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

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SUMMARY

The genus *Marasmius* (Basidiomycetes, Agaricales, Tricholomataceae), exclusive of section Chordales (7), is described as it occurs in the northeastern United States and adjacent Canada west to the Great Lakes region. Thirty species are included, representing sections *Androsacei, Epiphylli, Globulares, Sicci, Hygrometrici,* and *Marasmius*. Two of these species, *Marasmius fulvoferrugineus* and *M. robinianus,* are described as new. *Collybia cystidiosa* A. H. Smith & Hesler is transferred to *Marasmius,* and *M. lachnophyllus* Berkeley is treated as a variety of *M. cohaerens* (Persoon ex Fries) Cooke & Quélet. *Mycena albiceps* (Peck) Gilliam, *Collybia subnuda* (Ellis ex Peck) Gilliam, *Collybia dichrous* (Berkeley & Curtis) Gilliam, and *Collybia praeacuta* (Ellis) Gilliam are proposed as new combinations.

INTRODUCTION

Although a comprehensive theoretical framework for the taxonomic study of *Marasmius* has been laid by Kühner (13-15), Kühner & Romagnesi (16), and Singer (33, 36-39, 41), modern treatments are available only for European, Australian, and neotropical species. The pioneering work in North America of Pennington (25), Kauffman (11), and

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

Morgan (22) did not include significant information about microscopic characters, which have become so crucial to modern taxonomy. With the growth of mycology in North America, additional taxa have been found for which published keys and descriptions are inadequate. The present work represents an attempt to treat the taxonomy of northeastern North American Marasmii, making full use of current ideas and practices as well as numerous recent collections.

MATERIALS AND METHODS

Macroscopic descriptions are based on notes from fresh material except where otherwise indicated. Color terms are those of Maerz and Paul (20), cited as "M&P"; Ridgway (28), cited as capitalized color terms; and the *ISCC-NBS Color Name Charts Illustrated with Centroid Colors* (12), cited as uncapitalized color terms. Sections of all specimens were studied microscopically in 2% KOH and in Melzer's reagent. The cresyl blue reaction of the pileus trama, which has been used in *Marasmius* taxonomy, did not always give consistent results when large numbers of specimens were studied and so is not reported here. Sections of fresh specimens were also studied in water. Colors of microscopic structures are described as they appear in fresh specimens in water mounts. 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. Drawings were made with 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. Scanning electron micrographs were photographed using a Hitachi Hi-Scan model scanning electron microscope. Specimens were mounted on aluminum-base silver paint and coated with gold. Unless otherwise indicated by the appropriate symbol from the *Index Herbariorum* (10), all specimens are deposited in the University of Michigan Herbarium.

BIOLOGY

In temperate North America, Marasmii are found most frequently in woodland habitats. The largest number of species occurs in oak or oak-hickory woods or in deciduous-coniferous woods containing oak. Some species occur with regularity in stands of conifers. Beech-maple woods have relatively few Marasmii. A few species (e.g., *Marasmius* *minutus, M. uliginosus)* occur in swampy areas. The grassland Marasmii, which deserve to be explored in more detail, may fruit in otherwise dry and unfavorable habitats after a heavy rain. These, as well as the species that grow on litter of herbaceous dicots in open areas, are probably more abundant than the records indicate.

In the northeastern United States, Marasmii begin fruiting during mid-June, early July, or late August to early September. The first period begins slightly later in the northern areas, including Canada. Once the fruiting period of a particular species has begun, that species usually continues to fruit after each sufficiently heavy rain until late October to early November. Several times during the duration of this study an especially long, heavy rain in early September produced almost the entire *Marasmius* flora at once. In fact, attempts to collect spore-producing specimens of more than one or two species may be vain if there has not been rain during the day or at most two days before the collecting trip. Rain-dependent spore discharge in *Marasmius rotula* has been documented using a Kramer-Collins spore sampler (6).

In species whose vegetative mycelium can decompose different types of substrates, basidiocarp size and aspect may vary with the type of litter. For example, the largest basidiocarps of *Marasmius scorodonius* grow on pine needles. Smaller basidiocarps which do not differ microscopically grow on the bark of living trees. Still smaller ones may be found rarely on grass. This finding is consistent with Lindeberg's (17-19) discovery of marked differences in the growth of *Marasmius* mycelia under different nutritional regimes. Similar variations with substrate are found in *M. rotula* and *M. oreades*.

In dry or otherwise unfavorable conditions basidiocarps may fail to develop normally and may produce semigastroid basidiocarps. I have observed this in *Marasmius scorodonius* and *M. oreades*.

Little is known of the early development of basidiocarps of Marasmii. Kühner (14) described development of *Marasmius rotula* as hemiangiocarpous. He demonstrated that the hymeniform layer of broom cells was present from the beginning and that a cortina-like structure covers the developing lamellae until the pileus breaks away from the stipe. Although an attempt was made during the present study to section very young primordia (less than 1 mm in diameter), fully or almost fully differentiated tissues were always found. Radial free-hand sections of pilei from young to old were, however, instructive in interpreting the variation of many characters, particularly those of the pileus cuticle, and in understanding development past the primordial stage. In *Marasmius androsaceus*, for example, an almost uninterrupted layer of diverticulate hyphal end cells covers the surface of the primordium. In somewhat older pilei only the pileus edge and the central disc have many such cells. In still older pilei the original diverticulate hyphal cells have been so far separated by the expansion of the pileus that the cuticle appears in many places to be composed only of the incrusted subcutal hyphae. To ascertain whether or not diverticulate cells are present, it is necessary to cut a radial section and examine the extreme edge and the central disc. A similar situation occurs with respect to nodulose cells in the development of *M. scorodonius* (7). In *M. cohaerens*, the primordium is covered entirely by setae. These are eventually separated by broom cells with both long and short projections and finally by broom cells with short projections. In *M. delectans* young pilei have cuticles of strongly dextrinoid broom cells or seta-like elements which become separated in age by smooth, lobed, usually thin-walled, almost nonamyloid cells.

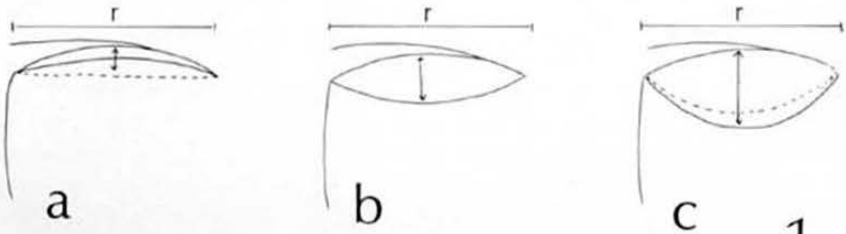
GENERIC CONCEPT

Fries established the genus *Marasmius* in the *Flora Scanica* (4). The concept first associated with the name *Marasmius* referred to species with white spores, central cartilaginous stipes, and reviving basidiocarps. A more complete presentation of the genus is found in his *Epicrisis Mycologici* (5). In the *Epicrisis*, *Collybia*, which has been the genus most difficult to separate from *Marasmius*, included species also having white spores and central cartilaginous stipes but with non-reviving (i.e., putrescent) basidiocarps. Fries characterized species of *Collybia* as having pilei with the margin incurved at first but did not cite a contrasting feature in *Marasmius*.

Since all of the published treatments of North American Marasmii follow Fries' concept, the majority of mycologists in the United States and Canada have been trained in this tradition. The primary objection to the use of Fries' concept involves the subjectivity of determining the ability to revive. Romagnesi (30) and Singer (36, 39) have commented on this difficulty. Several species usually considered as *Collybia* may also revive (1, 29). Therefore, in order to preserve the use of the revival character in generic determination, Kühner and Romagnesi (16) consider *Marasmius* to encompass the reviving species of *Collybia*. The problem is compounded, however, by species undoubtedly belonging to *Marasmius* but whose basidiocarps are far from tough and may fail to revive (e.g., *Marasmius felix*, *M. minutus*, *M. armeniacus*).

Other generic concepts have de-emphasized the revival character and stressed microscopic features. Patouillard (24) established *Androsaceus* for species with broom cells and *Crinipellis* for species with long thick-walled hairs in the pileus cuticle. *Marasmius* under Patouillard's concept is reserved for species with cuticles having smooth, inflated hyphal end cells in a hymeniform arrangement or interwoven smooth hyphae. Dennis (3) restricts *Marasmius* to species in which the pileus cuticle is composed of broom cells or diverticulate hyphae. This concept seems not to reflect a natural grouping, since species in *Marasmius* section *Chordales* are not included. Some species in this section have cuticles composed of cells similar to broom cells when the basidiocarps are in the primordial stage but have cuticles composed almost entirely of smooth cells at maturity.

Based on extensive study of tropical, subtropical, and temperate species, Singer's (37 - 39, 41) classification of *Marasmius* reflects a more natural grouping. This is, with a few slight modifications, the concept employed in the present work. Singer's generic concept, using criteria other than revival, provides a practical way to separate *Collybia* from *Marasmius*. His concept includes species of the Tricholomataceae having the following combination of features: (1) white, nonamyloid spores, (2) no gelatinous layers in the pileus cuticle, (3) no prominently projecting amyloid or dextrinoid hairs or projecting cystidia (except setae) in the pileus cuticle, and (4) usually, hymeniform cuticles of smooth cells (e.g., fig. 14) or broom cells (figs. 4a & 4b). A few species with diverticulate hyphae in the cuticle (fig.9c) are included (*Marasmius* section *Androsacei*), but these have tough, horsehair-like stipes (figs. 3a & 3b) and black rhizomorphs. Species whose basidiocarps have cuticles of diverticulate hyphae and whose stipes have specialized hairs at the point of



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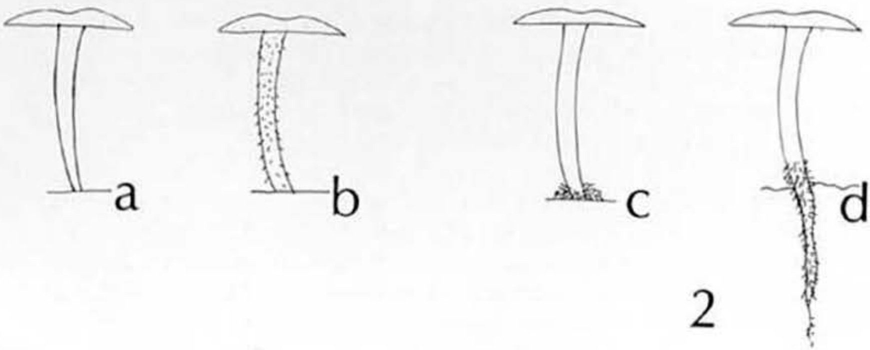

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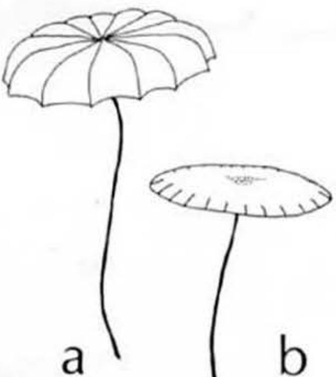

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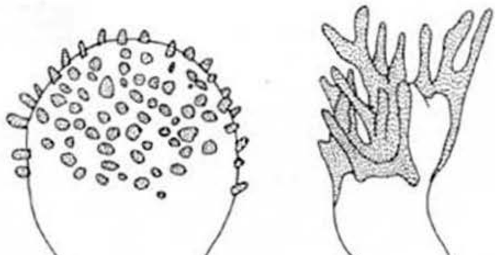

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emergence from the substrate (non-insititious stipes, figs. 2c & 2d) are placed in *Collybia* section *Subfumosae*. Those with cuticles of interwoven, smooth or incrusted hyphae and non-insititious stipes belong to *Collybia* section *Vestipedes* or section *Laevipedes*. Species whose basidiocarps have diverticulate hyphae in the pileus cuticle but which lack specialized hairs at the point of emergence of the stipe (i.e., insititious stipes, figs. 2a & 2b) are placed in *Marasmiellus* Murrill emend. Singer 1962. *Micromphale* S. F. Gray includes species whose basidiocarps have cuticles of interwoven hyphae in a gelatinous matrix and black rhizomorphs present or not. North temperate species formerly placed in *Marasmius* may also be found in *Xeromphalina, Strobilurus, Mycena,* and *Crinipellis*. For the disposition of these species, see the key to temperate marasmioid genera and the appendix of the present work. For a discussion of related subtropical and tropical genera, see Singer (41).

Available keys to North American species of *Marasmius* are those of Pennington (25) and Kauffman (11). Keys to European species appear in treatments by Singer (33), Kühner and Romagnesi (16), and Moser (23). Singer's (32, 34, 35) type studies also contribute valuable information. Singer has recently monographed South American (36, 39) and Australian (40) Marasmii.

For a discussion of the nomenclatural status of *Marasmius* and of its sections, see Singer & Smith (42), Singer (33, 37) and Gilliam (7).

Figure 1. Explanation of terms denoting breadth of lamellae. a. Narrow, with the breadth less than 1/4 the pileus radius. b. Moderately broad, with the breadth about 1/4 the radius. c. Broad, with the breadth 1/3 or more the radius.

Figure 2. Insititious and non-insititious stipes. a, b. Insititious stipes. c,d. Non-insititious stipes. Note the presence of specialized hairs at the juncture of stipe and substrate.

Figure 3. Plicate and striate pilei. a. Plicate pileus. b. Striate pileus.

Figure 4. Broom cells. a. Type of broom cell usually found in *Marasmius* sections *Marasmius* and *Hygrometrici*. b. Type of broom cell usually found in *Marasmius* section *Sicci*.

SECTIONAL CONCEPTS

Sectional concepts in current use are those of Kühner (14) as modified by Kühner and Romagnesi (16) and by Singer (37). Sections of *Marasmius* with species occurring in the northeastern United States and adjacent Canada are *Androsacei* Kühner, *Epiphylli* Kühner, *Globulares* Kühner, *Chordales* Fries (= *Alliacei* Kühner), *Sicci* Singer, *Hygrometrici* Kühner, and *Marasmius* (= *Rotulae* Kühner).

A species of *Marasmius* is placed in section *Androsacei* if the basidiocarps have black rhizomorphs, insititious stipes, and diverticulate or rarely smooth, interwoven hyphae in the pileus cuticle. Rhizomorphs of *Marasmii*, as distinguished from sterile stipes and pseudorhizae, are narrow, often branched, threads which arise from the litter on which the basidiocarps are growing and may bind debris. In *Marasmius* they are always black. Sterile stipes also arise from the substrate and extend into the air but have the same diameter as the fertile stipes and are about the same length. Pseudorhizae, which are not present in the *Androsacei* but may occur in other sections, are rootlike extensions of the stipe below ground level. Diverticulate hyphae are not the equivalent of diverticulate hyphal end cells in the descriptions: only the terminal hyphal cell has diverticula in the latter case, whereas diverticulate hyphae have many such cells.

Kühner includes in *Marasmius* section *Epiphylli* species whose pilei have hymeniform cuticles of smooth cells and sometimes also short, hyaline cystidia; whose stipes are insititious; and whose trama is nonamyloid. Species in this section usually have basidiocarps whose pilei are less than five mm broad, are usually pale in color, and grow on leaves or twigs. In the present work, the term "smooth cell" is used whenever the cell type involved almost always lacks diverticula or appendages. If one or a few diverticula are occasionally present, the term is still used in a general sense but is then qualified in the description.

Marasmius section *Globulares* Kühner includes species whose pilei have hymeniform cuticles of smooth cells, whose trama is dextrinoid, and whose stipes are non-insititious. Pilei of these species are larger than in the previous section (up to about 65 mm broad).

Species placed in *Marasmius* section *Chordales* Fries have pilei with hymeniform cuticles of smooth cells (or cells with a few rounded nodules) and stipes which are non-insititious. The trama is nonamyloid, and the pilei are usually more than five mm broad. This section has been treated separately (7).

Singer described *Marasmius* section *Sicci* for species whose basidiocarps have dextrinoid trama, non-insititious stipes, and hymeniform cuticles of cylindric to clavate broom cells with rodlike projections (fig. 4b). Setae may also be present. Species in this section often have plicate pilei (fig. 3a). The lamellae are adnate to the stipe or almost free.

Characters which, in combination, define *Marasmius* section *Marasmius* are nonamyloid trama, a hymeniform pileus cuticle composed of broom cells ornamented with numerous warts (fig. 4a), and black rhizomorphs. The lamellae are adnate to a collar surrounding the stipe. A collar arises when tissue from the pileus and lamellae is elaborated at the juncture of pileus and stipe. In the present work, if the tissue joins two or more, but not all, the lamellae and remains united with the stipe, the collar is termed partial and adnate. If complete but not free from the stipe, the collar is called a complete, adnate collar. If free from the stipe and also complete, as is usually the case in section *Marasmius*, the collar is called complete and free.

Marasmius section *Hygrometrici* is similar to section *Marasmius* in including species whose pilei have nonamyloid trama and hymeniform cuticles of obovate broom cells with wart-like projections. Species in this section, however, lack black rhizomorphs, and the lamellae are adnate to the stipe or to a partial, adnate collar rather than to a complete, free collar.

DIAGNOSTIC CHARACTERS OF SPECIES

This section will not attempt to discuss the entire range of variation present in all characters but will rather discuss the basis of characters which are critical in diagnosis, using more detail than is possible in the individual species descriptions. Singer (39) has published an excellent review of diagnostic characters in *Marasmius* which includes a discussion of many features not mentioned here.

Color may vary considerably within a species but usually remains within a single hue (e.g., yellowish brown) and varies in shade and intensity. Color should be noted for the pileus, the lamellae, the stipe, and rhizomorphs if present. Often the disc of the pileus is darker than the margin, and younger basidiocarps darker than old ones. Since the pigment is not cytoplasmic or vacuolar but resides in the walls of the cuticular cells, color does not usually change markedly with variation in the amount of moisture except in the few species with moderately thick trama.

The degree of striation or folding of the pileus surface often serves as a useful character in diagnosis of species. If faint lines are visible on the pileus above the lamellae (fig. 3b), the pileus is described as striate. "Rugulose-striate" has been used in the descriptions as a designation of texture in combination with striation, referring to a condition in which the pileus surface is rugulose directly over the lamellae but not elsewhere. If there are radial folds above the lamellae, the condition is called sulcate (if the folds are shallow to moderately deep) or plicate (if the folds are deep) (fig. 3a).

Vesture, since it reflects the type of cuticle present, may often be diagnostic and should be examined with at least a 10X lens. Vesture is most likely to be present on the disc. Here, as elsewhere when the term "minutely" is used, it means that the character was visible only with such a lens.

In studying Marasmii odor and taste should be carefully recorded. Some odors are detectable only in moist, crushed pilei. Garlic and onion odors are those most likely to be species-specific. These latter odors may be weak to strong or even absent in a given specimen, but can usually be found in at least some basidiocarps of even dried herbarium specimens. A wide variety of other odors and tastes may be encountered, but these are not usually valuable in distinguishing species reliably.

The breadth of lamellae provides one of the most useful diagnostic characters in *Marasmius*. Figure 1 illustrates the meanings of narrow, moderately broad, and broad lamellae as used in the present work. Spacing of the lamellae may be defined arbitrarily for *Marasmius* in terms of the number of mm between lamellae (including lamellulae which reach halfway or more to the stipe) at the edge of a pileus about 20 mm broad. A pileus with crowded lamellae has less than 1 mm between lamellae; one with close lamellae has about 1 mm between lamellae; one with distant lamellae, about 3 mm between lamellae; and one with remote lamellae, 4 or more mm between lamellae. The number of lamellae per basidiocarp, especially in species with few lamellae, may be useful, as may the equality or inequality of the lamellae. Irregularities in color, such as blotches of a different color, marginate edges, or dark dots on the lamellar faces, are almost always significant.

In separating species, the two most important characters of the stipe are consistency and vesture. Consistency has been used in the classification of *Marasmius* since the time of Fries and requires some experience to interpret. In general, stipes termed "delicate" in the present work are thin and very flexible, although they do not collapse on loss of moisture as would the stipe of a *Mycena*. Cartilaginous stipes have approximately the consistency of cartilage and are tough but relatively flexible. Broomstraw-like stipes are thin and flexible but tough, while stipes described as wiry or horny are very stiff and relatively inflexible. Descriptions of Marasmii should note the location and extent of the stipe vesture, color changes with time, and the characteristics of the hairs. Use of a 10X lens is necessary.

Since spore prints of Marasmii are difficult to obtain, their colors have not been much used in the taxonomy of the genus. In most cases the spore print is white, but pale orange yellow to dark orange yellow prints have been noted. More data are needed before the significance of such variation may be evaluated.

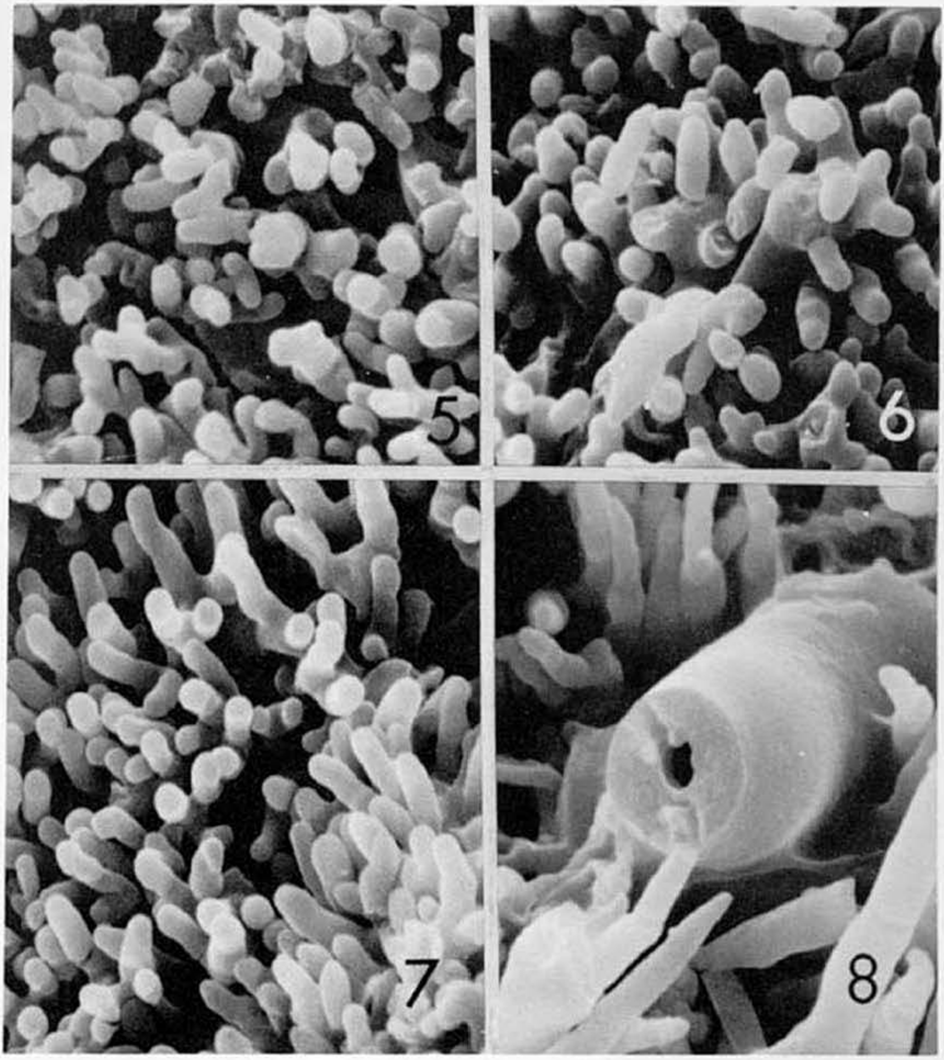
As discussed by Singer (39), spore size varies widely within species of *Marasmius*, particularly in species with large spores. Ranges of spore size, therefore, are of only limited value in distinguishing species, except in species with extremely small spores. There do exist differences in mean spore size, however, that are more meaningful. Although this was not recognized in time to collect data accordingly, the use of mean spore size provides the most diagnostic spore measurement. Length-to-width ratio and shape are also valuable.

Broom cells (fig. 4) and leptocystidia (e.g., fig.14b) on the lamellar edges and faces provide useful diagnostic information with respect to their presence or absence, size and shape, pigmentation, and the configuration of projections if present. The terms "pleurocystidia" and "cheilocystidia" are confusing when used for *Marasmius*. Leptocystidia occupy both the faces and edges of the lamellae with no differences in morphology between cells in the two locations. Broom cells usually occur on the edges only. If both broom cells and leptocystidia occupy the lamellar edge, the use of the term "cheilocystidia" for both is confusing. Setae, if present, may occur on both the lamellar edges and faces. If the terms "cheilocystidia" and "pleurocystidia" are used for them, two identical descriptions of the same cell type must be used. Cells are called hymenial cystidia in the present work if they have specialized (e.g., capitate, acute, or moniliform) apices or if they project beyond the basidioles and have hyaline walls up to 1 µm thick. Broom cells and hymenial setae are described as such, and their location is specified.

Clamp connections are present on most hyphae of the basidiocarp in all species of *Marasmius* occurring in the geographical area under consideration. This feature is of some importance in the differentiation of subtropical and tropical species but has not been found to be so here.

Many diagnostic characters may be found by examining the structure of the pileus cuticle. The arrangement of the component cells or hyphae, their size and shape, their color as mounted in water and in Melzer's reagent, and the size and shape of projections from the cells offer dependable criteria for identification of species. The term "cuticle" is used to denote the covering layer of the pileus in its entirety, following Singer (38) and Shaffer (31). If there is differentiation into two layers, the upper layer is termed the epicutis and the lower, the subcutis.

The appearance of broom cells on the pileus surface may, upon comparison, aid in separating species. Scanning electron micrographs (figs. 5-8) were instructive in detecting differences, which could then be more clearly seen with the compound microscope. Broom cells vary in uniformity of wall thickness, in diameter of the projections, and in length of projections. Radial scans of pilei revealed cells with nodules or projections on the disc and edges of the pilei in species which had formerly been described



Figures 5-8. Scanning electron micrographs of the pileus surface, x6000 (courtesy of Larry Allard).

Figure 5. *Marasmius borealis*, Gilliam 1171.

Figure 6. *Marasmius bellipes*, Mazzer 6626.

Figure 7. *Marasmius siccus*, Gilliam 869.

Figure 8. *Marasmius cohaerens* var. *lachnophyllus*, Ammirati 2477. The large structure in the center is a seta.

as having only smooth cells in the cuticle.

The microscopic appearance of the stipe vesture is often sufficiently distinct to permit recognition of certain species by virtue of that feature alone. In section *Sicci* the features of broom cells, if present, at the apex of the stipe may be diagnostic. The configuration of the outer walls of the cortical hyphae, of the broom cells, or of the hairs, may also be important.

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TAXONOMY

MARASMIUS Fries, Fl. Scan. 339. 1835, nom. cons., emend. Singer, Mycologia 50: 103. 1958.

Androsaceus Patouillard, Hymen. Eur. 105. 1887. Type species: *Androsaceus rotula* (Scopoli ex Fries) Patouillard, Hymen. Eur. 105. 1887.

Chamaeceras Rebentisch ex Kuntze, Rev. Gen. Pl. III,2: 454. 1898. Type species: *Chamaeceras androsaceus* (Fries) Kuntze, Rev. Gen. Pl. III, 2: 454. 1898.

Mycenitis Earle, Bull. New York Bot. Gard. 5: 414. 1909. Type species: *Mycenitis alliaceus* (Fries) Earle, Bull. New York Bot. Gard. 5: 414. 1909.

Scorteus Earle, Bull. New York Bot. Gard. 5: 415. 1909. Type species: *Scorteus oreades* (Bolton ex Fries) Earle, Bull. New York Bot. Gard. 5: 415. 1909.

Type species: *Marasmius rotula* (Scopoli ex Fries) Fries, Epicr. Myc. 385. 1838.

Pileus small to moderately large (1-65 mm broad), convex, squarely pulvinate, or campanulate and sometimes papillate, umbonate, or depressed, often striate or sulcate, usually thin, usually tough and reviving, glabrous or minutely velutinous. Odor and taste lacking, or foetid, spermatic, or of garlic or onions. Lamellae narrow to broad or sometimes veinlike, thin, few, or rarely numerous, remote to crowded, adnate to free or adnate to a partial or complete collar. Stipe central or somewhat eccentric (sometimes lacking in subtropical or tropical species), thin, equal or tapered to the apex or base, bristle-like, broomstraw-like, cartilaginous, pliant, or horny, glabrous or pubescent to strigose, insititious or with a tuftlike basal mycelium, sometimes with a short pseudorhiza. Rhizomorphs or sterile stipes sometimes present, black.

Spores white or rarely pale orange yellow in mass, clavate, cylindric, obovate, or pip-shaped, hyaline, smooth, nonamyloid, not metachromatic. Basidia clavate to subclavate, 4- or rarely 2-spored, clamped, nonamyloid. Basidioles subclavate or subfusiform to fusiform. Hymenial cystidia often present, clavate, cylindric, or fusoid-ventricose, capitate, capitellate, submoniliform, short-appendiculate, or sometimes rounded to acute apically, hyaline to pale orange yellow. Hymenial setae sometimes present. Hymenial broom cells often present on the lamellar edges, similar to the cuticular broom cells. Lamellar trama of parallel to interwoven, septate, branched, nonamyloid or dextrinoid connective hyphae. Clamp connections usually present. Pileus trama of interwoven, often inflated hyphae otherwise similar to those of the lamellar trama. Pileus subcutis rarely present, but if delimited, not of inflated cells. Pileus cuticle or epicutis a hymeniform layer of smooth cells, diverticulate cells, or broom cells and sometimes occasional setae or short cystidia, or a dense layer of interwoven, diverticulate or rarely smooth hyphae (and then black rhizomorphs present and the stipe insititious). Stipe usually corticated thinly, the cortical hyphae dark in color and thick-walled. Stipe vesture, if present, of broom cells, cystidia, or thin- to thick-walled hairs. On fallen leaves, wood, humus, or grasses, or rarely on living trees.

The following key is based in part on Singer's (37-39, 41) classification. Taxa included are those formerly placed in *Marasmius* sensu Fries as well as the sections of *Marasmius* treated here. Related tropical and subtropical taxa do not appear in the key.

KEY TO SECTIONS OF MARASMIUS AND OTHER NORTH TEMPERATE TAXA CONTAINING MARASMIOID SPECIES

1. Spores amyloid
    2. Basal mycelium yellow to brownish orange; pileus subcutis, if present, not pseudoparenchymatous .... *Xeromphalina*
    2. Basal mycelium, if present, usually white or gray, but not yellow or brownish orange; pileus subcutis often pseudoparenchymatous if present....... *Mycena*
1. Spores nonamyloid
    3. Pileus cuticle with long dextrinoid hairs.......... .... *Crinipellis*
    3. Pileus cuticle lacking long dextrinoid hairs, but sometimes with short nonamyloid filaments or cystidia
        4. Cuticle of unexpanded pilei composed of interwoven hyphae; black rhizomorphs absent
            5. Cuticular hyphae weakly to strongly diverticulate
                6. Stipe insititious; cuticular hyphae diverticulate from the beginning .... *Marasmiellus* emend. Singer 1962
                6. Stipe not insititious (with mycelium

visible at the point of emergence); cuticular hyphae smooth at first, diverticulate only in age; black rhizomorphs absent........ *Collybia* sect. *Subfumosae*

5. Cuticular hyphae smooth or occasionally lobed or incrusted
   7. Pileus cuticle embedded in a gelatinous matrix.......................*Micromphale*
   7. Pileus cuticle lacking gelatinous layers
      8. Stipe pubescent or tomentose overall.......*Collybia* sect. *Vestipedes*
      8. Stipe glabrous except at the base ....*Collybia* sect. *Laevipedes*

4. Cuticle of unexpanded pilei a hymeniform layer of smooth or diverticulate hyphal end cells or broom cells, or, if composed of interwoven smooth or diverticulate hyphae, then black rhizomorphs also present
   9. Pileus cuticle a dense layer of interwoven diverticulate or rarely smooth or spirally incrusted hyphae; stipe insititious; black rhizomorphs present.......................................*Marasmius* sect. *Androsacei*
   9. Pileus cuticle a hymeniform layer of smooth or diverticulate hyphal end cells or broom cells; stipe insititious or not; black rhizomorphs present or absent
      10. Growing from cones; clamp connections consistently absent.........................*Strobilurus* (marasmioid species)
      10. Growing from other substrates; clamp connections present in all north temperate species examined
         11. Cells of the pileus cuticle usually smooth, if diverticulate or with a few hyaline nodulose projections, then the trama nonamyloid and black rhizomorphs absent
            12. Pileus or lamellar trama or both dextrinoid.............*Marasmius* sect. *Globulares*
            12. Pileus and lamellar trama nonamyloid
               13. Pileus white, pale pink or pale orange yellow, less than 5(-8) mm broad

at maturity; lamellae usually poorly developed .... *Marasmius* sect. *Epiphylli*

13. Pileus usually darker, more than 5 mm broad at maturity; lamellae well developed........*Marasmius* sect. *Chordales* (7)

11. Cells of the pileus cuticle ornamented, at least in young pilei, with numerous warts or rodlike projections; trama dextrinoid, or if nonamyloid, then black rhizomorphs present <u>or</u> the warts on the cuticular cells moderate brown

14. Cuticular broom cells usually subglobose to sphaeropedunculate and ornamented with warts (fig. 4a); trama nonamyloid

15. Lamellae adnate to a complete, free collar or rarely a partial, adnate collar; cystidia absent; black rhizomorphs present.................*Marasmius* sect. *Marasmius*

15. Lamellae adnate or adnexed to the stipe or rarely adnate to a partial, adnate collar; cystidia present on the lamellae and sometimes on the pileus cuticle; black rhizomorphs absent ....*Marasmius* sect. *Hygrometrici*

14. Cuticular broom cells usually clavate to cylindric and ornamented with rodlike or finely divided projections (fig. 4b); trama dextrinoid ....*Marasmius* sect. *Sicci*

KEY TO MARASMIUS SECTION ANDROSACEI

1. Pileus minute (1-3 mm broad); odor of crushed pilei in fresh and dried, remoistened specimens of garlic.... ....1. *Marasmius thujinus*
1. Pileus small but not minute (2-20 mm broad); odor of crushed pilei mild or absent
   2. Diverticulate cells not present in the hymenium; pileus light yellowish brown to yellowish white with the disc dark brown or moderate brown; hyphal walls of the stipe cortex irregularly incrusted or spirally thickened.....2. *Marasmius pallidocephalus*
   2. Diverticulate cells present on the lamellar edges, clavate, with 3-20 hyaline diverticula; pileus dark brown to light brown, sometimes fading in age to light yellowish brown; hyphal walls of the stipe cortex smooth or rarely somewhat incrusted, but not spirally thickened........3. *Marasmius androsaceus*

KEY TO MARASMIUS SECTION EPIPHYLLI

1. Pileus cuticle a hymeniform layer of thick-walled cells with 1-5 broad, often incrusted, conic projections; on fallen beech leaves...............4. *Marasmius epifagus*
1. Pileus cuticle a hymeniform layer of thin- to thick-walled smooth cells; on leaves of various herbaceous and woody plants, but not on beech leaves
   2. Pileus light yellowish pink; on leaves of herbaceous dicots..........................5. *Marasmius felix*
   2. Pileus white to yellowish white; on leaves of monocots or woody dicots
      3. On culms of *Carex*.......6. *Marasmius caricicola*
      3. On leaves of woody dicots, particularly Betulaceae...................7. *Marasmius epiphyllus*

KEY TO MARASMIUS SECTION GLOBULARES

1. Hymenial cystidia or setae lacking; growing in grass or rarely under spruce, often in fairy rings............. ....8. *Marasmius oreades*
1. Hymenial cystidia or setae present; growing on humus in deciduous woods, not in fairy rings
   2. Hymenial setae hyaline.......................... ....11. *Marasmius delectans* (sect. *Sicci*)
   2. Hymenial setae absent
      3. Hymenial cystidia present on the lamellar faces and usually on the edges as well; stipe

vesture lacking........9. *Marasmius cystidiosus*
3. Hymenial cystidia present on the lamellar edges only; stipe vesture of hyaline hairs 4-7 µm broad..................10. *Marasmius strictipes*

KEY TO MARASMIUS SECTION SICCI

1. Hymenial setae present
    2. Pileus yellowish white; setae hyaline in water or 2% KOH, often with capitate or rounded apices...... ....11. *Marasmius delectans*
    2. Pileus some shade of brown; setae light yellowish brown to moderate brown in water or 2% KOH, usually with acute apices
        3. Lamellae no broader than 1/4 the pileus radius, close (at least 1/mm at the pileus edge); stipe setae usually abundant........................ .....13. *Marasmius cohaerens* var. *lachnophyllus*
        3. Lamellae broader than 1/4 the pileus radius; distant to remote (<1/mm at the pileus edge); stipe setae rare............................. ....12. *Marasmius cohaerens* var. *cohaerens*
1. Hymenial setae absent
    4. Stipe covered overall with broom cells and branched or unbranched hairs
        5. Lamellae crowded (at least 10/mm at the pileus edge); stipe >2 mm thick..16. *Marasmius spissus*
        5. Lamellae remote to close (fewer than 10/mm at the pileus edge) or, if crowded, then the stipe <2 mm thick
            6. Pileus 6-25 mm broad, brilliant orange to strong brown or moderate reddish orange, often with minute yellow spots on the margin when dried........14. *Marasmius sullivantii*
            6. Pileus 2-6 mm broad, moderate orange or paler..............15. *Marasmius armeniacus*
    4. Stipe glabrous above the basal mycelial pad or with broom cells only at the extreme apex or base
        7. Lamellae crowded (at least 10/mm at the pileus edge)....................16. *Marasmius spissus*
        7. Lamellae remote to close (<1/mm at the pileus edge)
            8. Sterile stipes present; usually on Gramineae ...26. *Marasmius graminum* (sect. *Marasmius*)
            8. Sterile stipes absent; on woody or herbaceous debris, but only rarely on Gramineae

9. All cuticular broom cells on a single pileus uniformly either thin-walled or thick-walled, with the projections either narrow (0.5-1 µm) on all cells or broad (1-2.2 µm) on all cells
    10. Pileus remaining even (nonstriate and nonsulcate) throughout development
        11. Projections of cuticular broom cells 2.8-5.6 X 0.5-1.5 µm; spores 13-17 µm long................17. *Marasmius borealis*
        11. Projections of cuticular broom cells 7-14 X 1-2.2 µm; spores 7-10.8 µm long......................18. *Marasmius spadiceus*
    10. Pileus soon <u>either</u> striate <u>or</u> sulcate
        12. Hymenial cystidia refractive and usually pale yellow, often arising deep in the trama and curved at the base; pileus 2.5-27 mm broad...........................19. *Marasmius siccus*
        12. Hymenial cystidia, if present, hyaline, nonrefractive, rare, and inconspicuous, arising at the same level as the basidiles and not curved at the base; pileus 19-45 mm broad........ 18. *Marasmius fulvoferrugineus*
9. Cuticular broom cells on a single pileus both thick-walled and thin-walled (e.g., fig. 38), with the thicker-walled cells inset or spaced evenly at intervals and the projections narrow (0.5-1.5 µm broad) on some cells and broad (1-2.5 µm broad) on others
    13. Spores 2-2.5 times longer than broad; lamellae broad in age; pileus moderate brown or moderate yellowish brown at first.........................21. *Marasmius glabellus*
    13. Spores at least 2.6 times longer than broad; lamellae narrow to moderately broad in age; pileus pink,

purplish pink, light yellowish brown, or moderate yellowish pink at first

14. Spores 9-13 µm long; cuticle not appearing mottled in a regular pattern on low magnification..22. *Marasmius bellipes*

14. Spores 11-16 µm long; cuticle (surface view) appearing mottled in a regular pattern on low magnification

    15. Lamellae 16-23; pileus campanulate at first; projections of cuticular broom cells up to 2 µm broad; stipe apex purplish pink to light yellowish brown at first... 23.*Marasmius pulcherripes*

    15. Lamellae 11-16; pileus convex at first; projections on cuticular broom cells up to 1(-1.5) µm thick; stipe apex white or light yellow at first. .24. *Marasmius robinianus*

MARASMIUS SECTION HYGROMETRICI

Only a single species occurs in the region under consideration: 25. *Marasmius minutus*.

KEY TO MARASMIUS SECTION MARASMIUS

1. Pileus moderate orange to strong reddish brown or nearby, at least when young; cuticular broom cells with 2-25 unbranched, short, rodlike projections
    2. Stipe moderate reddish brown to blackish brown below, glabrous.............26. *Marasmius graminum*
    2. Stipe white overall, pubescent.27. *Marasmius olneii*
1. Pileus white to light yellowish brown or light brown at first; cuticular broom cells densely covered above with numerous warts or finely divided projections
    3. Cuticular broom cells with finely divided projections; spores 9-13 µm long..28. *Marasmius pruinatus*
    3. Cuticular broom cells ornamented with closely spaced warts; spores 6-11 µm long

4. Stipe less than 0.3 mm thick; pileus obtusely conic, often abruptly paler on the disc; usually on oak leaves..........29. *Marasmius capillaris*
4. Stipe more than 0.3 mm thick; pileus pulvinate, then convex-depressed, not markedly paler on the disc; on decaying hardwood logs or debris............................. 30. *Marasmius rotula*

MARASMIUS section ANDROSACEI Kühner, Botaniste 25: 91. 1933.

Marasmius I Insititii I Setipedes a Foliicolae Quélet, Fl. Mycol. France 311. 1888.

Marasmius C Rotulina Patouillard, Ess. Taxon. 145. 1900.

Type species: *Marasmius androsaceus* (Linnaeus ex Fries) Fries, Epicr. Myc. 385. 1838.

Pileus small (<20 mm broad), smooth or radially rugulose, thin, tough, light or dark in color. Odor and taste mild, foetid, or of garlic or onions. Lamellae thin, few, close to distant, adnate to adnexed, or attached to a partial, adnate collar. Stipe thin, bristle-like, cartilaginous, or firm and filiform, glabrous or rarely pubescent, insititious. Rhizomorphs numerous, black. Sterile stipes and basal mycelium absent.

Spores elliptic to narrowly obovate or pip-shaped. Diverticulate cells sometimes present on the lamellar edges. Trama of pileus and lamellae nonamyloid or dextrinoid. Pileus cuticle of interwoven, diverticulate or rarely smooth hyphae. Stipe cortex of smooth or roughened hyphae, lacking vesture or with thick-walled hairs.

On needles of coniferous trees or rarely on leaves of deciduous trees.

1. MARASMIUS THUJINUS Peck, New York State Mus. Bull. 67: 26. 1902 (1903). FIG. 9

Marasmius piceina Kauffman, Pap. Michigan Acad. Sci. 1: 143. 1921 (1923).

PILEUS 1-3 mm broad; pulvinate at first, becoming convex and sometimes shallowly depressed or umbilicate; dry; dull; opaque; at first smooth; soon minutely rugulose; often faintly sulcate-striate to the disc; entire or lobed; membranous and rather tough; reviving. CUTICLE minutely velutinous; brownish pink centrally, light yellowish pink (Pinkish Buff) on the margin, in dried specimens pale yellow or brownish pink. TRAMA thin; white or nearly so. ODOR of crushed pilei of garlic. TASTE tardily of garlic.

LAMELLAE moderately broad (up to 1 mm broad on a pileus 2 mm across); thin; distant; few (8-10 reach the stipe); equal at first, soon with short lamellulae alternating with the lamellae; adnate at first, then adnexed to deeply emarginate; pliant; entire; at first straight, then broadest near the edge; not intervenose; not forked; nearly white, drying pale yellow.

STIPE 12-25 mm long, 0.1-0.2 mm thick; terete; filiform; straight, but curled upon drying; dry; shining; translucent; solid; firm; even; glabrous or minutely pruinose, particularly near the base; yellowish white at the apex, light yellowish brown tinged red below, rarely dark brown at the base; insititious. STERILE STIPES lacking. RHIZOMORPHS rare to abundant, often binding several needles; capillary (less than 0.1 mm broad); short (less than 10 mm long); curled; dark brown. BASAL MYCELIUM lacking.

SPORES (7.0-)8.0-11.2 X 2.5-4.2 µm; pip-shaped or narrowly fusoid-elliptic. BASIDIA 18-32 X 5.5-8.5 µm; clavate; 4-spored. BASIDIOLES subfusiform.

HYMENIAL CYSTIDIA absent.

TRAMAL HYPHAE of pileus and lamellae 1-4 µm broad; interwoven; hyaline to light grayish yellow or rarely light yellowish brown; with hyaline, thin walls; nonamyloid.

PILEUS CUTICLE an uneven layer of interwoven diverticulate hyphae. CUTICULAR HYPHAE up to 7 µm broad; thin-walled near the pileus margin, with light yellowish brown, unevenly or spirally thickened walls up to 1.5 µm thick on the disc; regularly and closely knobbed-diverticulate, the diverticula short and broad (2-5 X 2-4 µm), often blunt, refractive, and hyaline to pale yellow or light yellowish brown; with short branches which are occasionally clavate and erect.

STIPE corticated overall. CORTICAL HYPHAE 2-4 µm broad; with thin hyaline to light yellowish brown walls which are regularly and evenly short-diverticulate along the outer surface and smooth on the inner; nonamyloid. TRAMAL HYPHAE 6-8 µm broad; with thin hyaline to pale yellow walls; nonamyloid.

Gregarious and sometimes in troops on needles of

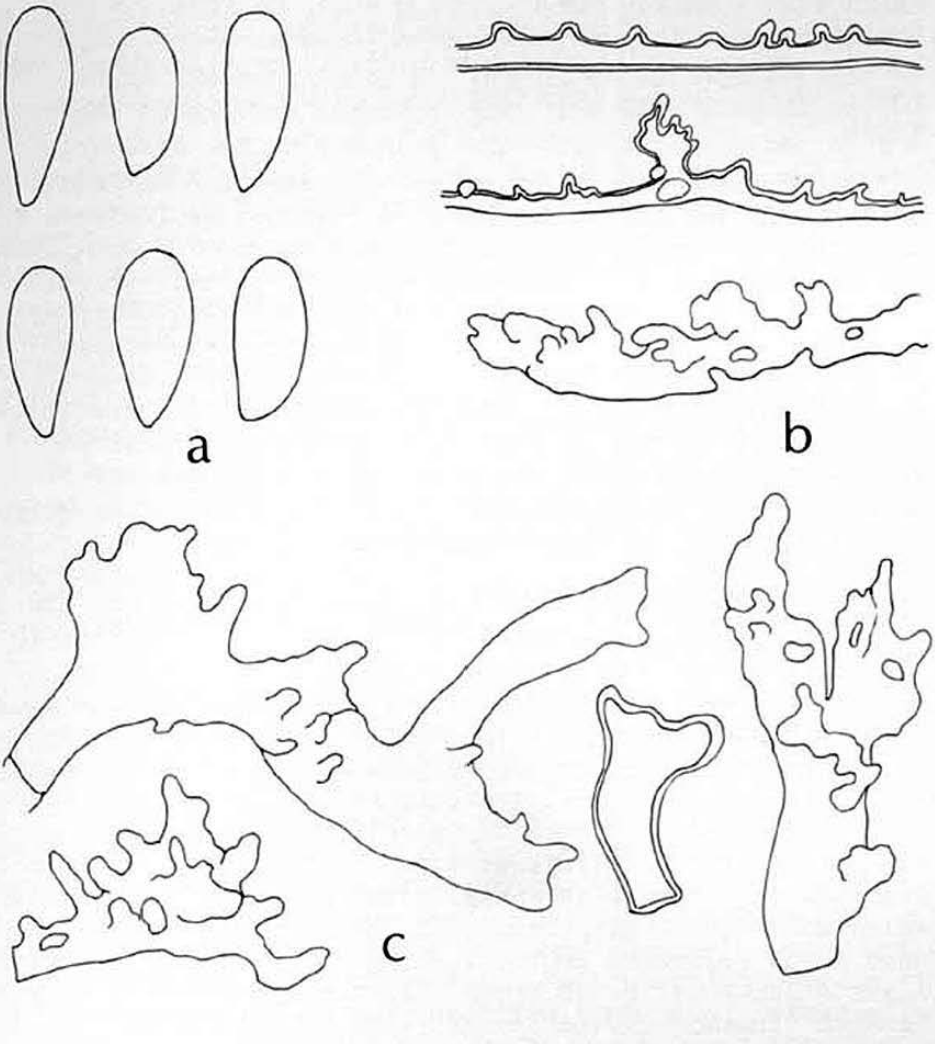


Figure 9. *Marasmius thujinus*, Gilliam 1459. a. Spores, x2300. b. Cortical hyphae of the stipe, x1500. c. Cuticular cells, x2300.

spruce, fir, and white cedar in coniferous woods. Fruiting period: 8 Sep-14 Oct (-8 Dec, Idaho).

Collections examined:

CANADA: BRITISH COLUMBIA: Harrison 6340. ONTARIO:

Smith 4745. UNITED STATES: COLORADO: Kauffman, 8 Sep (holotype of *Marasmius piceina* Kauffman). IDAHO: Cooke 19049. MICHIGAN: Smith 43798 & 63286; Gilliam 1459. NEW YORK: Peck, 19 Sep 1902 (holotype of *M. thujinus* Peck, NYS).

Although Peck's description of *Marasmius thujinus* does not mention the garlic or onion odor stated by Kauffman as occurring in *M. piceina,* the type specimens of *M. thujinus* when remoistened and crushed do give off a distinct odor of garlic. Since the garlic odor of fresh specimens may be missed if the pileus is not crushed, Peck's omission of the odor is understandable. Microscopic features of the type specimens of *M. thujinus* and *M. piceina* are similar. The difference in substrate appears to be unimportant, since Smith 63286 was found growing on needles of both *Picea* and *Thuja*. On the basis of the preceding evidence I consider *M. piceina* a synonym of *M. thujinus*.

2. MARASMIUS PALLIDOCEPHALUS Gilliam, Mycologia 67: 818. *f. 1-3.* 1975. FIG. 10

PILEUS 2-14 mm broad; pulvinate to convex at first, then plano-convex or broadly conic-convex, finally plane to shallowly concave and often subumbonate or umbilicate; dry, or subviscid in wet weather; matte, but shining when wet; opaque; smooth; even or faintly rugulose-striate up to 2/3 the pileus radius; at first entire, soon eroded or crenate; pliant or membranous; reviving. CUTICLE minutely velutinous or matted-fibrillose; dark brown in primordia, soon light yellowish brown, light grayish yellowish brown, light pinkish yellowish brown, light yellowish pink (Light Pinkish Cinnamon), pale orange yellow (Pale Pinkish Buff), or yellowish white (M&P 9B2) on the margin and darker [pale orange yellow (Pale Pinkish Buff), light yellowish brown (Cinnamon), dark brown (M&P 16A12), or moderate yellowish brown] on the disc. TRAMA thin (0.1-0.5 mm thick in the disc); yellowish white to light yellowish brown. ODOR and TASTE lacking.

LAMELLAE narrow (up to 1 mm broad); usually thin; subdistant to distant; moderately numerous (12-20 reach the stipe); unequal, with 1 or 2 irregular tiers of lamellulae; adnate at first, becoming adnexed to sinuate in age, or sometimes attached to a partial, adnate collar; pliant; entire or minutely fimbriate; straight at first, broader near the stipe in age; not intervenose or obscurely so in age; not forked; yellowish white, pale orange yellow

(Light Buff), or light yellowish brown.

STIPE 12-43 mm long, 0.2-0.8 mm broad; central or somewhat eccentric; terete; equal; straight when moist, soon curling and twisting in dry air; dry; shining; opaque; hollow; bristle-like but not tough (thin, stiff, and easily cut); even; glabrous or sometimes whitish-pruinose up to 1 mm from the apex downward; light yellowish brown to moderate yellowish brown or dark reddish brown to dark brown on the upper half, blackish brown below; insititious. STERILE STIPES absent. RHIZOMORPHS scarce to abundant; arising at intervals along the substrate; much branched; threadlike; twisted and curled; often binding several needles together; black. BASAL MYCELIUM absent.

SPORES white in mass; 6.0-9.8 X 2.5-4.2 µm; narrowly elliptic, narrowly obovate, or pip-shaped. BASIDIA 20-33 X 4-7 µm; clavate or subclavate; 4-spored. BASIDIOLES subfusiform to subclavate.

HYMENIAL CYSTIDIA lacking.

TRAMAL HYPHAE interwoven and inflated up to 8 µm broad in the pileus; parallel, uninflated, and 2.5-6 µm broad in the lamellae; with hyaline to light grayish yellow walls up to 0.5 µm thick; nonamyloid.

PILEUS SUBCUTIS 15-75 µm thick, composed of interwoven to ascending-interwoven hyphae 2-9 µm broad, with hyaline to moderate yellowish brown, often spirally thickened or irregularly incrusted walls up to 0.5 µm thick, often with broad diverticula or short branches, nonamyloid. PILEUS EPICUTIS up to 40 µm thick, an interrupted or continuous hymeniform or subhymeniform layer of clavate or cylindric cells 4-40 X 4-10 µm with few to many diverticula up to 4 µm broad and thin hyaline walls.

STIPE corticated overall. CORTICAL HYPHAE 1-3.5 µm broad; with smooth, beaded, roughened, or spirally thickened grayish yellow to deep brown walls less than 0.5 µm thick; nonamyloid. TRAMAL HYPHAE up to 7 µm broad; with hyaline walls up to 0.5 µm thick, or with the wall completely occluding the lumen; nonamyloid or more usually dextrinoid, at least in part.

Gregarious and sometimes in troops on needles of conifers, particularly spruce, in coniferous woods. Fruiting period: 14 Jun-30 Oct.

Collections examined:

CANADA: QUEBEC: Bigelow 4885 (MASS). UNITED STATES: MAINE: Bigelow 3086 (MICH) & 10140 (MASS). MASSACHUSETTS: Bigelow 6682 (MASS) & 6838 (MASS). MICHIGAN: Ammirati 1616 & 3056; Gilliam 1110, 1165 (holotype of *Marasmius pallidocephalus* Gilliam), & 1170; Patrick 268; Shaffer 1291; Smith 25365, 36435, 51673, & 66360. MINNESOTA: Weaver 1621. NEW HAMPSHIRE: Bigelow 11683 (MASS) & 12357 (MASS). NEW YORK: Bigelow 5128 (MASS) & 5138 (MASS). NORTH CAROLINA: Harrison 10976.

Marasmius pallidocephalus Gilliam may be commonly found in the summer after moderately heavy rains in spruce and hemlock woods. For a comparison between this species and *M. androsaceus*, see the original publication (8).

3. MARASMIUS ANDROSACEUS (Linnaeus ex Fries) Fries, Epicr. Myc. 385. 1838. FIGS. 11-13

Agaricus androsaceus Linnaeus ex Fries, Syst. Myc. 1: 137. 1821.

Chamaeceras androsaceus (Linnaeus ex Fries) Kuntze, Rev. Gen. Pl. III, 2: 454. 1898.

Marasmius melanopus Morgan, J. Cincinnati Soc. Nat. Hist. 18: 36. *pl. 1, f. 2.* 1895.

PILEUS 2-15(-20) mm broad; convex or pulvinate at first with the margin incurved, becoming broadly convex to plano-convex and often depressed or umbilicate centrally, finally plane with the margin wavy and uplifted; dry; dull, or sometimes shining in wet weather; opaque, or sometimes translucent on the margin when wet; smooth at first, then minutely rugulose; at first even, becoming rugulose-striate or sulcate up to 7/8 the pileus radius; entire, eroded, or crenate; pliant; reviving. CUTICLE glabrous at mid-margin, often minutely granular-roughened on the disc and extreme margin; dark brown (M&P 8A10) or dark yellowish brown tinged pink when young and moist, then moderate brown (Army Brown, M&P 16A9-10), grayish reddish brown (M&P 15A8-9), or light brown (M&P 14A6), often dark brown (M&P 16A9-12) on the disc, rarely white on the extreme edge, in age or on drying sometimes fading to light yellowish brown (Wood Brown, Vinaceous-Cinnamon). TRAMA up to 1 mm thick, often indistinguishable; yellowish white to light yellowish brown. ODOR mild or lacking. TASTE lacking or rarely somewhat bitter.

LAMELLAE narrow (up to 1 mm broad); thin; subdistant to distant; few (10-20 reach the stipe); unequal, with 2-7 tiers of lamellulae; adnate, adnexed, or sometimes

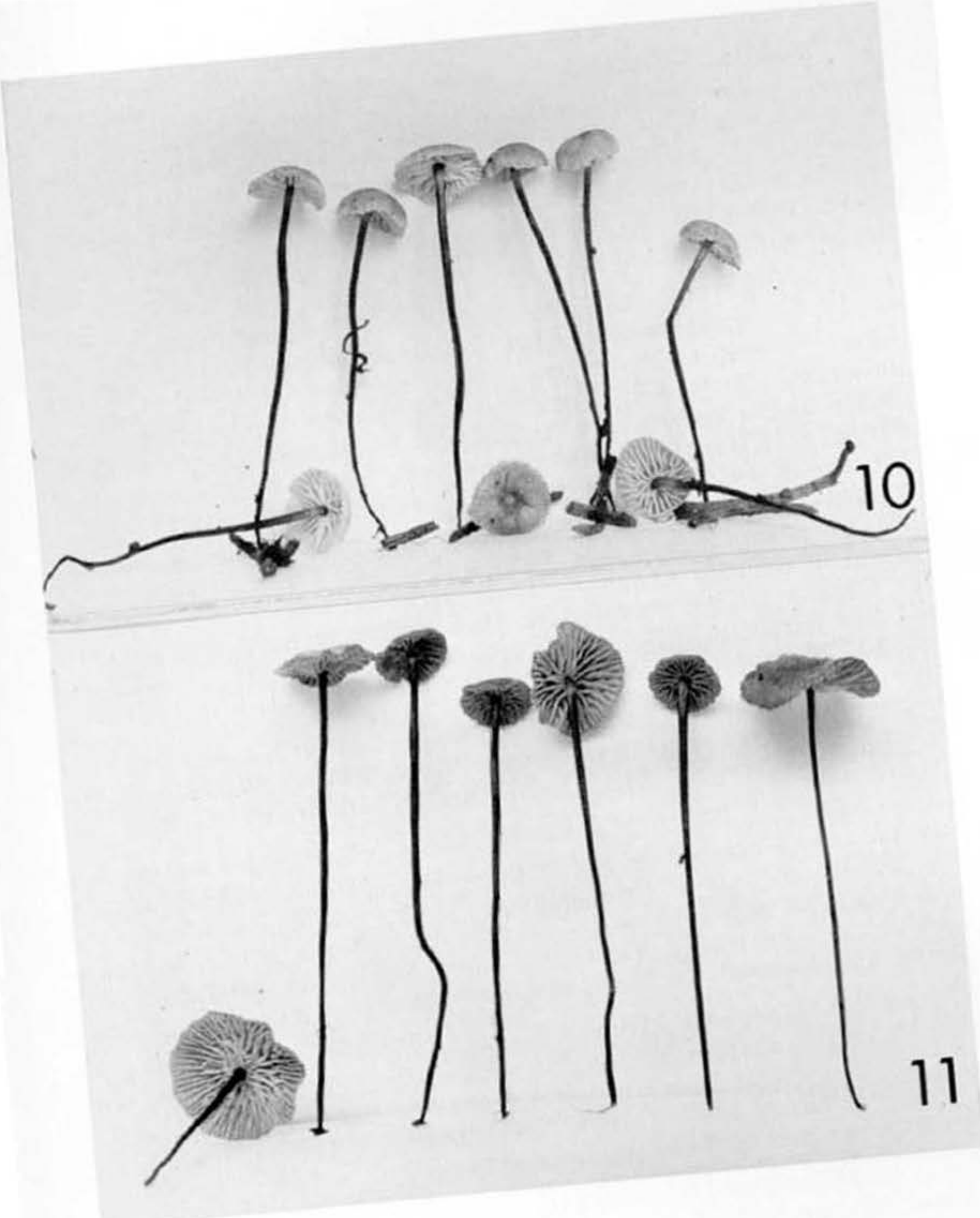


Figure 10. *Marasmius pallidocephalus*. Smith 51673, xl (courtesy of A. H. Smith).

Figure 11. *Marasmius androsaceus*. Smith 62447, xl (courtesy of A. H. Smith).

attached to a partial, adnate collar; tough-pliant; subfimbriate or minutely erose; at first straight, becoming subventricose in age; occasionally forked; yellowish white (M&P 11B5) at first, soon light grayish yellowish brown Avellaneous, M&P 12A6) or brownish pink, often tinged gray (M&P 12A2, 11A3) or grayish brown in age or when water-soaked.

STIPE 12-60 mm long, 0.2-1.1 mm thick; central; terete or flattened; equal or narrowed slightly to the base; straight or curved, often twisted; dry; dull or shining; opaque; hollow; wiry; glabrous, or with a few short barbs or slender branches; blackish brown to black overall or rarely moderate reddish brown or dark yellowish brown on the apical 1-2 mm; insititious. STERILE STIPES lacking. RHIZOMORPHS rare to abundant; 0.1-0.7 mm thick; arising from the substrate near the basidiocarps; often branched; bristle-like; twisted and coiled or recurved; glabrous or with fine barbs or tendrils which adhere closely to the substrate; blackish brown. BASAL MYCELIUM lacking.

SPORES white in mass; 6.7-8.8(-10) X 3.2-4.3 µm; elliptic, pip-shaped, or narrowly obovate. BASIDIA 19-34 X 4-7 µm; clavate; 4-spored. BASIDIOLES subfusiform.

HYMENIAL DIVERTICULATE CELLS 5.5-36 X 4-11 µm; usually clavate, sometimes obovate, subcylindric, or irregularly lobed; with 3-20 hyaline wartlike or rodlike diverticula 3-5(-11) X 0.5-3 µm which are rounded to acute and sometimes branched; with thin, hyaline walls; nonamyloid; rare to abundant on the lamellar edges.

TRAMAL HYPHAE interwoven and inflated up to 11.5 µm in the pileus; parallel-interwoven, uninflated, and 2.5-7 µm broad in the lamellae; with hyaline to light grayish brown walls up to 0.5 µm thick; nonamyloid, but sometimes with granular dextrinoid contents.

PILEUS SUBCUTIS 10-60 µm thick, composed of interwoven hyphae 4-13.5 µm broad, with hyaline to moderate brown, often unevenly or spirally thickened walls up to 1.5 µm thick; dextrinoid; in age forming the uppermost layer of the pileus. PILEUS EPICUTIS a hymeniform layer 8-25 µm thick, of smooth or diverticulate cells 10-21 X 4-14 µm which are lobed, clavate, obovate, or cylindric and often pedicellate, smooth or with many hyaline diverticula 0.5-5 X 0.2-3 µm, and with hyaline walls up to 1 µm thick.

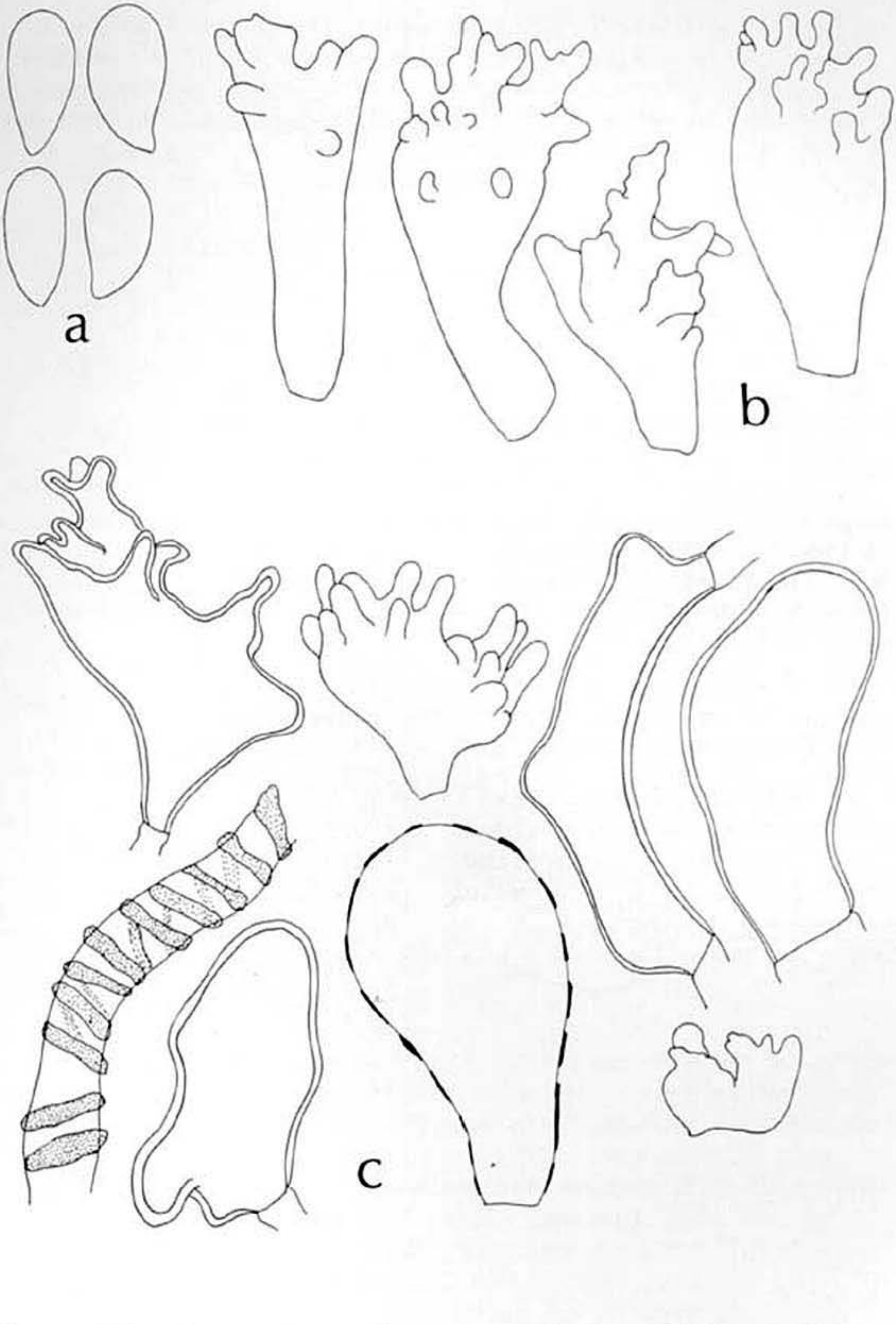


Figure 12. *Marasmius androsaceus*, Gilliam 1504, x2300.
a. Spores. b. Diverticulate cells from the lamellar edge. c. Elements of the pileus cuticle.

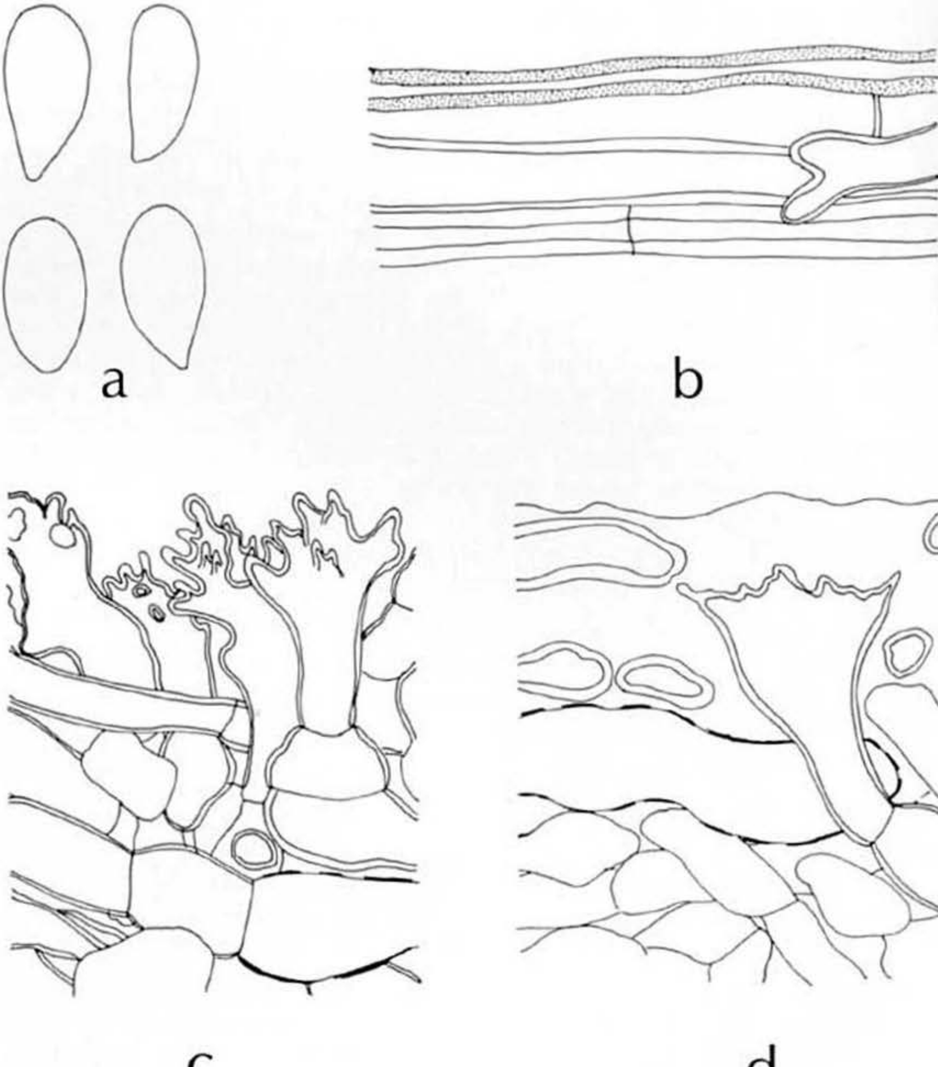


Figure 13. *Marasmius androsaceus*. a-b. Bigelow 3104. a. Spores, x2300. b. Section of stipe showing smooth cortical hyphae, x1500. c-d. Smith 62447, x2300. c. Tangential section of pileus cuticle taken from pileus edge. d. Tangential section of pileus cuticle taken halfway between the center and edge of the pileus.

STIPE corticated overall. CORTICAL HYPHAE 2.5-5.5 µm broad; with dark yellowish brown to blackish brown, often granular-roughened or unevenly incrusted walls up to 0.5-1 µm thick; nonamyloid or dextrinoid. STIPE VESTURE lacking.

Gregarious and often in troops on needles, cone scales, and debris of conifers, or rarely on deciduous leaves in coniferous or coniferous-deciduous woods. Fruiting period: 3 Jun-30 Oct.

Collections examined:

CANADA: NOVA SCOTIA: Smith 506. QUEBEC: Bigelow 4884 (MASS), 5427 (MASS) & 5723 (MASS). ENGLAND: SOMERSET: Smith 63164. FRANCE: HAUT-RHIN: Shaffer 4911. OISE: Shaffer 4647. GERMANY: Sydow, *Mycotheca Germanica* 301. SWITZERLAND: Favre, 29 Jun 1948. UNITED STATES: CALIFORNIA: Bonar 468. IDAHO: Smith 15805 & 58991. MAINE: Bigelow 3096 (MASS), 3104, 10053 (MASS), & 10208 (MASS). MASSACHUSETTS: Bigelow 6461 (MASS); Linder, Sep 1932 (FH). MICHIGAN: Gilliam 528, 529, 709, 778, 1166, 1172, 1239, 1455, & 1475; Patrick 226; Smith 33-405, 62447, 63434, & 72457; Weber 2569. MINNESOTA: Weaver 1194, 1958, & 2085. NEW JERSEY: Ellis, 20 Jul 1876 (NY). NEW YORK: Peck, Nov (FH); Gilliam 1284. NORTH CAROLINA: Harrison 10987, Hesler 10453 (FH). OHIO: Morgan, Preston, 1890 (holotype of *Marasmius melanopus* Morgan, IA); Gilliam 1504. OREGON: Smith 55757. VERMONT: Bigelow 14236 (MASS); Linder, 3 Jul 1938 (FH); Shaffer 3370. WASHINGTON: Smith 48818. WISCONSIN: Gilliam 1231. WYOMING: Solheim 5361.

Marasmius androsaceus is a Friesian name for which no holotype exists. After having examined numerous European collections, I am reasonably certain that the European and North American material belong to the same species and that the common taxon fits the Friesian description. For basidiocarps with light yellowish brown or pale orange yellow pilei and no diverticulate cells on the lamellar edges, see *M. pallidocephalus*.

Both large-spored (with spores 7-10 µm long) and small-spored (with spores 6.3-8.5 µm long) strains occur in *Marasmius androsaceus*. During the initial phases of my study of *M. androsaceus*, the presence of large spores seemed to correlate with a high frequency of diverticulate cells in the pileus cuticle, but this correlation soon broke down. The proportion of diverticulate cells in the pileus cuticle is at least partly a matter of age of the basidiocarp, since the diverticulate cells making up the epicutis become separated in age, leaving the interwoven hyphae of the subcutis to form the surface layer (fig. 13, c & d). Spore size ranges form a continuum if enough collections are studied.

A few collections (e.g., Weaver 1194) appear to have a gelatinous matrix present in the cuticular region, but this layer is actually composed of degenerate spores.

MARASMIUS section EPIPHYLLI ['Epiphylleae'] Kühner, Botan- 25: 93. 1933.
Type species: *Marasmius epiphyllus* (Persoon ex Fries) Fries, Epicr. Myc. 386. 1838.

Pileus minute to small (<5 mm broad), smooth becoming radially rugulose, thin, tough-membranous, white to pale orange yellow or pale yellowish pink. Odor and taste mild or lacking. Lamellae thick and veinlike, few or lacking altogether, distant to remote, adnate or attached to a partial, adnate collar. Stipe thin, pliant, minutely pruinose overall, insititious. Rhizomorphs lacking. Sterile stipes sometimes present. Basal mycelium lacking.

Spores obovate or fusoid-elliptic. Hymenial cystidia usually present, fusoid-ventricose, often capitate, hyaline. Trama of pileus and lamellae nonamyloid. Pileus cuticle a hymeniform layer of obovate or subglobose to cylindric thin- to thick-walled cells which are usually smooth but may have 1-5 broad conic projections, and sometimes occasional short cystidia. Stipe corticated thinly overall. Stipe vesture of thin- to thick-walled cystidioid hairs.

On leaves of dicotyledonous trees and herbs.

4. MARASMIUS EPIFAGUS Gilliam, Mycologia 67: 821. *f. 4-8.* 1975.

PILEUS 0.2-2 mm broad when dried; hemispheric at first, then convex to plano-convex; dry; dull; opaque at first, translucent in age; smooth; at first even, becoming distantly and obscurely rugulose-striate in age; entire; fragile. CUTICLE pruinose; pale yellow, moderate orange yellow, or light yellowish pink at first, fading in age to white or yellowish white. TRAMA not observed. ODOR and TASTE not observed.

LAMELLAE narrow and veinlike; thin or somewhat thickened; remote; few (1-7), or lacking altogether; equal; pruinose; adnate; entire; not intervenose; rarely forked; white.

STIPE up to 9 mm long, 0.1-0.2 mm thick; slightly eccentric; terete; filiform; dry; subshiny; delicate; even; densely whitish-pruinose; white overall at first, becoming moderate brown to deep brown from the base upward; insititious. STERILE STIPES lacking. RHIZOMORPHS lacking. BASAL MYCELIUM lacking.

SPORES 5.6-8.4 X 2.8-3.2(-3.8) μm; narrowly elliptic, subcylindric, or rarely obovate. BASIDIA 24-30 X 7-8.5 μm; clavate; 4-spored. BASIDIOLES subfusiform.

HYMENIAL CYSTIDIA 32-46 X 4.5-8.5 μm; fusoid-ventricose, sometimes with a constricted neck; with hyaline to pale yellow walls up to 1 μm thick; projecting up to 30 μm beyond the basidioles; nonamyloid; common on the edges and faces of the lamellae.

TRAMAL HYPHAE of the pileus and lamellae 1.5-5 μm broad; loosely interwoven; uninflated; with hyaline walls up to 1 μm thick; nonamyloid.

PILEUS CUTICLE a hymeniform layer of two types of cells: (1) THICK-WALLED CELLS (14-)25-30 X 5.5-7 μm, subcylindric to obovate, with 1-5 broadly conic or lobate, solid, hyaline to moderate orange yellow projections and hyaline to moderate orange yellow, unevenly incrusted or roughened walls up to 5 μm thick, nonamyloid but with granular dextrinoid contents; and (2) CYSTIDIA 25-35 X 5-7 μm, similar to the hymenial cystidia.

STIPE corticated in the pigmented portions only, the superficial hyphae elsewhere hyaline and undifferentiated. CORTICAL HYPHAE 2-4 μm broad; with moderate orange yellow to deep brown walls up to 1 μm thick; nonamyloid. TRAMAL HYPHAE 1.5-4 μm broad; with thin, hyaline walls; nonamyloid. CYSTIDIA up to 18 X 8.5 μm; cylindric, conic, or tapered; with hyaline to moderate orange yellow, sometimes incrusted walls up to 0.5 μm thick; abundant overall.

Gregarious on beech leaves in beech-maple woods. Fruiting period: 8 Sep-5 Oct.

Collections examined:

MASSACHUSETTS: Bigelow 6232 (MASS). MICHIGAN: Kauffman, 5 Oct 1912; Smith 80658 (holotype of *Marasmius epifagus* Gilliam). NEW YORK: Rogerson 3911 (NY).

Marasmius epifagus Gilliam differs from other species of the *Epiphylli* in several respects: (1) the pileus is light yellowish pink or pale yellow rather than white; (2) a partial adnate collar may sometimes connect one or two lamellae; and (3) the cuticular broom cells are not always smooth but may bear 1-4 conic projections. The species is nevertheless included in Section *Epiphylli* because *M. epifagus* lacks a complete, free collar and rhizomorphs and because the hymenial cystidia and basic cuticular structure resemble those of other *Epiphylli*.

5. MARASMIUS FELIX Morgan, J. Mycol. 12: 2. 1906.
FIG. 14

PILEUS 3-5 mm broad; pulvinate or convex at first, then plano-convex; dry; dull; opaque; chalky and smooth; at first even, becoming radially rugulose-striate; entire; tough-membranous. CUTICLE pruinose, with minute concolorous spicules overall; light yellowish pink (M&P 10A5-6, 10B6). TRAMA thin, or sometimes indistinguishable; concolorous with the cuticle. ODOR and TASTE lacking.

LAMELLAE narrow (0.2-0.5 mm broad); moderately thick; distant; few (10-11 reach the stipe); equal; adnate or often attached to a partial, adnate collar which may span up to 1/2 the circumference of the stipe; membranous; entire; not intervenose; often forked halfway to the stipe; usually crisped; yellowish white (M&P 9B2), blotched with moderate orange.

STIPE 25-45 mm long, 0.2-0.3 mm thick (long in relation to pileus size); central; terete; filiform and often tapered to the apex; hollow; delicate but pliant; even; minutely pruinose to spiculate overall; yellowish white (M&P 9B2) up to 3 mm from the apex downward, blackish brown below; insititious. STERILE STIPES distantly spaced along the substrate; up to 15 mm long; similar to the fertile stipes; black. RHIZOMORPHS lacking. BASAL MYCELIUM absent.

SPORES 7.7-11.2 X 3.1-5.3 µm; obovate or broadly fusoid-elliptic. BASIDIA 22-28(-33) X 5-8.5 µm; clavate; 4-spored. BASIDIOLES narrowly fusiform, with pinched apices.

HYMENIAL CYSTIDIA (11-)32-51 X 4-10(-16.5) µm; fusiform, fusoid-clavate, fusoid-ventricose, broadly clavate, or subglobose; capitate or mucronate, or if not, then rounded to acute apically; with hyaline walls up to 0.5 µm thick; projecting up to 10 µm beyond the basidioles; nonamyloid; abundant on the lamellar edges and faces.

TRAMAL HYPHAE of the pileus and lamellae 3-7 µm broad; loosely interwoven; uninflated; with hyaline walls up to 1 µm thick; nonamyloid.

PILEUS CUTICLE a hymeniform layer of two types of cells: (1) SMOOTH CELLS 9.5-16 X 2.5-11 µm, which are pyriform, obovate, clavate, elliptic, or lemon-shaped, with hyaline to pale orange yellow walls up to 3 µm thick; and (2) CYSTIDIA 18-27 X 4-6 µm, similar to the hymenial cystidia.

STIPE corticated in the pigmented portions only, the superficial hyphae elsewhere hyaline and thin-walled. CORTICAL HYPHAE 2-5 µm broad; with pale yellow to deep brown walls up to 1 µm thick. TRAMAL HYPHAE 2-6 µm broad; with hyaline walls up to 1 µm thick; nonamyloid. CYSTIDIA up to 25 X 8 µm; tapered, cylindric, subfusiform, fusoid-ventricose, short-clavate, or subglobose; with hyaline to pale orange yellow walls up to 2.5 µm thick; occasionally with hyaline incrustations; subcapitate, or if not, then rounded to acute apically; 0-1-septate; nonamyloid; abundant overall.

Solitary on scattered petioles of dead herbaceous vegetation at forest edge. Fruiting period uncertain.

Collections examined:

INDIANA: Gilliam 931. OHIO: Morgan 129, Preston, 1906 (2 specimens, syntypes of *Marasmius felix* Morgan, IA).

To my knowledge Gilliam 931 is the first collection of *Marasmius felix* Morgan since the original description in 1906. Features which, in combination, distinguish *M. felix* are a light yellowish pink pileus, pruinose lamellae blotched with orange, a densely pruinose stipe, prominent fusoid-ventricose cystidia on the pileus, stipe, and lamellae, and obovate or fusoid-elliptic spores. The occurrence on petioles of dicotyledonous herbs is unusual for North American Marasmii.

6. MARASMIUS CARICICOLA Kauffman in Pennington, N. Am. Fl. 9: 277. 1915.

"Pileus membranous, somewhat tough, pliant, convex-expanded, obtuse, gregarious, 4-8 mm broad; surface broadly sulcate or alveolate, pruinose, pure-white; spores 15-18 X 6-6.5 µ; basidia 2- or 4-spored; stipe very short, terete, equal, subglabrous, pure-white, inserted by a naked base, 2 mm long, 0.7 mm thick." (25).

Gregarious on culms of *Carex*.

Collection examined:

MICHIGAN: Kauffman, Oct 1907 (holotype of *Marasmius caricicola* Kauffman).

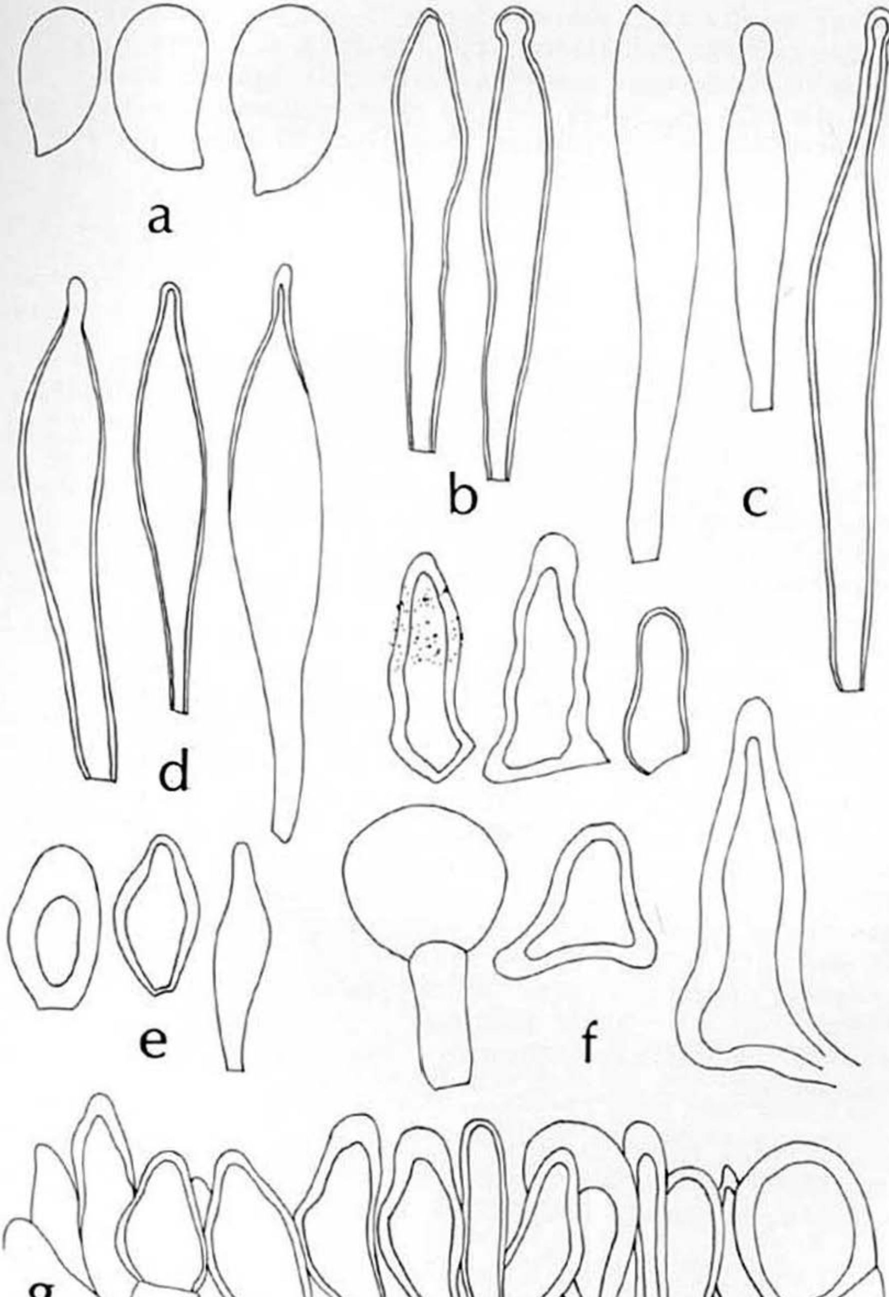
Marasmius caricicola is known only from the type specimen, which has been poorly preserved. No microscopic features are discernible. The white, pruinose pileus and insititious stipe suggest that *M. caricicola* belongs in section *Epiphylli*. According to Kauffman's measurements *M. caricicola* has larger spores than other species in the section.

7. MARASMIUS EPIPHYLLUS (Persoon ex Fries) Fries, Epicr. Myc. 386. 1838. FIG. 15

Agaricus epiphyllus Persoon ex Fries, Syst. Myc. 1: 139. 1821.

Marasmius subvenosus Peck, Annual Rep. New York State Mus. 23: 125. 1869 (1872). *pl. 6, f. 15-21.*

Figure 14. *Marasmius felix*. a. Spores, Gilliam 931, x2300. b-f. x1500. b. Cystidia from lamellar faces, Gilliam 931. c. Cystidia from lamellar faces, Morgan 129 (Type). d. Cystidia from lamellar edge, Gilliam 931. e. Cells from pileus cuticle, Morgan 129 (Type). f. Cells from pileus cuticle, Gilliam 931.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PILEUS 1-7 mm broad; nearly pulvinate at first, then convex to plano-convex or sometimes plane, rarely with a slight central depression; dry; dull; opaque, becoming translucent in age; smooth at first, in age and upon drying minutely rugulose; even or obscurely and irregularly striate; entire to crenate; fragile-membranous; reviving. CUTICLE minutely pruinose to minutely velutinous; white to yellowish white, becoming pale yellow to light orange yellow centrally in age and upon drying. TRAMA scarcely distinguishable; yellowish white or white. ODOR and TASTE lacking.

LAMELLAE narrow, almost veinlike (usually less than 0.5 mm broad, but up to 1.0 mm); thin or somewhat thick; distant to remote; few (up to 13 reach the stipe) or rarely lacking altogether; equal or unequal, with 1-4 short veinlike lamellulae; adnate or sometimes attached in pairs to a partial, adnate collar; fragile-membranous; entire; straight; usually intervenose; occasionally forked; pruinose; white to yellowish white, drying pale yellow.

STIPE (2-)6-17(-35) mm long, 0.1-0.3 mm thick; central; terete; equal or enlarged slightly at the apex or base; straight, but curling upon drying; dry; shining; translucent overall at first, soon opaque except at the apex; hollow; delicate at first, then bristle-like; even; pruinose overall with short, yellowish white to reddish brown hairs; yellowish white overall at first, remaining so on the apical 2 mm and becoming light yellowish brown (Wood Brown) or moderate yellowish brown (Sayal Brown) to deep brown below, sometimes dark brown or blackish brown at the base in age; insititious. STERILE STIPES sometimes present; tapered; similar to the fertile stipes. RHIZOMORPHS lacking. BASAL MYCELIUM usually absent, or rarely with an inconspicuous fringe of hairs around the point of emergence.

SPORES white in mass; (7.1-)8.1-11.6(-12.6) X 2.8-4.5 µm; pip-shaped or subcylindric. BASIDIA 21-39 X 5.5-10 µm; clavate; 4-spored. BASIDIOLES subfusiform.

HYMENIAL CYSTIDIA (15.5-)29-60 X 3-10 µm; fusoid-ventricose or subfusiform and often narrowed to a short neck; with hyaline walls up to 0.5 µm thick; projecting up to 35 µm beyond the basidioles; nonamyloid; occasional to abundant on the edges and faces of the lamellae.

TRAMAL HYPHAE 2-6 μm broad in the pileus and lamellae; loosely interwoven; uninflated; with hyaline walls up to 0.5(-1) μm thick; nonamyloid.

PILEUS CUTICLE a hymeniform layer of two types of cells: (1) SMOOTH CELLS 8-32 X 5.5-17 μm, which are obovate, subglobose, lemon-shaped, or subcylindric and occasionally pedicellate, with hyaline walls up to 0.5 μm thick; and (2) CYSTIDIA 21-46 X 4-11 μm, which are fusoid-ventricose to fusiform or evenly tapered, with hyaline walls up to 0.5 μm thick.

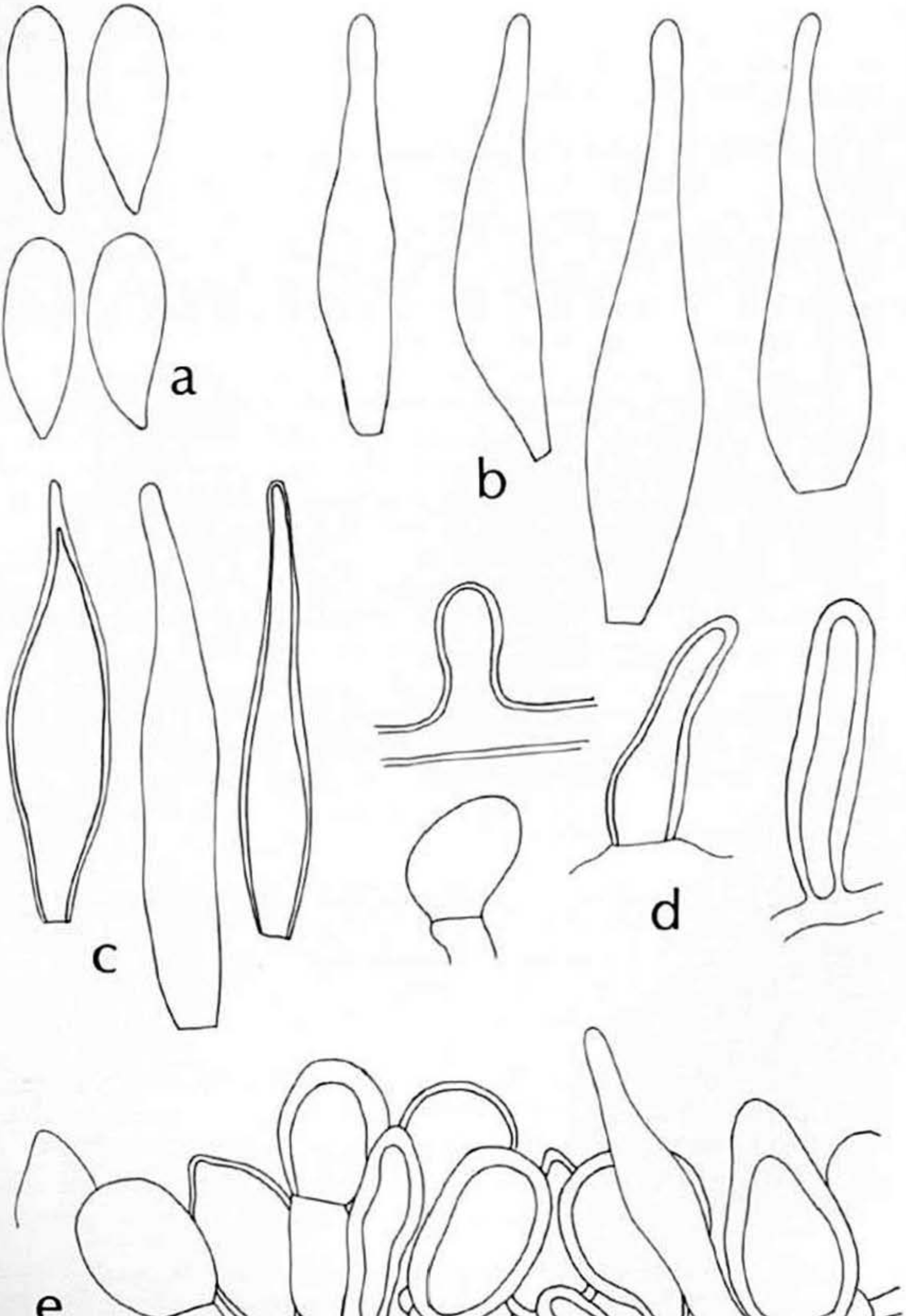
STIPE corticated in pigmented portions only, the superficial hyphae elsewhere hyaline and thin-walled. CORTICAL HYPHAE 1.4-4 μm broad; with light yellowish brown or deep brown walls up to 1.5 μm thick; nonamyloid. TRAMAL HYPHAE 1-6 μm broad; with hyaline walls up to 1 μm thick; nonamyloid. HAIRS up to 20(-56) X 8 μm; subcylindric, subclavate, or fusoid-ventricose and occasionally branched; with hyaline to light orange yellow walls up to 1 μm thick; rarely septate; abundant overall.

Gregarious on leaves and petioles of Betulaceae, or rarely of *Quercus*, *Prunus*, or *Fraxinus* in deciduous woods. Fruiting period: 28 Aug-2 Oct (-11 Nov, Washington).

Collections examined:

CANADA: MANITOBA: Bisby, 9 Sep 1921. ONTARIO: Groves 10518. GERMANY: Sydow, *Mycotheca Germanica* 101. UNITED STATES: COLORADO: Simms Sf-37 & Sf-275 (NY); Smith 51488, 51763, 52153. IDAHO: Cooke 21380 (NY); Smith 53753, 54089; Wehmeyer, 7 Sep 1922. MICHIGAN: Ammirati 4057; Gilliam 1234, 1442, 1472, & 1476; Kauffman, 18 Sep 1929; Potter 9093; Shaffer 2525; Smith 33-884 & 22320. MINNESOTA: Weaver 1917 & 2078. NEW MEXICO: Barrows 1782. NEW YORK: Peck, Oct 1869 (holotype of *Marasmius subvenosus* Peck, NYS). WASHINGTON: Cooke 18924. WISCONSIN: Gilliam 1232.

No holotype of *Marasmius epiphyllus* exists, but Singer (40) has recently designated a neotype which I have not as yet seen. According to Singer, specimens of *M. epiphyllus* show considerable variation with respect to the thickness of the cuticular cell walls.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MARASMIUS section GLOBULARES ['Globularini'] Kühner, Botaniste 25: 100. 1933.

Scorteus Earle, Bull. New York Bot. Gard. 5: 415. 1909.

Type species: *Marasmius globularis* Quélet, Mem. Soc. Émul. Montbéliard II, 5: 220. 1872.

Pileus medium-sized to large (11-65 mm broad), smooth or rugulose, not striate or sulcate, fleshy, firm, variously colored. Odor lacking or of cyanic acid or raphanoid. Taste bitter or raphanoid, sometimes lacking. Lamellae thin or somewhat thick, well-developed, moderately numerous to numerous, distant to crowded, unequal, adnexed to free. Stipe moderately thick (2-9 mm thick), cartilaginous, fibrillose or tomentose, with a short pseudorhiza or not, not insititious. Rhizomorphs and sterile stipes absent. Basal mycelium present.

Spores obovate, pip-shaped, or elliptic. Hymenial cystidia present or not. Trama dextrinoid. Pileus cuticle a hymeniform layer of smooth cells. Stipe cortex of thin- to thick-walled, smooth, usually dextrinoid hyphae. Stipe vesture of filamentous, thick-walled hairs or rarely lacking.

On humus or on soil in open, grassy areas or deciduous or coniferous woods.

8. MARASMIUS OREADES (Bolton ex Fries) Fries, Epicr. Myc. 375. 1838. FIGS. 16 & 20

[*Agaricus caryophylleus* Schaeffer, Fung. Bavar. 4: 38. 1774.]

[*Agaricus oreades* Bolton, Hist. Fung. Halifax 3: 151. 1789.]

Agaricus oreades Bolton ex Fries, Syst. Myc. 1: 127. 1821.

Marasmius caryophylleus (Schaeffer) ex Schröter in Cohn, Krypt.-Fl. Schles. 3A: 561. 1889.

Scorteus oreades (Bolton ex Fries) Earle, Bull.

Figure 15. *Marasmius epiphyllus*, Gilliam 1234. a. Spores, x2300. b-e. x1500. b. Hymenial cystidia. c. Cystidia from lamellar edge. d. Pileus cuticular cells. e. Cystidia from stipe.

New York Bot. Gard. 5: 415. 1909.
Collybia oreades (Bolton ex Fries) Kummer, Die Führer in die Pilzk. 116. 1871.

PILEUS 11-43 mm broad; at first bluntly conic or campanulate with the margin incurved, then convex to umbonate, in age convex to plano-convex with a wavy, uplifted margin; shiny when moist, soon dull; opaque or translucent-striate up to 3 mm inward when moist; smooth or pitted; entire; firm; reviving. CUTICLE usually glabrous, sometimes with powdery white patches overall at first or finely felted upon drying; deep brown (M&P 8A12) in primordia, then light yellowish brown (M&P 11E7, 13D9, 13E10) or light grayish brown (M&P 14A-D8, 14C7), hygrophanous and fading to light yellowish brown or yellowish white, occasionally tinged grayish red (M&P 6J8) in bruised areas, rarely light yellow or light yellowish pink (M&P 11A7) to grayish red (M&P 6J8) or dark reddish brown (M&P 8L9) overall. TRAMA up to 6.5 mm thick; white or yellowish white. ODOR of cyanic acid; faint or strong. TASTE mild or lacking.

LAMELLAE narrow at first, in age up to 5 mm broad; rather thick; close to distant; moderately numerous (20-28 reach the stipe); unequal, with 1-5 tiers of lamellulae; adnexed to free; tough; entire; straight or subventricose; intervenose or not; rarely forked; yellowish white.

STIPE 12-70 mm long, 2-4.5 mm thick; central; terete or compressed upon drying; equal, broader at the base, or subbulbous and often with a short, tapered pseudorhiza; straight; dry; dull; opaque; solid or stuffed; firm and rigid; even or with twisted longitudinal ribs; tomentose, hirsute, minutely felted, or fibrillose-squamulose basally or overall, the vesture white to yellowish white (M&P 9B-C2) or moderate orange yellow (M&P 9F2, 9G3) above, light yellowish brown to light reddish brown below or sometimes overall. STERILE STIPES and RHIZOMORPHS lacking. BASAL MYCELIUM continuous with the stipe vesture; inconspicuous.

SPORES white in mass; (6.3-)7.0-10.0 X 3.5-6.0 µm; obovate, ovate, lemon-shaped, fusoid-elliptic, or rarely subglobose. BASIDIA 33-45 X 5.5-8.5 µm; subclavate to clavate, with a long, narrow basal portion. BASIDIOLES subclavate.

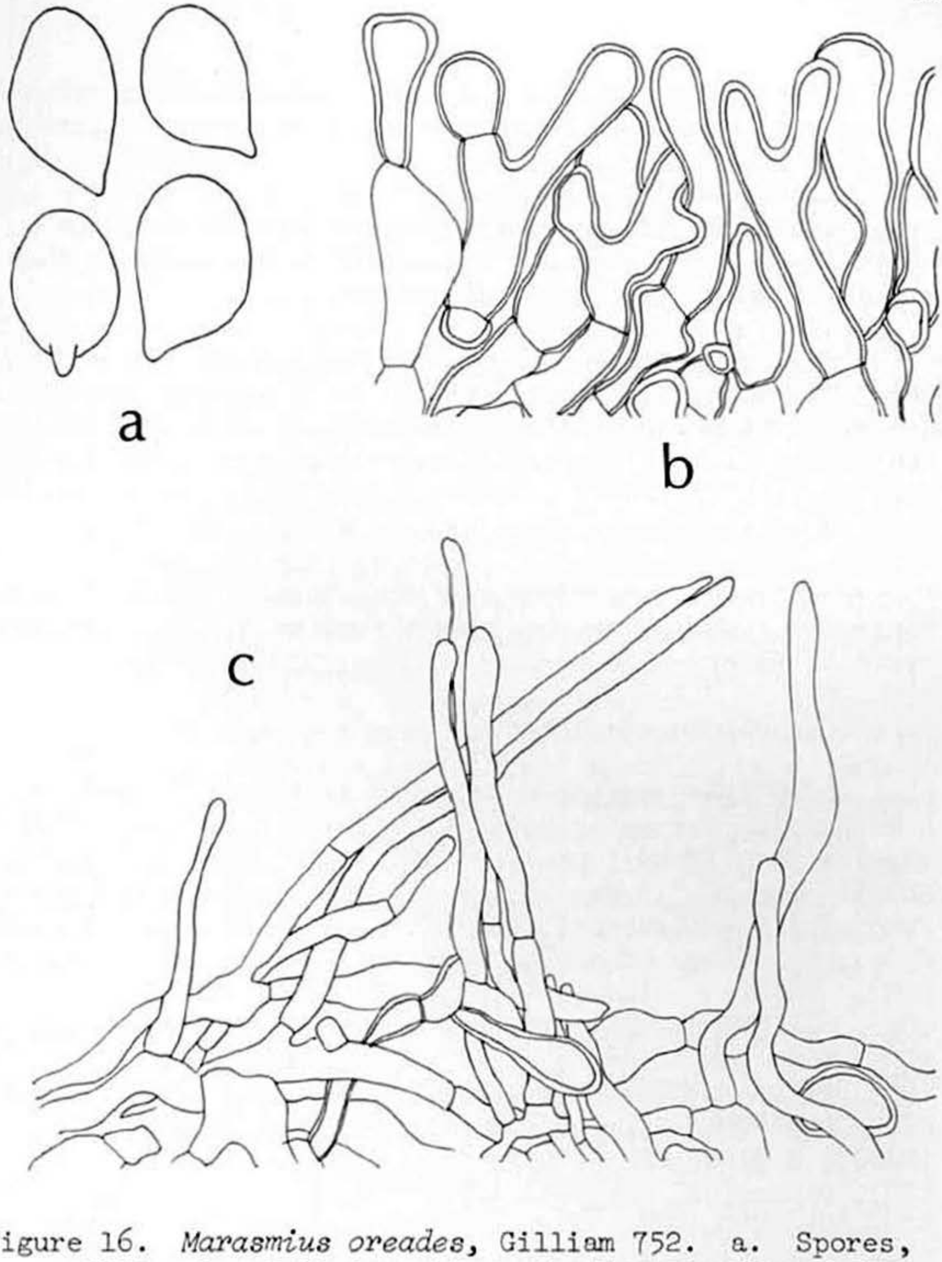

Figure 16. *Marasmius oreades*, Gilliam 752. a. Spores, x2300. b. Radial section of pileus cuticle, x1500. c. Longitudinal section of stipe surface layer, x850.

HYMENIAL CYSTIDIA lacking.

TRAMAL HYPHAE interwoven and up to 14 µm in the pileus; parallel-interwoven, uninflated, and 2-5.5 µm broad in the lamellae; with hyaline to light yellow walls up to

1 µm thick or rarely with the wall completely occluding the lumen; dextrinoid or rarely nonamyloid in the lamellae.

PILEUS CUTICLE a hymeniform layer of clavate, cylindric, deeply lobed, or short-branched smooth nonamyloid cells 15-39 X 3-8(-18) µm, with hyaline to light grayish yellow walls up to 0.5(-1) µm thick.

STIPE uncorticated overall. SURFACE AND TRAMAL HYPHAE 3-8.5 µm broad; with thin, hyaline to light yellowish brown walls; dextrinoid. STIPE HAIRS up to 12 µm broad; with hyaline to light yellowish brown walls up to 1 µm thick; usually with cylindric to clavate end cells; dextrinoid; forming a tangled layer up to 400 µm thick.

Scattered, gregarious, or cespitose, often in fairy rings, in lawns or meadows, rarely under spruce. Fruiting period: 20 May-29 Oct.

Collections examined:

ARGENTINA: Singer & Wright S229 & S363. CANADA: NOVA SCOTIA: Wehmeyer 250. ONTARIO: Kelly 752. QUEBEC: Bigelow 5007 (MASS); Shaffer 5985. ENGLAND: BUCKINGHAMSHIRE: Dennis, 15 Sep 1951. FRANCE: OISE: Roumeguère, *Fungi Gallici Exsiccati* 2002 (NY). GERMANY: Shaffer 5001; Sydow, *Mycotheca Germanica* 1407. JAPAN: Wright, 1853-1856 (FH). SWEDEN: Linder, 24 Jun 1927 (FH); Lundell, 10 Jul 1945. UNITED STATES: COLORADO: Shushan 102 (NY). CONNECTICUT: Earle, 18 Jul 1902 (NY). MAINE: Morse, 10 Oct 1935 (FH). MARYLAND: Kelly 532; Scribner, Oct 1886 (BPI). MASSACHUSETTS: Bigelow 6736 (MASS), 7953 (MASS), 8460 (MASS), & 9107 (MASS); Gilgut 54 (FH); Langer, Jun 1904 (FH); Singer, 20 May 1942 (FH). MICHIGAN: Gilliam 500, 505, 539, 742, 875, 1312, & 1443; Hicks 646 (FH); McVaugh 14688; Patrick 1116; Potter 5250 & 6799; Smith 15566, 42336, 58298, & 66316. MINNESOTA: Weaver 1036. MISSOURI: Routien, 15 Jun 1940 (NY). NEW JERSEY: Ellis & Everhart, *Fungi Columbiani* 1002 (BPI). NEW YORK: Burt, Jul 1895; Gilliam 1246; Kauffman, 31 Aug 1903. OKLAHOMA: Bulmer, 8 Sep 1963. OREGON: Sprague, 19 May 1951 (NY). SOUTH DAKOTA: Shaffer 6785. VERMONT: Bigelow 12772 (MASS); Pringle 1320 (FH). VIRGINIA: Kelly 350. WISCONSIN: Mazzer 6305, 6536, & 6539. WYOMING: Ferrell, Jul 1961.

Marasmius oreades is another Friesian name for which there is no holotype. The Lundell exsiccati specimen from Uppsala, Fries' principal collecting site, fits the North American concept of the species.

For such a widespread species, *Marasmius oreades* shows surprisingly little variation. The most striking variant, which seems to be limited to spruce, occurs both in Europe (23) and the United States (e.g., Gilliam 500 & 505). Early in the season such collections have light yellowish pink, grayish red, or reddish brown pilei, but collections from the same site later in the season (Gilliam 539) resemble typical *M. oreades* in color.

A gastroid form of *Marasmius oreades* is occasionally found when the season has been marginal for fruiting. Such basidiocarps (e.g., Gilliam 1443) grow among normal basidiocarps and, if even a rudimentary lamella or two is present, may be fertile.

Since the lamellae continue to increase in breadth and to produce spores as the basidiocarp ages, fertile specimens may be encountered in which the hymeniform structure of the pileus cuticle has degenerated.

Mounts of tramal tissue may be strongly to weakly dextrinoid or even partially nonamyloid. Stipe tramal tissue is nearly always dextrinoid.

9. MARASMIUS CYSTIDIOSUS (A. H. Smith & Hesler) Gilliam, comb. nov. FIG. 17

Collybia cystidiosa A. H. Smith & Hesler, J. Elisha Mitchell Sci. Soc. 56: 305. *pl. 8, f. 1, 3, 4, 6.* 1940.

PILEUS 20-45 mm broad; at first convex, then convex-umbonate with the margin elevated and undulate; subhygrophanous; subshiny; slightly sticky; rivulose or rugose to the smooth umbo; translucent-striate on the margin when moist; entire, but split in age; pliant. CUTICLE glabrous; light yellowish brown or light yellowish pink (Pinkish Buff) on the margin, dark orange yellow (Ochraceous-Tawny) to moderate yellowish brown (Sayal Brown) on the umbo. TRAMA moderately thin (2.5 mm thick on the disc in a pileus 45 mm broad, indistinguishable on the margin); when moist translucent light yellowish brown, otherwise white. ODOR mild or pungent. TASTE bitter.

LAMELLAE narrow at first, soon moderately broad (2.5-4.5 mm broad); thin; close; numerous; unequal, with numerous short, thin lamellulae; adnexed; pliant; often minutely fimbriate; broadest near the stipe, acute in front; faintly intervenose; occasionally forked about 1 cm from the pileus edge, less frequently elsewhere; crisped; yellowish white to white.

STIPE 30-65 mm long, 3-6 mm thick; central; terete; subbulbous; curved near the base; dry; shining; translucent when moist; striatulate from the midportion to the base; hollow; glabrous above, with white or yellowish white fibrils near the base; white at the apex, pale yellow below, then light yellowish brown. STERILE STIPES and RHIZOMORPHS lacking. BASAL MYCELIUM white.

SPORES white in mass; 7.6-10.5(-12.5) X 2.8-3.9 µm; narrowly fusoid-elliptic or narrowly elliptic. BASIDIA 22-31 X 5.5-8.5 µm; clavate; 4-spored. BASIDIOLES subclavate.

HYMENIAL CYSTIDIA 18-76 X 4-11 µm; fusiform, fusoid-ventricose, fusoid-clavate, lanceolate, or subcylindric; subcapitate or capitate, or if not, then rounded or subacute apically; with hyaline or pale yellow, thin walls; projecting up to 20 µm beyond the basidioles; nonamyloid; abundant on the lamellar faces and edges.

TRAMAL HYPHAE 2-8 µm broad in both pileus and lamellae; interwoven in the pileus, parallel-interwoven in the lamellae; with thin, hyaline walls; dextrinoid.

PILEUS CUTICLE a hymeniform layer of clavate, globose, subglobose, turbinate, or cylindric smooth nonamyloid cells 7-23 X 5.5-12(-15) µm, with hyaline to pale yellow walls up to 1 µm thick, sometimes with brown incrustations.

STIPE corticated in the pigmented portions only, the superficial hyphae elsewhere hyaline and thin-walled. CORTICAL HYPHAE 2-10 µm broad; with light yellowish brown walls up to 3 µm broad; dextrinoid. TRAMAL HYPHAE 1.5-11 µm broad; with thin, hyaline walls. STIPE VESTURE lacking.

Scattered to gregarious on leaf mold and twigs in deciduous woods. Fruiting period: 4 Jul-5 Sep.

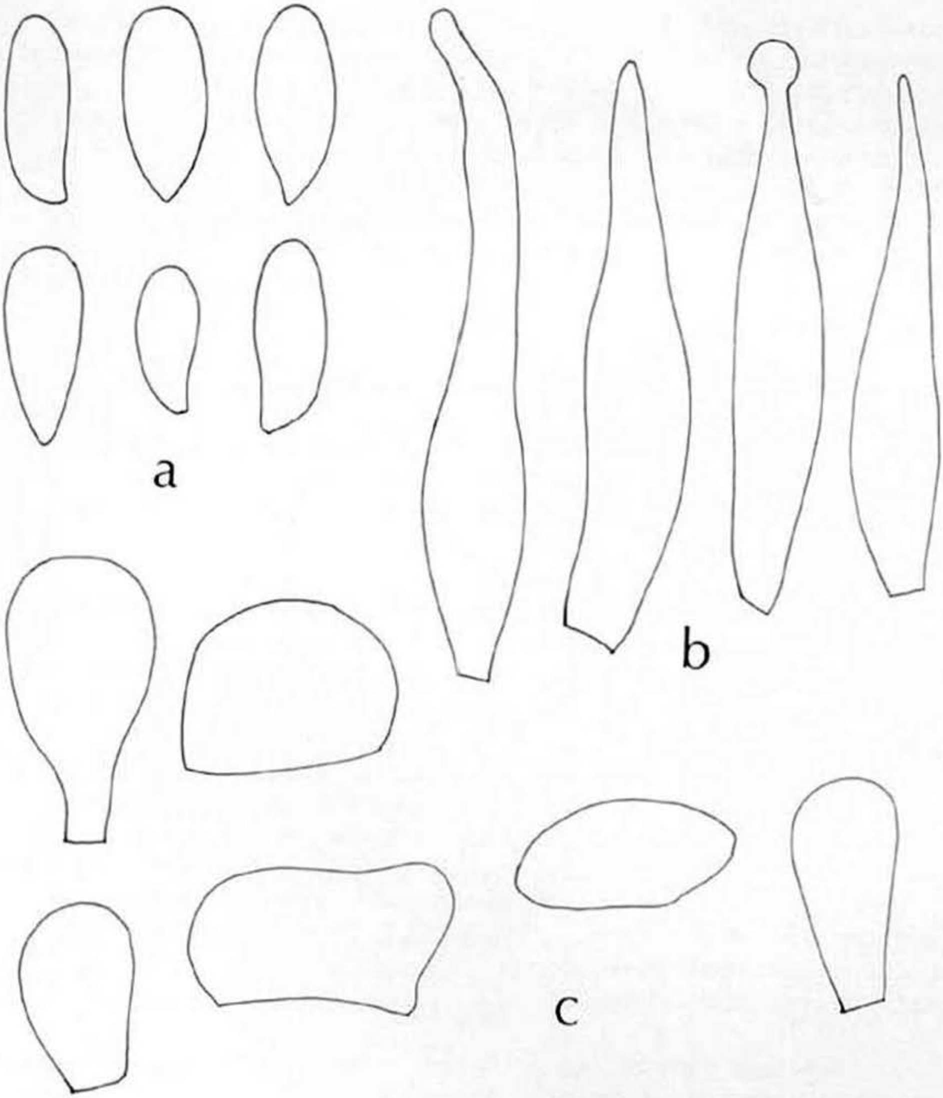

Figure 17. *Marasmius cystidiosus*, Weaver 7-4-62-N-1.
a. Spores, x2300. b. Hymenial cystidia, x1500.
c. Cells from pileus cuticle, x1500.

Collections examined:

MINNESOTA: Weaver 7-4-62-N-1. NORTH CAROLINA: Hesler 12195 (holotype of *Collybia cystidiosa* A. H. Smith & Hesler) & 14266; Smith 7416 & 7437 (paratypes of *C. cystidiosa*).

The description of macroscopic characters has been adapted from notes by Margaret G. Weaver and from notes present with the type collection. Study of type specimens established the identity of the Minnesota specimens, suggested by Mrs. Weaver. The hymeniform cuticle and dextrinoid trama indicate, according to the generic concept used here, that the species belongs in *Marasmius* rather than *Collybia*. Microscopically *Marasmius cystidiosus* is indistinguishable from collections determined as *M. fasciatus* Pennington. See the discussion of the latter species in the appendix under *M. anomalus* Peck non Lasch.

10. MARASMIUS STRICTIPES (Peck) Singer, Ann. Mycol. 41: 130. 1943. FIGS. 18 & 19

Collybia strictipes Peck, Annual Rep. New York State Mus. 41: 62. 1887 (1888).

Gymnopus strictipes (Peck) Murrill, N. Am. Fl. 9: 357. 1916.

PILEUS 20-65 mm broad; at first convex, then broadly convex to convex-umbonate, in age plano-convex, often with a flared margin; moist and subhygrophanous; dull; somewhat translucent; smooth or becoming rugulose; even or faintly translucent-striate up to 3 mm inward; entire; firm. CUTICLE glabrous; pale yellow, light yellow, pale orange yellow (Warm Buff) or moderate orange yellow (Ochraceous-Buff) on the margin, fading upon drying, often irregularly blotched on the disc with strong orange yellow (Ochraceous-Orange), deep orange (Orange-Rufous), strong orange, or strong yellowish brown. TRAMA thin (up to 3 mm thick); translucent yellowish white, fading to white. ODOR mild and nondescript or raphanoid. TASTE slightly raphanoid.

LAMELLAE narrow (up to 4 mm broad); moderately thick; close to crowded; numerous; unequal, with numerous lamellulae; adnate to deeply sinuate and often seceding; fleshy-brittle; entire or minutely crenate or eroded; ventricose; not intervenose; occasionally forked; pale orange yellow (Pale Pinkish Buff), pale yellow, or yellowish white.

STIPE 22-85 mm long, 3-9 mm thick; central; terete or compressed; equal or slightly enlarged at the base; straight or curved; dry; dull; opaque; hollow; cartilaginous; even; minutely pruinose overall or matted-fibrillose centrally and pruinose above; nearly white or pale yellow. STERILE STIPES and RHIZOMORPHS lacking. BASAL MYCELIUM of pale yellow, erect or appressed fibrils; often matting several leaves together; abundant.

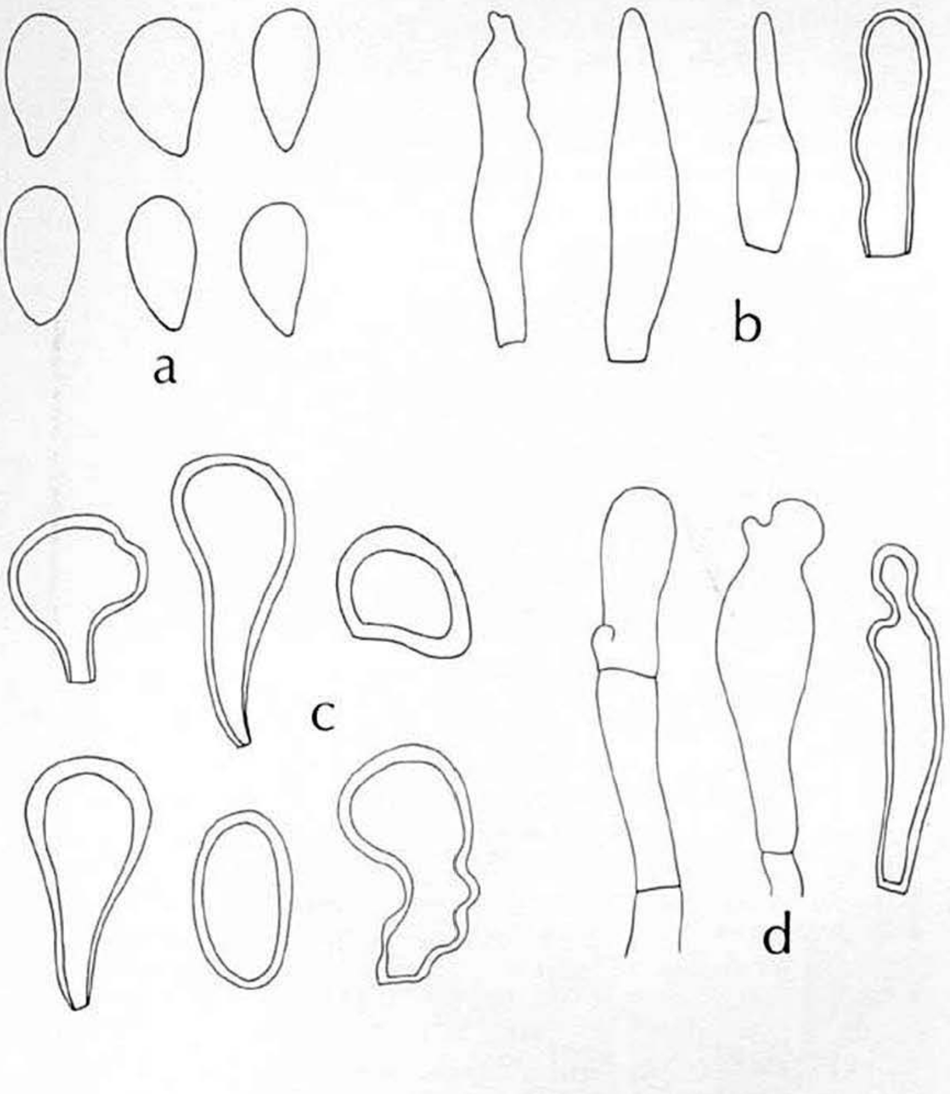

Figure 18. *Marasmius strictipes*, Bigelow 7493. a. Spores, x2300. b. Cystidia from lamellar edge, x1500. c. Cells from pileus cuticle, x1500. d. Cystidia from stipe, x1500.

SPORES white in mass; 6.3-10.5 X 3.0-4.5 µm; pip-shaped or fusoid-elliptic. BASIDIA 18-29 X 5-8 µm; clavate to subclavate; 4-spored. BASIDIOLES subfusiform.

HYMENIAL CYSTIDIA 14-35 X 4-9 µm; cylindric, fusoid-clavate, or clavate and often wavy in outline; occasionally branched or lobed; with hyaline walls up to 1 µm thick; projecting up to 20 µm beyond the basidioles; present only on the lamellar edges.

TRAMAL HYPHAE 3-11 µm broad in the lamellae, inflated up to 20 µm in the pileus; interwoven; with hyaline or pale yellow walls up to 1 µm thick; dextrinoid.

PILEUS CUTICLE a hymeniform layer of clavate, obovate, or subcylindric and sometimes lobed, branched, or pedicellate smooth cells 11-30 X 8-20 µm, with hyaline to pale yellow walls up to 1(-2) µm thick; sometimes with the subterminal cells inflated as well; dextrinoid.

STIPE corticated thinly or not at all. CORTICAL HYPHAE 4-12 µm broad; with hyaline to pale yellow walls up to 1.5 µm thick; dextrinoid. TRAMAL HYPHAE 4-20 µm broad; with hyaline or rarely pale yellow walls up to 1.5 µm thick; or occasionally with the wall material occluding the lumen; dextrinoid. STIPE HAIRS 4-7 µm broad; fusoid-clavate, cylindric, or subclavate; occasionally subcapitate; with hyaline walls up to 1 µm thick; abundant.

Scattered to gregarious or rarely subcespitose on fallen leaves in deciduous woods. Fruiting period: 8 Jul-10 Sep.

Collections examined:

MAINE: Bigelow 10438 (MASS), 10540 (MASS), & 11411 (MASS). MASSACHUSETTS: Bigelow 7493 (MASS) 9784 (MASS), & 14532 (MASS). MICHIGAN: Gilliam 789; Smith 15295. NEW YORK: Peck, Sep (holotype of *Collybia strictipes* Peck, NYS). OHIO: Gilliam 1499. TENNESSEE: Hesler 17700.

Bigelow & Barr's (2) excellent description of *Marasmius strictipes*, based on many of the same specimens as those cited above, needs little amendment. Although they state that basidiocarps usually occur singly, which I have found to be true in general, Smith 15295 consists of many

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Figure 19. *Marasmius strictipes*, Bigelow 13093, x3/4.
(courtesy of Howard E. Bigelow)
Figure 20. *Marasmius oreades*, x3/4.
(courtesy of Howard E. Bigelow)

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basidiocarps, a large number of which are united at the base in pairs. Singer's (36) description of Mexican material tallies well with other North American collections of *M. strictipes*.

MARASMIUS section SICCI Singer, Mycologia 50: 106. 1958.

Type species: *Marasmius siccus* (Schweinitz) Fries, Epicr. Myc. 382. 1838.

Pileus small to large, smooth or granular-roughened, even or striate to sulcate, usually thin, tough-membranous, variously colored. Odor nondescript or fragrant, rarely with a foetid or spermatic component. Taste bitter, spermatic, or nondescript. Lamellae thin, well-developed, few to moderately numerous, distant to close or rarely crowded, usually unequal, adnexed to free. Stipe thin, bristle-like to cartilaginous, glabrous or pruinose, not insititious. Rhizomorphs and sterile stipes absent. Basal mycelium often tuftlike.

Spores clavate or pip-shaped to fusoid-elliptic. Hymenial cystidia often present, hyaline or pale yellow, often capitate, on the faces and sometimes on the edges of the lamellae. Hymenial setae present or not. Hymenial broom cells usually present on the lamellar edges. Trama dextrinoid. Pileus cuticle a hymeniform layer of cylindric to clavate broom cells with rodlike or finely divided projections, sometimes also with setae or smooth cells. Stipe cortex of smooth, thick-walled hyphae. Stipe vesture lacking, or of broom cells, smooth cells, clavate cells, or setae or a combination of these.

On humus, leaves of deciduous trees, or needles of coniferous trees.

11. MARASMIUS DELECTANS Morgan, J. Mycol. 11: 206. 1905.

FIGS. 21 & 22

PILEUS 7-40 mm broad; deeply pulvinate, conic-convex, or broadly convex at first, often with the margin incurved, then convex to plano-convex and sometimes minutely papillate, subumbonate, or umbilicate centrally, finally plane or concave with the margin uplifted and wavy; dry; dull; opaque or rarely translucent-striate in age; smooth at first, then rugulose or rivulose overall; even or obscurely rugulose-striate 3-6 mm from the edge inward; entire to

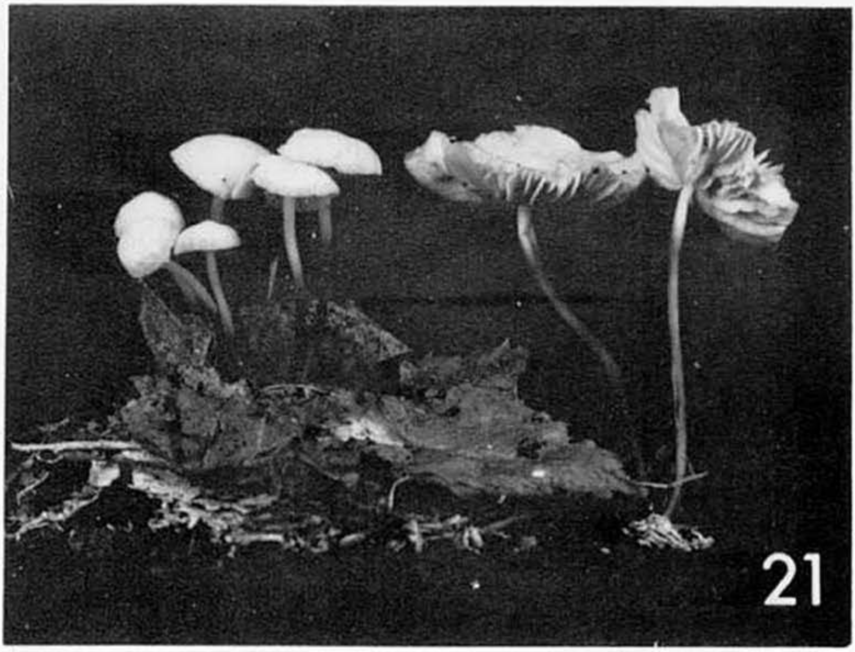

Figure 21. *Marasmius delectans*, Gilliam 1520, x1.

crenate; tough; reviving. CUTICLE minutely velutinous; yellowish white, pale yellow (Cartridge Buff, M&P 9J4), light yellow (Cream Color), moderate yellow (Chamois), or pale orange yellow (M&P C-E2), often with the darker colors on the disc only, pale yellow to moderate orange yellow in dried specimens. TRAMA thick at first (1.5-3 mm thick in the disc), thinner in age; white to yellowish white. ODOR usually mild and fragrant, but sometimes strong and with a foetid or spermatic component which may be marked in dried and remoistened specimens. TASTE mild or lacking.

LAMELLAE moderately broad (up to 4 mm broad in a pileus 30 mm broad); usually thin; subdistant to distant or rarely close; numerous (16-30 reach the stipe); unequal, with numerous lamellulae in 2-3 tiers; adnate, adnexed, or free; pliant; entire or minutely fimbriate; straight at first, then ventricose; prominently intervenose; not forked; often crisped; yellowish white or pale orange yellow, darker (pale yellow to light yellowish brown) in dried specimens.

STIPE 8-75 mm long, 1-1.6(-3.5) mm thick; central; terete; equal, swollen at the apex or tapered evenly to the base; straight or curved; dry; shining; opaque; hollow; cartilaginous; even; glabrous or rarely pruinose near the base; yellowish white, pale yellow (Ivory Yellow), pale orange yellow (M&P 9C3, 9D2), or rarely deep red on the upper 1/3 to 1/2 at first, darkening from the base upward through light yellowish brown (M&P 11G6), strong brown (M&P 14A12), deep brown, or grayish brown (Benzo Brown, Warm Sepia, Vandyke Brown) to dark grayish brown, brownish black, or black, in age these darker colors overall except at the extreme apex. STERILE STIPES and RHIZOMORPHS lacking. BASAL MYCELIUM cottony on the stipe, forming a flat sheet on the surrounding substrate; white.

SPORES white to yellowish white in mass; 5.6-8.7(-10) X 2.8-5 µm; narrowly to broadly elliptic, obovate, ovate, fusoid-elliptic, or pip-shaped. BASIDIA 22-42 X 4-7 µm; subclavate to clavate; 4-spored. BASIDIOLES subclavate.

HYMENIAL SETAE (4-)14-73 X 1.5-11 µm; usually fusoid-ventricose with a long, tapered neck, otherwise clavate, fusiform, subcylindric, or obovate, often constricted 1-several times; sometimes branched and then approaching the shape of broom cells; capitate, submoniliform, or truncate, or simply rounded to acute apically; with hyaline to pale orange yellow walls up to 3 µm thick which often occlude the lumen; empty; dextrinoid; embedded or projecting up to 50 µm beyond the basidioles; usually abundant on the lamellar edges and faces.

TRAMAL HYPHAE interwoven and inflated up to 11 µm broad in the pileus; parallel to interwoven, uninflated, and 2.5-5.5 µm broad in the lamellae; with thin, hyaline walls; dextrinoid.

PILEUS CUTICLE hymeniform, at first consisting of irregular broom cells which intergrade into setae, then of a combination of broom cells and smooth cells, finally almost entirely of smooth cells. CUTICULAR BROOM CELLS 6.5-21 X 6-10 µm; clavate, subcylindric, fusiform, or obovate and sometimes pedicellate; with 3-8 divergent, smooth, sometimes branched, dextrinoid knoblike or rodlike projections 2-14 X 5.5-17 µm or sometimes with only 1 or 2 projections and then transitional to setae; with hyaline walls up to 2-5 µm thick. SMOOTH CELLS 10-25 X 5.5-17 µm; subglobose, obovate, clavate, turbinate, or variously lobed; with hyaline walls up to 3 µm thick;

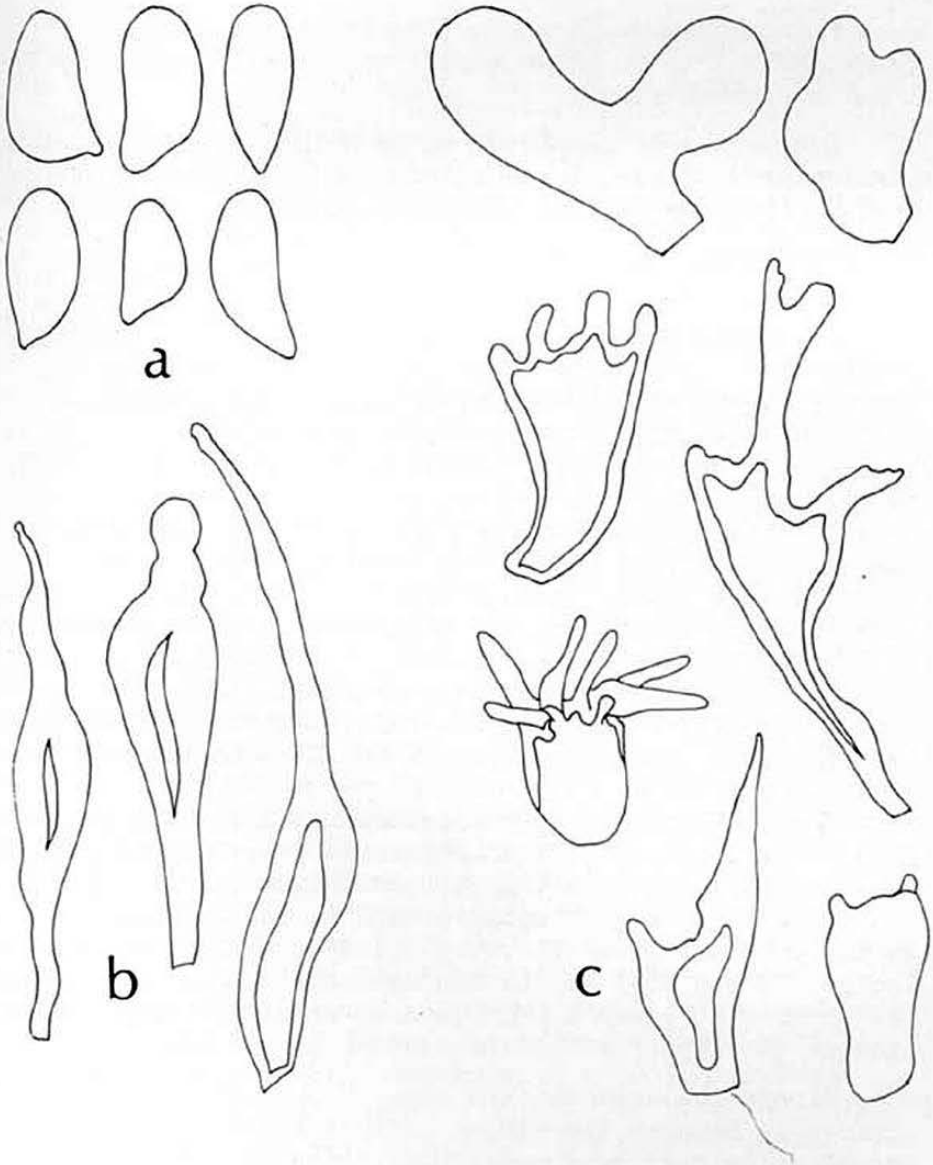

Figure 22. *Marasmius delectans*, Gilliam 771. a. Spores, x2300. b. Hymenial setae, x1500. c. Broom cells and setae from pileus cuticle, x2300.

dextrinoid or nonamyloid.

STIPE corticated only in pigmented portions, the superficial hyphae elsewhere hyaline and undifferentiated except in having walls up to 3 µm thick; dextrinoid. TRAMAL HYPHAE up to 12 µm broad; with hyaline walls up to 1 µm thick; dextrinoid.

Gregarious to cespitose on decaying leaves and twigs, particularly of oak, in deciduous and deciduous-coniferous woods. Fruiting period: 2 Jul-14 Oct.

Collections examined:

CANADA: ONTARIO: Cain, 25 Sep 1934 (NY). UNITED STATES: CONNECTICUT: Earle, 19 Jul 1902 (NY). ILLINOIS: Shaffer 844. INDIANA: Cooke 32725, 32872; Gilliam 935; Shaffer 6354. MASSACHUSETTS: Bigelow 9696 (MASS). MICHIGAN: Gilliam 771, 772, 774, 775, 790, 832, 860, & 1313; Peters 1115; Potter 8712, 9222; Shaffer 2511; Smith 7248, 10962, 15196, 15248, & 39257. MINNESOTA: Weaver 7-7-62-P-3, 1448, & 1559. NEW YORK: Murrill, 7-17 Aug 1916 (NY); Shaffer 490. NORTH CAROLINA: Harrison 10857. OHIO: Cooke 31944 & 32917; Moldenke 13026, 13745, 13767, & 14020 (FH); Morgan, 1895 [paratype of *Marasmius delectans* Morgan (IA), here designated lectotype], 27 Aug 1905 (IA), 1905 (IA), 1906 (3 collections, IA); Overholts 1224 (NY); Stover, 2 Aug 1909 (NY). PENNSYLVANIA: Murrill, 17-21 Jul 1904 (NY), 19 Jul 1910 (NY). WISCONSIN: Sherman (NY).

None of Morgan's type specimens of *Marasmius delectans* (two collections, 1895 and 1905, both from Preston, Ohio, labelled "TYPE", and a third, from Preston, Ohio, 27 Aug 1905, annotated as "probably a type") was clearly indicated in the original description as holotype. Since the basidiocarps in the 1895 collection revive more completely than the others, it seems appropriate to designate that collection as lectotype of *M. delectans*.

Singer (41) places this species in section *Globulares*, apparently because the mature cuticle consists mostly of smooth cells with only occasional setae or irregular broom cells. However, the numerous broom cells present in the cuticle of very young pilei seems to indicate that this species belongs in section *Sicci*.

Important characters which, in combination, delimit *Marasmius delectans* are the pale yellow or yellowish white pileus; the hollow, dark, cartilaginous stipe; small (usually 6-8 µm long), obovate or ovate spores with definite apiculi; and abundant hyaline setae in the hymenium.

12. MARASMIUS COHAERENS (Persoon ex Fries) Cooke & Quélet,

Clavis Hymen. 153. 1878, var. COHAERENS

FIGS. 23 & 24

[*Agaricus cohaerens* Persoon, Syn. Meth. Fung. 306. 1801.]
Agaricus (Hebeloma) cohaerens Persoon ex Fries, Syst. Myc. 1: 253. 1821.
Agaricus ceratopus Persoon, Myc. Eur. 3: 131. 1828.
Agaricus rigidus Lasch, Linnaea 4: 531. 1829.
Mycena cohaerens (Persoon ex Fries) Kummer, Die Führer in die Pilzk. 111. 1871.
Marasmius calopus (Persoon) ex Quélet, Champ. Jura et Vosg. 222. 1872. Non *Marasmius calopus* (Persoon ex Fries) Fries, Epicr. Myc. 379. 1838.
Marasmius ceratopus (Persoon) Quélet, Fl. Mycol. France 319. 1888.

PILEUS 9-36 mm broad; campanulate or conic-convex at first, becoming convex or convex-umbonate with or without a flared margin, finally convex-depressed or plano-convex; dry or subhygrophanous, particularly on the margin; dull; opaque, or translucent on the margin in age; smooth, or sometimes rugulose on the disc; even or occasionally becoming striate up to 1/2 the pileus radius; entire; pliant or tough, the surface usually brittle; reviving. CUTICLE minutely velutinous overall at first, in age often velutinous primarily on the disc; occasionally glaucous; dark yellowish brown (Mummy Brown) or dark brown to strong brown overall at first, then dark brown, deep brown, strong brown (Amber Brown), dark yellowish brown, moderate yellowish brown (Sayal Brown), or moderate brown on the disc and often on the extreme margin, with the area in between light yellowish brown (Vinaceous-Cinnamon), light brown (Cinnamon), or moderate yellowish pink (Pinkish Buff). TRAMA thin to moderately thick (up to 1.5 mm thick in the disc); light yellowish brown, fading to yellowish white or white. ODOR lacking or somewhat pungent with an earthy component. TASTE lacking or slightly alkaline with a bitter aftertaste.

LAMELLAE moderately broad to broad (3-6 mm broad); thin; subdistant to distant; moderately numerous [12-20 (-35) reach the stipe]; unequal, with 3-4 tiers of lamellulae; adnexed, sinuate, or adnate-seceding; pliant; entire; sometimes marginate, the edges moderate brown to light brown; straight at first, soon ventricose or broadest near the stipe; faintly to strongly intervenose; not forked; yellowish white, in age moderate yellowish pink (Pinkish Buff) or rarely light brown.

STIPE 20-75 mm long, 0.75-3 mm thick; central; terete; equal, or somewhat expanded at the apex; straight or curved; dry; shining; opaque; hollow; pliant to cartilaginous, or sometimes horny in age; glabrous, or rarely white-pruinose at the apex; white, yellowish white, pale yellowish pink (Tilleul-Buff), or in age light yellowish brown at the apex, darkening progressively from the base upward through light yellowish brown, strong brown (Amber Brown), or strong yellowish brown (Ochraceous-Tawny), finally deep brown, dark brown, or blackish brown at the base. STERILE STIPES and RHIZOMORPHS lacking. BASAL MYCELIUM a tuft or pad of light yellowish brown, pale yellow, or white mycelium which may bind the surrounding debris and leaves.

SPORES white in mass; (6.0-)7.0-9.8(-11.0) X 3.0-5.5 µm; obovate, broadly subfusiform, short-clavate, pip-shaped, or broadly to narrowly elliptic. BASIDIA 21-42 X 4-8.5 µm; subclavate to clavate; 4-spored. BASIDIOLES subfusiform.

HYMENIAL SETAE 21-75(-119) X 2.5-14(-21) µm; narrowly or rarely broadly fusiform, aciculate with or without a bulbous base, lanceolate, or rarely forked; sometimes constricted abruptly 1-several times; pedicellate or not; rounded or acute apically; with light yellowish brown to moderate brown or rarely hyaline walls up to 3 µm thick; dextrinoid; projecting up to 50 µm beyond the basidioles; common or scarce on the lamellar edges and faces.

HYMENIAL BROOM CELLS 5.5-14(-22) X 3-8.5 µm; cylindric to clavate; with 2-10(-16) hyaline to pale yellow, smooth or roughened, tapered, acute projections 3-21 X 0.2-1.5 µm which are usually of unequal lengths on a single broom

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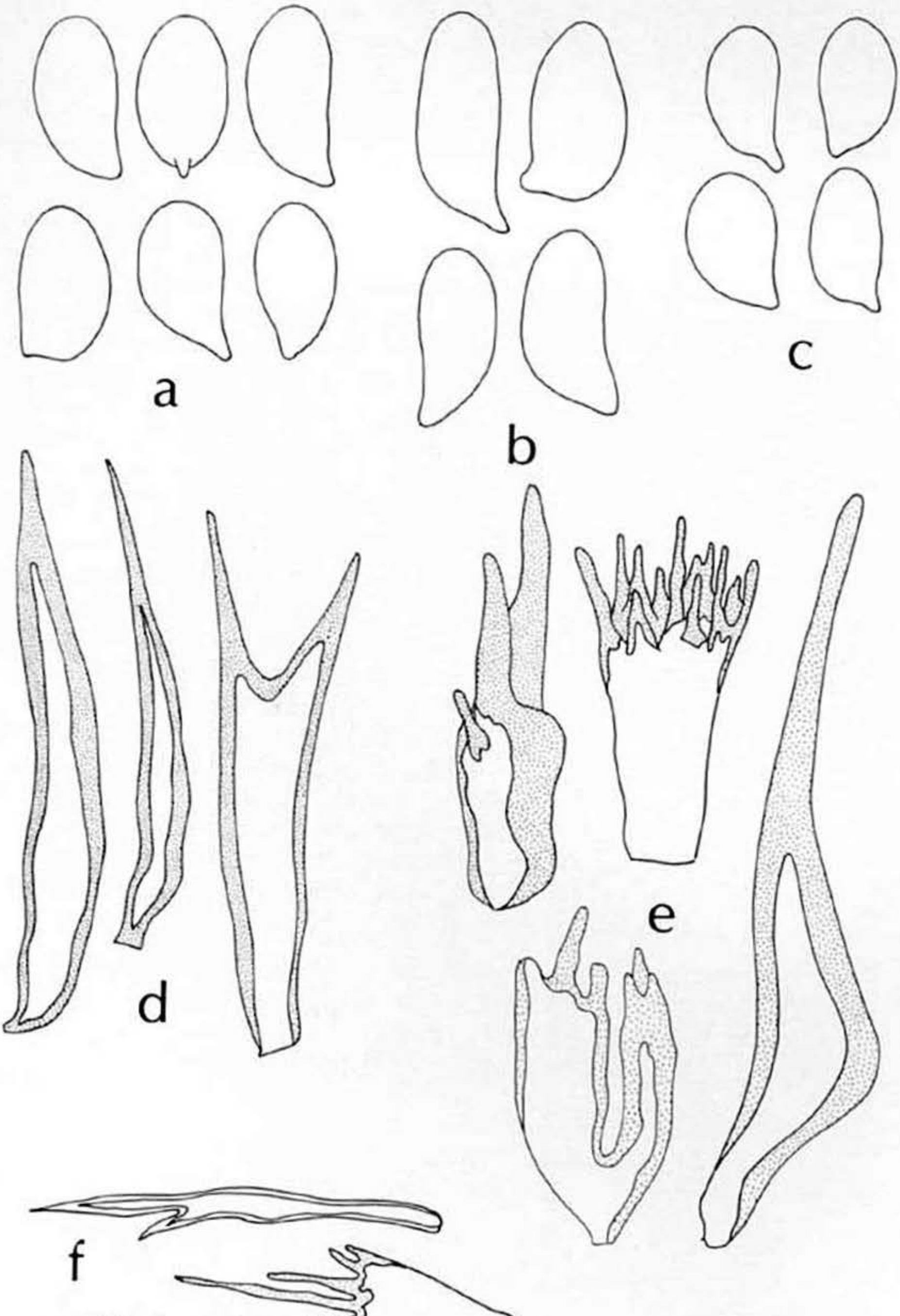
Figure 23. *Marasmius cohaerens* var. *cohaerens*. a. Spores, Ammirati 3150, x2300. b. Spores, Gilliam 1184, x2300. c. Spores, Gilliam 951, x2300. d-f. Ammirati 3150. d. Hymenial setae, x1500. e. Broom cells and setae from the pileus cuticle, x2300. f. Broom cells from the lamellar edge, x2300.


a
b
c
d
e
f

cell; with hyaline or pale yellow walls up to 1 µm thick; present only on the lamellar edges.

TRAMAL HYPHAE interwoven and inflated (up to 17 µm broad) in the pileus; interwoven, uninflated, and 1.5-10 µm broad in the lamellae; with thin, hyaline walls; dextrinoid.

PILEUS CUTICLE a hymeniform layer of two intergrading types of cells: (1) BROOM CELLS 3-22 X 2.5-11 µm; cylindric to clavate and sometimes lobed or pedicellate; with 2-15 hyaline to dark orange yellow, smooth or roughened, rounded or acute projections 2-10(-28) X 0.5-2 µm which are often conspicuously unequal in length; with pale yellow to dark orange yellow walls up to 1(-2.5) µm thick; and (2) SETAE 10-56(-84) X 2.5-10 µm; fusoid-ventricose, narrowly lanceolate, or aciculate; with strong brown to moderate brown walls up to 2.5 µm thick; relatively abundant on the disc, rare or absent on the margin.

STIPE corticated in pigmented portions only, the cortex then 20-50 µm thick, elsewhere with the superficial hyphae hyaline and undifferentiated. CORTICAL HYPHAE 1.5-8.5(-11) µm broad; with light yellowish brown to strong brown walls up to 1.5 µm thick; dextrinoid; olive brown to greenish yellow in 2% KOH. SETAE 14-45(-70) X 4-7(-11) µm; evenly tapered to an acute apex; with light yellowish brown walls up to 2 µm thick; usually rare (scattered near the apex and absent or scattered near the base of the stipe); arising at right angles to the surface hyphae which may themselves be thick-walled for a short distance from the bases of the setae.

Gregarious or subcespitose on decaying leaves, twigs, and fallen logs in deciduous woods (oak-hickory, beech-maple) or hemlock forests in which deciduous trees are present. Fruiting period: 14 Jul-25 Oct.

Collections examined:

CANADA: ONTARIO: Smith 4835. QUEBEC: Bigelow 5781 (MASS). GERMANY: Shaffer 4949. UNITED STATES: MICHIGAN:

Figure 24. *Marasmius cohaerens* var. *cohaerens*. Harrison 10347, x1 (courtesy of K. A. Harrison).
Figure 25. *Marasmius cohaerens* var. *lachnophyllus*. Harrison 10541, x1 (courtesy of K. A. Harrison).

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Ammirati 3150, 4417, & 4463; Gilliam 333, 951, 1132, 1176, 1183, 1184, & 1450; Harrison 10347; Potter 3846; Shaffer 3778; Smith 10961, 63938, 71805, & 74591. NEW YORK: Murrill, 7-17 Aug 1916 (NY). PENNSYLVANIA: Kauffman, 6 Sep 1924. TENNESSEE: Hesler 10217. VIRGINIA: Stevenson, 24 Sep 1936 (BPI).

13. MARASMIUS COHAERENS (Persoon ex Fries) Cooke & Quélet, var. LACHNOPHYLLUS (Berkeley in Lea) Gilliam, stat. nov. FIGS. 25 & 26

Agaricus lachnophyllus Berkeley in Lea, Catalog of Plants of Cincinnati 77. 1849.
Agaricus (Collybia) spinulifer Peck, Annual Rep. New York State Mus. 24: 62. 1871.
Marasmius lachnophyllus (Berkeley in Lea) Morgan, J. Mycol. 11: 239. 1906.
Collybia spinulifera (Peck) Peck, Annual Rep. New York State Mus. 49: 48. 1895 (1896).
Marasmius spinulifer (Peck) Morgan, J. Mycol. 11: 238. 1906.

PILEUS (6-)11-65 mm broad; hemispheric, convex, conic-convex, or campanulate at first with an inrolled or incurved margin, soon broadly convex, broadly conic, or plano-umbonate, finally almost plane with the margin uplifted; moist or subhygrophanous in basidiocarps with thin flesh and then fading in a subzonate pattern, finally dry; dull; opaque, or rarely translucent on the margin; smooth, or often cracked on the disc in age; even; entire or lobed; tough, but easily cracked on the surface when bent; reviving. CUTICLE minutely to conspicuously velutinous primarily on the disc; often with a white bloom at first; when moist and young deep brown (M&P 8H12), dark yellowish brown, deep yellowish brown, strong brown (Amber Brown, Antique Brown, M&P 7C12, 14A11, 14C12, 15A12), moderate yellowish brown (M&P 13G8), or moderate brown (Mars Brown, Cinnamon Brown, Brussels Brown, M&P 15A10-11), paler on drying or expansion and then the disc and extreme margin these same colors or light brown (Cinnamon, M&P 13C-D12), brownish orange (Tawny), dark grayish brown (M&P 16A10), or rarely blackish brown, and the region between the disc and extreme margin light yellowish brown (Pinkish Cinnamon, M&P 11B5-6), dark orange yellow (Ochraceous-Tawny), pale orange yellow (M&P 9C3, 9D4), brownish orange (M&P 13D12), or light yellowish pink (M&P 10B4, Pinkish Buff). TRAMA thin to moderately thick (0.5-4 mm thick in the disc);

light yellowish brown when young and moist, soon white or yellowish white. ODOR nondescript or faintly nitrous. TASTE mild to alkaline or sometimes bitter and astringent.

LAMELLAE narrow (up to 2 mm broad), sometimes broader in age; close or rarely crowded (18-50 reach the stipe); unequal, with 2-8 tiers of lamellulae; usually adnexed or sinuate, sometimes adnate, seceding, or almost free; pliant; entire, minutely fimbriate, or crenate; with the edge straight at first, broadest near the stipe in age; faintly to strongly intervenose; rarely forked near the stipe; light brown, light yellowish brown (Vinaceous-Cinnamon, Pinkish Cinnamon, M&P 11B4-6, 11D6, 12B3), pale orange yellow (M&P 10B2), or moderate yellowish pink (Vinaceous-Buff, Light Pinkish Cinnamon), when young often appearing moderate brown or deep brown from below as a result of reflection from setae on the lamellar faces, often moderate brown on the margins.

STIPE 11-65(-100) mm long, 0.75-5.0(-8.0) mm broad; central or slightly eccentric; terete at first, then compressed laterally; equal or tapered slightly to the base; straight or curved, often twisted; dry; shining when moist; opaque; hollow; cartilaginous to horny; even; finely and minutely pruinose to pubescent overall or nearly glabrous; pale orange yellow (M&P 10B-C2), light yellowish brown (M&P 11B2, 11C4, 12B5, 13C10), light brown, or moderate yellowish brown (M&P 14K7) above, centrally dark orange yellow (M&P 10G7), strong brown (M&P 7A11), moderate olive brown (M&P 13K7, or strong yellowish brown (Buckthorn Brown), with the base moderate brown, deep brown, or blackish brown, darkening progressively upward with age. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM of appressed or cottony white hairs which often stain pale yellow or may become pale orange yellow overall; usually uniting the bases of several stipes and sometimes forming an extensive compact or spongy pad.

SPORES white in mass; (5.5-)6.0-8.5(-9.1) X 3.0-4.5 µm; narrowly to broadly elliptic, fusoid-elliptic, obovate, or pip-shaped. BASIDIA 21-35 X 4-8 µm; subclavate to clavate; 4- or rarely 2-spored. BASIDIOLES subfusiform.

HYMENIAL SETAE (11-)35-120 X 4-24 µm; usually fusoid-ventricose and abruptly or evenly tapered to a long narrow neck, sometimes broadly clavate, ovate, fusiform, subulate or aciculate, rarely diverticulate at the base, forked up to 1/3 the length of the apex, or with 2-3 short knoblike or pyramidal appendages and then resembling broom cells; often pedicellate; acute, mucronate, or rounded apically; with light yellow to deep brown or rarely hyaline walls up to 3 µm thick; empty or with oily or granular particles which disappear in 2% KOH; projecting conspicuously (up to 78 µm beyond the basidioles); present on the edges and faces of the lamellae.

TRAMAL HYPHAE interwoven, often inflated, and 1.5-14 µm broad in the pileus; parallel to interwoven, occasionally inflated, and 2.5-12 µm broad in the lamellae; with thin, hyaline to light yellowish brown walls; dextrinoid.

PILEUS CUTICLE hymeniform; in primordia composed entirely of setae, later with the setae separated by broom cells or smooth cells. SETAE 33-103 X 3-10(-16) µm; tapering gradually or abruptly upward from a fusiform or elliptic base, or fusiform to cylindric and often pedicellate; with strong brown walls up to 3 µm broad; often arising deep in the trama. BROOM CELLS 4-28 X 3-11(-14) µm; cylindric, obovate, or subglobose and often lobed, branched, or pedicellate; with 4-25 smooth or rough, usually tapered, divergent, acute or rounded, hyaline to dark orange yellow projections 2-14 X 0.5-2 µm; with hyaline to deep brown walls 0.5-2 µm thick; often accompanied by cells intermediate between broom cells and setae. SMOOTH CELLS 4-11(-13) X 3-11 µm; cylindric, clavate, or subglobose: with hyaline walls up to 2 µm thick.

STIPE corticated in the pigmented portions only, the superficial hyphae elsewhere hyaline and undifferentiated. CORTICAL HYPHAE 1-14 µm broad; with strong brown walls up to 2 µm thick; dextrinoid; greenish yellow in 2% KOH. TRAMAL HYPHAE 1-11 µm broad; with hyaline walls up to 1 µm thick; dextrinoid. SETAE 19-140 X 5.5-14 µm; usually tapered from a broad, flat base but sometimes knoblike, diverticulate at the base, pyramidal, or fusiform, or rarely with 1-several apical projections and then resembling broom cells; with light yellowish brown to deep brown walls 0.5-2 µm thick; dextrinoid; scattered or clustered; usually abundant overall, sometimes rare near the base.

Gregarious to cespitose on rotted hardwood logs or woody debris in deciduous or deciduous-coniferous woods. Fruiting period: 4 Jun-2 Oct.

Collections examined:

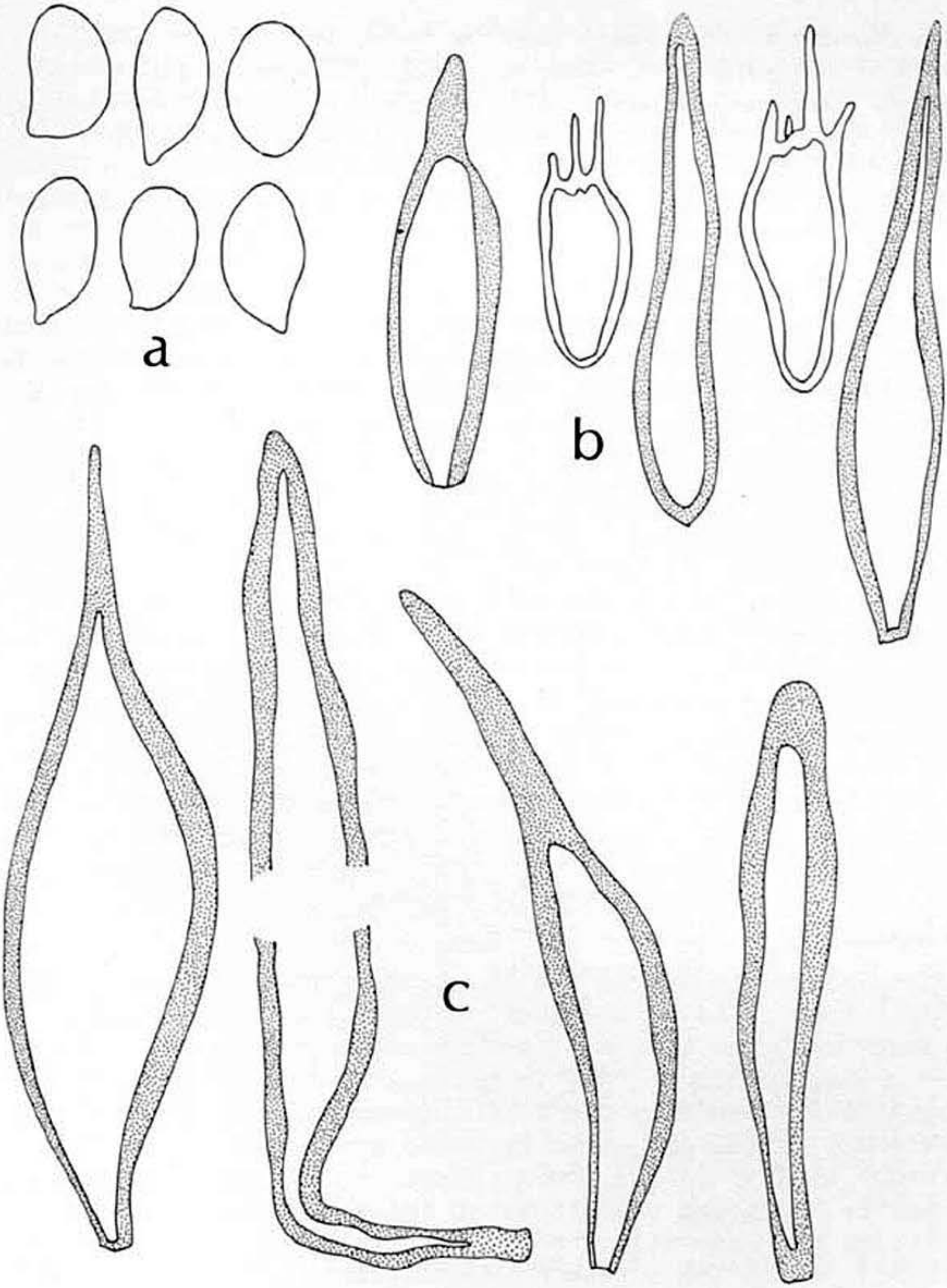


Figure 26. *Marasmius cohaerens* var. *lachnophyllus*. Gilliam 610. a. Spores, x2300. b. Broom cells from the lamellar edge, x2300. c. Hymenial setae, x1500.

CANADA: NOVA SCOTIA: Smith 855. ONTARIO: Kelly 785.

UNITED STATES: MAINE: Bigelow 10098 (MASS). MASSACHUSETTS: Bigelow 7743 (MASS). MICHIGAN: Ammirati 2477 & 4954; Gilliam 355, 356, 357, 560, 570, 593, 610, 620, 629, 839, 1144, 1169, 1185, & 1186; Harrison 10541, 10566; Patrick 1518; Potter 3945; Shaffer 2775; Smith 6323, 15141, 21597, 36499, 39492, 39536, 51198, 61479, & 63758. MINNESOTA: Weaver 1562. NEW HAMPSHIRE: Bigelow 12241 (MASS), 12418 (MASS). NEW YORK: Peck, Sep (holotype of *Agaricus (Collybia) spinulifer* Peck (NYS); Singer 171 (FH); Smith 421 & 544. NORTH CAROLINA: Harrison 11214, 11227, & 11424. OHIO: Curtis, 5 Sep 1844 (holotype of *Agaricus lachnophyllus* Berkeley in Lea, K). TENNESSEE: Hesler 14180; Smith 10549. VIRGINIA: Shear, 17 Jun 1897 (BPI).

Although several other characters correlate fairly well to distinguish *Marasmius cohaerens* var. *cohaerens* from *M. cohaerens* var. *lachnophyllus*, the two taxa are here primarily differentiated on the basis of broad, distant lamellae in the former and narrow, close lamellae in the latter. I have seen the type of *Agaricus lachnophyllus* Berkeley in Lea, on which the latter variety is based; it has narrow, close lamellae as well as the other features discussed below as characteristic of the taxon. The type of *Agaricus (Collybia) spinulifer* Peck, which I have also seen, belongs to the same taxon. *M. cohaerens* var. *lachnophyllus* is the predominant variety in North America. The type of *M. setulosus* Murrill (NY), suggested by Singer (39) as a possible synonym of *M. cohaerens*, does not seem to be conspecific.

I have considered the broad, distant-gilled taxon in North America to be the same as the European *Marasmius cohaerens*. The type of *Agaricus cohaerens* Persoon, which according to Singer (39) is not available, had distant lamellae. Certainly the descriptions and illustrations by Persoon, Fries, and other European mycologists suggest a fungus similar to the broad, distant-gilled form in North America, although the stipes of the basidiocarps in North America are generally shorter than those of European specimens. Since the European types of taxa with broad, distant lamellae were not available, I have followed Quélet (26, 27) and Singer (37) in synonymizing *Agaricus ceratopus* Persoon and Singer (39) in synonymizing *A. rigidus* Lasch. The best preserved European specimen of var. *cohaerens* that I have seen (Shaffer 4949) lacks the zonation of the pileus so characteristic of North American material but agrees in having large spores and short, narrow hymenial setae.

Variation in *Marasmius cohaerens* as a whole can be traced to three separate factors. The degree of expansion of the pileus usually accounts for the wide variation in cell composition of the cuticle, which may at first seem to be a taxonomic indicator. A second variational parameter is that of seasonal change. In *M. cohaerens* var. *lachnophyllus* June fruitings tend to be weak, with few, relatively small, often gregarious basidiocarps, as is the case with many fungi fruiting over a long period. From mid-July to early August large, strongly cespitose forms predominate. In September and October both size and number of basidiocarps are more variable. While yellowish brown and pinkish brown colors occur more frequently in the summer, orange brown colors prevail in fall fruitings. A third group of variations seems relatively independent of seasonal or developmental factors. These are the characters used to separate var. *lachnophyllus* from var. *cohaerens:*

Character	*M. cohaerens* var. *cohaerens*	*M. cohaerens* var. *lachnophyllus*
Lamellar breadth	broad	narrow
Lamellar spacing	subdistant to distant	close
Spore size	(5.9-)7.0-9.8(-11) x 3.0-5.5 μm (long and broad)	(5.5-)6.0-8.5(-9) x 3.0-4.5(-5) μm (short and narrow)
Size of hymenial setae	21-75(-119) x 2.5-14(-21) μm	(11-)35-120 x 4-24 μm
Presence of broom cells on lamellar edge	usually present	usually absent
Frequency of setae on stipe	rare	abundant
Habitat	usually on leaves or humus	usually on hardwood logs or twigs

Exceptions to the character state groupings above occur occasionally. For example, Gilliam 1169 has narrow, close to subdistant lamellae (and is therefore placed with var. *lachnophyllus)* but is otherwise similar to broad, distant-gilled specimens. Several collections with narrow, close lamellae have broad spores (e.g., Harrison 10566, Smith 21597, Gilliam 629) or long spores (Gilliam 629, Gilliam 1144, Smith 544). Basidiocarps with broad, distant lamellae (var. *cohaerens)* may have short, narrow spores (Gilliam 1132, Gilliam 951) or long, narrow spores (Smith 63938).

14. MARASMIUS SULLIVANTII Montagne, Syll. Crypt. 143. 1856. FIGS. 27-30

PILEUS 6-25 mm broad; at first pulvinate or convex with an incurved margin, becoming broadly convex to plano-convex and often subumbonate; dry; dull; opaque, or rarely translucent on the margin; smooth; even, or sometimes faintly striatulate in age; entire; pliant; reviving. CUTICLE minutely velutinous; at first with a whitish bloom; brilliant orange, deep orange (Orange-Rufous), moderate reddish orange (Ferruginous), or strong brown (Sanford's Brown, Hazel) at first, usually with the margin paler than the disc, in age strong yellowish brown on the disc and dark orange yellow on the margin, in dried basidiocarps strong brown to deep brown, often with minute pale yellow spots near the margin. TRAMA thin (up to 1.5 mm thick), tapering abruptly to the margin; nearly white. ODOR lacking. TASTE slowly bitter or sometimes lacking.

LAMELLAE narrow to moderately broad (up to 1-3 mm broad); thin; close, or rarely crowded; moderately numerous (18-20 reach the stipe); unequal, with numerous lamellulae in several tiers; adnexed to free; membranous; entire; broadest near the stipe, narrowing abruptly in front; not intervenose; not forked; nearly white (M&P 9B1-2) or light pink, often with moderate brown or light pink edges.

STIPE 10-60 mm long, 1-2 mm thick; central; terete; equal or enlarged at the apex or base; usually curved; dry; shining; opaque; hollow; cartilaginous; even; minutely pruinose or pubescent at the apex and mid-portion, strigose to tomentose near the base, the hairs white or nearly so; white to pale orange yellow or rarely tinged pink at the apex and almost overall when young, darkening below through strong yellowish brown or strong brown to deep brown, occasionally grayish red or blackish brown at the base. STERILE STIPES and RHIZOMORPHS lacking. BASAL MYCELIUM abundant and conspicuous on the surrounding substrate, often binding several leaves together; white, drying pale orange yellow.

SPORES white in mass; 6.7-8.4(-9.5) X 2.8-3.5(-4.5) µm; pip-shaped, narrowly elliptic, narrowly fusoid-elliptic, ovate, or narrowly obovate. BASIDIA 17-30 X 4-7 µm; subclavate to clavate; 4-spored. BASIDIOLES subclavate to subfusiform.

HYMENIAL CYSTIDIA 16-38 X 3-7 µm; cylindric, subclavate, or narrowly fusiform; subcapitate, submoniliform, short- to long-appendiculate, or if not, then rounded apically; with thin, hyaline walls; nonamyloid; scarcely projecting; rare to abundant on the edges and faces of the lamellae.

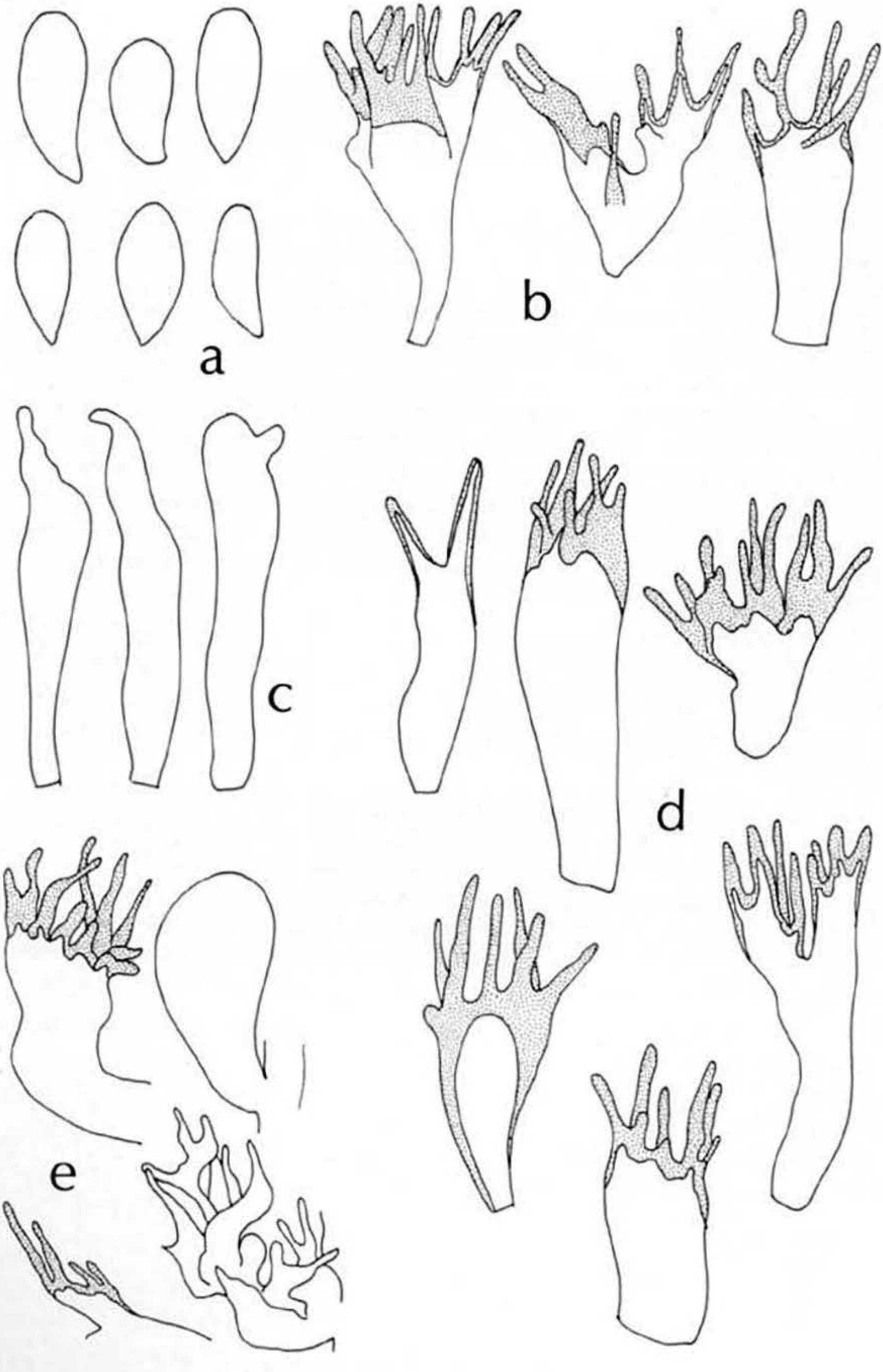
HYMENIAL BROOM CELLS 4-25 X 2-7 µm; clavate, cylindric, or deltoid; with 2-8(-15) hyaline to pale orange yellow, rodlike projections 5-11(-15) X 0.5-1.0 µm, which are tapered, smooth or wavy in outline, dextrinoid or nonamyloid, and usually divergent; with hyaline to pale orange yellow walls up to 1 µm thick; abundant on the lamellar edges.

TRAMAL HYPHAE pseudoparenchymatous and inflated up to 14 µm broad in the pileus; parallel, uninflated, and 2-7 µm broad in the lamellae; with thin, hyaline walls; dextrinoid (deep brown in Melzer's reagent, slowly becoming moderate red).

PILEUS CUTICLE a hymeniform layer of clavate, cylindric, or deltoid, often basally constricted or broadly pedicellate broom cells 5. 5-21 X 2.6-7(-12) µm, with 2-14 moderate orange yellow, divergent, smooth, occasionally branched, dextrinoid or nonamyloid rodlike projections 4.2-15 X 0.5-1.5 µm; with hyaline to light yellowish brown walls up to 1 µm thick.

STIPE corticated only in pigmented portions, the surface hyphae elsewhere hyaline and undifferentiated. CORTICAL HYPHAE 2-7 µm broad; with pale orange yellow to strong brown walls up to 2 µm thick; dextrinoid. TRAMAL HYPHAE 2-14 µm broad; with thin, hyaline walls or with the wall occluding the lumen; dextrinoid. STIPE VESTURE (at apex and midportion of the stipe) of two intergrading types of cells: (1) irregular broom cells with numerous hyaline to pale yellow, often branched projections, and (2) cylindric to clavate or lobed hairs 3-8.5 µm broad.

Gregarious or occasionally joined in pairs on leaves of deciduous trees, acorns, and nutshells in deciduous


a
b
c
d
e

and deciduous-coniferous woods. Fruiting period: 15 Jun-6 Sep.

Collections examined:

ILLINOIS: Shaffer 842. INDIANA: Cooke 32715 & 32833; Gilliam 938. MAINE: Murrill, 2-6 Sep 1905. MARYLAND: Stevenson 759 (BPI). MASSACHUSETTS: Bigelow 8194 (MASS), 9599 (MASS), & 15505 (MASS). MICHIGAN: Hoseney 1254. MINNESOTA: Weaver 6-20-62-N-1 & 1180. NEW YORK: House, 22 Jul 1945 (NYS); Atkinson (NYS). NORTH CAROLINA: Harrison 10909 & 10980. OHIO: Lloyd 27933 (BPI); Cooke 31920, 35695, & 35792. TENNESSEE: Smith 9715 & 10234. VIRGINIA: Kauffman, 20 Aug 1918; Murrill, 16-30 Jul 1920 (NY).

Both Kauffman and Morgan recognized this taxon, but both called it *Marasmius erythropus* Fries and considered it either identical to European material of the species or a distinct American variety. The colors of *M. erythropus* in Fries' *Icones* (Vol. 2, *t. 172, f. 2*) are similar to those of *M. sullivantii*, but a thick, hairy stipe is definitely figured and the stipe of *M. sullivantii* is thin and pruinose rather than hairy. Fries' description of *M. erythropus* (Epicr. Myc. 387. 1838) suggests a close relationship between it and *Collybia confluens* Fries. Although I cannot be certain of its correct determination, an exsiccati specimen of *M. erythropus* from Europe [Herpell (NY)] also indicates that that species rightly belongs in *Collybia* and that *M. erythropus* is not the correct name for the taxon described above.

The type of *Marasmius sullivantii* was originally at Paris but apparently is no longer available. The species described above is common in the part of its range from which Sullivant sent the type of *M. sullivantii* to Montagne and fits Montagne's original description. The use of the name for this taxon was first suggested to me by a specimen at BPI (Lloyd 27933) determined by Lloyd, who had worked

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Figure 27. *Marasmius sullivantii*. Gilliam 938. a. Spores, x2300. b. Broom cells from lamellar edge, x2300. c. Hymenial cystidia, x1500. d. Hyphal ends and broom cells from stipe, x2300. e. Broom cells from pileus cuticle, x2300.

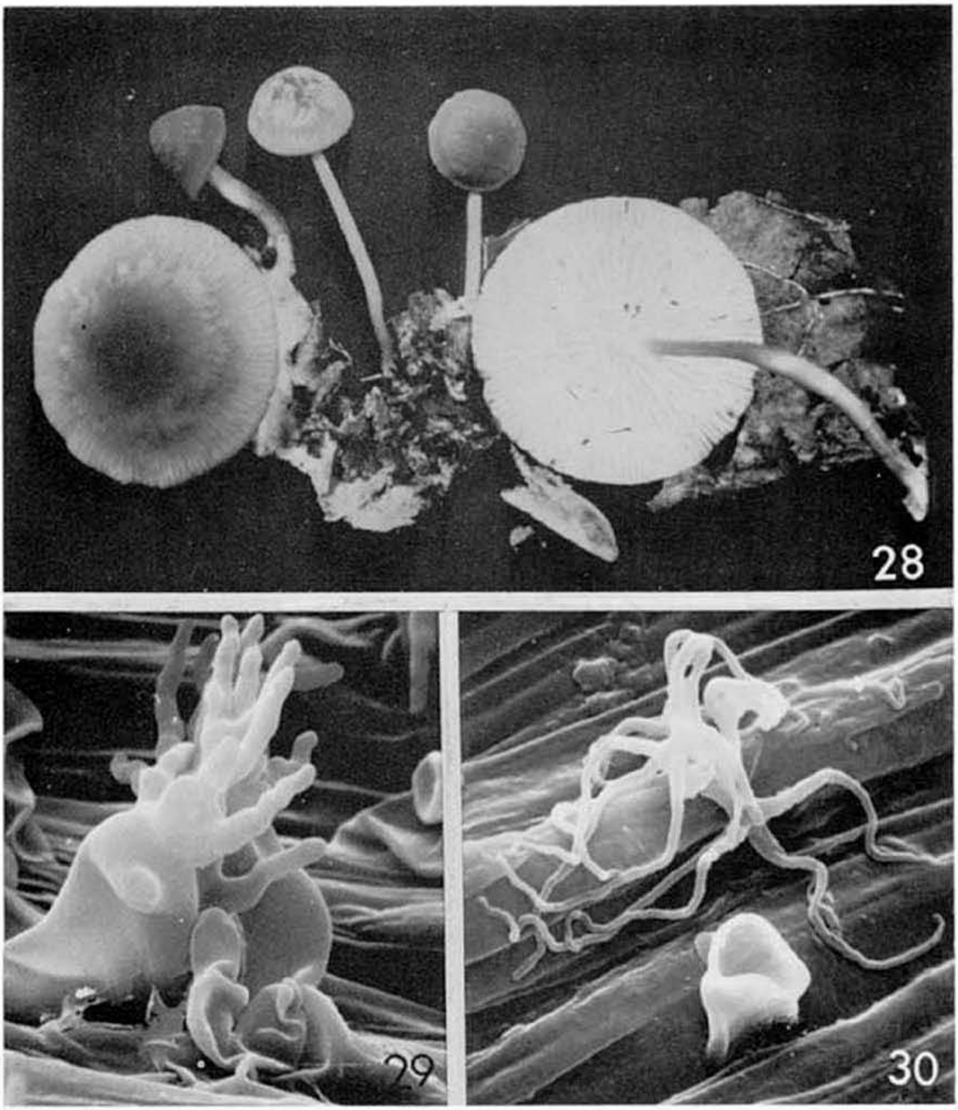


Figure 28. *Marasmius sullivantii*, x approximately 1-1/2. (courtesy of Richard Homola)

Figures 29 & 30. *Marasmius sullivantii*. Gilliam 938. Scanning electron micrographs of broom cells from the stipe surface, x4000 (courtesy of Larry Allard) in Paris.

Like *Marasmius glabellus*, *M. sullivantii* often has a a smooth (nonstriate and nonsulcate) pileus and a pallid stipe when young; as a consequence, specimens of *M. sullivantii* have often been misidentified as *M. glabellus*. The most prominent differences between the two are presented below:

Character	*M. sullivantii*	*M. glabellus*
Pileus color	brilliant orange, moderate reddish orange, strong brown	deep yellowish brown to pale orange yellow
Pileus striation	rarely more than faintly striatulate	usually distantly striate in age
Lamellar spacing	close to crowded	distant
Spore size	6.7-8.4(-9.5) x 2.8-3.5(-4.5) µm	(5.9-)7.0-11.2 x 3.1-6.0 µm
Stipe vesture at apex and midportion	broom cells and smooth clavate cells	none except at stipe base
Basal mycelium	abundant on surrounding substrate	not conspicuous on substrate

15. MARASMIUS ARMENIACUS Gilliam, Mycologia 67: 837. *f. 29-32*. 1975.

PILEUS 2-6 mm broad; pulvinate at first, then convex, umbonate, or nearly plane; dry; dull; opaque; smooth at first, becoming minutely rugulose or rugulose-striate; not plicate or striate; entire; membranous; pliant; probably not reviving. CUTICLE minutely velutinous; sometimes whitish-pruinose; moderate orange (M&P 11B8 at first, then 11A12). TRAMA thin (not measurable). ODOR lacking. TASTE bitter, with a spermatic aftertaste.

LAMELLAE narrow (less than 0.2 mm broad); thin; distant to remote; moderately numerous (12-14 reach the stipe); unequal, with 2 tiers of short lamellulae which alternate with the lamellae, or in young basidiocarps sometimes equal; adnate or sometimes attached to a partial adnate collar; membranous and fragile; entire; straight; sometimes faintly intervenose; occasionally forked in front; yellowish white (M&P 9B2).

STIPE short (2-12 mm long), 0.1-0.2 mm thick; slightly eccentric; filiform; equal; curved; moist; subshiny; opaque except at the apex; solid; fragile, soon collapsing; even; minutely pubescent overall, the hairs white, yellowish white, or pale yellow; translucent and colorless overall at first or sometimes yellowish white, later white at the apex and brownish orange (M&P 11D8) at the base; insititious. STERILE STIPES numerous; arising individually at intervals along the substrate; with tapered to acute apices; yellowish white. RHIZOMORPHS and BASAL MYCELIUM absent.

SPORES white in mass; 7.1-9.0 X 3.1-4.4 µm; narrowly to broadly elliptic, fusoid-elliptic, or obovate. BASIDIA 18.2-20.3 X 5-5.5 µm; subclavate to clavate; 4-spored. BASIDIOLES subclavate to fusiform.

HYMENIAL CYSTIDIA lacking.

HYMENIAL BROOM CELLS 9.8-16.8 X 4.2-7.0 µm; narrowly to broadly cylindric, fusoid-elliptic, fusoid-ventricose, or elliptic; with apical incrustations or projections which are finely and indistinctly divided and diffuse, or occasionally with 1-several discrete, rodlike projections up to 4 µm long; with thin, hyaline to pale yellow walls; dextrinoid; present only on the lamellar edges.

TRAMAL HYPHAE 2-8 µm broad; uninflated and interwoven in the pileus; uninflated and parallel in the lamellae; with thin, hyaline walls; dextrinoid.

PILEUS CUTICLE a hymeniform layer of truncate-clavate, cylindric, or subglobose, or sometimes deeply 2-lobed broom cells 2.8-14 X 3.5-8.4 µm with indistinctly divided and branched or rarely rodlike projections up to 6 µm long and hyaline to light yellow walls up to 1 µm thick.

STIPE corticated only in pigmented portions, the superficial hyphae elsewhere hyaline and undifferentiated. CORTICAL HYPHAE 4-6 µm broad; with pale yellow walls up to 0.5 µm thick; dextrinoid. TRAMAL HYPHAE with thin walls but otherwise similar to the cortical hyphae. STIPE VESTURE abundant overall, of three cell types: (1) cylindric to clavate or irregular broom cells with numerous knoblike, rounded, or rodlike projections 2-8 µm long and thin, hyaline to pale yellow walls; (2) modified broom cells with cylindric to clavate bases, with 1-6 tapered, threadlike extensions up to 50 µm long and hyaline walls up to 2 µm thick; and (3) tapered, clavate, or ovate, refractive smooth hairs with hyaline to pale yellow walls up to 2 µm thick, rarely septate.

On dead grass culms on a limestone outcropping with mixed low conifers and grassland plants. Fruiting period: unknown (23 Aug).

Collection examined:

INDIANA: Gilliam 932a (holotype of *Marasmius armeniacus* Gilliam).

Marasmius armeniacus is atypical of species in section *Sicci*, particularly in lacking well-defined basal mycelium. It has been placed here because the trama is dextrinoid, the lamellae are collarless, and the stipe bears *siccus*-like broom cells. For a further discussion, see Gilliam (8).

16. MARASMIUS SPISSUS Gilliam, Mycologia 67: 834. *f. 24-28.* 1975.

FIG. 32

PILEUS 10-50 mm broad; at first obtusely conic to convex with an incurved margin, becoming plane or broadly plano-umbonate, in age with the margin uplifted; moist and subhygrophanous; dull; opaque; smooth; not striate or only faintly so on the margin; entire; firm. CUTICLE glabrous; light yellowish brown (Pinkish Cinnamon) to moderate yellowish pink (Light Pinkish Cinnamon), paler on the margin in age. TRAMA moderately thick (1.5-2 mm thick); watery light grayish yellowish brown (Avellaneous) when moist, drying yellowish white. ODOR and TASTE mild.

LAMELLAE narrow (about 1.5 mm broad); thin; crowded; numerous (more than 50 reach the stipe); unequal, with few lamellulae; adnexed; entire; straight; forked or anastomosed; white at first, soon light grayish yellowish brown (Avellaneous).

STIPE 30-60 mm long, 3-4 mm thick; central; terete or compressed; equal or enlarged at the base; dry; shining; opaque; hollow; cartilaginous to horny; even; glabrous; light yellowish brown at the apex, brownish orange to moderate reddish brown (Chestnut) at the base. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM forming a pad at the base and adhering to the substrate; yellowish white, pale yellow, or brownish orange.

SPORES 5.2-8.5 X 2.6-3.4 µm; narrowly elliptic or narrowly pip-shaped. BASIDIA 14-24 X 3-6.5 µm; subclavate to clavate; 4-spored. BASIDIOLES subclavate to subfusiform.

HYMENIAL CYSTIDIA 19-35 X 4-14 µm; clavate, subcylindric, or lobed; capitate, or rounded to acute apically; with hyaline walls up to 0.5 µm thick; projecting up to 5 µm beyond the basidioles; rare on the lamellar faces and edges.

HYMENIAL BROOM CELLS 13-32 X 3-11 µm; clavate, fusoid-clavate, subcylindric, or lobed; with 2-8 lateral or apical hyaline or rarely pale yellow, nonamyloid projections up to 4 X 0.5 µm; with hyaline walls up to 0.5 µm thick; nonamyloid; present only on the lamellar edges.

TRAMAL HYPHAE interwoven and inflated up to 13 µm in the pileus; parallel-interwoven, uninflated, and 2-8 µm broad in the lamellae; with hyaline walls up to 1 µm thick; dextrinoid.

PILEUS CUTICLE a hymeniform layer of cylindric to subclavate or subglobose broom cells 5-28 X 4-10 µm, with 6-15(-20) pale orange yellow to moderate orange yellow, smooth or roughened, rounded projections 4-11 X 0.5-1.5 µm, with pale orange yellow walls up to 0.5(-1) µm thick.

STIPE corticated thinly overall. CORTICAL HYPHAE 3-7 µm broad; with pale orange yellow walls up to 1 µm thick; dextrinoid. TRAMAL HYPHAE up to 11 µm broad; with hyaline walls up to 0.5 µm thick; dextrinoid. STIPE VESTURE of clavate, slightly projecting hyphal ends and rare to moderately abundant, irregularly shaped, hyaline broom cells with projections to 20 µm long; abundant near the stipe base, rare elsewhere.

Solitary, gregarious, or cespitose on leaves in deciduous woods. Fruiting period: 2 Jul-17 Sep.

Collections examined:

INDIANA: Gilliam 938a. MICHIGAN: Smith 15426 & 62486 (holotype of *Marasmius spissus* Gilliam).

For a discussion of the differences between this species and *Marasmius sullivantii* Montagne, see the original publication of *M. spissus* (8). Numerous collections from North Carolina which probably belong to this taxon have not been included because they have no notes on macroscopic features and recognition of this species is not possible through microscopic characters alone.

Figure 31. *Marasmius borealis*. Gilliam 1188, x1.

Figure 32. *Marasmius spissus*. Smith 62486, x1 (courtesy of A. H. Smith).

17. MARASMIUS BOREALIS Gilliam, Mycologia 67: 831. *f. 21-23*. 1975.

FIG. 31

PILEUS 4-23 mm broad; pulvinate, conic-convex, or convex-umbonate at first, then conic to broadly campanulate, finally convex to plano-convex and umbonate or not; dry; dull; opaque; smooth almost until maturity, then rugose-reticulate on the disc and rugulose on the margin; even or in age shallowly sulcate 2/3-7/8 the pileus radius; entire, becoming crenate in age; tough-membranous; reviving. CUTICLE minutely velutinous; deep red (Garnet Brown), brownish orange, or strong brown (M&P 14A12) in primordia, then deep orange (Orange-Rufous), light brown, moderate orange (M&P 12G7), strong orange yellow (Capucine Yellow), moderate orange yellow (Orange-Buff), or pale orange yellow (M&P 9G6), sometimes with the disc brownish orange to strong brown (M&P 12C-E12), drying pale orange yellow to light yellowish brown. TRAMA thin (up to 1 mm thick in the disc, scarcely discernible 1 mm outward from the center); pliant; white to yellowish white, or purplish pink around the point of attachment of the stipe. ODOR of crushed pilei fragrant, somewhat like that of *Pleurotus ostreatus*. TASTE mild, with an alkaline aftertaste.

LAMELLAE narrow (up to 1.5 mm broad in an old pileus 12 mm broad); thin; distant; moderately numerous (15-20 reach the stipe); equal; ascending-adnate or adnexed; membranous and pliant; entire; straight at first, sometimes becoming ventricose; crisped upon drying; intervenose or not; not forked; yellowish white.

STIPE 10-60 mm long, 0.3-0.9 mm thick; central; terete, but soon collapsed and flattened; equal or tapering slightly to the apex; straight or curved; dry; shining; opaque; hollow; flexible at first, then broomstraw-like (not wiry); even; glabrous; dark red, grayish red, or moderate purplish red overall at first and later on the apex only, the basal portion becoming moderate brown (M&P 15E12) to dark grayish brown progressively upward. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM of cottony white hairs; not forming a distinct pad on the substrate.

SPORES white in mass; (9-)12.6-16.8(-17.5) X 2.9-4.5 µm; curved-clavate, clavate, or fusoid-elliptic. BASIDIA (21-)28-44 X 4.2-8.5 µm; clavate or subclavate; 4-spored. BASIDIOLES fusiform, often with constricted apices.

HYMENIAL CYSTIDIA lacking.

HYMENIAL BROOM CELLS 7-21 X 3-7 µm; cylindric, narrowly to broadly clavate, or rarely obovate; with (2-)6-15 hyaline to pale yellow, sometimes branched, roughened, delicate knoblike or rodlike dextrinoid projections 1.1-5.5(-7) X 0.2-1.0 µm; with hyaline walls up to 0.5 µm thick; present only on the lamellar edges.

TRAMAL HYPHAE 4-7 µm broad in both pileus and lamellae; interwoven; uninflated; with thin, hyaline walls; dextrinoid.

PILEUS CUTICLE a hymeniform layer of cylindric to clavate or lobed (always longer than broad) and sometimes indistinctly pedicellate broom cells 5.5-40 X 2.5-8.5 µm; with (4-)10-20 finely divided and indistinct or sometimes rodlike, rounded or acute, hyaline to pale orange yellow or rarely dark orange yellow, often knobby or roughened projections 2.8-5.6 X 0.8-1.5 µm, with hyaline walls up to 0.5 µm thick.

STIPE corticated overall. CORTICAL HYPHAE 3-7 µm broad; hyaline, pale yellowish pink, or pale purplish pink (the pigment cytoplasmic); with purplish pink to light yellowish brown walls up to 1 µm thick, or with pale yellow walls occluding the lumen; dextrinoid; dark grayish olive in 2% KOH. TRAMAL HYPHAE 2.8-5.5 µm broad; hyaline to rarely pale pink (the pigment cytoplasmic); with thin, hyaline walls; dextrinoid. VESTURE (at extreme apex of stipe only) of rare, pale purplish pink or pale orange yellow broom cells with strongly reduced or obsolescent basal portions and up to 10 irregular projections 0.2-7 X 0.5-1 µm.

On decayed leaves of deciduous trees in hardwood or mixed deciduous-coniferous woods. Fruiting period: 3 Jul-2 Sep.

Collections examined:

CANADA: QUEBEC: Bigelow 5398 (MASS), 5583 (MASS), 5773 (MASS), & 5775 (MASS); Smith 61779. UNITED STATES: MAINE: Bigelow 3098 (MASS), 3249 (MASS), 3507 (MASS), 10245 (MASS), & 10305 (MASS). MICHIGAN: Ammirati 1865 & 4628; Gilliam 1171 & 1188 (holotype); Harrison 10307 & 10528; Kauffman, 3 Jul 1905; N. J. Smith 1877; Thiers 991 & 3892. NEW HAMPSHIRE: Bigelow 12115 (MASS); Singer, 25-26 Jul 1941 (FH). NEW YORK: Bigelow 5088 (MASS). VERMONT: Bigelow 12984 & 12985 (MASS).

18. MARASMIUS FULVOFERRUGINEUS Gilliam, sp. nov.
FIGS. 33 & 34

Pileus 19-45 *mm latus, ex campanulato vel hemisphaerico convexus, deinde umbonatus, plicatulus, tenaci-membranaceus, cinnamomeus, fulvo-ferrugineus vel brunneo-aurantius. Odor et sapor farinacei. Lamellae latae, tenues, distantes, modice numerosae (23-28), aequales, liberae, membranaceae, eburneae. Stipes 54-80 mm longus, 1-1.25 mm crassus, aequalis, nitidus, corneus, glaber, apice roseus, base castaneus vel atrobrunneus. Mycelium basale album. Sporae 15.2-18 X 3-4.5 µm, clavatae vel fusoideo-clavatae. Cystidia hymenii nulla vel rara, hyalina, 38-42 X 6-8 µm. Echinidia hymenii 8-18 X 8-12 µm, cylindrica, cum 8-25 projecturis hyalinis vel luteolis 2-8 X 1-3 µm. Trama pilei dextrinoidea. Cuticula pilei hymeniformis, echinidiis 10-20 X 7-12 µm, cylindricis vel clavatis, tenuitunicatis, cum 10-25 projecturis hyalinis vel luteolis 3-6 (-8) X 1-2 µm praedita. Cortex stipitis laevis. Holotypus:* NORTH CAROLINA: Henderson Co.: Elks, Green Cove, *prope* Tuxedo, 14 Sep 1974, Gilliam 1557 (MICH).

PILEUS 19-45 mm broad; campanulate to hemispheric at first, becoming conic-convex to convex with the disc broadly depressed or not, occasionally papillate or umbonate; dry; dull; opaque; smooth at first, becoming minutely rugulose on the disc; deeply and distantly plicate except in very young pilei; entire or scalloped; pliant; reviving. CUTICLE minutely velutinous; strong brown (Hazel), near moderate brown (Russet), or moderate reddish brown (Mahogany Red) overall at first, remaining these colors on the disc in age, the margin becoming strong brown (Sanford's Brown) to brownish orange (Cinnamon Rufous). TRAMA thin (less than 1 mm thick); white. ODOR mildly farinaceous. TASTE farinaceous.

LAMELLAE broad (up to 6 mm broad); thin; distant; moderately numerous (23-28); equal; free; membranous but not fragile; entire; subventricose; slightly intervenose or not; not forked; yellowish white.

STIPE 54-80 mm long, 1-1.25 mm thick; equal or tapered slightly to the base; straight or curved; dry; shining; opaque; hollow; horsehair-like; even; glabrous; moderate pink at the apex, shading downward through strong brown or blackish brown to black at the base. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM a tuft of cottony white hairs.

Figure 33. *Marasmius fulvoferrugineus*. Harrison 11065, x 3/4 (courtesy of Kenneth A. Harrison).

SPORES white in mass; 15.2-18 X 3-4.5 µm; oblanceolate, curved-clavate, or fusoid-clavate. BASIDIA 35-38 X 8-12 µm; clavate or subclavate; 4-spored. BASIDIOLES subclavate to subfusiform.

HYMENIAL CYSTIDIA rare or lacking; if present, 38-42 X 6-8 µm; clavate or fusoid-clavate; capitate or attenuate; hyaline and lacking refractive contents; arising at the same level as the basidioles; nonamyloid.

HYMENIAL BROOM CELLS 8-18 X 8-12 µm; cylindric, clavate or obovate; usually not pedicellate; with 8-25 hyaline or rarely pale orange yellow projections 2-8 X 1-3 µm which are rounded, smooth to slightly roughened, often branched or lobed, and divergent; with walls up to 1 µm thick; present only on the lamellar edges.

TRAMAL HYPHAE interwoven and inflated up to 12 µm in

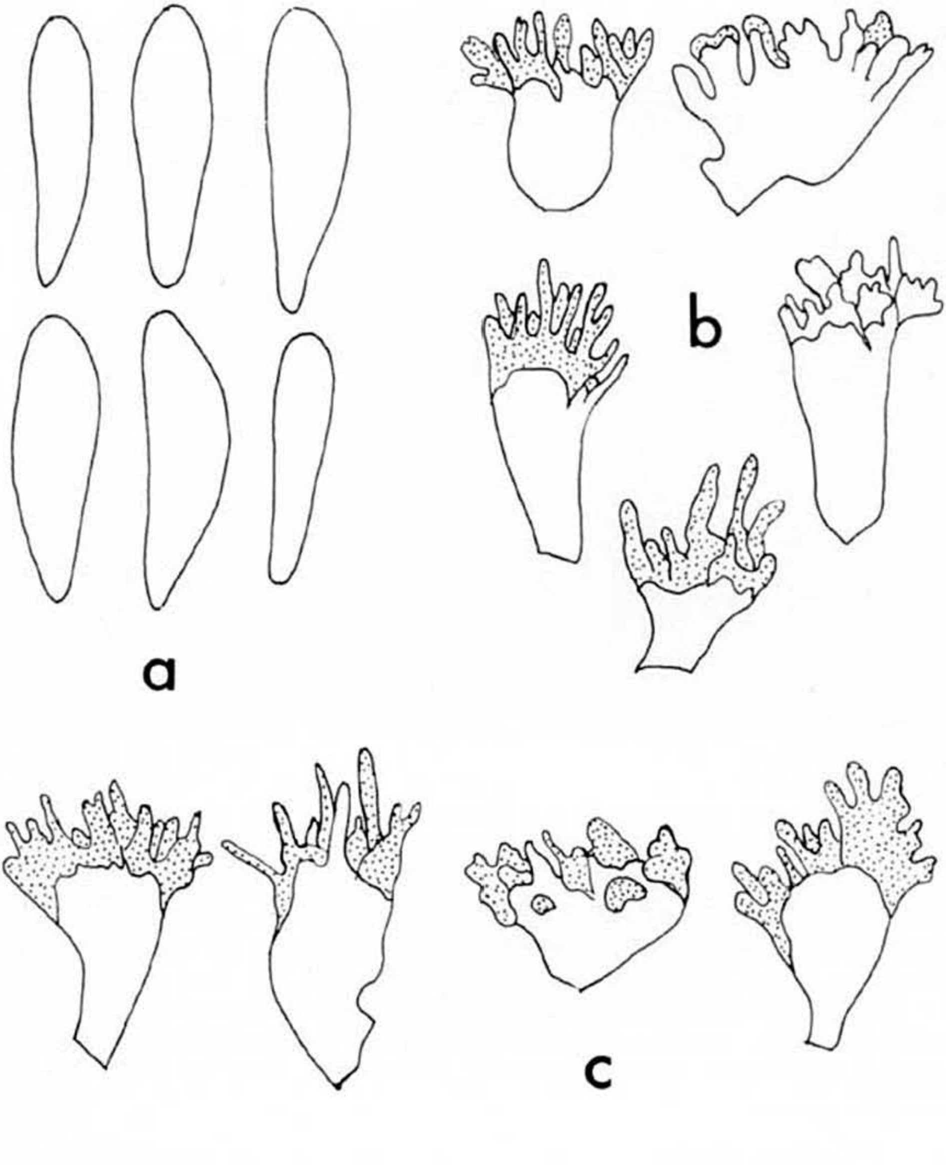


Figure 34. *Marasmius fulvoferrugineus*. Gilliam 1557, x 2300. a. Spores. b. Broom cells from the lamellar edge. c. Broom cells from the pileus cuticle.

the pileus; parallel to interwoven, uninflated and up to 6 µm broad in the lamellae; clamped; with thin, hyaline walls; dextrinoid.

PILEUS CUTICLE a hymeniform layer of short-clavate, obovate, or broadly turbinate broom cells 10-20 X 7-12 µm, usually not pedicellate, with 10-25 pale orange yellow to light yellowish brown, divergent to strongly divergent, smooth or knobby, blunt, often branched or lobed, dextrinoid, rodlike to wartlike projections 3-6(-8) X 1-2 µm, with hyaline to pale orange yellow walls up to 1 µm thick.

STIPE corticated overall, only thinly so apically. CORTICAL HYPHAE 3-6 µm broad; with light yellowish brown to deep brown walls up to 1 µm thick; dark grayish olive green in 2% KOH; dextrinoid. TRAMAL HYPHAE 3-8 µm broad; with thin, hyaline walls; clamped; dextrinoid to nonamyloid. STIPE VESTURE lacking.

Scattered to gregarious in mixed woods. Fruiting period: mid-July to mid October.

Collections examined:

FLORIDA: West & Murrill, 8 Nov 1932 (NY). NEW JERSEY: Ellis, 1 Sep 1896 (NY). NORTH CAROLINA: Gilliam 1557 (holotype of *Marasmius fulvoferrugineus* Gilliam) & 1558; Harrison 11061 & 11065. TENNESSEE: Hesler 5451 (FH). VIRGINIA: Singer, 11 Sep 1934 (FH).

Marasmius fulvoferrugineus is the common southeastern species which has usually been determined as *M. siccus*. Comparison between the present taxon and the type of *M. siccus* reveals a number of differences which justify describing *M. fulvoferrugineus* as new. The large, refractive hymenial cystidia present in *M. siccus* are lacking. The pileus is generally larger (19-45 mm vs. 2.5-27 mm broad) and its colors more nearly rusty brown or cinnamon rather than the orange shades of *M. siccus*. Spores of *M. fulvoferrugineus* are usually somewhat shorter than those of *M. siccus* (up to 18 µm long vs. up to 21-23 µm). The walls of the cuticular broom cells are thinner. Finally, *M. siccus* occurs more frequently north of the Great Smoky Mountains, and *M. fulvoferrugineus* is found more often in the Great Smokies and to the south. Excellent color photographs of *M. fulvoferrugineus* (as *M. siccus*) have been published in Hesler (9) and Miller (21).

19. MARASMIUS SICCUS (Schweinitz) Fries, Epicr. Myc. 382. 1838. FIGS. 7, 35, & 36

Agaricus siccus Schweinitz, Schriften Naturf. Ges. Leipzig 1: 84. 1822.

Marasmius campanulatus Peck, Annual Rep. New York State Mus. 23: 126. 1870 (1873).

Marasmius fulviceps Clements, Bot. Surv. Nebraska 4: 20. 1896. Non *M. fulviceps* Berkeley, London J. Bot. 6: 490. 1847.
Marasmius clementsianus Saccardo & Sydow, Syll. Fung. 14: 101. 1899, *nom. nov.* for *Marasmius fulviceps* Clements.

PILEUS 2.5-27 mm broad; convex, conic-convex, pulvinate, or campanulate at first, soon broadly convex to broadly campanulate and often papillate, umbonate, or with a flat central depression; dry; dull; opaque; smooth at first, soon rugulose and usually conspicuously roughened; deeply plicate or sulcate to the disc except in very young pilei, the sulcae up to 3 mm apart in expanded pilei; entire, scalloped, crenate, or lobed; fragile to pliant; reviving. CUTICLE minutely velutinous; deep orange (M&P 13A12, Xanthine Orange, Orange Rufous), strong yellowish brown (Ochraceous-Tawny), or strong brown (Sanford's Brown) at first, remaining these colors or fading to brownish orange (M&P 11K7, Cinnamon Rufous), moderate orange (Apricot Buff), deep orange yellow (M&P 12G8-9, Mars Yellow), or light orange yellow (M&P 9E-F3), often darker on the disc. TRAMA thin (less than 1 mm thick); white. ODOR mild or absent. TASTE mild, rarely somewhat bitter, or occasionally absent.

LAMELLAE narrow at first, becoming moderately broad (1.5-3 mm broad); thin; distant to remote; moderately numerous (15-22 reach the stipe); equal or with 1-3 short lamellulae; adnexed, sinuate, or free; fragile or pliant; entire; straight at first, often ventricose in age; not intervenose; usually not forked; white or pale yellowish white, rarely with the edge brownish orange.

STIPE 23-62 mm long, 0.2-1.0 mm thick; central; terete; equal, tapered slightly to the apex, or occasionally swollen at the apex or base; straight or curved; dry; dull at first, polished in age and on drying; opaque; hollow; cartilaginous to horny; even; glabrous; white, yellowish white, pale yellow (M&P 11G3), or rarely dark red at the apex, darkening from the base upward through light yellowish brown to deep brown, with the darker colors almost overall in age, sometimes with a ring of brownish orange at the juncture of pileus and stipe. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM a disc-shaped patch of white to yellowish white hairs.

SPORES white in mass; (13.3-)16-21(-23) X 2.8-4.2(-5) µm; narrowly clavate, oblong-oblanceolate, or asymmetrically fusoid-clavate and often curved. BASIDIA 21-50 X 4-8 (-10) µm; clavate, subclavate, or subcylindric; 4-spored. BASIDIOLES subclavate.

HYMENIAL CYSTIDIA 23-67(-81) X 3-14 µm; cylindric, clavate, fusiform, fusoid-clavate, or fusoid-ventricose, often with an abruptly bent pedicellate base; usually rounded or subcapitate apically, but sometimes mucronate, submoniliform, or short- to long-appendiculate; with thin, hyaline walls and moderately to strongly refractive, hyaline to pale orange yellow homogeneous contents; arising in the subhymenium or deep in the trama; projecting up to 10(-20) µm beyond the basidioles; nonamyloid; rare to common on the lamellar faces.

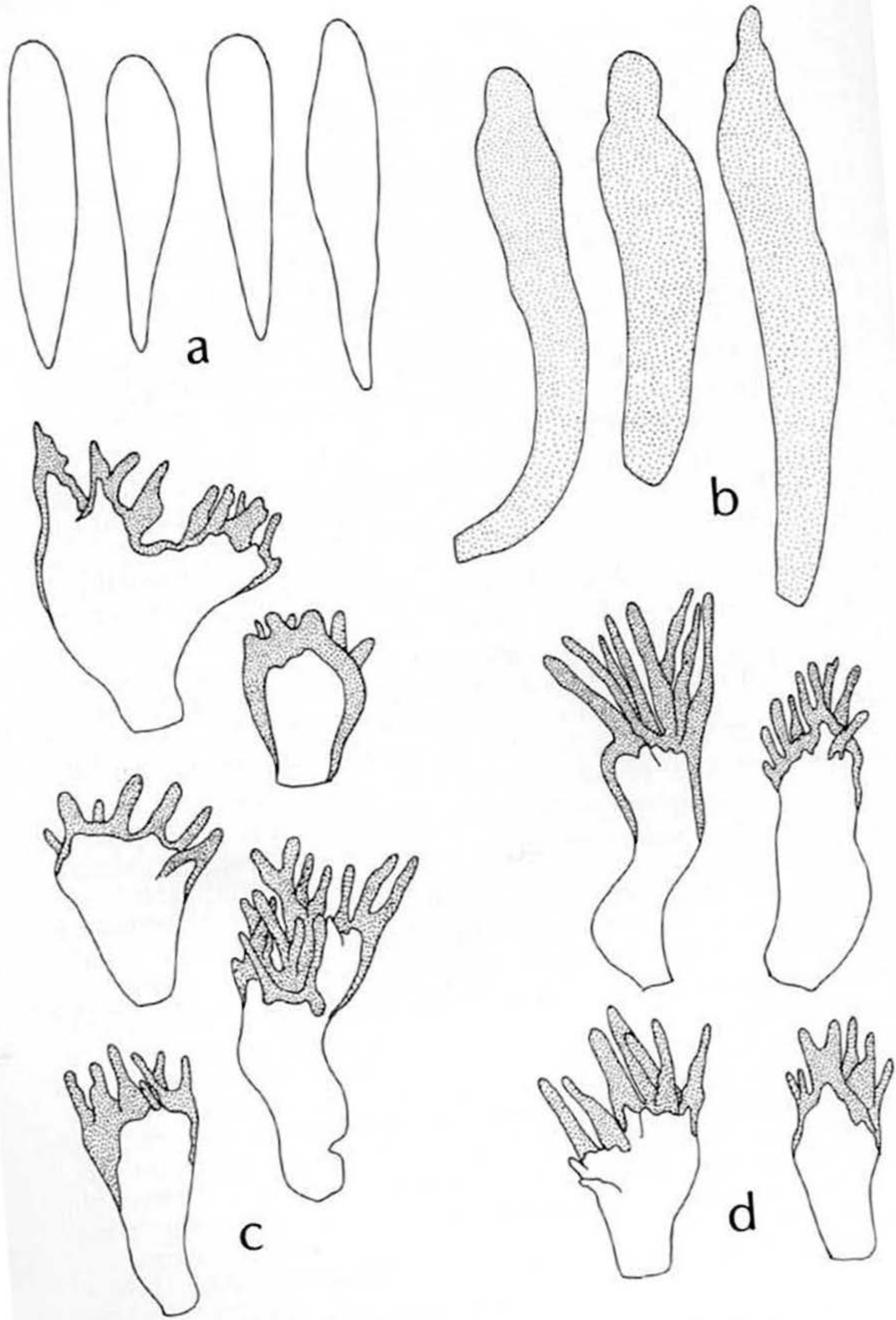
HYMENIAL BROOM CELLS 3-25 X 2-8.5 µm; cylindric, clavate, goblet-shaped, obovate, or lobed; with 3-15(-20) hyaline to pale orange yellow projections 4-10 X 1-1.5 µm which are rounded to acute, often roughened, dextrinoid, and parallel to divergent; with thin, hyaline walls; present only on the lamellar edges.

TRAMAL HYPHAE interwoven and inflated up to 18 µm broad in the pileus; parallel to interwoven, uninflated, and 2.5-5.0 µm broad in the lamellae; with thin, hyaline walls; dextrinoid, often with strongly dextrinoid granular contents in some cells.

PILEUS CUTICLE a hymeniform layer of subclavate, subglobose, pulvinate, turbinate, cylindric, lobed, or obovate broom cells 2.5-17(-21) X 2.5-8.5 µm, which are pedicellate or not, with (2-)6-15 pale orange yellow to light yellowish brown, parallel to divergent, usually smooth, blunt, rarely branched, dextrinoid, rodlike apical projections 1.4-7.0 X 1-1.5(-2) µm, with hyaline to pale orange yellow wallsup to 2 µm thick.

STIPE corticated only in pigmented portions, the surface hyphae elsewhere hyaline and undifferentiated. CORTICAL HYPHAE 3-5 µm broad; with light yellowish brown to strong brown walls up to 2 µm thick; dark grayish olive green in 2% KOH; dextrinoid or rarely nonamyloid at the apex of the stipe. TRAMAL HYPHAE 4-8 µm broad; with thin, hyaline walls; dextrinoid. VESTURE lacking or of rare, scattered broom cells at the juncture of stipe and pileus.

Scattered to gregarious and sometimes in troops on leaf mold, oak leaves, and twigs, on needles of white pine, or rarely on wood in beech-maple, oak-hickory, or pine


a
b
c
d

forests. Fruiting period: 3 July-6 October.

Collections examined:

CANADA: ONTARIO: Cain 24905 (BPI). JAPAN: Yasuda 279 (Lloyd 24829, BPI). UNITED STATES: CONNECTICUT: Underwood & Earle (NY). DISTRICT OF COLUMBIA: Murrill, 14-15 Jul 1905 (NY); Scribner, 1886 (BPI). ILLINOIS: Shaffer 845. INDIANA: Cooke 32728 & 32873; Shaffer 1240; Wright, 26 Sept 1938. MARYLAND: Kelly 504. MASSACHUSETTS: Bigelow 7113 & 15226; Underwood, Jul 1887 (NY). MICHIGAN: Ammirati 2450; Gilliam 638, 712, 756, 869, 940, 1237, & 1315; Patrick 428; Peters 1177; Potter 5695; Shaffer 2510, 2650; Smith 6539, 6884, 18461, 51193, & 74424. MINNESOTA: Weaver 1232. MISSOURI: Linder, 24 Aug 1928 (BPI, FH). NEBRASKA: Clements, 7 Sep 1895 (isotype of *Marasmius fulviceps* Clements, BPI). NEW YORK: Gilliam 1232; Peck, Aug (lectotype of *Marasmius campanulatus* Peck, NYS); Murrill, 7-17 Aug 1916 (NY); Underwood, Sep 1888 (NY). NORTH CAROLINA: Harrison 10971. OHIO: Moldenke 13744 (FH). PENNSYLVANIA: Schweinitz (holotype of *Agaricus siccus* Schweinitz, PH; part also collected in South Carolina). TENNESSEE: Hesler 10851 (FH); Murrill 18-24 Aug 1904 (NY). VERMONT: Pringle 1440 (FH). VIRGINIA: Kauffman, 24 Jul 1919; Linder, 2-4 Sep 1936 (FH); Murrill, 8-14 Jul 1909 & Jul 1910 (NY). WISCONSIN: Gilliam 1226; Shaffer 334; Sherman (NY).

An examination of many specimens tentatively determined as *Marasmius siccus* shows that the prevalent concept of this species is too broad. I have examined the type of *Agaricus siccus* Schweinitz and find it to belong to the common taxon with a moderate orange, distinctly sulcate pileus, spores up to 20 µm long, and conspicuous refractive hymenial cystidia. The types of *M. campanulatus* Peck and *M. fulviceps* Clements, which I have also seen, belong to this taxon as well. At least four other species have been commonly misidentified as *M. siccus*: *M. pulcherripes* Peck (both a pink and a yellowish brown variant), *M. borealis* Gilliam, *M. bellipes* Morgan, and *M. fulvoferrugineus* (described as a new species in the present work). Reports of pink varieties of *M. siccus* in the literature probably stem from confusion with one of the above species, particularly

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Figure 35. *Marasmius siccus*. Gilliam 869. a. Spores, x2300. b. Hymenial cystidia, x1500. c. Broom cells from pileus cuticle, x2300. d. Broom cells from lamellar edge, x2300.

Marasmius pulcherripes and perhaps forms of *M. fulvoferrugineus*. *M. siccus* is never pink but rather some shade of orange or brown at all stages of development. For the differences between *M. siccus* and closely related species, see the discussions under *M. borealis* (8), *M. pulcherripes*, *M. bellipes*, and *M. fulvoferrugineus*.

20. MARASMIUS SPADICEUS Gilliam, Mycologia 67: 840. *f. 33-36*. 1975.

PILEUS 15-30 mm broad; convex or nearly plane; hygrophanous; opaque; closely translucent-striatulate on the margin in age; somewhat fleshy. CUTICLE minutely velutinous; moderate brown (Argus Brown) to strong brown (Amber Brown) at first, fading to brownish orange (near Cinnamon-Rufous), strong brown to deep brown in dried material. TRAMA thick in the disc, thin on the margin; white. ODOR faint. TASTE mild or lacking.

LAMELLAE narrow; thin; close to crowded; numerous; unequal, with numerous lamellulae; free, but with a few lamellae touching the stipe; entire; ventricose; not intervenose; not forked; pale yellow at first, soon white or nearly so.

STIPE 30-50 mm long, 2-3 mm thick; central; terete; equal; straight; dry; polished; opaque; hollow; horny; even; glabrous; pale orange yellow above, deep brown below. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM tuftlike; white.

SPORES 6.7-10.8 X 2.8-3.5 µm; elliptic or pip-shaped. BASIDIA 21-29 X 4.5-7 µm; subclavate to clavate; 4-spored. BASIDIOLES subclavate.

HYMENIAL CYSTIDIA 22-33(-44) X 4-8.5 µm; clavate, fusoid-clavate, or fusoid-ventricose; capitate, short-appendiculate, submoniliform, or rounded apically; with thin, hyaline walls; usually embedded, rarely projecting beyond the basidioles; present but sometimes inconspicuous on the lamellar faces.

HYMENIAL BROOM CELLS 8.4-21 X 3-6 µm; cylindric or short-clavate; with few (3-8) pale yellow to light yellowish brown, rodlike projections 7-13 X 1-2.2 µm which are usually tapered, often branched, usually acute, divergent, and dextrinoid; with thin, hyaline to light yellowish brown walls; present only on the lamellar edges.

TRAMAL HYPHAE closely interwoven and inflated up to

17 µm broad in the pileus; parallel to interwoven, uninflated, and 4-10 µm broad in the lamellae; dextrinoid.

PILEUS CUTICLE a hymeniform layer of cylindric to short-clavate and often pedicellate broom cells 7-28 X 4-8.5 µm, with few (2-10) light yellowish brown to moderate brown, rodlike projections 7-14 X 1-2.2 µm which are tapered or not, sometimes branched, smooth, divergent, and dextrinoid; with hyaline to moderate brown walls up to 1 µm thick.

STIPE corticated overall at maturity. CORTICAL HYPHAE 4-11 µm broad; with light yellowish brown walls up to 1.5 µm thick, or with the wall occluding the lumen; dextrinoid; grayish greenish yellow in 2% KOH. TRAMAL HYPHAE up to 8.5 µm broad; with thin, hyaline walls or with pale yellow walls occluding the lumen; dextrinoid. STIPE VESTURE lacking except for rare, scattered short broom cells at the juncture of the pileus and stipe.

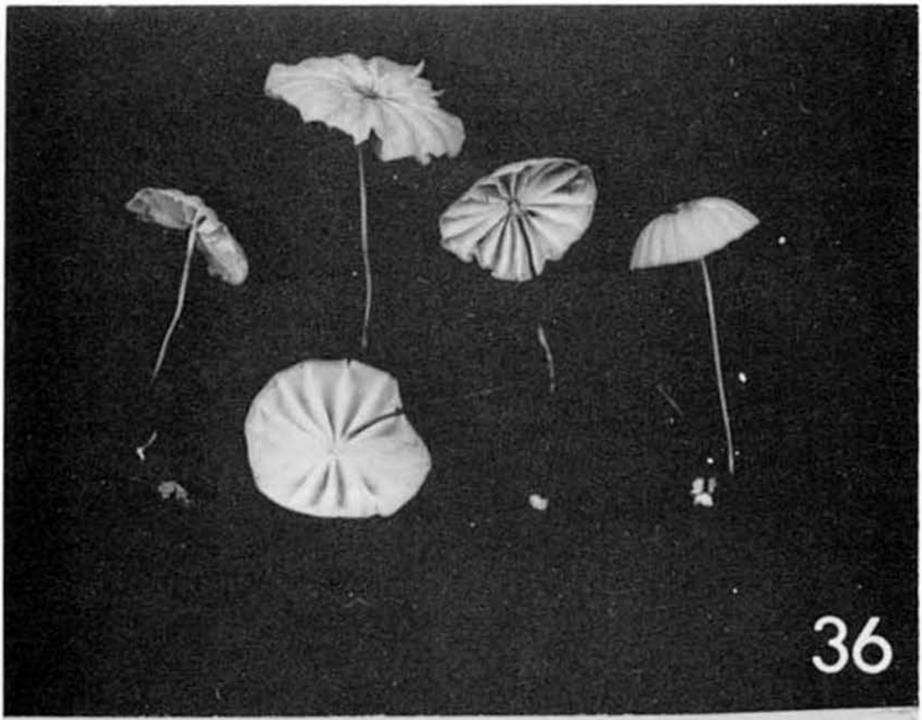
Scattered on decayed leaves in oak woods. Fruiting period uncertain; only known specimen found in mid-July.

Collection examined:

MICHIGAN: Smith 6591 (holotype of *Marasmius spadiceus* Gilliam).

21. MARASMIUS GLABELLUS Peck, Bull. Buffalo Soc. Nat. Sci. 1: 58. 1873 (1874). FIGS. 37 & 38

PILEUS 5-24 mm broad; convex or broadly campanulate at first, then convex or plano-convex and sometimes with a low umbo or indistinct central papilla, finally depressed, with the margin remaining decurved throughout; dry; dull; opaque; smooth at first, soon minutely rugulose on the disc; faintly to conspicuously striate up to 7/8 the pileus radius, particularly in age, the striae unequal in length and sometimes forming a star-shaped pattern on the disc at first; entire to crenate; pliant, but cracking on the surface when bent. CUTICLE minutely velutinous; at first deep yellowish brown (Sudan Brown), moderate brown (Verona Brown), moderate yellowish brown (Snuff Brown, M&P 13G8), or rarely strong brown, often with pale orange yellow radial striae, in age fading to pale orange yellow (Pinkish Buff) overall or retaining areas of deep yellowish brown on the disc, in dried basidiocarps deep yellowish brown, dark yellowish brown, or deep brown, often with light yellowish brown radial striae. TRAMA up to 1 mm thick in the disc; pliant; yellowish white. ODOR of crushed pilei mild



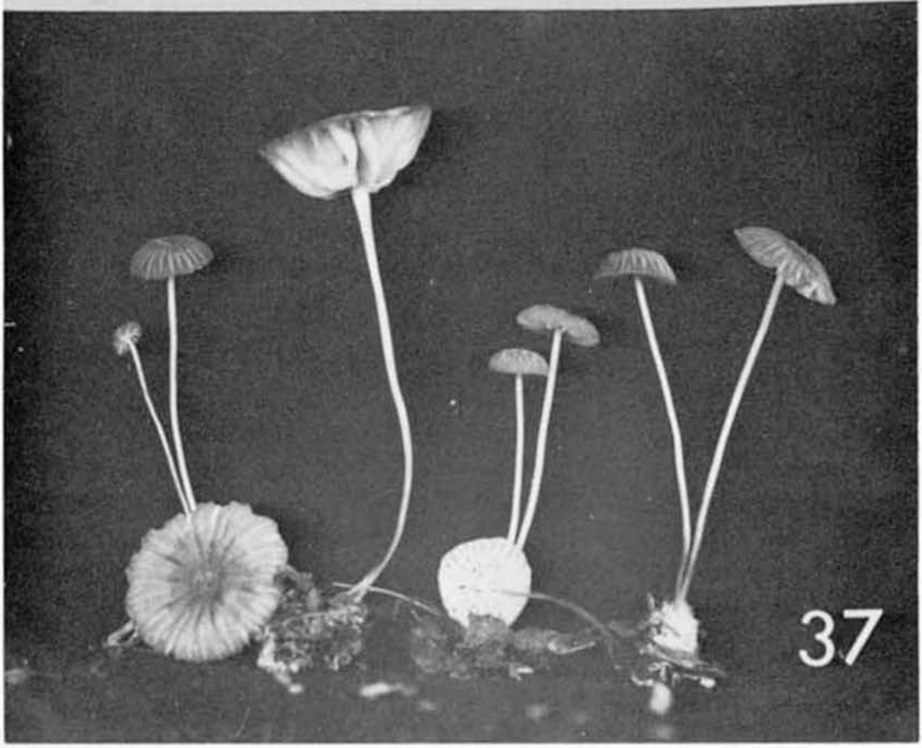


Figure 36. *Marasmius siccus*. Gilliam 869, x 1.

Figure 37. *Marasmius glabellus*. Gilliam 801, x 1.

with a spermatic component. TASTE mild, with a spermatic aftertaste.

LAMELLAE broad (1-6 mm broad); moderately thick; distant; few (12-15 reach the stipe); unequal, with the lamellulae alternating with the lamellae in a regular pattern; emarginate to free; pliant; entire; faintly intervenose at first, strongly so in age; not forked; pale yellow to yellowish white, sometimes with brown edges.

STIPE 15-58 mm long, 0.75-1.8 mm thick; central; terete, or flattened at the apex; equal or tapered slightly to the base; straight or curved, usually curling upon drying; dry; shining; opaque; hollow; broomstraw-like, or sometimes horny in old basidiocarps; even; glabrous; white at the apex at first, then yellowish white (M&P 9B2), the basal portion becoming light yellowish brown or moderate reddish brown (Chestnut) to deep brown, with the darker colors almost overall in age. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM tuftlike or cushion-like; of matted-fibrillose or cottony-tomentose, white to pale orange yellow hairs.

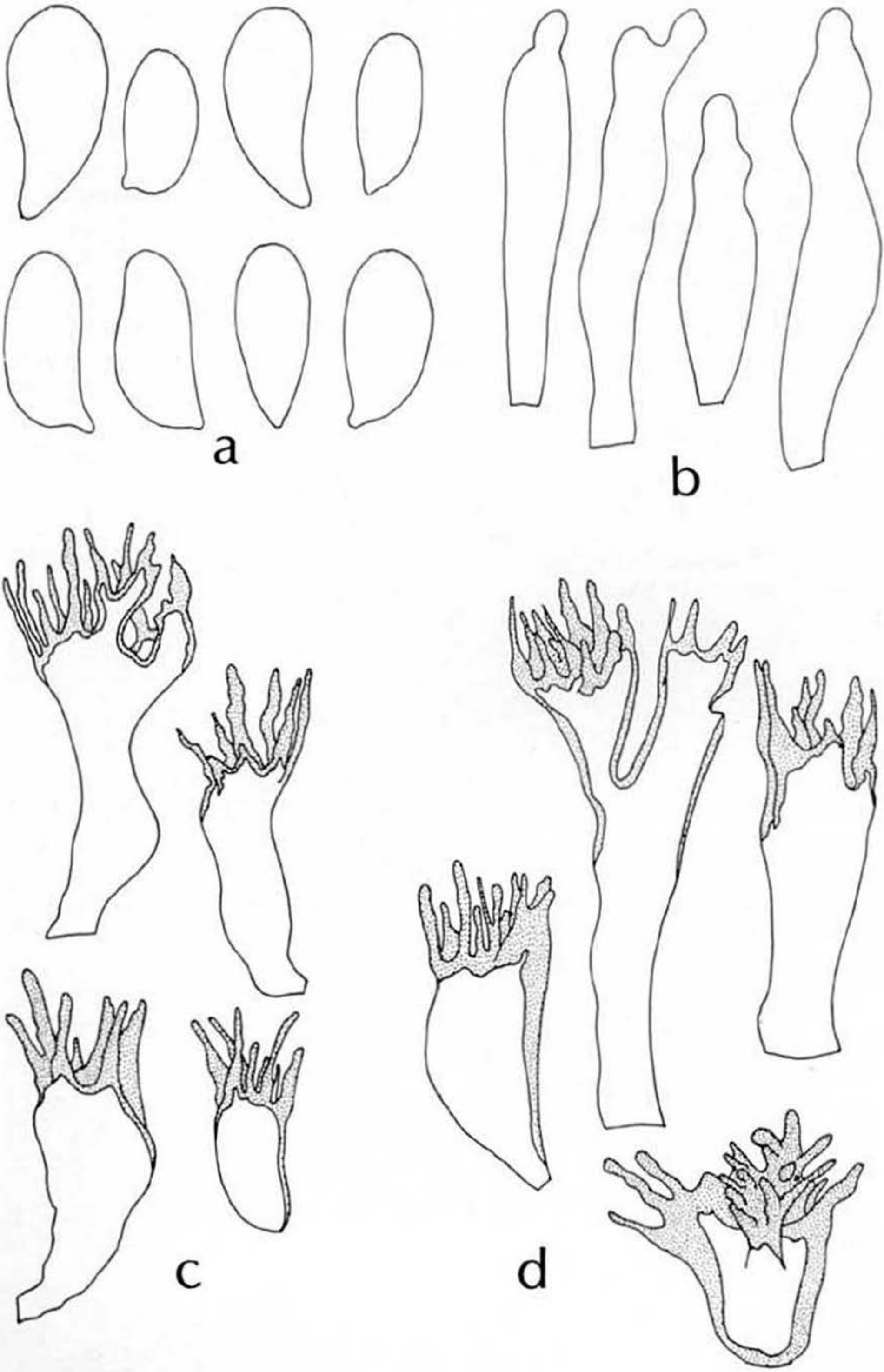
SPORES white in mass; (6-)7.0-11.5 X 3.1-6.0 µm; fusoid-elliptic, obovate, or broadly pip-shaped. BASIDIA 21-39 X 4-7 µm; subclavate to clavate; 4-spored. BASIDIOLES subclavate.

HYMENIAL CYSTIDIA 20-46 X 4-8 µm; fusoid-clavate; fusoid-ventricose, clavate, subcylindric, or rarely lobed; subcapitate, submoniliform, or capitellate, or if not, rounded apically; with thin, hyaline walls; nonamyloid; embedded or projecting up to 12 µm beyond the basidioles; rare and inconspicuous on the lamellar faces.

HYMENIAL BROOM CELLS 4.2-28 X 4-10 µm; elliptic, cylindric, clavate, hemispheric, or pedicellate and abruptly expanded at the apex; with 4-20 divergent, usually roughened, tapered, rodlike, dextrinoid projections 5.6-8.4 X 0.5(-1) µm; with hyaline to pale yellow walls up to 0.5 µm thick at the apex.

TRAMAL HYPHAE parallel to interwoven in the lamellae, interwoven in the pileus; inflated (up to 11 µm broad); with thin, hyaline walls; dextrinoid.

PILEUS CUTICLE a hymeniform layer of two types of broom cells: (1) cylindric, clavate, lobed, or rarely hemispheric broom cells 7-17(-28) X (3-)5-8.5 µm which are pedicellate or not, with 8-20 usually divergent, roughened,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sometimes short-branched projections 4-10 X 0.5-1.5 µm; and (2) isolated inset broom cells which are larger (up to 24 X 7 µm), with as few as 2 apical projections and with moderate orange yellow walls up to 2 µm thick.

STIPE corticated only in pigmented portions, the superficial hyphae elsewhere hyaline and undifferentiated. CORTICAL HYPHAE 3-5 µm broad; with pale yellow to moderate orange yellow walls up to 2 µm thick; dextrinoid. TRAMAL HYPHAE 4-7 µm broad; with thin, hyaline walls; dextrinoid. STIPE VESTURE lacking except for rare broom cells at the juncture of pileus and stipe.

Gregarious or subcespitose on decayed leaves in deciduous woods. Fruiting period: 5 Jul-29 Sep.

Collections examined:

INDIANA: Cummins, 27 Aug 1935 (FH). MICHIGAN: Gilliam 801 & 1551; Potter 4025; Smith 25892, 32857, 42151, 50039, 50040, 50041 & 74774. MISSOURI: Glatfelter 1136 (BPI). NEW JERSEY: Anderson, 20 Jul 1889 (NY). NEW YORK: Peck, Sep (NYS), Aug (NYS), & Jul & Aug (holotype of *Marasmius glabellus* Peck, NYS). NORTH CAROLINA: Harrison 11212. OHIO: Cooke 35821.

The distinctive combination of features which characterizes *Marasmius glabellus* includes the yellowish brown pileus color; the distant, rather shallow striae or sulcae on the pileus; and the distant, broad lamellae. The stipe is glabrous except for a conspicuous mycelial pad. Spores of *M. glabellus* are intermediate in length for species of section *Sicci*, are unusually broad, and have an apiculus which is more clearly defined than usual. Since pilei of basidiocarps of *M. glabellus* are smooth and convex at first, some specimens of *M. glabellus* may be confused with forms of *M. sullivantii*. For a comparison with that species, see the discussion under *M. sullivantii*.

Examination of the type specimen without reference to other collections gives a false impression of the size of the pileus in *M. glabellus*. All other collections that I have seen have had smaller pilei.

Figure 38. *Marasmius glabellus*. a. Spores, Gilliam 801, x2300. b-d. Gilliam 1500. b. Hymenial cystidia, x1500. c. Broom cells from lamellar edge, x2300. d. Broom cells from pileus cuticle, x2300.

22. MARASMIUS BELLIPES Morgan, J. Mycol. 11: 207. 1905.
FIGS. 6 & 39

Marasmius glabellus Peck var. *bellipes* (Morgan) Kauffman, Agar. Michigan 1: 66. 1918.

PILEUS 4-15 mm broad; campanulate at first, soon broadly pulvinate to convex and then convex-depressed, retaining throughout a conspicuous papilla, finally broadly convex-depressed; dry; dull; opaque; even at first, soon obscurely and then prominently striate to the central papilla. CUTICLE minutely velutinous; deep purplish red overall in the button stage, remaining so or becoming deep reddish brown on the papilla and fading on the disc through strong brown to light brown and finally light yellowish brown, paler over the striae.

LAMELLAE moderately broad; thin; distant; moderately numerous (20-25 reach the stipe); equal; crisped upon drying; pale yellow (dried).

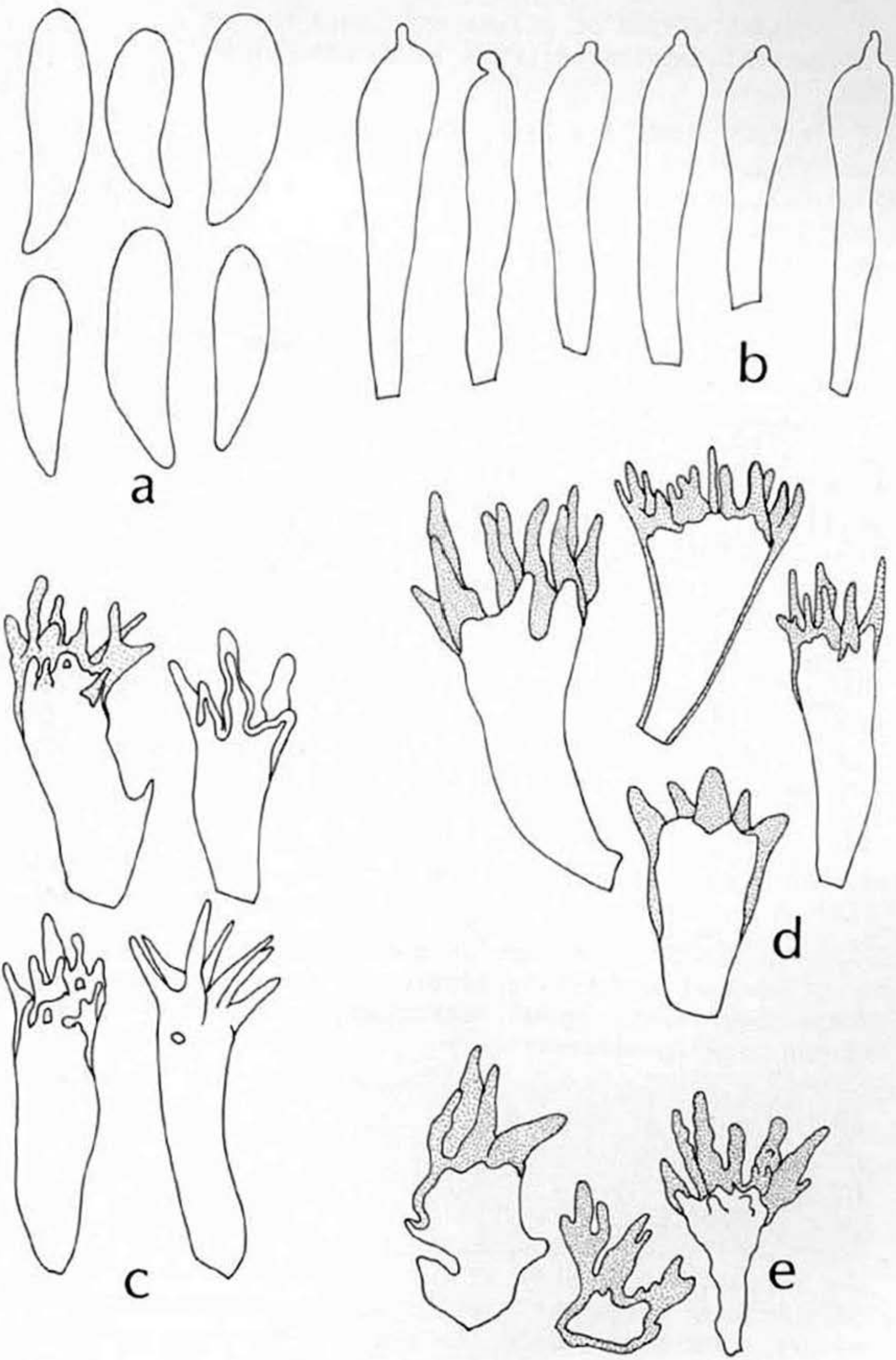
STIPE 22-40 mm long, 0.3-0.75 mm thick; equal or slightly tapered to the base or apex; straight; dry; shining; opaque; glabrous; hollow; broomstraw-like; smooth; very deep purplish red in the button stage, then grayish purplish red or moderate purplish red, fading from the base upward to light yellowish brown, becoming dark grayish brown at the base in age. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM often uniting several stipes; cottony; white; extensive.

SPORES 8.4-12(-14.6) X 2.8-3.6(-4.4) µm; curved-clavate, fusoid-elliptic, or pip-shaped. BASIDIA 26-32 X 4-5.5 µm; clavate. BASIDIOLES subclavate.

HYMENIAL CYSTIDIA 26-38 X 4-6 µm; clavate to cylindric; capitellate or short-appendiculate; with hyaline, thin walls; nonamyloid; scarcely projecting; infrequent to moderately abundant on the lamellar faces.

HYMENIAL BROOM CELLS 8-16 X 4-5.5 µm; narrowly clavate to cylindric; with hyaline to pale yellow, smooth or somewhat roughened, usually acute, dextrinoid projections 1-3.5 X 0.2-1.2 µm; with thin, hyaline walls; abundant on the lamellar edges.

Figure 39. *Marasmius bellipes*. Morgan, 1905 (type).
a. Spores, x 2300. b. Hymenial cystidia, x1500.
c. Broom cells from lamellar edge, x2300. d. Broom cells from pileus cuticle, x2300.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TRAMAL HYPHAE of pileus and lamellae 4-7 µm broad; interwoven; uninflated; with thin, hyaline walls; dextrinoid.

PILEUS CUTICLE a hymeniform layer of broom cells of two types: (1) short-clavate or obovate broom cells 5.5-18 X 4-11 µm which are often almost triangular in section and which have 6-20 roughened or smooth, hyaline to dark orange yellow, often tapered, dextrinoid projections 2-7 X 0.3-2.0 µm and pale orange yellow walls up to 2 µm thick; and (2) isolated inset broom cells with walls up to 2 µm thick, often bent or contorted, with fewer, often broader, projections.

STIPE corticated only in the pigmented portions, the superficial hyphae elsewhere hyaline and undifferentiated. CORTICAL HYPHAE 2-4.5 µm broad; with dark orange yellow walls up to 1 µm thick, or with the wall occluding the lumen. TRAMAL HYPHAE up to 6 µm broad; with thin, hyaline walls, or with the wall pale yellow, refractive, and occluding the lumen. VESTURE present only at the extreme apex of the stipe; of rare broom cells with a reduced or obsolescent base and numerous dark orange yellow, rodlike projections 2-8 X 0.5-1.5 µm.

Gregarious on old leaves in deciduous woods. Fruiting period: 8 June-11 September.

Collections examined:

OHIO: Morgan, 1906 (5 collections, IA), 8 Jun 1892 (IA), & 11 Sep 1905 (holotype of *Marasmius bellipes* Morgan, IA). WISCONSIN: Mazzer 6626.

The macroscopic description is based on notes from fresh material by Samuel Mazzer and on my own observations of the type specimens.

Morgan's specimens of *Marasmius bellipes* look similar to *M. glabellus*, since both species have convex, distantly striate pilei and broad lamellae. The purple tints of the stipe and the disc of *M. bellipes*, together with narrower spores, distinguish it from *M. glabellus*. From *M. pulcherripes*, which also usually has pink or purple colors on the pileus, *M. bellipes* differs in having broad, distant lamellae and a distantly striate, convex-depressed pileus, as well as shorter, relatively narrower spores. *M. bellipes* is closest to *M. borealis*, but this latter species has a smooth (non-sulcate) light yellowish brown pileus at maturity, narrow lamellae, and larger spores.

23. MARASMIUS PULCHERRIPES Peck, Annual Rep. New York State Mus. 24: 77. *pl. 4, f. 19-22.* 1871 (1872). FIG. 40

PILEUS 3-15(-20) mm broad; obtusely to sharply conic or campanulate at first, becoming conic-convex, campanulate with a sharp central papilla or umbo, finally broadly convex-umbonate, plano-umbonate, or plano-convex, with the margin flared or not; dry; dull; opaque, or sometimes translucent on the margin; minutely granular-roughened; even at first, soon closely to distantly plicate or striate; entire or crenate; membranous and delicate; reviving. CUTICLE minutely velutinous; at first moderate yellowish pink, dark yellowish pink (M&P 4J9), grayish reddish orange (M&P 5D-E10, Etruscan Red), grayish red (M&P 6J-K8, Indian Red, Corinthian Red), or moderate reddish brown (M&P 7H10), in some strains brownish orange or light yellowish brown from the first, the disc often darker [moderate reddish brown, dark reddish brown, or grayish red (Ocher Red) in pink strains, brownish orange in light yellowish brown strains], on drying and in age remaining these colors or fading to moderate yellowish pink (Vinaceous Fawn), grayish yellowish pink (Light Vinaceous-Fawn), or light yellowish brown (M&P 11B6, 11D4-6, 11I5, 12C7, 12H7-8), sometimes with the disc moderate brown (M&P 15A9) to light grayish reddish brown (Fawn Color). TRAMA thin (less than 1 mm thick in the disc); fragile; white. ODOR lacking. TASTE lacking or rarely faintly raphanoid or bitter.

LAMELLAE narrow, becoming moderately broad in age (1.5 mm broad in a pileus 9 mm broad); thin; subdistant to distant; moderately numerous (15-23 reach the stipe); equal, or if unequal, with only 1 or 2 short lamellulae; adnexed to free or rarely with a partial, adnate collar; fragile; entire or occasionally serrate or dentate; straight at first, becoming ventricose in age; not intervenose; not forked; crisped or not; often pale yellowish pink (Tilleul-Buff) or pinkish gray (Pale Ecru-Drab) at first, soon white or nearly so (M&P 9B1, 11B2), sometimes with minute brown dots on the lamellar edge.

STIPE 16-63 mm long, 0.2-0.6 mm thick; central; terete; equal, or enlarged slightly at the apex; straight or curved and often twisted; dry; shining; opaque; hollow; wiry; even; glabrous; moderate pink, dark pink, grayish red, grayish yellowish pink (Light Vinaceous-Fawn) or light yellowish brown overall at first and later on the apex only, the basal portion becoming grayish yellow (M&P 11C4), dark orange yellow (M&P 13K9), light yellowish brown, or moderate reddish brown to dark reddish brown or blackish brown, with the darker colors extending progressively upward in age. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM tuftlike; white or sometimes grayish white; rarely extending to the surrounding substrate.

SPORES white in mass; (9.5-)11.0-15.2(-16.8) X 2.8-4.3 µm; narrowly curved-clavate, subfusiform, narrowly tapered-elliptic, or occasionally pip-shaped. BASIDIA 19.5-36.5 X 4.5-7 µm; clavate, subclavate, or subcylindric; 4-spored. BASIDIOLES subclavate.

HYMENIAL CYSTIDIA 20-60 X 2-11 µm; cylindric, clavate, fusiform, fusoid-clavate, or fusoid-ventricose; capitellate, submoniliform, or short- to long-appendiculate, or if not, then rounded apically; with thin, hyaline walls; nonamyloid; embedded or projecting up to 15 µm beyond the basidioles; rare to common on the lamellar faces.

HYMENIAL BROOM CELLS 2-17(-25) X 2-8.5 µm; cylindric, clavate, pyriform, subglobose, lobed, or strongly reduced; with numerous (5-20) pale yellow to moderate orange yellow, parallel to slightly divergent, equal, smooth, dextrinoid, rodlike projections 2-7 X 0.5(-1) µm, or rarely with a few hyaline diverticula up to 2 µm long; present only on the lamellar edges.

TRAMAL HYPHAE interwoven and inflated (up to 11 µm broad) in the pileus; parallel to interwoven, uninflated and 3-6 µm broad in the lamellae; hyaline; dextrinoid.

PILEUS CUTICLE a hymeniform layer of two types of broom cells: (1) cylindric, clavate, ovate, elliptic, globose, deeply 2-lobed, or hemispheric and occasionally pedicellate broom cells 3-18 X 3-11(-14) µm, with 6-30 equal, parallel to slightly divergent, usually smooth, rounded, rodlike projections 2.8-9.8 X 0.5 µm which are dark red to moderate pink in water when fresh (pink strains) but moderate orange yellow to light yellowish brown otherwise (in light yellowish brown strains and in pink strains when revived in 2% KOH), with hyaline to pale pink walls up to 1 µm thick; and (2) broom cells at regular intervals with pale yellow to moderate orange yellow walls up to 2 µm thick and with fewer projections which are up to 2 µm thick.

STIPE corticated only in pigmented portions, the superficial hyphae elsewhere hyaline and undifferentiated.

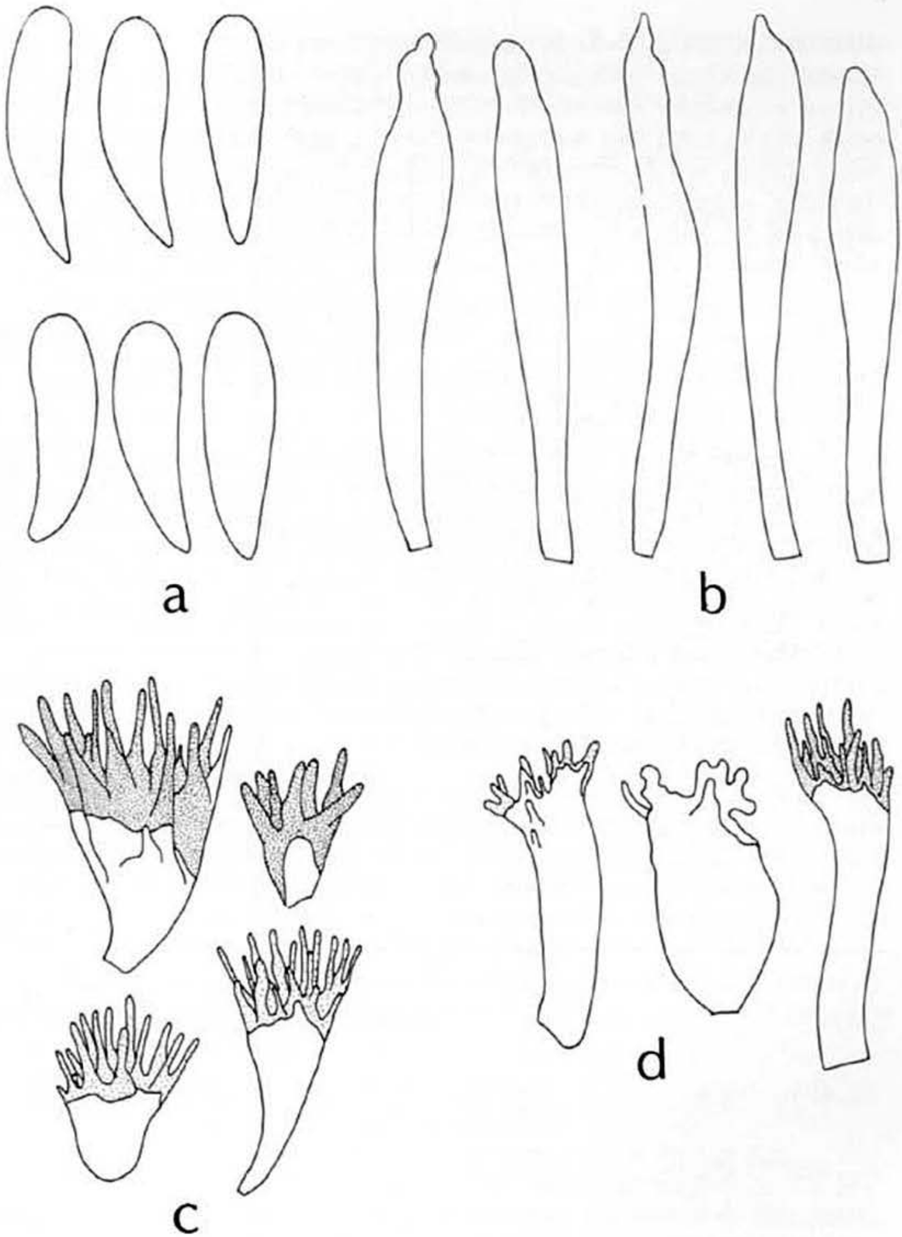


Figure 40. *Marasmius pulcherripes*. Gilliam 670. a. Spores, x2300. b. Hymenial cystidia, x1500. c. Broom cells from lamellar edge, x2300. d. Broom cells from pileus cuticle, x2300.

CORTICAL HYPHAE 6-8 µm broad; with walls up to 2.5 µm thick which are strong brown in water when fresh and olive green when revived in 2% KOH. TRAMAL HYPHAE 3-14 µm broad; with thin, hyaline walls or rarely with pale yellow refractive walls which completely fill the lumen. STIPE VESTURE lacking except for rare, scattered moderate pink to moderate red or light yellowish brown (in water mounts) irregular broom cells at the juncture of stipe and pileus.

Gregarious on deciduous leaves, pine needles, and woody debris in deciduous, deciduous-coniferous, and coniferous woods. Fruiting period: 17 June-13 October.

Collections examined:

CONNECTICUT: Earle (NY). MARYLAND: Kelly 22. MASSACHUSETTS: Bigelow 8254 (MASS) & 8525 (MASS); Linder, 20 Jun 1942 (FH). MICHIGAN: Gilliam 631, 670, 739, 740, 811, 813, 814, 871, 872, 873, 927, & 928; Nimke 35; Shaffer 2524 & 2652; Smith 6520, 39364, 41689, & 63063. NEW YORK: Bigelow 5129 (MASS); Peck, 9 Aug (lectotype of *Marasmius pulcherripes* Peck, NYS). NORTH CAROLINA: Harrison 10969, 10978, & 10979. OHIO: Moldenke 13033 (FH). PENNSYLVANIA: Dallas, Jul 1902 (BPI). TENNESSEE: Hesler 9645 (FH). VERMONT: Bigelow 13469 (MASS).

Often considered simply a pink form of *Marasmius siccus, M. pulcherripes* is sufficiently distinct to be recognized at the specific level. The two species are compared below:

Character	*M. siccus*	*M. pulcherripes*
Pileus color when young	moderate orange to strong brown	pink to moderate red or light yellowish brown
Pileus shape	convex, often umbilicate	campanulate, then convex
Pileus texture	moderately tough	rather delicate
Color of extreme stipe apex	brownish orange, light yellowish brown	purplish pink, moderate red, rarely light yellowish brown
Spore length	up to 15-18(-20) µm	(9.5-)11-15.2 (-16.8) µm
Hymenial cystidia	pale yellow, refractive,	hyaline, not refractive, not curved

	curved basally, arising deep in the trama	basally, arising at the level of the basidioles
Cuticular broom cells	only of one type, with more or less uniformly thick walls	of two types, some with thin walls and narrow projections, others not

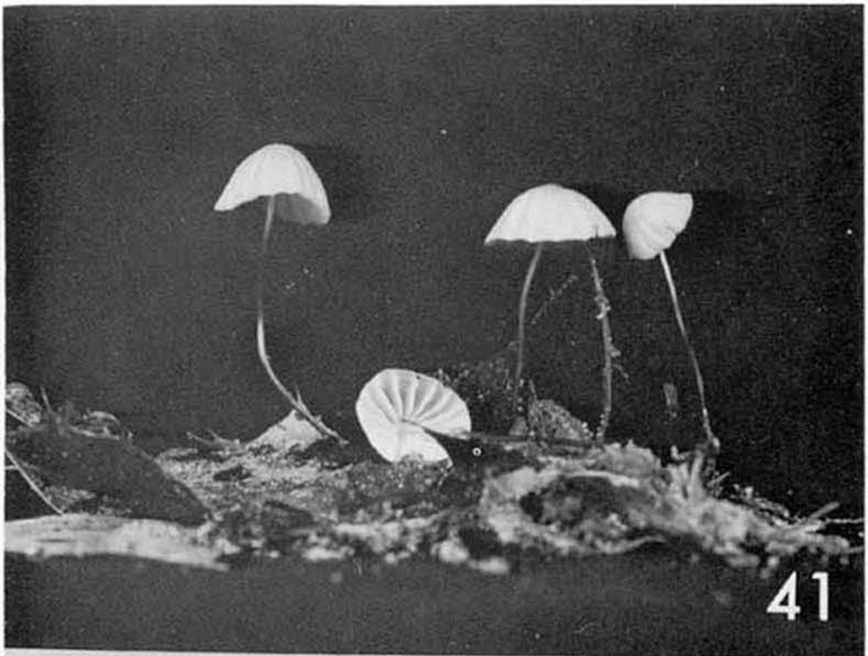
The holotype of *Marasmius pulcherripes* (NEW YORK: Garrisons, June, Peck, NYS) could not be located in the Peck herbarium; consequently I am following the suggestion of Stanley Smith that a lectotype be designated from among Peck's authentic collections. There are two such collections: Northville, (no date), Peck; and W. Shokan, 9 Aug, Peck. The Northville collection is mixed, containing several basidiocarps of *M. albiceps* (considered in the present work to be a *Mycena)*. It seems appropriate, then, to designate the W. Shokan collection as lectotype of *M. pulcherripes*.

According to Singer (39), *Marasmius pulcherripes* is the only acystidiate species of the North American *Sicci*. Although they are difficult to see except in squash mounts of 2% KOH and congo red, hyaline, usually capitate hymenial leptocystidia are present.

A common variant of *Marasmius pulcherripes* (e.g., Bigelow 8254, Gilliam 739 & 871) lacks the pink tints characteristic of the pileus and stipe but is otherwise similar in all respects. Microscopically the two are indistinguishable. Both the pink and the light yellowish brown forms may often be collected at the same site, although the groups of fruiting bodies do not occupy the same area.

24. MARASMIUS ROBINIANUS Gilliam, sp. nov. FIGS. 41 & 43

Pileus 4.5-13 mm latus, primitus hemisphaericus, obtuse conicus, vel rare campanulatus et interdum papillatus, in aetate convexus, membranaceus, distante plicatulus vel sulcatulus, ex aurantiaco aurantio-luteolus vel armeniacus, sulcis pallidioribus, inodorus. Sapor parum amarus. Lamellae angustae vel modice latae, tenues, distantes, paucae (11-16), aequales, adnexae vel subliberae, membranaceae, eburneae vel luteolae, in aetate albidae. Stipes 25-47 mm longus, 0.1-0.5 mm crassus, aequalis, nitidus, filiformis sed firmus et flexilis, apice eburneo vel flavissimo, base flavo-brunneo vel ferrugineo. Mycelium



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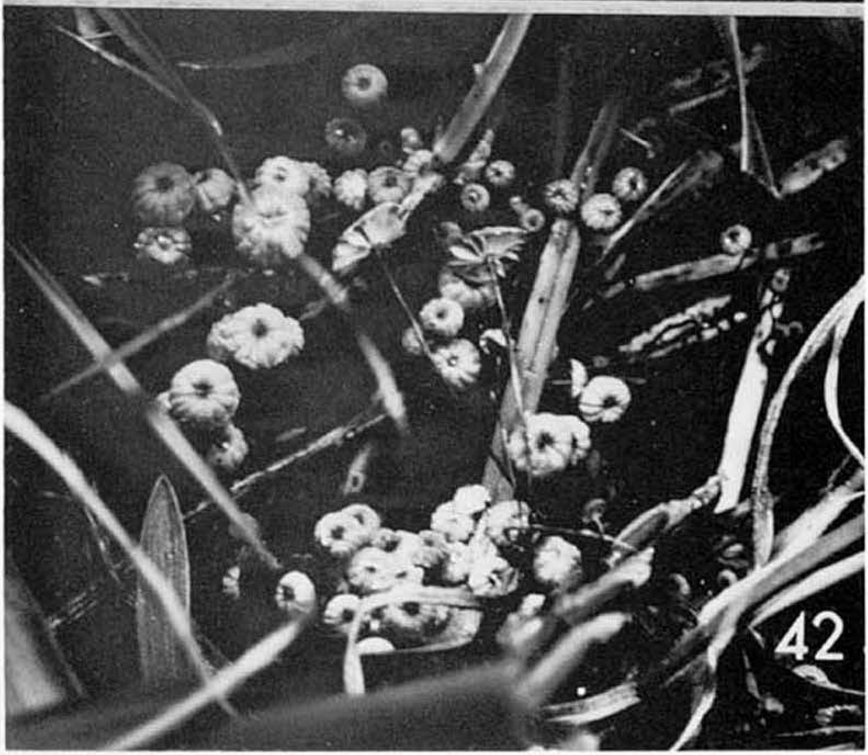

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basale pilis lutescentis in annulo tenuo. *Sporae 9.8-15.7 X 2.8-4.2 μm, fusiformia vel clavata.* *Echinidia hymenii 5.5-20 X 4-7 μm, clavata vel cylindricia, tenuitunicata, cum 6-20 projecturis flavo-aurantiacis 4-9 X 0.5-1 μm praedita, in marginibus lamellibus.* *Trama pilei dextrinoidea.* *Cuticula pilei hymeniformis, echinidiis 7-17 X 3-10 μm, cylindrica, tenuitunicata et crassitunicata intervallis regularibus, cum 10-25 projecturis 3-5.5(-10) X 0.5-1.5 μm praedita.* *Echinidia in apice stipitis luteola.* *Holotypus:* MICHIGAN: Livingston Co.: Oak Grove State Game Area, 18 Jul 1972, Gilliam 1511 (MICH).

PILEUS 4.5-13 mm broad; hemispheric, obtusely convex, conic-convex, or rarely campanulate, convex in age, papillate or not; dry; dull; opaque; smooth; at first even, then shallowly to deeply sulcate to the disc; entire, lobed or crenate; membranous and delicate. CUTICLE minutely velutinous; at first light orange to moderate orange overall, soon pale orange yellow to pale yellowish pink, often darker (moderate orange) on the papilla and paler on the sulcae. TRAMA thin; yellowish white. ODOR mild. TASTE faintly bitter, with a raphanoid aftertaste.

LAMELLAE narrow to moderately broad (1-2 mm broad); thin; distant; few (11-16 reach the stipe); equal, or with 1 or 2 lamellulae; adnexed or almost free; membranaceous; entire or minutely fimbriate; ventricose; not intervenose; not forked; yellowish white or pale yellow at first, becoming white in age.

STIPE 25-47 mm long, 0.1-0.5 mm thick; central; terete; equal; straight, or curved at the base; dry; shining; opaque; hollow; stiff and hairlike yet fragile; even; glabrous; yellowish white to brilliant yellow on the upper 1-4 mm, light yellowish brown, moderate yellowish brown, or deep yellowish brown to dark yellowish brown or strong brown below. STERILE STIPES and RHIZOMORPHS absent. BASAL MYCELIUM usually present as a faint pale yellow ring at the point of emergence.

SPORES 9.8-15.7 X 2.8-4.2 μm; clavate or naviculate. BASIDIA 24-32 X 5.5-7 μm; subclavate to clavate; 4-spored. BASIDIOLES subfusiform or subclavate.

HYMENIAL CYSTIDIA 31-42 X 4-10 μm; fusiform, clavate,

Figure 41. *Marasmius robinianus*. Gilliam 1511, x 1-1/4.

Figure 42. *Marasmius graminum*, x 1-1/2.

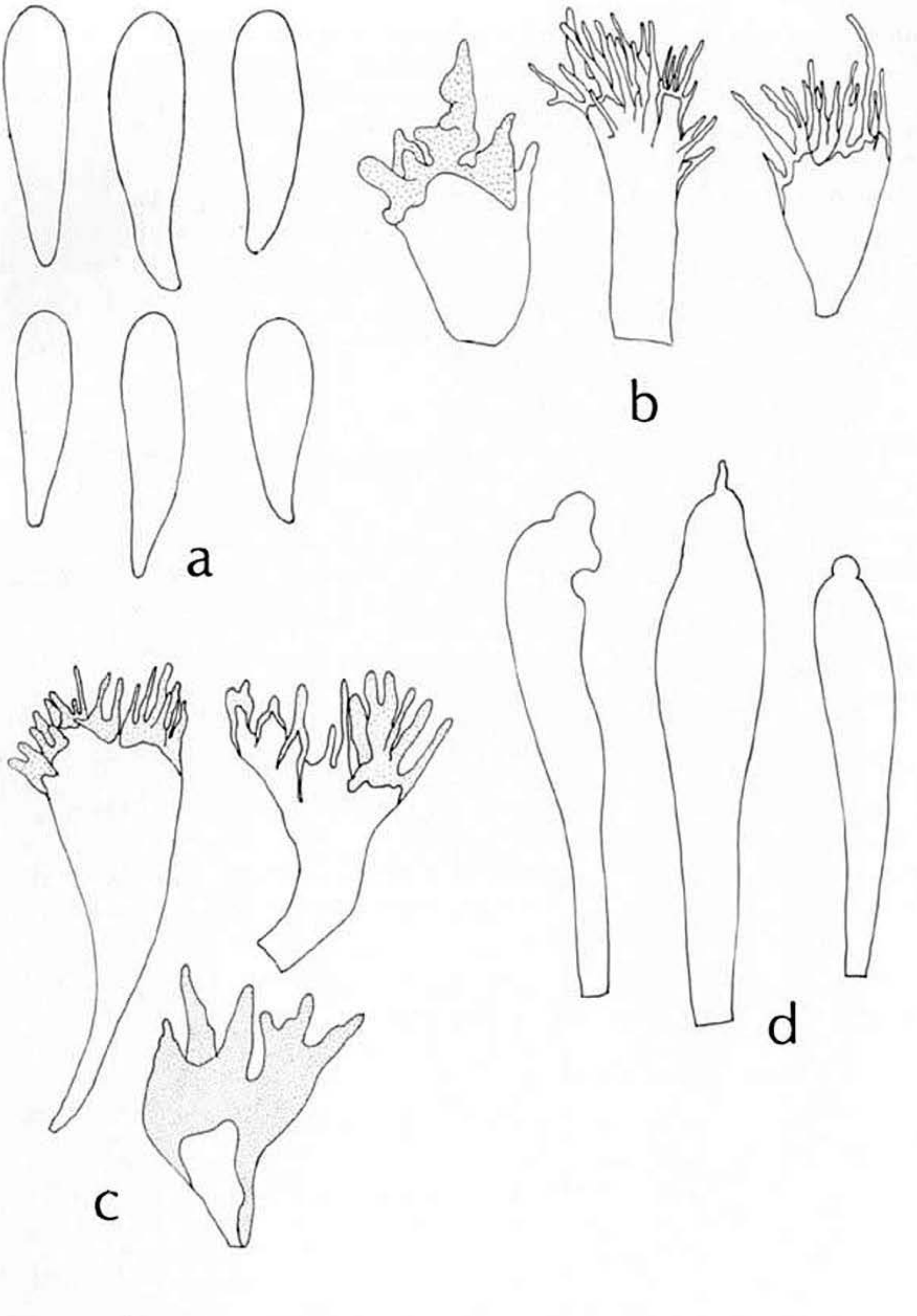

Figure 43. *Marasmius robinianus*. Gilliam 1511. a-c. x2300. a. Spores. b. Broom cells from the lamellar edge. c. Broom cells from the pileus cuticle. d. Hymenial cystidia, x1500.

or fusoid-clavate; rounded, subcapitate, or capitate apically; with hyaline walls up to 0.5 µm thick; projecting up to 14 µm beyond the basidioles; rare to moderately abundant on the lamellar faces.

HYMENIAL BROOM CELLS 5.5-20 X 4-7 µm; clavate or cylindric; with 6-20 smooth or roughened, acute, moderate orange yellow projections 4-9 X 0.5-1 µm thick; with hyaline or moderate orange yellow walls up to 0.5 µm thick.

TRAMAL HYPHAE of pileus and lamellae 3-11 µm broad; interwoven; uninflated; with hyaline walls up to 0.5(-1.0) µm thick; dextrinoid.

PILEUS CUTICLE a hymeniform layer of two types of broom cells: (1) cylindric to clavate or rarely lobed broom cells 7-17 X 3-10 µm, with 10-25 smooth or roughened, acute, moderate orange yellow, delicate rodlike projections 3-5.5(-10) X 0.5(-1) µm, and with hyaline to moderate orange yellow walls up to 0.5 µm thick; and (2) broom cells with walls up to 1.5 µm thick and projections up to 1.5 µm thick, occurring at regular intervals and imparting a mottled appearance to the pileus surface.

STIPE corticated overall. CORTICAL HYPHAE 2-4.5 µm broad; with hyaline to moderate orange yellow walls up to 1 µm thick or with the wall completely occluding the lumen; dextrinoid. TRAMAL HYPHAE up to 10 µm broad; with hyaline walls up to 1 µm thick; dextrinoid. STIPE VESTURE of pale yellow, irregularly shaped broom cells with projections up to 11 µm long; frequent at the stipe apex, rare or absent elsewhere.

Gregarious on humus and leaves under *Robinia pseudoacacia*. Fruiting period uncertain.

Collections examined:

MICHIGAN: Gilliam 1509 & 1511 (holotype of *Marasmius robinianus* Gilliam).

Marasmius robinianus is closely related to *M. pulcherripes*. The unique combination of features defining *M. robinianus* includes the hemispheric to convex apricot-colored pileus, few lamellae (11-16 vs. 15-23 in *M. pulcherripes*), and a white to brilliant yellow stipe apex. The projections on both the hymenial and the cuticular broom cells are finer than in *M. pulcherripes*. The occurrence on leaves of *Robinia pseudoacacia* leaves is unusual for a *Marasmius*.

MARASMIUS section HYGROMETRICI ["Hygrometriceae"] Kühner, Botaniste 25: 95. 1933.

Marasmius I Insititii I Setipedes a Foliicolae Quélet, Fl. Mycol. France 311. 1888.

Type species: *Marasmius hygrometricus* Briganti, Fung. Neap. 87. 1848.

Pileus small (<5 mm broad), plano-convex or convex, radially striate or not, thin, tough-membranous, dark in color. Odor and taste mild. Lamellae thin, or sometimes foldlike and then thick, few or lacking altogether, distant to remote, adnate or attached to a partial, adnate collar. Stipe thin (0.1 mm or less thick), pliant, glabrous, insititious. Rhizomorphs lacking, but sterile stipes present.

Spores obovate, nonamyloid. Hymenial cystidia fusoid-ventricose, often capitate or tapered, hyaline. Trama nonamyloid. Pileus cuticle a hymeniform layer of three types of cells: (1) broad, obovate or sphaeropedunculate broom cells closely ornamented with moderate brown, often acute warts, (2) rare cystidia similar to the hymenial cystidia, and (3) smooth cells similar to the broom cells in shape and size. Stipe cortex of roughened or spiculate thick-walled hyphae and occasional hyaline cystidia.

On leaves of deciduous trees.

With only one species here included:

25. MARASMIUS MINUTUS Peck, Annual Rep. New York State Mus. 27: 97. 1873 (1875). FIG. 44

Marasmius capillipes Saccardo, Nuovo Giorn. Bot. Ital. 8: 162. 1876.

Marasmius pyrinus Ellis, Bull. Torrey Bot. Club 8: 64. 1881.

PILEUS minute (0.1-3.2 mm broad); deeply convex or conic-convex at first, often with the margin incurved, remaining conic-convex or becoming plano-convex to plane, often with the disc slightly depressed; dry; dull; opaque; minutely roughened; not striate or distantly striate to sulcate inward to the disc; entire, lobed, or crenate; tough-membranous; drying and reviving rapidly. CUTICLE minutely velutinous; grayish brown (Natal Brown) when young, becoming moderate brown tinged pink (M&P 14B7-9, 15A7-10, Brownish Vinaceous), light grayish brown, light grayish yellowish brown, or light yellowish brown (Wood Brown), often darker (moderate brown, M&P 16A9-11, dark brown, Army Brown) on the disc and sometimes in the sulcae or on the extreme edge, darker overall (moderate brown, strong brown) upon drying. TRAMA indistinguishable. ODOR lacking. TASTE not tested.

LAMELLAE narrow and thin (less than 0.5 mm broad) or sometimes foldlike to ridgelike; distant to remote; few [1-6(-12)] or sometimes even lacking; equal; adnate or with a partial, adnate collar; pruinose overall; pliant; entire; straight; soon becoming crisped; minutely intervenose or not; sometimes forked halfway in to the stipe; white, yellowish white, or rarely purplish white.

STIPE 0.2-22 mm long, 0.1 mm or less in thickness; central; filiform; equal; curved, soon twisted and curled; dry; shining; opaque; solid; pliant; even or minutely longitudinally ribbed; glabrous; light yellowish brown, dark yellowish brown, deep yellowish brown (M&P 14F7-11), or pale yellow (near Cartridge Buff) at the apex, blackish brown or moderate reddish brown (Chestnut-Brown) below; insititious. RHIZOMORPHS absent. STERILE STIPES abundant; threadlike; tapered; upright; blackish brown.

SPORES white in mass; (4.5-)5.6-8.4 X 2.1-4.2 µm; pip-shaped, narrowly fusiform, or narrowly obovate. BASIDIA 15-22 X 4-7 µm; clavate, subclavate, or subcylindric; 4-spored or rarely 2-spored. BASIDIOLES fusiform with short necks and subcapitate or acute apices.

HYMENIAL CYSTIDIA 11-22 X 4-6 µm; lecythiform or fusoid-ventricose; subcapitate or rounded apically; with hyaline walls up to 0.5 µm thick; projecting up to 5 µm beyond the level of the basidioles; rare on the lamellar edges and faces.

TRAMAL HYPHAE interwoven and inflated up to 10 µm broad in the pileus; parallel, uninflated, and 1.4-3.0 µm broad in the lamellae; with thin, hyaline walls; nonamyloid.

PILEUS CUTICLE an irregular hymeniform layer of three types of cells: (1) subglobose, clavate, fusiform, sphaeropedunculate, obovate, pulvinate, or angular and irregular broom cells 7-21 X 2-18 µm, with closely spaced, often aligned, hyaline to moderate brown or deep brown, convex, conic, or cylindric warts or spines 0.2-1(-3) X 0.5-1 µm and with hyaline, moderate yellowish brown, or deep brown refractive walls up to 3 µm thick, usually tinted purplish white or light purplish gray in the lumen; (2) smooth cells of the same shapes and dimensions as the broom cells, with thin, hyaline walls; and (3) lecythiform or fusoid-

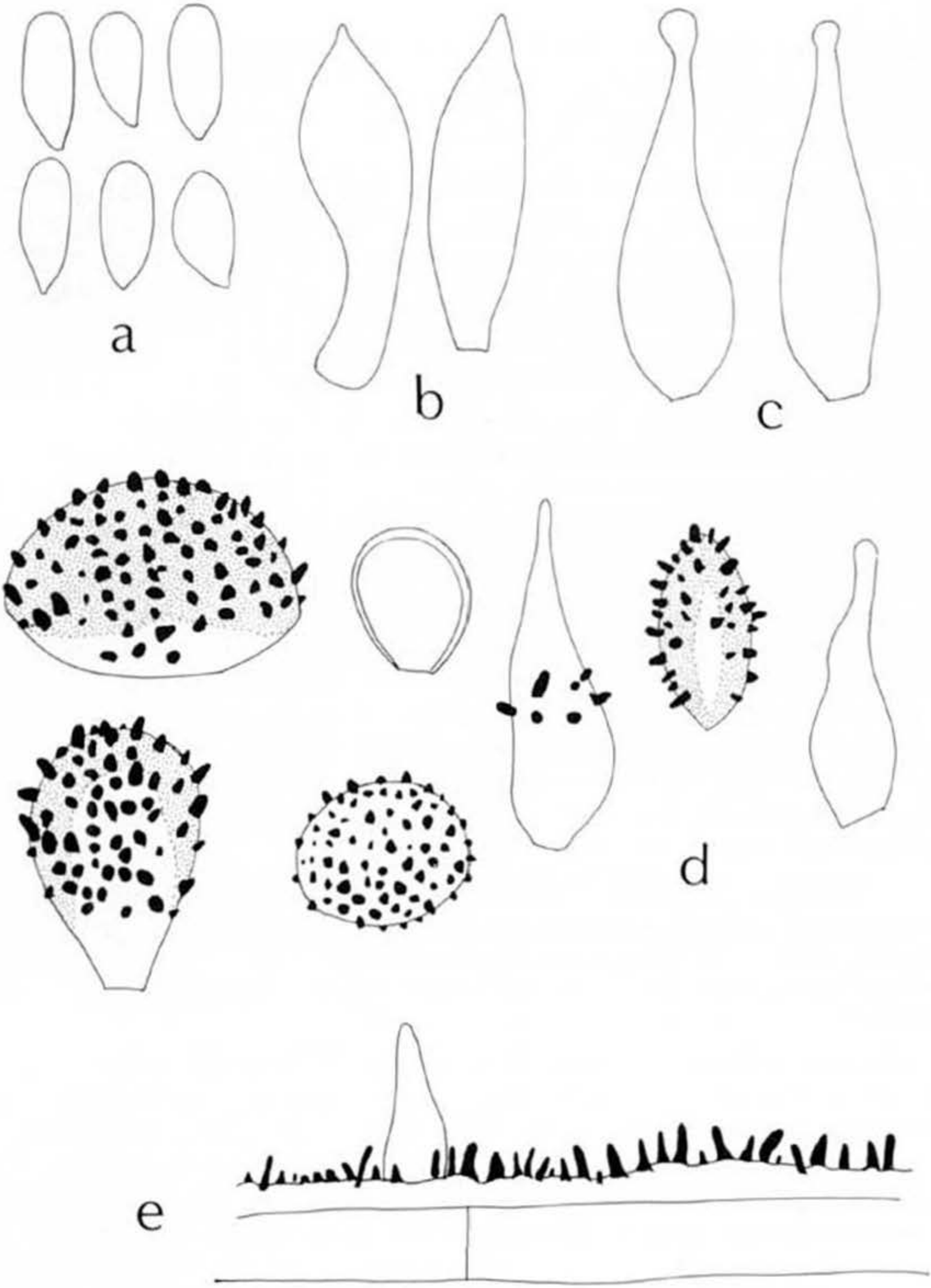

Figure 44. *Marasmius minutus*. Gilliam 1444. a. Spores, x2300. b. Basidioles, x1500. c. Hymenial cystidia, x1500. d. Cells from the pileus cuticle, x2300. e. Longitudinal section of the stipe cortex, x850.

ventricose cystidia 14-18 X 3.5-4.5 µm which are similar to the hymenial cystidia.

STIPE corticated only in pigmented portions, the superficial hyphae elsewhere hyaline and undifferentiated. CORTICAL HYPHAE 1.4-3.0 µm broad; with dark yellowish brown to dark brown walls up to 1.5 µm thick; nonamyloid; closely ornamented with short, hyaline to moderate yellowish brown spines up to 3 X 1 µm; sometimes with projecting hyaline, thin-walled lecythiform cells 8-14 X 3-5.5 µm with subcapitate or capitate apices. TRAMAL HYPHAE 1.5-3(-10) µm broad; with hyaline walls up to 0.5 µm thick, or sometimes with the wall occluding the lumen; nonamyloid.

Gregarious on curled, blackened leaves of *Fraxinus* in recently dried mucky openings of elm-ash swamps; rarely on well-decayed leaves and twigs of *Ulmus, Pyrus,* or *Populus*. Fruiting period: 16 June-15 November.

Collections examined:

ITALY: Saccardo, 1897, *Mycotheca Italica* (as *Marasmius capillipes,* BPI). CANADA: ONTARIO: Overholts 18503; Smith 4119, 26443, & 26451. UNITED STATES: MARYLAND: Hutchins, 24 Jun 1920 (BPI). MASSACHUSETTS: Singer, 18 Sep 1943 (as *M. capillipes,* FH). MICHIGAN: Brooks 1341 & 1356; Gilliam 1010 & 1444; Potter 5358; Shaffer 2526; Smith 33-774, 6619, 6838, 18842, 21791, 22031, 26039, 74587, & 77999. NEW HAMPSHIRE: Farlow, 6 Aug 1909 (FH). NEW JERSEY: Ellis, Jun 1880, North American Fungi 401 (holotype of *Marasmius pyrinus* Ellis, NY; isotypes, NYS, MICH, FH). NEW YORK: Peck, Aug (NY), 13 Aug 1910 (NY), 1874 (holotype of *M. minutus* Peck, NYS). PENNSYLVANIA: Stevenson, 15 Nov 1945 (BPI). VIRGINIA: Charles, 13 Sep 1939 (BPI). WISCONSIN: Dodge 1909 (NYS).

Although *Marasmius minutus* usually grows on curled, blackened leaves of *Fraxinus,* fruitings do occur occasionally on other substrates. These exceptions to the rule are frequent enough so that recognition of *M. pyrinus* does not seem justified, since the only difference between the type specimens of that name and of *M. minutus* is one of substrate. I have not seen the type of *M. capillipes;* however, one of Saccardo's exsiccati specimens identified as such and distributed several years after his publication of the species (ITALY: Vittorio, Sep 1897, Saccardo, *Mycotheca Italica,* BPI) agrees closely with *M. minutus*.

Although the specimen of *North American Fungi 401* now at NY was retained in Ellis' private herbarium and could therefore be considered the holotype of *Marasmius pyrinus*, there is very little if any usable material present. The best isotype appears to be that at MICH.

In Pennington (25) pale forms of *Marasmius graminum* will sometimes key to *M. minutus*. Although the former is usually found on grass and the latter on ash leaves, similarity in stature of the basidiocarps and in color of the pilei may make determination of dried material difficult. *M. graminum* has a free, usually complete collar, while *M. minutus* usually lacks a collar altogether, or if one is present, it is only partial and adnate to the stipe. In addition, hyphal walls of the stipe in *M. minutus* are spiculate, and those of *M. graminum* are smooth.

MARASMIUS section MARASMIUS

Marasmius tribus Mycena subtribus Rotulae Fries, Epicr. Myc. 384. 1838.

Marasmius I Insititii I Setipedes b Stipiticolae Quélet, Fl. Mycol. France 312. 1888.

Marasmius § *Mycena IV Insititii* Morgan, J. Mycol. 11: 244. 1905.

Marasmius section *Rotulae* Kühner, Botaniste 25: 98. 1933.

Type species: *Marasmius rotula* (Scopoli ex Fries) Fries, Epicr. Myc. 385. 1838.

Pileus small (<17 mm broad), obtusely convex to convex-depressed and often papillate or umbilicate with a dark spot at the center or not, striate or sulcate, thin, tough, white, light yellowish brown, moderate orange, or strong reddish brown. Lamellae thin, well-developed, few, distant, equal or with 1 or 2 short lamellulae, adnate to a free collar or rarely to a partial, adnate collar. Stipe thin, bristle-like, glabrous, insititious. Rhizomorphs or sterile stipes or both usually present.

Spores clavate to pip-shaped, nonamyloid. Hymenial cystidia lacking. Hymenial broom cells clavate to obovate, with numerous warts, present only on the lamellar edges. Trama nonamyloid or weakly dextrinoid. Pileus cuticle a hymeniform layer of obovate to sphaeropedunculate or rarely cylindric to clavate broom cells with numerous warts or short rodlike projections. Stipe cortex of smooth thick-walled hyphae. Stipe vesture lacking.

26. MARASMIUS GRAMINUM (Libert) Berkeley & Broome, Outl. Brit. Fungol. 222. 1865. FIGS. 42 & 45

Agaricus graminum Libert, Pl. Crypt. Arduennae 119. 1832.

Marasmius tritici Young, Phytopathology 15: 118. 1925.

PILEUS 2-9 mm broad; at first pulvinate, obtusely convex or plano-convex, then convex to plano-convex and often umbilicate, depressed, or papillate, in age almost plane or with an uplifted margin; dry; dull; opaque; smooth or minutely granular-roughened; distantly sulcate, less so in age; membranous; entire to crenate. CUTICLE minutely velutinous; at first deep orange (Orange-Rufous, M&P 6H12), strong brown to deep brown, dark reddish brown, strong reddish brown, deep reddish orange, or moderate orange (M&P 11C9, 10H8), often with a deep brown central dot, becoming moderate orange to light orange yellow (M&P 10F5) and progressively paler (M&P 6A12, 5A12, 10D3, 19E6) with age, usually retaining a darker central spot which fades with age, sometimes with the sulcae and the disc pale yellow (M&P 11H4), finally fading overall to yellowish white, often with a moderate brown central depression. TRAMA not distinguishable. ODOR and TASTE lacking.

LAMELLAE narrow (less than 1 mm broad); moderately thick; distant; few (8-13 reach the stipe); equal or sometimes with a single lamellula; adnate to a complete or partial, free collar or rarely to the stipe; fragile; entire; concave or straight, becoming subventricose; not intervenose; rarely forked; pale yellow to white, rarely with deep brown edges.

STIPE 13-36 mm long, 0.1-0.5 mm thick; central; terete; equal or tapering to the base; curved; dry; shining; translucent near the apex, opaque below; hollow; flexible at first, soon wiry and tough; even; glabrous; yellowish white (M&P 9B2) up to 2 mm downward, moderate reddish brown to blackish brown below; insititious. STERILE STIPES few to many on the surrounding substrate; tapered to an acute tip; often curled; deep blackish brown. RHIZOMORPHS lacking. BASAL MYCELIUM lacking, but the stipe often producing a black discoloration at the site of eruption from the substrate.

SPORES white in mass; 6.7-11.2 X 3.2-5.3 µm; pip-shaped, obovate, or broadly elliptic. BASIDIA 15-30 X 4-7 µm; clavate; 4-spored or rarely 2-spored. BASIDIOLES subfusiform.

HYMENIAL CYSTIDIA lacking.

HYMENIAL BROOM CELLS 7-15 X 4-8.5 µm; broadly clavate, subglobose, cylindric, or obovate; with 4-20 hyaline to pale yellow, peglike, wartlike, or rodlike projections 1.5-5.6 X 0.5-1 µm; with hyaline to pale yellow walls up to 2 µm thick; present only on the lamellar edges.

TRAMAL HYPHAE interwoven and inflated (up to 11 µm broad) in the pileus; parallel to interwoven, uninflated, and 3-7.5 µm broad in the lamellae; with hyaline walls up to 0.5 µm thick; nonamyloid.

PILEUS CUTICLE a hymeniform layer of erect and subglobose, broadly clavate, or obovate, or repent and cylindric broom cells 4.2-20 X 6-14 µm, with 3-25 knoblike, wartlike, or rodlike, moderate orange yellow to light yellowish brown projections 1.2-4.2 X 0.5-1(-2) µm, and with hyaline to light yellowish brown walls up to 2(-4) µm thick.

STIPE corticated in the pigmented portions only, the superficial hyphae otherwise hyaline and undifferentiated. CORTICAL HYPHAE 2.5-6 µm broad; with deep yellowish brown to strong brown walls up to 1 µm thick; nonamyloid. TRAMAL HYPHAE 4-8 µm broad; hyaline; nonamyloid. STIPE VESTURE lacking.

Scattered, gregarious, or subcespitose on dead and dying portions of leaves and roots of Gramineae. Fruiting period: 14 June-9 September.

Collections examined:

BELGIUM: Heinemann, 26 Jun 1958 (BPI). ENGLAND: SURREY: Dennis, Sep 1950. LUXEMBOURG: Libert, *Plantae Cryptogamae Arduennae*, Fasc. II, 119 (isotype of *Agaricus graminum* Libert, BPI). UNITED STATES: DELAWARE: Commons, 4 Jun 1889 (NY). ILLINOIS: Young, 12 Jul 1924 (holotype of *Marasmius tritici* Young, BPI). INDIANA: Gilliam 933a. MAINE: Thaxter 3379 (FH). MASSACHUSETTS: Bigelow 15106 (MASS). MICHIGAN: Ammirati 4438 & 4970; Gilliam 799 & 862; Hoseney 2133; Mains 34-127. MINNESOTA: Young, 20 Jul 1928 (BPI). MISSOURI: Ellis & Everhart, North American Fungi, 2nd Series, 2301; Linder, 16 Aug 1928 (FH). NEBRASKA: Lloyd 27937 (BPI). NEW YORK: Murrill, 24 Jun (NY). NORTH CAROLINA: Beardslee 17011. OHIO: Cooke 30275. PENNSYLVANIA: Morgan 125 (IA). RHODE ISLAND: Curtis, 24 Jul 1964 (MASS). SOUTH CAROLINA: Ravenel, *Fungi Americani Exsiccati* 105 (NY, BPI). VERMONT: Burt, 19 Jun 1898 (BPI).

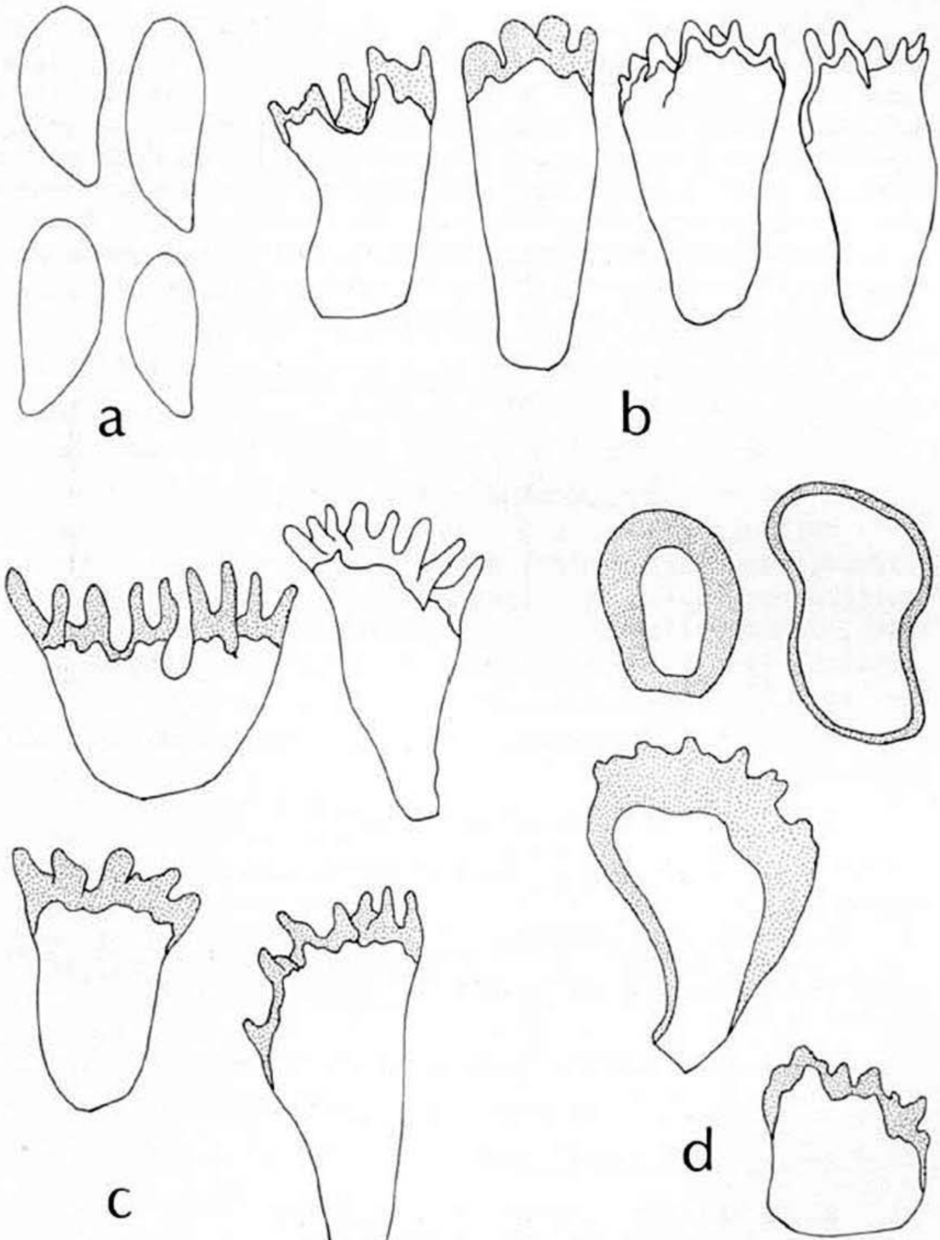

Figure 45. *Marasmius graminum*. a-e. x 2300. a. Spores, Gilliam 862. b. Broom cells from lamellar edge, Gilliam 862. c. Broom cells from pileus cuticle, Gilliam 933a. d. Broom cells from center of pileus cuticle, Gilliam 862.

Very little remains of the type of *Agaricus graminum*. The exsiccati specimen which I examined (BPI) lacked pilei; however, a stipe was present, and on its surface there were at least two spores (8 X 4 µm) resembling those of the species common on decaying grass in the United States and Europe. Although according to Singer (36) extensive variation occurs within this species at least in South America, the variation in the northeastern United States seems confined mostly to spore size and to the length and complexity of the projections on the cuticular broom cells.

Marasmius graminum may occasionally cause a disease of wheat and other grain crops (43).

27. MARASMIUS OLNEII Berkeley & Curtis, Ann. Mag. Nat. Hist. III, 4: 294. 1859.

"Pileus 1/3" across, convex, smooth, striate, pale rufous; stem 1-1/2" high, not a line thick, white, minutely pulverulent-tomentose, especially below; gills white, distant, minutely toothed, free, forming by their junction a little collar round the top of the stem." (Berkeley & Curtis, 1859)

SPORES 7-10 X 3-4 µm; elliptic. BASIDIA 21-25 X 4-6 µm; subclavate.

HYMENIAL CYSTIDIA not observed.

TRAMA nonamyloid to weakly dextrinoid, particularly below the cuticle.

PILEUS CUTICLE a hymeniform layer of subcylindric to subglobose broom cells with blunt cylindric projections up to 4 X 4 µm.

STIPE covered overall with long, nonamyloid hairs.

On hardwood twigs. Fruiting period unknown.

Collections examined:

RHODE ISLAND: Curtis 1821 (holotype of *Marasmius olneii* Berkeley & Curtis, K; isotype, FH).

Although Curtis' specimens are poorly preserved, certain features of the type suggest that *Marasmius olneii* is a distinct species belonging to sect. *Marasmius*. The combination of a white, pubescent stipe and cuticular cells with broad, blunt projections is unique. Section *Marasmius* is suggested by the collar and the nonamyloid trama.

28. MARASMIUS PRUINATUS Berkeley & Curtis, Ann. Mag. Nat. Hist. III, 4: 244. 1859.

"Pileus 1/2" across, campanulate, pale umber, pruinose, minutely wrinkled, stem 2" high, setiform, pale cinereous or tinged with reddish brown, shining with a satiny lustre; gills ochraceous, few, distant, interstices even. A thin white mycelium like a corticium spreads over the matrix." (Berkeley & Curtis, 1859).

SPORES 9-13 X 3 µm; lanceolate or narrowly elliptic.

PILEUS CUTICLE a hymeniform layer of cylindric to clavate broom cells ornamented with finely divided projections.

Gregarious on culms of grasses. Fruiting period unknown.

Collections examined:

NEW ENGLAND: Curtis 5064 (holotype of *Marasmius pruinatus* Berkeley & Curtis, K; isotype, FH).

According to Singer (39) *Marasmius pruinatus* is a form of *Marasmius graminum*. I have seen both the holotype and an isotype in the Curtis Herbarium. The holotype lacks spores, but spores from the Farlow material are longer than those of North American *M. graminum* (9-13 vs. 6.7-11 µm). Specimens of *M. pruinatus* are not well enough preserved to reveal much about the macroscopic appearance of the fungus. As a result, there is some disagreement between Singer and Dennis about the presence of a collar on the stipe. The most significant difference between *M. pruinatus* and *M. graminum* seems to be the finely divided projections on the cuticular cells of *M. pruinatus* which contrast with the broader, discrete projections of *M. graminum*.

29. MARASMIUS CAPILLARIS Morgan, J. Cincinnati Soc. Nat. Hist. 6: 194. 1883. FIGS. 46 & 47

PILEUS 1.5-15 mm broad; truncate-convex, bluntly conic, or squarely pulvinate, often umbilicate or papillate; dry; dull; opaque; granular-roughened or smooth; plicate-striate on the margin, smooth on the disc; crenate or lobed; pliant; reviving. CUTICLE minutely velutinous; light grayish yellowish brown (Avellaneous, Wood Brown), light yellowish brown (M&P 10C2, 11B-C3-4), or moderate yellowish brown (M&P 13D9) on the margin, usually yellowish white (M&P 9B1) to pale yellow (Cartridge Buff) on the disc and sometimes overall in age, occasionally with a

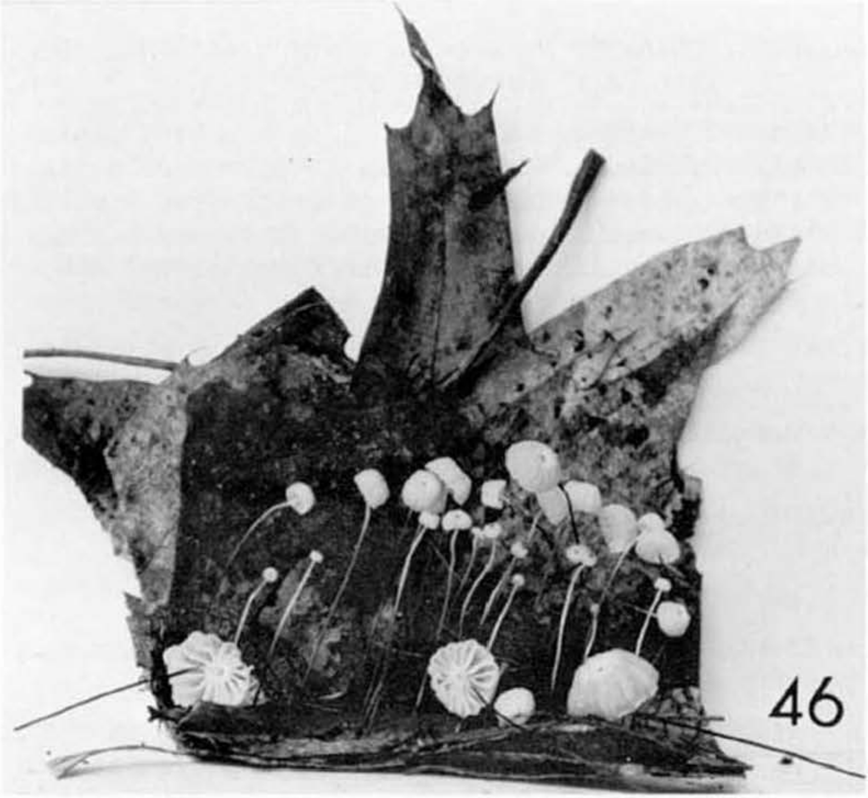

Figure 46. *Marasmius capillaris*. Shaffer 2568, x1. (courtesy of A. H. Smith)

minute central dark grayish yellowish brown dot. TRAMA thin (0.5-0.7 mm thick in the disc, scarcely distinguishable on the margin); yellowish white to white. ODOR mild or lacking. TASTE mild, sometimes with a bitter aftertaste.

LAMELLAE broad (1-2 mm broad); thin; distant; moderately numerous (13-20 reach the stipe); equal, or with one or two short lamellulae; adnate or arcuate-adnate to a free collar; pliant; entire; concave at first, soon straight; not intervenose; not forked; yellowish white.

STIPE 20-45(-110) mm long (long in relation to the pileus diameter), 0.1-0.3(-0.75) mm thick; central; terete; equal or enlarged slightly at the apex; straight or slightly curved; dry; shining; opaque; hollow; wiry; even; glabrous; concolorous with the darker portion of the pileus on the upper 1-3 mm, elsewhere blackish brown to black; insititious. STERILE STIPES usually abundant; tapered; acute; black. RHIZOMORPHS usually present but not usually conspicuous; 0.1-0.2 mm thick; twisted and curled; occasionally branched; black. BASAL MYCELIUM absent.

SPORES white in mass; 6.7-10(-11.2) X 2.8-5 µm; pip-shaped, narrowly obovate, or occasionally elliptic. BASIDIA 17-27 X 4-6 µm; clavate or subclavate; 4-spored. BASIDIOLES subfusiform.

HYMENIAL CYSTIDIA lacking.

HYMENIAL BROOM CELLS 5-21 X 4-14 µm; obovate, clavate, subglobose, or narrowly to broadly cylindric; with numerous convex, conic, or short-cylindric, hyaline to pale yellow deciduous warts or incrustations 0.5-3 X 0.5-1 µm; with hyaline walls up to 0.5 µm thick; nonamyloid or faintly dextrinoid.

TRAMAL HYPHAE 2.5-5 µm broad in both pileus and lamellae; tightly interwoven; uninflated; with hyaline, occasionally faintly incrusted walls up to 0.5 µm thick; nonamyloid or faintly dextrinoid.

PILEUS CUTICLE a hymeniform layer of clavate, subglobose, pulvinate, obovate, or rarely cylindric and lobed broom cells 4-28 X 4-23 µm, with numerous closely spaced, pale yellow or dark orange yellow, convex or cylindric warts or short spines 0.5-3 X 0.5-1(-2) µm and with hyaline to dark orange yellow walls up to 1 µm thick; nonamyloid or weakly dextrinoid.

STIPE corticated thinly overall. CORTICAL HYPHAE 1.5-3.5 µm broad; with hyaline to dark yellowish brown walls 0.5-1 µm thick. TRAMAL HYPHAE 1-3.5 µm broad; with thin, hyaline walls; dextrinoid (pale red in Melzer's reagent) or nonamyloid. VESTURE lacking.

Gregarious on decayed leaves, usually of oak, in deciduous woods, or rarely on needles in coniferous woods. Fruiting period: 14 June-10 October.

Collections examined:

CANADA: QUEBEC: Collins 5199 (FH). UNITED STATES: INDIANA: Gilliam 936. MARYLAND: Stevenson, 29 Aug 1937 (BPI). MICHIGAN: Gilliam 729, 817, 925, 936, 1448 & 1477; Kauffman, 20 Oct 1926; Potter 6374; Shaffer 2568; Smith 10796, 15073, 15212 & 63551. MINNESOTA: Weaver 1246 & 1735. NEW JERSEY: Ellis, Aug 1887 (NY). NORTH CAROLINA:

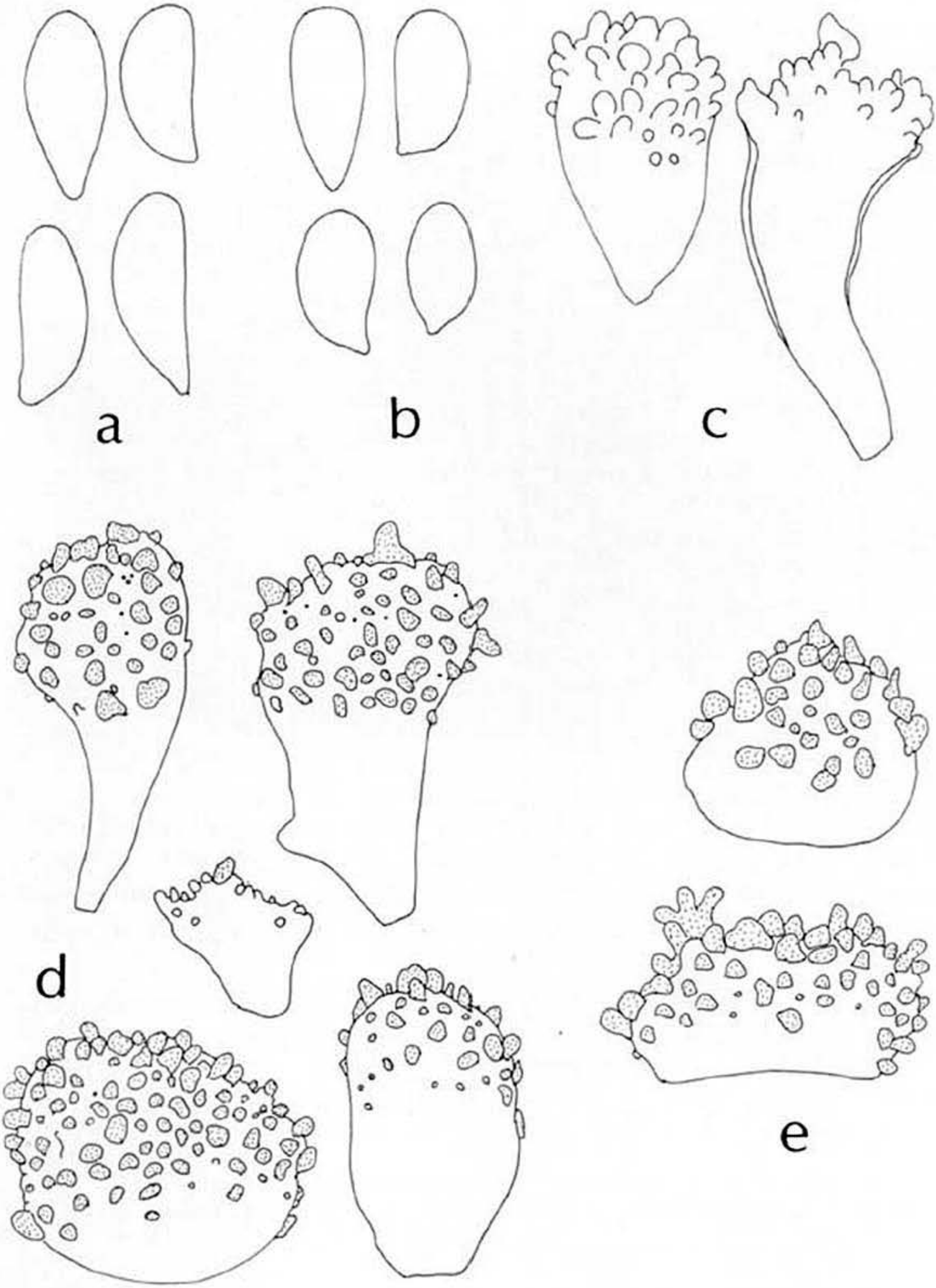

Figure 47. *Marasmius capillaris*. a-e. x2300. a. Spores, Shaffer 2568. b. Spores, Smith 63551. c. Broom cells from lamellar edge, Shaffer 2568. d. Broom cells from pileus cuticle, Shaffer 2568. e. Broom cells from pileus cuticle, Smith 63551.

Harrison 10968 & 11429. OHIO: Cooke 35612; Morgan, Oct 1890 (lectotype of *Marasmius capillaris* Morgan, IA), 14 Jun 1891 (paratype of *M. capillaris* Morgan, IA). PENNSYLVANIA: Kauffman, 6 Sep 1927. TENNESSEE: Smith 9721. VIRGINIA: Stevenson, 5 Sep 1937 (BPI). WISCONSIN: Mazzer 6276.

Since Morgan did not cite a holotype in the original description of *Marasmius capillaris* and no specimen in his collection is so marked, I am designating his collection of October 1890 as lectotype.

As long as the concept of *Marasmius capillaris* is restricted to specimens on oak leaves having bluntly conic pilei with pale discs and light yellowish brown margins as well as black capillary stipes, this species seems distinct from *M. rotula*. The following comparison applies to the majority of collections of both species:

Character	*M. capillaris*	*M. rotula*
Pileus shape	bluntly conic (flat on top, straight on sides)	pulvinate, then convex-depressed
Pileus color	light grayish yellowish brown on the margin, yellowish white on the disc	yellowish white or light yellowish brown overall
Stipe thickness	less than 0.3 mm	more than 0.3 mm
Stipe color	blackish brown to black	moderate brown to blackish brown
Substrate	leaves of various oaks	partially decayed logs, usually of hardwoods
Spore size	6.7-11.2 X 2.8-5 µm	6.2-9.5(-10) X 2.8-3.2 µm

Basidiocarps intermediate in many respects occur, however, on other substrates, such as beech leaves, well-decayed hardwood leaves other than oak, and even deer dung. For example, Smith 63551, on herbaceous debris, has spores and pilei characteristic of *M. capillaris* but stipes up to 0.75 mm thick and 11 cm long. Since spore size does not seem to be diagnostic except at the extremes of the range of variation in this group, specimens on oak leaves with the macroscopic features of *M. capillaris* but with spores only up to 8.4 µm long (e.g., Smith 10796, Gilliam 936 & 1448, Cooke 35612) or up to 5 µm broad (Weaver 1735) are retained in *M. capillaris*. Those with uniformly yellowish white or light yellowish brown pilei, small spores (averaging 7-9 X 3-3.5 µm), and moderate brown to blackish brown capillary stipes (e.g., Smith 63643, on well-decayed leaf mold) grade into the small light yellowish brown forms of *M. rotula* and are here considered variants of that species. A more satisfying definition of the limits of these two species will require more data from fresh specimens and perhaps culture work. Much of the variation in this group seems to correlate with the nature and extent of the substrate.

30. MARASMIUS ROTULA (Scopoli ex Fries) Fries, Epicr. Myc. 385. 1838. FIGS. 48 & 49

Agaricus rotula Scopoli ex Fries, Syst. Myc. 1: 136. 1821.

PILEUS 1.5-17 mm broad; hemispheric, pulvinate, or bluntly conic and often papillate at first, then convex or plano-convex and prominently umbilicate or shallowly to broadly depressed centrally; dry; dull; opaque; minutely granular-roughened; nearly even at first, soon plicate-striate or sulcate-striate 1/3-7/8 the pileus radius, deeply so in age; crenate or lobed; tough-pliant. CUTICLE glabrous or minutely velutinous; moderate yellowish brown to light yellowish brown in the primordial stage, becoming light yellowish brown or light grayish brown on the disc or overall, then yellowish white, light yellow (M&P 9-10 B2), pale yellow (Light Buff, Cartridge Buff), or pale orange yellow overall, in age yellowish white or pale orange yellow; with or without a central moderate brown (Prout's Brown), grayish yellowish brown (Bister), or moderate yellowish brown (Sayal Brown) spot. TRAMA moderately thick in the disc (0.25-1.5 mm thick), thin on the margin; white or yellowish white. ODOR mild or lacking. TASTE mild, sometimes with a bitter aftertaste.

LAMELLAE narrow at first, becoming moderately broad (1-3 mm broad), or sometimes broad from the first; thin; subdistant to distant; moderately numerous (16-25 reach the stipe); equal, or rarely with 1 tier of short lamellulae; adnate, uncinate, or sinuate and attached to a collar which may be broad or narrow and free from the stipe or adnate to it; tough-pliant; entire; straight or arcuate at first, sometimes ventricose in age; not intervenose; not

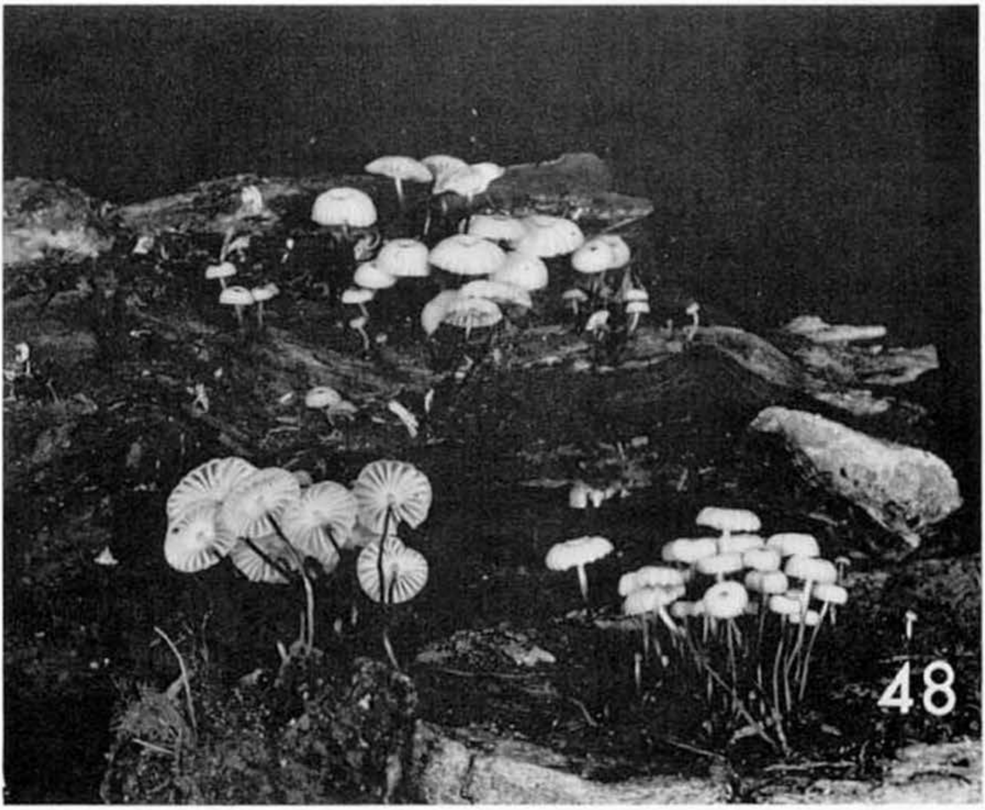

Figure 48. *Marasmius rotula.* Harrison 10511, x1. (courtesy of K. A. Harrison)

forked; yellowish white or pale yellow.

STIPE 15-85 mm long, 0.3-1.0 mm broad; central; terete; equal or tapering to the base, which is sometimes subbulbous; straight or curved; dry; dull or shining; opaque in the pigmented portions, translucent at the apex; hollow; cartilaginous to wiry; even; glabrous; yellowish white or light yellow overall in the primordial stage, darkening from the base upward through light yellowish brown, light brown, moderate brown (Verona Brown), grayish reddish brown, dark grayish reddish brown (M&P 16A-C12), dark reddish gray (Light Seal Brown), brownish gray (Fuscous-Black), or dark yellowish brown, becoming dark brown or blackish brown in age but usually retaining one of the paler colors on the apical 1-3 mm. STERILE STIPES occasionally present; tapered; moderate brown to blackish brown. RHIZOMORPHS rare, abundant, or occasionally absent; usually wiry; straight or curled; often branched; 0.1-0.3 mm thick; moderate brown to blackish brown.

SPORES white or rarely pale yellow (Cartridge Buff) to pale orange yellow in mass; 6.2-9.5(-10) X 2.8-4.3 µm; obovate, narrowly elliptic, fusoid-elliptic, or pip-shaped. BASIDIA 21-31 X 4-17 µm; clavate, subclavate, or subcylindric; 4-spored. BASIDIOLES subfusiform.

HYMENIAL CYSTIDIA lacking.

HYMENIAL BROOM CELLS 7-32 X 2.5-20 µm; globose, subglobose, pulvinate, obovate, clavate, or broadly elliptic and often pedicellate; thin-walled; ornamented on the exposed surfaces with closely spaced, hyaline, light yellow, or moderate orange yellow, convex or bluntly conic warts or indistinct incrustations 0.2-1.5(-3) X 0.2-1 µm; not projecting; nonamyloid; present only on the lamellar edges.

TRAMAL HYPHAE interwoven and inflated up to 28 µm in the pileus; interwoven, 0.5-11 µm broad, and inflated up to 15 µm broad in the lamellae; with hyaline walls up to 0.5(-1) µm thick, or with the wall occluding the lumen; nonamyloid or sometimes with granular, oily, or refractive contents which are often weakly dextrinoid.

PILEUS CUTICLE a hymeniform layer of pulvinate, obovate, clavate, or broadly elliptic and sometimes lobed or pedicellate broom cells 7-30(-42) X 5-17(-28) µm, with hyaline to pale yellow walls up to 1 µm thick, ornamented above or almost overall with numerous closely spaced, hyaline, pale yellow, or moderate orange yellow incrustations, bluntly convex to convex warts, or short spines 0.2-3 X 0.2-1 µm or rarely smooth, nonamyloid, or sometimes with the projections dextrinoid.

STIPE corticated thinly overall. CORTICAL HYPHAE 3-5 µm broad; with hyaline to deep brown walls up to 1.5 µm thick; nonamyloid or weakly dextrinoid. TRAMAL HYPHAE 3-5 µm broad; with thin, hyaline walls; nonamyloid or sometimes pale red in Melzer's reagent.

Gregarious to cespitose on wood of deciduous or rarely coniferous trees, or sometimes on well-decayed leaf mold in deciduous woods. Fruiting period: 1 May-29 October.

Collections examined:

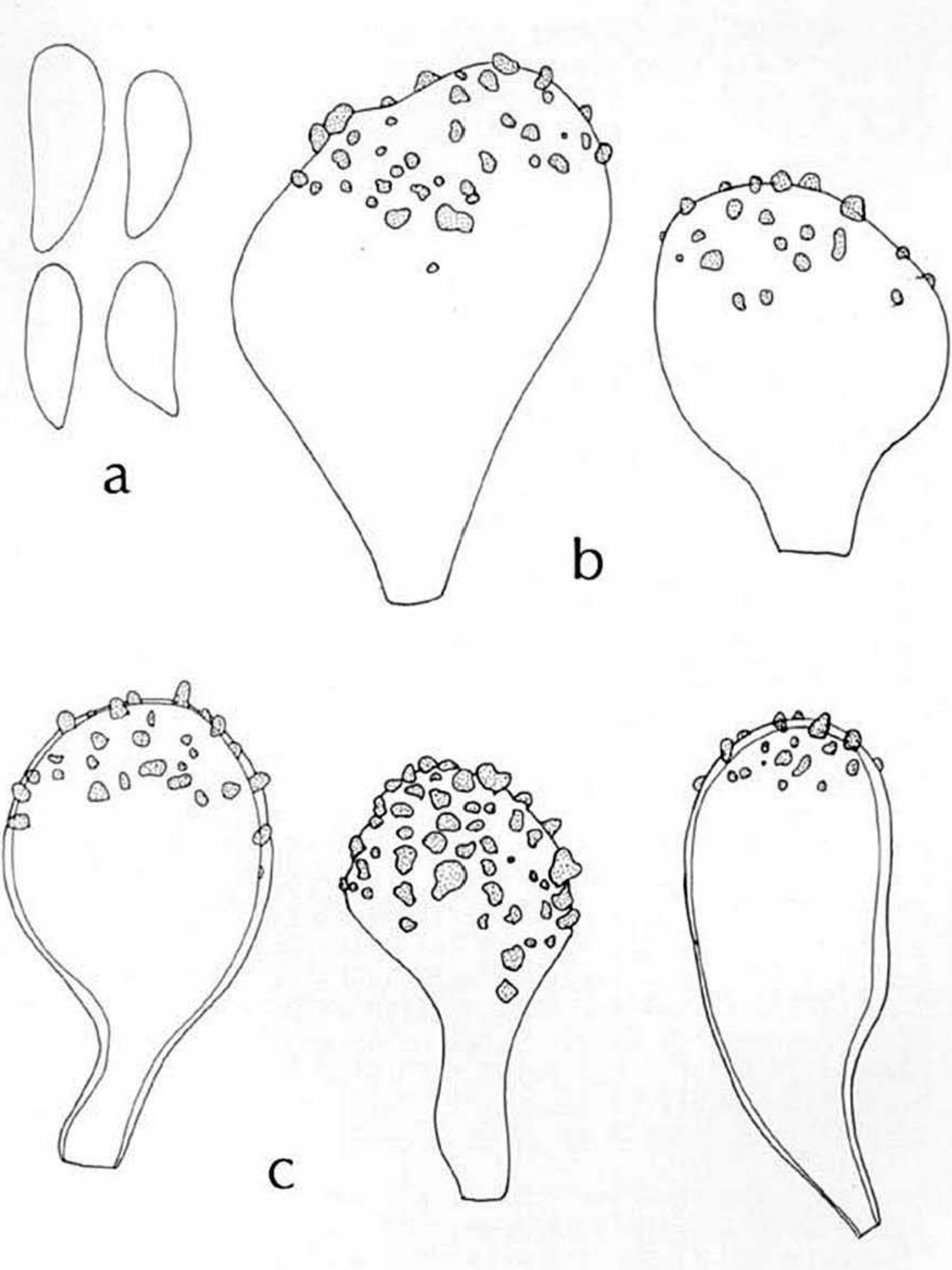

Figure 49. *Marasmius rotula*. Gilliam 532, x2300. a. Spores. b. Broom cells from pileus cuticle. c. Broom cells from lamellar edge.

BELGIUM: Westendorp & Wallays 1282 (NY). CANADA: NOVA SCOTIA: Harrison 7572; Wehmeyer 56. ONTARIO: Jackson 1669 (FH); Kelly 956. QUEBEC: Bigelow 5045 (MASS); Shaffer 5427. ENGLAND: SUSSEX: Austwick, 18 Jul 1950. FRANCE: AISNE: Shaffer 4204. OISE: Shaffer 4159. RHÔNE: Josserand, 30 Jun 1937. GERMANY: Krieger, *Fungi Saxonici* 225. ITALY: Bresadola, Jul 1891 (NY). SWEDEN: Romell, 21 Jul 1897 (NY). UNITED STATES: ALABAMA: Underwood, May 1897 (NY). CONNECTICUT: Underwood & Earle (NY); Stevenson 76923 (BPI). ILLINOIS: Shaffer 789; Stifler, 1940 (BPI). INDIANA: Cooke 32806; Stifler, Jun 1932 (BPI); Underwood, 1893 (NY). KENTUCKY: Underwood 27 (NY). MAINE: Bigelow 3155, 4383, 10185 (MASS), & 10235 (MASS). MARYLAND: Parker 1741 (BPI). MASSACHUSETTS: Bigelow 6710 (MASS). MICHIGAN: Ammirati 1598, 1800, 3375, & 4277; Bartelli 3126; Gilliam 492, 493, 530, 532, 558, 559, 759, 926, 1116, 1117, 1121, 1125, & 1451; Harrison 10379; Hicks 639 (FH); Hoseney 1247; Imshaug 3398; Mazzer 4811; Patrick 841 & 1053; Peters 1178; Potter 3301 (10 additional collections); Shaffer 2509; Smith 36508, 49586, 62448 & 63643. MINNESOTA: Weaver 1403 & 1416. MISSOURI: Ellis & Everhart, North American Fungi, 2nd Series, 2501 (NY). NEW HAMPSHIRE: Bigelow 11623 (MASS); Holmes 77 (MASS); Linder, Jul 1922 (FH). NEW JERSEY: Ellis & Everhart, North American Fungi 910 (BPI). NEW YORK: Bigelow 15024 (MASS); Rogerson 463 (NY); Shaffer 495. NORTH CAROLINA: Murrill & House 323 (NY); Shaffer 6246; Stanley 5792 (NY). NORTH DAKOTA: Brenckle, *Fungi Dakotenses* 173 (BPI). OHIO: Cooke 31922 & 40878; Fink, 8 Jul 1910 (BPI). PENNSYLVANIA: Henry, 25 Jul 1940 (FH); Murrill 1296 (NY); Parker, 4 Jul 1929 (BPI). RHODE ISLAND: Bigelow 14400 (MASS). TENNESSEE: Hesler 9114 (FH). TEXAS: Thiers 1915. VERMONT: Pringle 1334 (FH); Shaffer 3369. VIRGINIA: Murrill, 17-21 Jul 1904 (NY); Stevenson, 20 Jul 1905 (BPI). WISCONSIN: Gilliam 1189, 1229 & 1230; Shaffer 685.

Even in the absence of a type specimen, there is little doubt regarding the application of the name *Marasmius rotula*. European specimens I have studied show variation parallel to that in North American collections and belong to the same species.

Marasmius rotula varies in the shape, size, and color of basidiocarps. Some such differences are due to season, fluctuations in moisture, and stage of development. For example, collections in the spring on logs in oak-hickory woods tend to have yellowish white, convex-depressed pilei, while collections from the same areas in the fall often have light yellowish brown, obtusely convex pilei. This latter form persists in the woods for a long time during dry weather and is sometimes collected between periods of spore discharge. Many herbarium specimens are therefore sterile.

Spore size and shape are unusually variable, considering that *Marasmius rotula* is a small-spored species. Other features are not correlated with spore size differences, and so no justification exists for separating each variant as a different taxon. The usual size range for spores is about 6.5-8.5 X 3-3.5 µm. Collections with spores which do not exceed 8 µm in length (e.g., Ammirati 1800 & 1598) and those with spores up to 10 µm long (e.g., Bigelow 10185) occur fairly commonly. Spore print color should be extensively documented for this species, since Bigelow 10235 has a pale yellow to pale orange yellow spore print.

Some of the characters considered typical of *Marasmius rotula* have been found not to be constant. In particular, the dark central dot on the pileus is often lacking, and black rhizomorphs are conspicuous in some collections but not in others. The latter situation may be a function of collecting techniques.

For a discussion of the variants on beech leaves and decayed leaf mold, see the discussion under *Marasmius capillaris*.

EXCLUDED, EXTRALIMITAL, AND DOUBTFUL SPECIES

Marasmius acerinus Pk. New York State Mus. Bull. 5: 648. 1898 (1899). = *Micromphale foetidum* (Fr.) Singer, Lloydia 8: 182. 1945. Type specimen: NEW YORK: St. Lawrence Co.: Fine, 4 Aug 1909, Peck (NYS).

Marasmius albiceps Pk. Annual Rep. New York State Mus. 43: 21. 1889 (1890). = **Mycena albiceps (Peck) Gilliam, comb. nov.** Type specimen: NEW YORK: Manor, Sep 1899, Peck (NYS). Although the basidiocarps revive and the stipe is horsehair-like, *Marasmius albiceps* belongs to *Mycena*. Its spores are amyloid, and there is a well-defined subcutis of inflated dextrinoid hyphae, as well as an epicutis of narrow, hyaline, diverticulate hyphae. The lamellae are decurrent.

Marasmius albipilatus (Pk.) Singer, Ann. Mycol. 41: 129. 1943. = *Strobilurus albipilatus* (Pk.) Wells & Kempton, Mycologia 63: 377. 1971. I have not seen the type.

Marasmius albo-marginatus Clements, Bot. Surv. Nebraska 4: 20. 1896. Type not found. According to Pennington (25), the type consists of a single specimen, probably a *Mycena*.

Marasmius alienus Pk. New York State Botanist Rep. for 1909: 25. 1910. Type specimen: NEW YORK: St. Lawrence Co.: 7 Aug 1909, Peck (NYS). The type specimen is a *Collybia*. It has spores 10.5-12.5(-14) X 3-3.5 µm and abundant, projecting, tapered hymenial cystidia. The pileus cuticle consists of a dense layer of interwoven hyphae. The stipe is clothed overall with abundant, septate hairs.

Marasmius anomalus Lasch ex Rabenhorst in Klotzchii Herb. Vivum 1806. 1854. *M. anomalus* Lasch, of *Marasmius* sect. *Sicci*, probably occurs in North America but is not positively documented. The only possible record is a collection without data and without notes in the University of Michigan Herbarium.

Marasmius anomalus Pk. Annual Rep. New York State Mus. 24: 76. 1870 (1872). Non *M. anomalus* Lasch 1854. Type specimen: NEW YORK: Greene Co.: Catskill, Jul 1871, Peck (NYS). Pennington (25) published *Marasmius fasciatus* as a *nomen novum* for *M. anomalus* Pk. non Lasch. Apparently Pennington based his concept of the species on two Peck specimens labeled "*M. anomalus*", since his description in *North American Flora* cites features of both the type (spore size) and of another Peck collection (Caroga, Fulton, Aug) which differs in having fasciate basidiocarps. The type of *M. anomalus* Peck definitely belongs to *Collybia,* since it has a pileus cuticle of interwoven, smooth hyphae and nonamyloid trama. The basidiocarps are not fasciate. The name *Marasmius fasciatus* Pennington, however, has fallen into common usage for the fasciate fungus, which has dextrinoid trama, a hymeniform cuticle of smooth cells, and spores up to 11 µm long. As far as I can determine, the latter fungus is *Marasmius cystidiosus* (A. H. Smith & Hesler) Gilliam of *Marasmius* sect. *Globulares*. If transferred to *Collybia,* the epithet *anomalus* is again legitimate for the original Peck species.

Marasmius archyropus (Pers.) Fr. Epicr. Myc. 378. 1838. American material determined as *M. archyropus* (e.g., a collection from NY without collection data) has obovate spores 6.5-8.5 X 4-4.5 µm and filamentous cheilocystidia. A collection made by Robert Fries in Uppsala (NY) has pip-shaped spores 5-6 X 3-4 µm and clavate, nodulose cheilocystidia. If the Fries collection is representative of *M. archyropus*, American material does not belong to this species. Both have pileus cuticles of interwoven, smooth hyphae and thus belong to *Collybia*.

Marasmius atrorubens Berkeley, London J. Bot. 1: 138. 1842. This species has been reported by Morgan, but I have not found specimens from the northeastern United States.

Marasmius autumnalis Johnson, Bull. Minnesota Acad. Nat. Sci. 1: 358. 1880. Type specimen not found.

Marasmius biformis Pk. New York State Mus. Bull. 67: 25. 1902 (1903). = *Collybia biformis* (Pk.) Singer, Sydowia 15: 55. 1961 (1962). Type specimen: NEW YORK: Rensselaer Co.: Sandlake, Aug 1902, Peck (NYS).

Marasmius caespitosus Pk. Bull. Buffalo Soc. Nat. Sci. 1: 58. 1873 (1874). = *Collybia dichrous* (Pk.) Gilliam, which see. Type specimen: NEW YORK: Schoharie Co.: Richmondville, (no date), Peck (NYS).

Marasmius campanella (Pk.) Atkinson & House, Bull. New York State Mus. 65: 205. 1919. = *Crinipellis campanella* (Pk.) Singer, Lilloa 8: 492. 1942.

Marasmius candidus Fr. Epicr. Myc. 381. 1838. = *Marasmiellus albuscorticis* (Secr.) Singer, Lilloa 22: 300. 1951.

Marasmius caulicinalis ['*cauticinalis*'] With. ex Fr. Epicr. Myc. 383. 1838. = *Xeromphalina caulicinalis* (With. ex Fr.) Kühner & Maire, Bull. Soc. Mycol. France 50: 18. 1934.

Marasmius clavaeformis Berkeley, London J. Bot. 6: 316. 1847. Perhaps a *Collybia*. Curtis 474, Blake 729, Michener 358, and Ravenel 162 from the Curtis Herbarium (FH) do not belong to *Marasmius*, but as a result of the poor preservation of the specimens little additional information can be gained.

Marasmius confluens (Fr.) Ricken, Blätterp. Deutschl. 1:72. 1911. = *Collybia confluens* Fr. Epicr. Myc. 88. 1838.

Marasmius concinnus Ellis & Everhart, Proc. Acad. Philadelphia 1893: 441. 1894. Type specimen: DELAWARE: Mt. Cuba, 20 Sep 1893, Ellis & Everhart (NY).

The type specimen is immature, and no spores are available for study. *M. concinnus* seems closest to *Collybia* sect. *Subfumosae*. The cheilocystidia are 17-25 X 3.5-7 µm, with lateral or apical hyaline diverticula, and the pileus cuticle is formed of pale yellow diverticulate hyphae whose terminal cells are 8-11 X 6-10 µm.

Marasmius contrarius Pk. New York State Mus. Bull. 150: 34. 1910 (1911). = *Collybia umbonatella* Singer, Mycologia 35: 156. 1942 (1943). See *Marasmius umbonatus* Pk. Type specimen: NEW YORK: Essex Co.: N. Elba, Peck (NYS).

Marasmius cucullatus Ellis, Bull. Torrey Bot. Club 6: 76. 1876. Type specimen: NEW JERSEY: Gloucester Co.: Newfield, Oct 1875, Ellis, North American Fungi 702 (NY). The amyloid spores, the clavate, echinulate cheilocystidia, the dextrinoid trama, and the inflated cells of the pileus subcutis indicate that the type specimen is probably a *Mycena*.

Marasmius cucurbitula Montagne, Syll. Crypt. 141. 1856. Type specimen: OHIO: Franklin Co.: Columbus, Sullivant (PC). The type specimen is perhaps a *Collybia*. Its spores are 4.5-6 X 2-2.5 µm, nonamyloid, and narrowly pip-shaped. There are no cystidia. The trama is thick and nonamyloid, and the pileus cuticle is composed of interwoven, smooth hyphae.

Marasmius decurrens Pk. Annual Rep. New York State Mus. 24: 77. 1870 (1872). Non *M. decurrens* Montagne, Ann. Sci. Nat. Bot. IV, 1: 118. 1854. = *Marasmius resinosus* (Pk.) Sacc. Syll. Fung. 5: 522. 1877, *nom. nov.* for *M. decurrens* Pk. Type specimen: NEW YORK: Albany Co.: Albany Rural Cemetery, Jul-Aug 1870, Peck (NYS).

This species shows an unusual combination of features which exclude it from *Marasmius* and might form the basis for a new genus. The spores are amyloid. On the exposed surfaces of the basidiocarp (the gill edges, the pileus surface, and the stipe) are large, inflated cells exuding copious amounts of yellow resin. The pileus cuticle is composed of a hymeniform layer of such cells and occasional narrow laterally diverticulate hyphae. There are no gelatinous layers in the pileus and no long dermatocystidia characteristic of *Pseudohiatula*, a related genus with amyloid spores. *Gloiocephala*, which might also be related, does not have amyloid spores.

Marasmius dichrous Berkeley & Curtis, Ann. Mag. Nat. Hist. II, 12: 426. 1853. = **Collybia dichrous (Berkeley & Curtis) Gilliam, comb. nov.** Curtis' specimens at FH (SOUTH CAROLINA: Society Hill, Jul 1849, Curtis 2834, & Aug 1855, Curtis 5061 & 5065) have the pileus cuticle of interwoven hyphae with occasional clavate end cells; the voluminous, sometimes lobed or diverticulate cheilocystidia; and the branched stipe hairs characteristic of *M. caespitosus* Pk. and *M. fagineus* Morgan. All three names refer to a commonly collected taxon which belongs not to *Marasmius* but rather to *Collybia*.

Marasmius elongatipes Pk. Annual Rep. New York State Mus. 26: 66. 1872 (1874). = *Marasmius pyrrhocephalus* Berkeley, London J. Bot. 6: 316. 1847. Type specimen: NEW YORK: Wayne Co.: Savannah, Aug, Peck (NYS). See Gilliam (7).

Marasmius erythropus (Pers. ex Fr.) Fr. Epicr. Myc. 378. 1838. = *Collybia erythropus* (Pers. ex Fr.) Lange, Fl. Agar. Danica 2: 12. *pl. 45, f. 11.* 1936. This name has been used erroneously in the United States for several taxa, particularly *Marasmius sullivantii*.

Marasmius fagineus Morgan, J. Mycol. 11: 204. 1905. = *Collybia dichrous* (Berkeley & Curtis) Gilliam, which see. Type specimen: OHIO: Hamilton Co.: Preston, 17 Jul 1906, Morgan (IA).

Marasmius fasciatus Pennington, N. Am. Fl. 9: 270. 1915, *nom. nov.* for *M. anomalus* Pk. non Lasch. See discussion under *Marasmius anomalus* Pk.

Marasmius filopes Pk. Annual Rep. New York State Mus. 24: 77. *pl. 4, f. 27-29.* 1870 (1872). Type specimen: NEW YORK: Lewis Co.: Indian Lake, Oct 1871, Peck (NYS). There is too little left of the specimen to section, but a squash mount of pileus tissue shows narrow, laterally short-diverticulate hyphae and a few hyphal ends with broad diverticula. The stipe cortical hyphae have minutely roughened walls. Black rhizomorphs were not seen, and the stipe is not tough. *M. filopes* is nearest *Marasmiellus*.

Marasmius foetidus Sow. ex Fr. Epicr. Myc. 380. 1838. = *Micromphale foetidum* (Sow. ex Fr.) Singer, Lloydia 8: 182. 1945.

Marasmius graminis Murrill, N. Am. Fl. 9: 259. 1915. = *Marasmiellus tricolor* (Albertini & Schweinitz ex Fr.) Singer, Pap. Mich. Acad. Sci. 32 (1946): 128. 1948.

Marasmius haematocephalus (Montagne) Fr. Epicr. Myc. 382. 1838. Reports by Curtis and Morgan for the northeastern United States are based on specimens which do not fit Singer's description of this species.

Marasmius hirtipes Clements, Bot. Surv. Nebraska 4: 20. 1896. = *Marasmius pyrrhocephalus* Berkeley, London J. Bot. 6: 316. 1847. See Gilliam (7).

Marasmius impudicus Fr. Epicr. Myc. 377. 1838. = *Collybia impudica* (Fr.) Singer, Beih. Bot. Centralbl. Abt. B, 56: 163. 1936.

Marasmius insititius Fr. Epicr. Myc. 386. 1838. A North American fungus which has gone under this name has a pubescent stipe which is pale above and moderate brown below; a cuticle of interwoven, smooth hyphae; obovate spores 6-9 X 3-5 µm; and nonamyloid trama. A European specimen determined as *M. insititius* (GERMANY: Brandenburg, 14 Aug 1920, Sydow, *Mycotheca Germanica* 1406, MICH) has incrusted hyphae in the pileus cuticle, pip-shaped spores, and orange tints on the stipe. Neither of these concepts fits *Marasmius* as defined here; both taxa probably belong to *Collybia*.

Marasmius iocephalus (Berkeley & Curtis) Pennington, N. Am. Fl. 9: 271. 1915. = *Collybia iocephala* (Berkeley & Curtis) Singer, Lloydia 9: 116. 1946.

Marasmius lanatus (Schumacher) ex Morgan, J. Mycol. 11: 204. 1905. Morgan reports this species from Ohio, but his herbarium contains no specimen labeled as such. The description indicates that *M. lanatus* is a *Collybia*.

Marasmius leptopus Pk. New York State Mus. Bull. 67: 25. 1902 (1903). Type specimen: NEW YORK: Bronx Park, 11 Aug 1902, Peck (NYS). The type specimen is closest to *Collybia* sect. *Subfumosae*. No rhizomorphs were seen; the spores and trama are nonamyloid; and the pileus cuticle is composed of an irregular layer of repent to erect, hyaline, thin-walled hyphae whose terminal cells have numerous broad diverticula 2-4 X 2-6 µm. There are inconspicuous pleurocystidia and 2-6-diverticulate cheilocystidia. The stipe is covered with thick-walled, often diverticulate hyaline hairs.

Marasmius leucocephalus Montagne, Syll. Crypt. 142. 1856. = *Marasmiellus opacus* (Berkeley & Curtis) Singer, Lilloa 22: 300. 1951. Type specimen: OHIO: Franklin Co.: Columbus, Sullivant (PC).

Marasmius longipes Pk. Bull. Buffalo Soc. Nat. Sci. 1: 58. 1873 (1874). = *Marasmius pyrrhocephalus* Berkeley, London J. Bot. 6: 316. 1847. See Gilliam (7).

Marasmius longistriatus Pk. New York State Mus. Bull. 105: 25. *pl. S, f. 1-4.* 1905 (1906). = *Collybia biformis* (Pk.) Singer, Sydowia 15: 55. 1961 (1962) Type specimen: NEW YORK: Warren Co.: Bolton Landing, 28 Jul 1905, Peck (NYS).

Marasmius macrorrhizus Montagne, Syll. Crypt. 142. 1856.

= *Marasmius pyrrhocephalus* Berkeley, London J. Bot. 6: 316. 1847. See Gilliam (7). Type specimen: OHIO: Franklin Co.: Columbus, Jul, Sullivant (PC).

Marasmius magnisporus Murrill, Mycologia 4: 166. 1912. Type specimen: NEW YORK: Bronx, New York Bot. Gard., 28 Aug 1911, Murrill (NY). The type specimens have the aspect of *Marasmiellus*. The spores are pip-shaped or irregularly clavate and 11.5-17.5 X 3-4.5 µm. Cystidia are lacking in most sections but are sometimes present as projecting clavate cells on the lamellar edge. The pileus cuticle is composed of interwoven, hyaline hyphae.

Marasmius minutissimus Pk. Annual Rep. New York State Mus. 27: 97. *pl. 2, f. 27-28.* 1873 (1875). Type specimen: NEW YORK: Sullivan Co.: Forestburgh, Sep 1874, Peck (NYS). So little is left of the type that microscopic study was impossible. Judging from the macroscopic features visible, I would consider *M. minutissimus* to be an immature specimen of *Marasmius epiphyllus*.

Marasmius morganianus Sumstine, Mycologia 6: 35. 1914. Type not found. The description indicates a similarity to *M. pyrrhocephalus* Berkeley (7).

Marasmius multifolius Pk. ex Pennington, N. Am. Fl. 9: 270. 1915. Type specimen: NEW YORK: Essex Co.: Minerva, Jul, Peck (NYS). The unusual combination of amyloid spores with a nonamyloid trama and a pileus cuticle of interwoven, smooth hyaline hyphae does not fit any genus in the Collybiae or the Clitocybeae as defined by Singer (41). The aspect of the type specimens is closest to *Collybia*.

Marasmius nigripes (Schweinitz) Fr. Epicr. Myc. 383. 1838. = *Marasmiellus nigripes* (Schweinitz) Singer, Pap. Michigan Acad. Sci. 32: 130. 1946 (1948).

Marasmius nucicola McDougall, Trans. Illinois State Acad. Sci. 17: 84. 1925. Type specimen: ILLINOIS: 1924, McDougall. According to Smith (*North American Species of Mycena*, 1947), *Marasmius nucicola* is a synonym of *Mycena luteopallens* (Pk.) Sacc. The type, however, is now almost totally destroyed and could not be studied microscopically.

Marasmius nuptialis Morgan, J. Mycol. 11: 238. 1905. Type not found in the Morgan herbarium (IA).

Marasmius opacus Berkeley & Curtis, Hooker's J. Bot. Kew Gard. Misc. 1: 99. 1849. = *Marasmiellus opacus* (Berkeley & Curtis) Singer, Lilloa 22: 300. 1951.

Marasmius papillatus Pk. Annual Rep. New York State Mus.

24: 76. 1870 (1872). = *Collybia umbonatella* Singer, Mycologia 35: 156. 1942. Type specimen: NEW YORK: Rensselaer Co.: Sandlake, Aug 1871, Peck (NYS).

Marasmius papillosus Clements, Bot. Surv. Nebraska 4: 20. 1896. Type not found.

Marasmius perforans (Hoffman ex Fr.) Fr. Epicr. Myc. 385. 1838. = *Micromphale perforans* (Hoffman ex Fr.) Singer, Sydowia 2: 32. 1948.

Marasmius peronatus (Fr.) Fr. Epicr. Myc. 373. 1838. = *Collybia peronata* (Fr.) Singer, Beih. Bot. Centralbl. Abt. B, 56: 163. 1936. Although reported by earlier mycologists, this species probably does not occur in North America.

Marasmius phyllophilus Pk. New York State Mus. Bull. 116: 26. 1906. Type specimen: NEW YORK: Suffolk Co.: Wading River, 21 Aug 1906, Peck (NYS). The type specimen is a *Collybia* of sect. *Subfumosae*.

Marasmius polyphyllus Pk. Annual Rep. New York State Mus. 67: 286. 1897 (1898). = *Collybia polyphylla* (Pk.) Singer, Agaricales in Modern Taxonomy, ed. 2. 315. 1962. Type specimen: NEW YORK: Essex Co.: Minerva, Jul, Peck (NYS).

Marasmius praeacutus Ellis, Bull. Torrey Bot. Club 6: 76. 1876. = **Collybia praeacuta (Ellis) Gilliam, comb. nov.** Type specimen: NEW JERSEY: Gloucester Co.: Newfield, Jul & Aug, Ellis & Everhart, North American Fungi 402 (NY). *Collybia praeacuta* is a fairly common species on twigs in the hardwoods of the northeast. The type specimen has spores 4.5-6 X 2.5-3.5 µm and lacks cystidia. The pileus cuticle is composed of undifferentiated interwoven hyphae. On the stipe are numerous cylindric or tapered hairs 6-9 µm broad, with walls up to 1 µm thick.

Marasmius prasiosmus (Fr.) Fr. Epicr. Myc. 376. 1838. A North American species which closely parallels this European species is *Marasmius olidus* Gilliam (7, 8).

Marasmius putillus (Fr.) Fr. Epicr. Myc. 377. 1838. = *Collybia putilla* (Fr.) Singer, Beih. Bot. Centralbl. Abt. B, 56: 163. 1936.

Marasmius ramealis (Fr.) Fr. Epicr. Myc. 381. 1838. = *Marasmiellus ramealis* (Fr.) Singer, Pap. Michigan Acad. Sci. 32: 130. 1946 (1948).

Marasmius ramulinus Pk. Annual Rep. New York State Mus. 51: 286. 1897 (1898). Type specimen: NEW YORK: Albany Co.: Delmar, Aug, Peck (NYS). *Marasmius ramulinus* is close to *M. salignus* Pk.; both resemble

Marasmiellus. The type specimen of *M. ramulinus* has spores 7-10 X 3-4.5 µm, nonamyloid trama, cheilocystidia with a few hyaline diverticula or branches, and a pileus cuticle of interwoven hyphae with spirally thickened walls and occasional narrow diverticula. There are abundant clavate to cylindric hyaline hairs on the insititious stipe.

Marasmius resinosus (Pk.) Sacc. Syll. Fung. 5: 522. 1877, *nom. nov.* for *M. decurrens* Pk. non Montagne. Type specimen: NEW YORK: Albany Co.: Albany Rural Cemetery, Jul-Aug 1872, Peck (NYS). See *M. decurrens*.

Marasmius resinosus var. *niveus* Pk. New York State Mus. Bull. 67: 38. 1903. Type specimen: NEW YORK: Suffolk Co.: Port Jefferson, 6 Aug, Peck (NYS). See *M. decurrens*.

Marasmius resinosus var. *candidissimus* Pk. New York State Mus. Bull. 94: 40. 1905. Superfluous name for *M. resinosus* var. *niveus* Pk. given under the provisions of the Rochester Code.

Marasmius rigidus Montagne, Syll. Crypt. 143. 1856. = *Collybia dichrous* (Berkeley & Curtis) Gilliam. Type specimen: OHIO: Franklin Co.: Columbus, Sullivant (PC).

Marasmius rubrophyllus Pennington, N. Am. Fl. 9: 271. 1915. I have not studied the type specimen microscopically, but the description and the macroscopic appearance of the specimens are similar to *Collybia subnuda* (Ellis ex Peck) Gilliam, which see.

Marasmius salignus Pk. Annual Rep. New York State Mus. 35: 135. 1882 (1884). Type specimen: NEW YORK: Albany Co.: Bethlehem, Sep 1881, Peck (NYS). *Marasmius salignus* is similar to *M. ramulinus* Pk. in having nonamyloid trama and a pileus cuticle of diverticulate hyphae. Spiral thickening is also occasionally observed in the walls of the hyphae of the pileus, and the stipe hairs are similar. The spores of *M. salignus* are somewhat smaller than those of *M. ramulinus* (6-8 vs. 7-10 µm in length). Both probably belong in *Marasmiellus*.

Marasmius salignus Pk. var. *major* Pk. Annual Rep. New York State Mus. 41: 85. 1887 (1888). Type specimen: NEW YORK: Saratoga Co.: Gansevoort, Jul 1887, Peck (NYS). The overall aspect of the specimens and the large spores (12.5-18.5 X 4-6.5 µm) suggest a resemblance to *Marasmius magnisporus* Murrill, which see. The pileus cuticle is composed of smooth, interwoven hyphae. This taxon is not conspecific with

M. salignus var. *salignus.*

Marasmius scabellus Morgan, J. Mycol. 11: 202. 1905. = *Crinipellis setipes* (Pk.) Singer, Lilloa 8: 492. 1942. Type specimen: OHIO: Hamilton Co.: Preston, 1906, Morgan (IA).

Marasmius sclerotipes Bresadola, Fung. Trident. 12. *t. 11, f. 1.* 1881. = *Collybia cookei* (Bresadola) J. D. Arnold, Mycologia 27: 413. 1935.

Marasmius semihirtipes Pk. Bull. Buffalo Soc. Nat. Sci. 1: 57. 1873 (1874). = *Collybia spongiosa* (Berkeley & Curtis) Singer, Lilloa 22: 201. 1951. Type specimen: NEW YORK: Orange Co.: West Point, Jun 1872, Peck (NYS).

Marasmius semisquarrosus Berkeley & Cooke, Grevillea 6: 129. 1878. = *Collybia spongiosa* (Berkeley & Curtis) Singer, Lilloa 22: 201. 1951. I have not seen the type specimens.

Marasmius setipes (Pk.) Atkinson & House, New York State Mus. Bull. 205: 65. 1919. = *Crinipellis setipes* (Pk.) Singer, Lilloa 8: 493. 1942.

Marasmius spongiosus Berkeley & Curtis, Hooker's J. Bot. Kew Gard. Misc. 1: 100. 1849. = *Collybia spongiosa* (Berkeley & Curtis) Singer, Lilloa 22: 201. 1951.

Marasmius straminipes Pk. Bull. Buffalo Soc. Nat. Sci. 1: 59. 1873 (1874). Type specimen: NEW YORK: Albany Co.: Center, Oct 1872, Peck (NYS). The type specimen is closest to *Marasmiellus*. A glabrous, insititious stipe and pale, straw-colored rhizomorphs are present. The spores are 7-10 X 3-5 µm, and there are hyaline, clavate cheilocystidia with diverticula up to 6 µm long. The pileus cuticle consists of a single layer of narrow hyaline diverticulate hyphae.

Marasmius striatipes Pk. Annual Rep. New York State Mus. 24: 76. 1870 (1872). Type specimen: NEW YORK: Lewis Co.: Greig, Sep 1870, Peck (NYS). The combination of nonamyloid spores and trama with a pileus cuticle of interwoven undifferentiated hyphae suggests *Collybia*. The stipe, which is not insititious, is clothed with thin-walled, septate, filamentous hairs. If a transfer is made to *Collybia*, a new name will have to be designated, since the epithet *striatipes* is preoccupied (*Collybia striatipes* Velenovský, České Houby 2: 329. 1920).

Marasmius subnudus Ellis ex Peck, Annual Rep. New York State Mus. 51: 287. 1897 (1898).= **Collybia subnuda (Ellis ex Peck) Gilliam, comb. nov.** Peck's name is based on *Marasmius peronatus subnudus* Ellis, North American Fungi 909. 1883, a *nomen nudum*. I have seen one of the isotypes (NEW JERSEY: Gloucester Co.: Newfield, Ellis, NYS). This taxon has been called *Marasmius urens* by some but has a darker, tougher stipe and a less fleshy pileus than the acrid European species of that name. Both species belong to *Collybia* section *Vestipedes*.

Marasmius sulphureus Johnson, Bull. Minnesota Acad. Sci. 1878 (citation from Morgan, 1906). I have been unable to locate the type, but the description suggests *Marasmius strictipes* (Peck) Singer.

Marasmius tomentosipes Pk. Bull. Torrey Bot. Club 29: 71. 1902. = *Xeromphalina caulicinalis* (With. ex Fr.) Kühner & Maire, Bull. Soc. Mycol. France 50: 18. 1934.

Marasmius trullisatipes Pk. Annual Rep. New York State Mus. 66: 44. 1912 (1913). Type specimen: MINNESOTA: near Minneapolis, Peck (NYS). Owing to the state of decay of the basidiocarps and particularly the pileus cuticle, the taxonomic position of *M. trullisatipes* is difficult to assess. Its habit is that of a *Collybia*, but the amyloid spores and abundant, projecting fusiform hymenial cystidia suggest otherwise.

Marasmius umbonatus Pk. Bull. Buffalo Soc. Nat. Sci. 1: 58. 1873 (1874). = *Collybia umbonatella* Singer, Mycologia 35: 156. 1942 (1943). The epithet *umbonata* was preoccupied in *Collybia* (*C. umbonata* Peck, Bull. Torrey Bot. Club 31: 178. 1904).

Marasmius urens (Fr.) Fr. Epicr. Myc. 373. 1838. The species often called by this name in North America is *Collybia subnuda* (Ellis ex Peck) Gilliam. See *Marasmius subnudus*.

Marasmius varicosus Fr. Epicr. Myc. 376. 1838. There is a species of *Collybia* which, when it fruits in early spring with a dark brown rather than a reddish brown stipe, has been called *M. varicosus* in North America. The correct name for this taxon is *Collybia spongiosa* (Berkeley & Curtis) Singer or, if *C. spongiosa* and *C. semihirtipes* are thought to be separate species, the latter name. *M. varicosus* in Europe is figured as a fleshier fungus.

Marasmius velutipes Berkeley & Curtis, Ann. Mag. Nat. Hist. III, 4: 294. 1859. = *Collybia biformis* (Pk.) Singer, Sydowia 15: 55. 1961 (1962). Type specimen: SOUTH CAROLINA: Society Hill, Aug 1849, Curtis 2548.

I have seen the isotype at FH.

Marasmius vialis Pk. Annual Rep. New York State Mus. 51: 287. 1897 (1898). = *Marasmiellus tricolor* (Albertini & Schweinitz ex Fr.) Singer, Pap. Mich. Acad. Sci. 32 (1946): 128. 1948. Type specimen: NEW YORK: Saratoga Co.: Gansevoort, Jul 1897, Peck (NYS).

Marasmius viticola Berkeley & Curtis, Ann. Mag. Nat. Hist. III, 4: 294. 1859. = *Micromphale foetidum* (Sow. ex Fr.) Singer, Lloydia 8: 182. 1945. I have seen the isotype (ALABAMA: 1854, Curtis 4604) at FH.

LITERATURE CITED

1. Arnold, Jean D. 1935. A comparative study of certain species of *Marasmius* and *Collybia* in culture. Mycologia 27: 388-417.
2. Bigelow, H. E., and Margaret E. Barr. 1963. Contributions to the flora of northeastern North America. III. Rhodora 65: 289-309.
3. Dennis, R. W. G. 1951. Some Agaricaceae of Trinidad and Venezuela. Leucosporae: Part I. Trans. Brit. Mycol. Soc. 34: 411-482.
4. Fries, E. M. 1835. Corpus florarum provincialium Sueciae. I. Flora scanica. Uppsala, Palmblad. 394 p.
5. __________. 1836-1838. Epicrisis systematis mycologicum. Uppsala. 610 p.
6. Gilliam, Martina S. 1975. Periodicity of spore release in *Marasmius rotula*. Mich. Bot. 14: 83-90.
7. ________________. 1975. *Marasmius* section *Chordales* in the northeastern United States and adjacent Canada. Contr. Univ. Mich. Herb. 11(2): 25-40.
8. ________________. 1975. New North American species of *Marasmius*. Mycologia 67(4): 817-844.
9. Hesler, L. R. 1960. Mushrooms of the Great Smokies. Ann Arbor, Univ. of Michigan Press. 289 p.
10. Holmgren, Patricia, and W. Keuken. 1974. Index Herbariorum, Part I. 6th Ed. Regnum Veg. Vol. 92. Utrecht.
11. Kauffman, C. H. 1918. The Agaricaceae of Michigan. 2 vol. Mich. Geol. and Biol. Survey Publ. 26. Biol. Ser. 5. Lansing.
12. Kelly, K. L. and D. B. Judd. 1955. The ISCC-NBS method of designating colors and a dictionary of color names. National Bureau of Standards

Circular 553. Washington, D.C. (This publication is supplemented by the "ISCC-NBS color-name charts illustrated with centroid colors.")

13. Kühner, R. 1926. Contribution à l'étude des Hyménomycètes et spécialement des Agaricacés. Botaniste 17: 1-224.
14. ________. 1933. Études sur le genre *Marasmius*. Botaniste 25: 5-114.
15. ________. 1935. Nouvelles recherches sur le genre *Marasmius*. Ann. Soc. Linn. Lyon 79: 99-120.
16. ________ and H. Romagnesi. 1953. Flore analytique des Champignons Supérieurs. Paris, Masson et Cie. 556 p.
17. Lindeberg, G. 1939. Über das Wuchsstoffbedürfnis verschiedener Arten der Pilzgattung *Marasmius*. Svensk Bot. Tidsk. 33: 85-90.
18. ________. 1941. Über die Wirkung von Biotin auf *Marasmius androsaceus* (L.) Fr. Arch. Mikrobiol. 12: 58-62.
19. ________. 1944. Über die physiologie lignin-abbauender boden hymenomyzeten. Studien an schwedischen *Marasmius*-arten. Symb. Bot. Upsal. 8: 1-183.
20. Maerz, A., and M. R. Paul. 1950. A dictionary of color. Ed. 2. New York, McGraw-Hill Book Co. 208 p.
21. Miller, O. K., Jr. 1972. Mushrooms of North America. New York, Dutton. 360 p.
22. Morgan, A. P. 1905-1906. North American species of *Marasmius*. J. Mycol. 11: 201-212, 233-247. 12: 1-9, 159-162.
23. Moser, M. 1967. Die Röhrlinge und Blätterpilze, in Gams, H., Kleine Kryptogamenflora II (2). Stuttgart, Gustav-Fischer Verlag.
24. Patouillard, N. 1900. Essai taxonomique sur les familles et les genres des Hyménomycètes. Duclume, Lons-le-Saunier. 184 p.
25. Pennington, L. H. 1915. North American species of *Marasmius*. N. Am. Fl. 9: 250-286.
26. Quélet, L. 1873. Les champignons du Jura et des Vosges. Mém. Soc. Émul. Montbéliard, ser. II, 5: 219-225.
27. ________. 1886. Enchiridion fungorum. Lutetiae, Octavii Doin. 352 p.
28. Ridgway, R. 1912. Color standards and color nomenclature. Published by the author, Washington, D.C. 43 p.

29. Rockett, T. R., and C. L. Kramer. 1974. Periodicity and total spore production by lignicolous basidiomycetes. Mycologia 66: 817-829.
30. Romagnesi, H. 1952. Sur deux nouveaux Marasmes fétides et leur position taxonomique. Bull. Soc. Mycol. France 68: 133-140.
31. Shaffer, R. L. 1970. Cuticular terminology in *Russula* (Agaricales). Brittonia 22(3): 230-239.
32. Singer, R. 1943. Type studies on Basidiomycetes. II. Mycologia 35: 142-163.
33. ________. 1949 (1951). The Agaricales (Mushrooms) in Modern Taxonomy. Ed. 1. Lilloa 22: 321-340.
34. ________. 1951. Type studies on Basidiomycetes V. Sydowia 5: 445-475.
35. ________. 1952. Type studies on Agarics. III. Lilloa 25: 463-514.
36. ________. 1958. Studies toward a monograph of the South American species of *Marasmius*. Sydowia 2, 12: 54-145.
37. ________. 1958. New genera of fungi. VIII. Notes concerning the sections of the genus *Marasmius*. Mycologia 50: 103-110.
38. ________. 1962. The Agaricales in Modern Taxonomy. Ed. 2. Weinheim, J. Cramer. 916 p.
39. ________. 1964 (1965). Monographic studies on South American Basidiomycetes, especially those of the East Slope of the Andes and Brazil, 2. The genus *Marasmius* in South America. Sydowia 18: 106-358.
40. ________. 1969. Mycoflora Australis. Nova Hedwigia 29: 95-104.
41. ________. 1975. The Agaricales in Modern Taxonomy. Ed. 3. Weinheim, J. Cramer.
42. ________, and A. H. Smith. 1946. Proposals concerning the nomenclature of the gill fungi including a list of proposed lectotypes and genera conservanda. Mycologia 38: 240-299.
43. Young, P. A. 1925. A *Marasmius* parasitic on small grains in Illinois. Phytopathology 15: 115-118.

INDEX TO TAXA

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AN ANNOTATED INDEX FOR J. C. SCHAEFFER'S "BAVARIAN FUNGI."

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Summary

An alphabetical index to the taxa included by Schaeffer in "Fungorum... in Bavaria..."(1762-"1774") is furnished, together with notes on the origins of pre-existing binomials.

In the course of tracing early names used for fungi, I have had constant reference to Jacob Christian Schaeffer's "Fungorum qui in Bavaria... nascuntur" (1762-"1774"). This four volume series is of uncertain date, but the final volume, with it "index" must have been published in or just after 1774 (Petersen, 1975).

The entire work consists of excellent hand-colored lithographed plates, usually one per taxon, accompanied by the number, vulgar name and German description for each fungus. Finally, as part of the fourth volume, an "index" was furnished, consisting of a Latin name and description for each taxon, its text and plate numbers. Within the four volumes, then, Latin names are cited only in the last volume, and it is from its publication date that such names must be cited, not from the preceding plates or vulgar descriptions not accompanied by Latin names.

At the end of volumes one and two (all agarics) are indices to German names and taxonomic characters (by text numbers of the fungi). Many taxa are cross-indexed under two or more characters, and in this way these two indices can be used as a simple key to the included taxa.

Between the dates of appearance of the first volumes and the "index" of volume four, Scopoli's (1772) second edition of "Flora Carniolica..." was published. While his first edition (Scopoli, 1762) had employed polynomials, the second edition strictly used binomials. Examining those plates by Schaeffer available to him (but unnamed in Latin by Schaeffer), Scopoli supplied Latin binomials for selected taxa (Scopoli's was a local flora). These binomials, in turn, were observed by Schaeffer and used in the "index" to his volume four. In short, Schaeffer supplied illustrations and descriptions for some Scopoli names, then repeated these names later. In such cases, following what has become an informal convention, such names may be cited "[Schaeffer apud Scopoli]" followed by the post-1821 validating author.

It is evident that Schaeffer had a discerning eye, for he "split" taxa described by previous authors in several instances, e.g. his treatment of *Boletus bovinus sensu* Linnaeus and *sensu* Scopoli. Following the custom of the day, he also furnished a new epithet when it seemed appropriate, even though a "legitimate" epithet already existed and could be cited in synonymy. Beyond description of new taxa, Schaeffer's best contribution may have been to furnish binomial names to taxa previously known only by polynomials. Schaeffer used the binomials of only two other authors, Linnaeus (1753) and Scopoli, although many authors' publications were surely available in Regensburg, already a major scientific center.

At the conclusion of volume four, Schaeffer offered a concise listing of taxa, by genus, and then largely by groups of presumedly related taxa. Plate numbers and text numbers were listed, but no page numbers in the "index" - the only place where Latin names appeared. It is partly to remedy this awkward situation that the index below has been compiled.

It is hoped that this index will be of help in the use of Schaeffer's series now. In the event that the starting date for all fungi is changed to 1753, however, Schaeffer's publications will take on even more importance, and the roots of names he used will be needed for nomenclatural citation. For this reason also, the index has been gathered.

A few explanatory notes on the index are required.

1. In those cases where Schaeffer used a binomial of a preceding author, this is shown in the column labelled "Authority." LSP = Linnaeus, "Species Planatarum..." First Edition; Scop = Scopoli, "Flora Carniolica..." Second edition; each followed by the page in those works where the name appears.

2. When Schaeffer gave a binomial to a fungus previously known only by a polynomial, "nom. nov." appears as the authority, with no annotation.

3. When Schaeffer changed in some way (*nomen novum*, *comb. nov.*) an already extant binomial, "nom. nov." appears as the authority, but with an annotation (by number) to the relevant data.

4. When Schaeffer listed no synonyms, either binomial or polynomial, it is assumed that Schaeffer considered the taxon new to him, and "sp. nov." appears as authority. This

is true also when it is clear that Schaeffer separated two or more taxa from a "single" preceding name. In some cases the preceding name was retained for one taxon, and the segregate given a new name, assumedly as new species (e.g. his treatment of *Hydna imbricatum*), but often the original name was eliminated (e.g. his treatment of Linnaeus's *H. repandum*).

5. Page numbers refer to the location in the "index" to volume four, where the Latin name is cited for the first time, followed by the plate number (cf. bibliography for key to plate numbers and their locations in the volumes). Schaeffer already furnished an index to text numbers, which are often cited by post-1821 validating authors.

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ANNOTATIONS

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15. A new name for *A. membranaceus* Scop: 459.
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19. Several species segregated from *B. bovinus* LSP: 1177.
20. Several new species segregated from *B. bovinus* Scop: 463.
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22. A new name for *B. versicolor* Scop: 468. cf. *B. versicolor* (L.) Schaeff.
23. A new name for *B. igniarius* LSP: 1176.
24. A new combination of *Coralloides albida* Tourn. Inst.: 562.
25. A new name for *C. muscoides* LSP: 1183.
26. A new combination of *Coralloides flava* Tourn. Inst.: 562.
27. A new name for *C. arbuscula* Scop: 484.
28. A new name for *C. militaris* LSP: 1182.
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30. Is this an orthographic varient of *cornucopioides* Scop: 476?

31. This and *E. monacella* were segregated from *E. mitra* LSP: 1780, while Schaeffer's *E. mitra* is apparently a new species, for Linnaeus's *E. mitra* is not cited in synonymy.
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41. A new name for *P. cyathiformis* Scop: 486.

LITERATURE CITED

Linnaeus, Caroli. 1753. Species plantarum, exhibentes plantas rite cognitas, cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum systema sexuale digestas. Vol. II. Holmiae. pp. 561-1200 + indices.

Petersen, R. H. 1975. Specific and infraspecific names for fungi used in 1821. Part II. C, and supplement to part I. Mycotaxon 2: 151-165.

Schaeffer, Jacob Christian. Fungorum qui in Bavaria et Palatinatu circa Ratisbonam nascuntur icones nativis coloribus expressae. Ratisbonam.
Vol. I. 1762. pls. 1-100 + accom. text.
Vol. II. "1767" [1763]. pls. 101-200 + accom. text.
Vol. III. "1770" pls. 201-300 + accom. text.
Vol. IV. undated [1774].. pls. 301-330 + 136 pp. "index" + index to plates [preface dated April, 1774].

Scopoli, Joannis Antonii. 1772. Flora Carniolica, exhibens plantas Carnioliae indigenas et distributas in classes, genera, species, varietates, ordine Linnaeano. Tom. II. Vindobonensis. 496 pp + index + pls. 33-65.

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GIGASPORA MARGARITA, A NEW SPECIES IN THE ENDOGONACEAE

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In 1972, a soil sample from a soybean field on the Agronomy South Farm, University of Illinois Urbana, was wet-sieved and found to contain both white spores and yellow *Gigaspora* spores greater than 233 µm. Initially the white spores were considered immature spores of *Gigaspora gigantea* (Nicol. & Gerd.) Gerd. & Trappe (*Endogone gigantea* Nicol. & Gerd.). The white spores were collected and maintained in a pot culture. After three years of pot culturing on different hosts, yellow spores have not been found in pots inoculated with white spores. Furthermore, as determined from pot cultures started with yellow spores, the immature spores of *G. gigantea* are yellow and not white. We also found that the white-spored species differed in other respects from all of the five described species of *Gigaspora* (Gerdemann and Trappe, 1974).

Gigaspora margarita Becker & Hall, sp. nov. Figs. 1-6

Azygosporae singillatim in solo efformatae, globosae, 260-480 µm diametro, vel in solo compacto irregulares. Tunica sporarum levis, hyalina, e 4-8, raro 10 laminis, pluribus in maturioribus, efformata, 5-24 µm crassa, lamina quaque 1.5-4 µm crassa. Sporarum contentus albus, e guttulis oleosis minutis multis denique coalescentibus constitutus. Sporae directe per tunicam prope basim germinantes. Sporae terminales in hyphis sustinentibus productae. Hypha sustinens plerumque sub cellula instar suspensoris septata. Cellula instar suspensoris, 27-58 µm lata, hyalina vel pallide brunnea, levis, tunica 1-5 µm crassa, juxta sporam crassior. In solo vesiculae plerumque in hyphis spiratis singillatim vel in glomerulis compactis usque ad 20 numero, 22-35 µm diametro efformatae, juveniles tenuiter tunicatae, albae, maturiores pallide brunneae et prominentiis verruciformibus usque ad 4 µm altis, 5 µm latis ornatae. In radicibus endomycorrhizas cum arbusculis efformans.

Azygospores formed singly in the soil, globose, or irregular in compacted soils. Globose spores 260-480 µm diam. Spore wall smooth and hyaline, composed of 4-8, rarely 10, fused laminations, the number of laminations increasing with age. Spore wall 5-24 µm thick in mature spores, each lamination 1.5-4 µm thick. Contents of spores white, composed of many small oil droplets which tend to coalesce with age particularly in germination regions. Spore germination directly through the spore wall near the base. Spores terminal on the subtending hypha. Subtending hypha generally septate below the suspensor-like cell. Suspensor-like cell, 27-58 µm broad, hyaline to light brown, smooth, walls 1-5 µm thick, thicker at the point of attachment to the spore. Vesicles formed in the soil usually on coiled hyphae, singly or in tight clusters of up to 20, 22-35 µm diam., thin-walled and white when young, turning light brown with age and becoming covered with warty projections up to 4 µm high and 5 µm wide. Forms endomycorrhizae with arbuscules.

DISTRIBUTION, HABITAT, AND SEASON: Known from agricultural fields in east central Illinois and from a virgin sand prairie in central Illinois. Probably widespread in the midwestern states and present in soil throughout the year. Reportedly common in Florida (T. H. Nicolson, personal communication) and recently collected in the Waikato area of the North Island, New Zealand (Hall, 1976). The Illinois isolate is also very similar or identical to a species collected by M. J. Hattingh in South Africa.

MYCORRHIZAL ASSOCIATIONS: This species formed arbuscular endomycorrhizae in pot cultures with *Allium cepa* L., *Glycine max* (L.) Merr., *Lycopersicon esculentum* Mill., *Sorghum sudanense* (Piper) Staph. and *Zea mays* L.

ETYMOLOGY: Latin, *margarita* (pearl), referring to the large pearly white globose spores.

COLLECTIONS EXAMINED: TYPE: ILLINOIS - Champaign Co., University of Illinois, Agronomy South Farm, field # 1101, inoculum from a soybean field mixed with autoclaved soil and planted with soybeans, spores retrieved February 9, 1976, Becker 01 (OSC).

Gigaspora margarita is readily distinguished from other members of the genus in having white spores (Fig. 1) with laminated walls (Fig. 2) and white clustered warty vesicles (Fig. 3).

The shape of the spores, vesicles and arbuscules (Fig. 4) of *G. margarita* are similar to those of *G. gigantea* (B spores, Gerdemann, 1955; Nicolson and Gerdemann, 1968), but the differences in the color and the structure of the spore wall readily distinguish the two species. *G. gigantea* is yellow and has a thin outer wall tightly covering an inner wall while *G. margarita* is white and has a spore wall consisting of several laminations.

G. margarita differs from *G. gilmorei* primarily in spore wall structure and spore germination. While *G. gilmorei* has a complex wall consisting of five layers of widely varying thickness which easily separates into an inner and outer wall (Gerdemann and Trappe, 1974), *G. margarita* has a wall with up to ten fused laminations 1.5 to 4 μm thick which do not readily separate when spores are crushed (Fig. 2). The innermost layers of the spore wall of *G. margarita* do not separate into peripheral compartments prior to germ tube penetration of the outer wall (Figs. 5 and 6).

G. margarita is like *G. calospora* except the globose spores of *G. margarita* are generally larger than 300 μm diameter and have laminated walls. The vesicles are usually borne in clusters rather than singly.

G. coralloidea and *G. heterogama* are brown-spored species and are readily distinguishable from the white-spored *G. margarita*.

AMENDED KEY TO THE SPECIES OF GIGASPORA:

1. Azygospores white 2
1. Azygospores not white 3

2. Spore wall with distinct laminations of near equal width; spores germinate without forming peripheral compartments; vesicles white . . . . *G. margarita*
2. Spore wall with inner and outer layers of unequal thickness; spores germinate from peripheral compartments; vesicles brown . . . . *G. gilmorei*

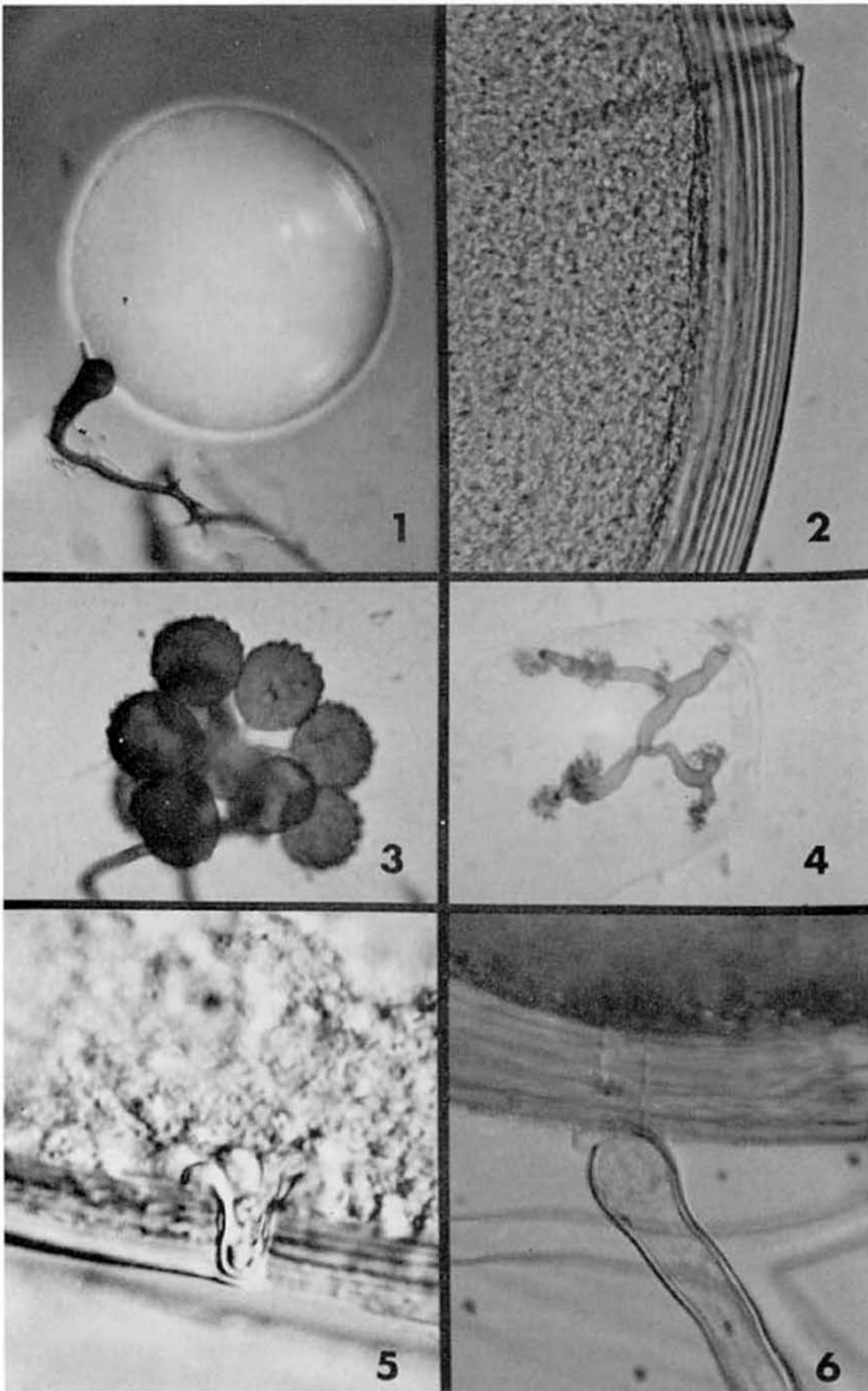
3. Azygospores yellow, smooth 4
3. Azygospores brown, with warts or minute spines 5

4. Globose spores less than 300 µm diam., pale yellow; vesicles smooth to knobby, formed singly . . . . *G. calospora*
4. Globose spores greater than 300 µm diam., bright yellow to greenish yellow; vesicles echinulate, formed in clusters . . . . *G. gigantea*

5. Globose spores greater than 300 µm diam., dark brown with hyaline warts; vesicles with coralloid projections . . *G. coralloidea*
5. Globose spores less than 300 µm diam., light brown with minute spines; vesicles smooth . . . . *G. heterogama*

FIGURES 1-6. *Gigaspora margarita.*

1. Mature azygospore, × 114.
2. Laminated spore wall, × 378.
3. Vesicles, × 378.
4. Arbuscule, × 378.
5. Section of a spore embedded in glycolmethacrylate resin showing young germ tube penetrating spore wall, × 378.
6. Late stage in spore germination, × 378. Note constriction of germ tube through the spore wall.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ACKNOWLEDGMENTS: This work was supported by funds from the Illinois Agricultural Experiment Station. We wish to thank Dr. D. P. Rogers for preparing the Latin description and Vicki Toews for typing the camera-ready copy.

LITERATURE CITED:

GERDEMANN, J. W. 1955. Relation of a large soil-borne spore to phycomycetous mycorrhizal infections. Mycologia 47:619-632.

GERDEMANN, J. W. & J. M. TRAPPE. 1974. The Endogonaceae in the Pacific Northwest. Mycologia Memoir No.5. 76p.

HALL, I. R. 1976. The spores and mycorrhizal infections of the New Zealand Endogonaceae. (In preparation).

NICOLSON, T. H. & J. W. GERDEMANN. 1968. Mycorrhizal *Endogone* species. Mycologia 60:313-325.

MYCOTAXON

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STACHYBOTRYS RENISPORA SP. NOV.

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SUMMARY

Stachybotrys renispora Misra, a new species isolated from seeds of *Phlox drummondii* Hook., is described and illustrated.

A new species of *Stachybotrys* Corda was isolated in November, 1975 from seeds of *Phlox drummondii* Hook. which were placed over a wad of wet filter paper in a petri dish. The fungus first appeared on seeds and later grew and spread on the filter paper. It was readily isolated in pure culture and grown on malt extract agar medium. The specific epithet of the new taxon is based on the reniform shape of its conidia.

Stachybotrys renispora sp. nov. (FIG. 1)

Coloniae in agaro cum extracto maltoso composito crescentes die undecima 1.0-1.5 cm diametro, obscure griseae, velutinae. Conidiophori subhyalini vel pallide griseo-brunnei, subtiliter verrucosi, sympodialiter ramosi, septati; ramuli 20-50 µ longi, 2.3-3.2 µ diametro, ad apicem phialides 4-7 producentes. Phialides subhyalinae vel pallide griseo-brunneae, tunicis apicem versus obscurioribus, crassioribus, crebro minute verrucosi, 7.5-9.3 µ longae, parte latissima 3.0-4.5 µ diametro. Conidia reniformia, atra, levia, 5.2-7.0 × 3.5-5.2 µ.

Colonies on malt extract agar 1.0-1.5 cm in diam in 10 days, deep grey, velvety. Mycelium superficial and immersed, composed of 1.7-2.3 µ thick, hyaline, septate, sparsely branched hyphae. Conidiophores subhyaline to light greyish brown, minutely verrucose, sympodially branched, septate; branches 20-50 µ long, 2.3-3.2 µ im diam, bearing 4-7 phialides at their apices. Phialides subhyaline to light greyish brown, with darker and thicker walls at the apex, often minutely verrucose, 7.5-9.3 µ long, 3.0-4.5 µ in diam at the broadest part. Conidia reniform, black, smooth, 5.2-7.0 × 3.5-5.2 µ.

Type: PCM *555*, isolated from seeds of *Phlox drummondii* Hook., Gorakhpur, U.P., India, November, 1975. A dried petri dish culture of the type strain has been deposited in the Commonwealth Mycological Institute, Kew as IMI *199591*.

Stachybotrys renispora can be easily distinguished from *S. nephrospora* Hansf. (synonyms: *S. reniformis* Tubaki and *S. sinuatophora* Matsushima *fide* Jong & Davis, MYCOTAXON 3: 453.

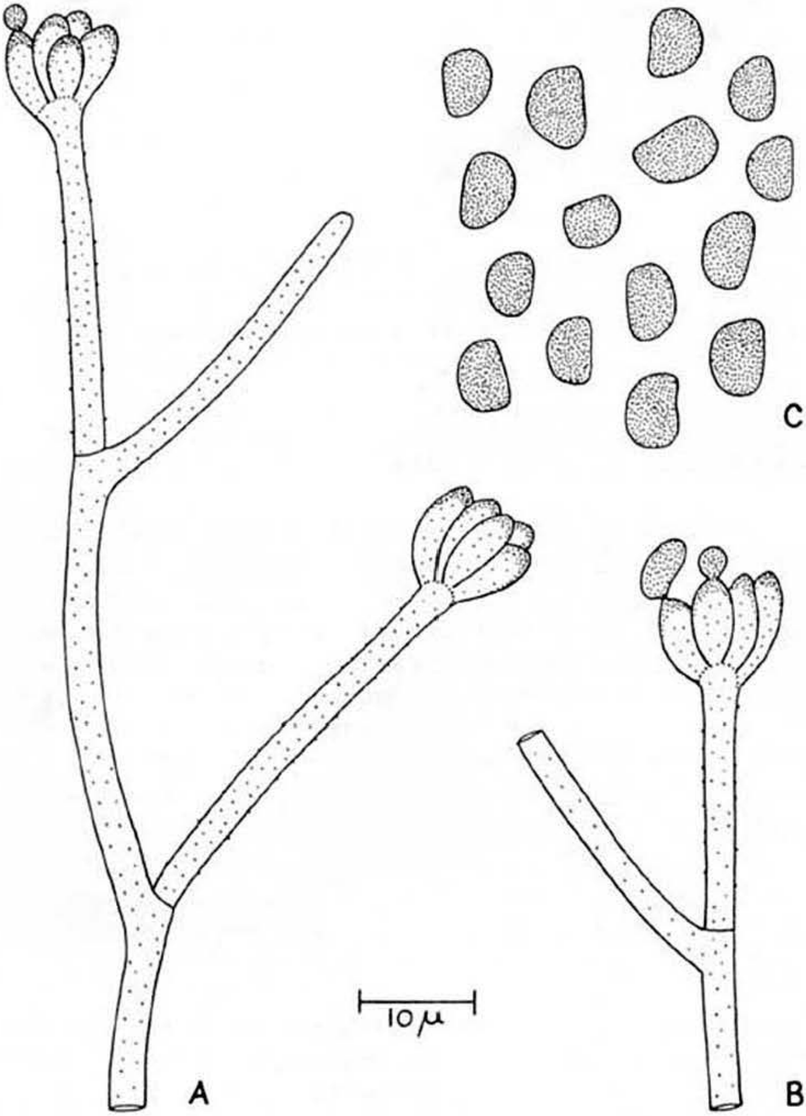

FIG. 1. *Stachybotrys renispora.* A and B, conidiophores with phialides. C, conidia.

1976) and from *S. oenanthes* M. B. Ellis, two other species with reniform conidia, on the basis of the smaller conidia.

ACKNOWLEDGEMENTS

The author wishes to thank Dr. M. B. Ellis for examining the fungus and reviewing the manuscript, Dr. D. P. Rogers for the Latin diagnosis, and Prof. K. S. Bhargava for laboratory facilities.

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A NEW TREMELLA FROM ECUADOR

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Tremella dumontii sp. nov. (Fig. 1)

Fructificatio in humido molliter gelatinosa, alba, 2.2 cm lata usque 7 mm alta cum vesiculae laevigatae, lacunosae et leptodermae (circa 225 µm crassa); in sicco cornea, sordide alba; superficie inferioris alveolata, ad substratum late affixa; hymenio 50-60 µm crassa, basidia numerosa; zona hyalina externa gelatinosa usque 40-50 µm crassa; probasidia subglobosa, 11.0-13.5 µm diam; metabasidia ovoidea vel subovoidea, cruciatim septata, 17-21.5 X 10.5-13.5 µm diam; hyphae nodosae, 3.4 µm diam; sterigmata anguste cylindraceae, 2.0-2.5 µm diam, ad apicem inflata, usque 5 µm lato; conidiophori in hymenio interspersae; conidia subglobosa, 1.5-2.5 µm diam; basidiosporae subglobosae vel ovoidae, 8-10.5 X 5.5-8 µm diam, per repetitionem germinantes.

Holotype: Ecuador. 9 km from Limón on Limón-Mendez road, Prov. Morona Santiago. On unidentified wood, 3-VIII-1975. Leg. K.P. Dumont, S.E. Carpenter and P. Buriticá. Dumont EC-2090 (NY).

The species is named for Dr. Kent P. Dumont, collector of this and other new tremellaceous fungi from South America, recently described by the author.

Fructification soft gelatinous when wet, white, 2.2 cm X 7 mm in height, with inflated, smooth, hollow, bladder-like lobes having walls about 225 µm thick; drying rigid, dirty white, diminishing in volume by about 50 per cent; inferior surface alveolate, broadly attached to substrate by mucilaginous-gelatinous extensions of basidiocarp wall; hymenium 50-60 µm wide with abundant basidia, beneath a

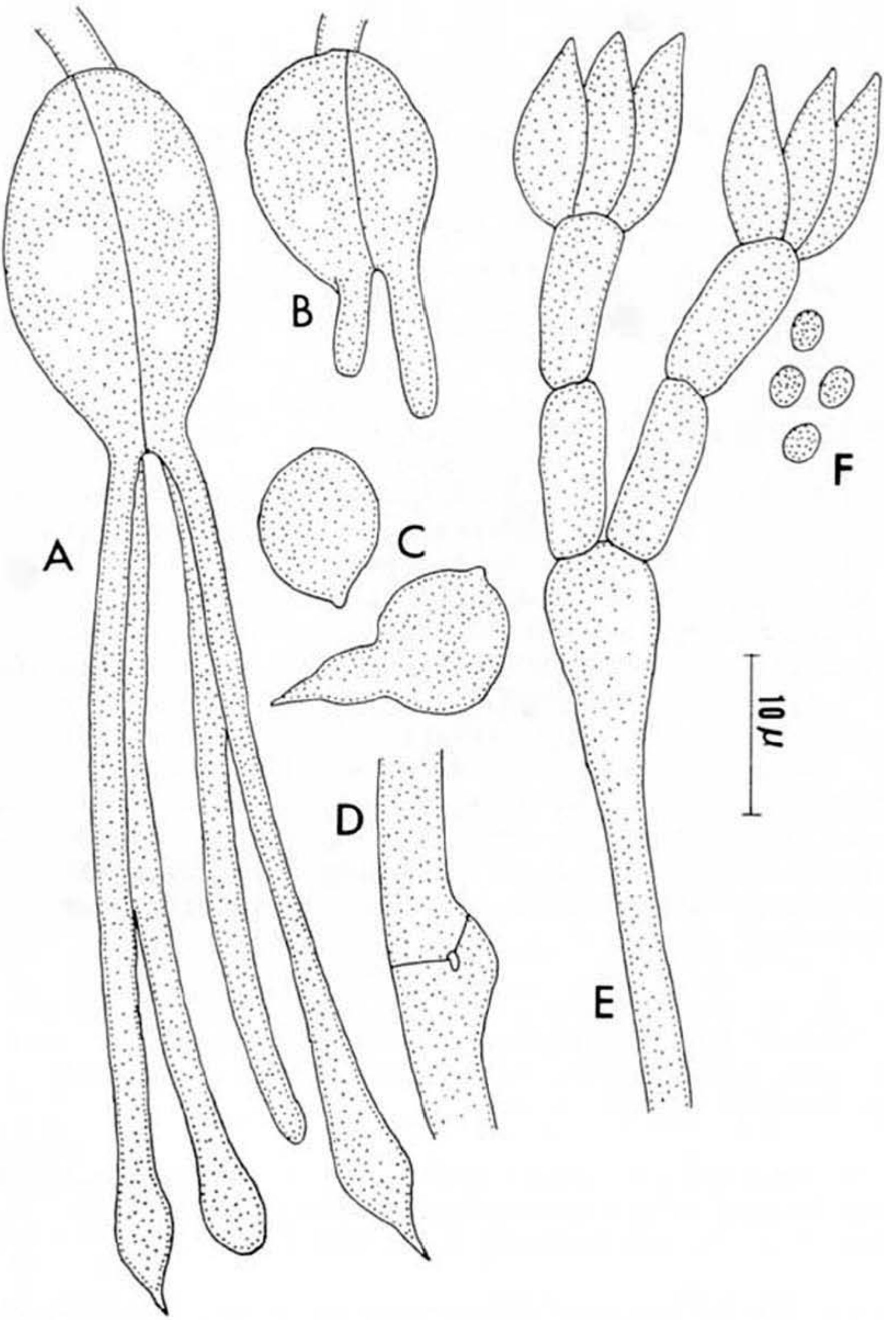

Fig. 1. Tremella dumontii (Dumont-EC 2090). A, mature metabasidium; B, 2-sterigmate, developing basidium; C, two basidiospores, one germinating by repetition; D, hypha with clamp connection; E, conidiophore; F, conidia.

hyaline, gelatinous external zone about 40-50 µm wide, penetrated by sterigmata; hyphae of subhymenium 3-4 µm diam with clamp connections; probasidia subglobose, 11.0-13.5 µm diam; metabasidia becoming cruciate-septate, ovoid to subovoid, 17-21.5 X 10.5-13.5 µm; sterigmata narrow cylindrical, 2.0-2.5 µm diam, apically inflated beneath the spiculum to about 5 µm; conidiophores interspersed in hymenium, forming apical clusters of phialides; conidia subspherical 1.5-2.5 µm diam; basidiospores subspherical to ovoid, 8-10.5 X 5.5-8.0 µm with prominent apiculi; germinating by repetition.

Of the neotropical species of _Tremella_, only _T. fibulifera_ A. Möller bears a superficial resemblance to this in gross morphology, in the fresh state. The lobes of _T. fibulifera_, however, have a much softer, almost watery-gelatinous consistency, which upon drying, collapse and become reduced to a horny film with traces of pale yellow pigmentation. _Tremella volcanagua_ Lowy from Guatemala (Lowy,1964) although much more massive than _T. dumontii_ and dark in color, is not unlike it in its hollow lobes, hyaline external gelatinous zone and wide, clamped subhymenial hyphae.

REFERENCE CITED

Lowy B. 1964. New Species of Tremellales from Guatemala. Jour. Elisha Mitchell Soc. 60: 65-70.

MYCOTAXON

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NOTES ON HYPHOMYCETES. X. *CODINAEOPSIS* GEN. NOV.

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ABSTRACT

A new genus, *Codinaeopsis* Morgan-Jones, is established to accommodate *Codinaea gonytrichoides* Shearer and Crane. The fungus is described and illustrated from a collection on dead *Rubus* stems made in Alabama.

INTRODUCTION

Examination of a collection of *Codinaea gonytrichoides*, made on dead stems of *Rubus* sp. from debris at the edge of a river, prompted questions concerning the suitability of its classification in *Codinaea* Maire. This species, whilst admittedly possessing a number of characteristics which link it to *Codinaea*, exhibits a peculiar arrangement of its conidiogenous cells on short collar hyphae which encircle a central setose stipe at intervals. In this respect it closely resembles a condition seen in *Gonytrichum* C.G. and F. Nees ex Pers., and which is unknown elsewhere among the hyphomycetes. This was recognized by Shearer and Crane (1971) in their choice of a specific epithet. *C. gonytrichoides*, in effect, occupies an intermediate position between *Codinaea* and *Gonytrichum*. To accurately reflect generic concepts and delimitations as they are currently accepted in the hyphomycetes it is my view that this organism should be placed in a genus of its own. A new generic name is therefore proposed for it herein.

TAXONOMIC PART

Codinaeopsis gen. nov.

Deuteromycotina, Hyphomycetes.

(Etym. *Codinaea* et. Gr. *opsis*, aspect)

Coloniae late effusae, appressae, albidae vel brunneae, setosae. Mycelium partim superficiale, partim immersum. Hyphae repentes, septate, laxe ramosae, laeves, subhyalinae vel pallide brunneae. Conidiophora numerosa, macronemata, mononemata, erecta, recta vel subrecta, laevia, atro-brunnea, sursum pallidiora, cum hyphae circumdata. Cellulae conidiogenae terminales et laterales, cylindricae vel flexuosae, monophialidicae vel polyphialidicae. Conidia hyalina, continua, cylindrica, curvata, hyalina, basi cicatrice conspicua, utrinque setula singula praedita, in capitulum mucosum incoloratum producta.

Species typica: *Codinaeopsis gonytrichoides* (Shearer and Crane) Morgan-Jones.

Colonies broadly effuse, appressed, whitish to brown, setose. Mycelium partly superficial, partly immersed in the substratum. Hyphae repent, septate, branched, smooth, subhyaline to pale brown. Conidiophores macronematous, mononematous, erect, straight or very slightly curved, septate, smooth, dark brown, paler towards the apex, bearing short encircling collar hyphae. Conidiogenous cells borne terminally and laterally on the collar hyphae or terminally on the main axis, cylindrical, monophialidic or polyphialidic, with collarettes. Conidia continuous, cylindrical, curved, hyaline, with a basal scar, bearing a single setula at each end, aggregated in mucilaginous masses.

Codinaeopsis gonytrichoides (Shearer and Crane) comb. nov. (Fig. 1).

≡ *Codinaea gonytrichoides* Shearer and Crane, Mycologia 63:245, 1971.

Colonies broadly effuse, somewhat appressed, whitish or cream to brown as numerous conidiophores are produced, setose. Mycelium partly superficial, parly immersed, composed of branched, repent, septate, smooth, subhyaline to pale brown hyphae, 3 - 5.5μm wide. Conidiophores macronematous, mononematous, scattered or gregarious in large groups, erect, straight or very slightly curved, dark brown, paler distally, apex frequently pale brown to subhyaline, producing laterally at the septa in the middle part short, encircling, somewhat nodose hyphae, slightly bulbous at the base, 160 - 380 X 4 - 8μm. Encircling hyphae occasionally grow out to form subhyaline to brown, sometimes setose branches. Conidiogenous cells mono or polyphialidic, borne terminally and laterally on encircling hyphae or sometimes terminally on the main axis, hyaline to subhyaline, smooth, cylindrical, straight or somewhat flexuous, with an apical funnel-shaped collarette or with several collarettes as a result of the production of a number of new conidiogenous loci by sympodial proliferation, 10 - 19 X 3 - 4.5μm, collarettes 1.5 - 2.5 X

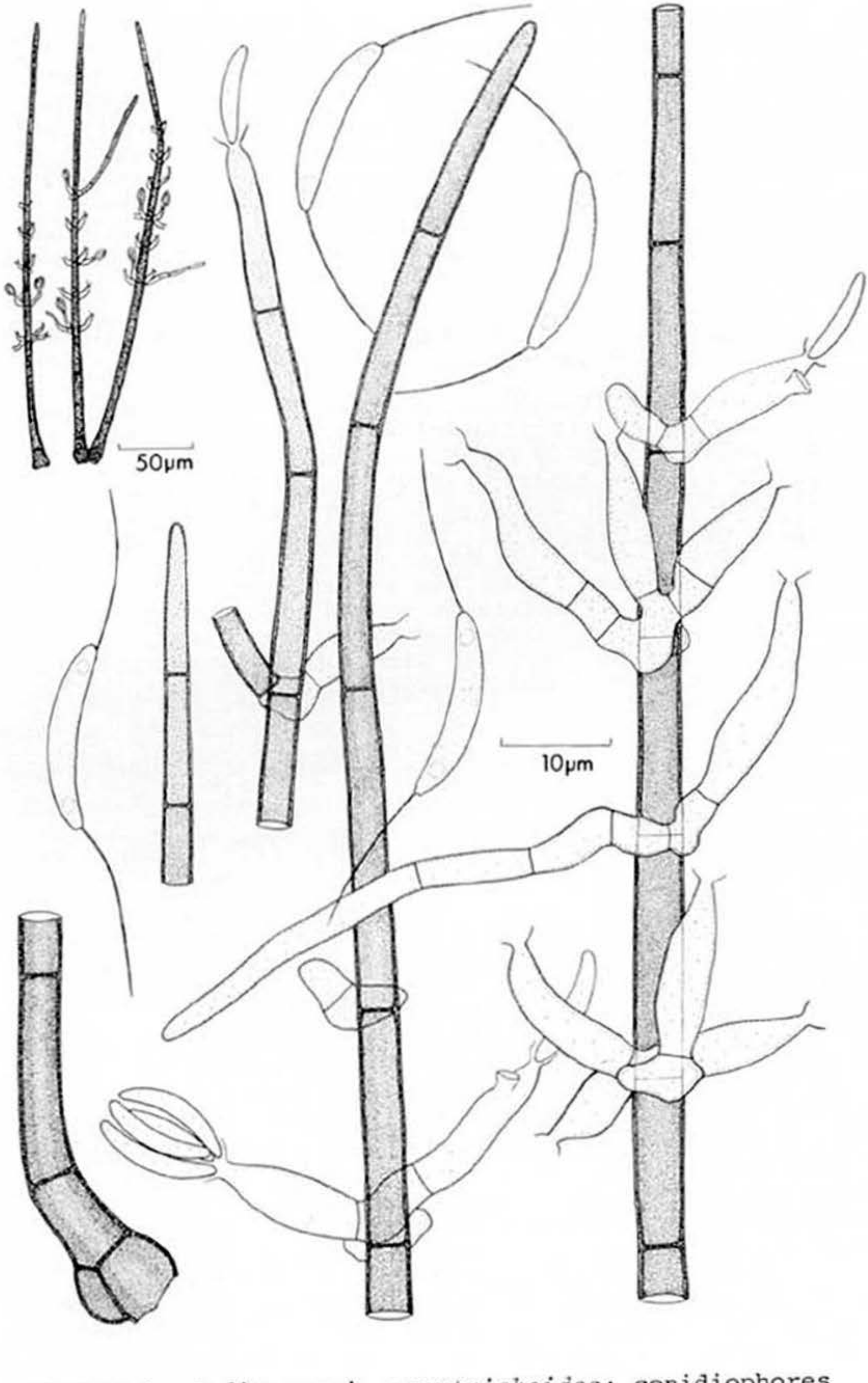

FIGURE 1. *Codinaeopsis gonytrichoides*; conidiophores and conidia.

1.5 - 3μm. Conidia continuous, cylindrical, curved, hyaline, obtuse at each end, guttulate, with a basal scar, bearing at the apex and to one side of the basal scar a simple, curved, setula, aggregated at the collarettes in mucilaginous masses, 10 - 15.5 X 1.5 - 2.5μm, setula 5 - 13μm long.

On samaras of *Acer* sp., fruit of *Carya* sp., leaves of *Castanopsis cuspidata*, seeds of *Liriodendron tulipifera*, stems of *Rubus* sp., and balsa-wood; North America and Japan.

Specimen examined: on dead stem of *Rubus*, Chewacla State Park, Lee County, Alabama, U.S.A., April 4, 1974, W. C. Blair, AUA, BPI.

The type collection was made on dried fruit of *Carya* sp., in a swampy habitat in Illinois. Two other collections were made in that state and one on submerged balsa-wood in a Maryland river (Shearer and Crane, 1971). Yokoyama (1975) reported a collection from Japan.

DISCUSSION

Codinaeopsis has, in addition to possession of distinct encircling hyphae borne at intervals on the main conidiophore axis, another characteristic in common with *Gonytrichum*. The nodose hyphae occasionally grow out to form long, setiform, sterile branches. The only real differences between the two genera lie in the facts that the conidiogenous cells of *Codinaeopsis* bear collarettes and are sometimes polyphialidic, and that its conidia are allantoid in shape and bear setulae.

In *Codinaea* the conidiogenous cells arise terminally and singly on simple conidiophores, in almost all cases independently of any seta. In seven species of the genus setae are absent. Only in the *Codinaea* state of *Chaetosphaeria dingleyae* Hughes, were rarely the setae become fertile apically, in *Codinaea maharashtrensis* Pirozynski and Patil, where the conidiogenous cells occasionally arise in tufts from the basal cells of the setae, and in *Codinaea apicalis* (Berk. and Curt.) Hughes and Kendrick and *Codinaea glauco-nigra* (Cooke and Ellis) Hughes and Kendrick where they are borne on the setae, on short lateral branches, or exist as fertile apical cells, is there any association between a central seta and the conidium bearing structures. It is possible that the arguments advanced here for segregating *C. gonytrichoides* in a separate genus might also apply to the latter two species.

Menisporopsis Hughes is distinguished from *Codinaea* because a synnema of conidiophores is formed surrounding a central seta in the former. This in spite of the fact that a mononematous versus a synnematous arrangement has been recognized as an insubstantial character on which to base generic distinctions. That *Codinaea obesispora* Hughes and Kendrick possesses a synnematous arrangement to its conidiophores, yet is not classified in *Menisporopsis* because of the absence of seta, underlines the problem of providing a fully satisfactory generic home from some species in this complex.

It is arguable that *C. gonytrichoides* has as much if not more in common with *Gonytrichum* than it has with *Codinaea*. Equally it has perhaps no more in common with *Codinaea* than do members of *Menisporopsis*, a segregate currently accepted as useful. The justification for erecting a new genus for it is therefore evident.

ACKNOWLEDGMENT

I thank Mrs. Elaine Gillam Turner for her typing of this manuscript.

REFERENCES

SHEARER, C. A. and J. L. Crane. 1971. Fungi of the Chesapeake Bay and its tributaries. 1. Patuxent River. Mycologia 63:237-260.

YOKOYAMA, T. 1975. In Descriptive Catalogue of IFO fungus collection. IV. IFO Res. Comm. 7:113-142.

MYCOTAXON

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KUEHNIELLA, A NEW GENUS OF THE GYMNOASCACEAE

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Summary

A fungus, originally described as a species of *Myxotrichum*, is redescribed and a new combination is proposed: *Kuehniella racovitzae* (Lagarde) Orr.

Kuehn (6) discussed species of *Gymnoascus* and *Myxotrichum* listed in the literature with comments about their possible relationships. Orr et al. (19, 20) monographed the two genera, excluding numerous species assigned to them by many investigators.

Among the excluded species was one described by Lagarde (14) as *Myxotrichum racovitzae*. The relationship of this fungus was confused because Lagarde also referred to it as *Gymnoascus racovitzae* in the same paper. He did not discuss any characters which would relate this fungus to either of the genera. Orr et al. (19, 20) suggested that this species might be closely related to *Arachniotus* as it was then accepted by many mycologists.

Attempts were made to obtain Lagarde's original material, but none apparently exists. Five strains of a fungus isolated from different areas and habitats in the United States were determined by the author to be the same as that described by Lagarde. They are characterized below.

Kuehniella gen. nov.

Gymnothecia alba globosa, ad peripherum appendicibus spiralibus praedita, confluentia; elementa gymnothecia componentia eis hypharum vegetarum similis, laxe intertexta et ascos circumdata; asci plerumque sphaerici hyalini evanescentes octospori; ascosporae globosae glabrotunicatae; status asexualis in forma arthroaleuriosporarum et aleuriosporarum; hyphae "racquet" dictae praesentes.

Species typica: *Myxotrichum racovitzae* Lagarde

Etym: After Dr. H.H. Kuehn, Mycologist.

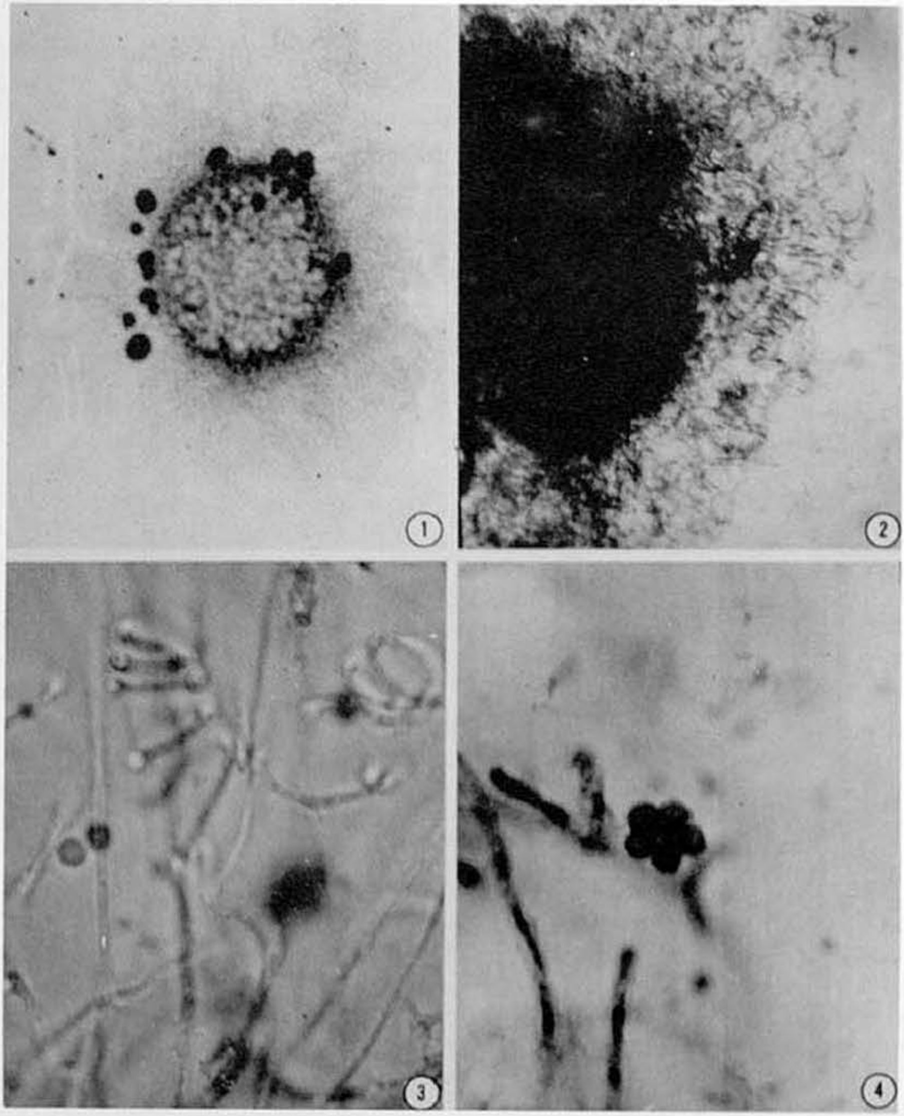
Gymnothecia white, globose with spiral appendages at the periphery, confluent. Elements comprising the gymnothecia similar to those of the vegetative hyphae, loosely interlaced to enclose the asci. Asci mostly spherical, hyaline, evanescent, 8-spored. Ascospores globose, hyaline, with walls smooth. Asexual state represented by arthroaleuriospores and aleuriospores. Racquet hyphae present.

Kuehniella racovitzae (Lagarde) Orr, comb. nov.

= *Myxotrichum racovitzae* Lagarde, Arch. Zool. Expér. Genér. 53:280. 1913.

= *Gymnoascus racovitzae* (Lagarde) Lagarde, Arch. Zool. Expér. Genér. 53:281. 1913. (lapsus calami?)

Gymnothecia white, mostly spherical, 50-1400 µm diam, excluding the spiral appendages, confluent. Spiral appendages forming at the periphery of the gymnothecia, variable in number, length and in number of turns per spiral. Elements of the gymnothecia are similar to the somatic hyphae and surround the asci loosely. Asci hyaline, spherical, 6.8-11.4 µm diam or oval to ellipsoid, 5.7-7.6 x 8.1-11 µm, occasionally stipitate, the wall evanescent, 8-spored. Ascospores hyaline, globose, 2.3-4.2 µm dia., with thick, smooth walls. Asexual spores of two types: (1) aleuriospores that are hyaline, more or less pyriform, 2.2-4.2 x 5.6-6.7 µm and (2) arthroaleuriospores that are hyaline, more or less cylindrical, 1.9-2.9 x 4.2-9.5 µm. Racquet hyphae sparse, when present not in association with the gymnothecia.



Figs. 1-4. *Kuehniella racovitzae*. All material stained with cotton-blue, all magnifications approximately x1000.
Fig. 1. Gymnothecium packed with young asci and ascospores.
Fig. 2. Gymnothecium showing spiral appendages at periphery.
Fig. 3. Coiled appendages and ascospores.
Fig. 4. Ascospores in the ascus.

Type habitat: On rotting wood found in a cave, France.

Neotype specimen (dessicated): 0-3436 (Weeks, KCFS 62-4739, ATCC 28557, NRRL 6154) isolated from a lesion on a dog, Mission, Kansas. Other specimens examined: 0-3212 (ATCC 32467) isolated from sputum, Kansas City, Kansas; 0-3636 (ATCC 32468) isolated from mouse dung, Fruita, Colorado; 0-1294 (ATCC 32466) isolated from soil, Dugway, Utah; 0-3203 (Bachus WE 4465) from soil, Wisconsin. Dried specimens have been deposited in the New York Botanical Garden, Bronx, New York, in the Farlow Herbarium, Harvard University, Cambridge, Massachusetts and in the Plant Pathology Herbarium, Cornell University, Ithaca, New York, U.S.A.

Lagarde (14) also found this species on rotting wood, organic matter and insect remains in France and Spain.

Colonies on Freezing agar (9) and Oatmeal-Salts agar (23) are white, plane to somewhat floccose with gymnothecia found throughout the colony. Greater numbers of gymnothecia may sometimes be found at the periphery of the colony. No exudate, odor or coloration on the colony reverse was observed.

Somatic hyphae and elements forming the gymnothecia are more or less indistinguishable from one another and walls of both are smooth. Spirals, similar to the appendages of the gymnothecia, may be found individually or in groups on the somatic hyphae (Figure 3). These spirals are also illustrated by Lagarde (14).

Gymnothecia appear somewhat solid when packed with asci (Figures 1, 2). Spiral appendages on some gymnothecia are few.

Ascospores (Figures 3, 4) are numerous and released early by the deliquescing asci. Lagarde (14) described the ascospores of *M. racovitzae* as containing 1-4 granules, but granules were not observed in the ascospores of any of the strains.

Ascospore measurements given by Lagarde are somewhat smaller than those given here.

Lagarde (14) mentioned terminal conidia (aleuriospores), but made no mention of arthroaleuriospores.

Although it had been suggested earlier that *K. racovitzae* might be related to *Arachniotus* (19, 20), a later study of that genus (21) indicates no close relationship. Ascospores of *Arachniotus (A. candidus)* are oval to ellipsoid (21) and those of *K. racovitzae* are globose. The latter species also possesses numerous coiled appendages on the gymnothecia, but no such structures are present on the gymnothecia of *Arachniotus*.

Amauroascus aureus (3) produces gymnothecia with sinuous to spiral filaments (10). Although the ascospore of *A. aureus* are also globose, they are yellowish, ridged, possess a scalloped band and appear reticulate. Species of *Arthroderma* (1, 2, 4, 5, 7, 22, 24) and *Nannizzia* (2, 5, 24) also produce gymothecia with spiral appendages. The dumb-bell and bone-shaped segments of the gymnothecial elements of those species are lacking in *K. racovitzae*. Furthermore, ascospores of *Arthroderma* and *Nannizzia* have been determined to be yellow oblate spheroids (23).

Shanorella (4) produces yellow gymnothecia with spiral appendages; individual segments of the gymnothecia are thick-walled and tend to disarticulate. Ascospores are yellow and oblate with an equatorial band. *Apinisia* (15) produces white gymnothecia with thick-walled, disarticulating segments with spirals at the periphery; ascospores are yellowish, globose and echinulate. *Spiromastix* (8) produces brownish gymnothecia with spirals somewhat more rigid than the elements from which they arise; ascospores are oval.

Ajellomyces (16) produces buff gymnothecia with numerous coils and globose, hyaline ascospores. This fungus, however is heterothallic and is pathogenic to man and animals. Asci arise from the coils of the gymnothecia. *Emmonsiella* (11, 12, 13) also produces buff gymnothecia with numerous coils and globose, hyaline ascospores. Gymnothecia are stellate in shape rather than spherical as in *K. racovitzae*. *Emmonsiella* is also heterothallic and pathogenic to man and animals. Ascospores of *K. racovitzae* are 1.5-2 times larger than those of the two genera above.

Relationship of *K. racovitzae* with any of the genera discussed may be somewhat distant because of the numerous differences discussed.

Spirals on vegetative hyphae of strains of *Trichophyton* *mentagrophytes* are common and well known. They have also been reported in *Coccidioides immitis* under special circumstances (17, 18). Such spirals, uncommon in species of Gymnoascaceae, are frequent in *K. racovitzae*.

Young colonies and ascospores of *K. racovitzae* may be temporarily confused with young colonies and ascospores of *Arachnotheca* (3). Young colonies of both resemble one another and the spherical ascospores of both are smooth when young. Mature colonies of *Arachnotheca* are rather cottony and those of *K. racovitzae* are somewhat floccose to granular. Ascospores of the former possess an irregularly tuberculate sheath; those of the latter remain smooth.

ACKNOWLEDGEMENTS

I wish to thank the following individuals for their aid: Drs. R.P. Korf, D. Malloch, R. Hanlin and J. Kimbrough for helpful comments and suggestions; Dr. Edith Cash for the Latin diagnosis; Mr. R. Stephens of the Photo Branch, U.S. Army Dugway Proving Ground, for the photographic work; Mr. R. Weeks for the neotype culture; Dr. L. Granel de Solignac of the Institut de Botanique, Université de Montpellier, France for Attempting to locate the original material of Lagarde. Special appreciation is due Dr. H.H. Kuehn, who spurred my interest in the Gymnoascaceae.

This study was supported by DA Project 1T161101A91A, In-House Laboratory Independent Research through U.S. Army Dugway Proving Ground.

LITERATURE CITED

1. AJELLO, L., and S. Cheng. 1967. The perfect state of *Trichophyton mentagrophytes*. Sabouraudia 5:230-234.

2. APINIS, A.E. 1964. Revision of British Gymnoascaceae. Mycol. Pap. 96:1-96.

3. ARX, J.A., von. 1971. On *Arachniotus* and related genera of the Gymnoascaceae. Persoonia 6:371-380.

4. BENJAMIN, R.K. 1956. A new genus of the Gymnoascaceae with a review of the other genera. Aliso 3:301-328.

5. DAWSON, C.O., and J.C. Gentles. 1961. The perfect states of *Keratinomyces ajelloi* Vanbreuseghem, *Trichophyton terrestre* Durie and Frey and *Microsporum nanum* Fuentes. Sabouraudia 1: 49-57.

6. KUEHN, H.H. 1959. A preliminary survey of the Gymnoascaceae. II. Mycologia 51:665-692.

7. _____. 1960. Observations on Gymnoascaceae. VIII. A new species of *Arthroderma*. Mycopathol. Mycol. Appl. 13:189-197.

8. _____ and G.F. Orr. 1962. A new genus of the Gymnoascaceae. Mycologia 54:160-167.

9. _____, _____ and G.R. Ghosh. 1961. A new and widely distributed species of *Pseudoarachniotus*. Mycopathol. Mycol. Appl. 14:216-229.

10. _____, H. Tubaki and G.F. Orr. 1964. *Arachniotus aureus*. Mycologia 56:863-782.

11. KWON-CHUNG, K.J. 1972. Sexual stage of *Histoplasma capsulatum*. Science 175:326.

12. _____. 1972. *Emmonsiella capsulata:* Perfect state of *Histoplasma capsulatum*. Science 177:368-369.

13. _____. 1973. Studies on *Emmonsiella capsulata*. I. Heterothallism and development of the ascocarp Mycologia 65:109-121.

14. LAGARDE, J. 1913. Champignons (premiere serie). Arch. Zool. Expér. Génér. 53:277-307.

15. LATOUCHE, J.A. 1968. *Apinisia graminicola* gen. et sp. nov. Trans. Brit. Mycol. Soc. 51:283-285.

16. MCDONOUGH, E.E., and A.L. Lewis. 1968. The Ascigerous stage of *Blastomyces dermatitidis*. Mycologia 60:76-83.

17. NEGRONI, P., and R. Negroni. 1964. Estudios Sobre el *Coccidioides immitis*. XVI. Poder queratolítico. Revista Argentina Dermatologia 165 (1):35-38.

18. ORR, G.F. 1967. The use of bait in isolating *Coccidioides immitis* from soil: A preliminary study. Mycopathol. Mycol. Appl. 13:189-187.

19. _____, H.H. Kuehn and O.A. Plunkett. 1963. The genus *Gymnoascus* Baranetzky. Mycopathol. Mycol. Appl. 21:1-18.

20. _____, _____ and _____. 1963. The Genus *Myxotrichum* Kunze. Canad. J. Bot. 41:1457-1480.

21. _____, G.R. Ghosh and K. Roy. 1976. The genera *Gymnascella*, *Arachniotus* and *Pseudoarachniotus*. Mycologia (submitted).

22. PADHYE, A.A., and J.W. Carmichael. 1972. *Arthroderma insingulare* sp. nov., another gymnoascaceous state of the *Trichophyton terrestre* complex. Sabouraudia 10:47-51.

23. _____ and _____, 1972. Ascospore Morphology of *Nannizzia* and *Arthroderma* by Scanning Electron Microscopy. Sabouraudia 10:313-314.

24. STOCKDALE, P.M. 1961. *Nannizzia incurvata* gen. nov., sp. nov., A perfect state of *Microsporum gypseum* (Bodin) Guiart et Grigorakis. Sabouraudia 1:41-48.

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XYLOBOTRYUM ANDINUM, A TROPICAL PYRENOMYCETE FROM NORTHERN CALIFORNIA

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At the 1974 Stuntz Mycological Foray, *Xylobotryum andinum* Patouillard was collected near Arcata, California and is herein reported for the first time from continental North America. This unusual pyrenomycete was previously known only from the American and Asian tropics.

The genus *Xylobotryum* was erected by Patouillard in 1895 for *X. andinum* from Ecuador. The specimen from California was compared with the type specimen with which it is conspecific. In *X. andinum* the erect, branching stromata are 5-9 mm high and bear numerous lobes at the apex in which the perithecia are borne (Fig. 1). Each lobe contains one perithecium which has a distinct, separate wall (Fig. 2). Although not always visible externally, the perithecia are ostiolate with periphyses lining the canal (Fig. 3). The unitunicate asci are clavate, long-stalked, without any apical mechanism (Fig. 4). Numerous unbranched paraphyses are present at maturity. The brown, translucent spores are usually one-septate, 10-12.5 (-13) x (3-) 3.5-4.0 µm, without any germ slit or pore (Figs. 5-7). Although the well-developed, black stroma and dark spores suggest the Xylariaceae, the lack of any amyloid, apical apparatus and the lack of germ slit or pore eliminate *Xylobotryum* from that family. *Xylobotryum* keys through the Sphaeriaceae (Müller & von Arx, 1973) but its generic affinities are unknown. The undifferentiated ascus apex suggests that the asci break down within the fruiting bodies as in *Thamnomyces*. This genus also has well-developed, branched stromata but the spores are 1-celled.

Xylobotryum andinum Pat., Bull. Herb. Boiss. 3:69. 1895.

=*X. dussii* Pat. in Duss, Enum. Champ. Guadel. p. 77. 1903.

The type specimen of *Xylobotryum dussii* was examined and found to be a synonym additional to those listed by Müller and von Arx (1962).

Holotype: Ecuador, San Jorge, on decorticated wood, coll. Lagerheim, July, 1892 FH.

Distribution: *Australia* (Sydow, 1938); *China*; *Dominica* (Smith, 1901); *Ecuador*; *Guadelope*; *India* (Agnihothrudu & Barua, 1960); *Puerto Rico*; *Tasmania* (Rodway, 1926); *U.S.A., California; Trinidad.*

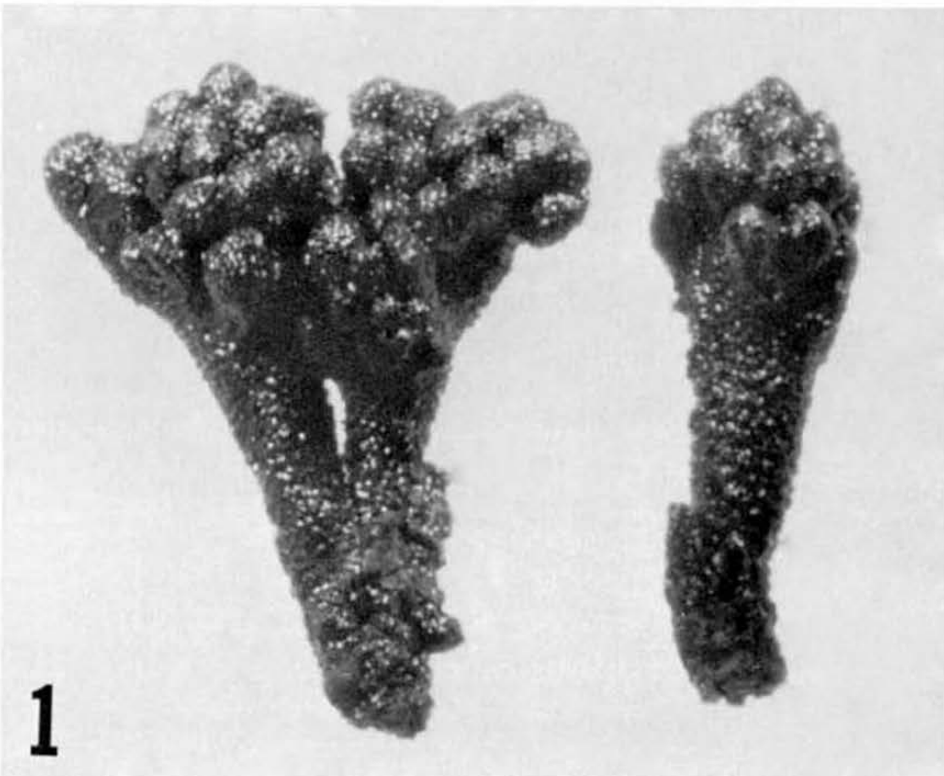
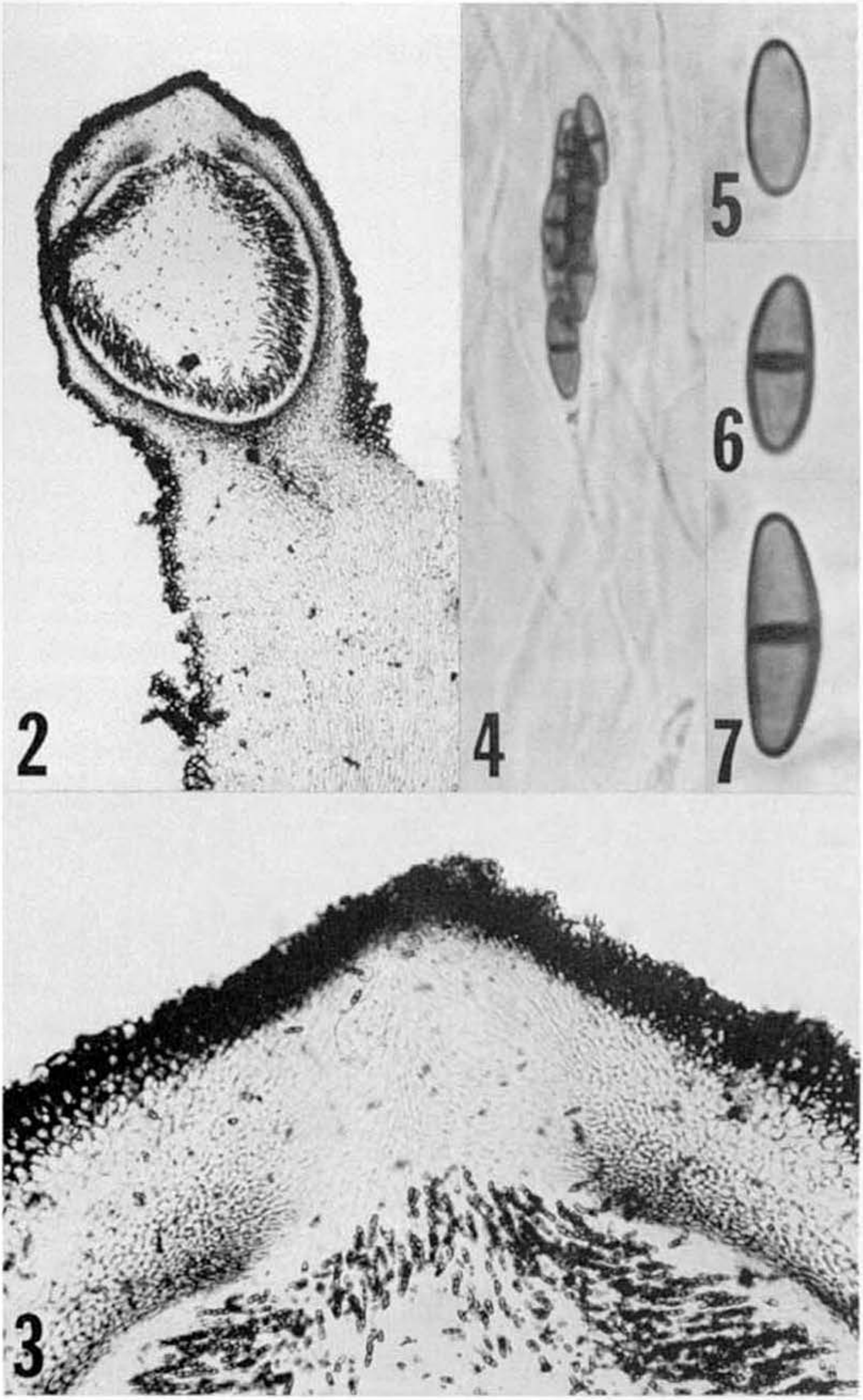


Fig. 1. *Xylobotryum andinum.* Branched and unbranched stroma.



Figs. 2-7. *Xylobotryum andinum*. 2. Section through stromatal lobe with perithecium embedded in apex x 60. 3. Section through perithecial apex x 300. 4. Ascus x 1000. 5-7. Ascospores x 2300.

Specimens Examined: China, Ting-an, Hainan, 13 Nov. 1934 coll. S.Q. Deng #6425 det. S.C. Teng CUP; Ecuador, San Jorge, July, 1892 HOLOTYPE FH; Guadeloupe, Deshaies, coll. Duss 779, 16 April 1903 HOLOTYPE of *Xylobotryum dussii* FH; Puerto Rico, Jan., 1927 coll. Müller det. J.H. Miller CUP; Trinidad, Grand Etang, coll. & det. R. Thaxter 5065, 1912-13 FH; Trinidad, La Leina Valley, Port of Spain, R. Thaxter, 1913 FH; U.S.A., California, Humboldt Co., Fern Canyon near mouth of river, on unidentified stump, coll. Mary Eckstrom, 8 Nov. 1974 OSC 35,157.

Specimens of the recognized *Xylobotryum* species were studied. Two species, *X. andinum*, the type, and *X. portentosum*, belong in the genus; *X. rickii* is excluded.

Xylobotryum portentosum (Mont.) Pat., Bull. Soc. Myc. France 16:185. 1900. (For complete synonymy, see Müller and von Arx, 1962).

X. portentosum is similar to *X. andinum*, differing primarily in the macrostructure of the stroma, which is large, up to 3 cm high and unbranched, tapering from the base to the broadly rounded apex. Perithecia form along the entire length of the stroma. Microscopically, these species are identical.

Distribution: *Brazil* (Möller, 1901); *Chile* (Montagne, 1856); *Dominica* (Smith, 1901); *Guadeloupe; Martinique*.

Specimens Examined: Guadeloupe, Capesterre, Bois du Grand-Etang, on the stipe of *Cyathea serra*, 1036 FH; Martinique, Montagne Pelee, on the stipe of *Alsophila aspera*, coll. Duss 478, 1911 FH.

Xylobotryum rickii Lloyd is excluded from this genus. The type specimen from the Lloyd Herbarium (BPI 7690) and two specimens identified by Rick were examined and found to be truly xylariaceous unlike *Xylobotryum*. The amyloid ascus apex and opaque, dark-brown spores with distinct germ slits indicate that this species is not related to *Xylobotryum portentosum* as suggested by Dennis (1970) and Müller and von Arx (1962). This species belongs in *Xylaria*.

ACKNOWLEDGEMENTS

The author wishes to thank Donald Pfister, Margaret Barr-Bigelow and Jack Rogers for creating a moment in scientific discovery at the Ascomycete Workshop, August, 1975, and is grateful to Donald Pfister, Farlow Herbarium, Harvard University, Richard Korf, Plant Pathology Herbarium, Cornell University, Paul Lentz, National Fungus Collections, and their assistants for the loan of specimens.

LITERATURE CITED

Agnihothrudu, V. and G.C.S. Barua. 1960. Notes on fungi from North-East India-VI. *Xylobotryum andinum* Pat. on tea (*Camellia sinensis* (L.) O. Kuntze). Sydowia 14: 136-137.

Dennis, R.W.G. 1970. Fungus flora of Venezuela and adjacent countries. Cramer, Lehre. 531 p.

Müller, E. and J.A. von Arx. 1962. Die Gattungen der didymosporen Pyrenomyceten. Beitr. Kryptogamenfl. Schweiz. 11(2): 7-922.

__________. 1973. Chapter 6. Pyrenomycetes: Meliolales, Coronophorales, Sphaeriales. In Ainsworth, G.L., F.K. Sparrow and A.S. Sussman (eds). The Fungi: An Advanced Treatise Vol. IV-A. Academic Press, New York.

Möller, A. 1901. Phycom. u. Ascom. Bras., p. 308, In Müller, E. and J.A. von Arx, 1962. Die Gattungen der didymosporen Pyrenomyceten. Beitr. Kryptogamenfl. Schweiz. 11(2): 7-922.

Montagne, J.F.C. 1856. Syll. Gen. Sp. Crypt. p. 201-202.

Rodway. 1926. Pap. and Proc. Roy. Soc. Tasmania, 1925. p. 168. In Die Gattungen der didymosporen Pyrenomyceten. Beitr. Kryptogamenfl. Schweiz. 11(2): 7-922.

Smith, A.L. 1901. On some fungi from the West Indies. J. Linn. Soc., Bot. 35: 16-17.

Sydow, H. 1938. Neue oder bemerkenswerte australische Micromyceten -- III. Ann. Mycol. 36: 297-298.

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NOTICE

ASSISTANCE REQUESTED
FOR INDEX OF DR. FRANZ PETRAK'S WORKS

The undersigned is preparing an index to the fungi and their hosts included in the mycological papers and exsiccati of Dr. Franz Petrak, and would like to know which herbaria received exsiccati and whether they are distributed or undistributed within the herbaria. He would also like to have reprints of Petrak's papers appearing in journals other than Annales Mycologici or Sydowia.

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MYCOTAXON

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SPECIFIC AND INFRASPECIFIC NAMES FOR FUNGI USED IN 1821. IV. H - M.

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Since the preceding portion of this series appeared, no new 1821 literature has been uncovered.

Conversely, the number and obscurity of literature including fungi which appeared between 1753 and 1821 continues to be amazing. Some of it, to be sure, is important as name-bringing sources for validated names. The rest would seem at present to be more academic - local floras and enumerations of genera, etc. - but there constantly lurks the possibility that a name introduced in such a work was validated properly *after* 1821, and may replace a more popular name now in common usage, so such literature is presented along with the rest below. Because no references to these works appears in the "formulae" following this text, no abbreviations are furnished.

More pre-1821 Literature

Braune, Franz Anton von. 1797. Salzburgische flora, ober Beschreibung der in dem Ergstiste Salzburg wilwachsenden Pflanzen, nebst Angabe ihrer Wohnorte, Blühzeiten, Dauer, Gestalt ic. ihrer Unwendbarkeit in der Heilkunde und Haushaltungwissenschaft, und ihrem Nussen für Mahler, Färber, Gärber, Bienenzieher, Forster und Landwirthe. Salzburg.

Vol. 1. lxxvi + 426 + table

Vol. 2. xl + 380 + index [fungi: 249-308]

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[1]This paper represents contribution No. 475 from the Botanical Laboratories, University of Tennessee.

Browne, Patrick. 1756. The civil and natural history of Jamaica in three parts. Containing, I. An accurate description of that island, its situation and soil, with a brief account of its former and present state, government, revenues, produce and trade. II. A history of the natural productions, including the various sorts of native fossils; perfect and imperfect vegetables; quadrupedes, birds, fishes, reptiles and insects; with their properties and uses in mechanics, diet and physic. III. An account of the nature of climates in general, and their different effects upon the human body; with a detail of the diseases arising from this source, particularly within the tropics. In three dissertations. The whole illustrated with fifty copper-places: in which the most curious productions are represented of the natural size, and delineated immediately from the objects. x + map + 490 + 49 pls. + index. London.

Feldner, M. J. N. [no date] Prodromus historiae fungorum agri Vindobonensis. 775 pp. Vind[obonensae]. [Cited by Schultes, q.v., so published before 1794].

GSN: Gmelin, Jo. Frid. 1788. Caroli a Linné, Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis locis. Editio decima tertia. Vol. 1. Lipsiae.

Gorter, Davidis de. 1781. Flora Zutphanica. 88 + index. Zutphaniae.

Dörrien, Catharina Helena. 1777. Verzeichniss und Beschreibung der sämtlichen in den Fürstlich Oranien-Nassauischen Landen wildwachsenden Gewächse. vorwort + 496. Herborn.

Dörrien, Catharina Helena. 1794. Verzeichniss und Beschreibung der sämtlichen in den Fürstlich Oranien-Nassuaischen landen wilwachsenden Gewächse. vorwort + 496. Leipzig.

Haller, Alberti de. Ad enumerationem stirpium Helveticarum emendationes et auctaria. Basel?

Pars. I. 1759. 56 pp

Pars. II. 1759. 45 pp [includes fungi]

Pars. III. ? 96 pp

Pars. IV. 1761 22 pp

Haller, Alberto v. 1769. Nomenclator ex historia plantarum indigenarum Helvetiae excerptus auctore... iv + 216. Berne.

HT: Hedwig, Ioanne. 1795. Theoria generationis et fructificationis plantarum cryptogamicarum Linnaei. xii + 268 + xlii pls. Lipsiae.

Hill, John. 1758. An account of a stone in the possession of the Right Honorable the Earl of Stafford; which on being watered produces excellent mushrooms. With the history of the Iolanthos, or violet-stone of the Germans. 38 + 2 pls. London.

Host, Nicolai Thomae. 1797. Synopsis plantarum in Austria proviciisque adiacentibus sponte crescentium. introd. + 666. Vindobonae.

Jacquin, Nicolai Josephi. 1762. Enumeratio stirpium plerarumque, quae sponte crescunt in agro Vindobonensi, montibusque confinibus. Accedunt observationum centuria et appendix de paucis exoticus. 315 + index. Vindobonae.

Leers, Joannis Danielis. 1775. Flora Herbornensis exhibens plantas circa Herbornam Nassoviorum crescentes, secundum systema sexuale Linnaeanum distributas, cum descriptionibus rariorum in primis graminum, propriisque observationibus et nomenclatore. Graminum omnium indigenorum eorumque adfinium icones CIV. Auctoris manu ad vivum delineatae aerique incisae. introd. + lix + 288 + index + xvi pls. Herbornae Nassouiorum.

Leyser, Friderici Wilhelmi. 1761. Flora Halensis exhibens plantas circa Halam Salicam crescentes secundum systema sexuale Linnaeanum distributas. v + introd. + 224 + index. Halae Salicae.

Leysser, Friderici Wilhelmi. 1783. Flora Halensis, exhibens plantas circa Halem Salicam crescentes, secundum systema sexuale Linneanum distributas. introd. + 305 + indices. Halae Salicae.

LFS: Lightfoot, John. Flora Scotica: or, a systematic arrangement, in the Linnaean method, of the native plants of Scotland and the Hebrides.

Vol. I. 1789. xli + 530.

Vol. II. 1789. pp. 531-1151 + index [includes fungi]

LSP: Linnaeus, Caroli. 1753. Species plantarum, exhibentes plantas rite cognitas, cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum systema sexuale digestas.

Vol. II. Holmiae. pp. 561-1200 + indices.

LSpPl: Linnaeus, Caroli. Species Plantarum, exhibentes plantas rite cognitas, ad genera relatas, cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum systema sexuale digestas. Editio secunda.

Vol. 1. 1762. [no fungi] 784 pp.

Vol. 2. 1763. pp. 785-1684 + index.

Ludwig, Christiani Gottlieb. 1760. Definitiones generum plantarum olim in usum auditorum collectas nunc auctas et emendatas edidit Georgius Rudolphus Boehmer. xlviii + 516 + index. Lipsiae. [Furnishes an excellent generic synonymy to pre-1753 names]

Lumnitzer, Stephani. 1791. Flora Posoniensis, exhibens plantas circa Posonium sponte crescentes, secundum systema sexuale Linneanum digestas. viii + 557 + 1 pl. Lipsiae.

Mattuschka, Henrici Godefridi. 1779. Enumeratio stirpium in Silesia sponte crescentium in usum herborisantium. introd. + 348 + index. Vratislaviae.

Moench, Conrado. 1794. Methodus plantas horti botanici et agri Marburgensis, a staminum situ describendi. 780 + index. Marburgi Cattorum.

Moench, Conradi. 1802. Supplementum ad methodum plantas a staminum situ describendi. 328 pp. Marburgi Cattorum.

PAH: Persoon, C. H. 1797. Adnotationes quaedam ad Theodori Holmskijoldi Coryphaeos Clavarias Ramariasque complectentes. pp. 120-239 [following Coryphiae]

PS: Persoon, C. H. 1801. Synopsis Methodica Fungorum. Pars prima & secunda. xxx + 706 + 5 pls. Gottingen.

PIP: Persoon, C. H. Icones pictae specierum rariorem fungorum in Synopsi Methodica descriptarum.

Fasc. I. 1803. Paris & Strasbourg. ii + 14 + pls. 1-6.

Fasc. II. 1804. Paris & Strasbourg. 15-28 + pls. 7-12.

Fasc. III. 1805. Paris & Strasbourg. 29-44 + pls. 13-18.

Fasc. IV. 1808. Paris & Strasbourg. 45-64 + pls. 19-24.

PT: Persoon, C. H. 1818. Traité sur les champignons, contenent l'indication des espèces nuisibles; précédé d'une introduction a l'histoire des champignons avec quatre planches coloriées. 10 + 276 + 2 pls. Paris.

Reichenbach, Henrico Theophilo Ludovico. 1817. Flora Lipsiensis pharmaceutica. Sistens plantarum agri Lipsiensis nunc et olim officinalium venenatarumque diagnoses, descriptiones, synonyma, locos natales, qualitates, vires et usum. xii + 248. Lipsiae.

Retzio, Andrea Jahanne. 1795. Florae Scandinaviae prodromus enumerans plantas Sueciae, Lapponiae, Finlandiae et Pomeraniae ac Daniae, Norvegiae, Holsatiae, Islandiae Groenlandiaeque. Editio altera. xvi + 383. Lipsiae.

Reyger, Gottfried. 1764. Tentamen florae Gedanensis, methodo sexuale adcommodatae.

[Vol. I] Dantisci. 293 pp.

Vol. II. Dantisci. 224 pp.

Röhling, Joh. Chr. 1796. Deutchlands flora zum bequemen Gebrauche heim Botanisiren nebst einer erklärenden Einleitung in die botanische Kunstprache zum Besten der Anfänger. Ein Taschenbuch. Bremen.

Abteilung I. lxiv + index + 384.

Abteilung II. pp. 385-540 + index [fungi: 472-540]

RAB: Roth, Alberto Gugliemlo. 1791. Vegetabilia cryptogamica minus hucusque cognita. Ann. Bot., Usteri 1: 5-12.

Schäffer, Jacob Christian. 1759. Vorläufige Beobachtungen der Schwämme um Regensburg angestellet und mit vier Kupfertafeln ausgemahlter Abbildungen erläutert. introd. + 59 + expl. plt. + IV pls. Regensburg.

Schaeffer, Jac. Chr. 1759. Isagoge in botanicam expeditiorem. vi + 96 + index + iv pls. Ratisbonae.

[Schultes, J. A.] 1794. Oestreichs flora. Ein Taschenbuch auf botanischen Excursionen. Wien.

Vol. I. introd. + 215 pp.

Vol. II. 244 pp. [fungi, pp. 192-204]

Scopoli, Joannis Antonio. 1760. Flora Carniolica exhibens plantas Carnioliae indigenas et distributas in classes naturales cum differentiis specific, synonymis recentiorum, locis natalibus, nominibus incolarum, observationibus selectis, viribus medicis. introd. + 607. Viennae.

SLT: Smith, James Edward. 1818. An account of *Rhizomorpha medullaris*, a new British fungus. Trans. Linn. Soc. London 12: 372-374.

SFH: Sprengel, Curtii. 1806. Florae Halensis tentamen novum. xvi + 420 + 13 pls. Halae Saxonum.

Wo: Weigel, Christ. Ehrenfr. 1772. Observationes Botanicae. introd. + 51 + 3 pls. Gryphiae.

J Coll: Wulfen, F. X. Plantae rariores Carinthiacae, *in* Jacquin, N. J. Collectanea ad botanicam, chemiam et historiam naturalem spectantia.

[part 1] vol. 1: 186-362. 1786.

[part 2] vol. 2: 112-234. 1788.

[continued as WJ 1 and WJ 2]

For reasons unexplainable, in part III of this series, all names beginning with G, adopted by Fries (Systema Mycologicum), were overlooked and not included. It is, of course, necessary to list them.

G (only those names adopted by Fries)

galeatus (Cantharellus) Fr: 324 ← [Sae: 371 (Merulius)]
galericulatus (Agaricus) Fr: 143 ← [Scop: 455]
gallicus (Polyporus, as "P. Fav. gallicus") Fr: 345, nom. nov.
galopus (Agaricus) Fr: 143 ← [PS: 379 ← POM 2: 56]
gambosus (Agaricus) Fr: 50, sp. nov.
gausapatus (Agaricus) Fr: 43, sp. nov.
gelatinosum (Hydnum) Fr: 407 ← [Scop: 472]
gentilis (Agaricus) Fr: 212, nom. nov.
geophyllus (Agaricus) Fr: 340 ← [BH: 546, pl. 522, fig. 2, as "geophilus"]
gibbosa (Daedalea) Fr: 338 ← [POM 1: 21 (Merulius)]
gibbus (Agaricus) Fr: 81 ← [PS: 449]
gigantea (Thelephora) Fr: 448 ← [FO 1: 152]
giganteus (Agaricus) Fr: 80 ← [SEF: pl. 244 + accom. text ← Sib: 420]
giganteus (Polyporus) Fr: 356 ← [PS: 521 (Boletus)]
gilvus (Agaricus) Fr: 80 ← [PS: 448]
glabrata (Thelephora) Fr: 438 ← ["Vetensk. Acad. Handl. 1820: 51"]
glabrum (Geoglossum) Fr: 488, not 483 ← [PRNB: 116]
glandulosus (Agaricus) Fr: 182 ← [BH: 388, pl. 426]
glaucopus (Agaricus) Fr: 224 ← [Sch 4: 23]
glojocephalus (Agaricus) Fr: 278 ← [DC 6: 52, as "gloiocephalus"]
glossoides (Clavaria) Fr: 487 † ← [PAH: 200]
glutinosum (Geoglossum) Fr: 489 ← [POM 1: 11]
glutinosus (Agaricus) Fr: 315 ← [Sch 4: 17]
glyciosmus (Agaricus) Fr: 72, not 92 ← [FO 2: 194]
gossypinus (Agaricus) Fr: 310 ← [BH: 419, pl. 425, fig. 2]
gracilis (Agaricus) Fr: 299 † ← [PS: 425]
gracilis (Clavaria) Fr: 475 ← [PAH: 182]
graminicola (Agaricus) Fr: 261 ← [NS: 202, as Agaricus Mycena ______ †]
grammopodius (Agaricus) Fr: 93 ← [BH: 617, pl. 548]
granulatus (Boletus) Fr: 387 ← [LSP: 1177]
granulosa (Thelephora) Fr: 446 ← [PS: 576]
granulosus (Agaricus) Fr: 24 ← [BEF: 79]
graveolens (Agaricus) Fr: 45 ← [PS: 361]

grisea (Clavaria) Fr: 468 ← [PCC: 44]
griseocyaneus (Agaricus: "griseo-cyaneus" of index) Fr: 202, nom. nov.
griseo-fuscus (Agaricus) Fr: 29 ← [DC 6: 52]
gunneri (Agaricus) Fr: 285, nom. nov.

-- H --

haematochelis (Agaricus) M: 82, N&B: 312 ← [BH: 660, pl. 527, fig. 1, as "aimatochelis"]
haematopus (Agaricus) Fr: 149 ← [POM 2: 56]
haematospermus (Agaricus) Fr: 282, M: 86 ← [BH: 638, pl. 595, fig. 1, as "aimatospermus"]
haemispherica (Peziza) G: 665 ← [PS: 647, as "hemispherica"]
hariolorum (Agaricus) Fr: 125, M: 74, N&B: 315 ← [BH: 618, pl. 585, fig. II, pl. 56]
haustellaris (Agaricus) Fr: 274 ← [FO 2: 232]
hebepodius (Agaricus) Fr: 97, sp. nov.
hederae (Astoma) G: 525 ← [SEF: pl. 371, fig. 5 (Sphaeria)]
hederae (Hypoderma xylomoides var.) M: 152, var. nov.
hederae (Sclerotium) Schl: 59, sp. nov.
hederaecola (Sphaeria lichenoides var.) M: 146, var. nov.
helveolus (Agaricus) M: 84-85, SA: 585 ← [BH: 653, pl. 431, fig. V]
helveolus (Agaricus araneosus var.) SA: 583, M: 82 ← [BH: pl. 431, fig. V only as "A. aran. helveolus"]
helvola (Clavaria) Fr: 482 ← [PAH: 201 as "helveola"]
helvola (Lepiota) G: 603 ← [BH: 653, pl. 431, fig. 1 (Agaricus "helveolus")]
helvus (Agaricus) Fr: 72, sp. nov.
hemispherica (Tremella) Schl: 60, sp. nov.
hemitrichus (Agaricus) Fr: 280 ← [PS: 296]
hepatica (Fistulina) Fr: 396, not 16, G: 648 ← [PS: 549 (Boletus) ← Sch 4: 82 (Boletus)]
hepatica (Thelephora) Fr: 439, nom. nov.
hepaticus (Boletus) M: 39, L: 470, H: 26, P: 444, HFL: pl. 126 + text ← [Sch 4: 82]
heraclearia (Sphaeria punctiformis var.) M: 146, var. nov.; Fr 2: 525
heraclei (Erysiphe) SA: 615, Schl: 57, M: 133 ← ["Schleich. Crypt. Exs. no. 89"]
heraclei (Xyloma) Schl: 60, sp. nov.
herbariorum (Eurotium) G: 566-567 ← [WH: 111 (Mucor)]
herbariorum (Mucor) M: 114 ← [WH: 111]

herbarum (Byssus) M: 12-13 ← [PAB: 32 (Dematium)]
herbarum (Calycina) G: 670 ← [PAB: 30 (Peziza)]
herbarum (Cladosporium) G: 556, LD 20: 496-497 ← [PAB: 32 (Dematium)]
herbarum (Clavaria) M: 32-33 ← [PRNB: 118]
herbarum (Dematium) Schl: 57, N&B: 368 ← [PAB: 32]
herbarum (Exormatostoma) G: 522 ← [PS: 78 (Sphaeria)]
herbarum (Geoglossum) G: 659 ← [PRNB: 118 (Clavaria)]
herbarum (Peziza) Schl: 58 ← [PAB: 30]
herbarum (Sphaeria) N&B: 300, Schl: 59, H: 7 ← [PS: 78]
herbarum (Torula) G: 557 ← [LM 3: 21 (Torula) ← PS: 693 (Monilia)]
herbarum (Xyloma) Schl: 60, M: 150 † ← [A&S: 65]
herculeana (Clavaria) P: 270, G: 657 ← [LFS: 1065]
heteroclitus (Boletus) G: 640, P: 244-245 ← [Bolt: 164]
heteroclitus (Polyporus) Fr: 344 ← [Bolt: 164 (Boletus)]
heteromorpha (Daedalea) Fr: 340 ← [FO 1: 108]
heyderi (Mitrula) G: 660, sp. nov.
hiascens (Agaricus) Fr: 303, sp. nov.
hilaris (Agaricus) Fr: 254, nom. nov.
himantioides (Merulius) Fr: 329 ← [FO 2: 238]
hinnuleus (Agaricus) P: 215, H: 21-22 ← [With 4: 232]
hippopinus (Agaricus) P: 209-210 ← [With 4: 202]
hippotrichoides (Thamnomyces) Ehren: 519 ← [SEF: pl. 200 + text, (Sphaeria "hypotrichoides"]
hippotrichoides (Rhizomorpha setiformis var. Lichen ___) M:136-137† ← [Wild.:360(Lichen ___)]
hirneolus (Agaricus) Fr: 206 ← [FO 2: 211]
hirsuta (Agaricus ephemeroides var.) M: 55 ← [BH: 403, pl. 582?]
hirsuta (Sphaeria) H: 7, G: 527 ← [PAB: 24]
hirsuta (Thelephora) Fr: 439, Schl: 60, N&B: 342, HFD: 13, pl. 1738, fig. 1 ← [Willd: 397]
hirsutum (Geoglossum) Fr: 488, G: 658, H: 30, LD 18: 358 ← [PAH: 169]
hirsutum (Helotium) LD 20: 509-510 ← [TM 1: 23]
hirsutum (Stereum) G: 653 ← [Willd: 397 ("Thaelaephora")]
hirsutus (Polyporus) Fr: 367 ← [JColl 2: 149 (Boletus)]
hirtipes (Agaricus) Fr: 206, not 269, HFD: 12, pl. 1730, fig. 2 ← [Sae: 272]
hirtus (Polyporus) Fr: 345, nom. nov.
hispida (Peziza) P: 462 ← [HFA: 635]
hispida (Sphaeria) M: 144 ← [TM 2: 17]
hispidulum (Chordostylum) LD 21: 166 ← [TM 1: 39]

hispidulus (Agaricus) Fr: 201 ← [FO 2: 97, not BEF: 81]
hispidus (Boletus) M: 42, SA: 548, G: 640, N&B: 337 ← [BH: 351, pl. 210, 493]
hispidus (Polyporus) Fr: 362 ← [BH: 351, pls. 210, 493 (Boletus)]
hollii (Hydnum) Fr: 420 ← ["Schmidt: 87" (Sistotrema)]
hordus (Agaricus) Fr: 47, sp. nov.
horisontalis (Agaricus) SA: 582 ← [BH: 573, pl. 324, as "horizontalis"]
horizontalis (Agaricus) M: 80, H: 21, P: 211 † ← [BH: 573, pl. 324]
hornemannii (Agaricus) Fr: 285, not 47, nom. nov.
hortènsis (Agaricus) Fr: 195 ← [PS: 362]
hudsonii (Agaricus) M: 64 ← [PS: 390]
hudsoni (Mycena) G: 620 ← [PS: 390 (Agaricus)]
humuli (Erysiphe) M: 133 ← [DC 6: 106]
hyalina (Octospora) G: 667 ← [PS: 655 (Peziza)]
hyalina (Sphaeria) Schl: 59 ← ["P[ersoon?]"]
hybrida (Clavaria) Re: 54 ← [BH: 194, pl. 440, fig. 1]
hybrida (Helvella) P: 453 ← [SEF: pl. 238 + text]
hybrida (Morchella) G: 662 ← [SEF: pl. 238 + text (Helvella)]
hybrida (Peziza) G: 666 ← [SEF: pl. 369, fig. 1 + text]
hybridum (Hydnum) M: 38 ← [BH: 307, pl. 453, fig. 2]
hybridus (Agaricus) Fr: 239, SA: 584 ← [BH: index, pl. 398 only †]
hybridus ([Agaricus]) M: 83 ← [BH: index, pl. 398 only†]
hybridus (Polyporus) Fr: 362 † ← [Bosc: 84 (Boletus)]
hydnoidea (Thelephora) Fr: 445 ← [POM 1: 15 (Corticium)]
hydnoides (Ceratium) M: 13, G: 562 ← [LM 3: 20]
hydnoides (Peziza) P: 467 ← [SEF: pl. 178 + text]
hydrogrammus (Agaricus) Fr: 197, M: 66 ← [BH: 515, pl. 564, figs. A, B, G, H]
hydrolips (Merulius var. Helvella ____) M: 48 † ← [BH: 292, pl. 465, fig. 2 (Helvella ____)]
hydrolips (Merulius) N&B: 333, M: 48 ← [BH: 292, pl. 465, fig. 2 (Helvella)]
hydrophilus (Agaricus) M: 83 ← [BH: 440, pl. 511]
hydrophora (Mucor) G: 561 ← [PS: 202, not TM 2: 5]
hydrophora (Peziza) M: 27 ← [BH: 243, pl. 410, fig. 2]
hydrophora (Sphaeria peziza var. Peziza ____) M: 143-144 † ← [BH: 243 (Peziza ____)]
hydrophorus (Agaricus) Fr: 304, M: 57 ← [BH: 411, pl. 558, fig. 2]
hypnorum (Agaricus) N&B: 317 ← [PS: 385, as "hypnorum" ← BEFC 1: 117, as "hypni"]
hypnorum (Agaricus mycena) Z: 106 † ← [BEFC 1: 117 (Agaricus "hypni")]
hypnorum (Agaricus) Fr: 267 ← [BEFC 1: 117, as "hypni" ?Schrank]

hypodermia (Peziza) M: 19-20 ← [DC 6: 19]
hypophylla (Sphaeria) Spr: 318 ← ["Rebentisch"]
hypothejus (Agaricus) Fr: 35, nom. nov.
hypotrichoides (Sphaeria) Schl: 59 ← [?SEF: pl. 200 + text]
hypoxylon (Sphaeria) H: 4 ← [POM 1: 20]
hypoxylon (Hypoxylon cornutum var. Sphaeria ____)M: 137-138 † ← [POM 1: 20 (Sphaeria)]
hypoxylon (Sphaeria [Cordyceps]) FSS: no. 181 ← [LSP: 1182 (Clavaria)]
hypoxylon (Sphaeria) P: 496 ← [LSP: 1182 (Clavaria)]
hypoxylon (Sphaeria) Schl: 59 ← [POM 1: 20]
hysginus (Agaricus) Fr: 67 ← [FO 2: 192]
hysterioides (Xyloma) Schl: 60, P: 283 ← [PIC: 38, pl. 10, fig. 3]
hystrix (Hydnum) Fr: 410 ← [BEF: 113, "hystricinum"]
hystrix (Sphaeria) Schl: 59 ← [TM 2: 53]

-- I --

icterinus (Agaricus) Fr: 207, sp. nov.
igniarius (Boletus) M: 41, P: 447, G: 641, H: 28 ← [LSpPl: 1645 ← LSP: 1176]
igniarius (Polyporus) Fr: 375, not 378 ← [LSP: 1176 (Boletus)]
ileopodius (Agaricus) M: 81 ← [BH: 656, pl. 578, 592, 586, fig. 2]
ilicinum (Erineum) Re: 56, M: 17, ← [LDC: 15]
ilicinus (Agaricus) Fr: 251, not 257 ← [DC 6: 48]
ilicium (Erineum) SA: 529 ← [LDC: 15, as "ilicinum"]
iliopodius (Agaricus) Fr: 231 ← [BH: 656, as "ileopodius"]
illinitus (Agaricus) Fr: 23 ← [FO 2: 8]
imberbis (Boletus) M: 40 ← [BH: 339, pl. 445 fig. 1]
imberbis (Peziza) SA: 532-533, M: 22-23 ← [BH: 245, pl. 467, fig. 2]
imbricata (Daedalea) P: 251-252 ← [BH: 349, pl. 366 (Boletus)]
imbricatum (Hydnum) Fr: 398, M: 38, G: 650 ← [LSpPl: 1647 ← LSP: 1178]
imbricatus (Agaricus) Fr: 42 ← [FO 1: 27]
imbricatus (Boletus) M: 42, P: 252 ← [BH: 349, pl. 366]
imbricatus (Polyporus) Fr: 357 ← [BH: 349, pl. 366 (Boletus)]
immersa (Nemania) G: 517 ← [SEF: pl. 374, fig. 1 + text (Sphaeria)]
immersa (Patellaria) G: 664 ← [SEF: pl. 369, fig. 9 + text (Peziza), not SEF: 389]
immersum (Sclerotium) SA: 617 ← [DC 6: 111 (Sclerotium)]

impatiens (Agaricus) Fr :302, not 244, sp. nov.
impressa (Sphaeria) FSS: no. 152, sp. nov., Fr 2: 564
inaequalis (Clavaria) Fr: 481 ← [FD 14: 8, pl. 836]
inamoenus (Agaricus) Fr: 111 ← [FO 1: 10]
incana (Omphalia amethystea [var.]) G: 615 ← [BH: pl. 570, fig. 1]
incanus (Agaricus) Fr: 209, sp. nov.
incarnatus (Hypochnus) Schl: 58, sp. nov.
incarnatus (Polyporus) Fr: 379 ← [PS: 546 (Boletus) ← PAB: 30 (Poria)]
incomtus (Agaricus) Fr: 171 ← [FO 2: 212, not 218]
inconstans (Agaricus) Fr: 181, SA: 560, M: 51 ← [PCS: 17]
inconstans (Pleuropus) G: 615 ← [PCS: 17 (Agaricus)]
incrassata (Rivularia) P: 178 ← [SEF 14: no. 967? (Ulva) as alga]
incurvus (Agaricus) Re: 52-53 ← [Sch 4: 29]
infractus (Agaricus) Fr: 223 ← [PS: 283 ← POM 2: 42, as "infrcactus"]
inequale (Peripherostoma fuscum [var.]) G: 514, var. nov.
inflexa (Peziza) P: 458 ← [Bolt: 71, as "inflecta"]
infundibuliformis (Agaricus) SA: 574, M: 67, N&B: 328, P: 393[1] ← [BH: 510, pls. 286, 553]
infundibuliformis (Agaricus) P: 393[1] ← [Bolt: 34]
infundibuliformis (Boletus melanopus var.) M: 43 ← [PIPR: 8, pl. 4 (Boletus ____)]
infundibuliformis (Helotium) G: 661 ← [Sch 4: 110 (Helvella)]
infundibuliformis (Hymenoscyphus) G: 673 ← [BEFC 1: 211 (Peziza "infundibulum"), <u>non</u> Sch]
infundibuliformis (Merulius) H: 25 ← [Bolt: 34 (Agaricus)]
infundibuliformis (Peziza crocea var.) M: 25, var. nov.?
infundibulum (Hydnum) Fr: 401 ← [Swartz, "Vetensk. Acad. Handl. 1810: 244"]
infundibulum (Polyporus melanopus var.) Fr: 347 ← [PD: 70 (Boletus "infundibuliformis"]
ingratus (Agaricus) Fr: 123 ← [Sae: 304]
inodorus (Agaricus) M: 79-80 ← [BH: 552, pl. 524, fig. 2]
inopus (Agaricus) Fr: 251 ← [FO 2: 32]
inornatus (Agaricus) Fr: 93 ← [SEF: pl. 342 + text]
inquilans (Agaricus) Fr: 264 ← [FO 2: 170]
inquinans (Dermodium) G: 570 ← [LM 3: 25, as "Demordium"]
inquinans (Octospora) G: 667, sp. nov. ← [non PS: 631 (Peziza) ← Sch: t. 158 (Peziza)]
inquinans (Peziza) Schl: 58, H: 32 ← [PS: 631]
inquinans (Sphaeria) M: 145 ← [PS: 83]
insidens (Sphaeria) G: 528 ← [SEF: pl. 372, fig. 12, + text]
insitiva (Sphaeria) M: 140 ← [TM 2: 36]
insulsus (Agaricus) Fr: 68, sp. nov.

integer (Agaricus) P: 403, Schl: 56, H: 20 ← [LSP: 1171]
integrella (Mycena) G: 621 ← [PIC: 54, pl. 14 (Agaricus)]
integrellus (Agaricus) Fr: 161 ← [PIC: 54, pl. 14]
integrellus (Agaricus mycena) Z: 104 † ← [PIC: 54, pl. 14 (Agaricus ____)]
intertexta (Byssus) M: 12 ← [DC2: 68]
intestina (Rhizomorpha) M: 136 ← [DC 6: 115]
intumescens (Gyraria) G: 593 ← [SEF 26: no. 1870 (Tremella), as alga)]
intumescens (Tremella) H: 32 ← [SEF 26: no. 1870, as alga]
intybacea (Thelephora) Fr: 431 ← [PS: 567]
inundatum (Myrothecium) G: 569 ← [TM 1: 25]
involuta (Omphalia) G: 611 ← [BEFC 1: 39 (Agaricus)]
involutus (Agaricus) Fr: 271, not 270 ← [BEFC 1: 39]
ionides (Agaricus) M: 73-74 ← [BH: 557, pl. 533, fig. 3]
irregulare (Peripherostoma) G: 514 ← [SEF: pl. 374, fig. 9 + text (Sphaeria)]
irregularis (Sphaeria) P: 286 ← [SEF: pl. 374, fig. 9 + text]
irrigatus (Agaricus) Fr: 101 ← [PS: 361]
isabellinus (Hypochnus) LD 22: 368, Schl: 58 ← [FO 2: 281]
iungenda (Aspergillus) MNA: 510 ← ["Ehrenberg. Flora 3"]

-- J --

janthinus (Agaricus purus var.) M: 72, var. nov.
jecorinus (Agaricus) Fr: 66, sp. nov.
jolithus (Dematium) Schl: 57 ← [WFL: 535]
jonides (Agaricus) Fr: 107 ← [BH: 557, pl. 533, fig. 3, as "ionides"]
jubatus (Agaricus) Fr: 196, sp. nov.
jugis (Agaricus) Fr: 177, nom. nov.
juglandis (Boletus) M: 43, SA: 552, N&B: 337, R: 25 ← [Sch 4: 75, "iuglandis"]
juglandis (Erineum) M: 17 ← ["Schleich. Cent. Exs. no. 92"]
juglandis (Erineum) Schl: 57, sp. nov.?
juglandis (Stilbospora) FSS: no. 215, sp. nov., Fr 3: 485
juncea (Clavaria) Fr: 479 ← [FO 2: 291]
junceus (Agaricus) Fr: 208, sp. nov.
juncicola (Agaricus) Fr: 160, sp. nov.

juniperi (Tremella) Schl: 60 ← [LSP: 1157, as alga, as "juniperina"]
juniperina (Gyraria) G: 594 ← [LSP: 1157, as alga (Tremella)]
juniperina (Tremella) LD 20: 140 ← [LSP: 1157, as alga]
junonius (Agaricus) Fr: 244, sp. nov.
junonius (Agaricus) SB: no. 582, pl. 582, fig. 1 ← [Fr: 244]

-- K --

katui (Boletus) Spr: 310 ← [EHor: 93]
kirbii (Sphaeria) G: 529 ← [SEF: pl. 371, fig. 3 + text]
kunzei (Clavaria) Fr: 474, sp. nov.
küttlingerii (Thelephora, "küllingerii" of index) Fr: 434 ← ["Mart. Erl.: 396"]

-- L --

labellum (Peziza) M: 25-26, N&B: 349 ← [BH: 262, pl. 204]
laburni (Sphaeria) P: 280-281, M: 142 ← [POM 1: 68]
labyrinthiformis (Agaricus) SA: 558-559 ← [BH: 377, pl. 352, 442, fig. 1]
labyrinthiformis (Boletus) M: 41, SA: 551 ← [BH: 357, pl. 497, fig. 1]
laccatus (Agaricus) Fr: 106 ← [Scop: 444]
lacerus (Agaricus) Fr: 257, sp. nov.
laciniata (Clavaria) M: 33, SA: 541, P: 473 ← [Sch 4: 122]
laciniata (Thelephora) Fr: 431 ← [POM 1: 36 (Corticium)]
laciniatum (Stereum) G: 652 ← [POM 1: 36 (Corticium)]
laciniatus (Boletus) P: 251 †, in obs.
lacrimans (Merulius, "lacrymans" of index) Fr: 328 ← [WJ 2: 111 (Boletus)]
lacrymabundus (Agaricus) Fr: 287, H: 23-24, P: 425, M: 55, SA: 566 ← [BH: 438, pl. 194, 525, fig. 3]
lacrymalis (Agaricus) P: 218-219 ← [BEF: 75, as "lacrimalis"]
lacrymalis (Gyraria) G: 595 ← [PS: 628 (Tremella)]
lacrymans (Boletus) P: 245-246 ← [WJ 2: 111]
lacrymans (Merulius) H: 25-26, SA: 557, M: 49 ← [WJ 2: 111 (Boletus)]
lactea (Peziza) M: 23, SA: 533 ← [BH: 253, pl. 376, fig. 3]

lactea (Thelephora) Fr: 452, nom. nov.
lactea (Typhoderma) G: 559 ← ["Dillwyn. Conf.: 79" (Conferva)]
lacteum (Hydnum) Fr: 412 ← [FO 2: 266 (Sistotrema)]
lacteus (Agaricus) Fr: 152 ← [PS: 394]
lacteus (Agaricus mycena) Z: 106 † ← [PS: 394 (Agaricus ______)]
lacteus (Polyporus) Fr: 359, sp. nov.
lactifluum (Leccinum) G: 647 ← [With 4: 320 (Boletus)]
lactifluus (Agaricus) P: 193, R: 31, H: 20 ← [LSP: 1172]
lacunosum (Sclerotium) G: 591 ← [PD: 15] Fr 2: 252 (as var.).
lacustris (Peziza) FSS: no. 173, sp. nov., Fr 2: 143
laetus (Agaricus) Fr: 102 ← [POM 2: 48]
laevigatum (Hydnum) Fr: 399 ← [Swartz, "Vetensk. Acad. Handl. 1810: 243"]
laevigatus (Agaricus metatus var.) Fr: 144 ← [PS: 380 (Agaricus ______)]
laevis (Nemania) G: 519 ← [SEF: pl. 394, fig. 5 + text (Sphaeria)]
laevis (Thelephora) Fr: 451 ← [PD: 30 (Corticium)]
lagopus (Agaricus) Fr: 312, sp. nov.
lamellirugis (Agaricus) Fr: 184 ← [DC 6: 44]
lamprocephalus (Agaricus) M: 83 ← [BH: 652, pl. 544, fig. 2]
lampropus (Agaricus) Fr: 203 ← [FO 1: 19]
lanata (Cytispora) FSS: no. 159, sp. nov.: Fr 2: 482
lanatus (Agaricus) P: 211 ← [SEF: pl. 417 + text]
laneus (Aspergillus) G: 555 ← [LM 3: 16 ← "Ditmar Icon."]
lanuginosa (Peziza) M: 25, N&B: 349, P: 462 ← [BH: 260, pl. 396, fig. 2]
lanuginosus (Agaricus) Fr: 257, M: 83, N&B: 312, P: 212-213 —— [BH: 659, pl. 370]
laricis (Boletus) R: 18 ← [?"Linn."]
laricis (Boletus) Schl: 56, sp. nov.?
lascivus (Agaricus) Fr: 110, sp. nov.
lata (Nemania) G: 518 ← [POM 1: 66 (Sphaeria)]
lata (Sphaeria) Schl: 59, H: 6 ← [POM 1: 66]
lateralis (Agaricus) P: 238-239 ← [Bolt: 71]
lateralis (Boletus) H: 27 ← [Bolt: 83]
latericola (Boletus) H: 27 ← [Bolt: 83]
lateritia (Auricularia cariophyllea var.) M: 33, var. nov.
lateritia (Himantia) LD 21: 166 ← [PS: 704 †]
lateritia (Peziza vesciculosa var.) M: 25 ← [BH: 270, pl. 457, figs. 1G, I, R]
lateritia (Pratella) G: 627 ← [Sch 4: 22 (Agaricus)]

lateritius (Agaricus) Fr: 265, nom. nov.
lateritius (Agaricus) Fr: 288 ← [PC: 19, non Sch 4: 22]
lateritius (Agaricus pratella) Z: 313 † ← [Sch 4: 22 (Agaricus _____)]
latissima (Daedalea) Fr: 340 ← [FO 1: 128 (Polyporus)]
latus (Agaricus) Fr: 215 ← [PS: 276]
lauri (Astoma) G: 525 † ← [SEF: pl. 371 + text (Sphaeria)]
lauri (Clavaria) Fr: 486 ← [Brot: 475]
lauri (Xyloma) Schl: 60, sp. nov.?
lecanora (Peziza) Schl: 58 ← ["Schm. & K"]
lejocephalus (Agaricus) Fr: 277 ← [DC 6: 53, as "leïocephalus"]
lenticulans (Peziza) Schl: 58 ← [POM 2: 85]
lenticularis (Octospora) G: 667, sp. nov., non POM 2: 85 ← BH: 248.
lenticularis (Peziza) M: 20-21, SA: 530 ← [BH: 248, pl. 300, figs. a, c]
lentus (Agaricus) Fr: 253 ← [PS: 287]
leoninum (Hydnum) Fr: 411, sp. nov.
leoninus (Agaricus) Fr: 199 ← [Sch 4: 21]
lepideus (Agaricus) Fr: 176 ← [FO 1: 21]
lepista (Agaricus) Fr: 271, not 265, sp. nov.
leporina (Scodellina) G: 668 ← [BEF: 117 (Peziza)]
leptocephala (Coltricia) G: 645 ← [WJ 1: 142 (Boletus)]
leptocephalus (Polyporus) Fr: 349 ← [WJ 1: 142 (Boletus)]
leucocephalus (Agaricus) R: 37, SA: 580, M: 77 ← [BH: 597, pl. 428, fig. 1, pl. 536]
leucocreas (Xyloma) Schl: 60: M: 149, G: 545 ← [LDC: 63]
leucoloma (Octospora) G: 667 ← [PS: 665 (Peziza) ← "Hedwig. Musc.: 13"]
leucomela (Peziza) L: 467 ← [DC 6: 21 ← PS: 670]
leucophaea (Helvella) G: 662, LD 20: 512 ← [PS: 616 ← "Batav. Fung. armen.: 25"]
leucopodium (Leccinum aurantiacum [var.]) G: 646, var. nov.
leucopodius (Agaricus) M: 80 ← [BH: 556, pl. 533, fig. 2]
leucopus (Agaricus) Fr: 236 ← [BH: 556, pl. 533, fig. 2, as "leucopodius"]
leucosperma (Cytispora) FSS: no. 156 ← [POM 1: 81 (Naemaspora)] Fr 2: 543
leucosperma (Nemaspora) SA: 524, M: 148, Spr: 278, LD 22: 386 ← [PS: 108 —— POM 1: 81, in obs.]
leucostoma (Sphaeria) M: 142 ← [PAB: 23]
leucostomum (Engizostoma) G: 520 ← [PAB: 23 (Sphaeria)]
leviuscula (Gemmularia) LD 18: 311 ← ["Rafinesque. J. Phys., Aug. 1819"]
lichenoides (Periconia) M: 18 ← [TM 2: 2]

lichenoides (Sphaeria) L: 486, M: 146 ← [DC 2: 299]
lichenoides (Xyloma) SA: 519 ← [DC 2: 304 †]
ligatus (Agaricus) Fr: 32, sp. nov.
ligatus (Agaricus) P: 414, sp. nov.?
lignatilis (Agaricus) Fr: 94 † ← [PS: 368][2]
lignatilis (Agaricus) SA: 577, M: 71 ← [BH: 528, pl. 554, fig. 1]
lignatilis (Agaricus gymnopus) Z: 93 † ← [PS: 368 (Agaricus _____)]
ligni (Sphaeria byssiseda var.) M: 144, var. nov.
lignifraga (Botrytis) SA: 527, M: 14 ← [BH: 103, pl. 504, fig. 6 (Mucor)]
lignifragus (Mucor) P: 503 † ← [BH: 103, pl. 504, fig. 6]
lignisedum (Hysterium ostraceum var.) M: 153, var. nov.
ligula (Clavaria) Fr: 477 ← [Sch 4: 116]
limacinus (Agaricus) P: 209 ← [Sch 4: 74]
limacinus (Gymnopus) G: 609 ← [Sch 4: 74 (Agaricus)]
limonius (Agaricus) Fr: 213 ← [FO 2: 56]
linearis (Peziza scutellata var.) P: 263-264 †, var. nov.
lineatus (Agaricus) Fr: 152, M: 63 ← [BH: 547, pl. 522, fig. 3]
linkii (Agaricus) Fr: 204 ← [FO 2: 217]
listeri (Agaricus) P: 191 ← [With 4: 158, p. p.]
littoralis (Conferva) Fodere: 249 ← ?
livida (Thelephora) Fr: 447 ← [FO 2: 276 ← POM 1: 58 (Corticium)]
livida (Vaginata) G: 601, sp. nov, non PS: 247 (Amanita)
livida (Tremella mesenteriformis var.) M: 28-29 ← [BH: 230, pl. 406, 499, fig. 6]
livido-fuscus (Agaricus stipitus var.) P: 198, var. nov.
livido-rubescens (Agaricus lactifluus) Z: 317 † ← [BEFC 2: 51]
lividus (Agaricus) M: 77, SA: 580 ← [BH: pl. 382 only †]
lividus (Agaricus russula) Z: 354 † ← [BH: pl. 382 only (Agaricus _____) †]
lividus (Boletus) Fr: 389 ← [BH: 327, pl. 490, fig. 2]
lividus (Boletus chrysenteron var.) M: 45-46 ← [BH: 327, pl. 490, fig. 2 (Boletus _____)]
lobata (Corniola) G: 637 ← [PS: 494 (Merulius)]
lobata (Omphalia) G: 612 ← [SEF: pl. 186 + text (Agaricus)]
lobatus (Cantharellus) Fr: 323 ← [PS: 494 (Merulius)]
longa (Sphaeria) G: 529 ← [SEF: pl. 393, fig. 4 + text]
longicaudus (Agaricus) Fr: 248 ← [PS: 332]
longipes (Agaricus) SA: 578, M: 75 ← [BH: 613, pl. 232, 515]

longum (Hysterium) LD 22: 401 ← [PS: 99]
lonicera (Erysiphe) SA: 615 ← [DC 6: 107, as "lonicerae"]
lonicerae (Erysiphe) M: 133 ← [DC 6: 107]
lonicerae (Sphaeria) G: 528 ← [SEF: pl. 393, fig. 6 + text]
lonicerae (Xyloma) Schl: 60, sp. nov.?
lubrica (Leotia) Schl: 58, G: 660 ← [Scop: 477 (Elvela)]
lubricus (Agaricus) Fr: 252 ← [PS: 307]
lucida (Grifola) G: 644 ← [GSN: 1434 (Boletus) ← "Leysser. Fl. Hols."]
lucidus (Agaricus) Fr: 235 ← [PS: 299]
lucidus (Boletus) H: 27, P: 439-440 ← [GSN: 1434 ← "Leysser. Fl. Hols."]
lucidus (Polyporus) Fr: 353 ← [GSN: 1434 (Boletus) ← "Leysser. Fl. Hols."]
lucifugus (Agaricus) Fr: 258 ← [FO 2: 50]
lugubris (Agaricus) Fr: 254, sp. nov.
lurida (Octospora) G: 668 ← [PS: 666 (Peziza)]
luridum (Leccinum) G: 648 ← [Sch 4: 78 (Boletus)]
luridus (Agaricus) Fr: 65 † ← [PS: 436, non Sch.][3]
luridus (Agaricus) Fr: 40 † ← [Sch 4: 30][3]
luridus (Agaricus gymnopus) Z: 98 † ← [Sch 4: 30 (Agaricus _____)]
luridus (Boletus) Fr: 391, K: 25 - 26 ← [Sch 4: 78]
luridus (Gymnopus) G: 606 ← [Sch 4: 30 (Agaricus)]
luridus (Lactarius) G: 625 ← [PS: 436 (Agaricus) non Sch]
luscinus (Agaricus) Fr: 87 ← [FO 2: 108]
lutea (Auricularia reflexa var.) M: 34 ← [BH: 281, pl. 274]
lutea (Clavaria) M: 31, L: 468 ← [LFF: 126]
lutea (Clavaria coralloides var.) M: 32 ← [BH: 201]
lutea (Clavaria lutea var.) M: 31 ← [LFF: 126 (Clavaria _____)]
lutea (Peziza fructigena var.) M: 23 ← [BH: 236]
lutea (Peziza vesciculosa var.) M: 25 ← [BH: 270]
lutea (Peziza stercoraria var.) M: 22 ← [BH: 256, pl. 376]
lutea (Peziza stercoraria [var.]) SA: 532 ← [BH: 256, pl. 376]
lutea (Russula) G: 618 ← [HFA: 611 (Agaricus)]
lutea (Tremella cerebrina var.) M: 28 ← [BH: 221]
lutea (Tremella mesenteriformis var.) M: 28-29 ← (BH: 230, pl. 406]
luteo-alba (Mycena) G: 620 ← [Bolt: 38, as "lateo albus" (Agaricus)]
luteoalbus (Agaricus) Fr: 152 ← [Bolt: 38, as "lateo albus"]

luteo-albus (Agaricus stipitis var.) P: 199, var. nov.
luteolus (Agaricus pyxidatus var.) M: 68 ← [BH: 514]
luteo-virens (Agaricus), "luteovirens" of index, Fr: 41 ← ["Pers." ← A&S: 168]
lutescens (Boletus) N&B: 339 ← [PAB: 29]
lutescens (Cantharellus) Fr: 320, G: 636 ← [PS: 489 (Merulius)]
lutescens (Merulius) SA: 556, M: 47 ← [PS: 489]
luteus (Agaricus) P: 212, H: 22 ← [Bolt: 50][4]
luteus (Agaricus) Fr: 55 ← [HFA: 611][4]
luteus (Agaricus caespitosus var.) M: 84 ← [Bolt: 50 (Agaricus ______)]
luteus (Agaricus russula) Z: 352 † ← [HFA: 611 (Agaricus ______)]
"luetus" (Boletus: orthographic error for luteus?) H: 27 ← [LSP: 1177]
luteus (Boletus hispidus var.) M: 42 ← [BH: 351, pl. 493]
luteus (Boletus hispidus [var.]) SA: 548 ← [BH: 351, pl. 493]
luteus (Suillus) G: 646 ← [Sch 4: 81 (Boletus) ← Scop: 465 (Boletus)]
lycoperdioides (Piligena) HFD: 13, t. 1740, fig. 2 ← [Sae: 221]
lycoperdoides (Agaricus) N&B: 314 ← [BH: 610, pl. 516, fig. 1, as "lycoperdonoides"]
lycoperdoides (Agaricus gymnopus) Z: 92 † ← [BH: 610, pl. 516, fig. 1, as Agaricus "lycoperdonoides"]
lycoperdoides (Asterophora) G: 635 ← [BH: 610, pl. 516, fig. 1 (Agaricus "lycoperdonoides")]
lycoperdoides (Merulius) M: 47 ← [BH: 610, pl. 516, fig. 1 (Agaricus "lycoperdonoides")]
lycoperdoides (Sphaeria) P: 486 ← [WO: 47]

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macer (Agaricus) P: 217 ← [With 4: 256]
macilentus (Agaricus) Fr: 131, sp. nov.
macrodon (Hydnum) Fr: 415 ← [PS: 560]
macropus (Agaricus) Fr: 215 ← [PS: 275]
macropus (Clavaria) Fr: 475 ← [PAH: 183]
macropus (Macroscyphus) G: 672 ← [POM 1: 26 ← Bolt: pl. 96 (no name)]
macrorhiza (Clavaria) Fr: 478 ← [Swartz, "Vetensk. Acad. Handl. 1811: 135"]
macrosperma (Stilbospora) M: 147 ← [PD: 14, as "macrospora"]
maculaeformis (Sphaeria) M: 145 ← [PD: 52]
maculaeformis (Thelephora) Fr: 454 ← [FO 1: 150]

maculare (Hysterium) FSS: no. 167, sp. nov.: Fr 2: 592
maculata (Nemania) G: 517 ← [TM 2: 33, as "macula" (Sphaeria)]
maculatus (Agaricus) Fr: 45 ← [A&S: 186]
maculatus (Agaricus muscarius var.) P: 200-201 ← [Sch 4: 39 (Agaricus _____)]
maculiformis (Sphaeria) Schl: 59 ← [PD: 52, as "maculaeformis"]
maculosus (Agaricus) Fr: 253 ← [PS: 288]
majalis (Agaricus) Fr: 205 ← [FO 2: 172]
malachius (Agaricus) Fr: 218 ← [FO 2: 71]
mali (Hypoderma xylomoides var.) M: 152, var. nov.?
mammaeformis (Sphaeria) M: 143 ← [HV: 13, as "mammiformis" ← Dick 1: 24, as "mammosa"]
mammillanum (Xylaria polymorpha [var.]) G: 513, var. nov.
mammosa (Sphaeria) P: 486 ← [Dick 1: 24]
mammosus (Agaricus) P: 219 ← [LSP: 1174]
mappalis (Amanita citrina [var.]) G: 599 ← [Willd: 381 (Agaricus "mappa" BEF: 57]
marcida (Leotia) G: 660 ← [PS: 613 ← FD 11: 3, pl. 654, fig. 1 (Phallus)]
marginatus (Polyporus) Fr: 372 ← [PD: 28 (Boletus)]
marginellus (Agaricus) Fr: 113 ← [PS: 309]
marzuolus (Agaricus) Fr: 84, sp. nov.
mastoideus (Agaricus) Fr: 20, sp. nov.
mastrucatus (Agaricus) Fr: 190 ← [FO 2: 229]
maurus (Agaricus) Fr: 168, sp. nov.
maxima (Daedalea) Fr: 332 ← [Brot: 468 (Boletus)]
meculiformis (Sphaeria) N&B: 300 ← [PD: 52, as "maculaeformis"]
medicaginis (Rhizoctonia) M: 135, SA: 616 ← [DC 6: 111]
medius (Agaricus) Fr: 278 ← [Sae: 248]
medulla panis (Boletus) P: 247 †, Schl: 56, M: 40, N&B: 340 —— [WJ 1: 141]
medulla panis (Polyporus) Fr: 380 † ← [WJ 1: 141 (Boletus)]
medullaria (Poria) G: 640, nom. nov.
medullaris (Daedalea) P: 250, nom. nov.
medullaris (Rhizomorpha) P: 307 ← [SLT 12: 374]
melaena (Sphaeria) FSS: no. 200, sp. nov.: Fr 2: 431.
melaleuca (Hypoderma) LD 22: 370, nom. nov.
melaleucum (Hydnum) Fr: 406 ← [FO 1: 142 ← "Swartz"]
melaleucum (Hysterium) Schl: 58 ← [FO 1: 192]
melaleucus (Agaricus) Fr: 114 ← [PS: 355]
melanopus (Boletus melanopus var.) M: 43 ← [PIC: 9 (Boletus _____)]

melanopus (Polyporus) Fr: index only, not 347 (nom. nud.) ← [PS: 517 (Boletus infundibuliformis [var.] ← PIC: 9 (Boletus ____)]
melanospermus (Agaricus) Fr: 283, M: 60, N&B: 323 ← [BH: 628, pl. 540, fig. 2]
melanospermus (Agaricus pratella) Z: 310 † ← [BH: 628, pl. 540, fig. 2]
melasperma (Cytispora) FSS: no. 157, sp. nov.: Fr 2: 545.
melastoma (Calycina) G: 670 ← [SEF: pl. 149, + text (Peziza)]
meleagris (Gymnopus) G: 609 ← [SEF: pl. 171 + text (Agaricus)]
melinoides (Agaricus) Fr: 206, M: 63-64 ← [BH: 444, pl. 560, fig. 1]
melinoides (Agaricus mycena) Z: 104 † ← [BH: 444, pl. 560, fig. 1 (Agaricus ____)]
melizius (Agaricus) Fr: 13, sp. nov.?
melleus (Agaricus) Fr: 30 ← [FD 17: 9, pl. 1013]
melogramma (Peripherostoma) G: 514 ← [BH: 182, pl. 492, fig. 1 (Variolaria)]
melogramma (Sphaeria) N&B: 297, SA: 521-522, M: 140 ← [BH: 182, pl. 492, fig. 1 (Variolaria)]
melogramma (Sphaeria rugosa var.) P: 289-290 ← [BH: 182, pl. 492, fig. 1 (Variolaria ____)]
membranacea (Coniophora) M: 36 ← [DC 6: 34]
membranaceum (Hydnum) Fr: 415, P: 451, SA: 545, M: 37, L: 469 ← [BH: 302, pl. 481, fig. 1]
membranaceus (Boletus) Ehren: 519 ← ?
membranaceus (Merulius) P: 180-181 ← [With 4: 153 (Merulius) ← Bolt: 177 (Helvella)]
membranaceus (Polyporus) Fr: 370 ← [SIN: 1922 (Boletus)]
merdarius (Agaricus) Fr: 291, sp. nov.
merismoides (Phlebia) Fr: 427, not 417 ← [FO 2: 235 (Merulius)]
mesenterica (Gyraria) G: 593 ← [WJ 1: 142 (Tremella "mesenteriformis")][5]
mesenterica (Thelephora) Schl: 60 ← [Bolt: 172 (Helvella)]
mesenterica (Tremella) LD 20: 179, P: 509, H: 32 ← [Sch 4: 108 (Elvela)][5]
mesentericum (Stereum) G: 653 ← [Bolt: 172 (Helvella)]
mesenteriformis (Tremella) M: 28-29, SA: 526-527 ← [WJ 1: 142][5]
mesomorphus (Agaricus) Fr: 23, M: 85-86, N&B: 309 ← [BH: 481, pl. 506, fig. 1]
mesplinum (Erineum) M: 16 ← [DC 6: 12 †]
metachrous (Agaricus) Fr: 172, not 144, nom. nov.
metatus (Agaricus) Fr: index only, not 144 †, nom. nud.
mezerei (Sphaeria) Schl: 59, sp. nov.?
micaceus (Agaricus) M: 56, N&B: 318, SA: 567 ← [BH: 415, pls. 94, 246, 565]
micaceus (Agaricus, as "A. copr. micaceus") Fr: 309 ← [BH: 415, pls. 94, 246, 565]
micans (Clavaria) SA: 538, M: 30 ← [PAH: 217]
micans (Pistillaria) Fr: 297 ← [PAH: 217 (Clavaria)]

micans (Polyporus) Fr: 383 ← [Ehren: 30 (Poria)]
michelii (Polyporus) Fr: 343, sp. nov.
microdon (Hydnum) Fr: 417 ← [PS: 561]
microporus (Polyporus) Fr: 376 ← [SIN: 1925 (Boletus)]
microsperma (Cytispora) FSS: no. 158, sp. nov., Fr 2: 546
microsperma (Stilbospora) M: 147-148 ← [POM 1: 31]
microstoma (Sphaeria) FSS: no. 185 ← [PS: 40] Fr 2: 388
microstomum (Engizostoma) G: 520 ← [PS: 40 (Sphaeria)]
militare (Hypoxylon) M: 137 ← [LSP: 1182 (Clavaria)]
militaris (Sphaeria) L: 485, P: 276-278, SA: 519 ← [LSP: 1182 (Clavaria)]
militaris (Xylaria) G: 510-511 ← [LSP: 1182 (Clavaria)]
millus (Agaricus) Fr: 93 ← [SEF: pl. 184 + text]
miniata (Clavaria) P: 267-268, sp. nov.
miniata (Sphaeria peziza var.) M: 143-144, var. nov.?
miniatus (Agaricus) Fr: 105, nom. nov.
minima (Hydrophora) LD 22: 261 ← [TM 2: 5]
minor (Amanita muscaria [var.])G: 600, var. nov.
minor (Xyloma multivalve var.) M: 150, var. nov.
minus (Helmisporium) LD 20: 496, nom. nov.?
minuta (Mitrula) Fr: 492 ← [SEF: pl. 391 + text (Clavaria)]
minuta (Tremella) Schl: 60, sp. nov.?
minutula (Peziza) P: 457, sp. nov.?
minutulus (Agaricus) P: 410 ← [Sch 4: 72]
minutum (Geoglossum) G: 659 ← [SEF: pl. 391 + text (Clavaria)]
minutum (Hydnum) Fr: 412 ← [Sae: 394]
mitis (Agaricus) Fr: 188 ← [POM 1: 54]
mitissimus (Agaricus) Fr: 69, sp. nov.
mitrata (Geoglossum) H: 30 ← [Dick 4: 27 (Clavaria)]
mitra (Helvella) P: 255-256, Fodere: 249, L: 468, SA: 537, LD 20: 510, M: 29, H: 31 ← [LSP: 1180]
molibdocephalus (Agaricus) SA: 578, M: 73 ← [BH: 620, pl. 523]
mollis (Agaricus) Fr: 274, not 184, SA: 574, M: 68, P: 433 ← [Sch 4: 49]
mollis (Crepidopus) G: 616 ← [Sch 4: 49 (Agaricus)]
mollis (Polyporus) Fr: 360, not 364 ← [POM 1: 22 (Boletus)]
mollis (Thelephora) Fr: 443, sp. nov.

mollissima (Thelephora) Fr: 435 ← [PS: 572 †]
molluscus (Merulius) Fr: 329, sp. nov.
molluscus (Polyporus) Fr: 384 ← [PS: 547 (Boletus)]
molybdinus (Agaricus) Fr: 49 ← [BH: 620, pl. 523, as "molibdocephalus"]
momentaneus (Agaricus ephemerus var.) M: 57, var. nov. ← [BH: index, pl. 128 only †]
monilioides (Acrosporium) G: 552 ← [NS "Ueberblick": 14]
monilioides (Epochnium) G: 550 ← [LM 3: 18]
monilioides (Isaria) M: 13 ← [A&S: 362]
monocella (Helvella) LD 20: 512 ← [Sch 4: 106, as "monacella"]
montanus (Agaricus) Fr: 293 ← [POM 1: 9]
mori (Polyporus) Fr: 344 ← ["Pollini. Pl. Nov.: 35" (Boletus)]
mori (Sphaeria) P: 279-280 ← [RelS 2: 31]
moriforme (Astoma) G: 524 ← [TM 2: 22 (Sphaeria)]
moriformis (Arthonia) Spr: 279 ← ["Ach[arius]" (Dothidea)]
moriformis (Sphaeria) H: 8, Schl: 59 ← [TM 2: 22]
moschatum (Tuber) G: 592, SA: 619, ← [BH: 79]
mouceron (Agaricus) P: 192, SA: 576 ← [BH: 580, pl. 142]
mucedo (Mucor) H: 13, L: 481, M: 114, SA: 601, P: 501-502, N&B: 357 ← [LSP: 1185]
mucerdae (Mitrula) Fr: 492 ← [Sae: 405 (Clavaria)]
mucida (Clavaria) Fr: 476, Schl: 56 ← [PAH: 187]
mucidum (Hydnum) Fr: 418, not 416 ← [GSN 2: 1440]
mucidus (Agaricus) Fr: 28 ← [Schr: 116]
mucidus (Boletus) N&B: 340 ← [SFH: 377]
mucidus (Polyporus) Fr: 382 ← [PS: 546 (Boletus) ← POM 1: 87 (Poria)]
mucor (Agaricus) Fr: 155, not 156 ← [BEFC 1: 91]
mucosus (Agaricus) SA: 584, M: 83 ← [BH: 661, pl. 596, fig. 2]
mucronata (Aregma) Schl: 56 ← [FO 1: 225 ← PD: 38 (Puccinia)]
multicapsulare (Peripherostoma concentricum [var.]) G: 513 ← [SEF: pl. 436 + text
(Sphaeria "multicapsula")]
multiceps (Peripherostoma) G: 514 ← [SEF: pl. 394, fig. 8 + text (Sphaeria)]
multiceps (Sphaeria) P: 494 ← [SEF: pl. 394, fig. 8 + text]
multicolor (Agaricus) Fr: 48 ← [PS: 350]
multivalve (Phacidium) Schl: 58 ← ["K."]
multivalve (Xyloma) G: 546, SA: 518, M: 150 ← [DC 2: 303]
muralis (Agaricus) Fr: 165 ← [SEF: pl. 322 + text]
murcidus (Agaricus) Fr: 299, sp. nov.

muricatus (Agaricus) Fr: 244, sp. nov.
murinaceus (Agaricus) Fr: 116, not 110, M: 77 ← [BH: 588, pl. 520]
murinus (Agaricus) Fr: 115 ← [BEF: 79]
murinus (Mucor) G: 561 ← [PS: 201] Fr 3: 315 (Hydrophora)
muscaria (Agaricus pseudo-aurantiacus var. Amanita ____) M: 87-88 ← [LSP: 1172 (Agaricus ____)]
muscaria (Amanita) H: 19, G: 600, R: 41 ← [LSP: 1172 (Agaricus)]
muscarius (Agaricus) Fr: 16, P: 200-201, L: 476, N&B: 307, SA: 587-588 ← [LSP: 1172]
muscicola (Pistillaria) Fr: 498, not 298 ← [POM 2: 60 (Clavaria)]
muscigena (Auricularia) M: 34, not sp. nov. ← [PS: 572 (Thelephora)]
muscigena (Corniola) G: 637 ← [BH: index, pl. 288 only (Agaricus)]
muscigena (Thelephora) L: 469 ← [PS: 572]
muscigenus (Agaricus) Fr: 145 ← [Sae: 307]
muscigenus (Agaricus) P: 238 ← [BH: index, pl. 288 only †]
muscigenus (Cantharellus) Fr: 323 ← [BH: index, pl. 288 only (Agaricus) †]
muscigenus (Merulius) SA: 557, M: 48 ← [BH: index, pl. 288 only (Agaricus) †]
muscoidea (Peziza) Re: 49, sp. nov.[6]
muscoides (Clavaria) M: 32, L: 468, N&B: 345, SA: 540, P: 475, H: 30 ← [LSP: 1183]
muscorum (Agaricus) Fr: 167 ← ["Hoffm[ann]"]
muscorum (Canthare-lus) Fr: 325 ← [RAB 1: 10 (Merulius)]
muscorum (Hydnum) Schl: 57, sp. nov.?
muscorum (Rhizoctonia) FSS: no. 174, sp. nov., Fr 2: 265
muscorum (Sclerotium) G: 591 ← [PS: 120] Fr 2: 252
muscorum (Tremella) Schl: 60, sp. nov.?
mutabilis (Agaricus) Fr: 245, not 244 ← [Sch 4: 6 ← Scop: 440]
mutabilis (Boletus aureus [var.]) SA: 553, var. nov.
mutabilis (Tubercularia) Schl: 60, sp. nov.?
mutilus (Agaricus) Fr: 191, sp. nov.
mycenoides (Agaricus) Fr: 246, sp. nov.
myomyces (Agaricus) Fr: 44, ← [PD: 20]
myomyces (HFD 29: 11, t. 1729 ← [Fr: 44]
myomyces (Agaricus gymnopus) Z: 98 † ← [PD: 20 (Agaricus ____)]
myomyces (Gymnopus) G: 608 ← [PD: 20 (Agaricus)]
myosotis (Agaricus) Fr: 290 ← [FO 2: 34]
myosurus (Agaricus) Fr: 132 ← [FO 2: 129]

myrtilli (Hypoderma virgultorum var.) M: 152, var. nov.?
mythilinum (Hysterium) LD 22: 402, sp. nov.?
mytilinum (Hysterium) Spr: 278, G: 510 ← [PS: 97]

Notes

1. It would appear that BH and Bolt originated independent concepts of *Agaricus infundibuliformis.* Bolt is near presentday *Cantharellus infundibuliformis*, while BH seems to be a *Clitocybe, s. l.* Validation by M is synonymous to *Craterellus cornucopioides* of Persoon. Validation by P leads to both Bolt and BH!

2. Fries states PS: 368 as protologue, but with "sed descri. erronea." Does this constitute validation since Fries obviously had another organism in mind?

3. Fr: 65 and Fr: 40 are homonyms but not synonyms. Nomenclaturally, either name can be used, but not both.

4. The concepts of Bolt and HFA are apparently different.

5. Sch and WJ 1 are two different roots, but both wind up near *Tremella*, with validation by G and orthographic error in addition.

6. Stated by Re as "Balbis in epist." By modern standards, the authority citation would read "[Balbis] apud Re."

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ADDITIONS TO THE HYPOGEOUS MYCOFLORA OF COLORADO. I. ASCOMYCETES.

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SUMMARY

The following hypogeous Ascomycetes are reported for Colorado, U.S.A.: *Elaphomyces granulatus* var. *asperulus*, *E. reticulatus*, *E. subviscidus*, *Geopora cooperi* f. *cooperi* and f. *gilkeyae*, *Hydnotrya cerebriformis*, *H. michaelis*, and *H. variiformis*. Six of these taxa represent new records for Colorado.

Mycological investigations in Colorado, Wyoming, and Idaho have produced few records of hypogeous Ascomycetes. Hawker (1968a) listed six from Idaho: *Elaphomyces granulatus* var. *asperulus* (Vitt.) Hawker, *Barssia oregonensis* Gilkey, *Hydnotrya cerebriformis* Harkn., *Geopora cooperi* Harkn. f. *cooperi*, *Choiromyces alveolatus* (Harkn.) Trappe (≡ *Piersonia alveolata* Harkn.), and *Tuber californicum* Harkn. Burdsall (1968) reported *Geopora cooperi* f. *cooperi* and f. *gilkeyae* from Idaho. Only two taxa have been cited from Colorado. *Elaphomyces granulatus* var. *asperulus* was recorded from Custer County (Cockerell 1889, Dodge 1929), but we could not locate the collection for verification. *Geopora cooperi* f. *gilkeyae* was collected in Clear Creek County (Burdsall 1968, Cooke 1968).

Marr (1967) describes four climax regions on the east slope of the Front Range in Boulder County: lower montane, upper montane, subalpine, and alpine tundra. Many of the fungi listed below were collected in Boulder County during 1969, 1970, 1973, and 1975. Since most, if not all, hypogeous Ascomycetes are presumed to form ectomycorrhizae, we paid special attention to host trees associated with sporocarps.

All specimens were rehydrated for microscopic examination in 5% KOH. Rehydration by heating sections in cotton blue-lactic acid was particularly useful for locating spores with well developed ornamentation in immature specimens of Tuberales. Collections are deposited in herbaria of Oregon State University (OSC), San Francisco State University (SFSC), University of Michigan (MICH), and the New York Botanical Garden (NY).

1. *ELAPHOMYCES GRANULATUS* Fr. var. *ASPERULUS* (Vitt.) Hawker *sensu* M. Lange, Trans. Brit. Mycol. Soc. 50(1): 135. 1967.

COLLECTIONS EXAMINED: BOULDER CO.--Mitchell Lake, west of Ward, Fogel F311, F312 (OSC). GRAND CO.--Frazer Experimental Forest, Fogel F244 (OSC).

Hypogeous in mineral soil among ectomycorrhizae of *Picea engelmannii* Parry and *Pinus contorta* Dougl., June to August, elev. 2,900 to 3,300 m. The Mitchell Lake site has a mixed stand of *P. engelmannii* and *Abies lasiocarpa* (Hook.) Nutt. with a *Vaccinium* ground cover. The Frazer site is an open stand of *P. contorta* with sparse ground cover.

The taxonomic problems of differentiating *E. granulatus* Fr. var. *granulatus* from var. *asperulus*, as discussed at length by Lange (1956), Hawker *et al* (1967), Hawker (1968b), and Arteman (1968), cannot be resolved until the type collections are found or the taxa are neotypified. Neotypification should be based on specimens from continental Europe, but no European mycologist has chosen to take this essential step. Meanwhile, our experience with many collections of these taxa from western North America leads us to follow Lange's and Arteman's conclusion: specimens having spores ornamented with minute, crowded spines less than 1 μm long that coalesce in patches should be designated *E. asperulus* Vitt. At the same time, we agree with Hawker *et al* (1967) that *E. asperulus* is so closely related to *E. granulatus* that the former is best reduced to a variety of the latter.

2. *ELAPHOMYCES RETICULATUS* Vitt. *sensu* M. Lange, Dansk Bot. Ark. 16: 23. 1956.

COLLECTION EXAMINED: BOULDER CO.--Flagstaff Mt. near Boulder, Fogel F1106 (OSC).

Hypogeous in mineral soil among pine ectomycorrhizae in a *Pinus ponderosa* Laws. stand with a scattered understory of small *Pseudotsuga menziesii* (Mirb.) Franco, May 25, 1975, elev. 2,135 m.

We have followed Lange's (1956) concept of this species, which apparently still needs neotypification.

3. *ELAPHOMYCES SUBVISCIDUS* (Zeller) Trappe & Guzmán, Madrõno 21: 128-129. 1971. (published in 1972).

COLLECTION EXAMINED: BOULDER CO.--Flagstaff Mt. near Boulder, Fogel F203 (OSC).

Hypogeous among pine ectomycorrhizae in a *Pinus ponderosa* stand with a scattered understory of *Pseudotsuga menziesii*, June 3, 1970, elev. 2,135 m.

Because this is the first report of the species since the type was described from southwestern Oregon by Zeller (1947), the redescription of the type by Trappe and Guzmán (1972) can be further expanded by incorporation of our data:

ASCOCARPS subglobose, up to 30 x 50 mm., smooth, not subviscid, white to dull light gray, drying light yellow to brownish orange, encrusted with soil held together by abundant light yellow hyphae and hyphal tufts emerging from the surface. PERIDIUM 2.5-3.0 mm thick, with a thin, pale yellow outer layer and a thick, white to light gray inner layer. GLEBA dark brown before maturity, nearly black at maturity, a powdery mass of spores and hyphae. ODOR of onions.

SPORES globose, (12-) 17-27 (-29) µm including ornamentation, light olive to light brown when immature, dark reddish brown at maturity, in cotton blue-lactic acid dark blue in youth but nonreactive at maturity, monoguttulate. Ornamentation of crowded spines 1-2 x 0.2 µm, separated by 0.2 to 0.5 µm or often joined in two's and three's by ridges but never forming a partial reticulum, embedded in a gelatinous matrix, often separating from the spore surface when cover slip is tapped.

ASCI globose, hyaline, thin-walled, 38-50 µm diam.

GLEBAL HYPHAE hyaline to pale yellowish brown, 1.5-4 (-6) µm diam, with occasional swellings and short lateral branches, apices obtuse; brown amorphous deposits frequent between hyphae in cotton blue-lactic acid.

PERIDIAL HYPHAE: Emergent, superficial hyphae sinuous, hyaline, thin-walled, 2.5-4.0 µm diam. Outer peridial layer 100-150 µm thick, of periclinal, single to fascicled hyphae 3-5 µm thick with hyaline to pale yellow, thin to slightly thickened walls. Inner layer of interwoven fascicles of a few to many, hyaline to pale yellow hyphae 4-8 µm diam. with refractive thickening of the walls to 1-3 µm.

No distinctive reaction to Melzer's reagent.

Cross sections of the dried peridia of the Colorado specimens show large gray, lens-shaped areas separated by fine, white lines. This is an artifact of drying and not differentiated tissue in the sense of that found in *E. reticulatus* and related species which have marbled peridia.

4. *GEOPORA COOPERI* Harkn. f. *COOPERI*, Bull. Calif. Acad. Sci. 1: 168. 1885.

COLLECTIONS EXAMINED: BOULDER CO.--West of Gold Hill, Fogel F350 (OSC). GILPIN CO.--Rollinsville, Thiers 11470 (SFSC).

Hypogeous among ectomycorrhizae of *Pinus contorta*, June to August, elev. 2,800 m. The Gold Hill site is a windswept ridgetop with shallow, stony soil that supports an open stand of *P. contorta* and *Pseudotsuga menziesii*.

Litter accumulates only under tree crowns or around clumps of trees, with the intervening ground resembling a desert pavement.

5. *GEOPORA COOPERI* Harkn. f. *GILKEYAE* Burdsall, Mycologia 60: 518-519. 1968.

COLLECTIONS EXAMINED: BOULDER CO.--Rainbow Lakes, near Nederland, Fogel F279 (OSC); Gross Reservoir, southwest of Boulder, Fogel F224 (OSC). CLEAR CREEK CO.--Echo Lake, south of Idaho Springs, Fogel F670 (OSC), Trappe 3698 (OSC), Rogerson 4003 (NY). SAN MIGUEL CO.--Trout Lake, Smith 32974 (OSC, MICH).

Hypogeous among ectomycorrhizae of *Pinus contorta* and *Picea engelmannii*, June to September, elev. 2,250 to 3,250 m. Gross Reservoir is a dry site with litter mats only under *P. contorta* crowns and with the intervening bare, loose, sandy soil. Rainbow Lakes, Echo Lake, and Trout Lake are high elevation sites with continuous litter layers under dense stands of *Picea engelmannii* and *Abies lasiocarpa*.

6. *HYDNOTRYA CEREBRIFORMIS* Harkn., Proc. Calif. Acad. Sci. Ser. 3. 1: 266. 1899.

COLLECTION EXAMINED: LARIMER CO.--Zimmerman Lake, near Cameron Pass, Trappe 3680 (OSC).

Hypogeous in rotten wood among ectomycorrhizae of *Abies lasiocarpa* in a mixed stand of *A. lasiocarpa* and *Picea engelmannii*, Sept. 5, 1973, elev. 3,170 m.

7. *HYDNOTRYA MICHAELIS* (Fischer) Trappe, Mycotaxon 2(1): 113. 1975.

COLLECTIONS EXAMINED: BOULDER CO.--Lake Eldora, near Nederland, Fogel F301 (OSC). CLEAR CREEK CO.--Mt. Goliath Natural Area, Trappe 3691 (OSC).

Hypogeous among ectomycorrhizae of *Pinus contorta* at Lake Eldora and in a *Picea engelmannii* - *Pinus aristata* Engelm. krummholz at Mt. Goliath, Sept., elev. 2,800 to 3,400 m.

8. *HYDNOTRYA VARIIFORMIS* Gilkey, Mycologia 39: 444. 1947.

COLLECTIONS EXAMINED: BOULDER CO.--Fourth of July Campground, near Nederland, Thiers (SFSC). WYOMING, CARBON CO.--Medicine Bow Mountains, just north of the Colorado-Wyoming border, leg. Binegar, Cooke 28610 (Gilkey 466, OSC).

Hypogeous under *Pinus*, Aug., elev. ±3,200 m.

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LITERATURE CITED

Arteman, R. L. 1968. The morphology and cytology of *Elaphomyces asperulus* Vitt. Ph.D. Diss., Univ. Illinois, Urbana. 124 p.

Burdsall, H. H. Jr. 1968. A revision of the genus *Hydnocystis* (Tuberales) and of the hypogeous species of *Geopora* (Pezizales). Mycologia 60: 496-525.

Cockerell, T. D. A. 1889. Some fungi of Custer County, Colorado. J. Mycol. 5: 84-85.

Cooke, W. B. 1968. The 1964 Colorado foray. Mycologia 60: 1093-1098.

Dodge, C. W. 1929. The higher Plectascales. Ann. Mycol. 27: 145-184.

Hawker, L. E. 1968a. Hypogeous Ascomycetes from Idaho. J. Elisha Mitchell Sci. Soc. 84: 248-253.

Hawker, L. E. 1968b. Wall ornamentation of ascospores of species of *Elaphomyces* as shown by the scanning electron microscope. Trans. Brit. Mycol. Soc. 51: 493-498.

Hawker, L. E., J. Fraymouth, and M. de la Torre. 1967. The identity of *Elaphomyces granulatus*. Trans. Brit. Mycol. Soc. 50: 129-136.

Lange, M. 1956. Danish hypogeous macromycetes. Dansk Bot. Ark. 16: 1-84.

Marr, J. W. 1967. Ecosystems of the east slope of the Front Range in Colorado. Univ. Colo. Stud. Ser. Biol. No. 8. 134 p.

Trappe, J. M. and G. Guzmán. 1971. A newly determined species of *Elaphomyces* from Oregon. Madrõno 21: 128-130.

Zeller, S. M. 1947. More notes on Gasteromycetes. Mycologia 39: 282-312.

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COMPARATIVE ZONE ELECTROPHORESIS AND MATING EXPERIMENTS IN THE TAXONOMY OF MUCOR HIEMALIS

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SUMMARY

Crude protein extracts from mycelium of 31 isolates of *Mucor hiemalis* and related species were subjected to acrylamide gel electrophoresis. Gels were stained for α-Esterase, Alcohol dehydrogenase, Malic dehydrogenase, Lactic dehydrogenase, Benzaldehyde oxidase, and Tetrazolium oxidase. Using a single linkage cluster analysis, the isolates were grouped on the basis of their isozyme similarities. In addition, mating tests were performed, and the patterns of sexual interactions observed. Isozyme similarity and sexual compatibility shows a correlation of .61. This is discussed in relationship to the taxonomy of the section *Hiemalis* of the genus *Mucor*. Caution is advised in the use ot comparative isozyme studies in fungal taxonomy.

INTRODUCTION

Comparative gel electrophoresis of soluble proteins has been used with varying success as a criterion for species delimitation in fungi. This has recently been done by Moorhouse and de Bertoldi (1975) and Bradford, Jones and Garber (1975). Most studies show that isozyme patterns for isolates of a single species are more similar than patterns for isolates of different species (for example: Hall, 1969; Clare, Flentje, and Atkinson, 1968; and Shechter, 1973).

However, some investigators have found so much intraspecific variation in isozyme patterns that they have recommended against the use of electrophoresis in taxonomic studies (Glynn and Reid, 1969, and Peberdy and Turner, 1968). In particular, Stout and Shaw (1974) found as much variation between seven isolates of *Mucor racemosus* (identified on morphological grounds) as they found between isolates representing twenty different *Mucor* species.

For three isolates of *M. circinelloides*, they found no isozyme similarities. Moreover, they found no isozyme differences between *M. hiemalis* and *M. mucedo*, species which are distinct morphologically.

There are two ways to interpret these conflicts between morphological and isozyme data. The first possibility is that comparative zone electrophoresis is of limited usefulness in defining taxa. If this is true, more classical, usually morphological, tests should continue to be used in taxonomic studies of fungi. If, on the other hand, isozyme comparison is a good indication of genetic similarity, and if it is desirable that taxonomic similarity correlate with genetic similarity, then in cases where electrophoretic and morphological determinations of taxa conflict, the biochemical methods should be considered more valid.

To decide between these two alternatives, a third means of distinguishing species should be employed. The classical test (Mayr, 1966) for deciding whether individuals are members of the same species is to test their ability to mate with one another, or if a direct mating is impossible, whether they will mate with a third individual. By comparing results of matings with data from electrophoretic and morphological studies, a decision about the validity of each of the diagnostic methods can be reached. Most previous isozyme studies have been done with morphologically dissimilar species, which presumably do not mate with each other. Such studies have shown that electrophoretic and morphological data agree. A real test of electrophoresis as a taxonomic tool would be accomplished by studying closely related species, in which morphological differences are ill-defined, and with which mating experiments are possible.

The section *Hiemalis* of the genus *Mucor* provides an interesting group of organisms for a study of this type. Since successful matings only occur within the same species, that is, interspecific hybridization does not occur, mating experiments are useful in delimiting species in this genus (Schipper, 1969). This method works extremely well in deciding relationships of even closely related species. It has provided the basis for a recent reorganization of much of the section *Hiemalis* (Schipper, 1973). Within the *Mucor hiemalis* complex of species, "there is no correlation between successful matings and morphological characteristics"

TABLE I

ISOLATES STUDIED

Mucor hiemalis Wehmer:
ATCC 8977a(+), ATCC 8977b(-), UNB 5(+), UNB R107-4 (25)-4(+)(albino mutant of UNB 5), UNB 6(-), F 461 (+), F 466(+), F 477(+), F 511(+), F 520(+), F 525 (+), F 526(+), F 546(+), F 547(+), F 429(-), F 434 (-), F 447(-), F 517(-), F 541(-)

M. hiemalis f. hiemalis:
CBS 200.28(-), CBS 201.28(+)

M. hiemalis f. hiemalis (= *M. humicolus* Raillo):
CBS 224.29(+)

M. hiemalis f. hiemalis (= *M. adventitius* Zycha):
CBS 229.35(+)

M. hiemalis f. hiemalis (= *M. varians* Povah):
CBS 233.29(-)

M. hiemalis f. hiemalis (= *M. vallesiacus* Lendner):
CBS 107.19(+)

M. hiemalis f. luteus (Linneman) Schipper
(= *M. luteus* Linneman): CBS 243.35(+), CBS 244.35(-)

M. hiemalis f. silvaticus (Hagem) Schipper
(= *M. silvaticus* Hagem): CBS 249.35(+), CBS 250.35 (-)

M. odoratus Treschow:
CBS 130.41

M. varians Povah:
ATCC 18361

Explanation of abbreviations:

ATCC = American Type Culture Collection
CBS = Centraalbureau voor Schimmelcultures
F = Farlow Herbarium, Harvard University
UNB = University of Nebraska, Lincoln

(Schipper, 1973, p. 19). The present study was undertaken to determine whether there is a correlation between successful matings and isozyme similarity.

MATERIALS AND METHODS

The isolates studied, their mating type, and origin are listed in Table I. Mating type was determined by mating trials with ATCC 8977a (+) and 8977b (-). The Centraalbureau voor Schimmelcultures (CBS) isolates were used by Schipper (1973) in her taxonomic study of the section. In some cases the mating type designation disagrees with that given by Schipper. The University of Nebraska-Lincoln (UNB) isolates were obtained through the courtesy of Dr. Wendell Gauger. Farlow Herbarium (F) strains were collected from locations in Massachusetts by the author, and identified as *Mucor hiemalis* because of their ability to form zygospores with ATCC 8977a or 8977b. These two ATCC cultures were chosen as testers because they were used by Cutter in his cytological studies (Cutter, 1942).

Stock cultures were grown on Potato Dextrose Agar (PDA, Difco) and stored at 4°C. Mating tests were performed following the recommendations of Schipper (1973), however, PDA was used for most of the trials, rather than Beerwort Agar.

To prepare material for electrophoresis, isolates were cultured on a reciprocating shaker, 100 shakes per minute, at room temperature (± 20°C) for 48 hours in 250 ml flasks. One hundred ml of Mycological Broth (Difco) plus 0.3% Yeast Extract (Difco) was used as a culture medium. Mycelium was collected on filter paper by vacuum filtration in a Buchner funnel; washed with water and 0.1 M TRIS Borate EDTA, pH 8.9; and blotted dry. The dried mycelium was stored frozen (-20°C) for a maximum of 30 days.

Proteins were extracted by grinding 1 g of mycelium in 1 ml of 0.1 M TRIS Borate EDTA, pH 8.9, with 5% Sucrose. Grinding was done with sand in a mortar and pestle in an ice bath. The mycelium/buffer mixture was centrifuged at 7,000 g for 30 min. The resulting supernatant was used for electrophoresis.

Electrophoresis was carried out on vertical gels of 5% Acrylamide in 0.1 M TRIS Borate EDTA, pH 8.9, cooled by

TABLE II

MATING REACTIONS OF SOME MUCOR HIEMALIS ISOLATES[1]

PLUS \ MINUS	ATCC 8977b	CBS 200.28	CBS 233.29	CBS 244.35	CBS 250.35	F429	F434	F447	F517	F541	UNB-6
ATCC 8977a	Z	Z	G	0	Z	Z	Z	Z	Z	Z	Z
ATCC 18361	Z	0	0	0	0	0	Z	0	0	0	Z
CBS 107.19	G	0	0	0	0	0	G	0	0	0	G
CBS 201.28	Z	Z	0	0	0	Z	Z	G	G	Z	Z
CBS 224.29	G/Z	Z	0	0	0	Z	G	0	0	0	G
CBS 229.35	Z	0	0	0	0	Z	G	Z	Z	0	G
CBS 243.35	G	Z	0	Z	0	0	G	G	0	0	G
CBS 249.35	0	Z	0	0	G/Z	Z	G	0	G	Z	0
F461	Z	Z	0	G	G	Z	Z	Z	Z	Z	Z
F466	Z	Z	0	0	0	Z	Z	Z	Z	Z	Z
F477	Z	Z	0	0	0	Z	Z	G	0	Z	Z
F511	Z	Z	0	0	0	Z	Z	Z	Z	Z	Z
F520	Z	0	0	0	0	Z	Z	Z	Z	Z	Z
F525	Z	0	0	0	0	Z	Z	Z	Z	Z	Z
F526	Z	Z	0	0	0	Z	Z	G	0	Z	Z
F546	Z	Z	0	0	G	Z	Z	Z	Z	Z	Z
F547	Z	Z	0	0	0	Z	Z	Z	Z	Z	Z
UNB-5	Z	Z	0	G	Z	Z	Z	Z	Z	Z	Z
UNB R107	Z	Z	0	G	G	Z	Z	Z	Z	Z	Z

Explanation of Abbreviations:

Z = zygospores formed
G = gametangial initials (progametangia) formed
0 = no reaction

[1]CBS 130.41 did not react with any other isolates and is therefore omitted from the above table.

a constantly circulating solution of Ethylene Glycol (14%) in water at -4°C. All gels were run for three hours at 250 V, producing less than 100 ma of current.

To stain for each set of isozymes, gels were immersed in the following mixtures on a platform shaker:

Alcohol dehydrogenase (ADH): 100 ml of 0.1 M TRIS HCl, pH 8.5; 30 mg Nicotinamide adenine dinucleotide (NAD); 25 mg Nitro Blue Tetrazolium salts (NBT); 1 ml Hexanol; 1 ml Phenazine methylsulfate in water, 2 mg/ml (PMS).

Benzaldehyde oxidase (BO): 100 ml of 0.1 M TRIS HCl, pH 8.5; 26 mg NBT; 2 ml PMS; 3 ml Benzaldehyde.

α-Esterase: Incubate gel in 0.5 M Botic acid for one hour in refrigerator, then wash with water, stain in mixture of 50 mg Fast Red TR salt, 100 ml of 0.1 M Phosphate Buffer, pH 6.5; 20 mg α-napthyl acetate dissolved in 1 ml 50% Acetone in water, for 1 1/2 hours.

Lactic dehydrogenase (LDH): 100 ml of 0.1 M TRIS HCl pH 8.5, 40 mg NAD, 70 mg NBT, 20 ml of 1 M solution of Sodium Lactate; 2 ml PMS.

Malic dehydrogenase (MDH): 10 ml of 1 M L-Malic acid, 10 ml 1 M TRIS HCl pH 8.5, 80 ml water, 15 mg NAD, 50 mg NBT, 1 ml PMS.

All tests were repeated at least three times. As a further control, 20 single spore isolates of ATCC 8977a were grown and tested simultaneously. All gave identical patterns for all enzymes.

RESULTS

Mating reactions of the isolates studied are given in Table II. Some of these crosses are repeats of Schipper's (1973) mating experiments. Corrected for the differences in mating type designation (determined by reaction with ATCC 8977a and 8977b) the repeated crosses agree with her results.

To gauge how closely related one isolate is to the rest of the isolates, I calculated "mating potency" as:

$$\text{mating potency} = \frac{2Z + G}{N}$$

Z = the number of crosses in which zygospores were formed; G = the number of crosses in which gametangial initials were formed; and N = the total number of crosses (including crosses in which there were no interactions). Thus, for an isolate that formed zygospres in all crosses, the mating potency would be 2. The last column of Table III gives the mating potencies for all the isolates.

For each of the six enzymes studied, between four and 16 different isozyme patterns were distinguishable for the 31 isolates. All the isolates were grouped according to their pattern type. The letter designation for the pattern that each isolate showed for each enzyme studied is given in Table III. Diagrams of patterns for representatives of each lettered group are shown in Figures 1-6.

The most variation was present in α-Esterases, which showed 16 different patterns for the 31 isolates. Tetrazolium oxidase (T.O.) showed only 4 different patterns. Lactic dehydrogenase pattern F is a "null allele"; that is, no band appeared under the given experimental conditions.

Figure 7 is a dendrogram made from a single linkage cluster analysis (Sneath and Sokal, 1975) of the electrophoretic data of Table III. Vertical lines represent the degree of similarity between isolates, calculated by comparing all the electrophoretic patterns of each isolate with the patterns of every other isolate. Numbers in parentheses by certain of the vertical lines indicate the average mating potency for the isolates connected at that degree of similarity. To facilitate discussion, the four main clusters have been identified by letters (a, b, c, d).

The dendrogram shows that, in general, the average mating potency is high in groups of isolates that are electrophoretically similar. For group a, with 22 members, the average mating potency within the group is 1.8, implying that zygospores were formed in almost all of the intragroup crosses. The isolates in this cluster show identical patterns for at least three of the six enzymes studied. Morphologically, the group is extremely variable; for example, one of the isolates (ATCC 18361) is listed as *M. varians* in the ATCC catalogue.

On the basis of morphological comparison alone it is difficult to decide into which forma some of the Farlow Herbarium isolates should be placed; however, on the basis

TABLE III

Isozyme patterns shown by 31 *Mucor* isolates for six different stains. The letters under each enzyme indicate the pattern that an isolate showed for that stain. Diagrams of representatives of each pattern type are shown in Figures 1-6. The last column in the table shows the mating potency for each isolate.

ISOLATE / ENZYME	ESTER-ASE	B.O.	T.O.	ADH	MDH	LDH	MATING POTENCY
8977a	A	A	A	A	A	A	1.73
8977b	B	A	A	A	A	A	1.79
18361	C	A	A	A	A	B	0.54
107.19	D	B	B	A	B	C	0.27
130.41	E	C	C	B	C	D	0.0
200.28	F	A	A	A	D	E	1.47
201.28	G	A	A	A	D	E	1.27
224.29	D	B	D	A	B	C	0.73
229.35	D	B	D	C	B	F	0.91
233.29	H	B	D	C	B	F	0.05
243.35	I	D	D	D	E	F	0.73
244.35	J	D	D	D	E	F	0.26
249.35	K	E	D	E	F	F	0.91
250.35	K	E	D	E	F	F	0.47
429	C	A	A	F	G	B	1.68
434	L	A	A	A	G	F	1.74
447	C	A	A	F	B	B	1.37
461	M	A	A	A	B	F	1.64
466	C	A	A	F	G	B	1.45
477	C	A	A	F	G	B	1.18
511	C	A	A	A	G	B	1.45
517	C	A	A	F	G	B	1.26
520	C	A	A	F	G	B	1.27
525	C	A	A	F	G	B	1.27
526	N	A	A	A	G	B	1.18
541	C	A	A	F	B	B	1.47
546	O	A	A	F	B	B	1.54
547	O	A	A	F	G	B	1.45
5	P	A	A	A	G	F	1.73
6	P	A	A	A	H	F	1.68
R107	P	A	A	A	H	F	1.63

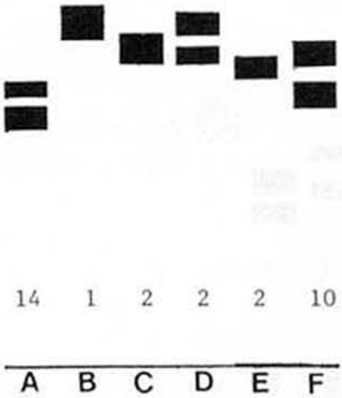


Fig. 1. Alcohol Dehydrogenase banding patterns.

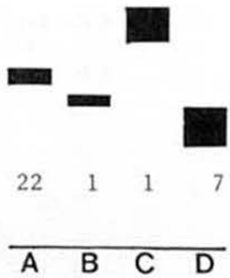


Fig. 2. Tetrazolium Oxidase banding patterns.

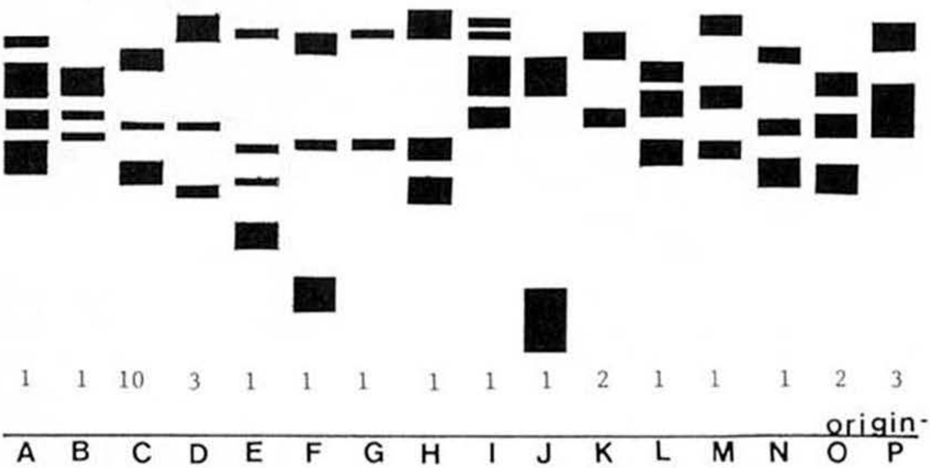


Fig. 3. α-Esterase banding patterns.

Fig. 1-6. Diagrams of isozyme banding patterns for representatives of each pattern group, for each enzyme, as indicated. The numerals below each pattern indicate the number of isolates in that group.

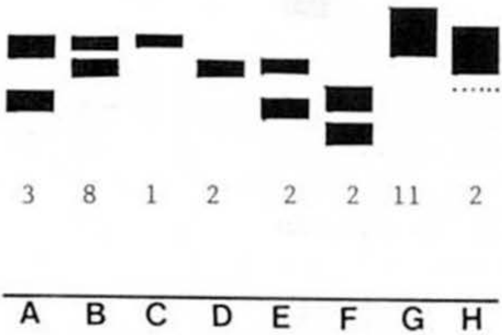


Fig. 4. Malic Dehydrogenase banding patterns.

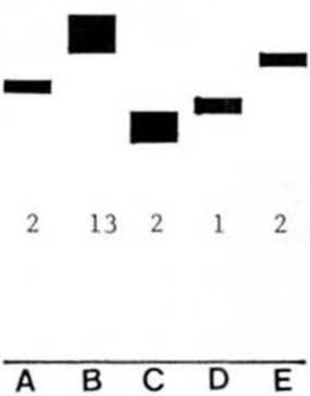


Fig. 5. Lactic Dehydrogenase banding Patterns.

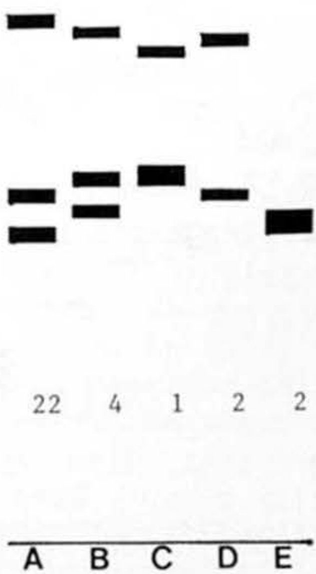


Fig. 6. Benzaldehyde Oxidase banding patterns.

of this study, they should all be considered *M. hiemalis f. hiemalis*.

The two isolates of *M. hiemalis f. luteus* (CBS 243.35 and 244.35) differ from each other only by one α-Esterase band. They form zygospores when crossed, as do the two members of cluster c, both isolates of *M. hiemalis f. silvaticus*. These isolates (CBS 249.35 and 250.35) are electrophoretically identical.

The isolates of cluster d do not interact at all in mating tests. Schipper (1973) also notes their lack of sexual interaction, but places them in the forma *hiemalis* because of their morphological similarity. The electrophoretic clustering of these isolates also indicates their inter-relatedness, but their relative distance from cluster a casts doubt on their inclusion in the same forma as CBS 200.28 and 201.28.

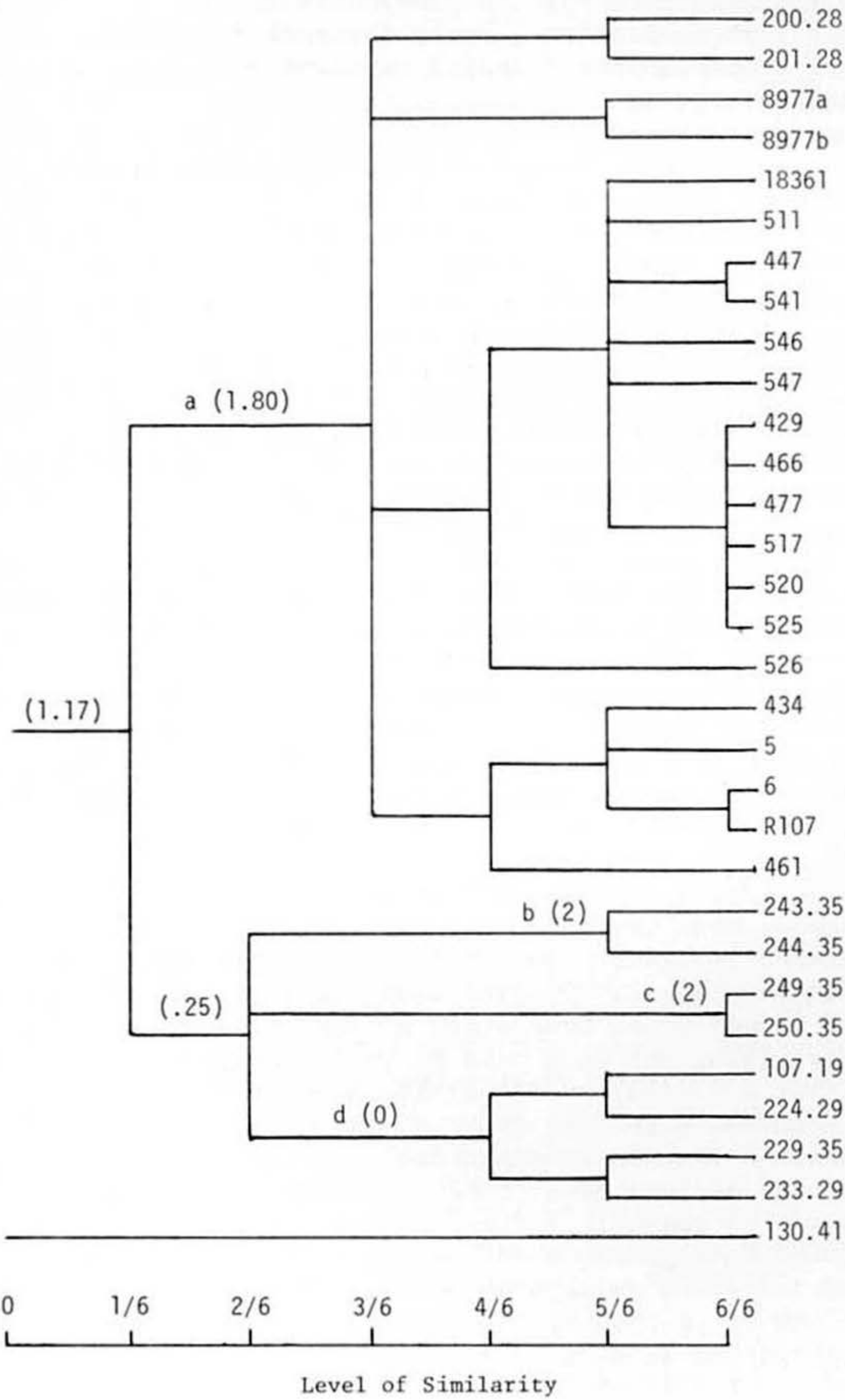
Mucor odoratus Treschow (CBS 130.41) is completely separated from the *M. hiemalis* complex both on the basis of electrophoretic similarity and mating potency (both are zero).

For the 31 isolates studied, the correlation between mating potency and electrophoretic similarity is 0.61 ($p<<.001$). There is no correlation between mating type, substrate of isolation, and isozyme pattern.

DISCUSSION

The lettered clusters of isolates in Figure 7 are only related at the 1/6 level of similarity. Such large intergroup differences could be interpreted to mean that each group of isolates should be considered a separate species. However, mating tests, based on the assumption that zygospore formation is an indicator of interfertility, showed that these 30 isolates are members of one interfertile group. Even though zygospores were not germinated, it is well established that in the genus *Mucor* zygospores are only formed in crosses of conspecific individuals. In crosses between isolates from different species, only progametangia or gametangia are formed (Blakeslee, 1915, 1920; Blakeslee and Cartledge, 1927; Satina and Blakeslee, 1930; Ling-Young, 1930; Schipper, 1973). Therefore, the 30 isolates that formed zygospores in this study must be placed in a single species, and the electrophoretic differences

Fig. 7. Dendrogram showing relationships between 31 *Mucor* isolates.



cannot be judged large enough to define different species. However, the differences can be used to distinguish formae of the same species. As previously pointed out, these electrophoretically determined formae are generally the same as the morphologically distinct groupings proposed by Schipper (1973).

The large amount of electrophoretic dissimilarity can be attributed to three things. First, acrylamide gel electrophoresis is an extremely sensitive technique that shows very small differences in protein structure (single amino acid substitutions are detectable). It may be that not all of these differences are important enough to be the basis for separating groups of isolates into species: they could be attributed to "normal intraspecific variation". Milkman (1973) working with *Escherichia coli* and Speith (1975) with *Neurospora intermedia* found essentially the same amount of intraspecific variation in those organisms as is shown for *Mucor hiemalis*.

Second, the choice of enzymes studied may have prejudiced the results by artificially increasing variation observed. Different enzymes show different amounts of variation. Had other, more stable, enzymes been studied, instead of α-Esterase, for example, which is known to be variable in a number of organisms (Peberdy and Turner, 1968), the general degree of similarity would have increased somewhat.

Third, scoring the gels by pattern type instead of band by band tends to increase the observed differences between isolates. For example, consider two patterns, each with four bands. Even if they differ in only one band they are judged to be completely different in a pattern type comparison, but in a band by band comparison they would be either 7/8 (87%) or 3/4 (75%) the same. However, since the chromosome structure of *M. hiemalis* is unknown, it is impossible to compare zymograms on a band-by-band basis, because one can never tell if different mobilities are caused by genes at different loci, or just different alleles of the same gene. A correct interpretation of electrophoretic results depends on not fabricating "presumed loci" unless it is possible to prove their constancy by showing segregation in mating experiments.

This study shows that electrophoretic similarity is a useful indicator of taxonomic similarity. Clusters of electrophoretically related individuals may occur at the subspecific level, while all the members of a species show less homogeneous isozyme patterns. Large differences (that is, zero similarity) indicate at least a species distinction. Results can be strongly biased by the choice of enzymes studied, and by the method of scoring gels. Careful interpretation of electrophoretic data should take both of these factors into account.

ACKNOWLEDGEMENTS

I would like to thank the following people: R.C. Lewontin for the use of his laboratory, equipment, and supplies; C.A. Raper, for her valuable advice, and a job; and especially D.H. Pfister, for his generous financial, intellectual, and moral support, without which this project would have been impossible.

LITERATURE CITED

Blakeslee, A.F. 1915. Sexual reactions between hermaphroditic and dioecious Mucors. Biol. Bull. Mar. Biol. Lab. Woods Hole 29: 87-96.

_______. 1920. Sexuality in Mucors. Science 51: 375-382, 403-409.

_______ and J.L. Cartledge. 1927. Sexual dimorphism in Mucorales II. Interspecific Reactions. Bot. Gaz. (Crawfordsville) 84: 51-57.

Bradford, L.S., R.J. Jones, and E.D. Garber. 1975. An electrophoretic survey of fourteen species of the fungi genus *Ustilago*. Bot. Gaz. (Crawfordsville) 136: 109-115.

Clare, B.G., N.T. Flentje, and M.R. Atkinson. 1968. Electrophoretic patterns of oxireductases and other proteins as criteria in fungal taxonomy. Austral. J. Biol. Sci. 1968: 275-295.

Cutter, V.M., Jr. 1942. Nuclear behavior in the Mucorales I. The *Mucor* pattern. Bull. Torrey Bot. Club 69: 480-508.

Glynn, A.N. and J. Reid. 1969. Electrophoretic patterns of soluble fungal proteins and their possible use as taxonomic criteria in the genus *Fusarium*. Canad. J.

Bot. 47: 1823-1831.

Hall, R. 1969. Molecular approaches to taxonomy of fungi. Bot. Rev. (Lancaster) 35: 285-304.

Ling-Young. 1930. Étude Biologique des Phénomenes de la sexualité chez les Mucorinées. Rev. Gén. Bot. 42: 348-365.

Mayr, E. 1966. Animal species and evolution. Belknap Press, Cambridge, Mass. 797 pp.

Milkman, R. 1973. Electrophoretic variation in *Escherichia coli* from natural sources. Science 182: 1024-1026.

Moorhouse, J. and M. de Bertoldi. 1975. Electrophoretic characteristics of enzymes as a taxonomic criterion in the genus *Humicola*. Mycotaxon 3: 109-118.

Peberdy, J.F. and M. Turner. 1968. The esterases of *Mortierella ramanniana* in relation to taxonomy. J. Gen. Microbiol. 51: 303-312.

Satina, S. and A.F. Blakeslee. 1930. Imperfect sexual reactions in homothallic and heterothallic Mucors. Bot. Gaz. (Crawfordsville) 90: 299-311.

Schipper, M.A.A. 1969. Zygosporic stages in heterothallic *Mucor*. Antonie van Leeuwenhoek Ned. Tijdschr Hyg. 35: 189-208.

_______. 1973. A study on variability in *Mucor hiemalis* and related species. Studies in Mycology 4: 1-40.

Shechter, Y., ed. 1973. Symposium on the Use of Electrophoresis in the Taxonomy of Algae and Fungi. Bull. Torrey Bot. Club 100: 253-312.

Sneath, P.H.A. and R.R. Sokal. 1975. Numerical taxonomy. W.H. Freeman Co., San Francisco. 573 pp.

Spieth, P.T. 1975. Population genetics of allozyme variation in *Neurospora intermedia*. Genetics 80: 785-805.

Stout, D.L. and C.R. Shaw. 1974. Genetic distance among certain species of *Mucor*. Mycologia 66: 969-977.

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THE GENUS COPRINUS IN WESTERN NORTH AMERICA, PART I: SECTION COPRINUS[1]

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SUMMARY

In this first paper of a series on western North American species of *Coprinus*, 10 species and 3 varieties comprising the section *Coprinus*, are considered. Of these only *C. comatus* var. *comatus* has been previously reported in regional handbooks. Eight new species, *C. arachnoideus*, *C. spadiceisporus*, *C. xerophilus*, *C. colosseus*, *C. asterophoroides*, *C. palmeranus*, *C. roseistipitatus*, and *C. alnivorus* are described. Three new varieties of *C. comatus*, var. *parvus*, var. *excentricus*, and var. *caprimammillatus* are described. One species, *C. umbrinus*, is reported for the first time from North America. A key to the species and varieties found in western North America is provided.

INTRODUCTION

There is no complete monographic study of *Coprinus* in the modern sense. For North America, the only treatment is that of L. H. Pennington in C. H. Kauffman's Agaricaceae of Michigan (1918). However, for use in western North America, Kauffman's work has its

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[1] This paper is based in part on a thesis submitted to the Graduate School of the University of Washington in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

limitations. It covers an area very different in climate, geography, and vegetation, and no consideration is given to microscopical details other than spore size and shape.

This study represents the first treatment of Coprinus, section Coprinus, as it occurs in Washington and other western states having similar geography and plant associations.

The concept of infrageneric taxa followed here is essentially that of Kühner and Romagnesi (1953) which emphasizes the nature of the pileal surface below the universal veil and the nature of the universal veil and its elements.

MATERIALS AND METHODS

The materials used included collections from the herbaria of the University of Washington and Central Washington State College as well as fresh collections from a variety of locations. Preliminary data were, in most cases, obtained from fresh collections which were then either dried while still in the field using a modification of the silica-gel method of Hoseney (1963) or were immediately dried in a heated, forced-draft drier. This procedure is necessary due to the extreme fragility of most Coprinus species and their rapid deliquescence which would otherwise destroy the usefulness of the collection. Collections of coprophilous species were obtained by incubation of dung samples in the laboratory.

All microscopical data were obtained from dried material. Each collection was examined microscopically with a Zeiss Standard GFL microscope. The microscopical characters examined included spores, basidia, clamp connections, pileal surface, universal veil, and cell ornamentation. For most of these data a simple squash-mount technique was satisfactory. Pileal surface scalp sections or radial sections were used to determine the nature of the pileal surface and universal veil. The material to be examined was wetted with 95% ethanol and then placed in 3% KOH or in 3% KOH to which a small drop of 1% aqueous Congo Red was added. The section was allowed to soak for several minutes before being examined. Spores were examined in 3% KOH with no staining and were observed at least twice, at two to three minutes and then later at ten to fifteen minutes to determine any color change. Dorsoventrally or laterally compressed spores were measured in three dimensions, length, width, and breadth.

Drawings were made using a Zeiss camera lucida, and the collections used are indicated by an asterisk (*).

All collections examined are deposited in the Mycological Herbarium of the University of Washington (WTU) or of Central Washington State College (ELRG).

TERMINOLOGY

The terminology used is essentially that of Snell and Dick (1957). Color terminology is that of Kornerup and Wanscher (1967). Several unusual terms are: glandiform, referring to the ovate and somewhat basally truncate acornlike shape of some young pilei; ululiform is roughly clavate but modified by a waist constriction and refers to the shape of some long basidia; brachybasidioles are short, squat, permanently sterile cells that serve as spacing elements in the hymenium of all Coprinus species.

Coprinus Pers. per S. F. Gray, Section Coprinus
= Comati Fr. (1838) em. Lange, Dansk. Bot. Ark. Bd. 2 No. 3, p. 36. 1915.
= Pelliculosi (Fr. 1838 ut tribus) em. Schröter, Pilze, p. 521. 1889.

Pileal surface outside of the apical disk composed of radially oriented hyphae, covered with and sometimes obscured by a universal veil of fibrils, often until late maturity. No sphaerocysts in the universal veil. No erect pileocystidia or caulocystidia, and usually no pleurocystidia. Definite annulus present, either free or attached to the base of the stipe like a volva and not reduced to a small bulge or flange. Stipe lumen generally with a yarnlike or weblike mass of loose hyphae. Sporocarp of medium to very large size and always undergoing autodigestion. Spores usually large, 10-25 µm in length, smooth walled. Species growing on dung or soil, rarely on wood, especially in disturbed areas.

TYPE SPECIES: Coprinus comatus O. F. Müller per S. F. Gray, Nat. Arrang. Brit. Pl. 1:632. 1821.

Observations: The distinguishing characters of section Coprinus are the pileal surface of radially oriented hyphae, the universal veil of mostly unbranched nondiverticulate hyphae with no sphaerocysts present, the abundance and loose nature of the veil when mature, the conspicuous annulus or volva and the lack of pleurocystidia in most species. The several species reported for this section seem to form a rather closely related group. Two species, Coprinus arachnoideus and C. alnivorus, appear to be transitional to section Lanatuli in the nature of the universal veil and in the completely empty stipe lumen of C. arachnoideus.

Coprinus comatus has been found to be somewhat variable. Of the several varieties presented below, one is considered to be typical C. comatus var. comatus; however, until a neotype is declared, the concept of C. comatus will remain somewhat nebulous.

KEY TO TAXA OF SECTION COPRINUS

A. Stipe lumen without a weblike or yarnlike mass of loose hyphae inside
1. Coprinus arachnoideus

A. Stipe lumen with a weblike or yarnlike mass of loose hyphae inside

B. Basidiocarps lignicolous 2. Coprinus alnivorus

B. Basidiocarps coprophilous or terrestrial

C. Spores 8.0-10.0 µm long, contents never finely granular

D. Spores clear translucent, light brown microscopically; coprophilous
3. Coprinus spadiceisporus

D. Spores dark, purplish grey microscopically; terrestrial 4. Coprinus palmeranus

C. Spores (8.1-)9.8-22.0(-25.0) µm long, contents often finely granular or even guttulate

E. Basidiocarps inhabiting dry semidesert areas, not coprophilous

F. Pileal universal veil remnant a single stellate patch 5. _Coprinus asterophoroides_

F. Pileal universal veil remnant an irregular patch or several small patches 6. _Coprinus xerophilus_

E. Basidiocarps inhabiting moister climatic areas, sometimes coprophilous

G. Basidiocarps small, pileus 1.2-2.5 cm long, species coprophilous

H. Stipe white at apex and pale umber at base 7. _Coprinus umbrinus_

H. Stipe pink at apex and white at base 8. _Coprinus roseistipitatus_

G. Basidiocarps larger, pileus 4.0-25.4 cm long; species not coprophilous

I. Stipe very long, up to 50.5 cm; spores 17.0-20.0 μm long 9. _Coprinus colosseus_

I. Stipe shorter, up to 21.0 cm (one 32 cm); spores (8.1-)9.8-15.4(-18.0) μm long

J. Sterigmata of basidia hyaline and not darkened by a thick refractive plug; basidiocarps small, pileus 4.0-5.0 cm long prior to expansion, stipe attaining ultimate length of 5.0-6.0 cm 11. _Coprinus comatus_ var. _parvus_

J. Sterigmata of basidia containing a somewhat dark and refractive plug; basidiocarps medium to large size, pileus (5.5-)6.0-12.0 cm long prior to expansion, stipe length 7.0-21.0 cm

K. Germ pore of all spores always apical in position 10. _Coprinus comatus_ var. _comatus_

K. Some or all spores with germ pore eccentric in position

L. Germ pores of spores very eccentric in position, spores 14.0-18.0 µm long
12. Coprinus comatus var. excentricus

L. Germ pores of spores mixed apical to somewhat eccentric in position, spores (8.1-)9.8-14.0(-15.4) µm long
13. Coprinus comatus var. caprimammillatus

1. Coprinus arachnoideus VAN DE BOGART sp. nov. (Fig. 1)

Pileus primo elongato-glandiformis, dein campanulatus, primo 1.8 cm longus, post expansionem 3.0 cm latus, e pallide cremeialbo pallide griseialutaceus vel pallide cremeigriseialutaceus, in maturitate tenuiter plicatostriatus; velum universale tenue, fibrosum, in maturitate fragmenta dispersa formans, carne tenui, membranacea; stipes cavus, gracilis, 4.0-6.5 cm longus, 2.2-3.6 mm crassus, e basi leviter tumida apicem versus parum angustatus, glaber sed basi aliquantum tomentosa, carne tenui, fragili; lamellae lineares, late adnatae, aggregatae, primo albae, dein atrae; autolysis completa.

Sporae laeves, complanatae, dorsaliter ovatae, lateraliter ellipsoideae, 11.2-13.8 x 7.5-8.8 x 6.2-7.3 µm, poro germinationis excentrico; basidia dimorpha, tetraspora; basidia breviter clavata 22.0-25.0 µm longa, 12.0 µm crassa; basidia longe clavata 30.2-35.2 µm longa, 13.0-15.0 µm crassa; cheilocystidia sphaerica vel ellipsoidalia, 12.5 µm usque ad 50.0 µm longa, 39.0 µm crassa, pro maxima parte breviter pedicellata, 3.0-6.0 µm longa, hyalina, laevia; pleurocystidia ellipsoidalia, 77.0-98.4 µm longa, 42.5-58.0 µm crassa, pedicellata, 1.0-12.0 µm longa, hyalina, laevia; pagina pilei cellulis radialiter duplo vel triplo longioribus quam latioribus; velum universale superficiei pilei et basis stipitis catenarum longarum intertextarum cellularum constantium, cellulis cylindraceis vel irregularibus vel ramosis, hyalinis, tenuitunicatis interdum tumidis et ad septis constrictis, amplitudibus valde variabilibus, 16.2-112.5 µm longis, 2.5-33.8 µm crassis, fibulae desunt.

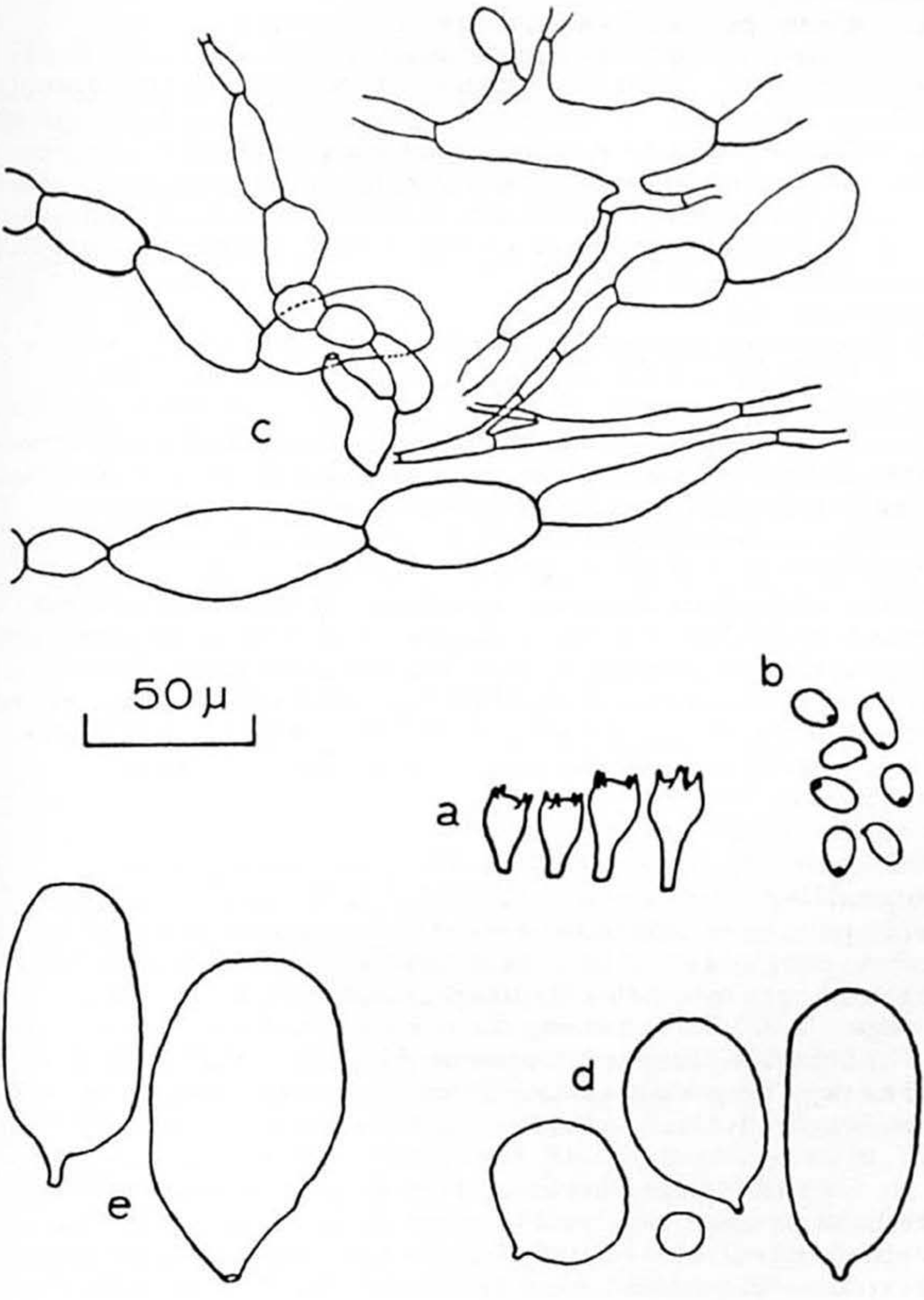

Fig. 1. Coprinus arachnoideus FVDB 2161, a. basidia, b. spores, c. universal veil, d. cheilocystidia, e. pleurocystidia.

Holotypus FVDB 2161 in solo tepidarii, Seattle, comitato King, pago Washingtonis, Mar., 1950, in herbario Universitatis Washingtonis conservatus (WTU).

PILEUS at first long glandiform, then conic, then campanulate. Prior to expansion 1.8 cm in length and after expansion 3.0 cm in breadth. Pale creamy white at first, soon becoming pale grey-tan to pale creamy grey-tan. Small shallow plicate striations developing as pileus becomes mature. Surface covered at first with a thin wispy fibrillar universal veil that soon breaks up into small scattered irregular patches. Flesh thin and membranous.

STIPE hollow, slender, nearly equal but with a slight swelling at the base and slightly narrowed towards the apex, 4.0-6.5 cm x 2.2-3.6 mm. White, opaque, glabrous except for a few small bits of loosely interwoven fibrillose tomentum scattered around the stipe base. Flesh thin and fragile.

LAMELLAE linear, some short lamellae present, 0.6-1.6 cm x 5.0 mm, broadly adnate, crowded, with no appreciable spreading by the limited amount of plicate striation, white, then soot black. Autolysis complete.

ODOR AND TASTE not observed.

SPORES ovate in dorsal view and ellipsoidal in lateral view, flattened, 11.2-13.8 x 7.5-8.8 x 6.2-7.3 µm, suprahilar depression present on most, apiculus small, visible only in lateral view, germ pore eccentric, 1.3-1.8 µm in diameter. Color en masse black, microscopically deep purple-brown in 3% KOH. Wall smooth.

BASIDIA dimorphic, short clavate and 22.0-25.0 x 12.0 µm, long clavate and 30.2-35.2 x 13.0-15.0 µm, all four-spored.

CYSTIDIA: Cheilocystidia globose to ellipsoidal, 12.5 µm in diameter to 50.0 x 39.0 µm, mostly with a short pedicel 3.0-6.0 µm long, hyaline, smooth. Pleurocystidia ellipsoidal, 77.0-98.2 x 42.5-58.0 µm, pedicellate, pedicels 1.0-12.0 µm long, hyaline, smooth. No other cystidia present.

PILEAL SURFACE a cutis of more or less radially oriented hyphae, the surface cells two or three times as long in the radial orientation as in any other direction.

UNIVERSAL VEIL of fibrillar nature, interwoven. Individual elements occurring in long chains of more or less cylindrical cells, hyaline, thin walled, some swollen and somewhat constricted at the septations, others not swollen. Some cells irregular, the chains composed of cells of varied sizes all along its length, some of them branched or anastomosed. The same types of chains of cells found on both the pileal surface and at the stipe base. Universal veil cell size 16.2-112.5 x 2.5-33.8 µm.

CLAMP CONNECTIONS absent.

HABITAT terrestrial, on prepared soil mixes in a greenhouse, solitary.

Observations: This species differs from most of the other species of section Coprinus in its lack of any web or thread of hyphae inside the lumen of the stipe, its lack of refractive plugs in the sterigmata, its adnate lamellae, and its lack of clamp connections. C. arachnoideus differs from C. alnivorus microscopically. It resembles some of the species of section Lanatuli in its universal veil characters and in the possession of pleurocystidia.

Material Examined. Washington: HOLOTYPE, FVDB 2161*, March, 1950.

2. Coprinus alnivorus VAN DE BOGART sp. nov. (Fig. 2)

Pileus primo breviter glandiformis, dein campanulatus, postremo laciniatus et aliquantum revolutus, primo 2.0 cm longus, post expansionem 2.0 cm latus, primo albus et ad apicem pallidibrunneus, dein griseascens, postrema ater, sed ad apicem solummodo griseibrunneus, pagina pilei primo velo universali tenui arachnoideo et minute squamuloso obtecta, in maturitate velo arachnoideo pro parte maxima evanescenti sed squamis minutis persistentibus etsi dispersis; pagina pilei in maturitate leviter plicato-striata, carne tenui et fragili; stipes gracilis, versus apicem leviter angustatus, 9.0 cm longus, 4.0-6.0 mm crassus, cavus, telam hypharum laxis capiens, pagina stipitis laevis, glabra, alba; annulus laxus et membranaceus, albus, friabilissimus et mox in

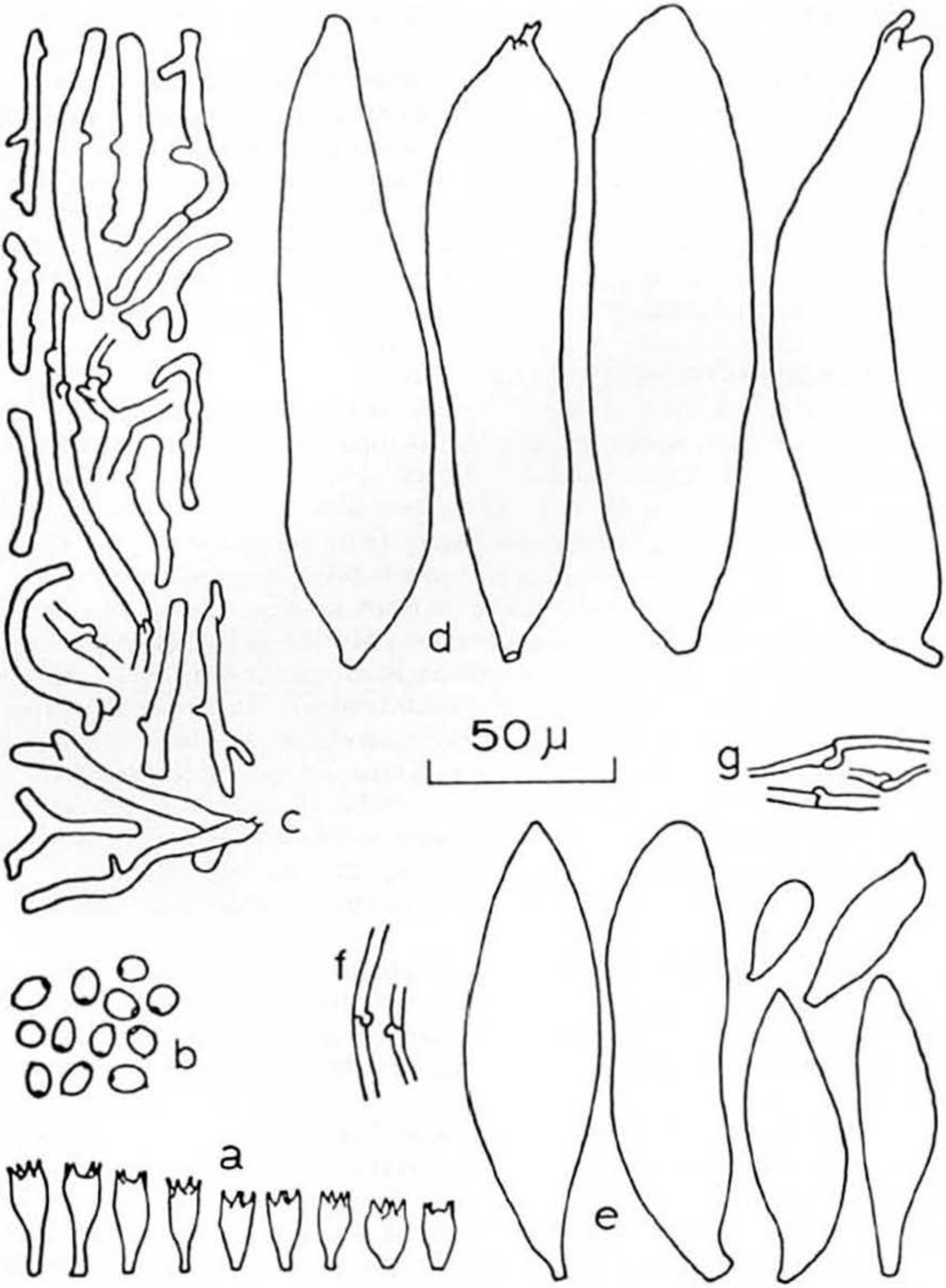

Fig. 2. Coprinus alnivorus FVDB 3370, a. basidia, b. spores, c. universal veil, d. pleurocystidia, e. cheilocystidia, f. stipe base clamp connections, g. lamellar clamp connections.

fragmentis parvis fatiscens, carne stipitis leviter fibrosa sed fragilissima; lamellae lanceolatae, liberae, confertae, primo albae, dein atrae, autolyse completo.

Sporae subglobosae vel breviter ellipsoideae variantes, 7.5-10.7 x 6.2-7.5 µm, poro germinationis apicali, in cumulo atrae, dein per microscoporium atropurpureae vel brunneipurpureae, in solutione 3% KOH atrae; basidia trimorphica, tetraspora; basidia breviter clavata 16.5-17.5 µm longa, 8.0-10.5 µm crassa; basidia clavata 18.0-26.0 µm longa, 8.0-9.0 µm crassa; basidia longe clavata pedicellata 27.0-29.0 µm longa, 8.0-9.0 µm crassa; cheilocystidia clavata, ellipsoideofusiformia, apicibus obtusis vel subacutis, 28.0 135.0 µm longa, 11.0-35.0 µm crassa, hyalina, tenuitunicata, laevia; pleurocystidia ellipsoidea vel subfusiformia, apicibus obtusis vel leviter ramificantibus, 145.0-182.0 µm longa, 30.0-45.0 µm crassa, hyalina, tenuitunicata, laevia; pagina pilei ex hyphis gracilibus, tenuitunicatis, cylindraceis, hyalinis constans, hyphae paginae radiantes; velum universale ex squamis parvis et tela tenui arachnoidea constans, velum in pagina pilei et basi stipitis praesens, squamis et telis ex hyphis intertextissimis, gracilibus, haud tumidis, tenuitunicatis, hyalinis, cylindraceis, septatis, et fibuligeris constantes, cellulis hypharum aliquantum ramificantibus, pro parte maxima ad septos facile secedentibus, 2.5-10.0 µm latis; squamae nonnullae paginam membranaceam habentes; annulus 1.0 mm latus; fibulae basi stipitis, in velo universali, in trama lamellarum adsunt; sporocarpia odore fungorum.

Holotypus FVDB 3370 in ligno alni, in sylva humida, Cispus Center, Gifford Pinchot National Forest, comitato Lewis, pago Washingtonis, 25 Oct., 1975, in herbario Universitatis Washingtonis conservatus (WTU).

PILEUS at first short-glandiform, then campanulate, then margin becoming laciniate and somewhat revolute, when unexpanded 2.0 cm in length, expanding to 2.0 cm in width. At first white except pale brown at the apex, then becoming grey, then black, but only brownish grey at the apex. Surface at first with a thin arachnoid universal veil with some minute squamules, in maturity the arachnoid veil largely vanishing but the minute squamules persisting although scattered, surface eventually slightly plicate-striate. Pileal margin at first connected to the stipe with a prominent, scaly white annulus. Flesh thin and fragile.

STIPE slender, tapering only slightly from base towards apex, 9.0 cm x 4.0-6.0 mm, hollow, lumen with some loosely interwoven hyphal webbing, surface smooth, glabrous, white. Flesh slightly fibrous, but very fragile. Loose membranous annulus present, 1.0 mm in width, white, very friable and soon disintegrating into small fragments.

LAMELLAE lanceolate, free, very crowded, at first white, then black. Autolysis complete.

ODOR faint odor of mushrooms.

SPORES subglobose to short ellipsoidal, 7.5-10.7 x 6.2-7.5 µm, apiculus small, often not visible, germ pore apical, 1.5 µm in diameter. Color soot black en masse and at first dark purple or brownish purple microscopically, then soon black and opaque in 3% KOH. Wall smooth.

BASIDIA trimorphic, short clavate and 16.5-17.5 x 8.0-10.5 µm, clavate and 18.0-26.0 x 8.0-9.0 µm, long-pedicellate-clavate and 27.0-29.0 x 8.0-9.0 µm, all four-spored.

CYSTIDIA: Cheilocystidia clavate to ellipsoidal-fusiform, apices obtuse to subacute, 28.0-135.0 x 11.0-35.0 µm; hyaline, thin walled, smooth. Pleurocystidia ellipsoidal to subfusiform, apices obtuse to slightly branching, 145.0-182.0 x 30.0-45.0 µm, hyaline, thin walled, smooth. No other cystidia present.

PILEAL SURFACE a cutis of slender, cylindrical, radially oriented, hyaline, thin walled hyphae.

UNIVERSAL VEIL of small scales and a thin arachnoid web on pileal surface and base of stipe, scales and web consisting of slender, nonswollen, thin walled, hyaline, cylindrical, septate and clamped hyphae, very interwoven, some branching, most cells separating readily at the septations, 2.5-10.0 µm in diameter, some scales with membranous surface.

CLAMP CONNECTIONS present on the hyphae of the stipe base, in the universal veil, and in the lamellar trama.

HABITAT lignicolous, on hard scarcely rotted wood of Alnus sp. in a hardwood rain forest.

Observations: This species is similar in many features to C. arachnoideus and likewise appears to be transitional to section Lanatuli in its veil characteristics and possession of pleurocystidia. It differs from C. arachnoideus in most of its microscopical features.

Material Examined. Washington: HOLOTYPE, FVDB 3370*, 25 October, 1975.

3. Coprinus spadiceisporus VAN DE BOGART sp. nov. (Fig. 3)

Pileus primo ovatus-ellipsoideus, dein campanulatus, postremo aliquantum revolutus, primo 3.0-3.8 cm longus, post expansionem 5.0-6.0 cm latus, primo albidus, dein propter sporas maturas atrogriseibrunneus; apex pallide brunneus, pagina plicato-striata, velo universali tecta; velum ex squamis parvis appressis constans, sordide albidum aetate laxum et magis dispersum tamen semper aliquantum persistens, carne tenui, membranacea; stipes aliquantum crassus, 10.0-12.0 cm longus, 5.0-8.0 mm crassus, cavus, tela hypharum laxarum capiens, annulo conspicuo laxo albo coacto, 1.0 mm lato, pagina laevis glabra, basi leviter tomentosa, primo albus, dein apice atranti, carne aliquantum crassa et fibrosa; lamellae lanceolatae, liberae et remotae, aggregatae, in maturitate brunneolae-atrae, autolysis completa.

Sporae laeves, aliquantum complanatae, ovato-ellipsoideae, 8.1-10.0 x 6.2-6.9 x 5.0-5.6 µm, in cumulo atrobrunneae, per microscopium badiae, translucidae, poro germinationis excentrico; basidia trimorphica, tetraspora; basidia breviter clavata 12.5-17.5 µm longa, 10.0-11.2 µm crassa; basidia longe clavata 20.0-25.0 µm longa, 10.0-11.2 µm crassa; basidia ululiformia 28.7-35.0 µm longa, 10.0-11.2 µm crassa; cheilocystidia sphaerica vel ellipsoidalia, 15.0 µm usque ad 42.5 µm longa, 30.0 µm crassa, hyphis tenuibus filamentosis mixtis, pagina pilei hypharum radialium; velum universale superficiei pilei ex catenis cellularum longis parallelis inramosis constantium, cellulis interdum tumidis et catenulatis, aliter

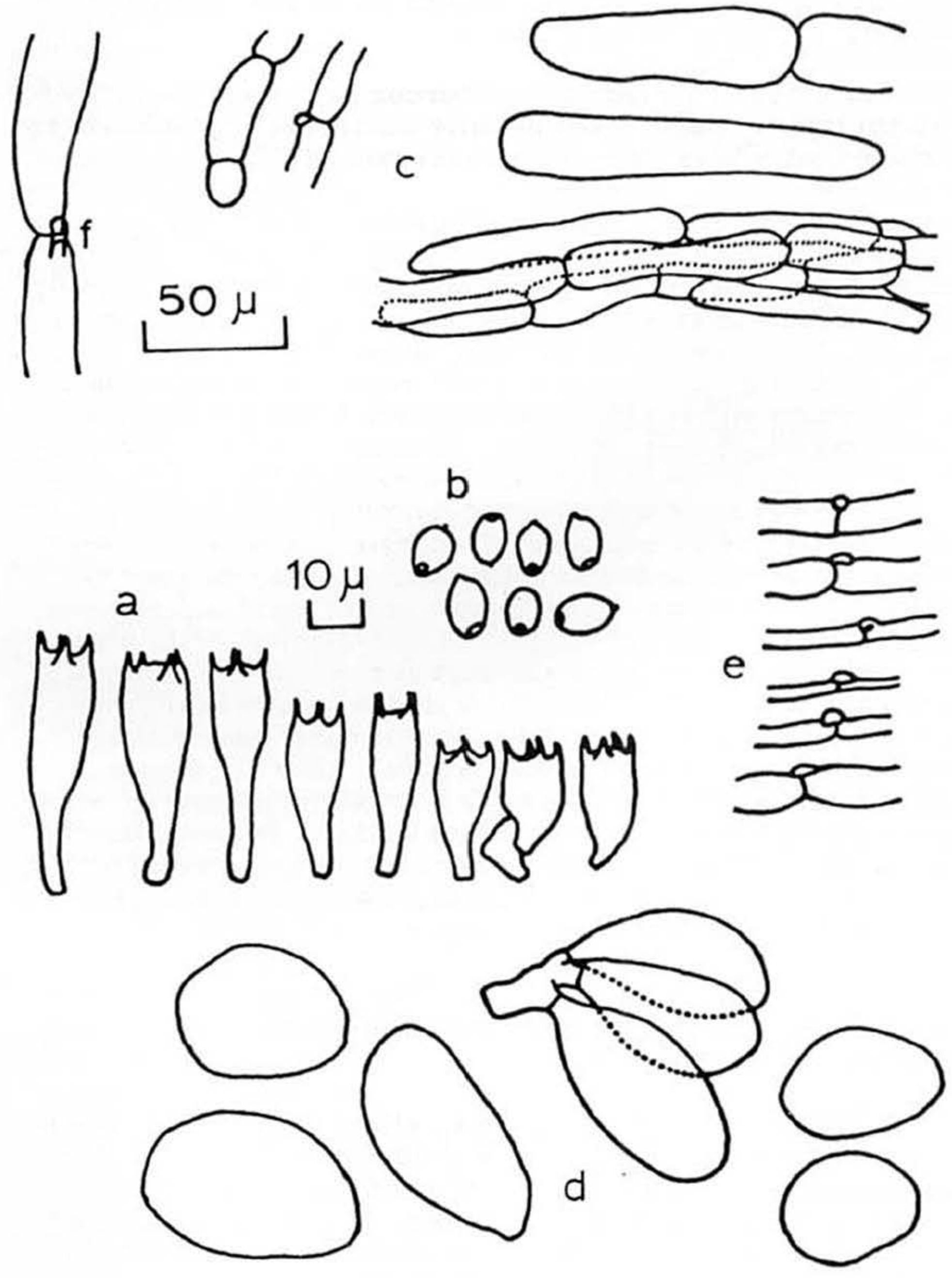

Fig. 3. <u>Coprinus</u> <u>spadiceisporus</u> FVDB 217, a. basidia X1000, b. spores X1000, c. universal veil X500, d. cheilocystidia X1000, e. stipe clamp connections X500, f. universal veil clamp connection X1000.

disjunctis et incohaerentibus, cellulis omnibus laevibus, tenuitunicatis, hyalinis, cellulis contiguis amplitudibus et formis similibus; fibulae in stipite et velo universali adsunt.

Holotypus FVDB 217 in stercore cuniculo vel cervo detrito mixto, pago Washingtonis occidentalis, in herbario Universitatis Washingtonis conservatus (WTU).

PILEUS at first ovate-ellipsoidal, then conical, then campanulate, and eventually somewhat revolute, when unexpanded from 3.0-3.8 cm long, expanding to 5.0 to 6.0 cm wide. Whitish when young but soon grey from ripening spores, the apex pale brownish, soon entirely dark greyish brown, except the apex which remains paler brown. Radial pileal striations apparent even at young stage and soon developing into plicate striations. Surface covered with a universal veil of small somewhat appressed scales of dingy or dirty white color, becoming much looser in age and more scattered but even then more or less persistent. Flesh rather thin and membranous. Leaves and debris stuck to pileal surface.

STIPE hollow, rather stout for Coprinus, 10.0-12.0 cm x 5.0-8.0 mm. Prominent, loose, white, felty annulus present, about 1 mm in width. Hollow center filled with a weblike mass of loose hyphae. Outer surface smooth and glabrous except for a loose tomentum of woolly hairs at the base. White in color at first but soon darkening to light brownish over most of its length and becoming dark, almost black near the apex, opaque. Flesh rather thick and fibrous for a Coprinus.

LAMELLAE lanceolate, 2.5 to 4.0 mm broad, free and remote, crowded, dark brownish black when mature. Autolysis complete.

SPORES ovate-ellipsoidal, slightly flattened, basal end broader than apical end, 8.1-10.0 x 6.2-6.9 x 5.0-5.6 µm, apiculus and germ pore both prominent, germ pore eccentric, 1.5-2.0 µm in diameter. Color dark blackish brown en masse and a clear translucent chestnut brown microscopically in 3% KOH. Wall smooth.

BASIDIA trimorphic, short clavate and 12.5-17.5 x 10.0-11.2 µm, long clavate and 20.0-25.0 x 10.0-11.2 µm, ululiform and 28.7-35.0 x 10.0-11.2 µm, all four-spored.

CYSTIDIA: Cheilocystidia globose to more or less ovate, 15.0 µm in diameter to 42.5 x 30.0 µm, intermixed with thin filamentous hyphae on gill edge. No other cystidia present.

PILEAL SURFACE a cutis of radially oriented hyphae.

UNIVERSAL VEIL scales composed of fibrils aligned parallel to each other and composed of chains of unbranched, often swollen cells 6.2-20.0 µm in diameter, often constricted at the septations and then catenulate, also tending to break up into single loose cells. All cells of the universal veil with smooth, thin, hyaline walls, and all adjacent cells of the universal veil tending to be of similar size and shape.

CLAMP CONNECTIONS present on the hyphae of the stipe surface and occasionally on the universal veil.

HABITAT coprophilous, on rabbit or deer dung.

Observations: This species shares a peculiar feature with two other species of section Coprinus, C. sterquilinus and C. colosseus, namely, the discoloring and eventual blackening of the apical portion of the stipe flesh. The ovate, flattened spores with their clear light brown color seem distinctive.

Material Examined. Washington: HOLOTYPE, FVDB 217*, collector and date unknown.

4. Coprinus palmeranus VAN DE BOGART sp. nov. (Fig. 4)

Pileus primo glandiformis, dein conicus, postea campanulatus, postremo revolutus, primo 3.2 cm longus, post expansionem 3.0 cm latus, primo ubique albus vel ad apicem subbrunneus, in maturitate cinereialbus, ad apicem brunneus, pagina pilei primo cum squamis parvis veli universalis obtecta, in maturitate squamae veli universalis dispersae et evanescentes, in maturitate pagina pilei leviter plicato-striata, carne tenui et membranacea; stipes cavus, tela hypharum laxarum capiens, gracilis, basi bulbosa, cum rhizomorphis gracilibus subtenta, apicem versus leviter contractus, 8.5 cm longus, 3.0-7.0

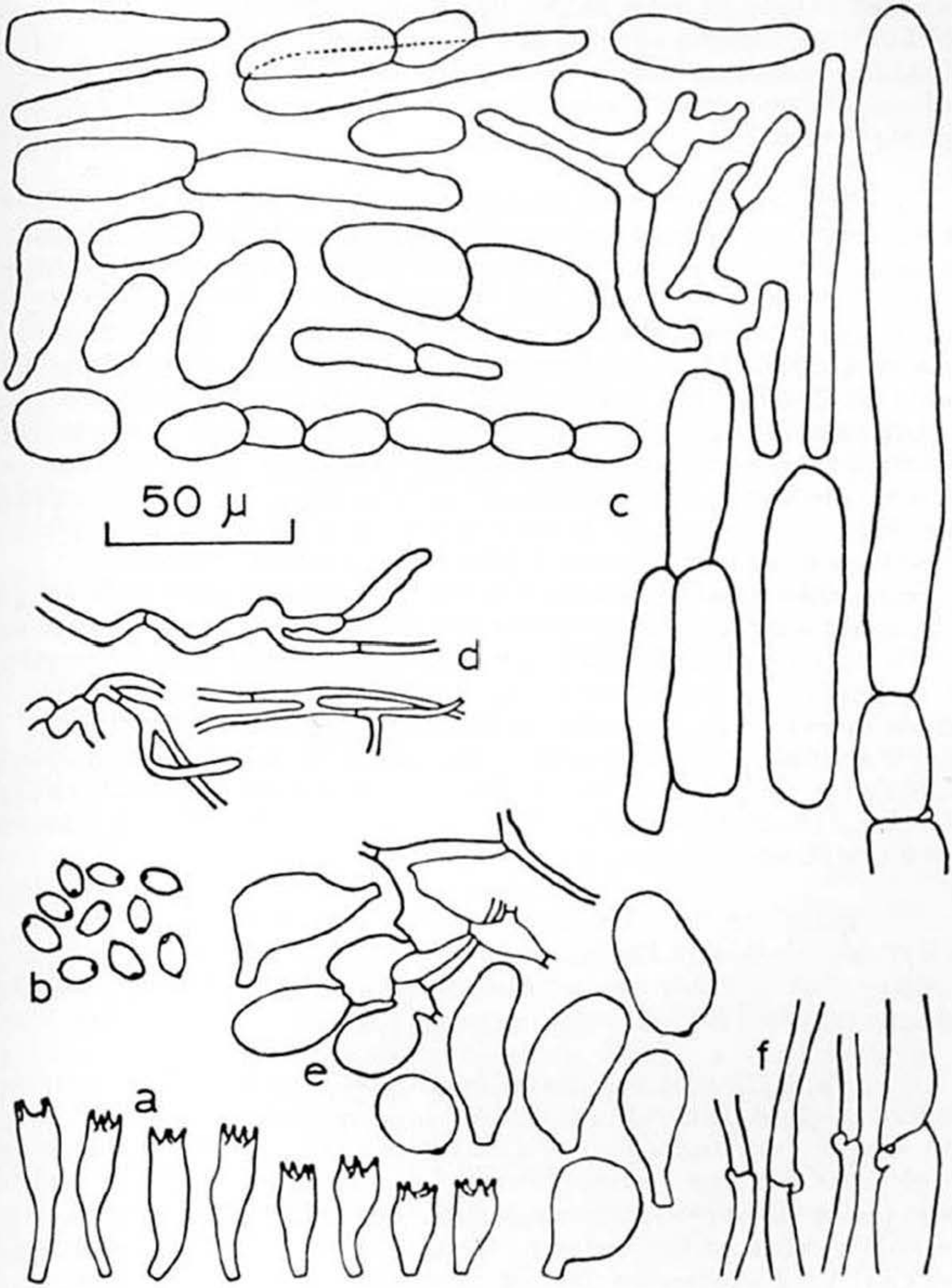

Fig. 4. Coprinus palmeranus FVDB 3340, a. basidia, b. spores, c. universal veil, d. annulus, e. cheilocystidia with associated hyphal structures, f. stipe clamp connections.

mm crassus, pagina stipitis pro parte maxima laevis, glabra vel fibrilis paucis laxis, area prope basin furfuraceae; stipes annulo parvo libero albo membranaceo praeditus, scapo albo carne aliquantum fibrosa etsi fragili; lamellae lanceolatae, liberae, confertae, primo albae, dein roseae, postea brunneae vel atrobrunneae, postremo atrae; autolysis completa.

Sporae moderate complanatae, lateraliter visae late ellipsoideae, dorsaliter visae anguste ovatae, 8.7-10.0 x 5.6-6.3 x 4.3-5.7 µm, poro germinationis leviter excentrico, in cumulo atrae, per microscopium atripurpurei-griseae; basidia trimorphica, tetraspora; basidia breviter clavata 20.0-22.5 µm longa, 12.5 µm crassa; basidia clavata 31.2-37.5 µm longa, 10.0-11.3 µm crassa; basidia ululiformia 45.0-49.0 µm longa, 10.0-12.5 µm crassa; sterigmata obturamentis refractivis; cheilocystidia globosa, obovata, lageniformes, ellipsoidea, 10.0 µm usque ad 46.5 µm longa, 19.0 µm crassa; pagina pilei ex hyphis gracilibus tenuitunicatis hyalinis radiantibus constans; velum universale superficiei pilei ex squamis constans, squamis ex catenis parallelis cellularum constantibus, cellulis cylindracea interdum tumidis, et ad septa constictis, hyalinis, tenuitunicatis, 5.0-19.0 µm latis; annulus membranaceus, ex cellulis pro parte maxima gracilibus cylindraceis, hyalinis, tenuitunicatis et sparsim septatis constans, cellulis aliquantum intertextis et anastomosantibus, 2.5-11.5 µm latis; fibulae in contextu stipitis adsunt sed non frequentes.

Holotypus FVDB 3340 in solo argillaceo, Staircase, Olympic National Park, comitato Mason, pago Washingtonis, Oct., 1974, in herbario Universitatis Washingtonis conservatus (WTU).

PILEUS at first glandiform, then conic, then campanulate and becoming revolute, when unexpanded 3.2 cm in length, expanding to 3.0 cm in width. White and light brown at the apex when young, becoming grey-white and brown at the apex with maturity, covered at first with small scales of the universal veil, with maturity the universal veil scales becoming scattered and evanescent, slightly plicate striate where not covered with veil, margin at first attached to stipe by partial veil, flesh very thin and membranous.

STIPE hollow, the lumen stuffed with a loose webbing of hyphae, slender, base bulbous with a slender subtending rhizomorph, shaft tapering slightly towards apex, 8.5 cm x 3.0-7.0 mm, surface smooth and mostly glabrous with an occasional loose fibril, white and opaque, base with a scurfy area and a small free white membranous annulus, flesh somewhat fibrous although fragile.

LAMELLAE lanceolate, free, very crowded, few short lamellulae present, at first white, then pink, then brown, then dark brown, then black. Autolysis complete.

SPORES moderately flattened, laterally broadly ellipsoidal, dorsally narrowly ovate, 8.7-10.0 x 5.6-6.3 x 4.3-5.7 µm, apiculus present, small, germ pore slightly eccentric, 1.8 µm in diameter. Color soot black en masse and a dark purplish grey microscopically in 3% KOH. Wall smooth.

BASIDIA trimorphic, short clavate and 20.0-22.5 x 12.5 µm, clavate and 31.2-37.5 x 10.0-11.3 µm, ululiform and 45.0-49.0 x 10.0-12.5 µm, sterigmata with refractive plugs, all four-spored.

CYSTIDIA: Cheilocystidia globose, obovate, lageniform, and ellipsoidal, 10.0 µm in diameter to 46.5 x 19.0 µm. No other cystidia present.

PILEAL SURFACE a cutis of slender, radially oriented thin-walled hyaline hyphae.

UNIVERSAL VEIL scales composed of parallel chains of cells, cells cylindrical, some swollen and constricted at the septa, all hyaline, thin-walled 5.0-19.0 µm in diameter. Annulus membranous, composed of mostly slender cylindrical cells, sparsely septate, somewhat interwoven and anastomosed, hyaline, thin-walled, 2.5-11.5 µm in diameter.

CLAMP CONNECTIONS present in stipe context, not common.

HABITAT terrestrial, on clay soil in open grassy maple woods.

Observations: This species bears a striking resemblance to C. comatus in its overall appearance. It differs mainly in its much smaller stature and the much smaller size of the spores and basidia.

Material Examined. Washington: HOLOTYPE, FVDB 3340*, October, 1974.

5. Coprinus asterophoroides VAN DE BOGART sp. nov. (Fig. 5)

Pileus primo rotundus, dein campanulatus, postea planiusculus, postremo pro parte maxima per lysem destructus, primo 2.0-3.0 cm longus, post expansionem 4.0-6.0 cm latus, propter velum universale primo albus, dein recedit velum, et cuticula ut videtur pallide grisea, dein atrescens vel brunneiatra, apice propter velum universale alba remanenti; velum universale crassissimum, consistentia coacta, mox vestigium persistens et distincte stellatum praebens; pagina pilei in maturitate profunde plicato-striata, margine revoluto vel subtus crispato, postremo ad frustilla laciniosa deminuto; stipes cavus, filum persistens hypharum capiens, gracilis, 7.0-11.5 cm longus, 3.0-6.0 mm crassus, pagina stipitis pro parte maxima laevis et glabra, prope basem fibrillis appressis, subinde squamis parvis in dimidio inferno stipitis, primo albus, lente denigricans, carne tenui fragili; lamellae lanceolatae, liberae et remotae, confertissimae, in maturitate atrifuligineae, autolyse completo.

Sporae ovatae vel ovato-ellipsoideae, leviter complanatae, 17.5-20.0 x 11.2-12.5 µm, poro germinationis apicali vel excentricissimo; basidia trimorphica, tetra spora; basidia breviter clavata 35.0-39.0 µm longa, 20.0-22.5 µm crassa; basidia clavata 50.0-54.0 µm longa, 20.0-22.5 µm crassa, basidia subululiformia 52.0-64.5 µm longa, 20.0-21.5 µm crassa; sterigmata obturamenta refractiva vel pigmentifera praebentia; apex basidii pigmento atrogriseibrunneo; pagina pilei ex hyphis radiantibus, cellulis numerosis paginae pigmentum atrobrunneum praeditis; velum universale superficiei pilei fragmentum stellatum coactum faciens, quod ex catenis longis parallelis cellularum constans, cellulis catenarum cylindraceis, hyalinis, tenuitunicatis, saepe aliquot tumidis et ad septa constrictis, cellulis amplioribus catenarum 12.5-63.5 µm latis per hyphas graciles 3.5-11.0 µm latas, ramosas et anastomoscantes colligatis; fibulae in velo universale et in stipite rarae, plerumque valde irregulares.

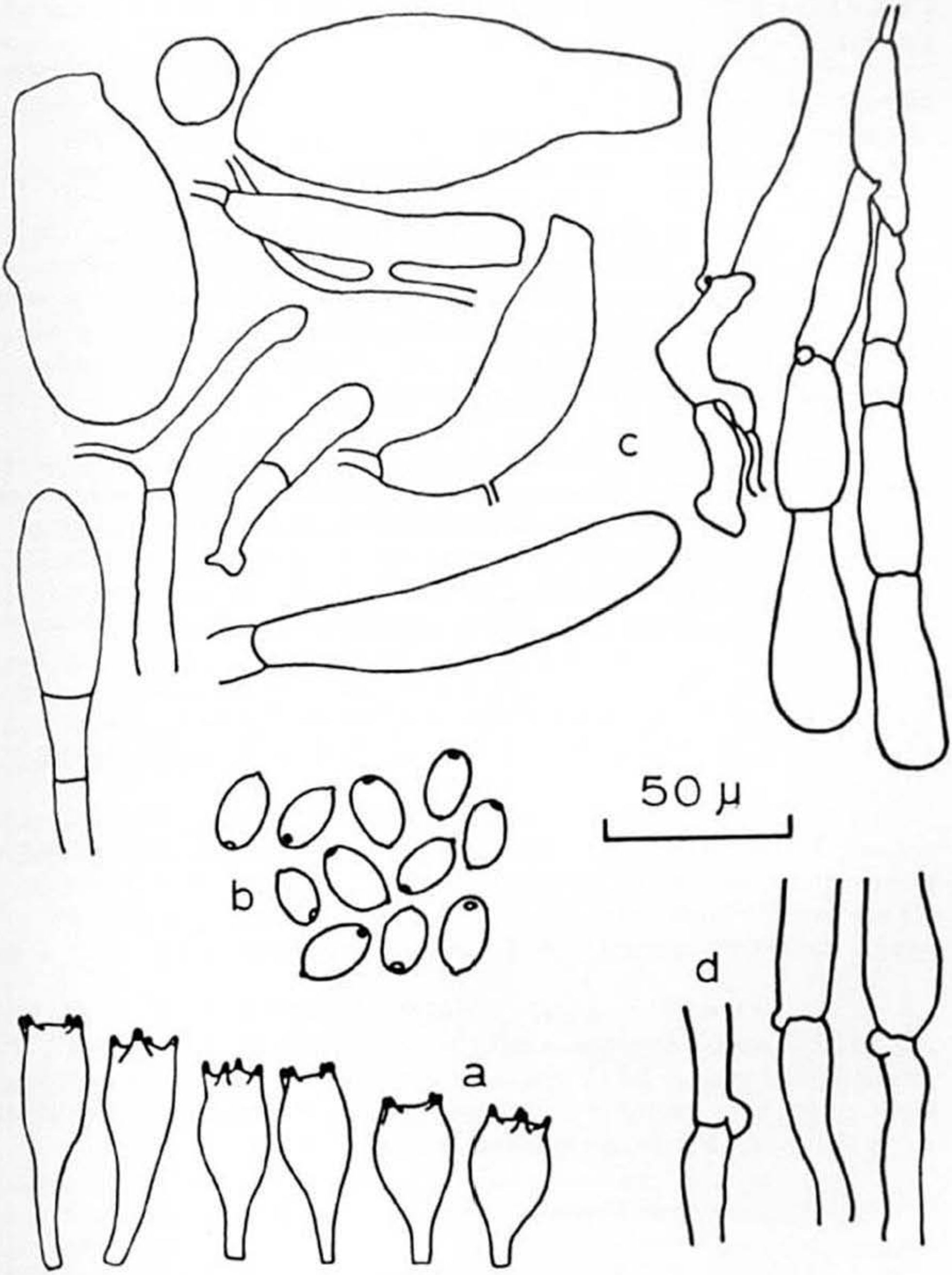

Fig. 5. Coprinus asterophoroides FVDB 3333, a. basidia, b. spores, c. universal veil, d. universal veil clamp connections.

Holotypus FVDB 3333 in solo arenario in deserto, Beverly, comitato Grant, pago Washingtonis, 5 Aug., 1974, in herbario Universitatis Washingtonis conservatus (WTU).

PILEUS at first rounded, then hemispherical, then campanulate, then plane, and finally mostly lysed, when unexpanded 2.0-3.0 cm long, expanding to 4.0-6.0 cm broad. Universal veil white when young, then cuticle darkening to black or blackish brown as universal veil recedes, apex remaining white with universal veil. Universal veil of a felt-like consistency, very thick, soon torn into a distinctly stellate persistent remnant as pileus expands. Pileal surface becoming deeply plicate striate. Pileal margin becoming revolute or curling under and eventually reduced to tattered shreds.

STIPE hollow, slender, 7.0-11.5 cm x 3.0-6.0 mm. Stipe lumen with a distinct and persistent hyphal strand in the center. Surface mostly smooth and glabrous, some appressed fibrils near the bottom or occasionally small scales on the lower half. White at first, then slowly blackening as lysis proceeds, opaque. Flesh very thin and fragile.

LAMELLAE lanceolate, free and remote, very crowded, soot black when mature, autolysis complete.

SPORES ovate to ovate-ellipsoidal, slightly flattened, 17.5-20.0 x 11.2-12.5 μm, apiculus usually small, germ pore apical to very eccentric, 1.8 μm in diameter. Color soot black en masse and a dark brownish purple-black microscopically in 3% KOH. Wall smooth.

BASIDIA trimorphic, short clavate and 35.0-39.0 x 20.0-22.5 μm, clavate and 50.0-54.0 x 20.0-22.5 μm, subululiform and 52.0-64.5 x 20.0-21.5 μm, sterigmata with dark somewhat refractive plugs, apex of basidia dark grey-brown, all four-spored.

CYSTIDIA not seen.

PILEAL SURFACE of slender, cylindrical, radially aligned, thin-walled hyphae. Many hyphae with irregular patches of dark brown pigment on the cell walls.

UNIVERSAL VEIL composed of long parallel, radially aligned chains of long, often somewhat swollen cells, constricted at the septae, larger cells of the chains bound together by slender, branched and anastomosed hyphae. All cells of universal veil hyaline and thin walled. Large cells 12.5-63.5 µm in diameter. Cells of the binding hyphae 3.5-11.0 µm in diameter.

CLAMP CONNECTIONS present in universal veil and rarely on the stipe, usually very irregular.

HABITAT terrestrial, on sandy soil in dry open sagebrush desert area.

Observations: This species is closely related to *C. asterophorus* Long & Miller and to *C. xerophilus* Van De Bogart. It shares many morphological features as well as the arid habitat with both. *C. asterophoroides* differs from *C. asterophorus* in possessing a distinct and persistent hyphal strand in the stipe lumen, the universal veil remaining white even when dried, the germ pore often very eccentric, the much larger diameter of the universal veil elements, the absence of a bulbous volvate stipe base, and the larger and much broader basidia with pigmented apices. *C. asterophoroides* differs from *C. xerophilus* in the universal veil remaining stellate, the smaller germ pore, the absence of a bulbous volvate stipe base, and the pigmented apex of the basidia.

Material Examined. Washington: HOLOTYPE, FVDB 3333*, 5 August, 1974; Hosford 1878 (ELRG).

6. *Coprinus xerophilus* VAN DE BOGART sp. nov.
(Fig. 6)

Pileus primo breviter glandiformis vel subglobosus, dein campanulatus, tandem revolutus, apice late tholiformi remanenti, 1.6-4.0 cm latus, primo candidus, ubi velo universali tectus albus remanens, margine atrascenti; pagina pilei leviter plicato-striata vel velo universali crasso coacto albo tecta, velo ex fragmento unico pileato vel fragmentis aliquot irregularis constanti carne tenui et membranacea; stipes albus, cavus, lumine telam subtilam vel filum laneum continenti, gracilis supra fere aequalis, 4.0-7.5 cm longus, 2.5-6.0 mm crassus, basi bulbosa et 6.0-12.0 mm lata, pagina stipitis supra basem crista distincta volvata instructa, carne pro parte maxima

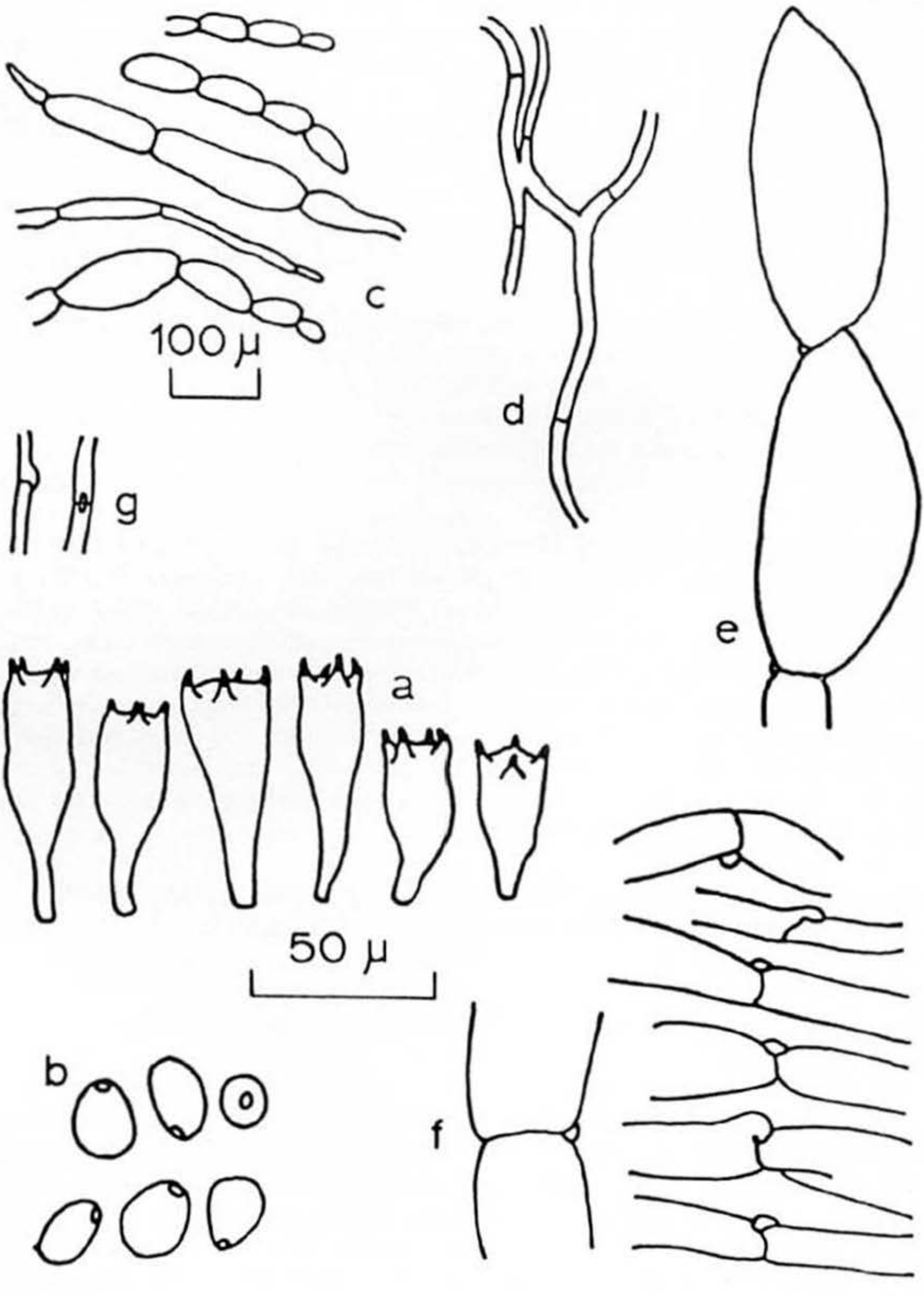

Fig. 6. Coprinus xerophilus FVDB 2159, a. basidia X500, b. spores X500, c. universal veil X125, d. universal veil X500, e. universal veil X500, f. stipe clamp connections X500, g. universal veil clamp connections X500.

crassa et fibrillosa, basi solida; lamellae anguste ovatae vel lanceolatae, liberae et remotae, aggregatae, in maturitate atrae, autolyse tantum partiali.

Sporae laeves, dorsaliter late ovatae, lateraliter ovato-ellipsoideae, aliquantum complanatae, 17.5-22.6 x 11.2-16.3 x 10.6-12.5 µm, poro germinationis excentrico; basidia trimorphica, tetraspora; basidia breviter clavata 38.8-47.5 µm longa, 18.8 µm crassa; basidia longe clavata 50.0-62.5 µm longa, 17.5-18.8 µm crassa; basidia subululiformia 53.8-60.5 µm longa, 17.5-25.0 µm crassa; sterigmata obturamenta granda refractiva vel pigmentifera praebentia; pagina pilei ex hyphis radiantibus constans; velum universale superficiei pilei ex strato crasso coacto constans, strato ex catenis longis cellularum cylindricarum vel oblongarum constanti, cellulis catenarum laevibus, hyalinis, tenuitunicatis hyphis nonnullis tenuioribus insuper adsunt; basis stipitis cristam volvatum cellularum similium praebens; stipes et velum universale fibulata.

Holotypus FVDB 2159 terrestris, in solo arenario vel glareosa locorum aridorum, Nephi, comitato Juab, pago Utah, 15 June, 1957, in herbario Universitatis Washingtonis conservatus (WTU).

PILEUS short glandiform to subglobose, then rounded conic, then broadly campanulate and eventually revolute, apex remaining somewhat broadly domelike, upon expansion becoming 1.6 to 4.0 cm broad, white at first and remaining white where covered by the universal veil. Margins eventually becoming black due to spore production and lysis. Surface showing only a small amount of plicate striation where not covered by the universal veil along the margin, mostly covered by a thick, densely interwoven universal veil which may remain in one caplike piece or break up into irregular patches and areolae, the surface under the universal veil usually becoming evident only upon complete pileal expansion and then mostly along the pileal margin. Flesh under the thick universal veil thin and membranous, only becoming about 1.0 mm thick at the apex.

STIPE hollow, stuffed with widely spaced and more or less loose hyphae that sometimes form a fine webbing or a slender yarnlike thread in the center of the lumen, somewhat slender, nearly equal above the distinctly bulbous base, 4.0-7.5 cm x 2.5-6.0 mm, and the base itself 6.0-12.0 mm in diameter, white and opaque. Bulb of stipe base with a distinct volvate ridge on its upper surface, well separated from the stipe shaft. Flesh fairly thick and fibrous, up to 1.5 mm thick, the base tending to be solid. Surface of base outside of the volva covered with sand grains and debris.

LAMELLAE narrowly ovate to lanceolate, some short lamellulae present, but sometimes few in number, 0.8-2.8 x 1.0-1.2 cm, free and remote to free and close, crowded at first, then somewhat less crowded with the limited development of plicate striation as the pileus expands, pale then black. Autolysis fairly complete, the lamellae all lysing and only the universal veil and part of the pileal surface remaining.

ODOR AND TASTE unknown.

SPORES broadly ovate to somewhat mitriform in dorsal view, ovate-ellipsoidal in lateral view, somewhat flattened, 17.5-22.6 x 11.2-16.3 x 10.6-12.5 μm, apiculus sometimes large and conspicuous, and sometimes small and not conspicuous, germ pore eccentric and broad, 2.5-3.2 μm in diameter. Color en masse soot black, microscopically deep clear brown to deep purplish brown in 3% KOH. Wall smooth.

BASIDIA trimorphic, short clavate and 38.8-47.5 x 18.8 μm, long clavate and 50.0-62.5 x 17.5-18.8 μm, subululiform and 53.8-60.5 x 17.5-25.0 μm, all four-spored, sterigmata pigmented or plugged.

CYSTIDIA: Cheilocystidia probably present but all destroyed by lysis of lamellar margin. No other cystidia present.

PILEAL SURFACE a cutis of radially oriented hyphae.

UNIVERSAL VEIL consisting of a thick feltlike portion on the pileus and a distinct volvate rim on the upper part of the bulbous base of the stipe, the pileal universal veil composed of long chains of cylindrical to sausagelike swollen cells that are constricted at the septations. All cells smooth, hyaline, and thin walled, 25.0-195.0 x 3.7-50.5 μm. Some narrow hyphae interwoven among the swollen cells and sometimes anastomosed with them, appearing to bind the larger filaments together. The volval universal veil composed of the same kind of elements but having a larger proportion of the slender nonswollen filaments.

CLAMP CONNECTIONS present on stipe and sometimes on universal veil elements.

HABITAT terrestrial, on sandy or gravelly soil in dry to semiarid areas, solitary or in groups of scattered individuals.

Observations: This species is closely related to two other species, C. asterophorus and C. asterophoroides. It differs from C. asterophorus in its larger flattened spores, much larger basidia, persistent stipe thread, nonasteriform universal veil remnant on the pileus, and white universal veil as opposed to honey yellow to chamois. C. xerophilus differs from C. asterophoroides in its pileal universal veil of scattered patches, larger germ pore, presence of a bulbous volvate stipe base, and lack of a pigmented apex of the basidia. These species bear a striking superficial resemblance to the gasteroid genus Montagnea.

Material Examined. Washington: FVDB 2155. Utah: HOLOTYPE, FVDB 2159*, 15 June, 1957.

7. Coprinus umbrinus Cke. and Massee, Grevillea 21:41, 1892: sensu Rea, Brit. Basid., p. 500, 1922. (Fig. 7)

PILEUS at first glandiform. Pale creamy yellowish to umber at apex at first, becoming dark grey with an umber apex. Surface at first covered with small scales but by maturity only the apex remaining covered with a small loose cap of scales.

STIPE hollow, with a loose web of hyphae and a yarnlike hyphal cord in the upper half. Slender, slightly tapered from base to apex, 6.0-7.8 cm x 2.0-4.0 mm. Mostly white to dingy white, base pale umber, opaque. Prominent, loose, flaring, submembranous annulus present and appearing to be a volva margin dislodged from the stipe base and carried a short distance up the stipe as it

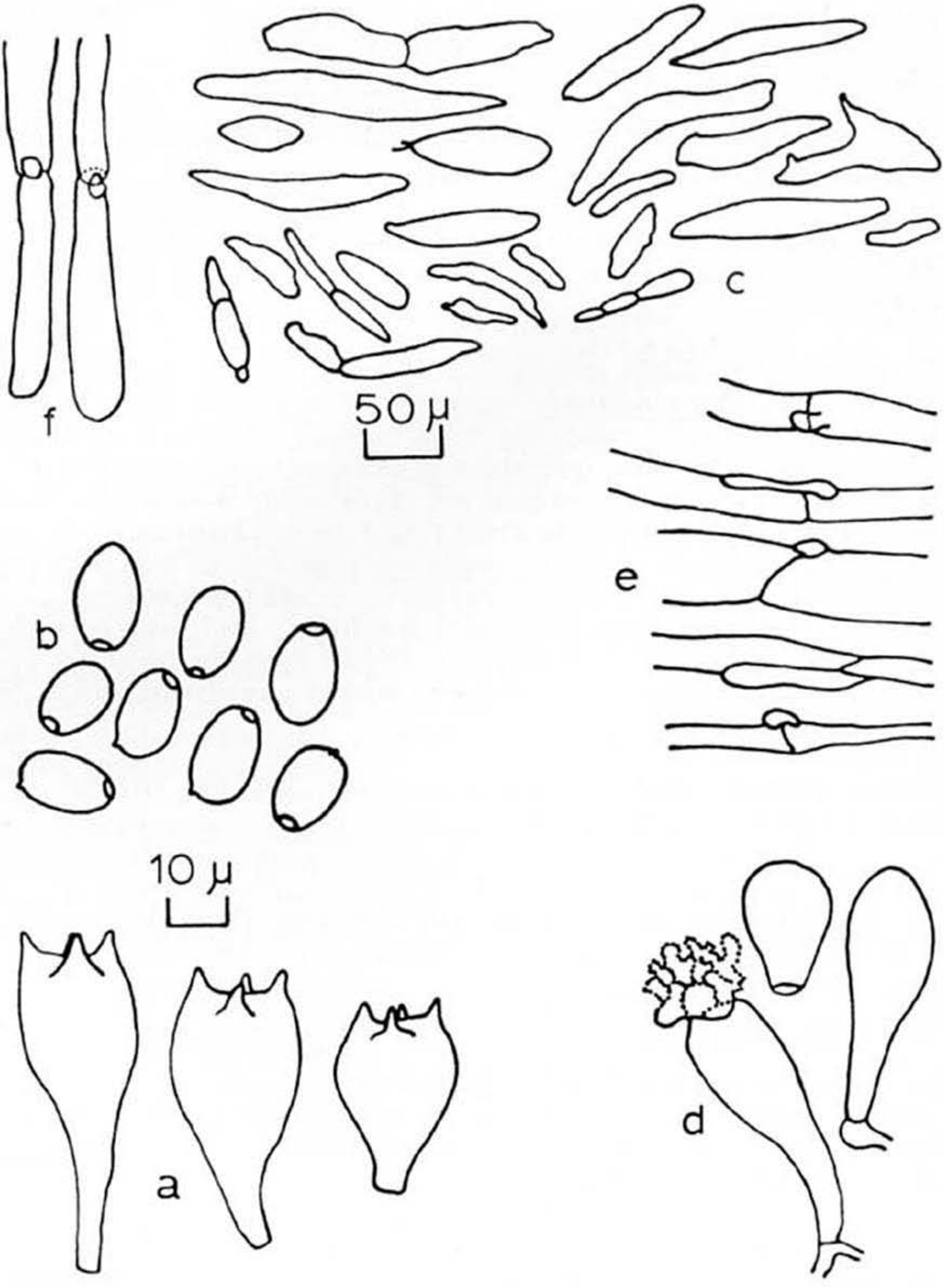

Fig. 7. Coprinus umbrinus FVDB 207, a. basidia X1000, b. spores X1000, c. universal veil X250, d. cheilocystidia X1000, e. stipe clamp connections X1000, f. universal veil clamp connections X1000.

elongates. Some loose bits and patches of white woolly tomentum below the annulus. Flesh somewhat fibrous but very fragile.

LAMELLAE narrow, linear, mostly long, few short lamellae present, 11.0 x 2.5 mm. Autolysis complete.

ODOR AND TASTE indistinct.

SPORES ovate-elliptic in both dorsal and lateral views, slightly flattened, (14.0-)16.0-17.0(-18.0) x 10.0-11.0 x 9.0-9.5 µm, apiculus large and conspicuous, germ pore eccentric, 2.0-2.5 µm in diameter. Color microscopically smoky brown in 3% KOH, appearing to contain many tiny dark granular inclusions. Wall smooth.

BASIDIA trimorphic, short clavate and 28.5-30.0 x 22.0 µm, long clavate and 44.0-47.5 x 18.5-22.0 µm, long pedicellate-clavate and 55.0-56.5 x 19.5-20.5 µm, all four-spored.

CYSTIDIA: Cheilocystidia subglobose, pyriform or clavate, 15.0-45.0 x 13.0-17.5 µm, smooth, hyaline or with an amorphous content that stains in 1% aqueous Congo Red. No other cystidia present.

PILEAL SURFACE of radially oriented hyphae.

UNIVERSAL VEIL elements consisting of large swollen sausage-shaped cells and ordinary cylindrical septate hyphae, the swollen cells tending to form parallel chains that are constricted at the septations. Cell size variable, 30.0-350.0 x 2.0-30.5 µm. All cells hyaline, smooth, and thin walled.

CLAMP CONNECTIONS present in stipe and rarely on pileal veil.

HABITAT coprophilous, on horse dung in open grassy pasture, solitary.

Observations: My collection of this species differs from that described by Rea only in the volva being torn loose so that it becomes an annulus, and in the more pallid coloring of the sporocarp.

Material Examined. Washington: FVDB 207*.

8. Coprinus roseistipitatus VAN DE BOGART sp. nov. (Fig. 8)

Pileus primo glandiformis, dein conicus, postremo campanulatus, marginibus aliquantum revolutis et laciniatis, primo 2.5 cm longus, post expansionem 3.5 cm latus, primo pallide brunneus et color ille ad apicem remaneus, dein sordidialbus, postremo ater cum striis albidis, pagina pilei velo universali primo intacto et ad instar membranae rasilis, dein in squamis rumpenti, squamis postremo dispersis et evanescentibus, pagina hoc modo exposita plicato-striata, carne tenui et fragili; stipes gracilis, apicem versus gradatim angustatus, 11.5 cm longus, 4.0-7.5 mm crassus, cavus, telam hypharum laxis capiens, pagina stipitis sericea, rugosa, basi alba, dimidio apicali in maturitate pallide subroseigrisescenti; annulus prominens, laxus, in maturitate in pagina infera atrescens; caro stipitis tenuis et fragilis etsi fibrosa; lamellae lanceolatae, confertae, liberae et remotae, primo albae, postea roseibrunneae pallidae, postremo atrae, autolyse completo.

Sporae fere ovatae, apice dorsaliter viso leviter angustato, 9.0-11.0 x 5.5-6.5 x 7.0-7.8 µm, poro germinationis leviter excentrico, in cumulo atrae, per microscopicum fere atrae; basidia trimorphica, tetraspora; basidia clavata 25.0-28.0 µm longa, 8.0-11.5 µm crassa; basidia longe clavata 40.0-43.5 µm longa, 8.0-10.0 µm crassa; basidia ululiformia 48.0-50.0 µm longa, 9.0-10.0 µm crassa; sterigmata obturamenta refractiva habentia; basidia zonam griseam in medio habentia; cheilocystidia obovata, oblonga, clavata, subglobosa, interdum conjuncta, pro parte maxima pedicellata, 30.0-70.0 µm longa, 17.0-33.0 µm crassa, pedicellis usque ad 20.0 µm longis, cheilocystidiis in cumulo distincte roseis; pagina pilei ex hyphis radiantibus constans, in maturitate cellulis hypharum pro parte maxima atrogriseibrunneis; velum universale superficiei pilei ex squamis constans, velo ad basem stipitis ex tomento constans, squamis ex catenis parallelis cellularum constantes, cellulis catenarum cylindracea laevis, leviter tumidis, tenuitunicatis hyalinis, 5.0-22.0 µm latis, raro ramificantibus, aliquando ad septum secedentibus; tomentum ad basem stipitis tenuissimum, ex hyphis gracilibus tenuitunicatis haud tumidis constans, cellulis hypharum raro ramosis sed abundanter intertextis, 3.0-6.0 µm latis, septis sparsis; annulus 1.0 mm latus; fibulae desunt.

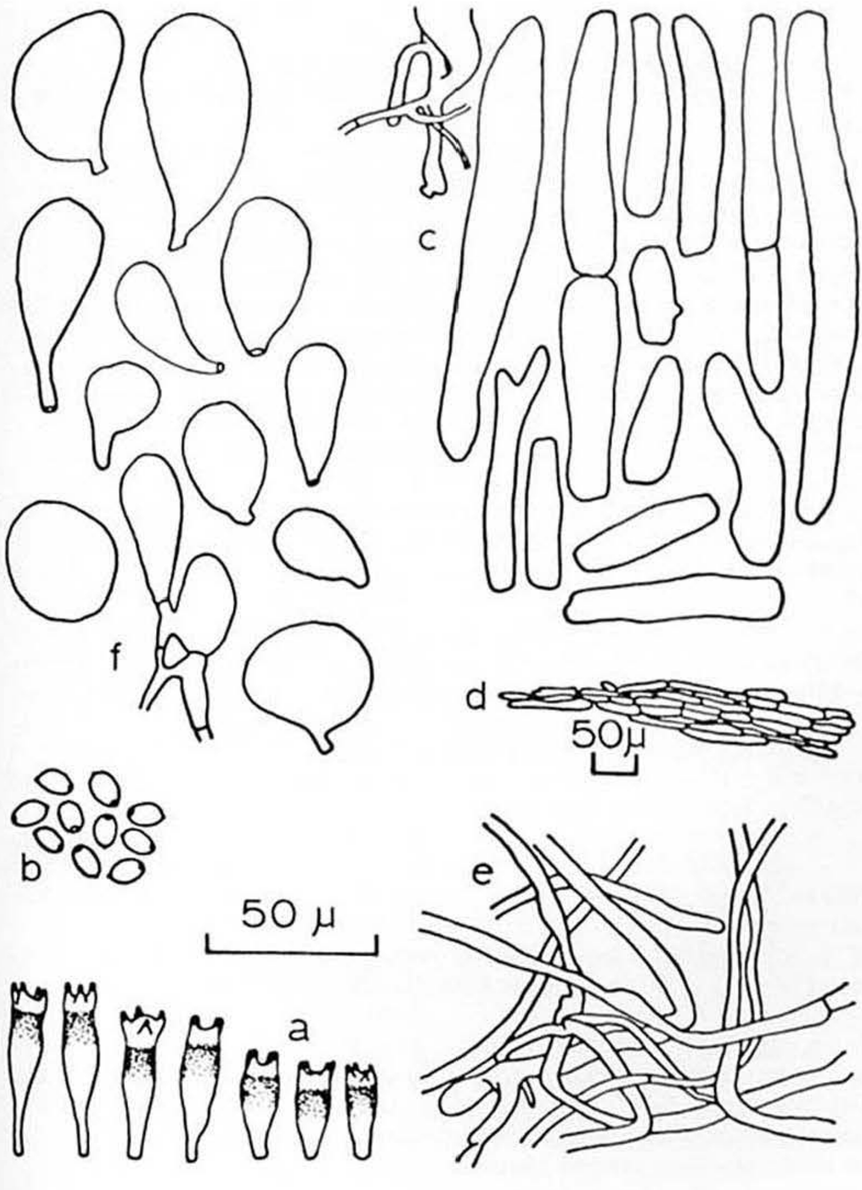

Fig. 8. Coprinus roseistipitatus FVDB 3369, a. basidia X500, b. spores X500, c. pileal universal veil X500, d. parallel chains of pileal universal veil X125, e. stipe base universal veil tomentum X500, f. cheilocystidia X500.

Holotypus FVDB 3369, in stercore cuniculorum vel cervorum, substratum mycelio albo coacto persistenti obtectum, Cispus Center, Gifford Pinchot National Forest, comitato Lewis, pago Washingtonis, 25 Oct., 1975 in herbario Universitatis Washingtonis conservatus (WTU).

PILEUS at first glandiform, then conic, then campanulate with margins somewhat revolute and laciniate, when unexpanded 2.5 cm in length, expanding to 3.5 cm in width. Pale brown at first and remaining so at the apex, the remainder soon whitish, then black with whitish striae marking the interlamellar spaces. Pileal surface at first covered with smooth universal veil which then becomes scaly, then scales scattered and evanescent exposing a plicate-striate surface. Margin attached to stipe by an annulus at first. Flesh thin and fragile.

STIPE slender, tapering gradually toward the apex, 11.5 cm x 4.0-6.5 mm, hollow, lumen with a thinly dispersed webbing of hyphae, surface silky, wrinkled, white at base, in maturity the upper half of the stipe becoming pale pinkish grey, fading to grey when dried, annulus prominent, loose, becoming black on under surface when mature; stipe flesh thin and fragile although fibrous.

LAMELLAE lanceolate, very crowded, free and remote, at first white, then pale pinkish brown, then soot black. Autolysis complete.

SPORES nearly ovate, the apex slightly narrowed in dorsal view, 9.0-11.0 x 5.5-6.5 x 7.0-7.8 μm, apiculus large and distinct, germ pore somewhat eccentric, 1.5-2.5 μm in diameter. Color soot black en masse and nearly black microscopically in 3% KOH. Wall smooth.

BASIDIA trimorphic, clavate and 25.0-28.0 x 8.0-11.5 μm, long clavate and 40.0-43.5 x 8.0-10.0 μm, ululiform and 48.0-50.0 x 9.0-10.0 μm, all four-spored, all sterigmata with refringent plugs, all basidia with a median grey pigment band.

CYSTIDIA: Cheilocystidia obovate, oblong, clavate, subglobose, occasionally interconnected, mostly pedicellate, 30.0-70.0 x 17.0-33.0 μm, pedicels up to 20 μm in length, cells distinctly pink en masse until destroyed by lysis. No other cystidia present.

PILEAL SURFACE a compact layer of cylindrical, septate, thin-walled, radially oriented hyphae, in maturity mostly pigmented dark grey-brown, some cells dark, some light, some pigment in the walls, some pigment in the intercellular spaces.

UNIVERSAL VEIL of scales on pileus and tomentum at stipe base. Scales of long parallel chains of slightly swollen cells, cells cylindrical, 5.0-22.0 µm in diameter, thin-walled, hyaline, rarely branching, showing some tendency to separate at the septa, smooth. Tomentum at stipe base very thin, composed of slender, cylindrical, hyaline, thin-walled hyphae, seldom branched, very interwoven, 3.0-6.0 µm in diameter, septation sparse. Annulus 1.0 mm wide.

CLAMP CONNECTIONS absent.

HABITAT coprophilous, on rabbit or deer dung in a very moist hardwood rain forest. Substrate covered with a thin but persistent white feltlike mycelium.

Observations: This species somewhat resembles _C. sterquilinus_ but differs in the brown color of the universal veil when young, the much smaller spores, the pink color of the stipe apex, the pink cheilocystidia, the blackening of the undersurface of the annulus, and the median grey band on each basidium.

Material Examined. Washington: HOLOTYPE, FVDB 3369*, 25 October, 1975.

9. _Coprinus colosseus_ VAN DE BOGART sp. nov. (Fig. 9)

Pileus primo oblongo-ovalis, dein late campanulatus, postremo laciniatus et revolutus, 13.0-25.4 cm longus, 8.0-14.0 cm latus, primo albus, squamis apicibus brunneis et apice pallide brunneo, in maturitate ater, aliquantum plicato-striatus; pagina pilei velo universali tecta; velum squamas parvas, albas vel apicibus brunneis praebens, primo ad pileum firme affixum, in maturitate tantum laxe affixum, carne pro parte maxima tenui et membranacea; stipes cavus, lumine filum tenuem hypharum intertextarum continenti, fere aequalis, 35.0-50.5 cm longus, 1.5-2.5 cm crassus, basi abrupta, usque ad 8 cm in solo inclusa, plerumque annulo parvo laxo munitus, primo omnino albus, dein in maturitate carne apicali tarde denigricanti, pagina stipitis laevis et glabra, carne grossa et fibrosa; lamellae lineares liberae sed ad collarium parvium affixae, confertissimae, in maturitate ater, autolyse fere completo.

Sporae laeves, aliquantum complanatae, dorsaliter visae ovatae, lateraliter visae ovato-ellipsoideae, 16.8-20.0 x 9.8-13.7 x 8.4-11.3 μm, contento minute guttulato, poro germinationis excentrico; basidia trimorphica, tetraspora; basidia breviter clavata 31.5-35.5 μm longa, 16.0-18.0 μm crassa; basidia longe clavata 42.5-48.5 μm longa, 17.0-18.0 μm crassa; basidia longissime clavato-pedicellata 54.0-65.0 μm longa, 19.0-20.0 μm crassa; sterigmata obturamentum amplum refractivum vel pigmentiferum praebentia; cheilocystidia globosa vel ellipsoido-ovata, 20.0 μm usque ad 35.0-50.0 μm longa, 20.0-25.0 μm crassa, hyalina, laevia; pagina pilei ex hyphis radiantibus constans; velum universale superficiei pilei ex squamis constans, hyphis squamarum cylindraceis, septatis, pro parte maxima aliquantum tumidis et catenulatis velum universale; basis stipitis tomento tenui hypharum tenuium non tumidarum ramosarum et intertextarum praedita, cellulis tomenti omnes laevibus, hyalinis, tenuitunicatis; rhizomorphae usque ad 15.0 cm longae ex hyphis compactis albis constans; fibulae in stipite rarae.

Holotypus FVDB 143 terrestris, Redmond, comitato King, pago Washingtonis, 20 May, 1966, in herbario Universitatis Washingtonis conservatus (WTU).

PILEUS oblong-oval at first, then narrow conical, then narrow campanulate, then broadly shallow campanulate, and eventually laciniate-revolute. Prior to expansion 13.0-25.4 cm in length and after expansion 8.0-14.0 cm broad, the smaller size due to autodigestion during expansion. White with brownish-tipped scales and pale brown pileal apex at first and then gradually darkening with maturity and autolysis. Plicate striation limited in development, involving little or none of the lamellar trama. Surface covered with a universal veil of rather small scales that are white to white with brownish tips. Scales firmly attached when pileus is immature but becoming loose and easily removable as pileus matures. Flesh mostly thin and membranous but up to 3.0 mm in thickness at apex.

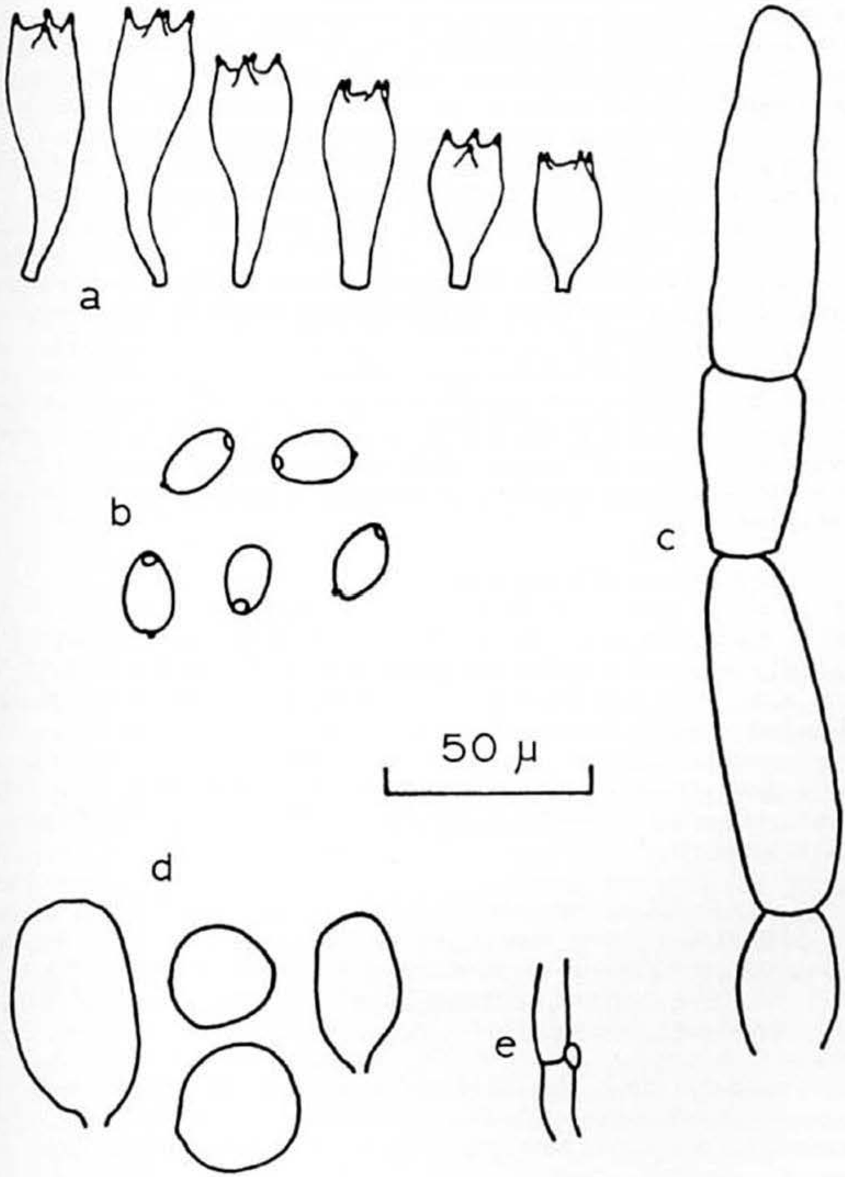

Fig. 9. Coprinus colosseus FVDB 143, a. basidia, b. spores, c. universal veil, d. cheilocystidia, e. stipe clamp connection.

STIPE hollow, the lumen containing a loose yarnlike thread of loosely interwoven filaments. Almost equal but with a slight tapering from base to apex, 35.0-50.5 cm x 1.5-2.5 cm , the base abrupt and embedded up to 8 additional centimeters into the soil. A small loose annulus present on some specimens. Surface seeming smooth and glabrous. White at first, then as spores are produced and autolysis proceeds the apical flesh slowly blackening internally as well as externally. Flesh opaque, coarse and fibrous.

RHIZOMORPHS of compact white hyphae penetrating about 15.0 cm into the substrate from some specimens.

LAMELLAE linear, almost all long, 8.0-25.0 x 1.5-2.3 cm, free but attached to a small collarium. Extremely crowded at first and remaining crowded throughout sporulation and lysis, pale but becoming soot black. Autolysis almost complete, nearly the entire pileus affected.

ODOR AND TASTE none.

SPORES ovate in dorsal view and ovate-ellipsoidal in lateral view, somewhat flattened, 16.8-20.0 x 9.8-13.7 x 8.4-11.3 μm,apiculus large and conspicuous, germ pore somewhat eccentric to very eccentric, 1.8-3.1 μm in diameter. Color en masse soot black, microscopically an extremely dark smoky black color in 3% KOH. Contents seeming minutely guttulate or granular in 3% KOH. Wall smooth.

BASIDIA trimorphic, short clavate and 31.5-35.5 x 16.0-18.0 μm, long clavate and 42.5-48.5 x 17.0-18.0 μm, very long clavate-pedicellate and 54.0-65.0 x 19.0-20.0 μm, all four-spored, all sterigmata with a large refractive or pigmented plug.

CYSTIDIA: Cheilocystidia globose or ellipsoidal-ovate, globose 20.0-37.5 μm in diameter, ellipsoidal-ovate 35.0-50.0 x 20.0-25.0 μm, hyaline, smooth. No other cystidia present.

PILEAL SURFACE of radially oriented hyphae.

UNIVERSAL VEIL scales composed of cylindrical septate hyphae, mostly swollen and somewhat constricted at the septations, smooth, hyaline, thin-walled cells 17.5-165.0 x 5.0-38.0 µm. A thin tomentum present at base of stipe, composed of slender, nonswollen, hyaline, smooth, thin-walled, branched and interwoven septate hyphae, the cells tending to be long and straight.

CLAMP CONNECTIONS rare on stipe cuticle.

HABITAT terrestrial, on loose, crumbly soil in a dense brushy scrub frondose forest, in large loose clumps, rare.

Observations: This species is well marked by its huge overall size, large spore size, and by the darkening of the stipe apex. The last two features it shares with *C. sterquilinus*, a coprophilous species which is much smaller.

Material Examined. Washington: HOLOTYPE, FVDB 143*, 20 May, 1966.

10. *Coprinus comatus* var. *comatus* (Fig. 10)

PILEUS ovate-oblong at first, then conic, then campanulate, and eventually revolute or laciniate or both. Prior to expansion 6.4-12.0 cm in length and after expansion 3.5-10.0 cm in breadth. White ground color with brown-tipped scales and all brown at the apex, eventually most of the pileus slowly blackening and the brownish scales and apex becoming dark brown with age. Numerous shallow plicate striations developing beneath the thick white universal veil and only becoming apparent when the pileus expands enough to dislodge some of the veil from the pileal margin area, the striations involving little or no splitting of the lamellar trama. Universal veil thick, smooth at the pileal apex, the remainder squarrosely scaly, the fibrillose scales 2.0-9.0 mm long and wide. The veil covering the pileal surface entirely until late maturity when small portions of the surface are revealed by splitting, dislodgment, or lysis of the veil elements. Flesh thin and membranous except at the apex where it may reach up to 2.0 mm thick.

STIPE hollow, the lumen containing a loosely interwoven yarnlike hyphal thread in its center, base bulbous to abrupt, tapering to a narrower apex 7.5-19.0(-32.0) cm

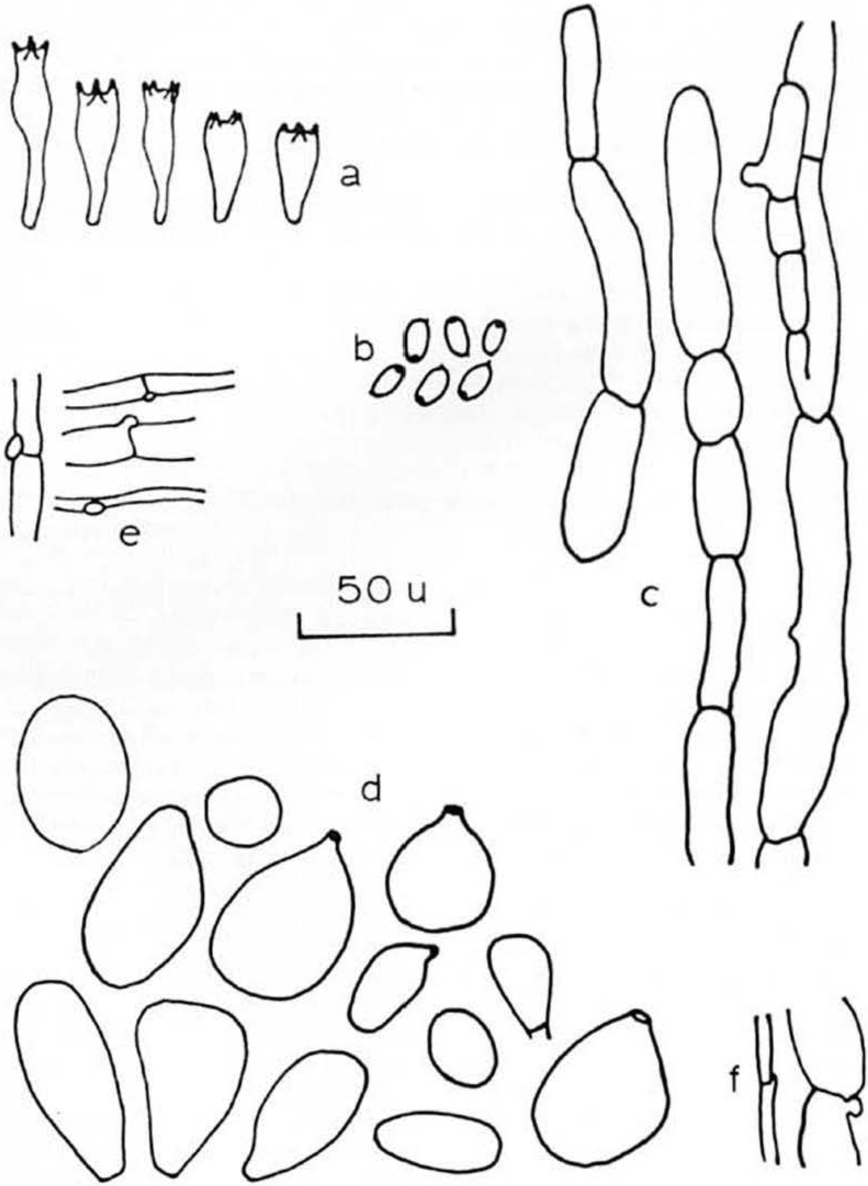

Fig. 10. Coprinus comatus var. comatus FVDB 2140, a. basidia, b. spores, c. universal veil, d. cheilocystidia, e. stipe clamp connections, f. universal veil clamp connections.

x 3.5-21.0 mm. White and opaque. Surface smooth, silky-glabrous. Flesh fibrous but somewhat brittle, up to 2.0 mm thick. Large loose white annulus present, usually near the stipe base, which seems to be the edge of a fragile volva that is almost always attached more firmly to the pileal margin than to the stipe base and hence carried part way up the stipe upon expansion.

LAMELLAE linear, lamellulae few or none, 4.0-11.8 x 1.0-1.2 cm, free and remote, crowded and remaining so throughout the spore discharge period, white, then rose pink, then purple to grey-black, and finally soot black. Autolysis complete.

ODOR AND TASTE; faint odor of mushrooms, taste mild.

SPORES mostly ellipsoidal and round in cross section, some broadly ellipsoidal, 10.6-13.8(-17.6) x 5.5-7.6 (-10.0) μm, apiculus usually large and prominent but sometimes small, germ pore apical, 1.8-3.0 μm in diameter. Color en masse soot black, microscopically medium to deep brown or smoky brown or smoky grey-brown in 3% KOH. Contents guttulate or not, often with a finely granular appearance in 3% KOH. Wall smooth.

BASIDIA trimorphic, short clavate and 23.8-33.0 x 11.5-15.0 μm, long clavate and 35.0-46.5 x 9.0-16.2 μm, subululiform to ululiform and 45.0-67.5 x 11.3-17.5 μm, all four-spored, the sterigmata with conspicuous dark, refringent plugs inside them.

CYSTIDIA: Cheilocystidia globose, ovate, clavate, and short ellipsoidal, often with one or more types lacking, globose 13.9-35.0 μm in diameter, ovate 25.0-50.0 x 19.0-25.0 μm, clavate to ellipsoidal 25.0-50.0 x 13.9-28.0 μm, hyaline, smooth, a few with a short pedicel 1.0-3.0 μm long. No other cystidia present.

PILEAL SURFACE of radially oriented hyphae.

UNIVERSAL VEIL composed of slender, nonswollen, septate, hyaline to pale yellowish, somewhat branched and anastomosed, thin-walled, smooth hyphae and of long chains of hyaline, thin-walled, unbranched, nonanastomosed, smooth, swollen hyphae with sausage-shaped cells and with constriction at the septa. Nonswollen cells

1.5-5.5 µm in diameter. Swollen cells 5.5-33.5 µm in diameter. The macroscopically brown veil from the pileal apex is yellow-brown in 3% KOH microscopically.

CLAMP CONNECTIONS almost always present on some universal veil hyphae and often present on stipe hyphae, but rarely present on pileal surface hyphae.

HABITAT terrestrial, on lawns, by roadsides, along trails, near compost heaps, and occasionally in forested areas, always on soil, solitary to clumped or even densely caespitose.

Observations: Coprinus comatus is a good example of a species possessing a pileal universal veil which is at first very adherent and which cannot be removed but which becomes progressively looser until it can be easily wiped off of the pileal surface. Variety comatus is based on information given in two modern European handbooks that include some microscopical information. According to Marchand (1971, p. 54 and 225) and Romagnesi (1961, p. 21, fig. 48) typical spores of C. comatus have an apical germ pore, hence the use of that feature here.

Material Examined. Washington: FVDB 180, 236, 254. 1188, 1728, 1730, 1744, 1880, 2136, 2140*. Utah: 1789. Arizona: 1800.

11. Coprinus comatus var. parvus VAN DE BOGART var. nov. (Fig. 11)

A typo differt sterigmatabus hyalinis obturamentis refractivis destitutis, amplitudine parva sporocarpii, pileo 4.0-5.0 cm longo, stipite in maturitate 5.0-6.0 cm longo.

Holotypus FVDB 225 in solo, Burton, comitato King, pago Washingtonis, 18 Sept., in herbario Universitatis Washingtonis conservatus (WTU).

As described in variety comatus except the sterigmata of the basidia are hyaline and lack the refractile plug, and the sporocarps are of small size, the pileus 4.0-5.0 cm long prior to expansion and the stipe 5.0-6.0 cm long at maturity.

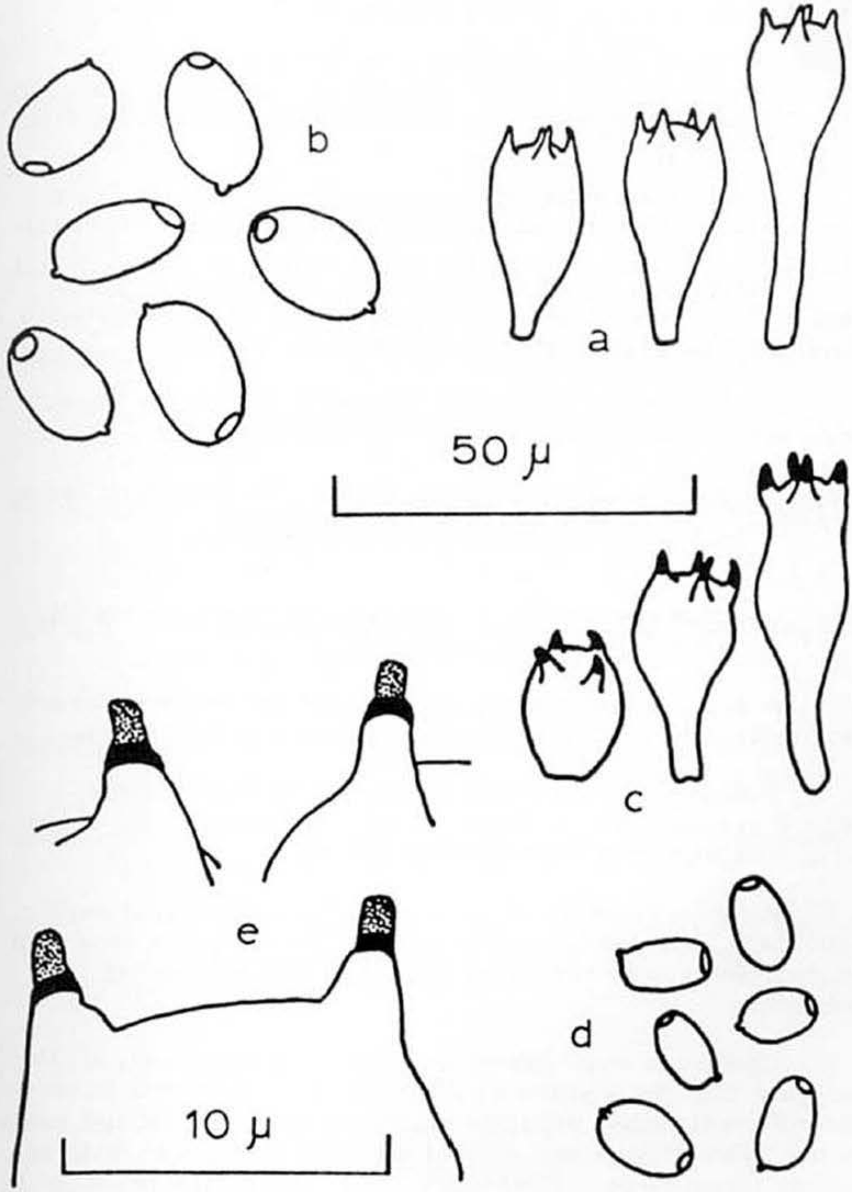

Fig. 11. Coprinus comatus var. parvus FVDB 225, a. basidia X500; var. excentricus FVDB 1801, b. spores X500; var. caprimammillatus FVDB 2141, c. basidia X500, d. spores X500, e. sterigmata X2500.

Material Examined Washington: HOLOTYPE, FVDB 225*, 18 September, 1971; FVDB 2139.

12. Coprinus comatus var. excentricus VAN DE BOGART var. nov. (Fig. 11)

A typo differt sporis pergrandibus, 14.0-18.0 µm longis, porum germinationis excentricissimum praebens.

Holotypus FVDB 1801 in solo, comitato Coconino, pago Arizonae septentrionalis, 18 Aug., 1973 in herbario Universitatis Washingtonis conservatus (WTU).

As described in variety comatus except the germ pore is very eccentric and the spores are usually large.

Material Examined. Arizona: HOLOTYPE, FVDB 1801*, 18 August, 1973. Washington: FVDB 2138.

13. Coprinus comatus var. caprimammillatus VAN DE BOGART var. nov. (Fig. 11)

A typo differt sporis sporocarpium omnium porum germinationis apicalem excentricumque praebentibus.

Holotypus FVDB 2141 in solo, comitato Pierce, pago Washingtonis, 14 Sept., 1956, in herbario Universitatis Washingtonis conservatus (WTU).

As described in variety comatus except that each sporocarp has some spores with an apical germ pore and some spores with the germ pore at least somewhat eccentric.

Observations: Marchand (1971) and Romagnesi (1961) indicate that the spores of the typical C. comatus have an apical germ pore, presumably invariably and indeed some of my collections (var. comatus) have all spores with an apical germ pore. Therefore, var. caprimammillatus is presented as a separate taxon of varietal rank.

Material Examined. Washington: FVDB 5, 19, 30, 50, 52, 55, 56, 64, 67, 129, 229, 1941; HOLOTYPE, FVDB 2141*, 14 September, 1956; FVDB 2181, 2188. Montana: FVDB 1837.

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LITERATURE CITED

Hoseney, F. V. 1963. The silica gel method for drying mushrooms. Mich. Bot. 2: 125-126.

Kauffman, C. H. 1918. The Agaricaceae of Michigan. Mich. Geol. Biol. Survey, Publ. 26, Biol. Ser. 5, Vol. I. Wynkoop Hallenbeck Crawford Co., Lansing, Mich. 924 p.

Kornerup, A. & J. H. Wanscher. 1967. Methuen Handbook of Colour. 2nd Ed., Methuen Co., Ltd., London. 243 p.

Kühner, R. & H. Romagnesi. 1953. Flore Analytique des Champignons Superieurs. Masson et Cie, Paris. 556 p.

Marchand, A. 1971. Champignons du Nord et du Midi. Soc. Mycol. Pyrén. Médit., Perpignan. 264 p.

Romagnesi, H. 1961. Exotic Mushrooms. Sterling Publishing Co., New York. 192 p.

Snell, W. N. & E. A. Dick. 1957. A Glossary of Mycology. Harvard University Press, Cambridge, Massachusetts. 171 p.

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A NEW SPECIES OF TETRACOCCOSPORIUM

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SUMMARY

Tetracoccosporium aerium Misra & P. Srivastava, a new species isolated from air, Gorakhpur, U.P., India, is described and illustrated.

Tetracoccosporium paxianum Szabó, the type species of *Tetracoccosporium* Szabó, is characterized by solitary, cruciately septate conidia developed from integrated, terminal, holoblastic conidiogenous cells of acroauxic, loosely branched conidiophores (Ellis, *1971*). A fungus undoubtedly congeneric with *T. paxianum* was isolated by the authors in September, 1975. It appeared in a petri dish containing malt extract agar medium (Blakeslee, *1915*) and exposed to air at the first floor of the Department of Botany, University of Gorakhpur. The fungus was readily obtained in pure culture. It grew well and sporulated profusely on malt extract agar medium and is considered to be a new species. It differs from *T. paxianum* in having smaller and relatively smooth conidia. Three other species of *Tetracoccosporium* have been described: *T. quadratum* (Cooke) Wiltshire differs from both *T. paxianum* and the present isolate in having larger conidia which are deeply constricted at the septa; *T. sacchari* Stevenson has been shown to be *Dictyoarthrinium sacchari* (Stevenson) Damon, and *T. cupulatum* Rao & Rao appears to have a conidiophore unlike that described for the type species.

Tetracoccosporium aerium Misra & P. Srivastava, sp. nov.
(Fig. 1)

Coloniae in agaro cum extracto maltoso composito cultae anguste crescentes, die undecima sub calore 25-27° C 0.5-1.0 cm diametro, obscure griseo-brunneae. Mycelium ex hyphis sparse ramosis, septatis, subhyalinis, 1-2 μ crassis compositum. Conidiophori semi-macronemati, laxe ramosi, pallide brunnei, leves; rare plerumque 5-30 μ longi, 1.5-3.0 μ crassi, vulgo prope apicem septo divisi. Conidia singula, acrogena, applanata, in plena facie quadrata, angulis rotundatis, e latere late ellipsoidea, quadricellularia, cruciatim septata, ad septa constricta, fuscobrunnea, minute verruculosa, 8-12 × 6-8 μ.

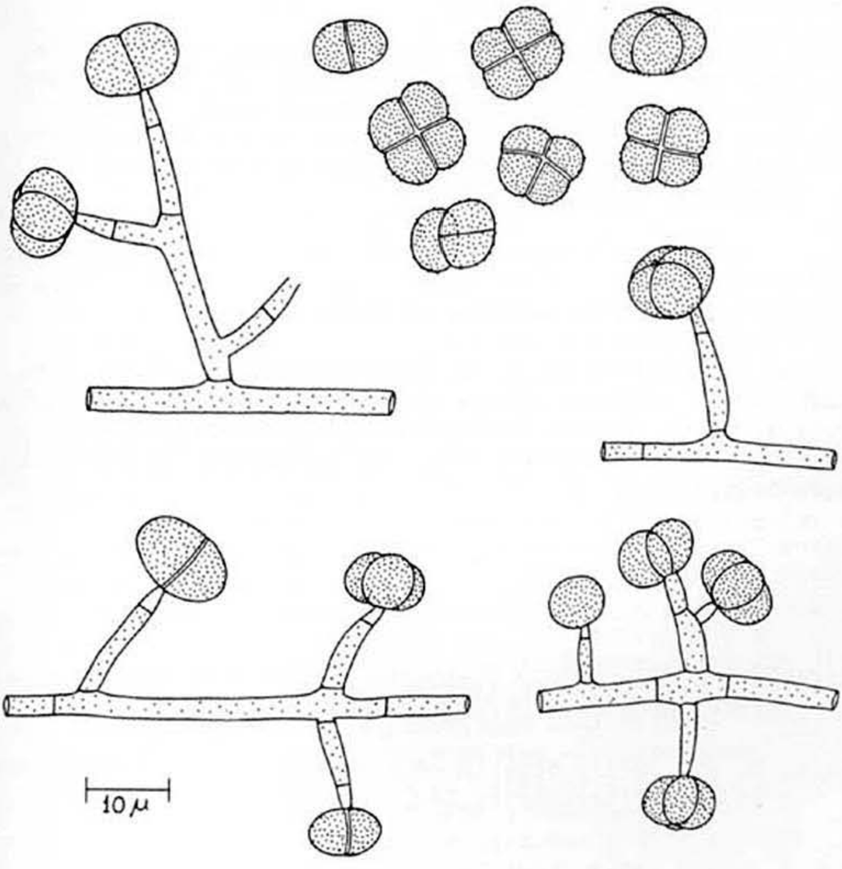

FIG. 1. *Tetracoccosporium aerium*.
Conidia and conidiophores, from type.

Colonies on malt extract agar growing restrictedly, about 0.5-1.0 cm in diam in 10 days at 25-27° C, dark greyish brown. Mycelium consisting of sparsely branched, septate, subhyaline, 1-2 μ thick hyphae. Conidiophores semi-macronematous, loosely branched, light brown, smooth; branches usually at acute angles to the stipe or one another, occasionally at right angles, usually tapered, 5-30 μ long, 1.5-3.0 μ in diam, usually 1-septate, with the septum placed near the apex. Conidia colitary, acrogenous, flattened in one plane, square rounded at corners in face view, broadly ellipsoidal in side view, divided cruciately by septa at right angles to one another, constricted at the septa, 4-celled, dark brown, minutely verruculose, 8-12 μ in diam in face view, 6-8 μ thick. In old cultures, larger conidia with more than 4 cells were occasionally seen.

Type: PCM 554, isolated from air, Gorakhpur, U. P., India, September, 1975. A dried culture of the type has been deposited in the Commonwealth Mycological Institute, Kew, as IMI 197434. A subculture of the type culture will be sent to the American Type Culture Collection, Maryland, U.S.A.

ACKNOWLEDGEMENTS

We thank Dr. M. B. Ellis for confirmation of the identification and critical review of the maniscript. We are also grateful to Dr. Donald P. Rogers for the Latin diagnosis. The financial assistance of the U.G.C., India, is gratefully acknowledged.

LITERATURE CITED

BLAKESLEE, A. F. *1915*. Lindner's roll tube method of separating cultures. Phytopathology *5:* 68-69.

ELLIS, M. B. *1971*. Dematiaceous Hyphomycetes. Commonwealth Mycological Institute, Kew, England, 608 pp.

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TYPE SPECIMENS OF HYPOGEOUS FUNGI IN THE HERBARIUM OF THE NEW YORK BOTANICAL GARDEN

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SUMMARY

Locating type specimens is frequently a prime difficulty in taxonomic research that involves collections older than 50 or more years. All too often, letters of inquiry have to be directed to several likely herbaria in hopes that one of them may have a type or types of interest. During a 3 month research visit to NY, funded by a Burlingham Fellowship from the Garden, we took the opportunity to examine and compile a list of types of hypogeous fungi, which are filed in the general collection. The list was intended for our own use but after several associates expressed interest, we decided it is of general interest and would encourage publication of similar lists for other herbaria.

The following list was compiled by recording label information from all packets labeled "type" and filed in the Tuberales, Hymenogastrales, and Gautieriales. The label information has been annotated with the amount of material present, reference of original type description, synonymy, and an indication (where possible) of the deposition of a designated holotype collection and the possible status of the NY "type" collection. Many of the NY "types" are probably isotypes of Gilkey types at OSC, Harkness or Lloyd at BPI, Thaxter at FH, Massee at K, and Rodway at K or H. The list follows NY's filing system and uses Zeller's (1949) families for the Basidiomycetes and Gilkey's (1954a) treatment for the Ascomycetes.

TUBERALES

Geneaceae

Genabea tasmanica Massee & Rodway in Massee, Kew Bull. Inf. 1898: 125. 1898. Tasmania. Rodway 119. Isotype. One slice. Holotype at HO. *Nomina confusa*. Parasitized by *Microthecium geoporae* (Obermeyer) von Höhnel with no spores of host present (Gilkey 1954b).

Petchiomyces kraspedostoma Gilkey, Oreg. St. Monogr. Bot. 1: 15. 1939. Guadaloupe Mines, California. Coll. H. E. Parks 1051. Det. H. M. Gilkey 42. Two sporocarps plus pieces. Isotype. Holotype in OSC.

Terfeziaceae

Leucangium readeri Cooke & Massee, in clay soil, Victoria, (Dimboola) Reader. *Nomen nudum?* One sporocarp.

Terfezia longii Gilkey, Mycologia 39: 448. 1947. Near Corona, New Mexico, September 17, 1941. Coll. W. H. Long and D. J. Stouffer. Fragments. Isotype in OSC.

Terfezia spinosa Harkn., Proc. Calif. Acad. Sci. III. 1: 277. 1899. In red sand, banks of Red River, Natchitoches, Louisiana, September 1886. Coll. A. B. Langlois 704. Det. J. B. Ellis (?) as *T. leonis*. Abundant collection. Isotype. Holotype in BPI.

Tuberaceae

Choiromyces compactus Gilkey, Oreg. St. Monogr. Bot. 1: 34. 1939. Guadaloupe Mines, California, April 16, 1921. Coll. H. E. Parks 1054. 1 half sporocarp. Isotype. Holotype in OSC.
≡ *Hydnotryopsis compacta* (Gilkey) Trappe, Mycotaxon 2: 116. 1975.

Tuber indicum Cooke & Massee, Grevillea 20: 67. 1892. G. Massee Herbarium, Himalayas. From Kew. One sporocarp plus one half sporocarp. Isotype. Holotype in K.

HYMENOGASTRALES

Gasterellaceae

Gasterella lutophila Zeller & Walker. Mycologia 27: 578-579. 1935. On mud in the greenhouse, University of Nebraska, Lincoln, Nebraska, January 1935. Coll. Leva B. Walker. One sporocarp. Syntype.

Gasterellopsis silvicola Routien, Mycologia 32: 165-166. 1940. 1st. st., College Woods, East Lansing, Michigan, 14 November 1938. Coll. J. B. Routien 9. Isotype. Preserved in FAA.

Melanogastraceae

Alpova cinnamomeus Dodge, Ann. Mo. Bot. Gard. 18: 461. 1931. Half buried in soil beside stream (Siskowit Outlet), Siskowit Bay, 4 September 1930. Coll. A. H. Povah Fp 635. Labelled Syntype but is a Paratype since Holotype is Fp 73 in MICH. Four pieces. ≡ *Alpova diplophloeus* f. *diplophloeus* (Zeller & Dodge) Trappe & Smith in Trappe, Nova Hedwigia Beih. 51: 286. 1975.

Cremeogaster levisporus Mattirolo in Lloyd, Mycol. Writ. 7: 1278. 1924. San Antonio Mountains, Southern California. Coll. Dr. I. M. Johnston, det. O. Mattirolo. Two halves. Isotype. ≡ *Leucogaster rotundisporus* (Matt.) Fogel & Trappe in Trappe, Nova Hedwigia Beih. 51: 306. 1975.

Leucogaster anomalus (Peck) Zeller & Dodge, Ann. Mo. Bot. Gard. 11: 399-400. 1924. In ground in woods, Rock Creek Park, Washington, D. C., September 1906. Coll. T. E. Wilcox. Two halves. Isotype of *Hymenogaster anomalus* Peck, N. Y. State Mus. Bull. 116: 31-32. 1907.

Leucogaster araneosus Zeller & Dodge, Ann. Mo. Bot. Gard. 11: 399. 1924. Cranberry, North Carolina, August 1896. Coll. R. Thaxter 96. Fragments. Isotype. Holotype in FH.

Leucogaster columellatus Zeller, Mycologia 39: 289. 1947. Hypogeous under *Pinus ponderosa*, "Rim of the World," northeast of San Bernardino, San Bernardino County, California, May 1923. Coll. N. L. Gardner 581. Two halves. Holotype. Isotype in UC.

Leucogaster fulvimaculosus Zeller & Dodge, Ann. Mo. Bot. Gard. 11: 401. 1924. In damp woods, Cold Spring Harbor, Long Island, New York. Coll. A. F. Blakeslee. Fragment. Isotype. Holotype in FH.

Leucogaster levisporus Zeller, Mycologia 33: 206. 1941. Hat Point near Imnaha, Wallowa County, Oregon, 26 July 1939. Coll. A. M. Rogers. Abundant collection. Holotype.

Leucogaster longisterigmatus Zeller, Mycologia 39: 289-290. 1947. Under coniferous duff on Monument Peak, Linn County, Oregon. Coll. H. M. Gilkey and Dr. and Mrs. D. P. Rogers. Holotype. Preserved in FAA(?).

Leucogaster luteomaculatus Zeller & Dodge, Ann. Mo. Bot. Gard. 11: 394-395. 1924. Cranberry, North Carolina. Coll. R. Thaxter 3. Fragments. Isotype. Holotype in FH.

Leucogaster rubescens Zeller & Dodge, Ann. Mo. Bot. Gard. 11: 395-396. 1924. Under maple, Corvallis, Oregon, 6 May 1922. Coll. L. M. Boozer. Five halves. Holotype.

Leucogaster tozziana (Cavara & Saccardo) Mattirolo in Zeller & Dodge, Ann. Mo. Bot. Gard. 11: 463. 1924. Vallombrosa, Italy, 23 November 1899. Coll. and det. O. Mattirolo. One half sporocarp. Isotype(?) of *Endogone tozziana* Cav. & Sacc., Nuovo Bot. Ital. Ser. II. 7: 296. 1900.

Melanogaster euryspermus (Zeller & Dodge) Zeller, Mycologia 31: 8. 1939. In strawberry patch, Rickreall, Oregon, 1 May 1924. Coll. Etta Neiderheiser. Det. S. M. Zeller 2660. Abundant collection. Holotype of *Melanogaster ambiguus* var. *euryspermus* Zeller & Dodge, Ann. Mo. Bot. Gard. 22: 373. 1935.

Melanogaster luteus Zeller, Mycologia 31: 9. 1939. Under vine maple, Trout Creek Camp, Linn County, Oregon, 23 September 1937. Coll. S. M. Zeller 8312. Two halves. Holotype. ≡ *Alpova luteus* (Zeller) Trappe, Nova Hedwigia Beih. 51: 291. 1975.

Melanogaster macrocarpus Zeller, Mycologia 31: 9,11. 1939. In duff under conifers, mostly hemlocks, where pack horses had been tethered, about 100 yards up on trail to Paradise Park from Twin Bridges Forest Camp, Clackamas County, Oregon, 3 September 1935. Coll. S. M. Zeller 8230. Abundant collection. Holotype.

Melanogaster microsporus Mattirolo, Beitr. Krypt.-Flor. Schweiz. 8: 27-29. 1935. Rodero, Como Provence, Italy, M. 500, 1936. One sporocarp. Isotype. ≡ *Alpova diplophloeus* f. *europaeus* Trappe, Nova Hedwigia Beih. 51: 289. 1975.

Melanogaster mollis Lloyd, Mycol. Notes 65: 1047. 1921. Wyoming, Coll. Simon Davis 2030. Two halves. Syntype.

Melanogaster parksii Zeller & Dodge, Ann. Mo. Bot. Gard. 23: 649-650. 1936. Under leaves of *Quercus agrifolia*, Guadaloupe Mines, Santa Clara County, California, 17 April 1918. Coll. H. E. Parks 136 (pro part). Four sporocarps. Syntype.

Rhizopogonaceae

Holocotylon anomalum Zeller, Mycologia 39: 287-288. 1947. On barren soil, Cisco, Eastland County, Texas, July 1938. Collected with *Diciseda brandegeei*. Coll. E. A. Smith. Det. S. M. Zeller 1234. One fragmented sporocarp. Holotype.

Rhizopogon angustisepta Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 24. 1918. Germany. Coll. W. Kruger. Lloyd Mus. No. 6692. Isotype(?). Fragments. Holotype in BPI.

Rhizopogon anomalus A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 32-33. 1966. Pend d'Oreille, Nat. Forest, Copeland, Idaho, 2 September 1922. Mountain road in forest of cedar, larch, pine, and hemlock, 3800 ft. Coll. C. H. Kauffman 8 and 16. Three sporocarps. Isotype. Holotype in MICH.

Rhizopogon arctostaphyli A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 35. 1966. Willow Creek, Humboldt County, California, 1935. Coll. J. P. Tracy 5705. Zeller Herb. No. 8273. Three halves. Holotype.

Rhizopogon baxteri A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 105-106. 1966. Univ. of Michigan Forest Nursery, 17 October 1927. Coll. D. V. Baxter 2578. Abundant collection. Isotype.

Rhizopogon brownii A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 102-103. 1966. In a pinewood, Denham Springs, Livingston Parish, Louisiana, 16 December 1927. Coll. C. A. Brown. Abundant collection. Holotype.

Rhizopogon brunnescens Zeller, Mycologia 33: 196. 1941. Under logs, Horse Camp Flats, Mt. Shasta, California. Coll. W. B. Cooke 13305. Holotype (?). Three sporocarps. Two Cooke collection numbers (13305, 13306) are given in the original description without either being designated type. Preserved in FAA; later dried.

Rhizopogon burlinghamii A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 121. 1966. In a sandy soil, Pacific Grove, California, January 1937. Coll. G. S. Burlingham. Two sporocarps. Holotype.

Rhizopogon diplophloeus Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 8-9. 1918. In the roof and on the sides of a protruding cliff among rhizomes of *Adiantum*, clinging to rock, Fern Cave, north of Point Caution, near Friday Harbor, Washington, 4 July 1917. Coll. S. M. Zeller. Abundant collection. Holotype. ≡ *Alpova diplophloeus* f. *diplophloeus* (Zeller & Dodge) Trappe & Smith in Trappe, Nova Hedwigia Beih. 51: 286. 1975.

Rhizopogon exiguus Zeller, Mycologia 31: 2. 1939. In duff among mycorrhizal roots of hemlock, Silver Springs Recreational Area, Mt. Rainier National Park, Washington, 18 August 1937. Coll. S. M. Zeller 8278. One sporocarp plus fragments. Holotype.

Rhizopogon gilkeyae A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 72-73. 1966. Corvallis, Oregon, April 1925. Coll. H. M. Gilkey. Three halves. Holotype.

Rhizopogon kauffmanii A. H. Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 38-39. 1966. Near bog, mixed conifers, Pend d'Oreille Nat. Forest, Copeland, Idaho, 11 September 1922. Coll. C. H. Kauffman. Two sporocarp halves. Labelled Isotype but is Paratype since Holotype is Smith 69813 in MICH.

Rhizopogon libocedri A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 117. 1966. Under *Libocedrus decurrens* at Darlingtonia, California, Del Norte County, 2 November 1939. Coll. H. E. Parks. Four halves. Holotype.

Rhizopogon maculatus Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 4. 1918. Growing in sand under pine trees, Golden Gate Park, San Francisco, California, May 1916. Coll. N. L. Gardner. Fragments. Holotype.

Rhizopogon niger (Lloyd) Zeller & Dodge, Ann. Mo. Bot. Gard. 16: 122. 1929. Covered with sand, black without, columella much branched, black, fibrils loose, branched, concolorous, South Africa.

Coll. Miss A. V. Duthie. Lloyd Mus. No. 081. One sporocarp. Isotype(?) of *Hysterangium niger* Lloyd, Mycol. Writ. 7: 1173. 1922.

Rhizopogon occidentalis Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 14. 1918. Moscow, Idaho. Coll. L. F. Henderson. One half sporocarp plus pieces. Holotype.

Rhizopogon pachyphloeus Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 9-10. 1918. Bank among lichens, Cinchona, Jamaica, 4500-5200 ft, wet, mountainous reg., 25 December-8 January 1908-9. Coll. W. A. and E. L. Murrill 605. One sporocarp. Holotype. ≡·*Alpova pachyphloeus* (Zeller & Dodge emend. Trappe) Trappe, Nova Hedwigia Beih. 51: 300-301. 1975.

Rhizopogon pannosus Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 6. 1918. Growing in trampled roadway, Mariposa County, California, June 1916. Coll. W. A. Setchell. One sporocarp. Holotype.

Rhizopogon parksii A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 76-77. 1966. Eight or ten specimens on top of soil beneath the needles. Spruce Cove, Trinidad, California. Coll. H. E. Parks 4626. Four halves. Holotype.

Rhizopogon rogersii A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 73-74. 1966. Hat Point near Imnaha, Wallowa County, Oregon, 25 July 1939. Coll. D. P. Rogers. One sporocarp plus fragments. Holotype.

Rhizopogon separabilis Zeller, Mycologia 31: 3-4. 1939. In sand under *Pinus contorta*, north of Florence, Lane County, Oregon, 22 November 1935. Coll. A. H. Smith, A. B. Hatch, and S. M. Zeller 8236. Abundant collection. Holotype.

Rhizopogon sepelibilis A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 87-88. 1966. Mt. Rainier Nat. Park, Washington, Greenwater, 28 October 1928. Coll. Keith O'Leary. Five halves. Holotype.

Rhizopogon sipei A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 119. 1966. Under Douglas-fir, on the upper McKenzie River, near Clear Lake, Linn County, Oregon, 21 October 1939. Coll. F. P. Sipe. Abundant collection. Holotype. Identified as *Rhizopogon pachyphloeus* Zeller & Dodge.

Rhizopogon tsugae A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 59-60. 1966. Under hemlock, Twin Bridges Forest Camp, Clackamas County, Oregon, 9 August 1937. Coll. Rogers and Zeller. Abundant collection. Holotype.

Rhizopogon villosulus Zeller, Mycologia 33: 196-197. 1941. Under duff of conifers, Hat Point along Snake River Canyon, 23 mi above Imnaha, Wallowa County, Oregon, 26 July 1939. Coll. H. M. Gilkey. Abundant collection. Holotype.

Rhizopogon viridis Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 5. 1918. In pine leaf mold, Priest River, Bonner County, Idaho, September 1917. Coll. J. R. Weir. One half sporocarp. Holotype.

Rhizopogon zelleri A. H. Smith in Smith & Zeller, Mem. N. Y. Bot. Gard. 14(2): 75. 1966. Under coniferous and hazel duff, dense woods, Gresham, Oregon, 28 April 1944. Coll. S. M. Zeller. Abundant collection. Holotype.

Truncocolumella citrina Zeller, Mycologia 31: 6-7. 1939. Under Douglas-fir and incense cedar, 1-4 inches deep under moss and soil, Comstock, Oregon, 20 October 1937. Coll. S. M. Zeller 8320. Two halves. Holotype.

Truncocolumella rubra Zeller, Mycologia 31: 7-8. 1939. Emergent in heavy duff under hemlock, near Denny Creek, not far from Snoqualmie Pass, King County, Washington, 19 August 1937. Coll. D. E. Stuntz. One half sporocarp plus portion in FAA. Holotype.

Hymenogastraceae

Dendrogaster elasmomycetoides Zeller, Mycologia 33: 199-200. 1941. Two inches under Shasta fir duff, Mt. Shasta, Siskiyou County, California, 18 July 1938. Coll. W. B. Cooke. One half sporocarp. Holotype. ≡ *Gymnoglossum elasmomycetoides* (Zeller) Zeller, Mycologia 40: 643. 1948.

Dendrogaster major Zeller & Dodge, Ann. Mo. Bot. Gard. 21: 686. 1934. Under *Quercus agrifolia* on Jasper Ridge near Stanford Univ., 13 March 1928. Coll. J. McMurphy 281. Specimen preserved. Holotype. ≡ *Gymnoglossum majus* (Zeller & Dodge) Zeller, Mycologia 40: 643. 1948.

Dendrogaster radiatus (Lloyd) Zeller & Dodge, Ann. Mo. Bot. Gard. 21: 688. 1934. Underground in leaf mold at foot of trees, Union of So. Africa. Lloyd Cat. No. 30493, Dept. Agric. Mycol. Herb. No. 17795. One fragment. Isotype of *Hymenogaster radiatus* Lloyd, Mycol. Notes 73: 1304. 1925. Holotype in BPI. ≡ *Gymnoglossum radiatum* (Lloyd) Zeller, Mycologia 40: 643. 1948.

Gymnoglossum stipitatum Massee, Grevillea 19: 97. 1891. No data. Three fragments. Isotype(?).

Hymenogaster albidus Massee & Rodway in Massee, Kew Bull. Misc. Inf. 1901: 158. 1901. No data with packet. Coll. Rodway 643. Fragment. Syntype. Portion also at K. ≡ *Gautieria albida* (Massee & Rodw.) Cunningham, Proc. Linn. Soc. New S. Wales 59: 172. 1934. (Sept.). ≡ *Gautieria albida* (Massee & Rodw.) Zeller & Dodge in Dodge & Zeller, Ann. Mo. Bot. Gard. 21: 704. 1934. (Dec.).

Hymenogaster caudatus Harkness, Proc. Calif. Acad. Sci. Bot. III. 1: 248. 1899. Hypogeous under *Sequoia* and *Quercus*, Mill Valley, Marin County, California, April. Coll. Harkness 240. One half preserved sporocarp. Syntype. Holotype in UC. ≡ *Gautieria caudata* (Harkn.) Zeller & Dodge, Ann. Mo. Bot. Gard. 21: 698. 1934.

Hymenogaster monticola (Harkn.) Harkness, Proc. Calif. Acad. Sci. Bot. III. 1: 249. 1899. Mariposa Tree Grove, found at the foot of the Grizzly Giant in vegetable mold, July 1883. Coll. H. W. Harkness 113. Fragment. Syntype(?). ≡ *Gautieria monticola* Harkn., Bull. Calif. Acad. Sci. 1: 30. 1884.

Hymenogaster trabuti sensu Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 137-138. 1918. Growing under oaks near wood rat's nest, rather deeply buried, San Jose County, California, April 1917. Coll. H. E. Parks. Zeller Herb. No. 1455. One half sporocarp. Isotype(?) of *Hymenogaster gautierioides* Lloyd, Mycol. Writ. 7: 1117-1118. 1922. Holotype in BPI(?). ≡ *Gautieria gautierioides* (Lloyd) Zeller & Dodge in Dodge & Zeller, Ann. Mo. Bot. Gard. 21: 697-698. 1934.

Hydnangiaceae

Arcangeliella africana (Lloyd) Zeller & Dodge, Ann. Mo. Bot. Gard. 22: 365. 1935. Stellenbasc, Union of South Africa, February 1922. Sent by Mattirolo. Det. Lloyd 97. Coll. A. V. Duthie 325. Small fragment. Isotype of *Octaviania africana* Lloyd, Mycol. Notes 67: 1142. 1922. Holotype in BPI(?). ≡ *Neosecotium africanum* (Lloyd) Singer & Smith, Madrono 15: 156-158. 1960. According to D. N. Pegler.

Hydnangium aurantium (Harkness) Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 30. 1918. Photo only. Isotype(?) of *Rhizopogon aurantius* Harkness, Proc. Calif. Acad. Sci. Bot. III. 1: 257. 1899. Holotype may be in BPI.

Hydnangium ellipsosporum Zeller, Mycologia 31: 13-14. 1939. Under hemlock, Twin Bridges Forest Camp, Clackamas County, Oregon, 9 August 1937. Coll. D. P. Rogers. Two halves. Paratype.

Hydnangium ellipsosporum Zeller, Mycologia 31: 13-14. 1939. Hypogeous under Douglas-fir, Alsea Mt., Oregon, June 1937. Coll. A. M. and D. P. Rogers 463. Zeller Herb. No. 8457. Specimen preserved. Holotype.

Hydnangium gilkeyae Zeller & Dodge, Ann. Mo. Bot. Gard. 22: 371. 1935. Under hazel on Peoria Rd., Linn County, Oregon, 25 May 1922. Coll. H. M. Gilkey. Two halves. Holotype.

Hydnangium nigrescens Zeller, Mycologia 40: 641. 1948. Partially exposed on the ground in mixed woods, Cornell Plantations, along Fall Creek, east of Floriculture Gardens, Tompkins County, New York, 18 August 1947. Coll. C. T. Rogerson 1615. Four sporocarp halves plus preserved material. Holotype. ≡ *Octavianina nigrescens* (Zeller) Singer & Smith, Mem. Torry Bot. Club 21(2): 11. 1960.

Hydnangium nigricans Kalchbrenner, Grevillea 10: 107. 1882. Under *Acacia* in grassy places at the base of Mt. Baschberg, near Somerset, East C.B.S., February 1876. Coll. Macowan. Three slices. Isotype. Holotype in K or B.

Hydnangium oregonense Zeller, Mycologia 33: 200-201. 1941. In mixed woods, Roaring River Fish Hatchery, Linn County, Oregon, 30 April 1938. Coll. S. M. Zeller 8487. Specimen preserved. Holotype.

Hydnangium setigerum Zeller, Mycologia 31: 14-15. 1939. Under moss in dense coniferous woods, 1/2 mi above Roaring River Fish Hatchery, Linn County, Oregon, 20 March 1934. Coll. S. M. Zeller 8202. Specimen preserved. Holotype.

Hydnangium soehneri Zeller & Dodge, Ann. Mo. Bot. Gard. 22: 372. 1935. "*Hydnangium carneum* Pupplinger Heide bei Wolfratshausen, Fuhrenwald, 21 October 1928. Coll. E. Soehner." One half sporocarp. Isotype. Holotype in M(?).

Gymnomyces vesiculosus Coker & Couch, Gasteromycetes E. U.S. and Can. p. 23. 1928. Chapel Hill, North Carolina, 4 August 1924. Zeller Herb. No. 7470. Fragments. Isotype. Holotype in NCU(?). ≡ *Hydnangium vesiculosum* (Coker & Couch) Zeller, Mycologia 40: 642. 1948.

Macowania agaricina Kalchbrenner, Gard. Chron. 5: 785. 1876. "G. Massee. 1909." Fragments. Isotype. Holotype in K. ≡ *Macowanites agaricinus* (Kalch.) Kalch., Hedwigia 15(8): 116. 1876. Annotated as *Macowanites agaricinus* (Waldbrenner ex Berk.) Kalch. by R. Singer.

Macowanites alpinus Zeller, Mycologia 39: 291-292. 1947. Under chunks of duff in fir woods below Shasta Alpine Lodge in Cascade Gulch, up 7500 ft on Mt. Shasta, California, 7 September 1942. Coll. W. B. Cooke 16797. Four sporocarp halves. Holotype. ≡ *Elasmomyces alpinus* (Zeller) Zeller, Mycologia 40: 643. 1948.

Octaviana mutabilis E. Bommer & M. Rousseau, Florenville (Ardennes), October 1884. Part of Fungi Gallici Exsiccati. C. Roumeguere 3159. Fragments. Isotype. Holotype in K. See discussion by Smith, Mycologia 54: 629. 1962.

Sclerogaster pacificus Zeller & Dodge, Ann. Mo. Bot. Gard. 22: 370-371. 1935. Under pines and gorse, Bandon-by-the-Sea, Oregon, 27 June 1928. Fragments. Holotype.

GAUTIERIALES

Gautieriaceae

Gautieria parksiana Zeller & Dodge, Mycologia 14: 196-197. 1922. In soil under *Heteromeles arbutifolia*, Santa Clara County, California, 22 March 1919. Coll. H. E. Parks 441. Zeller Herb. No. 1678. Eleven sporocarp halves. Isotype.

Gautieria plumbea Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 138-139. 1918. In rich pine leaf litter, Priest River, Idaho, September to October 1916. Coll. J. B. Weir. One half sporocarp. Holotype.

HYSTERANGIALES

Hysterangiaceae

Hysterangium affine Massee & Rodway var. *oreades* Zeller, Mycologia 31: 18-19. 1939. "The colony formed a semicircular fairy ring about 10 ft. in diameter. The other side of the ring extended into broken ground by *Abies lasiocarpa* (Hook) Nutt., Brighton (Silver Lake), Salt Lake County, Utah. Elev. 9000 ft, July 30, 1936." Coll. G. D. Darker 5873. Abundant collection. Holotype.

Hysterangium album Zeller & Dodge, Ann. Mo. Bot. Gard. 16: 87-88. 1929. "No material or data here. Material collected at Ithaca between 1912 and 1922." Coll. H. M. Fitzpatrick. Zeller Herb. No. 2800. One half sporocarp. Syntype(?).

Hysterangium aureum Zeller, Mycologia 33: 201-202. 1941. Under vine maples and conifers, Trout Creek Recreational Area, Linn County, Oregon, 21 May 1936. Coll. S. M. Zeller 8480. Specimens preserved. Holotype.

Hysterangium cerebrinum (Lloyd) Lloyd, Mycol. Writ. 7: 1119. 1922. Province Mikawa, Japan, 13 October 1914. Coll. A. Yasuda 262. Lloyd Herb. No. 22378. One half sporocarp plus portion in FAA. Isotype of *Rhizopogon cerebrinum* Lloyd, Mycol. Writ. 6: 889. 1919. Holotype in BPI(?).

Hysterangium crassirhachis Zeller & Dodge, Ann. Mo. Bot. Gard. 16: 101-102. 1929. In forest duff, Corvallis, Oregon, November 1922. Coll. S. M. Zeller. One half sporocarp. Paratype(?).

Hysterangium crassirhachis Zeller & Dodge, Ann. Mo. Bot. Gard. 16: 101-102. 1929. Under oak, Corvallis, Oregon, 6 May 1922. Det. S. M. Zeller 2319 and C. W. Dodge 334. Coll. L. M. Boozer. Three sporocarps. Holotype.

Hysterangium darkeri Zeller, Mycologia 31: 17-18. 1939. On ground in coniferous woods, east of Brighton (Silver Lake), Salt Lake County, Utah, elev. 9600 ft, 3 August 1936. Coll. G. D. Darker 5957. Four sporocarp halves. Isotype. Holotype in FH.

Hysterangium inflatum Rodway apud Trotter in Saccardo, Syll. Fung. 24: 1327. 1928. Mt. Wellington, Tasmania. Coll. S. Rodway 1267. Two slices. Syntype. Holotype in K or H.

Hysterangium neglectum Massee & Rodway, Kew Bull. Misc. Inf. 1899: 181. 1899. Hobart, Tasmania. Coll. L. Rodway 614. Two sporocarp halves. Syntype. Holotype in H.

Hysterangium neocledonicum Patouillard, Soc. Mycol. Fr. Bull. 31: 34. 1915. Nouvelle Caledonie, 1910. Coll. M. LeRat. One slice plus fragments. Isotype. Holotype in FH(?).

Hysterangium obtusum Rodway, R. Soc. Tasmania Pap. Proc. 1919: 112. 1920. Tasmania. Coll. S. Rodway 1264. One slice. Syntype. Holotype in H(?). = *Hysterangium sclerodermum* (Cooke) Cunningham, Proc. Linn. Soc. New S. Wales 59: 165. 1934.

Hysterangium pumilum Rodway, R. Soc. Tasmania Pap. Proc. 1917: 109. 1918. Tasmania. Coll. L. Rodway 1268. Five sporocarp halves. Syntype. Holotype in H.

Hysterangium purpureum Zeller & Dodge, Ann. Mo. Bot. Gard. 16: 110-111. 1929. Punta Arenas, Magellanes, Chili. Coll. R. Thaxter "hypogeous No. 12." Det. S. M. Zeller. Abundant collection. Isotype. Holotype in FH(?).

Hysterangium separabile Zeller, Mycologia 33: 203-204. 1941. Under vine maple and conifers, Trout Creek Forest Camp, Linn County, Oregon, 21 May 1938. Coll. S. M. Zeller 8479. Abundant collection. Holotype.

Hysterangium stoloniferum var. *brevisporum* Zeller, Mycologia 39: 288. 1947. Under moss beneath vine maple, Trout Creek Recreational Area, Linn County, Oregon, 21 May 1938. Coll. and det. S. M. Zeller. One sporocarp plus two halves. Holotype.

Hysterangium strobilus Zeller & Dodge, Ann. Mo. Bot. Gard. 16: 90. 1929. Under beech, Burbank, Tennessee. Coll. R. Thaxter. One slice. Holotype in FH.

Phallobata albida Cunningham, Trans. N.Z. Inst. 56: 73. 1926. On decaying wood in forest floor, Whakatikei Forest Reserve, Paikakanki, Wellington, 6 April 1923. Coll. J. C. Neill and J. G. Myers. Det. G. H. Cunningham 1187. Two sporocarps plus fragments. Isotype. Holotype in PDD.
≡ *Hysterangium lobatum* Cunningham, Trans. R. Soc. N.Z. 67: 408. 1938.

Protophallaceae

Calvarula excavata Zeller, Mycologia 31: 25-26. 1939. Coconut grove, Florida, November 1897. Coll. R. Thaxter. Det. S. M. Zeller. Specimen preserved. Isotype. Holotype in FH.

Protophallus brunneus Zeller, Mycologia 31: 28-29. 1939. In a park, Buenos Aires, 3 February and March 1906. Coll. R. Thaxter. Specimen preserved. Isotype. Holotype in FH.
≡ *Protubera brunnea* (Zeller) Zeller, Mycologia 40: 644. 1948.

Protophallus jamaicensis Murrill, Mycologia 2: 25. 1910. Wet mountainous region, Cinchona, Jamaica, elev. 4500-5200 ft, 7 January 1909. Coll. W. A. Murrill 567 and E. L. Murrill. Two small enclosed packets of slices plus fragments. Holotype. ≡ *Protubera jamaicensis* (Murr.) Zeller, Mycologia 40: 644. 1948.

ACKNOWLEDGMENTS

The preparation of this paper was made possible by the 1974 Gertrude S. Burlingham Fellowship in Mycology at the New York Botanical Garden and done in cooperation with the Pacific Northwest Forest and Range Experiment Station, Forestry Sciences Laboratory, Corvallis, Oregon. Drs. H. Larsen, A. Rossman, J. M. Trappe and C. T. Rogerson kindly reviewed the manuscript and Dr. E. Stewart supplied data for *Gautieria*.

LITERATURE CITED

GILKEY, H. M. 1954a. Tuberales. North Amer. Flora Ser. II. 1: 1-29.

__________. 1954b. Taxonomic notes on Tuberales. Mycologia 46: 783-793.

ZELLER, S. M. 1949. Keys to the orders, families, and genera of the Gasteromycetes. Mycologia 41: 36-58.

MYCOTAXON

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NOMENCLATURE OF MELAMPSORIDIUM BETULINUM

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The nomenclature of the common birch rust, *Melampsoridium betulinum* has been investigated. The conclusions agree with those of Hylander, Jørstad and Nannfeldt (1953) rather than with those of Boerema (1970).

Uredo populina B *Uredo betulina* Pers., Syn. Meth. Fung. :219, 1801. This name represents the uredinial state of *Melampsoridium betulinum*.

Peziza betulina Alb. & Schw., Consp. Fung. :339, 1805 (as *'P. betulina* nobis'; Albertini & Schweinitz also gave *'U. populina B betulina'* as a separate species - p. 125). Although this species has been given as *Mollisia betulina* (Alb. & Schw.) Rehm, Berichte Bayer Bot. Gesellsch. 14:96, 1914, its identity remains uncertain as the type material has not been found. However the species is illustrated and shown as regular circular objects with a central depression or ostiole. Compared with the serrations of the leaf they appear to be within 1 to 5 mm diam., probably about 2-3 mm. The size and regular shape seem to rule out the uredinia and telia of *Melampsoridium betulinum*, and the size also rules out other fungi such as *Venturia ditricha* and *Phyllactinia guttata* or *Microsphaeria betulae*. The possibility that they represent galls of insect origin should perhaps be considered. In any case we may conclude that this name is to be treated as 'devalidated', and as such should not be considered the basionym of later published valid names which appear to apply to different organisms.

Sclerotium betulinum Fries, Syst. Myc. 2:262, 1822. This name is represented by Fries Scler. Suec. exs. 426, 1834, which in K and UPS bears profuse telia of *Melampsoridium betulinum*, and there is little doubt that this is what was described by Fries. Although cited with the synonym "Peziza. A.S. p.339" (=*P. betulina*), the latter need not be considered the basionym because it is devalidated, and should not, on account of the different identity. The specimen referred to above can be considered the neotype.

Perisporium betulinum Fries, Syst. Myc. 3:249, syn: '*Peziza betulina* Alb. & Schwein. p. 339'; no reference to *Sclerotium betulinum* or to Scler. suec. 426). This name is represented by Fries, Scler. suec. exs. 374, which in K and UPS bears no *Melampsoridium*, and nothing else except perithecia of *Venturia ditricha* (Fr.) Karst. There seems little doubt that Fries changed his concept from that of *S. betulinum* given in Syst. Myc. 2, however whether he was really describing *V. ditricha* or something else remains uncertain. In any case the name may be considered as new (for the same reasons as *S. betulinum*) and referring to a species different from that of *S. betulinum*, with Scler. suec. 374 as the type.

Melampsora betulina (Fries) Desm., Pl. Crypt. Fr (exs.) I n. 2047, 1850; II n. 1647 (1850?) (syn.: '*Sclerotium betulinum*, Fr. Syst. Myc.') (note: this combination not given in Desm., Ann. Sci. Nat. Bot. III 4:107-118, 1850, cf. Boerema, 1970). The above specimens (in K) clearly apply to *Melampsoridium betulinum*, and thus agree with the basionym.

Melampsora betulina (Pers.) Wint., Hedw. 19:55, 1880 (as '*betulina* (Pers.)', no synonyms given and no description). Applies to the imperfect state, but placed in a 'perfect' genus, therefore <u>invalid</u> (Art. 59, par. 4).

Melampsora betulina Wint., Rabenh. Kryptog. Fl. II 1 (1) : 238, 1884 (as '*M. betulina* (Pers.).', syn. '*Uredo populina* B *betulina* Pers'., no reference, direct or indirect to *Peziza betulina* Alb. & Schw., nor to Desmazières, but '*P*(*erisporium*) *betulinum* (Alb. & Schw.)' is given as a separate species (1(2):68). Includes description of telia and therefore is treated as new and attributed to Winter alone - Art. 59, par. 4), *nom. illeg.* (later homonym of *M. betulina* (Fries) Desm.).

Melampsoridium betulinum (Fries.) Kleb., Z. Pfl. Kr. 9: (17-)22, 1899 (cites only *'Melampsora betulina* (Pers.) Desm.' and refers to Plowright, Z. Pfl. Kr. 1:130, which cites *'Melampsora betulina* (Pers.) Wtr.' Includes description and illustration of telia). It seems likely that Klebahn intended to adopt the concept of this species as that of Persoon, Desmazières and Winter, and intended to reject *Peziza betulina* Alb. & Schw. as referring to a different species. Since Klebahn's name is applied inclusive of telia, *U. betulina* Pers. cannot be considered the basionym. However the author citation may be revised under Art. 33, Note 2 (bibliographic errors of citation) and so indicate the correct basionym *S. betulinum* Fries, which is indirectly cited by Klebahn through the reference to Desmazières.

REFERENCES

Boerema, G.H. 1970. Nomenclatural remarks on three plant parasitic fungi. Neth. J. Pl. Path. 76:165-170.

Holm, L., and Nannfeldt, J.A. 1963. Fries's 'Scleromyceti sueciae'. Friesia 7:10-59.

Hylander, N., Jørstad, I., Nannfeldt, J.A. 1953. Enumeratio Uredinearum Scandinavicarum. Opera Botanica 1:1-102.

MYCOTAXON

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NOTES ON HYPHOMYCETES. XI. ADDITIONS TO THE GENERA *CERCOSPORIDIUM*, *PASSALORA* AND *PHAEOISARIOPSIS*

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ABSTRACT

Cercospora cassiocarpa (Sacc.) Chupp and *C. equadoriana* O. Const. are reclassified in *Cercosporidium* Earle, *Cercospora nodosa* O. Const. in *Passalora* Fries and *Cercospora sphaeroidea* Speg., in *Phaeoisariopsis* Ferraris. The fungi are redescribed and illustrated.

INTRODUCTION

A considerable number of fungi have been classified as species of *Cercospora* Fres., but in recent years this generic entity as accepted in the past has been recognized to be heterogeneous in character. Critical revision of generic concepts within the "*Cercospora* complex" has yielded more satisfactory generic dispositions for a number of taxa (Deighton, 1967). Examination of type specimens of a number of additional species currently classified in *Cercospora* has indicated that they are more suitably accommodated in other genera. Four such species are considered herein and appropriate transfers made.

TAXONOMIC PART

Cercosporidium cassiocarpum (Sacc.) comb. nov. (Fig. 1).

≡ *Cercospora occidentalis* Cooke var. *cassiocarpa* Saccardo, Ann. mycol. 11: 557, 1913.

≡ *Cercospora cassiocarpa* (Sacc.) Chupp, A monograph of the fungus genus *Cercospora* 290, 1953.

Lesions on pods dark brown, with no distinct border, frequently oriented transversely and up to four times longer than broad. Colonies effuse or orbicular, brown,

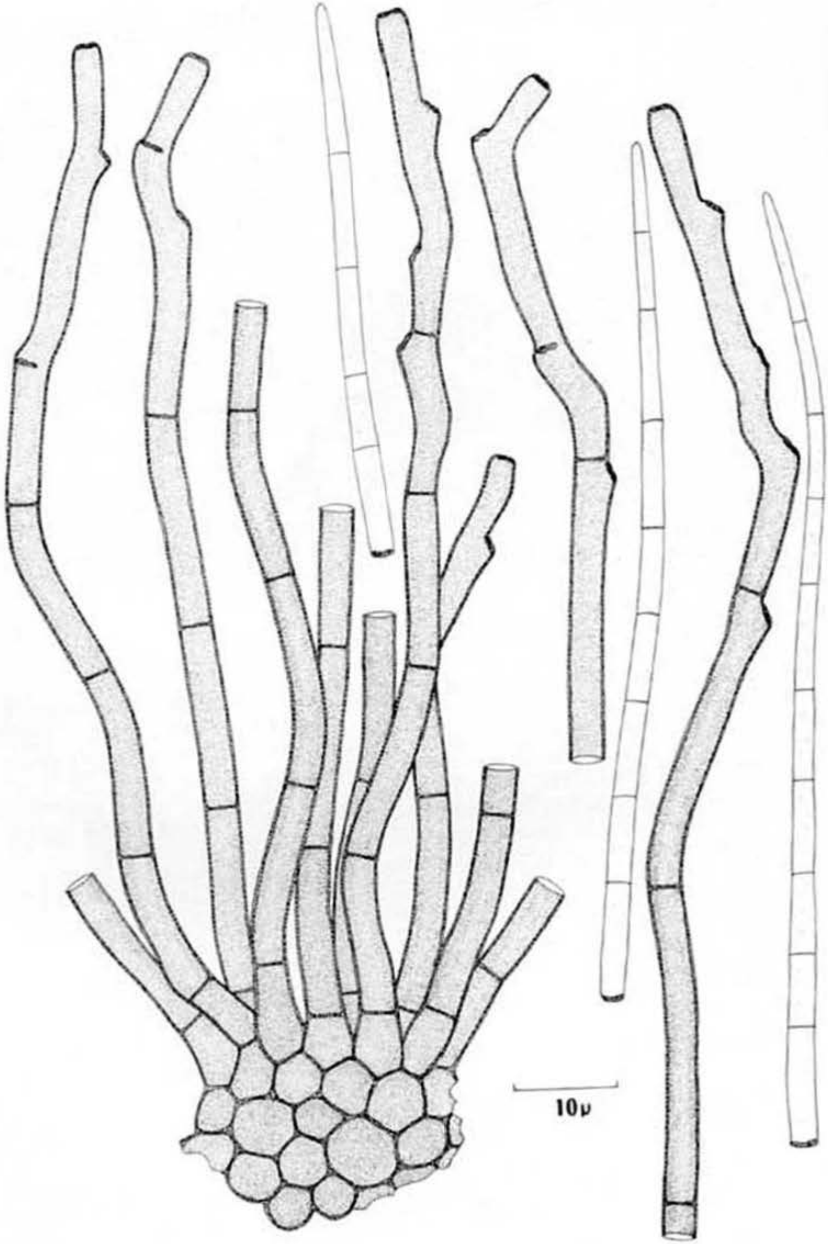

FIGURE 1. *Cercosporidium cassiocarpum*. Conidia and conidiophores.

hairy. Mycelium immersed in the substratum, composed of branched, septate, olivaceous brown to pale yellowish brown, 4 - 6µm wide hyphae. Stromata largely immersed, occasionally partly exposed, subglobose, prosenchymatous to pseudoparenchymatous, brown, 15 - 35µm wide. Conidiophores macronematous, mononematous, densely fasciculate, arising from the upper cells of the stromata, simple, straight to somewhat flexuous, smooth-walled, yellow brown to brown, paler towards the tip, geniculate distally, relatively thick-walled, 4 to 9-septate, scars prominent, 50 - 180 X 4 - 4.5µm. Conidiogenous cells polyblastic, cylindrical, integrated, terminal or intercalary. Conidia holoblastic, solitary, dry, acropleurogenous, straight or slightly curved, long cylindrical, attenuating gradually towards the apex, with several indistinct septa, smooth, tip obtuse, base subtruncate with a prominent scar, 36 - 90 X 4 - 5µm.

On pods of *Cassia occidentalis* L.; S.E. Asia.

Specimen examined: on *Cassia occidentalis*, Manila, Luzon, Philippines, 1912, E. D. Merrill (8463), type, BPI.

The conidia of *C. cassiocarpa* are not entirely typical of those of *Cercosporidium* being longer, more slender and possessing more septa than is usual. The dense fascicles of conidiophores, the well developed stromata and a tendency for the conidiophores to incurve indicate its affinity with this genus however.

Cercosporidium ecuadorianum (O. Const.) comb. nov. (Fig. 2).

≡ *Cercospora ecuadoriana* O. Constantinescu, Mycotaxon 3: 120, 1975.

= *Cercospora psoraleae* Petrak, Sydowia 4:572, 1950 [non *Cercospora psoraleae* Ray, Mycologia 33: 176 176, 1941].

Leaf spots orbicular to irregular, sometimes bordered by leaf veins, occasionally coalescing, cream to pale yellow in the center with a brown border. Colonies effuse or limited, brown, hairy. Mycelium immersed in the substratum, composed of branched, septate, pale brown hyphae, 3 - 4µm wide. Stromata immersed, occasionally partly exposed, substomatal, prosenchymatous to somewhat pseudoparenchymatous, up to 40µm wide. Conidiophores fasciculate, arising from the upper cells of the stromata, hypophyllous, macronematous, simple, straight or slightly flexuous, smooth-walled, pale brown, paler towards the tip, cylindrical, frequently somewhat bulbous at the base, 2 to 3-septate, geniculate above, incurved, scars prominent, 33 - 94 X 4.5 - 5.5µm. Conidiogenous cells polyblastic, integrated, terminal, sympodial. Conidia holoblastic,

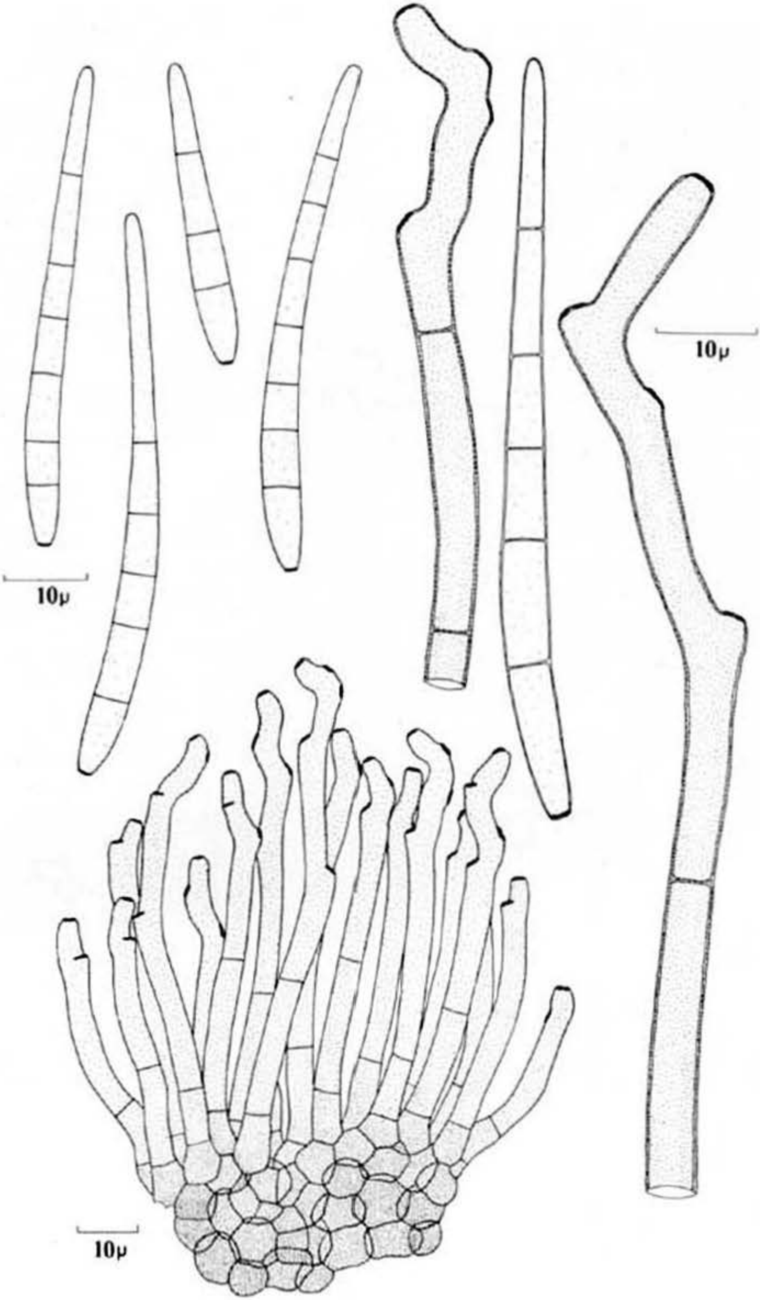

FIGURE 2. *Cercosporidium equadorianum.* Conidia and conidiophores.

solitary, dry, acropleurogenous, straight or slightly curved, obclavate, pale brown to subhyaline, smooth, 1 to 9-septate, obtuse at the apex, conico-truncate with a flattened scar to the base, 36 - 76 X 5.5 - 6μm.

On leaves of *Psoralea* sp.; South America.

Specimen examined: on *Psoralea* sp., Pichicha, near Quito, Ecuador, September 13, 1937, P. Sydow, type, M.

Passalora nodosa (O. Const.) comb. nov. (Fig. 3).

≡ *Cercospora nodosa* O. Constantinescu, Mycotaxon 3: 122, 1975.

Leaf spots dark brown, irregular, angular when bordered by veins, frequently coalescing, 1 - 3mm wide. Colonies effuse or orbicular, brown. Mycelium immersed in the substratum, composed of branched, septate, subhyaline, 2 - 3μm wide hyphae. A few hyphae, composed of swollen, very pale brown cells, aggregate in substomatal cavities and give rise to fascicles of conidiophores. Conidiophores macronematous, mononematous, caespitose, emerging through the stomata, simple, straight or flexuous, cylindrical, frequently irregularly swollen towards the tip, smooth, 1 to 2-septate, scars thin, 18 - 40 X 4 - 6μm Conidiogenous cells polyblastic, integrated, terminal. Conidia holoblastic, solitary, dry, acropleurogenous, very pale brown, smooth-walled, straight or more usually curved, 1 to 6-septate, obclavate, basal cell somewhat swollen, ellipsoid to doliiform and occasionally minutely verruculose, upper cells subcylindric terminating in an obtuse apex, base truncate, 70 - 160 X 3 - 5μm.

On leaves of *Psoralea* species; Europe and Asia.

Specimen examined: on *P. bituminosa*, Botanical Garden, Bucarest, Romania, September 23, 1966, O. Constantinescu, type, IMI 151119.

Constantinescu (1975) noted this species to be an "atypical" *Cercospora*. The thin scars, swollen conidiophore apices and basal conidial cells all indicate that it belongs in *Passalora*. It most closely resembles *P. alni* (Chupp and Green) Deighton.

Phaeoisariopsis sphaeroidea (Speg.) comb. nov. (Fig. 4).

≡ *Cercospora sphaeroidea* Spegazzini, Anal. Soc. Cient. Arg. 1: 59, 1880.

= *Cercospora iponemensis* P. Hennings, Hedwigia 48: 18, 1909.

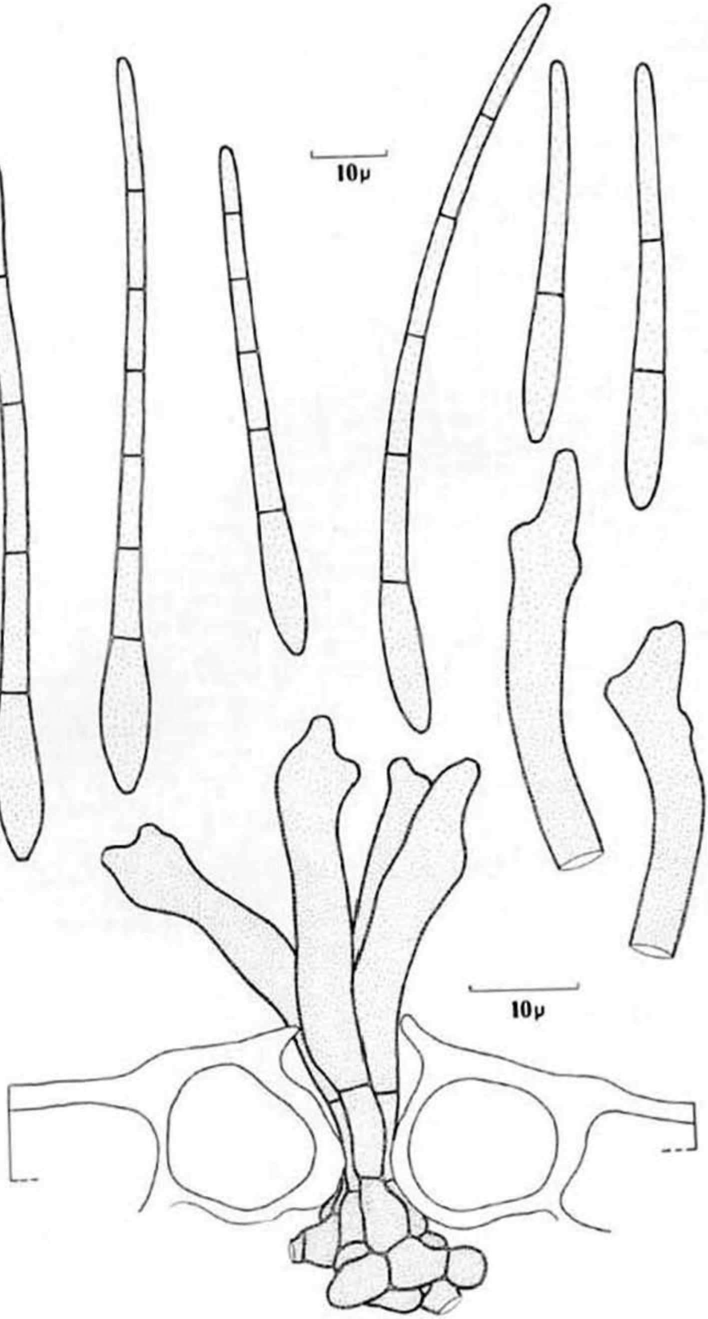

FIGURE 3. *Passalora nodosa*. Conidia and conidiophores.

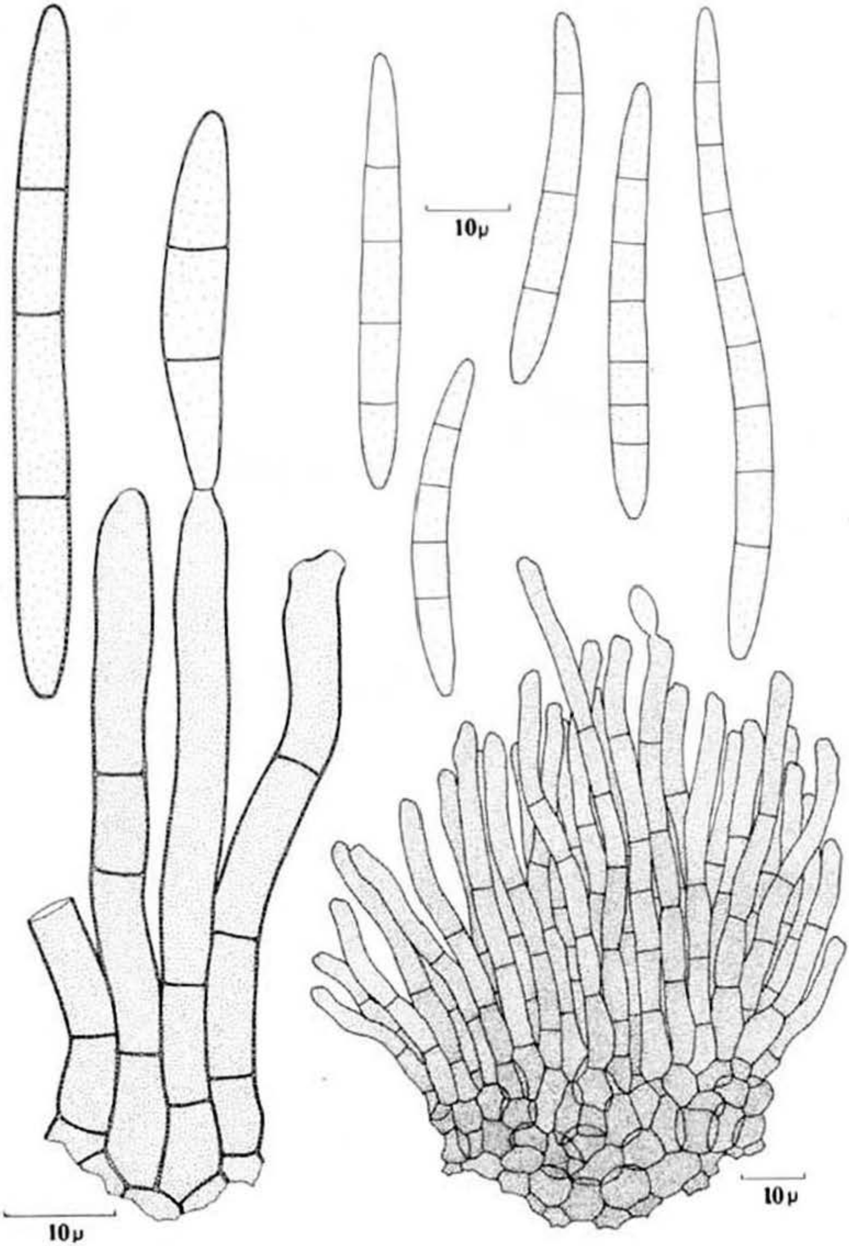

FIGURE 4. *Phaeoisariopsis sphaeroidea*. Conidia and conidiophores.

Leaf spots orbicular to irregular, frequently angular and bordered by the larger leaf veins, reddish-brown to brown, with a blackish margin, crowded or scattered. Colonies limited, dark brown, hairy. Mycelium immersed in the substratum, composed of branched, septate, pale brown, 3 - 4µm wide hyphae. Stromata partly immersed, partly erumpent, well developed, subglobose to somewhat flattened, mostly pseudoparenchymatous, dark brown, 50 - 230µm wide. Conidiophores macronematous, mononematous, densely fasciculate, parallel, straight,or slightly flexuous, arising from the upper cells of the stromata, amphigenous but mostly epiphyllous, up to 5-septate, smooth-walled, olivaceous brown, paler towards the tip, cylindrical, simple, scars thin, 30 - 90 X 4.5 - 5µm. Conidiogenous cells mono or polyblastic, integrated, terminal. Conidia holoblastic, solitary, dry, acropleurogenous, straight or slightly curved, cylindrical to narrowly obclavate, very pale brown, smooth, 2 to 8-septate, obtuse at the apex, subtruncate at the base, 47 - 110 X 3.5 - 4.5µm.

On leaves of *Cassia* species; South America.

Specimens examined: on *C. corymbosa* Lam., San Jose de Flores, Buenos Aires, Argentina, April 15, 1880, C. Spegazzini (911), type, LP; on *Cassia* sp., Iponema, Sao Paulo, Brazil, April 1903, A. Puttemans (732), (type of *C. iponemensis*), B.

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REFERENCES

CONSTANTINESCU, O. 1975. Revision of *Cercospora* species (hyphomycetes) parasitic on *Psoralea*. Mycotaxon 3: 119-125.

DEIGHTON, F. C. 1967. Studies on *Cercospora* and allied genera. II. *Passalora, Cercosporidium* and some species of *Fusicladium* on *Euphorbia*. Commonw. Mycol. Inst. Mycol. Pap. 112: 1-80.

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PSEUDOXENASMA, A NEW GENUS OF CORTICIACEAE (BASIDIOMYCETES)

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A new generic name and a new species *Pseudoxenasma verrucisporum* are proposed.

Pseudoxenasma nov. gen. K.-H. Larss. & Hjortst.

Fructificatio resupinata, effusa, tenuis, hymenio plus minusve sicco firmo ceraceo; systemate hyphali monomitico, hyphis plerumque indistinctis; sulphocystidiis clavatis, appendicibus apicalibus instructis; basidiis clavatis, basibus interdum biradicatis; sporis late ellipsoideis vel subglobosis, verrucosis amyloideis.

GENERITYPUS: *Pseudoxenasma verrucisporum* K.-H. Larss. & Hjortst.

Fruitbody resupinate, effused, thin, hymenium more or less ceraceous, generally smooth. Hyphal system monomitic with the individual hyphae indistinct. Always with sulphocystidia i.e. with positive reaction to sulphovanilline as in *Gloeocystidiellum*. The cystidia are provided with globose apical appendices (schizopapilles according to Boidin and Lanquetin). Basidia clavate, in most cases pleurobasidiate, with four sterigmata. Spores verrucose, thickwalled, broadly ellipsoid to subglobose in side view and with strong amyloid reaction.

Pseudoxenasma verrucisporum nov. spec. K.-H. Larss. & Hjortst.

Fructificatio semper resupinata, effusa, tenuis, hymenio plerumque albido vel cinereo sensim ravido, pruinoso, ceraceo, margine nusquam perspicuo; hyphis indistinctis, tenuitunicatis, 1,5-2,5 um latis, fibulatis; sulphocystidiis cla-

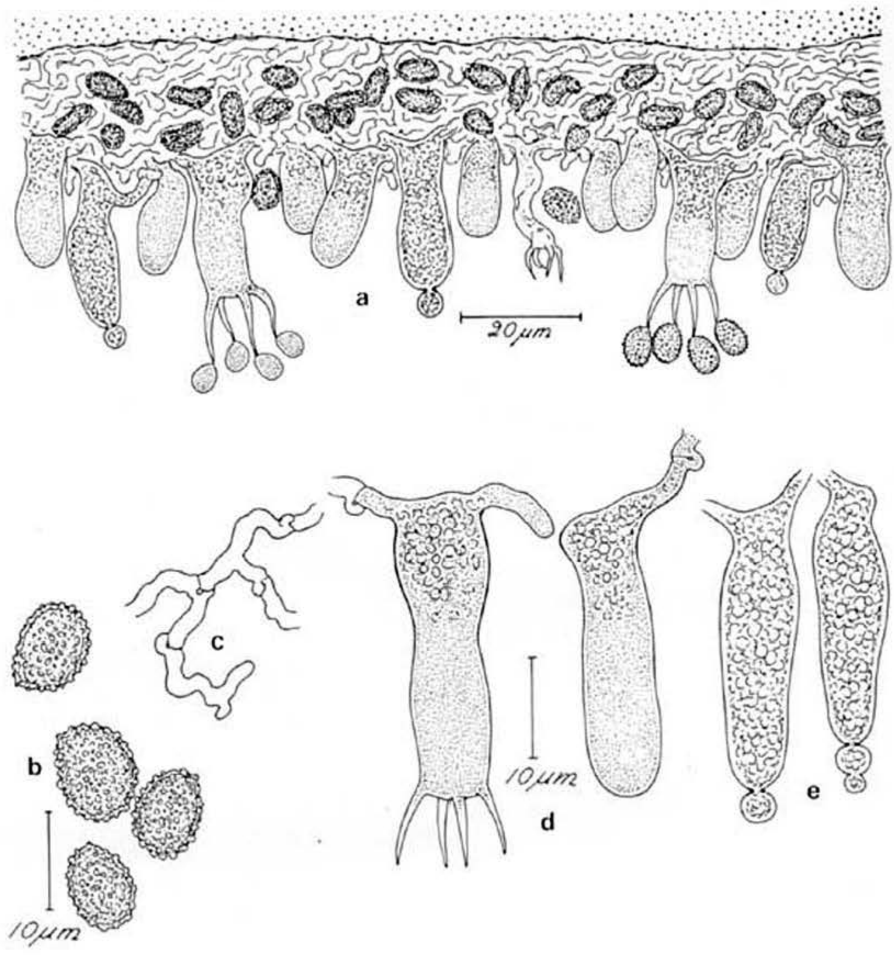

Fig. 1. *Pseudoxenasma verrucisporum*. a) section through fruitbody with lots of old spores enclosed in the texture b) spores c) part of hypha d) basidia e) cystidia. - Section a from type specimen, other details from coll. 6042.

vatis, appendicibus apicalibus instructis, 20-35 x 4-9 um; basidiis clavatis, infra plerumque lateralibus interdum biradicatis 25-35 x 7-9 um, 4 sterigmatibus; sporis crassitunicatis late ellipsoideis vel subglobosis, verrucosis, 8-10 x 7-8 um, valde amyloideis.

HOLOTYPUS: Sweden. Västergötland. Töllsjö par., SW of the little lake Skogstjärn, near Lafsån, on branches of decayed *Picea abies*. 1972-08-06, KHL & Hjortst. no. 5593.

FRUITBODY resupinate, effused, closely attached to the substrate, often of small dimension, ceraceous, thin, whitish to greyish white, hymenium pruinose under the lens or slightly furfuraceous, in dried condition almost hard, margin indistinctly thinning out. Hyphal system monomitic, hyphae narrow, thinwalled, in most cases very indistinct, 1,5-2,5 um wide, with clamps, richly branched. There are lots of old spore hides enclosed in the hyphal texture. Sulphocystidia rather frequent, 20-35 x 4-9 um, with one ore two, rarely in numbers of three to four apical outgrowths, the base of the cystidia is sometimes oblique. Basidia generally pleurobasidiate, clavate, 25-35 x 7-9 um, with four sterigmata which are 9-11 um long. Basidiospores broadly ellipsoid to subglobose, thickwalled, verrucose 8-10 x 7-8 um, and with strongly amyloid reaction.

HABITAT. On fallen branches and trunks as well as on dead but still attached branches of *Picea* in humid forests. The species grows often together with e.g. *Aleurodiscus amorphus* (Fr.) Schroet., *Globulicium hiemale* (Laurila) Hjortst., and *Gloeocystidiellum furfuraceum* (Bres.) Donk.

DISTRIBUTION. Hitherto little known and collected by the authors in Västergötland and Dalsland. By Hauerslev collected in Halland. Not known elsewhere.

REMARKS. The species agrees in essential details with *Xenasma* Donk and *Xenasmatella* Oberw. (pleurobasidia; dense, ceraceous texture) but we have found it necessary to refer it to a genus of its own. The main reason is the presence of sulphocystidia which make it differ from *Xenasmatella* and verrucose, amyloid spores which make it differ from *Xenasma*. *Gloeocystidiellum* Donk em. Donk could have been a proper place for the new species thanks to the sulphocystidia and the amyloid spores but pleurobasidia do not exist in this genus. The new genus reminds in some respects also of *Aleurodiscus* Rabenh. ex Schroet. but has not any acanthohyphidia, characteristic for this genus. Besides *Aleurodiscus* has mainly terminal basidia. Accordingly the species combines characters from at least three genera which are hitherto

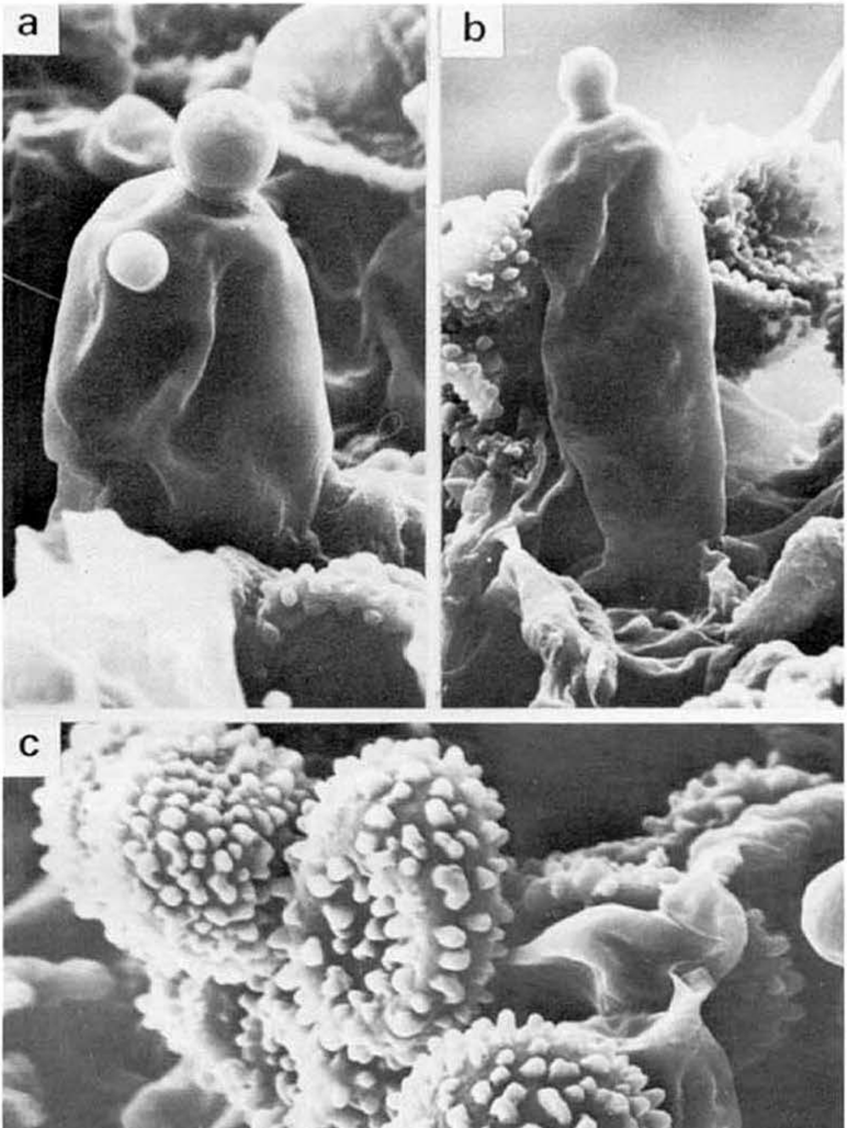

Fig. 2. *Pseudoxenasma verrucisporum*. a and b) sulphocystidia with apical appendix (in b with two) c) spores. - Coll. 6042.

considered as very little connected with each other.

The new species differs from *Xenasma amylosporum* Parm. in the larger size of the spores. This species also lacks the sulphocystidia.

ADDITIONAL MATERIAL STUDIED.

HALLAND. Halmstad, Simlångsdalen. 1970-10-03 K. Hauerslev.

VÄSTERGÖTLAND. Alingsås, east side of lake L. Trän, on stem of *Picea*, rather decayed in *Dicranum* forest. 1971-09-04 KHL 121; S of lake Valsjön, on dead but still attached branches of *Picea*.1972-11 KHL 1478; Skepplanda, S of lake Svillesjön, on *Picea* branch among *Sphagnum* in moist coniferous forest. 1972-09-24 KHL 1153; Horla par., N of Kollsered in brook valley, on still attached branches of *Picea*. 1976-05-16 Hjortst. 6596; Töllsjö par., SW of lake Skogstjärn, near Lafsån, on still attached branches of *Picea*. 1972-08-06 KHL & Hjortst. 5547; Östad par., SE of lake Grytesjön, in brook valley, on rather decayed trunk of *Picea* in *Dicranum-Picea* forest. 1972-08-13 KHL 821; SE of lake Kangekärr, on *Picea* stem on the ground. 1972-09-15 KHL 986 and 1004; NW of the little lake Långevatten, on dead but still attached branches of *Picea*. 1975-12-29 Hjortst. 6556.

DALSLAND. Ör par., W of the lake Örsjön in brook valley, on decayed trunk of *Picea* on the ground. 1972-11-03 KHL & Hjortst. 6042 and 6063.

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REFERENCES

Eriksson, John & Ryvarden, Leif. 1973 and 1975. The Corticiaceae of North Europe. Vol. 2 and 3.

Oberwinkler, F. 1965. Primitive Basidiomyceten. Sydowia 19: 1-72.

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REVUE DES LIVRES

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RECHERCHES MYCOSOCIOLOGIQUES DANS LES FORETS DE HAUTE BELGIQUE. ESSAI SUR LES FONDEMENTS DE LA SOCIOLOGIE DES CHAMPIGNONS SUPERIEURS, par † Fredi DARIMONT, édité par Jacques LAMBINON, Tome I, xiii + 220 p., 1 carte, 26 photos, 34 aquarelles de J. DAMBLON, Tome II, tableaux hors texte, 4°, broché, 1973. Mémoire no. 170, Institut Royal des Sciences Naturelles de Belgique, 31 rue Vautier, B-1040 Bruxelles. Prix 4000 FB, US $ 100.oo.

Résultat de 10 années de recherches et d'études, la thèse doctorale de feu Prof. Fredi DARIMONT, défendue en 1952, est une oeuvre monumentale, originale et unique qui, heureusement pour nous, a reçu les honneurs d'une excellente édition grâce aux soins du Prof. J. Lambinon de l'Université de Liège.

L'auteur, Fredi DARIMONT, est licencié en sciences botaniques à l'Université de Liège en 1941, y devient assistant à la Chaire de phytosociologie, est promu Docteur en sciences botaniques en 1952 et est nommé Chargé de Cours de la même Université en 1957. En plus de ses charges académiques, il exerça les hautes fonctions de Chef de Cabinet du Ministre de l'Instruction Publique, puis de Directeur Général de l'Enseignement Supérieur et de la Recherche Scientifique de Belgique. Auteur de 53 publications de botanique et de mycologie, il futaussi rédacteur en chef de la revue botanique Lejeunia. Enlevé accidentellement à son activité débordante en 1966, il laissa le souvenir d'un botaniste et mycologue brillant et dévoué.

Ses recherches sur la sociologie des champignons dans les forêts de Haute Belgique l'ont amené à établir les principes, la méthode et les premières structures de la Mycosociologie, fondements d'une science nouvelle, parallèle mais distincte de la phytosociologie.

Vingt quatre ans après son achèvement, ce travail reste actuel et acquiert d'autant plus d'attrait qu'il est resté sans devancier et que, dans l'analyse des biocénoses fongiques, sa nécessité se fait sentir aujourd'hui plus que jamais.

Etant donné la nature hétérotrophe des champignons, l'auteur observe que les facteurs phytosociologiques ne sont pas ceux qui règlent la sociologie des mycocénoses. La chorologie (étude de la distribution géographique) et l'écologie des champignons permettent de définir certains des facteurs mycosociologiques, mais elles ne peuvent fournir à la mycosociologie une méthode d'étude appropriée. L'auteur est donc amené, dans la 2e partie, à mettre sur pied une méthode de travail propre à la mycosociologie.

Il crée d'abord une série de concepts nouveaux. En parallèle des concepts de végétation, flore, liste floristique réservés aux

Végétaux, de population animale, faune, liste faunistique réservés aux Animaux, il introduit pour les Mycètes des concepts de mycétation, fonge et liste fongistique. Il définit aussi le mycotope dont les facteurs déterminants sont l'association végétale, le sol, l'altitude, le climat et le support de la mycétation. Le mycotope héberge une unité de mycétation ou synmycie, représentant un groupement mycosociologique. L'ensemble mycotope et synmycie constitue la mycosynécie.

Afin de caractériser, comparer et classer les synmycies, le mycosociologue établit d'abord la liste fongistique de la mycétation et applique à chaque espèce relevée un coefficient de fréquence et un indice de sociabilité. L'auteur renonce au dénombrement des unités fongiques réelles, parce qu'inaccessibles dans leurs limites mycéliennes; mais ce sont les stations où apparaissent un ou plusieurs carpophores qu'il dénombre et traduit par un coefficient de fréquence de 1 à 5. La sociabilité est caractérisée par la disposition des carpophores dans les stations, séparée (s), grégaire (g), cespiteuse (c), imbriquée (i), adjointe (a) ou circulaire (o), ces indices pouvant être aussi combinés (gc, oc, ic), et par leur nombre exprimé par un coefficient d'abondance sociale de 1 à 5. Le type physionomique de chaque espèce est aussi relevé: facies agaricoïde, pleurotoïde, stéréoïde, tremelloïde, pézizoïde, etc. Pour couvrir toute la synmycie d'un mycotope, les relevés mycosociologiques doivent être répétés au cours de la même année et durant plusieurs années. La liste fongistique cumulative ainsi obtenue met en évidence le rythme saisonnier de la mycétation.

Cette analyse étant faite, vient alors la synthèse des données. D'abord le mycosociologue compare les synmycies relevées dans des mycotopes identiques mais situés en des lieux différents et en établit la constance des espèces. Il compare ensuite les synmycies caractéristiques de mycotopes différents, afin d'en dégager les affinités et les classer en une taxonomie mycosociologique. Les taxa en sont la sociomycie (suffixe -ecium), l'alliance (-ecion), l'ordre (-ecia) et la classe (-ecea), à l'instar des taxa phytosociologiques d'association (-etum), d'alliance (-ion), d'ordre (-etalia) et de classe (-etea).

Dans la 3e partie de l'ouvrage, l'auteur livre les résultats de ses études et une première taxonomie mycosociologique de la mycétation des forêts caducifoliées calcicoles et silicicoles de Haute Belgique. L'auteur a exploré six associations végétales forestières de type Quercetum, Fagetum, Querceto-Carpinetum, Querceto-Lithospermetum et Acereto-Fraxinetum, dans 123 stations différentes. Dans celles-ci, il y a reconnu 21 mycotopes types (hypogé, endogé, épigé sur litière, épigé sur sol nu, bryophile, épixyle de brindilles, de souches, de branches et troncs couchés, de troncs debout, et de bois de cîme, carbonicole, marécageux, etc.). Dans chaque mycotope particulier, il a relevé la synmycie avec la liste des espèces, leur fréquence, leur sociabilité, leur constance, leur type physionomique et leur rythme saisonnier. Il décrit ainsi 70 mycosynécies différentes avec leur synmycie caractéristique.

Les 22 les mieux caractérisées des 70 synmycies observées sont alors dénommées et décrites par l'auteur comme sociomycies nouvelles (p. ex. Amanitecium muscariae, sociomycie du mycotope épigé de litière du Quercetum sessiliflorae, et Amanitecium caesareae, sociomycie du mycotope épigé du Querceto-Carpinetum medioeuropaeum caricetosum glaucae). Les sociomycies sont alors classées en alliances (Boletecion scabri, dans l'exemple choisi), celles-ci en ordres

(Boleto-Amanitecia) et les ordres en classes (Cortinario-Boletacea). L'auteur reconnaît ainsi six classes de mycétation, caractérisées par leur physionomie. Il en dénomme quatre: Dasyscyphecea à mycétation forestière endogée (de litière), Cortinario-Boletacea, à mycétation forestière épigée, Anthracobiecea, à mycétation carbonicole, et Stereo-Trametecea, à mycétation forestière épixyle. Il reconnaît encore 2 classes de mycétation, forestière hypogée et forestière bryophile, mais ne les dénomment pas, étant insuffisamment connues. Cette première nomenclature mycosociologique comprend donc déjà 4 classes, 8 ordres, 16 alliances et 22 sociomycies.

La description de ces taxa comprend les espèces caractéristiques de la classe, les espèces exclusives et électives de l'ordre et de l'alliance, les espèces exclusives et électives de la sociomycie, les espèces différentielles de l'étage des collines, le nombre de taxa recensés, le taux de constance, le taux de fréquence, les espèces dominantes, les spécialisations biologiques (cortège fongistique du bouleau, du charme, etc.), la synécologie du groupement (description du mycotope), le rythme saisonnier et la distribution géographique.

Il est intéressant de remarquer enfin que la méthode de DARIMONT permet la vérification de l'a priori d'homogénéité posé lors de la délimitation préliminaire des mycotopes. En effet la méthode a démontré l'homogénéité des mycotopes choisis à l'exception d'un seul, hétérogène, et a prouvé l'identité de deux autres.

En conclusion, on peut croire que DARIMONT sera pour les mycosociologues celui qu'est devenu BRAUN-BLANQUET pour les phytosociologues. Ce sont des principes et une méthode , mais aussi les premières constructions de l'édifice de la MYCOSOCIOLOGIE, science nouvelle, que le Professeur Fredi DARIMONT nous a léguées. A d'autres de continuer.

LES CHAMPIGNONS, par Uberto TOSCO et Annalaura FANELLI. Collection Spéciale Les Sciences, 80 p., 32 figs., 126 photos coul., 4° broché, 1974. Ed. Istituto Geografico de Agostini, Novara, Italia & Ed. Grange Batelière, 10 rue Chaudat, Paris. Prix FF 12.oo.

Il s'agit de la réimpression de l'ouvrage déjà paru sous le titre LA CUEILLETTE DES CHAMPIGNONS, volume 2 de la collection "Documentaires en couleurs" chez Grange Batelière, en 1969, en version française de l'édition italienne de 1968.

Les auteurs, mycologues du Bureau Sanitaire de Turin, illustrent 112 champignons comestibles et vénéneux, parmi les plus communs mais que tout amateur doit connaître. Les photographies, souvent en pleine page, sont de très bonne qualité, même si les champignons ne sont pas toujours photographiés en place. Le texte est bref et clair; la nomenclature latine est traditionnelle. Cet album est un cadeau à offrir, aussi agréable qu'utile.

CIUPERCI PYRENOMYCETES-SPHAERIALES DIN ROMÂNIA, par C. SANDU-VILLE, 409 p., 75 figs., 1971. Editura Academiei Republicii Socialiste România, Str. Gutenberg 3bis, Bucarest 6, România. Prix Lei 28.oo.

Liste descriptive de 620 espèces de l'ordre des "Sphaeriales" de Roumanie. L'ordre est compris au sens de Clements & Shear (1931). Seules les familles Sphaeriaceae, Hypocreaceae et Lophiostomataceae sont inventoriées. La clé des genres proposée est la traduction de celle de Clements & Shear. L'auteur n'ignore cependant pas l'existance des systèmes modernes de classification des Ascomycètes, distinguant les unituniqués des bituniqués, mais ne les accepte pas. Sa taxonomie est traditionnelle. Il réhabilite même Sphaerella Fr. (1849), invoquant sa priorité sur Mycosphaerella Joh., alors que ce nom est homonyme de Sphaerella Sommerf. (1824, = Protococcus Agdh.). Il y établit 7 combinaisons nouvelles. L'auteur décrit aussi 5 espèces et 1 variété nouvelles dans les genres Physalospora, Pleosphaerulina, Didymella, Metasphaeria, Leptosphaeria et fait une nouvelle combinaison dans Hercospora.

SEPTORIOZELE DIN ROMÂNIA, par E. RADULESCU, A. NEGRU et E. DOCEA, 325 p., 60 figs., 1973. Editura Academiei Republicii Socialiste România, Str. Gutenberg 3bis, Bucarest 6, România. Prix Lei 21.5o.

Une liste descriptive de près de 400 espèces de Septoria de Roumanie, arrangée suivant la taxonomie de la plante-hôte. Conforme à la tradition de Saccardo, la diagnose du genre et des espèces se base essentiellement sur la forme et la dimension des pycnides et des conidies, la septation des conidies et les symptômes de l'hôte, mais ignore complètement les caractères morphogénétiques de la conidiogénèse qui servent depuis 20 ans à la taxonomie des Sphaeropsidales. Le livre reste néanmoins un document pour la flore mycétique de Roumanie.

THE BIOLOGY OF LICHENS, par Mason E. HALE. Collection Contemporary Biology, 2e ed., 181 p., ill., 1974. Edward Arnold, 25 Hill str., London W1X 8LL. Prix £ 3.oo.

Il n'est pas étonnant qu'une introduction de cette qualité à la biologie des lichens ait été rapidement épuisée. La réédition a permis à l'auteur de mettre à jour le texte sur la base de 52 références bibliographiques nouvelles et d'inclure des aperçus sur la structure fine et la sociologie des lichens, tout en restant dans les limites de la pagination originale.

IMPROVING THE DISSEMINATION OF SCIENTIFIC AND TECHNICAL INFORMATION: A PRACTITIONER'S GUIDE TO INNOVATION, préparé par le CAPITAL SYSTEMS GROUP INC. for the Office of Science Information Service, National Science Foundation, U.S.A., 143 p., 4°, en reliure mobile, 1975. Distribué par National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, U.S.A. Prix US $ 10.25 ou en microfiches 3.75.

Cette publication ne traite pas de mycologie mais de technique dediffusion. C'est un guide à recommander à tous les intéressés et les responsables de la diffusion de l'information scientifique. Son but est de proposer, dans ou endehors des systèmes traditionnels d'édition, les idées nouvelles susceptibles d'encourager la diffusion la plus rapide, la plus large et la plus économique de l'information scientifique et de stimuler l'étude et l'essai de moyens nouveaux. Par exemple, la première des cent innovations proposées est le "manuscrit d'auteur prêt à la reproduction". Ce procédé - qui a été adopté par MYCOTAXON - est de plus en plus utilisé . Les avantages et les inconvénients de chaque innovation sont impartiallement exposés et discutés afin de permettre à chacun de prendre position et,s'il le veut, d'appliquer les conseils qui sont donnés.

C'est la boîtes aux idées, à laquelle d'ailleurs le lecteur est invité à contribuer en communiquant ses propres idées et expériences bonnes et mauvaises. En effet les éditeurs proje ent de continuer la publication du Guide par des additions régulières.

LICHENS, par Annie Lorrain SMITH, Cambridge University Press, 1921, xxviii + 464 p., 135 figs., réimprimé par The Richmond Publishing Co., Richmond, Surrey, England, avec intoduction et index par D. HAWKSWORTH, 1975. Prix £ 11.5o.

Cette réimpression du livre de Annie Lorrain SMITH, le meilleur livre de l'époque sur la lichénologie, est bienvenue. Le livre comprend une histoire de la lichénologie (20 p.), un texte très complet pour l'époque sur l'anatomie et la biologie des lichens (280 p.), un exposé unique des familles et genres de lichens du monde entier (37 p.) et enfin un essai sur l'écologie et la sociologie des lichens (40 p.). Dans une introduction, D. HAWKSWORTH rapelle la vie de l'auteur et propose une liste de la littérature récente qui complètera l'ouvrage et une liste des noms corrigés de lichens.

THE FILAMENTOUS FUNGI. VOL. I. INDUSTRIAL MYCOLOGY, édité par John E. SMITH et David R. BERRY, 340 p., ill., relié toilé, 1975. Edward Arnold Publ., 25 Hill str.,London W1X 8 LL. Prix £ 12.5o.

Il y a 7 ans sortait chez Arnold la sixième et dernière édition de AN INTRODUCTION TO INDUSTRIAL MYCOLOGY par G. SMITH. Cet ouvrage introductif a aidé et aidera encore de nombreux enseignants, chercheurs et industriels à se familiariser avec les champignons d'importance industrielle et les techniques de leur étude.

Aujourd'hui se fait sentir le besoin d'un ouvrage plus complet sur les connaissances actuelles en la matière. Le fait que des ouvrages récents (non cités) on été consacrés aux levures et à leurs activités biologiques, alors que les champignons filamenteux, selon les auteurs, ont été délaissés, est la raison pour laquelle les auteurs ont limités leur entreprise aux seuls champignons filamenteux.

Le Volume I, intitulé INDUSTRIAL MYCOLOGY, est une revue en 16 chapitres de différents auteurs du rôle des champignons filamenteux dans l'industrie biologique et alimentaire. Cela va de l'écologie du développement, la cinétique de la croissance, la formation de biomasse et les activités de fermentation aux multiples productions de métabolites secondaires, d'antibiotiques, d'acides organiques, d'enzymes, de substances organoleptiques, de substances pharmaceutiques, de protéines et même aux productions alimentaires comme telles, aliments fermentés à l'orientale et champignons comestibles. Il aborde aussi la biodétérioration des matériaux, la biodégradation des déchets et la formation de mycotoxines dans les aliments.

L'ouvrage est bien édité: on y reconnaît la qualité des éditions Arnold. Le style des auteurs est clair, concis, scientifique et didactique à la fois. Certains chapitres sont remarquablement informateurs. Par contre, d'autres restent brefs ou superficiels. On ne trouve pas, par ex., référence à l'ouvrage classique de Cl. Moreau sur les Mycotoxines. Le chapitre sur la biodétérioration n'est documenté que de 25 références très générales.

La coupure champignons filamenteux/levures comme l'exclusion de celles-ci dans le but de limiter le programme est discutable et sans doute regrettable. Elle nous enlèvera le bénéfice de la comparaison de l'activité des uns et des autres. D'autre part, à considérer le programme qui couvrira la biosynthèse et le métabolisme (vol. 2), la structure cellulaire, l'écologie, la génétique et la taxonomie des champignons filamenteux, on se demande à quel point ce traité fera-t-il double emploi avec d'autres, THE FUNGI p. ex., tout en restant amputé d'une partie difficilement dissociable de la mycologie industrielle, les levures.

Néanmoins, par tout ce qu'il nous offre dans son premier volume, cet ouvrage est déjà d'un grand intérêt et d'une utilité certaine.

MYCOGENETICS, AN INTRODUCTION TO THE GENERAL GENETICS OF FUNGI, par J. H. BURNETT, 375 p., ill., relié, 1975. John Wiley & Sons, Baffins Lane, Chichester, Sussex PO19 1UD, England. Prix £ 27.5o.

Constatant que "beaucoup de mycologues, de phytopathologues et d'utilisateurs industriels des champignons ont une connaissance limitée de la génétique des champignons ... et que beaucoup de généticiens ignorent les ressources que leur offrent les champignons" l'auteur nous présente ce livre comme une "introduction" où il "décrit la génétique des champignons en insistant sur les lacunes et les problèmes des connaissances actuelles plutôt que sur le détail des dernières découvertes".

Le livre se divise en 4 parties. La première partie, l'Introduction, initie le généticien à la mycologie (Fungi as organisms for genetic studies). La seconde partie (125 p.) résume les données de la génétique formelle des champignons (genetic markers; meiotic, mitotic, karyotic and somatic recombination, segregation and linkage; quatitative inheritance). La troisième partie (80 p.) concerne la génétique des populations (variation, mutation, mating systems, natural selection, genetic polymorphism, stability, isolation mechanisms). La quatrieme partie (85 p.) considère les domaines où s'utilise la génétique des champignons (industry, plant pathology, genetical research).

Le généticien averti trouvera dans ce livre un support étonnant à l'orientation de ses recherches dans des voies mycologiques. Mais l'auteur n'aura touché que la moitié de son audience. En effet le généticien est bien introduit à la mycologie, mais le mycologue sera déçu de ne pas l'être à la génétique au cours de l'introduction, car de la seconde partie à la fin du livre, le style et le vocabulaire ésotérique, propre à la génétique, sera totalement hermétique à sa compréhension. "Complementation", "protrophic phenotype","homomixis", "diaphoromixis", "interchange suppressor", "super-suppressor", etc. sont autant d'énigmes pour le non-initié. Il eut fallu dans la première partie un chapitre destiné au mycologue, intitulé "Fundamentals of genetics, as applied to the fungi".

BIODEGRADATION ET HUMIFICATION, RAPPORT DU Ier COLLOQUE INTERNATIONAL, NANCY, 1974, édité par Gérard KILBERTUS, Otto REISINGER, André MOURET et J.A. CANCELA DA FONSECA, 496 p., 1975. Ed. Pierron, 57206 Sarreguemines, France. Prix FF 130.oo.

Bien que l'intention des organisateurs était de se limiter à la relation organismes biodégradants/formation de l'humus, le titre du Symposium a ouvert la porte à un éventail très large de communications. Ce fait et l'absence de regroupement des articles par sujet engendrent chez le lecteur une impression d'hétérogénéité et de désordre.

Nombreux sont les articles devant intéresser les écologistes, les microbiologistes et biochimistes du sol. Pour sa part, le mycologue trouvera satisfaction dans les études de la mycoflore de la litière forestière (J.C. FRANCKLAND), de litière fraîche de Populus tremuloides (S. VISSER & D. PARKINSON), de grains d'orge (A.E. APINIS), de Phragmites communis (A.E. APINIS & H.K. TALIGOOLA), de feuilles d'Ulex europaea (R.N. STRINGER), d'aiguilles de Pinus sylvestris arrosées ou non d'urée (P.F. LEHMAN) et enfin... de la mycoflore de l'ambre (J. NICOT). Trois articles traitent encore de la dégradation de la cellulose et de la lignine par les champignons saprophytes (H.J. HUDSON), par Drechslera sorokiniana (G.T. COLE) et par Armillariella mellea (K. RYKOWSKI).

COELOMYCETES V. CORYNEUM, par B. C. SUTTON, C.M.I. Mycological Papers, no. 138, 224 p., 84 figs., 2 pls., 1975. Commonwealth Agricultural Bureaux, Farnham Royal, Slough SL2 3BN, England. Prix £ 6.oo.

Le genre Coryneum avec ses 182 taxa décrits est entièrement revu. 20 taxa seulement sont retenus, dont 3 nouvelles espèces, 1 nouvelle variété et 3 recombinaisons. 116 noms sont exclus de Coryneum, réduits en synonymie ou recombinés dans Apocoryneum, genre nouveau, ou les genres Seimatosporium, Seiridium, Stigmina, Colletogloeum, Stilbospora et 28 autres encore. 45 autres taxa, en l'absence de type, sont exclus sur la base des descriptions.

Les caractères conidiens suffisent, dans Coryneum, à la diagnose des 20 espèces et variété et sont le plus souvent les seuls figurés. Le lecteur aurait certainement apprécié des illustrations plus complètes de chaque espèce, incluant aussi les conidiophores et acervuli, comme les bonnes illustrations de beaucoup d'espèces à exclure, telles Seimatosporium pezizoides ou Stilbospora pistaciae. Cette monographie du genre Coryneum est certainement la bienvenue, après 150 années de confusion.

ANTHOSTOMELLA SACC. (PART I), par Sheila M. FRANCIS, C.M.I. Mycological Papers, no. 139, 97 p., 29 figs., 1975. Commonwealth Agricultural Bureaux, Farnham Royal, Slough SL2 3BN, England. Prix £ 3.oo.

Première partie d'une revision des Anthostomella, limitée aux espèces d'Europe sur conifères et plantes herbacées. L'auteur rejette la lectotypification fautive du genre par Clements & Shear mais aussi celle de Eriksson (A. limitata) en raison de l'absence de matériel type et d'un doute taxonomique; elle choisit A. tomicoides comme lectotype. Marinia, Myconeesia, Phaeophomatospora sont synonymes, de même que Paranthostomella Speg. après le rejet - peut-être discutable - du lectotype de von Höhnel qui en faisait un genre distinct. 32 taxa sont décrits, dont 2 nouvelles espèces et 2 recombinaisons; 2 genres et 30 espèces sont exclues ou considérées comme douteuses.

THE PYRENOMYCETOUS FUNGI, par Lewis E. WEHMEYER, Mycologia Memoir no. 6, 250 p., relié, 1975. The New York Botanical Garden, The Mycological Society of America, J. Cramer ed., D-3301 Lehre, Allemagne. Prix DM 80.-, MSA members: US $ 20.-

Dernière ouvre de l'auteur, que le Dr. Richard T. Hanlin a soignesement préparé à la publication et qui couronne une vie consacrée aux ascomycètes par un nouvel essai de systématique des Pyrénomycètes.

L'auteur a recherché un compromis susceptible de concilier les options taxonomiques modernes. Sa classification des Ascomycètes et la place des Pyrénomycètes se résument comme suit. Deux sous-classes, les Protoascomycètes (Endomycetales, Hemiascales et Taphrinales) et les Carpoascomycètes qu'il subdivise en Discomycètes (qu'il ne traite pas) et Pyrénomycètes. Ce sont ceux-ci qu'il subdivise en Loculoascomycètes (bitunicatae: Microthyriales, Hysteriales, Dothideales, Pleosporales) et en Euascomycètes (unitunicatae: Plectascales, Melanosporales, Xylariales, Allantosphaeriales, Diaporthales, Hypocreales, Laboulbeniales, Clavicipetales, Erysiphales et Sphaeriales). Dans chaque ordre, familles et genres sont données avec clés, caractères, affinités et références bibliographiques.

Même si l'arrangement taxonomique peut ne pas trouver l'agrément général, ce travail restera cependant un heureux essai de synthèse, un manuel didactique très utile et une bonne source d'information.

ICONES MICROFUNGORUM A MATSUSHIMA LECTORUM, par Takashi MATSUSHIMA, 209 p., 415 pls., 1975. Edité par l'auteur, Matsushima Fungus Collection, 601, Mikage Corporouse, 48 Tenjinyama, Nishihirano, Mikage-cho, Higashinada-ku, Kobe City, Japan 658. Prix non indiqué.

Après un premier ouvrage de l'auteur, MICROFUNGI OF THE SOLOMON ISLANDS AND PAPUA-NEW GUINEA (1971), recensé dans MYCOTAXON, 1:64, 1974, en voici un second et de la même haute qualité.

Le texte comprend la description, sans commentaire, de 655 microfungi, en provenance du Japon et de l'Alaska, récoltés et isolés en culture pure par l'auteur: 577 Deuteromycètes (dont 170 espèces nouvelles et 17 recombinaisons), 65 Ascomycètes (dont 2 nouveaux) et 13 Phycomycètes (Mucorales). Sept genres nouveaux d'Hyphomycètes sont décrits: Beauveriphora, Biflagellospora, Calceispora, Hyalosynnema, Lappodochium, Phialoarthrobotryum et Triramulispora.

Les espèces sont disposées par ordre alphabétique dans leur classe. Toutes sont illustrées, sauf 8 qui ne le sont pas et 15 qui l'ont été en 1971 par l'auteur. Si la recherche d'une description d'espèce est aisée, celle de son illustration ne l'est pas. La disposition compacte des figures de plusieurs espèces par planche, sans légende sur les planches (celles-la étant groupées dans une liste de 19 pages) et l'ordre taxonomique des planches différant de celui des descriptions rendent l'usage des planches très malaisé. Mais ce défaut est purement éditorial.

L'auteur fait preuve d'une parfaite maîtrise de sa technique mycologique. Ses illustrations sont surprenantes par leur qualité. Pour réaliser ses microphotographies, l'auteur a disposé conidiophores et conidies sur un mince film d'agar par micromanipulation!

L'abondance des espèces nouvelles est aussi étonnante. On doit reconnaître à la fois les connaissances mycologiques étendues de l'auteur et sa prudence à dénommer ses trouvailles, puisque 70 des 655 espèces décrites restent sans nom. On se plairait alors à imaginer les terres explorées par l'auteur comme autant de paradis pour le mycologue. C'est possible, mais nous croyons surtout dans la perspicacité du mycologue.

Tel est cet ouvrage qui, comme le précédent, est un témoignage de la valeur de son auteur et un document mycologique dont on ne pourra se passer dans l'étude des micromycètes.

FUNGI OF INDIA. SUPPLEMENT TO THE LIST OF INDIAN FUNGI, 1962-1972, Par K. G. MUKERJI et R. C. JUNEJA, vi + 224 p., 1 carte relié, 4°, 1975 (date indiquée sur la couverture mobile; le livre est non daté, mais sa préface datée du 24 décembre1974) Emkay Publications, B-19 East Krishma Nagar Extension, Delhi 110051, India. Prix US $ 15.oo, UK £ 6.oo.

Cette liste est le cinquième supplémentà la liste THE FUNGI OF INDIA de E. J. Butler et G.R. Bisby (jusqu'à 1930) après les quatre premier suppléments par B.B. Mundkur (1931-1938), K. Ramakrishnan et C. V. Subramanian (1938-1951), C. V. Subramanian et K. Ramakrishnan (1952-1956) et R. N. Tandon et S. Chandra(1957-1962). Ce cinquième supplément répertorie 3435 noms d'espèces publiés de 1962 à 1972.

Il est heureux que cet index des champignons de l'Inde soit ainsi continué grâce au dynamisme des mycologues indiens. On regrettera peut-être qu'ils n'ont pas groupés les genres par classe comme dans les volumes précédents. Cette disposition eut aidé la recherche des champignons d'une même classe et la comparaison avec les volumes précédents, sans compter l'épargne de quelques 900 lignes typographiques.

FUNGI. BASIDIOMYCETES. BOLETALES (Grzyby. Podstawczaki, Borowikowe), par Alina SKIRGIEŁŁO, 1960, version revisée 1975 traduite du polonais en anglais par A. Radziwiłł, 132 p., 51 figs., 30 pls. cols., toilé, Warsaw, 1975. Distribué par U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia 22161, USA (Document TT-54039). Prix non indiqué.

Après la parution des traductions des volumes 2 et 3 de la même série polonaise FUNGI (Grzyby), qui traitaient des Polyporés et familles voisines par Stanislas Domański, il est agréable de présenter la traduction d'une version corrigée du premier volume. La qualité de l'édition est excellente. L'ouvrage est de niveau scientifique et l'amateur y est introduit par un chapitre préliminaire et aidé d'un lexique terminologique.

L'auteur décrit 52 espèces et 26 variétés et formes existant en Pologne, 5 autres probables et 5 encore mais douteuses. Elle crée 18 combinaisons nouvelles de formes et variétés dans *Boletus rubellus*, *B. edulis*, *Leccinum aurantiacum* et *L. scabrum*.

L'ouvrage est rehaussé de très belles aquarelles dépeignant 35 espèces et 12 variétés.

Deux 'lapsus' de nomenclature ont été trouvés: *Boletus rubellus* "var. *versicolor*" (p.73) doit sans doute se lire "var. *rubellus*" et *Leccinum scabrum* "f. *rotundifoliae*" sans doute se lire "f. *rotundifoliae* (Sing.) comb. nov." (p.94).

LES CHAMPIGNONS COMESTIBLES ET VENENEUX, par † André MAUBLANC 6e édition revue par G. VIENNOT-BOURGIN (1971), Encyclopédie pratique du Naturaliste, vol. 22: TOME I. TEXTE GENERAL, vi + 305 p., vol. 23: TOME II. ATLAS, 279 p., 226 pls. cols., 16°, toilé, 2e tirage daté "1974" (sorti le 17 septembre 1975). Ed. Lechevalier, 19 rue Augereau, 75007 Paris. Prix FF 150.oo.

Le "MAUBLANC" est certainement l'ouvrage sur les champignons le plus vendu à travers le monde, puisque, à l'épuisement du présent tirage 1975 prévu pour cet été 1976, 100.000 exemplaires auront été vendus depuis la première édition. Les quatre premières éditions parurent en 1921, 1926-27, 1939 et 1952 sous la responsabilité de l'auteur et avec les deux titres CHAMPIGNONS DE FRANCE en couverture et LES CHAMPIGNONS COMESTIBLES ET VENENEUX en page de tête. C'est le second titre qui fut seul retenu pour la 5e édition revue par G. VIENNOT-BOURGIN en 1959. La 6e édition ne diffère de la précédente que par l'addition de la description et des aquarelles de deux espèces vénéneuses mortelles.

Ce qui a garanti à l'ouvrage un tel succès, c'est d'abord la clarté et la précision des clés et des descriptions incluant aussi des caractères microscopiques et des commentaires taxonomiques, mais aussi l'excellente qualité des planches en couleurs représentant avec grande véracité les formes et couleurs les plus caractéristiques des champignons et de leurs spores. 177 des 226 planches sont les aquarelles originales de Juliette Boully qui, au nombre de 185, ont illustré l'ouvrage depuis sa 2e édition. Trois d'entre elles représentant les Amanites blanches ont malheureusement été remplacées par des photographies en blanc-noir; de même cinq autres ont été substituées par des aquarelles récentes. 7 aquarelles sont de P. Konrad (non cité dans cette édition), 30 sont de F. Porchet (depuis la 3e édition) et 11, plus récentes et d'une autre qualité, de A. Bertaux et H. Essette. L'éditeur a cherché à maintenir l'exactitude des couleurs et y a assez souvent réussi.

La revision du texte, lors de la 5e édition en 1959, a essentiellement porté sur la nomenclature: 35 noms des 321 espèces ont alors été mis à jour, les autres restant inchangés depuis les premières éditions de 1921, 1926 ou 1939. Si l'on sait que plus de 80 autres noms devraient encore être revisés pour s'accorder avec la taxonomie moderne, on verra combien la nomenclature de ce livre est restée traditionnelle. Ce ne serait encore qu'un demi mal. Mais plus de 220 citations d'auteurs des espèces illustrées et l'orthographe d'une dizaine d'épithètes (sans compter encore les nombreux synonymes et autres espèces citées dans le texte) sont incorrectes. Ceci est d'autant plus regrettable que ce livre si attrayant est, du fait de sa grande diffusion, un moyen inestimable de formation à cette science en progrès constant qu'est la mycologie. D'ailleurs ce serait se tromper que de croire le mycologue amateur ou débutant rebuté par la modification du nom des champignons; surtout s'il est aidé d'une synonymie correcte lui rappelant l'ancienne dénomination, son désir d'ajuster toujours ses connaissances lui fera vite surmonter la difficulté. On voudrait espérer que lors du tirage prochain de ce livre, les noms adoptés soient correctement cités et qu'une liste de correspondance avec la nomenclature d'aujourd'hui puisse y être ajoutée. Ce serait donner à l'ouvrage la qualité scientifique qu'il mérite et que le lecteur en attend.

DIE TERRESTRISCHEN STACHELPILZE EUROPAS. THE TERRESTRIAL HYDNUMS OF EUROPE, par R. A. MAAS GEESTERANUS. Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen, Afd. Natuurkunde, 2e série, vol. 65, 126 p., 58 figs., 40 pls. (aquarelles par J. H. VAN OS et R. A. MAAS GEESTERANUS), broché, 1975. North Holland Publishing Co., Amsterdam, Prix Dfl 85.oo.

Cette monographie des Hydnums stipités terricoles d'Europe fournit la description de 42 espèces d'Auriscalpium, Bankera, Phellodon, Sistostrema, Hydnum, Hydnellum et Sarcodon, sur la base de l'étude des types, de relevés de terrains et d'études anatomiques.

L'auteur a eu l'heureuse idée de présenter la partie taxonomique de l'ouvrage ainsi que les clés d'identification dans les deux langues allemande et anglaise, afin d'aider le plus grand nombre de lecteurs.

L'illustration du texte consiste presque exclusivement dans des dessins de spores. On n'y trouvera pas l'illustration des structures microscopiques de l'hyménium et de la chair dont il est parlé dans les clés et les descriptions. Par contre, on admirera les très belles aquarelles représentant 40 des espèces décrites.

Cinq espèces, Hydnellum tardum, H. coalitum, Sarcodon cyrneus, S. lepidus et S. regalis, sont nouvelles; de même, 3 sections du genre Hydnellum et une section de Sarcodon. Une espèce de Sarcodon reste sans nom.

Par la qualité du texte et la beauté de son illustration, ce livre, comme le précédent du même auteur, HYDNACEOUS FUNGI IN THE EASTERN WORLD, s'affirme de grande valeur.

THE BIRD'S NEST FUNGI, par Harold J. BRODIE, 200 p., 64 figs., relié toilé, 1975. University of Toronto Press, Toronto, Canada M5S 1A6; 33 East Tupper street, Buffalo, NY 14203,USA. Prix US $ 25.oo.

Oeuvre de toute une vie, the BIRD'S NEST FUNGI est plus qu' une revision de cinq genres de Nidulariaceae, Cyathus, Crucibulum, Mycogalia, Nidula et Nidularia, au total 61 espèces et 1 forme (dont 11 espèces et 1 forme de l'auteur). C'est une monographie au plein sens du mot, où l'auteur s'attache avec autant d' ingéniosité que de science à préciser la biologie de ces champignons et leur mode de croissance, de fructification et de dispersion sur la base d'observations de terrain et d'expérimentations inédites sur cultures de laboratoire.

La plupart des espèces étudiées par l'auteur ontété obtenues en culture à partir des basidiospores, malgré la difficulté d'induire leur germination. Le comportement cultural et sexuel des homocaryons et des dicaryons et la production de fructifications dans des conditions contrôlées ont permis à l'auteur de définir le type sexuel de 21 espèces: toutes tétrapolaires à l'exception de 2, Mycogalia denudata, bipolaire hétérothalle et homothalle facultative et M. duriaeana homothalle.

L'énigmatique mécanisme de la dispersion des péridioles a passionné l'auteur, à l'exemple de Tulasne. Par de multiples observations et expériences, l'auteur a démontré qu'une goutte d'eau, à la vitesse de chute de 4 à 8 m/sec., est capable d'éjecter avec force les péridioles hors de la coupe en brisant la gaine du funicule et libérant le harpon d'hyphes adhésives qui termine le cordon funiculaire empaqueté dans la gaine. Le harpon s'accrochera au premier support rencontré et la péridiole retenue par le cordon y restera attachée. Une merveille de la nature qu'il nous est donné de découvrir avec l'enthousiasme de l'auteur.

Le livre est excellemment conçu et édité, abondamment illustré de dessins, de photographies et aussi d'humour.

ZUR ÖKOLOGIE DER PORLINGE. UNTERSUCHUNGEN UBER DIE SPORULATION EINIGER PORLINGE UND DIE AN IHNEN GEFUNDENEN KÄFERARTEN, par Ingo NUSS, Bibliotheca Mycologica, vol. 45, 258 p., 62 figs., 36 tab., broché, 1975. J. Cramer, FL-9490 Vaduz, Liechtenstein. Prix DM 50.oo.

L'ouvrage comporte deux pôles d'intérêt distincts mais relatifs de l'écologie des Polypores, l'écologie de la sporulation et l'incidence des insectes.

Par des observations sur 86 carpophores en place de 27 espèces de Polypores, répétées chaque semaine durant deux ans, l'auteur met en évidence la périodicité saisonnière de la sporulation, la fréquence des arrêts de sporulation, la durée de la sporulation en rapport avec la longévité et la vitesse de croissance des carpophores, l'influence des conditions climatiques (humidité relative et température de l'air) sur le rythme, le départ et la durée de la sporulation et enfin les rythme journaliers de libération des spores. Il examine aussi la relation entre le rythme de la sporulation et les variations dans la forme et les dimensions des basidiospores. Ces observations très nombreuses, précises et statistiques sont finalement formulées en principes et aboutissent à une classification écologique des espèces étudiées. En plus de cela, l'auteur fait une revue fouillée de toutes les connaissances acquises en la matière .

Ensuite, l'auteur relate ses observations sur l'incidence des coléoptères dans les carpophores, en relation avec l'espèce, le développement et la sporulation de ceux-ci. 153 espèces appartenant à 28 familles de coléoptères ont été relevées en un an sur 20 espèces de Polypores. Les Staphylinidae sont les mieux représentés et Laetiporus sulphureus et Polyporus squamosus sont les plus habités. L'auteur étudie aussi la nutrition des insectes mycophages et son rôle dans la dissémination des spores.

Ce livre contribue indiscutablement à l'avancement de l'écologie des basidiomycètes. Il apporte aussi d'intéressantes données sur la relation faune-fonge qui dans les biocénoses joue souvent un rôle important.

WOOD-INHABITING FUNGI OF ALDER FOREST IN NORTH-CENTRAL SCANDINAVIA. I. APHYLLOPHORALES (BASIDIOMYCETES). TAXONOMY, ECOLOGY AND DISTRIBUTION, par Åke STRID, Wahlembergia, Scripta Botanica Umensia, Prof. Bengt PETTERSSON édit., vol. 1, 237 p., 219 figs., 1975. University of Umeå, Department of Ecological Botany, S-90187 Umeå, Sweden. Prix Skr 45.oo, US $ 10.oo.

WAHLEMBERGIA est un nouveau périodique publié par le Département de Botanique et d'Ecologie de l'Université de Umeå, paraissant à intervale irrégulier. Chaque volume consiste en une monographie ou plusieurs travaux originaux dans les domaines de l'écologie et de la botanique systématique. Ce journal, auquel nous souhaitons la bienvenue, a consacré son premier volume à l'écologie des champignons. Les volumes 2 (1975) et 3 (1976) traitent d'écologie végétale. Le journal est vendu par volume ou par souscription.

Dans ce volume, STRID répertorie la flore des champignons lignicoles des forêts littorales et riveraines à Alnus glutinosa et A. incana du Nord et du Centre de la Suède et de la Norvège. Il en analyse alors la distribution et les caractéristiques écologiques. Cinq mille récoltes d'Aphyllophorales dans une centaine de localités ont mis en évidence 286 espèces, dont 6 non encore identifiées.Quatre recombinaisons sont proposées dans Hypochnicium, Phlebia et Systotrema.

THE CORTICIACEAE OF NORTH EUROPE, par John ERIKSSON et Leif RYVARDEN. VOL. I. (texte, clés, glossaire et index), p.1-59, figs. 1-20, (en préparation); VOL. II. ALEURODISCUS - CONFERTOBASIDIUM, p. 60-286, figs. 21-110, 24 pls., 1973; VOL. III. CORONICIUM - HYPHODERMA, p. 287-546, figs. 111-256, 1975; broché. Editions Fungiflora, Blindernveien 46C, Oslo-3, Norvège. Prix vol. 2: Nkr 54.oo, US $ 9.oo; vol. 3: Nkr 70.oo US $ 12.oo.

Les excellents dessins de John ERIKSSON, accompagnés de nombreuses photographies, illustrent un texte clair et précis et placent cette flore des Corticiaceae du Nord de l'Europe parmi les meilleurs ouvrages sur cette famille. L'intention de l'auteur est de présenter, avec une nomenclature correcte, des descriptions d'espèces permettant leur diagnose. Traité dans un ordre alphabétique, chaque genre est décrit et accompagné d'une clé des espèces. Chaque espèce est abondamment illustrée. 43 genres sont traités dans les volumes II et III; 3 genres sont nouveaux: Ceraceomerulius (3 espèces), Coronicium (1 espèce) et Fibriciellum (1 espèce). 143 espèces sont décrites, 9 sont nouvelles et 16 recombinées.

L'entreprise de cette flore, avec de telles qualités, est hardie, mais l'auteur la réussit. Plusieurs volumes sur la partie taxonomique devront encore paraître avant que le premier volume ne soit publié. Un ouvrage qui s'impose et est à suivre.

THE POLYPORACEAE OF NORTH EUROPE. VOL. I. ALBATRELLUS - INCRUSTOPORIA, par Leif RYVARDEN, 214 p., 87 figs., 1976. Editions Fungiflora, Blindernveien 46C, Oslo-3, Norvège. Prix Nkr 75.oo.

Ce volume est le premier de deux, devant couvrir tous les champignons poroïdes connus de l'auteur dans la moitié septentrionale de l'Europe, y compris l'Angleterre et les Pays-Bas. Au début de ce volume une clé des 49 genres à traiter est donnée. Ce volume décrit 76 espèces dans 28 genres de Albatrellus à Incrustoporia. L'illustration est abondante. Comme les autres publications de Fungiflora, cette flore est à la portée de tous, didactique et de qualité.

AN INDEX OF THE COMMON FUNGI OF NORTH AMERICA (SYNONYMY AND COMMON NAMES), par Orson K. MILLER et David F. FARR. Bibliotheca Mycologica, vol. 44, 206 p., broché, 1975. J. Cramer FL-9490 Vaduz, Liechtenstein. Prix DM 100.oo.

C'est une très heureuse initiative de mettre à jour la nomenclature des trente Guides des Champignons les plus utilisés aux Etats Unis et au Canada, depuis le MUSHROOMS AND THEIR USE de Charles H. Peck (1897) jusqu'au MUSHROOM POCKET FIELD GUIDE de H. E. Bigelow (1974) en passant par Atkinson, Güsson & Odell, etc.

Le livre consiste dans la liste des noms des 400 espèces publiées dans ces Guides, après correction conformément à la taxonomie et la nomenclature moderne. Les noms d'espèces sont disposés par genre avec l'indication des synonymes les plus usités et des noms vernaculaires anglais. Un index alphabétique des épithètes spécifiques permet de retrouver l'épithète correcte et son assignation générique.

L'utilité de cet index est évidente et sa nécessité indiscutable. Le mycologue amateur ou débutant se réjouira de le posséder. Le spécialiste aussi y trouvera un outil précieux, à condition de savoir que la référence aux auteurs préfriesiens a été omise dans un certain nombre de cas et que quelques rares erreurs typographiques subsistent.

On ne peut que recommander l'usage de ce livre et, grâce à lui, l'adoption d'une nomenclature moderne et correcte dans la publication de tout nouveau Guide des Champignons pour l'amateur.

A MONOGRAPHIC STUDY OF THE GENUS POUZARELLA, A NEW GENUS IN THE RHODOPHYLLACEAE, AGARICALES, BASIDIOMYCETES, par S. J. MAZZER. Bibliotheca Mycologica, vol. 46, 191 p., 85 figs., broché, 1976. J. Cramer, FL-9490 Vaduz, Liechtenstein. Prix DM 40.oo.

La reconnaissance de la section Induti dans le genre Rhodophyllus par Kühner et Romagnesi (1953) a constitué pour l'auteur le point de départ du concept générique Pouzarella Mazzer. L'auteur démontre que l'homogénéité du groupe s'affirme dans les affinités morphologiques des espèces et se retrouve dans son écologie confinée au bois en décomposition avancée ou l'humus qui en résulte, dans des forêts très humides de plaines marécageuses, à végétation mixte de conifères et de feuillus. L'auteur assigne au genre Pouzarella 31 espèces, dont 5 nouvelles, qu'il classe en trois sections, sect. Pouzarella (3 espèces), sect. Versatiles (11 espèces) et sect. Dysthales (17 espèces).

THE FUNGAL SPORE: FORM AND FUNCTION, édité par Darell J. WEBER et Wilford M. HESS, 865 p., illustr., relié toilé, 1976. John Wiley & Sons, Baffins Lane, Chichester, Sussex PO19 1UD, England. Prix £ 18.15, US $ 33.3o.

Communications originales présentées par 35 chercheurs au Second Symposium International sur la Spore fongique qui eut lieu à Brigham Young University, en 1974. Ce compte-rendu fait suite à celui du Premier Symposium de Bristol, édité par M.F. Madelin sous le titre THE FUNGUS SPORE (1966). Le premier symposium avait considéré la morphologie et la morphogenèse des spores. Le second étudie les variations et modifications de forme, de structure et de composition des spores durant la maturité, la dormance et la germination et étudie les mécanismes de ces trois états successifs pour mieux comprendre la fonction de la spore.

Contenu en bref: la dormance; inhibiteurs et activateurs de la germination; métabolisme des carbohydrates, lipides et protéines durant la germination; acides nucléiques et germination; changement des organelles durant la germination; relation forme-fonction chez les spores de chaque classe de champignons des Myxomycètes aux Deuteromycètes; spores fossiles.

Un fait transcende l'ensemble du livre: l'apport important de la microscopie électronique sur la structure fine de la spore et la genèse de ses parois.

RECENT ADVANCES IN AQUATIC MYCOLOGY, édité par E. B. GARETH JONES, 749 p., illust., relié toile, 1976. Paul Elek Science, 54-58 Caledonian Road, London N1 9RN; Halsted Press, U.S.A. Prix £ 21.oo, US $ 49.5o.

Depuis trente ans, les champignons aquatiques ont beaucoup retenu l'attention des mycologues; aujourd'hui les écologistes s'y intéressent aussi. Sept Sections du Ier Congrès International de Mycologie à Exeter (1971) concernaient les champignons aquatiques marins et d'eaux douces. Là est née l'idée de ce livre.

Il se divise en 2 sections: l'une traite des champignons marins, l'autre des champignons d'eaux douces. Chaque section est divisée en deux sous-sections: (A) Ascomycètes, Basidiomycètes et Deuteromycètes et (B) Phycomycètes. Dans chaque sous-section, le lecteur trouvera plusieurs chapitres sur les caractères morphologiques et les affinités de ces champignons, un chapitre sur leur structure fine et leur composition, et plusieurs autres sur leur écologie, leur physiologie et leurs activités de pathogénie et de biodégradation.

Une très large information a été réunie dans ce volumineux ouvrage, recensée par 27 des meilleurs spécialistes, y compris le Dr. GARETH JONES lui-même. Celui-ci, en tant qu'éditeur, est aussi à féliciter pour l'attachante conception de l'ouvrage et l'harmonie de ses parties. Son livre n'est pas une pure compilation, mais une synthèse de connaissances, ouverte vers des recherches futures.

Le livre n'a pas été non plus une revue systématique exhaustive des champignons aquatiques; le taxonomiste y trouvera cependant des chapitres remarquables sur les Phycomycètes marins (T.W. JOHNSON), les Plasmodiophoromycètes et Oomycètes marins (F. K. SPARROW), les Phycomycètes uniflagellés et leur milieu (C.E. MILLER) les levures océaniques (J.N. TELL), la relation forme-fonction chez les Ascomycètes et Fungi Imperfecti d'eaux douces (C.T. INGOLD)et les Trichomycètes (R.W. LICHTWARDT).

Tout mycologue soucieux de connaître la vie fongique dans l'eau de notre planète devra ouvrir ce livre.

ON MUCOR CIRCINELLOIDES, MUCOR RACEMOSUS AND RELATED SPECIES, par M. A. SCHIPPER. Studies in Mycology, no. 12, 40 p., 13 figs., 1 pl., 1976. Centraalbureau voor Schimmelcultures, Baarn, Pays-Bas. Prix Dfl 15.oo.

Après ses études précédentes des groupes <u>hiemalis</u> (1973), <u>mucedo</u> et <u>flavus</u> (1975) (voir Mycotaxon 3(3):486, 1976), l'auteur analyse cette fois le groupe <u>circinelloides</u> (<u>Mucor circinelloides</u> avec 4 formes, <u>M. ramosissimus</u>, <u>M. bainieri</u> et <u>M. zonatus</u>) et le groupe <u>racemosus</u> (<u>M. racemosus</u> avec 3 formes, <u>M. plumbeus</u> et <u>M. fuscus</u>).

Cette revision taxonomique est basée sur l'étude de souches vivantes, types et autres, et leur interfertilité. Les formes de <u>Mucor circinelloides</u>, qui étaient considérées comme espèces, sont interfertiles, de même les formes de <u>M. racemosus</u>. Les appariements de ces deux espèces entre elles et avec <u>M. plumbeus</u> n'engendrent que des zygospores stériles.

Cette étude démontre clairement la grande variabilité morphologique de certaines espèces ou de certaines souches, en fonction de la température, de la lumière et du substrat. Cependant l'auteur arrive à présenter une bonne clé d'identification de ces espèces.

A MONOGRAPH OF CHALARA AND ALLIED GENERA, par T. R. NAG RAJ et W. B. KENDRICK, 200 p., 61 figs., relié toilé, 1975. Wilfrid Laurier University Press, Waterlo, Ontario N2L 3C5, Canada. Prix Can $ 9.oo.

Les auteurs présentent une révision taxonomique du genre hyphomycète Chalara, monomorphique, auquel ils assimilent les deux genres pléomorphiques Thielaviopsis (syn. Hughesiella et Stilbochalara) et Chalariopsis dont ils considèrent les noms comme synonymes, de même que ceux de Cylindrocephalum et Excioconidium.

Le concept générique Chalara est dès lors considérablement élargi par l'entrée de 8 espèces dimorphiques produisant, en plus des phialoconidies, des conidies holoblastiques et thalliques que les auteurs appellent "chlamydospores" les considérant comme secondaires ou de valeur marginale. Sans vouloir ériger en principe la ségrégation générique des espèces pléomorphiques sur la base de leur pléomorphisme, on peut cependant s'interroger sur la signification de ce pléomorphisme et des caractères culturaux particuliers de ces espèces du point de vue de l'affinité de ces espèces avec le reste du genre.

L'option nomenclaturale des auteurs est intéressante à considérer en face des problèmes d'interprétation de l'article 59 du Code International de Nomenclature . Selon cet article, comme on sait, l'application de l'épithète spécifique et du nom générique est, chez les champignons imparfaits, limitée à la seule forme imparfaite. S'il y a plusieurs formes imparfaites chez le même champignon, la question est de savoir si le nom générique et l'épithète spécifique auront une application globale (comme en toute bonne nomenclature botanique) couvrant donc toutes les formes conidiennes associées, ou s'ils auront une application particulière, ne couvrant qu'une seule forme conidienne ou partie anatomique du champignon, ou enfin l'épithète spécifique aura-t-elle une application globale à l'espèce tandis que le nom générique n'aurait qu'une portée anatomique c'est-à-dire qu'il n'indiquerait que l' appartenance de l'espèce à un groupe anatomique? Là subsiste le doute. Mais déjà trois systèmes nomenclaturaux peuvent se concevoir et ont déjà été appliqués de manière plus ou moins évidente dans la littérature sur les Fungi Imperfecti.

Dans le présent travail, l'option des auteurs n'est pas suffisament explicitée; des doutes subsistent. Il semble que leur intention est d'adopter une nomenclature "botanique" de l'article 59 du Code, puisqu'il rejette comme inadmissible une nomenclature purement anatomique et critique le système intermédiaire anatomico-botanique parce qu'il laisserait place à "a multiplicity of state-generic names" pour désigner les formes conidiennes alors que "the fungus in its entirety is without a name".

Sur le plan générique, si l'inclusion des genres Chalaropsis et Thielaviopsis, pléomorphiques, dans le genre Chalara, monomorphique, peut être interprété comme l'adoption d'un concept "botanique" du genre Chalara, typifié par une espèce imparfaite plutôt que par une forme conidienne, on ne comprend pas alors pourquoi les auteurs nomment la forme phialidique "Chalara state" et la désignent comme "lectostate" de Chalaropsis et Thielaviopsis rendant ainsi le concept de ces deux genres monomorphique pour les placer en synonymie du genre monomorphique Chalara. C'est là une procédure de traitement des genres pléomorphiques caractéristique d'un système "anatomique" de nomenclature.

Sur le plan spécifique, l'option des auteurs restent ambiguë. Puisque dans un système "botanique" de nomenclature des champignons imparfaits, les épithètes spécifiques doivent s'appliquer à toute la phase imparfaite du champignon et l'épithète correcte choisie selon sa priorité, indépendamment de la forme conidienne ou hyphale particulière qui la typifie, on s'attendait à ce que les auteurs, s'ils adoptent un système "botanique" au niveau de l'espèce, appliquent ce principe aux épithètes d'espèces pléomorphiques de Chalara. Malheureusement, seuls deux des quatre noms spécifiques appliqués à des espèces pléomorphiques dans Chalara sont corrects, Chalara thielavioides et C. ovoidea, les autres n'étant pas en accord avec un système "botanique" au niveau de l'espèce. En effet Chalara paradoxa est incorrect, puisque deux épithètes synchrones prioritaires, Cylindrium intermixtum McAlpine et Coniosporium radicicola McAlpine, sont disponibles, quoiqu'elles aient été typifiées par une seule forme conidienne. De même l'épithète de Torula basicola Berk. & Br. ne devait pas être écartée parce que typifiée par la seule forme conidienne thallique et être remplacée par une nouvelle épithète, Chalara elegans, basée sur un nouveau type porteur de la forme phialidique et publiée comme "espèce" nouvelle. Puisque dans ces deux cas, il est refusé aux épithètes données à des formes d'une même espèce le droit de s'appliquer à l'entièreté de l'espèce imparfaite, il faut reconnaître que les auteurs appliquent un système "anatomique" de nomenclature où l'espèce peut avoir autant de noms que de formes imparfaites. Si l'intention des auteurs est d'appliquer un système "botanique", le nom Chalara elegans Nag Raj & Kendrick est nomen superfluum.

Huit espèces d'Ascomycètes ont une phase imparfaite Chalara, sept Ceratocystis, C. autographa, C. adiposa, C. coerulescens, C. fagacearum, C. moniliformis, C. paradoxa, C. radicicola, et l'espèce Cryptendoxyla hypophloia. Cette phase imparfaite est citée comme "Chalara state of ..." et aucune épithète, même si elle est disponible (p. ex. C. punctulata considéré comme synonyme), n'est appliquée à ces phases imparfaites. Mais dans les trois cas de Ceratocystis coerulescens, C. fagacearum et C. paradoxa, les auteurs renvoient à des espèces imparfaites qu'ils dénomment et numérotent séparément, respectivement Chalara ungeri, C. quercina et C. paradoxa. Ils expriment le doute qui subsiste sur la connection de Chalara ungeri avec Ceratocystis coerulescens, mais se taisent sur les deux autres cas. Serait-ce dire que la connection entre ces autres espèces seraient aussi douteuse?

Le genre Chalara, tel que revu par les auteurs, comprend 70 espèces, desquelles la contribution des auteurs est 27 espèces nouvelles et 8 décrites par eux en 1974. C'est dire l'importance de la contribution des auteurs.

L'étude a essentiellement été basée sur du matériel d'herbier. Les auteurs eux-mêmes regrettent n'avoir pu étudier qu'un petit nombre d'espèces (4) en culture. Cela ne diminue pas la qualité de cette étude, la précision des descriptions et la valeur des figures.

Les auteurs récapitulent aussi la taxonomie de quelques genres voisins, Chaetochalara, Sporoschisma, Fusichalara, Sporendocladia, Bloxamia et Ascoconidium. Ils décrivent aussi deux discomycètes nouveaux, Calycellina carolinensis et Hyaloscypha cladii, étroitement associés ou connectés à Chaetochalara aspera et C. cladii.

La bienvenue sera certainement donnée à cette monographie dont les qualités sont indéniables et l'édition attrayante.

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