syst. Mycol. 1: 188. 1821.

Pileus 5-8 mm long, 5-6 mm wide, spathulate to conchate, flat to broadly convex, a dull white ground color, covered with a fine white canescence from appressed fibrils (best seen with a hand lens). Lamellae subdistant, even, narrow, white to pale pinkish cinnamon. Stipe 1-2 mm long, 1 mm or less wide, laterally attached, covered with minute white fibrils over a pallid ground color.

Spores 3.5-6.0 × 0.9-1.2 (-1.5) μ, allantoid to cylindrical, smooth, thin-walled, amyloid (purple in Melzer's solution). Basidia 11-22 × 2.5-3.5 μ, narrowly clavate, 4-spored. Cheilocystidia 12-19 × 3.0-7.6 μ, fusiform, clavate to contorted and irregular, thin-walled, hyaline in KOH and Melzer's solution, projecting somewhat or embedded in the sterile gelatinous layer which covers the edges of the lamellae. Cuticle with long, thin-walled hairs (1.5-3.5 μ wide) solitary or in loose often tangled fascicles, hyaline, often with a basal clamp connection. Trama of the pileus duplex with a wide (300-400 μ) gelatinous upper layer, composed of gelatinous hyphae (1.5-3.5 μ wide) embedded in a refractive, hyaline matrix; lower layer non gelatinous, of interwoven, thin-walled hyphae (2.5-7.0 μ, in diam.), ochraceous in Melzer's solution, dingy yellowish brown in KOH. Trama of lamellae of interwoven hyphae similar to the lower trama of the pileus, with the exception of the edge which is composed of a broad gelatinous layer containing gelatinous hyphae.

Habit and habitat.—Usually scattered or in clusters along the sides of conifer logs and sticks; particularly abundant on western larch (*Larix occidentalis*). Fruiting in the fall especially during September and October in Europe and North America.

Observations.—The small white sporocarps containing a gelatinous upper layer in the pileus trama and at the gill edges (Fig. 31) combined with the unusual cheilocystidia (Fig. 13) are a combination of characters which is possessed by no other species of *Panellus*.

Material examined.—Canada: B.C.; A. Foster 44413 (DAOM), 44474 (DAOM). N. B.; Stillwell 87394 (DAOM). Nfld.; Stillwell 46768 (DAOM). Ont.; M. Nobles 46790 (DAOM), H. S. Jackson 50124 (DAOM), 8060 (DAOM). U.S.A.: Idaho; O. K. Miller 2850 (BFDL), 2856 (BFDL), 2901 (BFDL). A. H. Smith 54578 (MICH), 54842 (MICH), 55296 (MICH). Oregon; A. H. Smith 18133 (MICH), 55403 (MICH). Europe: Sweden; S. Lundell, Fungi Exsiccati Suecici 9. (BPI). Norway; J. Stordal 65000 (DAOM).

4. *Panellus stipticus* (Bull. ex Fr.) Karst.

Figs. 16-21, 29, 30, 34.

Bidr. Kann. Finl. Nat. Folk. 32: XIV. 96. 1879.

Agaricus stipticus Bull. ex Fr., Syst. Mycol. 1: 188. 1821.

Panus stipticus (Bull. ex Fr.) Fr., Epicr. Mycol. 399. 1838.

Pileus (5-)12-32 mm long, 12-15(-25) mm wide, convex to plano-convex, crenulate margin in age; dry areolate, woolly-pubescent, sometimes with several concentric ridges or zones, ochraceous buff, "pale ochraceous buff" to "light ochraceous buff," various shades of tan or brown when dried. Lamellae close, narrow, often forked, "ochraceous-buff" to "ochraceous salmon" even "tawny olive" in age. Stipe 6-12 mm long, 3-8 mm wide, usually eccentric, often lateral, minutely fibrillose, dull white, constricted somewhat just at base. Taste slightly acrid, perhaps somewhat astringent. Odor not distinctive.

Spores (3.0-)3.5-4.6 \times 1.2-2.2 μ , elliptical to somewhat allantoid, with yellow contents and amyloid (blue) walls in Melzer's solution. Basidia 15-20 \times 2.5-3.5 μ , narrowly clavate, 4-spored. Cheilocystidia 17-45 \times 3.5-6.0 μ , narrowly clavate, cylindrical, clavate-rostrate, fusiform to bifurcate, thin-walled, hyaline, abundant, protruding 1/2 total length or more (Fig. 30). Pleurocystidia 19-40 \times 3.0-4.5 μ , fusiform, narrowly clavate, to bifurcate at apex, thin-walled, hyaline, scattered or in a dense cluster, occasionally protruding up to 1/2 total length. Cuticle of pileus a tangle of thick- and thin-walled, clamped hyphae 1.2-6.0 μ diam. (Fig. 29) with scattered inconspicuous pileocystidia 40-55 \times 3.5-5.5 μ , cylindrical to cylindrical-capitate, thin-walled, often with a basal clamp, yellowish in Melzer's solution, hyaline in KOH and with scattered amorphous, embedded, dingy brown, incrustated material on the wall. Trama of pileus obscurely duplex with a layer of upright hyphae blending into a lower layer of interwoven hyphae (2.5-8.0 μ diam.), thin- and thick-walled, with clamp connections, light ochraceous to dingy yellowish in Melzer's solution, light yellowish to nearly hyaline in KOH. Trama of the lamellae of interwoven hyphae, mostly thick-walled, similar in all aspects to the lower pileus trama.

Habit and habitat.—Usually in tightly packed imbricate clusters as a saprophyte on the sides of logs, limbs, and stumps of hardwoods. Noted on *Quercus*, *Acer*, *Alnus*, *Betula* and on wood in service, particularly structural timbers. Fruiting in the fall in September, October, and November in Europe and North America.

Observations.—The brown pileus, luminescent lamellae, and constant presence of a short lateral stipe, combined with abundant, protruding cheilocystidia (Fig. 30) and the unique woolly-pubescent cuticle (Fig. 29) clearly separate *P. stipticus* from all other species in the genus. The amyloid (blue) spore, thick-walled hyphae of the trama of the lamellae and pileus, ability to revive when moistened, and lignicolous habitat, combined with the smooth (non-serrate) edges of the lamellae were used as central characters in erecting *Panellus* as a genus in the Tricholomataceae. It is spelled "*P. stypticus*" by many authors and is named for its styptic or astringent properties.

Buller (1924) investigated the luminescence of *P. stipticus* and found that the lamellae of the North American fruiting bodies are luminescent but the phenomenon cannot be observed in European specimens. Twelve hours exposure of the gills to film in complete darkness yielded negative results with



33



34

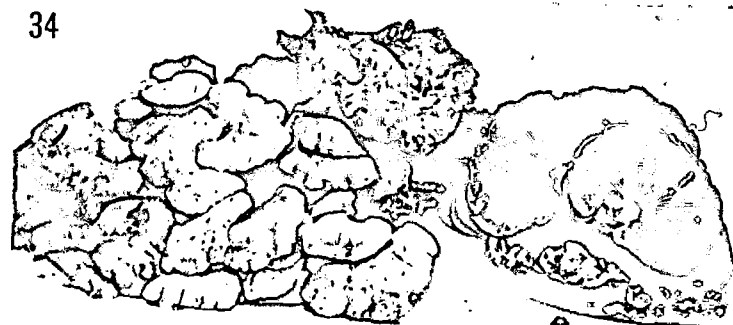


Fig. 32. *P. patellaris* (\times 2) Photo by J. Lindsay.
 Fig. 33. *P. serotinus* (\times 1/2) Photo by A. H. Smith.
 Fig. 34. *P. stipticus* (\times 1/2) Photo by A. H. Smith.

European material eliminating the possibility of very low levels of luminescence. Mycelium was examined by Buller (1924) and again luminescence of the vegetative cells could only be demonstrated in North American material. He compared spores and other morphological features of the fruiting bodies on both continents but no additional constant differences could be found. He concluded that two physiological races could be discerned and that both were variants of *P. stipticus*. The luminescence is usually visible after several minutes in a dark room and best observed in temperatures from 10 to 25°C.

Material examined.—U.S.A.: Idaho; O. K. Miller 2937 (BFDL). Louisiana; A. Laska 2639 (BFDL). Maryland; O. K. Miller 3668 (BFDL), 5100 (BFDL), 5102 (BFDL), 7119 (BFDL). Michigan; O. K. Miller 43 (BFDL), 1308 (BFDL), A. H. Smith 75145 (MICH). New York; O. K. Miller 3550 (BFDL), R. L. Gilbertson 6828 (BFDL). Washington D. C.; O. K. Miller 4949 (BFDL).

5. *Panellus ringens* (Fr.) Romagnesi.

Figs. 22-26, 36.

Bull. Soc. Mycol. Fr. 61: 38. 1945.

Lentinus ringens Fr. Epicr. Syst. Mycol. 396. 1836-38.

Panus salicinus Peck. N. Y. State Mus. Rep. 24: 77. 1872.

Panus ringens Fr. Hymen. Europe. 490. 1874.

Pileus (5-) 10-30 mm in diam., sessile, margin even to somewhat crenate, sometimes irregularly striate (see Fig. 36), light purple to purple drab or lilac colored with vinaceous tints ("purple-drab," "dark purple drab") fading in age sometimes to "vinaceous fawn" with a conspicuous pallid pubescence which is dense over the lateral attachment of the cap (Fig. 36) to the substrate; dried material is "vinaceous gray" to "lilac gray" at point of attachment. Lamellae radiating from the point of attachment, fawn to pink ("fawn color," "vinaceous-fawn" to "vinaceous-pink") often fading in age, reddish-brown when dried ("mikado brown" to "verona brown").

Spores (4.0-) 5.0-7.0 × 1.2-2.0 μ, oblong to allantoid, amyloid (blue in Melzer's solution), hyaline in KOH, often hard to find. Basidia 17-27 × (2.5-)3.5-6.3 μ, narrowly clavate, 4-spored. Pleurocystidia not found. Cheilocystidia 24-38 × 4.2-5.5 μ, clavate, cylindrical, fusiform, thin-walled, hyaline in Melzer's solution and KOH, infrequent. Cuticle of pileus of single, tangled, or fasciculate thin- and thick-walled clamped hyphae 2.5-5.0 μ diam., hyaline to light yellowish in Melzer's solution and KOH. Trama of pileus and lamellae of interwoven, thick-walled and infrequent thin-walled hyphae 3.5-7.0 μ diam., light yellowish in Melzer's, hyaline in KOH. Subhymenium a thin layer of tightly interwoven hyphae 1.0-2.5 μ diam.

Habit, habitat, and distribution.—Several to gregarious, often lining the sides of sticks and limbs on the ground, sometimes nearly imbricate. Recorded on species of *Alnus*, *Betula*, and *Salix* in Europe and North America but in Europe it is also occasionally found on conifers. It is widespread in North America, from Maine to Idaho and north into Canada. Fruiting in late summer and fall but the persistent sporophores have been collected throughout the winter.

Observations.—*P. ringens* is closely related to *P. violaceofulvus* but has smaller spores, smaller basidia, lacks a cellular hymenopodium, and does not



Fig. 35. *P. mitis* (× 1) Photo by A. H. Smith.
Fig. 36. *P. ringens* (× 6) Photo by O. K. Miller.

develop a venose hymenium between the lamellae. However, both species are purple to violet or violet tinted. *P. ringens* has been mistakenly identified as *P. violaceofulvus* (Batsch ex Fr.) Sing. by American authors and is discussed further by Miller (1967). The two collections cited by Coker (1944) were examined and both have the short spores and other characters of *P. ringens*.

Material examined.—Europe: Finland; Karsten Jan. 2, 1866 (NY). Italy; G. Bresadola, March 13, 1896 (BPI). Sweden; Bruun and Lundell, Fungi Exsiccati Suecici, 231 (BPI), A. Melderis 66411 (DAOM). Switzerland; Quélet 1890 (NY). North America: Canada. Ontario; J. Dearness (Peck 203) (MICH), J. W. Groves 17446 (MICH), J. Dearness 203 (NY), Feb. 1890 (NY), Elles & Everhart 2503 (NY), R. F. Cain 21551 (NY), 80577 (DAOM), A. H. Smith 80576 (DAOM). North America: U.S.A.: Colorado; Seaver & Bethel Aug. 30, 1910 (NY). Idaho; O. K. Miller 2908 (BFDL), 2933 (BFDL), 2937 (BFDL), 4893 (BFDL), J. R. Weir 5541 (NY), J. R. Weir & A. S. Rhodes 16145 (BPI), 16146 (BPI). Maine; Murrill 2017 (NY) & Everhart 2503 (NY). Maryland; O. K. Miller & J. Lindsay OKM 5026 (BFDL). New York. C. H. Peck, Center, New York (type of *Panus salicinus* Pk.) (NYS), O. K. Miller 3594 (BFDL), C. L. Shear 108 (NY). Pennsylvania; Herbst (NY).

6. *Panellus violaceofulvus* (Batsch ex Fr.) Sing.
Ann. Mycol. 34: 335. 1936.

Pileus 3-15 mm diam., sessile or with a short rudimentary stipe; margin even to slightly wavy, inrolled at first, dry, brown tinted violet, or darker violet-brown with a conspicuous white, woolly pubescence. Lamellae sub-distant, sometimes venose, pale violet to brownish in age.

Spores 6.5-10.0 × 2.2-3.5 μ, cylindrical to somewhat allantoid, amyloid. Basidia 25-35 × 4.5-6.0 μ, clavate, 4-spored. Cystidia, none seen. Cuticle of pileus of interwoven or loosely fasciculate, thick-walled, clamped hyphae 3.5-6.0 diam., light yellow brown in Melzer's, hyaline in KOH. Trama of pileus and lamellae of interwoven thick-walled, clamped hyphae 3.5-10.0 μ diam., light yellowish in Melzer's, hyaline in KOH. Subhymenium a cellular hymenopodium, particularly evident near gill attachment to pileus.

Habit, habitat, and distribution.—Several to many, often somewhat imbricate, on small limbs and logs. The only collection examined from North America was on balsam fir (*Abies balsamea*) from Anticosti Island in eastern Quebec, Canada. In Europe it has been reported on silver fir (*Abies alba* or *A. pectinata* of some authors) and other conifers, usually at high elevations in the Alps.

Observations.—Collections identified as *Panus*, *Resupinatus*, and *Panellus violaceofulvus* have been examined from a number of herbaria (MICH, QFB, BPI, BFDL, DAOM and NY). All North American collections which I have studied with one exception discussed above are *Panellus ringens* (Fr.) Sing. and are easily identified by the short spores, absence of a cellular hymenopodium, short basidia, and their occurrence on species of hardwood, particularly *Alnus*, *Salix*, and *Betula*. It is quite likely that *P. violaceofulvus* will be encountered frequently in the northern boreal forests.

Material examined.—Canada: Quebec; G. B. Ouellette 5083 (QFB). Europe: Austria; Magmus (NY), Italy; Bresadola 1896 (NY). Switzerland; 405. Les Champ. du Jura et des Vosges (NY).

EXCLUDED SPECIES

The following list deals only with species found in North America which have been referred to *Panellus*.

- Panellus dealbatus* (Berk.) Murrill. N. Am. Flora 9: 245-246. 1915.
= *Asterotus dealbatus* (Berk.) Sing. Mycologia 35: 161. 1943.
Panellus eugrammus (Mont.) Murrill. N. Am. Flora 9: 245. 1915.
= *Nothopanus eugrammus* (Mont.) Sing. Mycologia 36: 364. 1944.
Panellus haematopus (Berk.) Murrill. N. Am. Flora 9: 246. 1915.
= *Panus suavissimus* (Fr.) Sing.
Panellus mirabilis Singer. Mycologia 47: 770-771. 1955.
= *Mycena mirabilis* (Sing.) O. K. Miller comb. nov.

The type specimens of this minute fungus have central or slightly eccentric stipes which recurve very sharply from the host. It does not revive as the species of *Panellus* do, and the hyphae of the trama of the lamellae are thin-walled. In addition, the spores are very weakly amyloid, elliptical, pointed at one end, 6.0-9.5 × 2.5-4.0 μ, and not the usual allantoid to narrowly elliptical spores of *Panellus*. The cheilocystidia are of two types: (A) Clavate end-cells with dingy yellow contents 20-30 × 8-10 μ, thin-walled, often embedded or protruding slightly; (B) Narrowly clavate to cylindrical cells with branched projections 18-35 × 2-4 μ, thin-walled, hyaline. Pleurocystidia 21-35 × 5-7 μ, clavate to fusiform, with a short blunt tapered apex, thin-walled, and hyaline. In addition, the subcutis and trama of the pileus is deep red in Melzer's solution. The above combination of characters is found only in the genus *Mycena*, *Eumycena* in the section *Corticolae*. The cheilocystidia resemble those of *Mycena corticalis* A. H. Smith, while the spores are very much like those of *Mycena madronicola* A. H. Smith (Smith, 1947, Fig. 3).

- Panellus vulpinus* (Sow.) Murrill. N. Am. Flora 9: 246. 1915.
= *Lentinellus vulpinus* (Sow. ex Fr.) Kühn et R. Maire, Bull. Soc. Myc. Fr. 61: 44. 1946.

SUMMARY

Six species of *Panellus* are described from North America. A number of new characters have been found or used to clearly delimit species using material in either the fresh or dried condition. New ecological data, hosts, and wider distributions have been presented for many species. A key to the species is provided along with camera lucida drawings and photomicrographs to illustrate the important characters. Macrophotographs of five species are included.

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