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MARASMIUS SECTION CHORDALES IN THE NORTHEASTERN UNITED STATES AND ADJACENT CANADA[1]

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Although neotropical and European species of *Marasmius* have been comprehensively studied in recent years (*e.g.*, 6, 13, 16, 17), there are few modern descriptions of North American species. Early North American treatments, all based primarily on macroscopic characters, include those of Morgan (9), Pennington (10), and Kauffman (2). Kühner's (4, 5) classification scheme as modified by Singer (12, 14, 15) provides an excellent modern framework for the study of *Marasmius* and has been followed here. The present work consists of a key and descriptions for the six species of *Marasmius* section *Chordales* Fr. known to occur in the northeastern United States and adjacent Canada.

Marasmius section *Chordales* Fr. (=*M.* section *Alliacei* Kühner 1933) includes species whose pilei have hymeniform cuticles of smooth or occasionally nodulose cells, whose stipes are non-insititious (*i.e.*, there are hairs at the point of emergence from the substrate), and whose trama is nonamyloid. A partial, adnate collar may sometimes occur, but there is never a complete, free collar to which the lamellae are attached. Hyaline, capitate or appendiculate pileocystidia are present in some species. Usually the pilei are, for *Marasmii,* medium in size (*ca* 3–30 mm broad). An odor of garlic or onions is sometimes present. Species with broom cells of the *Rotula-* or *Siccus*-type are not placed in this section. Young pilei of *M. scorodonius* (Fr.) Fr. and both young and old pilei of *M. olidus* Gilliam and *M. insipidus* Gilliam, however, may have nodulose or apically diverticulate cuticular cells which fall under the definition of broom cells. Careful investigation of radial sections of pilei of *M. scorodonius* show a few such cells in every collection, although the cells in tangential section are usually all smooth. In primordia the entire surface may be formed of nodulose cells. If nodulose broom cells are present, the combination of nonamyloid trama, collarless lamellae, absence of black rhizomorphs, and non-insititious stipe will still indicate *M.* sect. *Chordales.*

Singer's (12,14) disposition of Fries' sections of *Marasmius* designed to preserve the widely-used sectional names of Kühner (1933) has proved to be practical and desirable, particularly since many of the type species on which the sections are based have remained poorly understood. The type species of *M.* section *Chordales* Fr. (*M. chordalis* Fr., according to Article 22 of the *International Code of Botanical Nomenclature*), however, is well understood. Kühner (4) cited it in the original description of his section *Alliacei* ("*Alliateae*"). In the spirit of Singer's (12) substitution of the name *Marasmius* for Kühner's section *Rotulae* on nomenclatural grounds, I have used the Friesian name *Chordales* for this section while preserving Kühner's circumscription.

Macroscopic descriptions are based on notes from fresh material. Color terms are those of Maerz & Paul (8), cited in the text as "M & P"; Ridgway (11), cited as capitalized color terms; or

[1] Portion of a dissertation submitted to the Graduate School of the University of Michigan in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

the *ISCC-NBS Color Name Charts Illustrated with Centroid Colors* (3), cited as uncapitalized color terms. All specimens were studied microscopically in 2% KOH and in Melzer's reagent. Fresh specimens were also studied in water. Colors of microscopic structures are described as they appear in fresh specimens in water. Tangential and radial sections of the pileus with attached lamellae, as well as longitudinal sections of the stipe near the apex and base, were examined for structural composition and chemical reactions. Hymenial or cuticular elements are called cystidia in the present work if they have capitate or short- to long-appendiculate apices or if they project beyond the basidioles and have thin, hyaline walls. Cells with broad apical diverticula or nodulose cells (broom cells) are described with respect to their location and are not termed cystidia.

Drawings were made with the aid of a Leitz Ortholux microscope and drawing tube. Structures are shown as they appear in sections or in squash mounts in 2% KOH or in KOH-congo red.

Unless otherwise indicated by the appropriate symbol from the *Index Herbariorum* (7), all specimens are deposited in the University of Michigan Herbarium.

MARASMIUS section CHORDALES Fries, Epicr. Myc. 381. 1838.

Marasmius B *Chordales* Patouillard, Ess. Taxon. 145. 1900.
Marasmius §. *Mycena* I *Longipedes* Morgan, J. Mycol. 11: 237. 1905.
Marasmius section *Alliacei* ["*Alliateae*"] Kühner, Le Botaniste 25: 87. 1933.

Type species: *Marasmius chordalis* Fries, Epicr. Myc. 383. 1838.

Pileus medium-sized (3–30 mm broad), smooth or rugulose, striate or not, thin to moderately fleshy, firm, variable in color but not white. Odor and taste mild or of garlic or onions. Lamellae thin, well-developed, moderately numerous, distant to close, adnate to free or attached to a partial, adnate collar. Stipe thin to moderately thick, tough-pliant or cartilaginous to horny, pruinose to pubescent or glabrous, not insititious, often with a short pseudorrhiza. Rhizomorphs lacking, but sterile stipes sometimes present.

Spores clavate, obovate, pip-shaped, or lemon-shaped. Hymenial cystidia when present fusoid-ventricose, prominently projecting. Diverticulate cells sometimes present on the lamellar edge. Trama of pileus and lamellae nonamyloid. Pileus cuticle a hymeniform layer of smooth or apically nodulose, obovate or pyriform cells occasionally mixed with short cystidia. Clamp connections present throughout. Stipe cortex of thick-walled, smooth or incrusted hyphae. Stipe vesture of cystidioid or filamentous thick-walled hairs or rarely absent.

On deciduous leaves, needles of conifers, bark of living trees, or humus.

Key to Species of Section *Chordales*

1. Odor of crushed pilei faint to strong, of garlic or onions.
   2. Lamellae light-brown; spores 10–16 μm long; usually on oak leaves. 1. *Marasmius olidus*
   2. Lamellae light yellowish-pink to white; spores (5.6–) 6.7–9.5(–10) μm long; on pine needles, bark of living trees, grass, or humus. 2. *Marasmius scorodonius*
1. Odor of crushed pilei not of garlic or onions, often lacking altogether.
   3. Spores 4.2–7.3 μm broad, lemon-shaped or broadly fusoid-elliptic; pileus gray or brown tinged olive. 3. *Marasmius chordalis*
   3. Spores less than 4.2 μm broad, or if broader, then elliptic to obovate but not broadly elliptic or lemon-shaped; pileus variously colored but not tinged olive.
      4. Spores 4.3–7 μm long; capitate or subcapitate cystidia present in the pileus cuticle. 4. *Marasmius uliginosus*
      4. Spores 6–10 μm long; cystidia absent from the pileus cuticle.
         5. Hyaline diverticulate cells present on the lamellar edges; capitate or subcapitate cystidia absent from the lamellar faces.
            6. Stipe yellowish-white to light yellowish-brown overall; stipe vesture of abundant, hyaline, thick-walled hairs up to 77 × 11 μm. 5. *Marasmius insipidus*
            6. Stipe yellowish-white or some shade of yellow at the apex only, with the base various shades of brown or reddish-brown; stipe glabrous, or with a few short hairs near the base. 2. *Marasmius scorodonius*
         5. Hyaline diverticulate cells absent from the lamellar edges; capitate or subcapitate cystidia present on the lamellar faces and edges. 6. *Marasmius pyrrhocephalus*

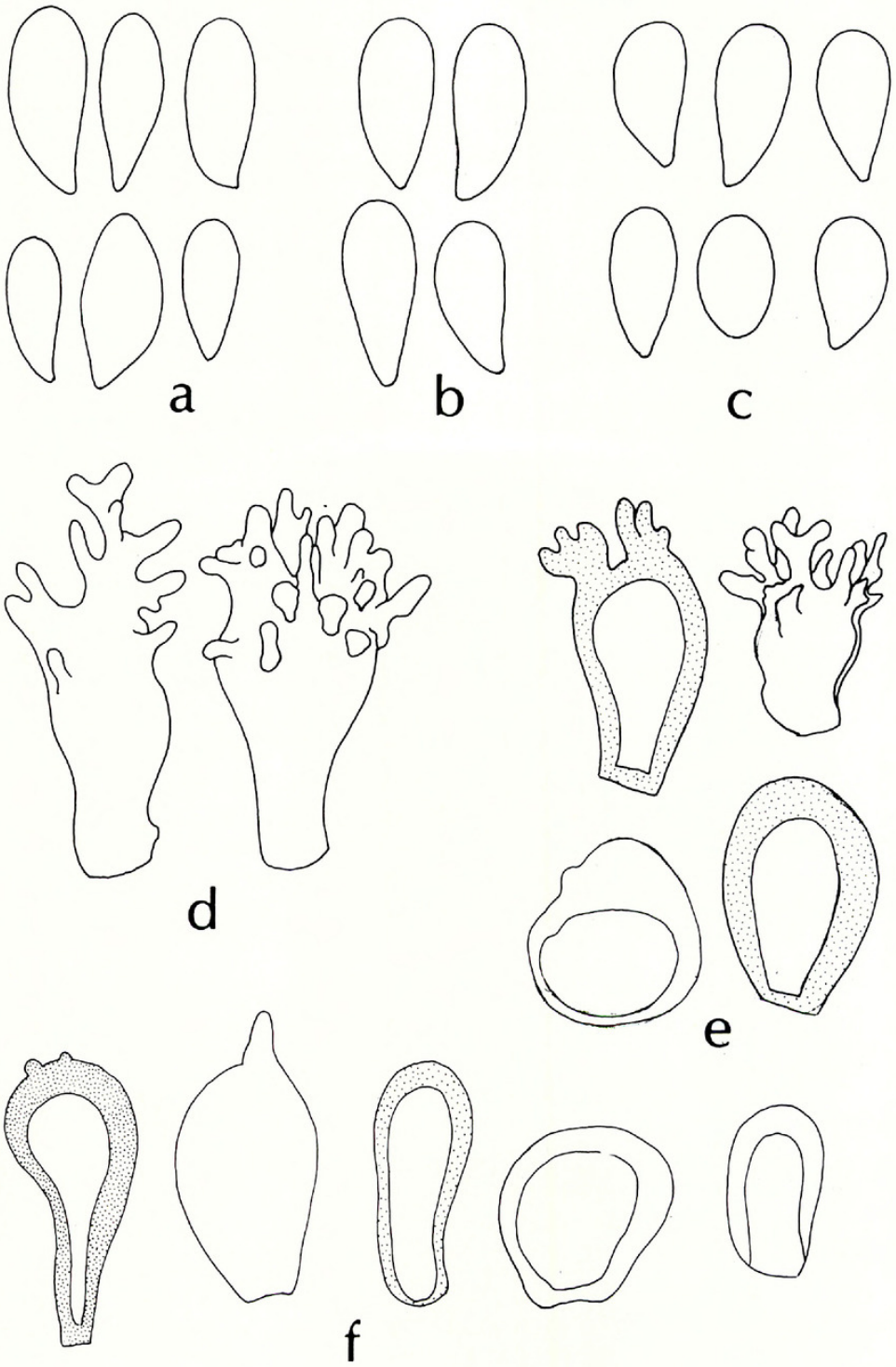

FIG. 1. *Marasmius scorodonius*. *a*. Spores (*Gilliam 710*) ×2300. *b*. Spores (*Nannfeldt 16288*) ×2300. *c*. Spores (*Ammirati 1866*) ×2300. *d*. Diverticulate cells from lamellar edge (*Gilliam 710*) ×2300. *e*. Cells from cuticle (*Ammirati 1866*) ×1500. *f*. Tangential section of pileus cuticle (*Gilliam 710*) ×1500.

1. **Marasmius olidus** Gilliam, Mycologia 67(4), in press. 1975. Fig. 2.

PILEUS 3–18 mm broad; pulvinate or convex at first, then plano-convex and often umbilicate, finally plane or concave with a wavy margin; dry; dull; opaque; rugulose on the disc; at first even, then shallowly plicate or rugulose-striate to the disc; entire to crenate; pliant; reviving. CUTICLE minutely velutinous particularly on the disc; moderate brown in primordia, soon light yellowish-brown (M&P 11B4-5), often tinged pink, or moderate brown on the disc and light yellowish-brown elsewhere. TRAMA thin (up to 1.5 mm thick); firm; yellowish-white. ODOR pungent, of garlic. TASTE of garlic or onion.

LAMELLAE narrow (0.6–1.5 mm broad); thin; distant; moderately numerous (about 20 reach the stipe); unequal, with 2–3 irregular tiers of lamellulae; adnate, adnexed, or subdecurrent, sometimes seceding in age; membranous; entire or minutely fimbriate; straight; somewhat intervenose or not; rarely forked near the stipe; light yellowish-brown (M&P 11B4), concolorous with mature pilei.

STIPE 12–31 mm long, 0.2–2.1 mm thick; central; terete or flattened at the apex; tapered slightly to the base; straight or curved; dry; dull; opaque; hollow; cartilaginous; even; pruinose above, tomentose below, the vesture brownish-pink or occasionally white at the apex; yellowish-white or light yellowish-brown up to 2 mm from the apex downward, moderate brown, grayish-brown tinged pink, or blackish-brown below; not insititious. STERILE STIPES present along the leaf veins near the basidiocarps; tapered; glabrous; yellowish-brown. RHIZOMORPHS lacking. BASAL MYCELIUM forming a flat disc, often visible near the leaf veins as well; fine, resembling spun glass; white.

SPORES white in mass; 10.2–16.5(–19.6) × 2.8–3.8 μm; narrowly clavate and often curved. BASIDIA 26–36 × 4–8.5 μm; subclavate to clavate; 4- or rarely 2-spored. HYMENIAL DIVERTICULATE CELLS 9–34 × 4–11 μm; clavate, cylindric, or obovate; with occasional broad, rounded lobes or short diverticula; thin-walled; not projecting beyond the basidioles; present on the lamellar edges only. TRAMAL HYPHAE 2–8(–14) μm broad; interwoven; clamped; often inflated; with thin, hyaline to pale grayish-brown walls; nonamyloid. PILEUS CUTICLE an irregular hymeniform

FIG. 2. *Marasmius olidus* (*Smith 33-1056*) ×1 (courtesy of A. H. Smith).

FIG. 3. *Marasmius chordalis* (*Smith 17399*) ×½ (courtesy of A. H. Smith).

layer of nonamyloid smooth cells 9–42 X 4–14(–24) μm which are globose to subcylindric or broadly cordate, often pedicellate, and occasionally 1-several-papillate, with hyaline, light yellowish-brown, or moderate reddish-brown, uniformly or unevenly thickened walls up to 1.5 μm thick. STIPE CORTEX of nonamyloid hyphae 2–8.5 μm broad with pale yellow to moderate reddish-brown walls up to 2 μm thick. STIPE TRAMA of nonamyloid, thin-walled hyphae 3–9 μm broad. STIPE VESTURE abundant overall; of nonamyloid, clavate to cylindric hairs 2.5–3.5 μm broad, with hyaline to moderate-brown walls up to 2.5 μm thick, which are light olive-green in 2% KOH.

Gregarious on veins of oak leaves in deciduous woods.

Collections examined: MICHIGAN: Livingston Co.: George Reserve, 4 Oct. 1936, *Smith 5034.* Oakland Co.: Proud Lake, 1 Nov. 1970, *Gilliam 997* (TYPE); Milford, 15 Sep. 1938, *Smith 10936* & 15 Oct. 1955, *Smith 51125*; Haven Hill, Highland Rec. Area, 11 Oct. 1959, *Smith 62192.* Washtenaw Co.: Ann Arbor, 1 Oct. 1933, *Smith 33-1056*; Silver Lake, Pinckney Rec. Area, 2 Oct. 1936, *Smith 5004,* & 23 Sep. 1938, *Smith 11057.*

For a discussion of *Marasmius olidus* and for drawings of microscopic structures see the original publication (1).

2. **Marasmius scorodonius** (Fries) Fries, Epicr. Myc. 379. 1838. Fig. 1.

[*Agaricus alliatus* Schaeffer, Fung. Bavaria 4: 43. *t. 99.* 1774.]
Agaricus scorodonius Fries, Syst. Myc. 1: 130. 1821.
?Agaricus calopus Persoon *ex* Fries, Syst. Myc. 1: 130. 1821.
?Marasmius calopus (Persoon *ex* Fries) Fries, Epicr. Myc. 379. 1838. *Nec Marasmius calopus* (Persoon) Quélet, Champ. Jura et Vosg. 222. 1872.
Marasmius alliatus (Schaeffer) Schröter *in* Cohn, Krypt. Fl. Schles. 3A: 559. 1889.
?Marasmius scorodonius (Fries) Fries var. *calopus* (Persoon *ex* Fries) Kauffman, Agar. Michigan 1: 72. 1918.

PILEUS (3.5–)6–30 mm broad; pulvinate, convex, or nearly plane with an incurved margin at first, becoming plano-convex, depressed-convex, obtusely campanulate, or plano-umbonate, sometimes umbilicate, papillate, or broadly depressed, finally plane with the margin wavy and uplifted; dry; shining when moist, soon dull; opaque; smooth at first, becoming minutely rugulose; rarely striate 2–7 mm from the edge inward; tough at first, soft-leathery when expanded; reviving. CUTICLE minutely pruinose at first, soon glabrous; moderate reddish-brown (Chestnut-Brown), moderate yellowish-brown (Clay Color), moderate-brown (M&P 14A8-9), light yellowish-brown (Pinkish-Cinnamon), or light-brown (Cinnamon, Mikado Brown) overall at first, remaining these colors on the disc and fading on the margin to pale orange-yellow (Light Pinkish Cinnamon, Light Ochraceous-Salmon, Pale Pinkish-Buff, Light Vinaceous-Cinnamon, Pale Pinkish-Cinnamon), or rarely pale-yellow (Cartridge Buff), in age often with these paler colors overall. TRAMA thin (0.5–2 mm thick); concolorous with the cuticle when moist, fading to yellowish white or white. ODOR of garlic or onion. TASTE of garlic, with a bitter-garlic aftertaste.

LAMELLAE narrow (1.5 mm broad in a pileus 12 mm broad, up to 3 mm in larger pilei); thin; close to subdistant or rarely distant; moderately numerous (16-30 reach the stipe); unequal, with numerous lamellulae in 2–5 tiers; adnate, adnexed, or nearly free, sometimes attached to a partial, adnate collar; pliant; entire, erose or minutely fimbriate; straight or broadest near the stipe; intervenose or not; usually forked; light yellowish-pink (Pinkish-Buff, Pale Cinnamon-Pink) at first, nearly white (M&P 9B1) or white in age.

STIPE 15–60 mm long, 0.2–3.5 mm broad; central; terete, compressed at the apex, or conduplicate, particularly in age; usually tapered to the base, occasionally equal; straight or curved; dry; shining; opaque; stuffed to hollow; cartilaginous, becoming horny in age; even; glabrous or rarely with minute, scattered, short, brown

fibrils, sometimes minutely yellowish-tomentose at the base; yellowish-white, pale yellow (Cartridge Buff), pale orange-yellow (M&P 9C-E3, 10D4), or light yellowish-pink (Pinkish-Buff, Pale Cinnamon-Pink) and sometimes tinged dark orange-yellow (Mars Yellow) at the apex at first, becoming moderate-orange (Orange-Cinnamon), moderate reddish-brown (Bay), brownish-orange (Tawny, M&P 14A11), light-brown (M&P 12B8, Mikado Brown, Cinnamon), grayish reddish-brown, or deep yellowish-brown (M&P 13I9) below, in age dark-brown, blackish-brown, or nearly black at the base; non-insititious, but with only a few minute fibrils at the base and thus often appearing insititious in dried specimens; often inserted obliquely. STERILE STIPES absent. RHIZOMORPHS absent. BASAL MYCELIUM inconspicuous.

SPORES white in mass; (5.6–)6.7–9.5(–10) × 2.8–4.2(–5) μm; elliptic, pip-shaped, or obovate. BASIDIA 22–45 × 4–8.5 μm; subclavate to clavate; 4- or rarely 2-spored. HYMENIAL DIVERTICULATE CELLS 5.5–40 × 4–11 μm; clavate, cylindric, ovate, obovate, lobed, or subdendroid; sometimes with short, dichotomous or sympodial branches; with hyaline walls up to 1.5 μm thick; with 2–20 apical or lateral, blunt or rounded, hyaline, knoblike or rodlike diverticula 2–10 × 1.5–3 μm; nonamyloid; present only on the lamellar edges. TRAMAL HYPHAE interwoven and inflated up to 14 μm broad in the pileus; parallel to interwoven, uninflated, and 2.5–7 μm broad in the lamellae; with hyaline walls up to 1 μm thick; clamped; nonamyloid. PILEUS SUBCUTIS 7–56 μm thick; of ascending-interwoven, nonamyloid connective hyphae 2.6–10 μm broad, with pale-yellow, dark orange-yellow, or light-brown walls up to 1.5 μm thick and often with the wall ruptured at intervals (appearing incrusted); with occasional thick-walled, lobed or globose hyphal ends. PILEUS EPICUTIS a hymeniform layer 5–45 μm thick; of clavate, globose, pyriform, elliptic, ovate, lobed, or turbinate, often pedicellate cells 5–42 × 4–14 (–35) μm which are smooth or with 2–20 blunt or knoblike projections 1.5–7 × 1.5–4 μm and which have hyaline to dark orange-yellow walls up to 6 μm thick, often with irregular pigment deposits on the walls or with the wall ruptured at intervals. STIPE CORTEX only in pigmented portions, the surface hyphae elsewhere hyaline and undifferentiated; of connective hyphae 4–7 μm broad with pale-yellow to deep-brown pigment deposits which give the surface a mottled appearance. STIPE TRAMA of thin-walled non-amyloid connective hyphae 3–9 μm broad with hyaline walls up to 1 μm thick. STIPE VESTURE usually lacking except for a few short, hyaline hairs near the base.

Scattered or gregarious and sometimes in troops on conifer needles, on the bark of living trees, or rarely on blades of grass in deciduous, deciduous-coniferous, or coniferous woods or occasionally in open, grassy areas.

Collections examined: FRANCE: RHÔNE: La Tour de Salvaguy, 16 Jul. 1938, *Josserand.* GERMANY: Near Finsterwalde in the Niederlauritz, Aug. 1886, *Krieger, Fungi Saxonici 367* (NY, MICH); Brandenburg, Sophienstädt near Biesenthal, Nieder-Barnim, 2 Jul. 1910, *Sydow 852.* NETHERLANDS: GELDERLAND: Wageningen, 3 Aug. 1959, *Bakker.* RUSSIA: Udelnaja, near Leningrad, 15-27 Aug. 1898, *Elenkin,* in Jaczewski's *Fungi Rossiae Exsiccati 181* (NY). SWEDEN: Stockholm, 27 Oct. 1895, *Romell* (NY); Uppsala, 1853, *Fries* (FH); Uppsala, Staksskogen, 15 Aug. 1945, *Lundell*; Gryt Parish, Östergötland, Strömmen, 25 Jul. 1960, *Nannfeldt 16288.*

CANADA: BRITISH COLUMBIA: Nanaimo Co.: North Arm Forest, Lake Cowichan, Vancouver Island, 16 Sep. 1943, *Buckland.* NOVA SCOTIA: Colchester Co.: Upper Brookside, 22 Jul. 1931, *Smith 689.* ONTARIO: Russell Co.: Ramsayville, 19 Jul. 1951, *Groves 26706.* Timiskaming Co.: Gull Lake Portage, Lake Timagami, 9 Sep. 1936, *Smith 4719.* QUEBEC: Portneuf Co.: St. Gabriel-Ouest, 29 Jul. 1967, *Shaffer 5584.*

UNITED STATES: ILLINOIS: Cook Co.: Paddock Woods Forest Preserve, 22 Jun. 1956, *Shaffer 787.* MAINE: Aroostook Co.: near Madawaska Lake, 10 Jul. 1956, *Bigelow 3156.* Hancock Co.: Castine, Aug. 1897, *Apresham* (FH). Penobscot Co.: Off Rt. 11, near Norcross, 22 Jul. 1962, *Bigelow 10427* (MASS). Piscataquis Co.: Chesuncourt Lake, 17 Jul. 1962, *Bigelow 10311.* MARYLAND: Frederick Co.: Loop Mt., State Sanatorium, Aug. 1920, *Kelly 530.* MASSACHUSETTS: Franklin Co.: Shutesbury (Banfields), 9 Jul. 1958, *Bigelow 6773* (MASS). Middlesex Co.: Cambridge, 12 Aug. 1943, *Singer* (FH); Cambridge, 20 Jun. 1907, *Bartlett 750* (FH).

MICHIGAN: Allegan Co.: New Richmond, 25 Sep. 1911, *Kauffman.* Barry Co.: The Pines, Yankee Springs Recreation Area, 24 Jul. 1970, *Gilliam 810*; Otis Lake, Yankee Springs Recreation Area, 24 Jul. 1970, *Gilliam 812* & 16 Aug. 1966, *Mazzer 4261.* Cheboygan Co.: Pine Point, Univ. of Michigan Biol. Station, 13 Jul. 1957, *Smith 57314.* Gratiot Co.: Ithaca, 12 Sep. 1947, *Potter 3841*; Crystal, 20 Jul. 1950, *Potter 9795.* Jackson Co.: Updike Rd., Waterloo Recreation Area, 21 Sep. 1971, *Gilliam 1235.* Livingston Co.: George Reserve, near Pinckney, 13 Jul. 1964, *Homola 903.* Marquette Co.: Conway Lake, Huron Mt. Club, 18 Jul. 1968, *Ammirati 1866*; Howe Lake, Huron Mt. Club, 14 Jul. 1970, *Ammirati 4411*; Ives Lake, Huron Mt. Club, 21 Jul. 1971, *Gilliam 1164.* Midland Co.: Midland City Forest, 13 Oct. 1971, *Gilliam 1461 & 1473.* Oakland Co.: Kent Rd., 12 Aug. 1937, *Smith 6987.* Ontonagon Co.: Government Peak Trail, Porcupine Mts. State Park, 31 Aug. 1962, *Peters 1191.* Oscoda Co.: Perry Creek, 20 Jul. 1970, *Gilliam 737.* Washtenaw Co.: Winnewana Lake, 11 Jul. 1970, *Gilliam 639, 640, & 652*; Stinchfield Woods, 9 Oct. 1971, *Gilliam 1453*; Ann Arbor, 17 Jun. 1911, *Kauffman 806*; Univ. Michigan Bot. Garden, Ann Arbor, 11 Jul. 1970, *Gilliam 710*; New Richmond, 25 Sep. 1911, *Kauffman.* MINNESOTA: Rice Co.: Nerstrand Woods State Park, 15 Jul. 1968, *Weaver 1588*; Weaver yard, 425 SW Third St., Fairibault, 29 Jul. 1970, *Weaver 2018.* NEW HAMPSHIRE: Carroll Co.: Fendler's Woods, Chocorua, Aug. 1906, *Farlow* (FH). Hillsboro Co.: Fox Forest, Hillsboro, 14 Aug. 1959, *Miller 250.* NEW JERSEY: Gloucester Co.: Newfield, 10 Jul. 1896, *Ellis* (FH). NEW YORK: Essex Co.: Lewis, 23 Aug. 1920, *Povah.* Warren Co.: State College of Forestry Camp near Warrensburg, 26 Sep. 1971, *Gilliam 1292*; Hudson River, near Warrensburg, 26 Sep. 1971, *Gilliam 1301.* NORTH CAROLINA: Swain Co.: Deep Creek, 1 Sep. 1971, *Harrison 10986.* OHIO: Hocking Co.: Cedar Falls, 17 Jul. 1960, *Cooke 32109.* PENNSYLVANIA: Monroe Co.: Pocono Lake Preserve, Sep. 1936, *Stifler* (BPI). VERMONT: Lamoille Co.: Mt. Elmore State Forest, 30 Jul. 1964, *Bigelow 13184* (MASS). Windham Co.: Newfane Hill, 24 Jun. 1961, *Shaffer 2841*; Williamsville-Newfane Rd., 15 Jul. 1961, *Shaffer 2907 & 2908.* WISCONSIN: Dunn Co.: Red Cedar River near Upper Tainter Lake, 30 Jun. 1971, *Mazzer 6534.* Walworth Co.: Wychwood, Lake Geneva, 20 Jul. 1956, *Shaffer 902.*

There are, as far as I know, no type specimens of either *Marasmius scorodonius* or *M. calopus.* I have, however, seen a specimen of *M. scorodonius* from Uppsala determined by Fries, and there seems little doubt that it belongs to the same species as the North American material. The identity of *M. calopus* poses a problem. Both Kauffman (2) and Peck [Annual Rep. New York State Mus. 31: 36. 1878 (1879)] recognized *M. calopus* as either a variety or a species. Both cited the differences from *M. scorodonius* to be a lack of odor, a different lamellar insertion, and a whitish pileus. Peck's specimens labelled *M. calopus* are actually *M. delectans* Morgan. A collection determined by Kauffman as *M. scorodonius* var. *calopus* (Ann Arbor, Mich., 17 Jun. 1911, *Kauffman 806*) shows a marked garlic odor when re-moistened and is indistinguishable from another collection which he called *M. scorodonius* (New Richmond, Mich., 25 Sep. 1911, *Kauffman*). The normal range of variation in strength of odor and lamellar attachment is broad in *M. scorodonius,* so that the characters cited do not seem sufficient to separate *M. calopus* as a distinct taxon. Singer (15) considered it a *nomen dubium,* since it was associated by Fries in the literature with two entirely different specific concepts.

Marasmius scorodonius shows perhaps the broadest habitat range of any of the temperate species of *Marasmius.* Growth is most luxuriant on conifer needles and least so on blades of grass. Tehon (18) reported damage to wheat by *M. scorodonius.* This is one of the few species of *Marasmius* which grows on the bark of living trees.

3. **Marasmius chordalis** Fries, Epicr. Myc. 383. 1838. Figs. 3 & 4.

PILEUS 10–20 mm broad; broadly convex with the disc depressed; moist; dull; entire; almost membranous but soft and pliant. CUTICLE at first white-hoary, soon glabrous; light yellowish-brown (Buffy Brown) on the disc, dark grayish-yellow (Dark Olive-Buff) on the margin, or brown with an olive cast overall, fading to olive-gray in age. TRAMA thin; white. ODOR and TASTE lacking.

LAMELLAE moderately broad; subdistant; equal at first, soon unequal, with 2 irregular tiers of lamellulae; adnate or with a slight tooth; entire; concolorous with the pileus.

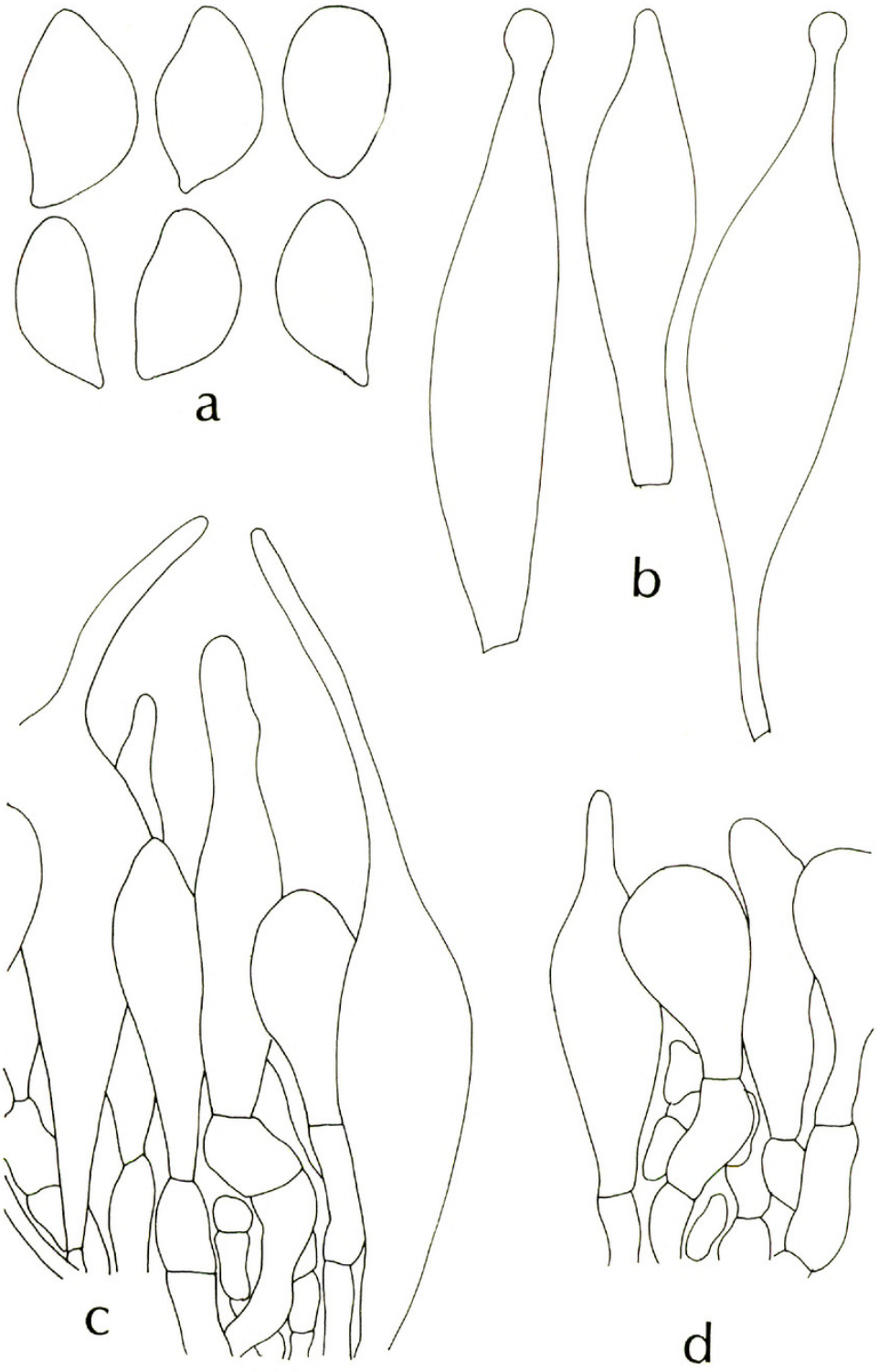

FIG. 4. *Marasmius chordalis*. *a*. Spores (*Smith 17399*) ×2300. *b*. Hymenial cystidia (*Smith 17399*) ×1500. *c*. Radial section of pileus cuticle showing area near the center of the pileus (*Smith 17399*) ×1500. *d*. Portion of the same radial section showing area near the pileus edge (*Smith 17399*) ×1500.

STIPE 60–100 mm long, 2–2.5 mm thick (unusually long in relation to the pileus size); central; terete; equal; straight; flexible but tough; white-pruinose and beaded with drops at the apex; densely scurfy overall; dark-brown or dark grayish-yellowish-brown (Bister) below; radicating. STERILE STIPES absent. RHIZOMORPHS absent. BASAL MYCELIUM not observed.

SPORES white in mass; 6.6–11.2 X 4.2–7.3 μm; lemon-shaped, broadly fusiform or broadly elliptic. BASIDIA 24–48 X 5.5–8.5 μm; clavate, often with a long, narrow base; 4- or rarely 2-spored. HYMENIAL CYSTIDIA (23–)37–84 X 4–14 μm; lecythiform, fusoid-ventricose, lanceolate, or subcylindric; usually capitate, or if not, with the apex rounded; with thin, hyaline walls; projecting up to 35 μm beyond the basidioles; fragile, soon collapsing; nonamyloid; rare to abundant on the lamellar edges and faces. TRAMAL HYPHAE interwoven and occasionally inflated up to 11 μm broad in the pileus; parallel to interwoven, uninflated and 1.5–7 μm broad in the lamellae; with thin, hyaline to light grayish-yellow walls; clamped; nonamyloid. PILEUS CUTICLE a hymeniform layer of three intergrading cell types which may not all be present: (1) smooth cells 11–57 X 5–17 μm which are clavate, obovate, subglobose, sphaeropedunculate, fusiform, or broadly cylindric and which have thin, hyaline to light grayish-yellow walls; (2) hairs 10–70 X 2–4 μm which are cylindric, often with wavy outlines and may be rarely branched or 1-septate, with hyaline walls up to 1.5 μm thick at the apex; and (3) smooth, appendiculate cells combining the characteristics of the first two types, with clavate, fusiform, or obovate bases and filamentous apices. STIPE CORTEX when present of nonamyloid connective hyphae 2–7 μm broad, with grayish-yellow to moderate yellowish-brown walls up to 1.5 μm thick. STIPE TRAMA of nonamyloid connective hyphae 2–7 μm broad, with hyaline walls up to 1 μm thick. STIPE VESTURE of abundant nonamyloid cystidia 3–10 μm broad which are filamentous, clavate, or fusoid-clavate and capitate or rounded apically, with hyaline to light grayish-yellow walls up to 1.5 μm thick and which sometimes contain oil droplets and are occasionally 1-septate.

Solitary to gregarious under bracken, spruce, fir, or pine in open areas in deciduous or coniferous woods.

Collections examined: ITALY: Sopramonte, Sep. 1901, *Bresadola* (NY). SWEDEN: Stockholm, 24 Sep. 1899, *Romell* (NY); Uppsala, *Sunnerstarhog 1250* (FH).

CANADA: QUEBEC: Kamouraska Co.: Ste.-Anne-de-la-Pocatière, 6 Sep. 1959, *Smith 61996.*

UNITED STATES: CALIFORNIA: Del Norte Co.: Crescent City, 4 Nov. 1937, *Smith 8423.* MICHIGAN: Cheboygan Co.: Maple River, 23 Sep. 1949, *Smith 34162*; Reese's Bog, 4 Sep. 1957, *Smith 57903.* Emmet Co.: Pellston, 27 Sep. 1953, *Smith 43445*; Pellston, 17 Jul. 1953, *Smith 42767.* Gratiot Co.: Potter's Woods, *Sumner,* 18 Sep. 1949, *Potter 8942*; Buzzard's Woods, Ithaca, 1 Oct. 1947, *Potter 4069.* Livingston Co.: George Reserve, near Pinckney, 4 Oct. 1936, *Smith 5020.* Ogemaw Co.: Rifle River, 4 Sep. 1963, *Smith 67402.* NEW YORK: Tompkins Co.: Ithaca, 31 Oct. 1902, *Thomas.* OREGON: Clackamas Co.: Rhododendron, 1 Oct. 1944, *Smith 19332,* & 14 Oct. 1944, *Smith 19709*; Welcher, 11 Oct. 1946, *Smith 24426.* Josephine Co.: Grants Pass, 11 Nov. 1956, *Smith 55446,* & 14 Nov. 1956, *Smith 55667.* Lane Co.: Blue River, 17 Oct. 1935, *Smith 7912.* Mt. Hood National Forest: Bear Springs, 11 Oct. 1947, *Smith 27625.* WASHINGTON: Clallam Co.: Crescent Beach, 22 Sep. 1935, *Smith 2553;* Joyce, 29 Sep. 1941, *Smith 17399.* Pierce Co.: Eatonville Woods, 18 Oct. 1954, *Smith 49204.*

The description of macroscopic characters is adapted from notes with *Smith 2553.*

Although I have examined material of *Marasmius chordalis* from Europe, I have not seen type material. Both the European and North American collections cited above agree with Singer's (13) drawings and description of *M. chordalis.*

Spore size varies considerably and thus seems to lack taxonomic significance. *Smith 55446,* for example, has spores whose measurements fall in the lower part of the range (7–8.7 μm long), whereas *Smith 55667,* a larger collection made three days

later from the same location, has longer spores (8.4–11.2 μm long). Width of the spores is a more constant feature, with all collections examined having spores more than 4 μm broad, an unusual situation in *Marasmius*. The peculiar spore shape also seems to be unique, at least in the North American representatives of the genus.

The pileus cuticle is usually composed of subglobose to clavate cells at first. Some or all of these proliferate at their apices, with the frequency of proliferation accounting for the differences in vesture of various collections. In older pilei the broader cells collapse, but the filamentous ones remain intact. This may give the suggestion of a trichoderm, or, if the filaments become appressed to the surface, even a cuticle of filamentous interwoven hyphae.

4. **Marasmius uliginosus** Gilliam, Mycologia 67 (4), in press. 1975. Fig. 5.

PILEUS 11–25 mm broad; convex to conic or nearly plane; depressed on the disc or not; dry; dull; opaque; smooth; even or faintly striate on the margin at first; entire; pliant. CUTICLE minutely pruinose or glaucous; at first moderate yellowish-brown overall, then moderate yellowish-brown on the disc and light yellowish-brown (Wood Brown) or paler (Tilleul-Buff) on the margin, finally light yellowish-brown overall, remaining these colors on drying or becoming brownish-gray, light brownish-gray, or light grayish-brown. TRAMA thin; white or nearly so. ODOR and TASTE not observed.

LAMELLAE narrow; thin; close; numerous (24–36 reach the stipe); unequal, with numerous lamellulae in 5 tiers; adnate to adnexed; at first straight, then subventricose; minutely pruinose; not intervenose; not forked; white.

STIPE 23–70 mm long, 1–2 mm thick; central; terete or flattened; expanded at the apex, otherwise equal above the radicating base; straight or curved; dry; dull or

FIG. 5. *Marasmius uliginosus* (*Harrison 12093* & *12094*) ×1½. The largest basidiocarp is from *12094* (courtesy of Kenneth A. Harrison).

shining; opaque; hollow; pliant; even; pubescent above, densely tomentose below, the vesture white above and light yellowish-brown or dark orange-yellow below; not insititious. STERILE STIPES absent. RHIZOMORPHS absent, but the stipe radicating up to 25 mm, with the rooting portion somewhat thickened. BASAL MYCELIUM copious on the radicating portion of the stipe, often with debris adhering; light yellowish-brown.

SPORES 4.3–7.0 × 2.1–3.0 μm; narrowly elliptic or pip-shaped. BASIDIA 15–20 × 3–4 μm; subclavate or subcylindric; 4- or rarely 2-spored. HYMENIAL CYSTIDIA 39–53 × 5.5–8.5 μm; cylindric, subfusiform, or fusoid-ventricose; subcapitate or capitate; with hyaline walls up to 1 μm thick; projecting up to 20 μm beyond the basidioles; abundant on the lamellar edges and faces. TRAMAL HYPHAE interwoven and inflated up to 22 μm in the pileus; parallel, uninflated and 4–10 μm broad in the lamellae; with hyaline walls up to 1.5 μm thick; clamped; nonamyloid. PILEUS CUTICLE a hymeniform layer of two types of cells: (1) obovate to subcylindric smooth cells 11–20 × 4–13 μm, with hyaline walls up to 1.5 μm thick; and (2) cylindric or narrowly fusoid-ventricose cystidia 38–90 × 4–11 μm, with capitate or rounded apices and hyaline walls up to 1.5 μm thick. STIPE CORTEX of nonamyloid connective hyphae 4–14 μm broad with hyaline to dark orange-yellow walls up to 2 μm thick. STIPE TRAMA of nonamyloid hyphae 3–17 μm broad, with hyaline walls up to 2 μm thick. STIPE VESTURE of abundant cylindric, tapered, or fusoid-ventricose cystidia 6–105 × 4–10 μm, with capitate or rounded apices and walls up to 1.5 μm thick.

Scattered in ravine on wet, mossy ground.

Collections examined: CANADA: NOVA SCOTIA: Kings Co.: Research Station, Kentville, 20 Sep. 1972, *Harrison 12093* (TYPE) & *12094*.

For a discussion of *Marasmius uliginosus* and drawings of microscopic structures see the original publication of this species (1).

5. **Marasmius insipidus** Gilliam, Mycologia 67 (4), in press. 1975.

PILEUS 3–24 mm broad; convex at first and remaining so for a long time, in age plano-convex; dry; dull; opaque; smooth at first, soon closely rugulose-striate up to ½ the pileus radius; entire; pliant. CUTICLE minutely velutinous; at first moderate-brown, fading to light-brown or brownish-pink. TRAMA thin; yellowish-white. ODOR lacking in crushed pilei. TASTE mild, with an acrid aftertaste.

LAMELLAE narrow (up to 1.5 mm broad); thin; close; numerous; unequal, with numerous lamellulae; adnate or adnate-seceding; pliant; entire; broadest near the stipe at first, becoming ventricose; intervenose in age; not forked; white.

STIPE 26–40 mm long, 1–2 mm thick; central or somewhat eccentric; terete; slightly tapered to the base or equal with a slight swelling at the base; dry; dull or shining; opaque; hollow; cartilaginous; even; minutely whitish-pruinose overall; yellowish-white to light yellowish-brown or tinged brownish-pink; not insititious. STERILE STIPES and RHIZOMORPHS lacking. BASAL MYCELIUM scarcely evident.

SPORES 7–9.1 × 2.8–4.2 μm; pip-shaped, curved-cylindric, or rarely obovate. BASIDIA 22–34 × 4–7 μm; clavate or subclavate; 4-spored. HYMENIAL DIVERTICULATE CELLS 11–25 × 5.5–8.5 μm; cylindric, clavate, or obovate and often lobed; smooth or with 1–10 hyaline diverticula up to 4 × 4 μm, with hyaline walls up to 1 μm thick, scarcely projecting; abundant; present only on the lamellar edges. TRAMAL HYPHAE interwoven; 2–8(–11) μm broad; clamped; with hyaline to light grayish-olive walls up to 1.5 μm thick; nonamyloid. PILEUS CUTICLE a hymeniform layer of cylindric, clavate, or irregular cells 18–38 × 5.5–20 μm, which are often lobed or once-branched, and smooth or with 1–8(–12) blunt diverticula up

to 10 × 5 μm, with hyaline to light-gray walls up to 1 μm thick; often subtended by cells with light grayish-olive spiral incrustations. STIPE CORTEX of nonamyloid connective hyphae 1.5–4 μm broad with hyaline to light grayish-olive walls 0.5–1.0 μm thick. STIPE TRAMA of nonamyloid connective hyphae 3–17 μm broad, with hyaline walls up to 3 μm thick. STIPE VESTURE of abundant cylindric or fusoid-clavate hairs up to 77 × 11 μm, with hyaline walls up to 3 μm thick.

Gregarious to cespitose on wood fragments and oak leaves in deciduous woods.

Collection examined: OHIO: Portage Co.: West Branch State Park, 8 Jul. 1972, *Gilliam 1500* (TYPE).

For a discussion of *Marasmius insipidus* and for drawings of microscopic structures see the original publication (1).

6. **Marasmius pyrrhocephalus** Berkeley, London J. Bot. 6: 316. 1847. Fig. 6.

Marasmius macrorrhizus Montagne, Syll. Crypt. 142. 1856.
Marasmius longipes Peck, Bull. Buffalo Soc. Nat. Sci. 1: 58. 1873. *Non Marasmius longipes* Montagne, Ann. Nat. Sci. Bot. IV, 1: 114. 1854.
Marasmius elongatipes Peck, Bull. Buffalo Soc. Nat. Sci. 4: 181. 1882, *nom. nov.* for *Marasmius longipes* Peck.
Marasmius hirtipes Clements, Bot. Surv. Nebraska 4: 21. 1896. *Nec Marasmius hirtipes* Spegazzini, Anales Mus. Nac. Hist. Nat. Buenos Aires 6: 112. 1898.

PILEUS 4–25 mm broad; convex to pulvinate at first, then convex or plano-convex and often depressed, umbilicate, or minutely papillate centrally, finally plane with the margin uplifted; moist to subviscid, soon dry; shining or dull, opaque, becoming translucent-striate overall; smooth or minutely rugulose; even at first becoming finely sulcate-striate to the disc in age; entire to crenate; pliant; reviving. CUTICLE glabrous; at first pale orange-yellow (M&P 10E4), moderate orange-yellow (M&P 11H7, Ochraceous-Buff), moderate-orange (M&P 11J9), or light yellowish-brown overall, then light orange-yellow (M&P 9J6) to dark orange-yellow (M&P 12L9), sometimes moderate- to deep-brown on the disc and paler (dark orange-yellow, dark-yellow, strong yellowish-brown) on the margin, occasionally tinged red, finally dark orange-yellow (M&P 13L8), brownish-orange (M&P 13L9, 13L1-2) or strong yellowish-brown (M&P 10F7), often darker on the disc (strong-brown, moderate-brown, or strong yellowish-brown) and in dried material. TRAMA up to 1 mm thick in the disc; translucent and colorless when moist, otherwise white, yellowish-white, or (in age) light yellowish-brown. ODOR slight. TASTE mild, slightly sweet, or occasionally with a bitter aftertaste.

LAMELLAE narrow (1.5 mm broad in a pileus 13 mm broad, up to 3 mm in older basidiocarps); thin; close to subdistant; moderately numerous (16–20 reach the stipe); unequal, with 2–4 tiers of lamellulae; adnate to adnexed; pliant or tough; entire; straight at first, sometimes becoming ventricose; not intervenose; not forked; nearly white or yellowish-white at first, soon dull pale-yellow to light yellowish-brown and often brown-dotted in age or when bruised.

STIPE 35–101 mm long, 0.5–1.5(–2.5) mm thick; central; terete; equal, slightly swollen at the apex, or tapering uniformly to the apex, usually radicating up to 5 cm below the ground level, the radicating portion irregular, somewhat thicker (up to 4 mm thick), and roughened; straight to curved; dry; dull; opaque; hollow or solid; tough or sometimes horny in old basidiocarps; even; minutely pruinose to pubescent above, densely tomentose to strigose below, with tangled, white, pale-yellow, light-gray, or moderate reddish-brown to deep-brown (rarely dark-brown) hairs; white to pale-yellow on the upper 1–15 mm in young basidiocarps, progressively darkening from the base

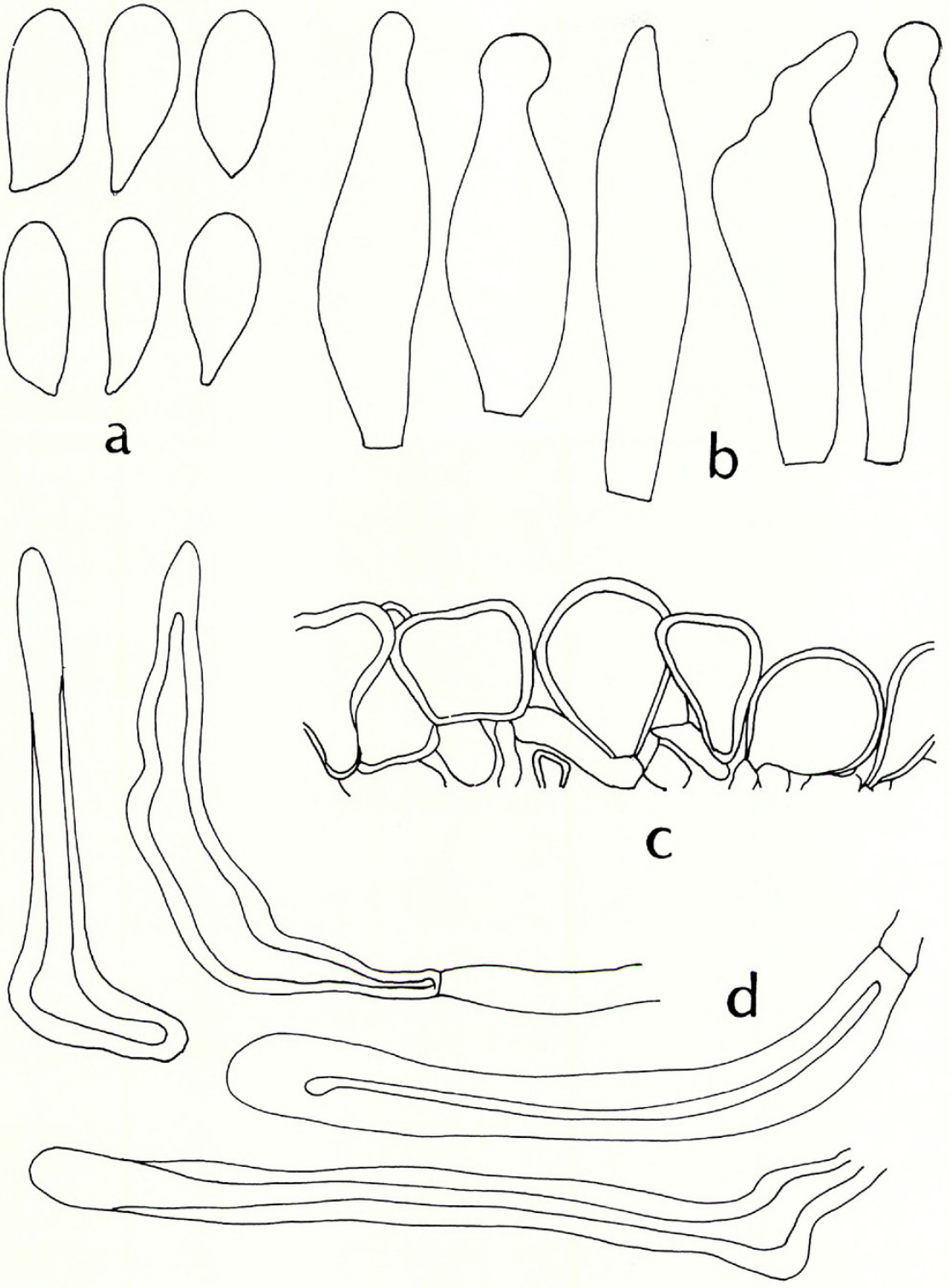

FIG. 6. *Marasmius pyrrhocephalus. a.* Spores (*Gilliam 496*) ×2300. *b.* Hymenial cystidia (*Gilliam 496*) ×1500. *c.* Cells from pileus cuticle (*Gilliam 496*) ×1500. *d.* Stipe hairs (*Gilliam 496*) ×1500.

upward through yellowish-brown, brownish-orange, or moderate-brown and finally blackish-brown at the base, with the darker colors almost overall in age. STERILE STIPES absent. RHIZOMORPHS absent. BASAL MYCELIUM sometimes present as a tuftlike cushion at the juncture of the stipe and substrate; white, pale-yellow, or light yellowish-brown.

SPORES white or pale yellowish-white in mass; 6.3–9.8 × 2.7–4.3(–5.1) μm; elliptic, obovate, fusoid-elliptic, or rarely subreniform. BASIDIA 22–35 × 4–8.5 μm; clavate or rarely subcylindric; 4-spored. HYMENIAL CYSTIDIA 29–73 × 2.5–9 μm; fusiform, fusoid-ventricose, or subcylindric; truncate or capitate, or with the apex tapered or rounded; empty or faintly granular; nonamyloid; with thin, hyaline walls; projecting up to 35 μm beyond the basidioles; rare to abundant on the lamellar edges and faces. TRAMAL HYPHAE tightly interwoven, uninflated, and 4–7 μm broad in the pileus; parallel to interwoven, uninflated, and 4–7 μm broad in the lamellae; with hyaline to pale yellow walls up to 0.5 μm thick; clamped; nonamyloid. PILEUS CUTICLE a hymeniform layer of smooth cells 8–24 × 4–24 μm which are clavate, truncate-clavate, globose, obovate, elliptic, pyriform, or turbinate and pedicellate or not, thin-walled at first, soon with moderate orange-yellow to light yellowish-brown walls up to 2 μm thick, rarely capitate, and nonamyloid or with granular dextrinoid contents when fresh. STIPE CORTEX when present of connective hyphae (2–)4–14 μm broad, with deep-brown walls up to 2 μm thick or with the wall occluding the lumen; nonamyloid or with granular dextrinoid contents in fresh basidiocarps. STIPE TRAMA of nonamyloid connective hyphae 2–11 μm broad, with hyaline walls up to 1 μm thick. STIPE VESTURE of hairs 10–130 × 2.5–9 μm which are cylindric to filiform, clavate, subglobose, pyriform, or elliptic and often spurred basally when near the stipe apex, with hyaline to pale-yellow walls up to 3 μm thick, subcapitate or with the apices rounded to acute, and scattered or clustered and often tangled.

Scattered, gregarious, or rarely subcespitose on decaying oak leaves and humus, rarely on wood, in deciduous or deciduous-coniferous woods.

Collections examined: CANADA: ONTARIO: York Co.: Don Valley, Toronto, 23 Jun. 1935, *Bell 7537* (FH).

UNITED STATES: CONNECTICUT: Fairfield Co.: Redding, 17 & 22 Jul. 1902, *Earle* (NY). MARYLAND: Frederick Co.: Point-of-Rocks, 1 Jun. 1924, *Cash* (BPI). MASSACHUSETTS: Middlesex Co.: Wakefield, 15 Aug., *Linder & Singer* (FH). MICHIGAN: Barry Co.: Deep Lake, 16 May 1970, *Mazzer 6029*. Gratiot Co.: Allen's Woods, Ithaca, 27 Jul. 1949, *Potter 7799*. Jackson Co.: Updike Rd., 21 Sep. 1971, *Gilliam 1236*; Big Portage Lake, 10 Oct. 1971, *Gilliam 1445*. Lenawee Co.: Vales Lake, 9 Jun. 1971, *Gilliam 1009*. Livingston Co.: George Reserve, 10 May 1967, *Hoseney 376*, 26 Sep. 1945, *Smith 20661*, & 4 Oct. 1971, *Gilliam 1316*. Oakland Co.: Haven Hill, Highland Recreation Area, 6 Oct. 1971, *Gilliam 1441*, 17 May 1968, *Ammirati 1465*, & 25 May 1970, *Gilliam 454 & 455*. St. Clair Co.: (no locality), 29 Aug. 1949, *Boynton*. Washtenaw Co.: Redwing Preserve, 12 May 1968, *Ammirati 1454*; Pinckney Recreation Area, 10 Aug. 1970, *Shaffer 2567*; Silver Lake, 8 May 1938, *Smith 9525*, & 14 Jun. 1970, *Gilliam 531*; Sharon Hollow, 16 Sep. 1970, *Gilliam 944*, & 26 Oct. 1948, *Smith 32015*; Stinchfield Woods, 29 Jul. 1970, *Gilliam 859*; Winnewana Lake, 11 Jul. 1970, *Gilliam 646 & 647*; Dieterle's Woods, 1 Jun. 1970, *Gilliam 496*. MINNESOTA: Rice Co.: Nerstrand State Park area, Sect. 16, Wheeling Twp., 30 May 1965, *Weaver 1134* & 23 Jun. 1968, *Weaver 1551*. MISSOURI: St. Louis Co.: St. Louis, *Glatfelter 856* (BPI). NEW JERSEY: (no location), Autumn 1909, *Ballow* (NY). NEW YORK: Onondaga Co.: Syracuse, Sep. 1889, *Underwood* (NY). Wayne Co.: Savannah, Aug., *Peck* (Lectotype of *Marasmius longipes* Peck, NYS); Bethlehem, Oct., *Peck* (syntype of *M. longipes* Peck, NYS). Westchester Co.: Chappaqua, Aug.-Sep. 1909, *Mrs. Rider & Mrs. Murrill* (NY). NORTH CAROLINA: Swain Co.: Almond, 21 Sep. 1971, *Harrison 11216 & 11217*. OHIO: Franklin Co.: Columbus, Jul., *Sullivant* (holotype of *Marasmius macrorrhizus* Montagne, PC). Hamilton Co.: Miami-Whitewater Forest Park, 13 Nov. 1960, *Cooke 32480*. Preble Co.: Hueston Woods State Park, 18 Oct. 1968, *Patrick 566*. Scioto Co.: Hobey Hollow, Shawnee State Forest, 4 Nov. 1961, *Cooke 33105*. Wayne Co.: Waynesville, 23 Aug. 1844, *Curtis* [holotype of *Marasmius pyrrhocephalus* Berkeley (K), 2 isotypes (K) (FH)]. VERMONT: Addison Co.: Middlebury, 14 Aug. 1897, *Burt* (FH). VIRGINIA: Montgomery Co.: Blacksburg, 27 Jul.-3 Aug. 1904, *Murrill* (NY).

I have seen the types of *Marasmius pyrrhocephalus* Berk. and of *M. longipes* Peck (=*M. elongatipes* Peck), and, as Singer (13) suggested, the two are definitely conspecific. Of the collections of *M. longipes* (the original name under which Peck described the species, rejected as a later homonym) cited in the original description, the Savannah collection is the more extensive and is here designated as lectotype of *M. longipes* and therefore also of *M. elongatipes*. I have not seen the type of *M. hirtipes* Clements, but the description fits this species well; I am following Pennington and others in synonymizing it here. *Marasmius morganianus* Sumstine (Mycologia 6: 35. 1914) probably also belongs here.

Marasmius pyrrhocephalus is one of the first agarics to appear in the spring and one of the last to cease fruiting in the fall. In June and October conspicuous fruitings of this species occur in the oak-hickory woods around Ann Arbor. In the early spring, however, basidiocarps are usually found growing singly.

In contrast to those of many *Marasmii*, pilei of basidiocarps of *M. pyrrhocephalus* darken markedly with age. This darkening is associated with the accumulation of a KOH-soluble, moderate orange-yellow pigment in the walls of the cuticular cells.

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LITERATURE CITED

1. Gilliam, Martina S. 1975. New North American Species of *Marasmius*. Mycologia 67 (4), in press.
2. Kauffman, C. H. 1918. The Agaricaceae of Michigan, Vol. 1. Mich. Geol. and Biol. Survey, Publ. 26, Biol. Series 5. Lansing.
3. Kelly, K. L., & D. B. Judd. 1955. The ISCC-NBS method of designating colors and a dictionary of color names. Natl. Bur. of Standards Circular 553. Washington, D.C. (This publication is supplemented by the "ISCC-NBS color-name charts illustrated with centroid colors.")
4. Kühner, R. 1933. Études sur le genre *Marasmius*. Le Botaniste 25: 5–114.
5. ———— 1935. Nouvelles recherches sur le genre *Marasmius*. Ann. Soc. Linn. de Lyon 79: 99–120.
6. Kühner, R., & H. Romagnesi. 1953. Flore analytique des Champignons Supérieurs. 556 pp. Masson et Cie, Ed., Paris.
7. Lanjouw, J., & F. A. Stafleu. 1964. Index Herbariorum, Part 1. Regnum Vegetabile, Vol. 31. Utrecht.
8. Maerz, A., & M. R. Paul. 1950. A Dictionary of Color. 2nd ed. 208 pp. McGraw-Hill Book Co., Inc., New York.
9. Morgan, A. P. 1905-1906. North American species of *Marasmius*. J. Mycol. 11: 201–212, 233–247; 12: 1–9, 159–162.
10. Pennington, L. H. 1915. North American species of *Marasmius*. North American Flora 9: 250–286.